LA-SUB--94-44-App. 2

Contract No. 9 - LQ3 - 2465J - 1

FINAL REPORT

MAY 28, 1992

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Pye Construction Technologies Inc.,

Santa Fe, New Mexico

MASTER

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Appendix II

Embankment Analyses of Line D Tunnel Structures

Computational Brief No.	Title
CB-1010-6 (T/21)	Structural Assessment of Tunnel Section 6(T/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-5(21/21)	Structural Assessment of Tunnel Section 5(21/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-3(21/21)	Structural Assessment of Tunnel Section 3(21/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-2(21/21) /	Structural Assessment of Tunnel Section 2(21/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-1(21/21)	Structural Assessment of Tunnel Section 1(21/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-2(21/24)	Structural Assessment of Tunnel Section 2(21/24) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
CB-1010-1(21/24)	Structural Assessment of Tunnel Section 6(T/21) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel

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Appendix II (Cont'd)

- CB-1010-3(23/23) Structural Assessment of Tunnel Section 3(23/23) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
- CB-1010-5(21/21)S Structural Assessment of Tunnel Section 5(21/21)S when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
- CB-1010-5(21/21)S Structural Assessment of Tunnel Section 5(21/21)S when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel
- CB-1010- 5 (2/8) Structural Assessment of Tunnel Section 5(2/8) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-6(T/21)

TITLE: Structural Assessment of Tunnel Section 6(T/21) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 6(T/21)) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft² for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY: _____

DATE: _____

Figure() Section 6(T/21) Compacted Tuff Shield Configuration

Figure() Section 6(T/21) Excavation and Backfill Configuration

FRAME MAC file: 6(T/21) EMBANK; Last modified at 13:01:46 on Mon, Mar 22, 1993

Node	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	Node
0.000	1.033	2.067	3.100	4.133	5.167	6.200	7.233	8.267	9.300	10.333	11.367	12.400	13.433	14.467	15.500	
7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500	7.500

Continuous Elements Output Data

FRAME MAC file: 6(T/21) EMBANK.

Last modified at 13:01:46 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
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45	0.001	-0.161	-0.003
46	0.001	-0.198	-0.003
47	0.001	-0.240	-0.003
48	0.000	-0.282	-0.003
49	0.000	-0.322	-0.003
50	0.000	-0.354	-0.002
51	0.000	-0.377	-0.001
52	0.000	-0.389	-0.000
53	-0.000	-0.389	0.000
54	-0.000	-0.377	0.001
55	-0.000	-0.354	0.002
56	-0.000	-0.322	0.003
57	-0.001	-0.282	0.003
58	-0.001	-0.240	0.003
59	-0.001	-0.198	0.003
60	-0.001	-0.161	0.003

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
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45,46	0.000	1244.133	214.267	0.000	1243.401	-214.267
46,47	0.000	1244.133	214.267	0.000	1243.401	-214.267
47,48	0.000	1244.133	214.267	0.000	1243.401	-214.267
48,49	0.000	1244.133	214.267	0.000	1243.401	-214.267
49,50	0.000	1244.133	214.267	0.000	1243.401	-214.267
50,51	0.000	1244.133	214.267	0.000	1243.401	-214.267
51,52	0.000	1244.133	214.267	0.000	1243.401	-214.267
52,53	0.000	1244.133	214.267	0.000	1243.401	-214.267
53,54	0.000	1244.133	214.267	0.000	1243.401	-214.267
54,55	0.000	1244.133	214.267	0.000	1243.401	-214.267
55,56	0.000	1244.133	214.267	0.000	1243.401	-214.267
56,57	0.000	1244.133	214.267	0.000	1243.401	-214.267
57,58	0.000	1244.133	214.267	0.000	1243.401	-214.267
58,59	0.000	1244.133	214.267	0.000	1243.401	-214.267
59,60	0.000	1244.133	214.267	0.000	1243.401	-214.267

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
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45,46	4301.827	18656.883	34910.431	-4301.827	-16169.349	-16917.256
46,47	4301.827	16169.349	16917.256	-4301.827	-13681.815	-1494.532
47,48	4301.827	13681.815	1494.532	-4301.827	-11194.281	11357.739
48,49	4301.827	11194.281	-11357.739	-4301.827	-8706.747	21639.559
49,50	4301.827	8706.747	-21639.559	-4301.827	-6219.213	29350.927
50,51	4301.827	6219.213	-29350.927	-4301.827	-3731.679	34491.843
51,52	4301.827	3731.679	-34491.843	-4301.827	-1244.145	37062.307
52,53	4301.827	1244.145	-37062.307	-4301.827	1243.389	37062.320
53,54	4301.827	-1243.389	-37062.320	-4301.827	3730.923	34491.880
54,55	4301.827	-3730.923	-34491.880	-4301.827	6218.457	29350.989
55,56	4301.827	-6218.457	-29350.989	-4301.827	8705.991	21639.646
56,57	4301.827	-8705.991	-21639.646	-4301.827	11193.525	11357.852
57,58	4301.827	-11193.525	-11357.852	-4301.827	13681.059	-1494.395
58,59	4301.827	-13681.059	1494.395	-4301.827	16168.593	-16917.093
59,60	4301.827	-16168.593	16917.093	-4301.827	18656.127	-34910.243

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
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45,46	0.001	-0.161	-0.003	0.001	-0.198	-0.003
46,47	0.001	-0.198	-0.003	0.001	-0.240	-0.003
47,48	0.001	-0.240	-0.003	0.000	-0.282	-0.003
48,49	0.000	-0.282	-0.003	0.000	-0.322	-0.003
49,50	0.000	-0.322	-0.003	0.000	-0.354	-0.002
50,51	0.000	-0.354	-0.002	0.000	-0.377	-0.001
51,52	0.000	-0.377	-0.001	0.000	-0.389	-0.000
52,53	0.000	-0.389	-0.000	-0.000	-0.389	0.000
53,54	-0.000	-0.389	0.000	-0.000	-0.377	0.001
54,55	-0.000	-0.377	0.001	-0.000	-0.354	0.002
55,56	-0.000	-0.354	0.002	-0.000	-0.322	0.003
56,57	-0.000	-0.322	0.003	-0.001	-0.282	0.003
57,58	-0.001	-0.282	0.003	-0.001	-0.240	0.003
58,59	-0.001	-0.240	0.003	-0.001	-0.198	0.003
59,60	-0.001	-0.198	0.003	-0.001	-0.161	0.003

Maximum deformations:

Node 60 moved 0.001 inch to the left.
Node 45 moved 0.001 inch to the right.
Node 52 moved 0.389 inch downwards.
No nodes moved upwards.
Node 47 rotated 0.003 radian clockwise.
Node 58 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
45,46	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
46,47	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
47,48	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
48,49	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
49,50	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
50,51	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
51,52	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
52,53	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
53,54	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
54,55	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
55,56	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
56,57	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
57,58	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
58,59	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
59,60	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
45,46	18656.883	0.000	18656.883	129.562	0.000	129.562
46,47	16169.349	0.000	16169.349	112.287	0.000	112.287
47,48	13681.815	0.000	13681.815	95.013	0.000	95.013
48,49	11194.281	0.000	11194.281	77.738	0.000	77.738
49,50	8706.747	0.000	8706.747	60.464	0.000	60.464
50,51	6219.213	0.000	6219.213	43.189	0.000	43.189
51,52	3731.679	0.000	3731.679	25.914	0.000	25.914
52,53	1244.145	-1243.389	1244.145	8.640	-8.635	8.640
53,54	0.000	-3730.923	-3730.923	0.000	-25.909	-25.909
54,55	0.000	-6218.457	-6218.457	0.000	-43.184	-43.184
55,56	0.000	-8705.991	-8705.991	0.000	-60.458	-60.458
56,57	0.000	-11193.525	-11193.525	0.000	-77.733	-77.733
57,58	0.000	-13681.059	-13681.059	0.000	-95.007	-95.007
58,59	0.000	-16168.593	-16168.593	0.000	-112.282	-112.282
59,60	0.000	-18656.127	-18656.127	0.000	-129.556	-129.556

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
45,46	0.000	-34910.431	-34910.431	0.000	-1454.601	-1454.601
46,47	0.000	-16917.256	-16917.256	0.000	-704.886	-704.886
47,48	11357.739	-1494.532	11357.739	473.239	-62.272	473.239
48,49	21639.559	0.000	21639.559	901.648	0.000	901.648
49,50	29350.927	0.000	29350.927	1222.955	0.000	1222.955
50,51	34491.843	0.000	34491.843	1437.160	0.000	1437.160
51,52	37062.307	0.000	37062.307	1544.263	0.000	1544.263
52,53	37383.715	0.000	37383.715	1557.655	0.000	1557.655
53,54	37062.320	0.000	37062.320	1544.263	0.000	1544.263
54,55	34491.880	0.000	34491.880	1437.162	0.000	1437.162
55,56	29350.989	0.000	29350.989	1222.958	0.000	1222.958
56,57	21639.646	0.000	21639.646	901.652	0.000	901.652
57,58	11357.852	-1494.395	11357.852	473.244	-62.266	473.244
58,59	0.000	-16917.093	-16917.093	0.000	-704.879	-704.879
59,60	0.000	-34910.243	-34910.243	0.000	-1454.593	-1454.593

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
45,46	0.000	-0.198	-0.198
46,47	0.000	-0.240	-0.240
47,48	0.000	-0.282	-0.282
48,49	0.000	-0.322	-0.322
49,50	0.000	-0.354	-0.354
50,51	0.000	-0.377	-0.377
51,52	0.000	-0.389	-0.389
52,53	0.000	-0.390	-0.390
53,54	0.000	-0.389	-0.389
54,55	0.000	-0.377	-0.377
55,56	0.000	-0.354	-0.354
56,57	0.000	-0.322	-0.322
57,58	0.000	-0.282	-0.282
58,59	0.000	-0.240	-0.240
59,60	0.000	-0.198	-0.198

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
At the intermediate nodes:		
1.033	-0.003	-0.198
2.067	-0.003	-0.240
3.100	-0.003	-0.282
4.133	-0.003	-0.322
5.167	-0.002	-0.354
6.200	-0.001	-0.377
7.233	-0.000	-0.389
8.267	0.000	-0.389
9.300	0.001	-0.377
10.333	0.002	-0.354
11.367	0.003	-0.322
12.400	0.003	-0.282
13.433	0.003	-0.240
14.467	0.003	-0.198

At evenly-spaced intervals:

0.000	-0.003	-0.161
1.550	-0.003	-0.218
3.100	-0.003	-0.282
4.650	-0.003	-0.339
6.200	-0.001	-0.377
7.750	0.000	-0.390
9.300	0.001	-0.377
10.850	0.003	-0.339
12.400	0.003	-0.282
13.950	0.003	-0.218

15.500

0.003

-0.161

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Node 17	Node 18	Node 19	Node 20	Node 21	Node 22	Node 23	Node 24	Node 25	Node 26	Node 27	Node 28	Node 29	Node 30	Node 31	Node 32
0.000	1.033	2.067	3.100	4.133	5.167	6.200	7.233	8.267	9.300	10.333	11.367	12.400	13.433	14.467	15.500
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Continuous Elements Output Data

FRAME MAC file: 6(T/21) EMBANK.

Last modified at 13:01:46 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

17	-0.001	-0.157	0.002
18	-0.001	-0.129	0.002
19	-0.001	-0.098	0.002
20	-0.001	-0.070	0.002
21	-0.001	-0.046	0.002
22	-0.001	-0.027	0.001
23	-0.000	-0.015	0.001
24	-0.000	-0.008	0.000
25	0.000	-0.008	-0.000
26	0.000	-0.015	-0.001
27	0.001	-0.027	-0.001
28	0.001	-0.046	-0.002
29	0.001	-0.070	-0.002
30	0.001	-0.098	-0.002
31	0.001	-0.129	-0.002
32	0.001	-0.157	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
17,18	0.000	108.500	18.686	0.000	108.500	-18.686
18,19	0.000	108.500	18.686	0.000	108.500	-18.686
19,20	0.000	108.500	18.686	0.000	108.500	-18.686
20,21	0.000	108.500	18.686	0.000	108.500	-18.686
21,22	0.000	108.500	18.686	0.000	108.500	-18.686
22,23	0.000	108.500	18.686	0.000	108.500	-18.686
23,24	0.000	108.500	18.686	0.000	108.500	-18.686
24,25	0.000	108.500	18.686	0.000	108.500	-18.686
25,26	0.000	108.500	18.686	0.000	108.500	-18.686
26,27	0.000	108.500	18.686	0.000	108.500	-18.686
27,28	0.000	108.500	18.686	0.000	108.500	-18.686
28,29	0.000	108.500	18.686	0.000	108.500	-18.686
29,30	0.000	108.500	18.686	0.000	108.500	-18.686
30,31	0.000	108.500	18.686	0.000	108.500	-18.686
31,32	0.000	108.500	18.686	0.000	108.500	-18.686

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
17,18	492.428	-16595.153	-21199.140	-492.428	16812.153	3938.698
18,19	-4180.715	-10846.061	-4247.348	4180.715	11063.061	-7072.366
19,20	-3467.224	-6515.236	6991.763	3467.224	6732.236	-13836.291
20,21	-5048.143	-3495.902	13671.727	5048.143	3712.902	-17396.275
21,22	-7372.731	-1579.395	17218.962	7372.731	1796.395	-18963.120
22,23	-7475.566	-532.725	18900.706	7475.566	749.725	-19563.305
23,24	-7930.806	-66.754	19509.039	7930.806	283.754	-19690.135
24,25	-8286.980	108.626	19663.430	8286.980	108.374	-19663.299
25,26	-7930.738	283.997	19690.005	7930.738	-66.997	-19508.659
26,27	-7475.433	749.934	19562.925	7475.433	-532.934	-18900.110
27,28	-7372.518	1796.542	18962.525	7372.518	-1579.542	-17218.215
28,29	-5047.962	3712.951	17395.523	5047.962	-3495.951	-13670.924
29,30	-3467.054	6732.138	13835.483	3467.054	-6515.138	-6991.057
30,31	-4180.475	11062.757	7071.657	4180.475	-10845.757	4247.742
31,32	492.457	16811.572	-3939.107	-492.457	-16594.572	21198.948

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
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17,18	-0.001	-0.157	0.002	-0.001	-0.129	0.002
18,19	-0.001	-0.129	0.002	-0.001	-0.098	0.002
19,20	-0.001	-0.098	0.002	-0.001	-0.070	0.002
20,21	-0.001	-0.070	0.002	-0.001	-0.046	0.002
21,22	-0.001	-0.046	0.002	-0.001	-0.027	0.001
22,23	-0.001	-0.027	0.001	-0.000	-0.015	0.001
23,24	-0.000	-0.015	0.001	-0.000	-0.008	0.000
24,25	-0.000	-0.008	0.000	0.000	-0.008	-0.000
25,26	0.000	-0.008	-0.000	0.000	-0.015	-0.001
26,27	0.000	-0.015	-0.001	0.001	-0.027	-0.001
27,28	0.001	-0.027	-0.001	0.001	-0.046	-0.002
28,29	0.001	-0.046	-0.002	0.001	-0.070	-0.002
29,30	0.001	-0.070	-0.002	0.001	-0.098	-0.002
30,31	0.001	-0.098	-0.002	0.001	-0.129	-0.002
31,32	0.001	-0.129	-0.002	0.001	-0.157	-0.002

Maximum deformations:
Node 18 moved 0.001 inch to the left.
Node 31 moved 0.001 inch to the right.
Node 17 moved 0.157 inch downwards.
No nodes moved upwards.
Node 31 rotated 0.002 radian clockwise.
Node 18 rotated 0.002 radian counter-clockwise.

Maximum reactions:
There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
17,18	0.000	-492.428	-492.428	0.000	-3.420	-3.420
18,19	4180.715	0.000	4180.715	29.033	0.000	29.033
19,20	3467.224	0.000	3467.224	24.078	0.000	24.078
20,21	5048.143	0.000	5048.143	35.057	0.000	35.057
21,22	7372.731	0.000	7372.731	51.200	0.000	51.200
22,23	7475.566	0.000	7475.566	51.914	0.000	51.914
23,24	7930.806	0.000	7930.806	55.075	0.000	55.075
24,25	8286.980	0.000	8286.980	57.548	0.000	57.548
25,26	7930.738	0.000	7930.738	55.075	0.000	55.075
26,27	7475.433	0.000	7475.433	51.913	0.000	51.913
27,28	7372.518	0.000	7372.518	51.198	0.000	51.198
28,29	5047.962	0.000	5047.962	35.055	0.000	35.055
29,30	3467.054	0.000	3467.054	24.077	0.000	24.077
30,31	4180.475	0.000	4180.475	29.031	0.000	29.031
31,32	0.000	-492.457	-492.457	0.000	-3.420	-3.420

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
17,18	0.000	-16812.153	-16812.153	0.000	-116.751	-116.751
18,19	0.000	-11063.061	-11063.061	0.000	-76.827	-76.827
19,20	0.000	-6732.236	-6732.236	0.000	-46.752	-46.752
20,21	0.000	-3712.902	-3712.902	0.000	-25.784	-25.784
21,22	0.000	-1796.395	-1796.395	0.000	-12.475	-12.475
22,23	0.000	-749.725	-749.725	0.000	-5.206	-5.206
23,24	0.000	-283.754	-283.754	0.000	-1.971	-1.971
24,25	108.626	-108.374	108.626	0.754	-0.753	0.754
25,26	283.997	0.000	283.997	1.972	0.000	1.972
26,27	749.934	0.000	749.934	5.208	0.000	5.208
27,28	1796.542	0.000	1796.542	12.476	0.000	12.476
28,29	3712.951	0.000	3712.951	25.784	0.000	25.784
29,30	6732.138	0.000	6732.138	46.751	0.000	46.751
30,31	11062.757	0.000	11062.757	76.825	0.000	76.825
31,32	16811.572	0.000	16811.572	116.747	0.000	116.747

Maximum moment and bending stress values:						
From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
17,18	21199.140	0.000	21199.140	883.298	0.000	883.298
18,19	4247.348	-7072.366	-7072.366	176.973	-294.682	-294.682
19,20	0.000	-13836.291	-13836.291	0.000	-576.512	-576.512
20,21	0.000	-17396.275	-17396.275	0.000	-724.845	-724.845
21,22	0.000	-18963.120	-18963.120	0.000	-790.130	-790.130
22,23	0.000	-19563.305	-19563.305	0.000	-815.138	-815.138
23,24	0.000	-19690.135	-19690.135	0.000	-820.422	-820.422
24,25	0.000	-19663.430	-19663.430	0.000	-819.310	-819.310
25,26	0.000	-19690.005	-19690.005	0.000	-820.417	-820.417
26,27	0.000	-19562.925	-19562.925	0.000	-815.122	-815.122
27,28	0.000	-18962.525	-18962.525	0.000	-790.105	-790.105
28,29	0.000	-17395.523	-17395.523	0.000	-724.813	-724.813
29,30	0.000	-13835.483	-13835.483	0.000	-576.478	-576.478
30,31	4247.742	-7071.657	-7071.657	176.989	-294.652	-294.652
31,32	21198.948	0.000	21198.948	883.290	0.000	883.290

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
17,18	0.000	-0.157	-0.157
18,19	0.000	-0.129	-0.129
19,20	0.000	-0.098	-0.098
20,21	0.000	-0.070	-0.070
21,22	0.000	-0.046	-0.046
22,23	0.000	-0.027	-0.027
23,24	0.000	-0.015	-0.015
24,25	0.000	-0.008	-0.008
25,26	0.000	-0.015	-0.015
26,27	0.000	-0.027	-0.027
27,28	0.000	-0.046	-0.046
28,29	0.000	-0.070	-0.070
29,30	0.000	-0.098	-0.098
30,31	0.000	-0.129	-0.129
31,32	0.000	-0.157	-0.157

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.033	0.002	-0.129
2.067	0.002	-0.098
3.100	0.002	-0.070
4.133	0.002	-0.046
5.167	0.001	-0.027
6.200	0.001	-0.015
7.233	0.000	-0.008
8.267	-0.000	-0.008
9.300	-0.001	-0.015
10.333	-0.001	-0.027
11.367	-0.002	-0.046
12.400	-0.002	-0.070
13.433	-0.002	-0.098
14.467	-0.002	-0.129

At evenly-spaced intervals:

0.000	0.002	-0.157
1.550	0.002	-0.113
3.100	0.002	-0.070
4.650	0.002	-0.036
6.200	0.001	-0.015
7.750	0.000	-0.008
9.300	-0.001	-0.015
10.850	-0.002	-0.036
12.400	-0.002	-0.070
13.950	-0.002	-0.113

15.500

-0.002

-0.157

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Node 17
0.000
0.000

Node 33
0.000
1.071

Node 35
0.000
2.143

Node 37
0.000
3.214

Node 39
0.000
4.286

Node 41
0.000
5.357

Node 43
0.000
6.429

Node 45
0.000
7.500

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb
-20231.883

15

Shear

631.199
lb
-4301.827

Moment

0.000
lb-ft
-34910.431
0.051

Defl.

Inch
-0.001

Distance 0.000

L/6 1.500 L/4 3.000 L/2 4.500 2L/3 6.000 3L/4 7.500 ft

Continuous Elements Output Data

FRAME MAC file: 6(T/21) EMBANK.

Last modified at 13:01:46 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

17	-0.001	-0.157	0.002
33	-0.025	-0.158	0.002
35	-0.041	-0.158	0.001
37	-0.050	-0.159	0.000
39	-0.051	-0.159	-0.000
41	-0.043	-0.160	-0.001
43	-0.027	-0.160	-0.002
45	0.001	-0.161	-0.003

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
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17,33	112.500	352.500	62.946	112.500	352.218	-62.946
33,35	112.500	352.500	62.946	112.500	352.218	-62.946
35,37	112.500	352.500	62.946	112.500	352.218	-62.946
37,39	112.500	352.500	62.946	112.500	352.218	-62.946
39,41	112.500	352.500	62.946	112.500	352.218	-62.946
41,43	112.500	352.500	62.946	112.500	352.218	-62.946
43,45	112.500	352.500	62.946	112.500	352.218	-62.946

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
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17,33	20231.883	631.199	21144.518	-20006.883	73.519	-20845.912
33,35	20006.883	-73.519	20845.912	-19781.883	778.237	-21302.361
35,37	19781.883	-778.237	21302.361	-19556.883	1482.955	-22513.865
37,39	19556.883	-1482.955	22513.865	-19331.883	2187.673	-24480.424
39,41	19331.883	-2187.673	24480.424	-19106.883	2892.391	-27202.038
41,43	19106.883	-2892.391	27202.038	-18881.883	3597.109	-30678.707
43,45	18881.883	-3597.109	30678.707	-18656.883	4301.827	-34910.431

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
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17,33	-0.157	0.001	0.002	-0.158	0.025	0.002
33,35	-0.158	0.025	0.002	-0.158	0.041	0.001
35,37	-0.158	0.041	0.001	-0.159	0.050	0.000
37,39	-0.159	0.050	0.000	-0.159	0.051	-0.000
39,41	-0.159	0.051	-0.000	-0.160	0.043	-0.001
41,43	-0.160	0.043	-0.001	-0.160	0.027	-0.002
43,45	-0.160	0.027	-0.002	-0.161	-0.001	-0.003

Maximum deformations:

Node 39 moved 0.051 inch to the left.
Node 45 moved 0.001 inch to the right.
Node 45 moved 0.161 inch downwards.
No nodes moved upwards.
Node 45 rotated 0.003 radian clockwise.
Node 17 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
17,33	0.000	-20231.883	-20231.883	0.000	-140.499	-140.499
33,35	0.000	-20006.883	-20006.883	0.000	-138.937	-138.937
35,37	0.000	-19781.883	-19781.883	0.000	-137.374	-137.374
37,39	0.000	-19556.883	-19556.883	0.000	-135.812	-135.812
39,41	0.000	-19331.883	-19331.883	0.000	-134.249	-134.249
41,43	0.000	-19106.883	-19106.883	0.000	-132.687	-132.687
43,45	0.000	-18881.883	-18881.883	0.000	-131.124	-131.124

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
17,33	631.199	-73.519	631.199	4.383	-0.511	4.383
33,35	0.000	-778.237	-778.237	0.000	-5.404	-5.404
35,37	0.000	-1482.955	-1482.955	0.000	-10.298	-10.298
37,39	0.000	-2187.673	-2187.673	0.000	-15.192	-15.192
39,41	0.000	-2892.391	-2892.391	0.000	-20.086	-20.086
41,43	0.000	-3597.109	-3597.109	0.000	-24.980	-24.980
43,45	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
17,33	0.000	-21144.518	-21144.518	0.000	-881.022	-881.022
33,35	0.000	-21302.361	-21302.361	0.000	-887.598	-887.598
35,37	0.000	-22513.865	-22513.865	0.000	-938.078	-938.078
37,39	0.000	-24480.424	-24480.424	0.000	-1020.018	-1020.018
39,41	0.000	-27202.038	-27202.038	0.000	-1133.418	-1133.418
41,43	0.000	-30678.707	-30678.707	0.000	-1278.279	-1278.279
43,45	0.000	-34910.431	-34910.431	0.000	-1454.601	-1454.601

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
17,33	0.025	0.000	0.025
33,35	0.041	0.000	0.041
35,37	0.050	0.000	0.050
37,39	0.051	0.000	0.051
39,41	0.051	0.000	0.051
41,43	0.043	0.000	0.043
43,45	0.027	-0.001	0.027

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---

At the intermediate nodes:

1.071	0.002	0.025
2.143	0.001	0.041
3.214	0.000	0.050
4.286	-0.000	0.051
5.357	-0.001	0.043
6.429	-0.002	0.027

At evenly-spaced intervals:

0.000	0.002	0.001
0.750	0.002	0.018
1.500	0.001	0.032
2.250	0.001	0.042
3.000	0.001	0.049
3.750	0.000	0.051

4.500	-0.000	0.050
5.250	-0.001	0.045
6.000	-0.001	0.035
6.750	-0.002	0.020
7.500	-0.003	-0.001

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Node 32
15.500
0.000

Node 34
15.500
1.071

Node 36
15.500
2.143

Node 38
15.500
3.214

Node 40
15.500
4.286

Node 42
15.500
5.357

Node 44
15.500
6.429

Node 60
15.500
7.500

F: lb
D: lb/ft
M: lb-ft
E: psi

Continuous Elements Output Data

FRAME MAC file: 6(T/21) EMBANK.

Last modified at 13:01:46 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
32	0.001	-0.157	-0.002
34	0.025	-0.158	-0.002
36	0.041	-0.158	-0.001
38	0.050	-0.159	-0.000
40	0.051	-0.159	0.000
42	0.043	-0.160	0.001
44	0.027	-0.160	0.002
60	-0.001	-0.161	0.003

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
32,34	112.500	-352.500	-62.946	112.500	-352.218	62.946
34,36	112.500	-352.500	-62.946	112.500	-352.218	62.946
36,38	112.500	-352.500	-62.946	112.500	-352.218	62.946
38,40	112.500	-352.500	-62.946	112.500	-352.218	62.946
40,42	112.500	-352.500	-62.946	112.500	-352.218	62.946
42,44	112.500	-352.500	-62.946	112.500	-352.218	62.946
44,60	112.500	-352.500	-62.946	112.500	-352.218	62.946

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL	FyL	MzL	FxR	FyR	MzR
32,34	20231.127	-631.199	-21144.330	-20006.127	-73.519	20845.724
34,36	20006.127	73.519	-20845.724	-19781.127	-778.237	21302.173
36,38	19781.127	778.237	-21302.173	-19556.127	-1482.955	22513.677
38,40	19556.127	1482.955	-22513.677	-19331.127	-2187.673	24480.236
40,42	19331.127	2187.673	-24480.236	-19106.127	-2892.391	27201.850
42,44	19106.127	2892.391	-27201.850	-18881.127	-3597.109	30678.519
44,60	18881.127	3597.109	-30678.519	-18656.127	-4301.827	34910.243

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
32,34	-0.157	-0.001	-0.002	-0.158	-0.025	-0.002
34,36	-0.158	-0.025	-0.002	-0.158	-0.041	-0.001
36,38	-0.158	-0.041	-0.001	-0.159	-0.050	-0.000
38,40	-0.159	-0.050	-0.000	-0.159	-0.051	0.000
40,42	-0.159	-0.051	0.000	-0.160	-0.043	0.001
42,44	-0.160	-0.043	0.001	-0.160	-0.027	0.002
44,60	-0.160	-0.027	0.002	-0.161	0.001	0.003

Maximum deformations:

Node 60 moved 0.001 inch to the left.
Node 40 moved 0.051 inch to the right.
Node 60 moved 0.161 inch downwards.
No nodes moved upwards.
Node 32 rotated 0.002 radian clockwise.
Node 60 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
32,34	0.000	-20231.127	-20231.127	0.000	-140.494	-140.494
34,36	0.000	-20006.127	-20006.127	0.000	-138.931	-138.931
36,38	0.000	-19781.127	-19781.127	0.000	-137.369	-137.369
38,40	0.000	-19556.127	-19556.127	0.000	-135.806	-135.806
40,42	0.000	-19331.127	-19331.127	0.000	-134.244	-134.244
42,44	0.000	-19106.127	-19106.127	0.000	-132.681	-132.681
44,60	0.000	-18881.127	-18881.127	0.000	-131.119	-131.119

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
32,34	73.519	-631.199	-631.199	0.511	-4.383	-4.383
34,36	778.237	0.000	778.237	5.404	0.000	5.404
36,38	1482.955	0.000	1482.955	10.298	0.000	10.298
38,40	2187.673	0.000	2187.673	15.192	0.000	15.192
40,42	2892.391	0.000	2892.391	20.086	0.000	20.086
42,44	3597.109	0.000	3597.109	24.980	0.000	24.980
44,60	4301.827	0.000	4301.827	29.874	0.000	29.874

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
32,34	21144.330	0.000	21144.330	881.014	0.000	881.014
34,36	21302.173	0.000	21302.173	887.591	0.000	887.591
36,38	22513.677	0.000	22513.677	938.070	0.000	938.070
38,40	24480.236	0.000	24480.236	1020.010	0.000	1020.010
40,42	27201.850	0.000	27201.850	1133.410	0.000	1133.410
42,44	30678.519	0.000	30678.519	1278.272	0.000	1278.272
44,60	34910.243	0.000	34910.243	1454.593	0.000	1454.593

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
32,34	0.000	-0.025	-0.025
34,36	0.000	-0.041	-0.041
36,38	0.000	-0.050	-0.050
38,40	0.000	-0.051	-0.051
40,42	0.000	-0.051	-0.051
42,44	0.000	-0.043	-0.043
44,60	0.001	-0.027	-0.027

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.071	-0.002	-0.025
2.143	-0.001	-0.041
3.214	-0.000	-0.050
4.286	0.000	-0.051
5.357	0.001	-0.043
6.429	0.002	-0.027

At evenly-spaced intervals:

0.000	-0.002	-0.001
0.750	-0.002	-0.018
1.500	-0.001	-0.032
2.250	-0.001	-0.042
3.000	-0.001	-0.049
3.750	-0.000	-0.051

4.500	0.000	-0.050
5.250	0.001	-0.045
6.000	0.001	-0.035
6.750	0.002	-0.020
7.500	0.003	0.001

Output Data

FRAME MAC file: 6(T/21) EMBANK.

Last modified at 13:01:46 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,17	0.000	-3636.730	-3636.730	0.000	-47.132	-47.132
2,18	0.000	-5947.367	-5947.367	0.000	-38.539	-38.539
3,19	0.000	-4544.937	-4544.937	0.000	-29.451	-29.451
4,20	0.000	-3236.334	-3236.334	0.000	-20.972	-20.972
5,21	0.000	-2124.199	-2124.199	0.000	-13.765	-13.765
6,22	0.000	-1264.071	-1264.071	0.000	-8.191	-8.191
7,23	0.000	-682.971	-682.971	0.000	-4.426	-4.426
8,24	0.000	-390.954	-390.954	0.000	-2.533	-2.533
9,25	0.000	-390.943	-390.943	0.000	-2.533	-2.533
10,26	0.000	-682.937	-682.937	0.000	-4.425	-4.425
11,27	0.000	-1264.009	-1264.009	0.000	-8.191	-8.191
12,28	0.000	-2124.101	-2124.101	0.000	-13.764	-13.764
13,29	0.000	-3236.188	-3236.188	0.000	-20.971	-20.971
14,30	0.000	-4544.731	-4544.731	0.000	-29.450	-29.450
15,31	0.000	-5947.091	-5947.091	0.000	-38.537	-38.537
16,32	0.000	-3636.555	-3636.555	0.000	-47.130	-47.130
17,33	0.000	-20231.883	-20231.883	0.000	-140.499	-140.499
17,18	0.000	-492.428	-492.428	0.000	-3.420	-3.420
18,19	4180.715	0.000	4180.715	29.033	0.000	29.033
19,20	3467.224	0.000	3467.224	24.078	0.000	24.078
20,21	5048.143	0.000	5048.143	35.057	0.000	35.057
21,22	7372.731	0.000	7372.731	51.200	0.000	51.200
22,23	7475.566	0.000	7475.566	51.914	0.000	51.914
23,24	7930.806	0.000	7930.806	55.075	0.000	55.075
24,25	8286.980	0.000	8286.980	57.548	0.000	57.548
25,26	7930.738	0.000	7930.738	55.075	0.000	55.075
26,27	7475.433	0.000	7475.433	51.913	0.000	51.913
27,28	7372.518	0.000	7372.518	51.198	0.000	51.198
28,29	5047.962	0.000	5047.962	35.055	0.000	35.055
29,30	3467.054	0.000	3467.054	24.077	0.000	24.077
30,31	4180.475	0.000	4180.475	29.031	0.000	29.031
31,32	0.000	-492.457	-492.457	0.000	-3.420	-3.420
32,34	0.000	-20231.127	-20231.127	0.000	-140.494	-140.494
33,35	0.000	-20006.883	-20006.883	0.000	-138.937	-138.937
34,36	0.000	-20006.127	-20006.127	0.000	-138.931	-138.931
35,37	0.000	-19781.883	-19781.883	0.000	-137.374	-137.374
36,38	0.000	-19781.127	-19781.127	0.000	-137.369	-137.369
37,39	0.000	-19556.883	-19556.883	0.000	-135.812	-135.812
38,40	0.000	-19556.127	-19556.127	0.000	-135.806	-135.806
39,41	0.000	-19331.883	-19331.883	0.000	-134.249	-134.249
40,42	0.000	-19331.127	-19331.127	0.000	-134.244	-134.244
41,43	0.000	-19106.883	-19106.883	0.000	-132.687	-132.687
42,44	0.000	-19106.127	-19106.127	0.000	-132.681	-132.681
43,45	0.000	-18881.883	-18881.883	0.000	-131.124	-131.124
44,60	0.000	-18881.127	-18881.127	0.000	-131.119	-131.119
45,46	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
46,47	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
47,48	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
48,49	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
49,50	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
50,51	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
51,52	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
52,53	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
53,54	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
54,55	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
55,56	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
56,57	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
57,58	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
58,59	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874
59,60	0.000	-4301.827	-4301.827	0.000	-29.874	-29.874

SOIL EMBANK
 FILL : 100%
 = 47.13
 = 2122.5

PRELIMINARY CONDITION

*** TRENCH INSTALLATION) SEE FIG 4.2

$$B_c = 16.5'$$

$$B_d = 22.5'$$

$$H = 7.63'$$

$$\frac{H}{B_d} = \frac{7.63'}{22.5} = 0.3391$$

$$K = \frac{1 - \sin \phi}{1 + \sin \phi} = 0.2948$$

$$\phi = 33^\circ$$

$$\mu' = \tan \phi = 0.6494$$

$$K\mu' = (0.2948)(0.6494) = 0.1914$$

$$W_d = C_d w B_d^2$$

$$= 0.3180 (115)(22.5)^2$$

$$= 18515 \text{ lbs/ft}$$

$$L = \frac{18515}{22.5} = 823 \text{ lbs/ft}^2$$

$$\sigma_v = 823 \text{ lbs/ft}^2$$

$$\sigma_H = 243 \text{ lbs/ft}^2$$

$$C_d = \left(\frac{1 - e^{-2K\mu' \left(\frac{H}{B_d} \right)}}{2K\mu'} \right)$$

$$C_d = \left(\frac{1 - e^{-\frac{(2)(0.1914)(7.63)}{22.5}}}{2(0.1914)} \right)$$

$$C_d = \left(\frac{1 - 0.87826}{2(0.1914)} \right) = 0.3180$$

EMBANKMENT

TOP OF EMBANKMENT

ORIGINAL
SURFACE.

*** NEGATIVE PROJECTION EMBANKMENT, PER FIG 4.2.
E 4.32(b)

$$B_c = 16.5'$$

$$B_d = 22.5'$$

$$H = 23.25 + 7.63$$

FROM TABLE 4.13

$$p' = \frac{22.5 + 7.63}{16.5} \cdot \frac{H}{B_c} = 1.826 \quad \gamma_{ss} \approx -1.0 \quad \frac{H}{B_d} = \frac{23.25 + 7.63}{22.5} = 1.339$$

COMPLETE INCOMPLETE
EON 4.4 OR 4.7

$$\text{CONDITION FOR } \frac{H}{B_d} = 1.339, p' = 1.8(2.0) \gamma_{ss} (-1.0) \therefore C_n = 1.1$$

$$\text{IS INCOMPLETE } \cdot \frac{H}{B_d} = 1.339 \frac{H_e}{B_d} = 6.4$$

$$\therefore H < H_e$$

$$W_n = W B_d^2 \left(\frac{e^{-2K\mu \frac{H}{B_d}} - 1}{-2K\mu} \right) \quad H \leq H_e \quad (4.27)$$

$$W_n = w B_d^2 C_n$$

$$w = 115 \text{ lb/cuft}$$

$$B_d = 22.5'$$

$$K_\mu = 0.1924$$

$$H = (23.25 + 7.63) = 30.88$$

$$p' = \frac{H}{B_c} = \frac{30.88}{16.5} = 1.87 \quad \text{FS} = -1.0 \text{ FROM FIG 1.33}$$

$$(C_n = 1.3)$$

$$C_n = \left(\frac{e^{-2K_\mu \left(\frac{H}{B_d} \right)} - 1}{-2K_\mu} \right)$$

$$C_n = \left(\frac{e^{-0.264058311} - 1}{-2(0.1914)} \right) = \frac{0.7679 - 1}{-2(0.1914)}$$

$$C_n = 0.606246$$

$$W_n = 0.606246 (115) (22.5)^2 = 35295 \text{ lb/ft}$$

$$\frac{W_n}{B_d} = 1568 \text{ lb/ft}^2$$

 EMBANKMENT
LOADING CONDITIONS

$$\sigma_v = 1570 \text{ lb/ft}^2$$

$$\sigma_H = 470 \text{ lb/ft}^2$$

$$\text{Non-settlement case: } W_d = C_d w B_d^2 + C_s w H \cdot B$$

$$C_s \approx \frac{H}{B_d} = 1.37 \quad = 18515 + 1.1 (115) (23.25') (22.5)$$

$$C_s = 1.1 \quad = 18515 + 66175$$

$$H = 23.25' \quad = 84690$$

$$= 3764 \text{ lbs/ft}^2$$

TUNNEL SECTION PAGE ____ OF ____	<div style="border: 1px solid black; border-radius: 50%; width: 40px; height: 40px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"><div style="border-right: 1px solid black; width: 15px; height: 15px; margin-right: 5px;"></div><div style="width: 15px; height: 15px; margin-right: 5px;"></div><div style="border-right: 1px solid black; width: 15px; height: 15px; margin-right: 5px;"></div><div style="width: 15px; height: 15px;"></div></div>	EMBANKMENT	STRUCTURAL ASSESSMENT		
		TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$		ROOF STRUCTURE	<u>40207</u> ft-lbs	<u>34,910</u> ft-lbs	
		FLOOR STRUCTURE	<u>40207</u> ft-lbs	<u>19,690</u> ft-lbs	
		LEFT INSIDE WALL	<u>9546</u> ft-lbs	<u> </u> ft-lbs	
		LEFT OUTSIDE WALL	<u>38,697</u> ft-lbs	<u>34910</u> ft-lbs	
		RIGHT INSIDE WALL	<u>9546</u> ft-lbs	<u> </u> ft-lbs	
		RIGHT OUTSIDE WALL	<u>38,697</u> ft-lbs	<u>34,910</u> ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$		ROOF STRUCTURE	<u>12151</u> lbs	<u>18,656</u> lbs	N.T.
		FLOOR STRUCTURE	<u>12151</u> lbs	<u>16,812</u> lbs	N.T.
		LEFT WALL	<u>12151</u> lbs	<u>4301</u> lbs	
		RIGHT WALL	<u>12,151</u> lbs	<u>4301</u> lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$		LEFT WALL	<u>185060</u> lbs	<u>20,231</u> lbs	
		RIGHT WALL	<u>185060</u> lbs	<u>20,231</u> lbs	

Loading Conditions

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-5(21/21)

TITLE: Structural Assessment of Tunnel Section 5(21/21) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 5(21/21) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Figure() Section 5(21/21) Trench Excavation and Backfill Configuration

Figure() Section 5(21/21) Compacted Tuff Shield Configuration

FRAME MAC file: 5(21/21) EMBANK; Last modified at 19:12:36 on Wed, May 5, 1993

FRAME MAC file: 5(21/21) EMBANK; Last modified at 19:12:36 on Wed, May 5, 1993

Node 25
0.500
6.500

Node 26
1.583
6.500

Node 27
2.667
6.500

Node 28
3.750
6.500

Node 29
4.833
6.500

Node 30
5.917
6.500

Node 31
7.000
6.500

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-3230.734
11401.791

Shear

lb

-11400.656
10605.358

Moment

lb-ft

-7921.659

Defl.

0.000
inch

-0.140

Distance 0.000

L/6 1.300 L/4 2.600 L/2 3.900 2L/3 5.200 3L/4 6.500 ft

Continuous Elements Output Data

FRAME MAC file: 5(21/21) EMBANK.

Last modified at 19:12:36 on Wed, May 5, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
25	0.000	-0.111	-0.001
26	0.000	-0.124	-0.001
27	0.000	-0.135	-0.001
28	-0.000	-0.140	0.000
29	-0.000	-0.135	0.001
30	-0.000	-0.124	0.001
31	-0.000	-0.111	0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
25,26	0.000	1900.762	343.193	0.000	1899.645	-343.193
26,27	0.000	1900.762	343.193	0.000	1899.645	-343.193
27,28	0.000	1900.762	343.193	0.000	1899.645	-343.193
28,29	0.000	1900.762	343.193	0.000	1899.645	-343.193
29,30	0.000	1900.762	343.193	0.000	1899.645	-343.193
30,31	0.000	1900.762	343.193	0.000	1899.645	-343.193

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
25,26	3230.734	11401.791	7921.659	-3230.734	-7601.383	2371.122
26,27	3230.734	7601.383	-2371.122	-3230.734	-3800.975	8546.794
27,28	3230.734	3800.975	-8546.794	-3230.734	-0.567	10605.358
28,29	3230.734	0.567	-10605.358	-3230.734	3799.840	8546.814
29,30	3230.734	-3799.840	-8546.814	-3230.734	7600.248	2371.161
30,31	3230.734	-7600.248	-2371.161	-3230.734	11400.656	-7921.601

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
25,26	0.000	-0.111	-0.001	0.000	-0.124	-0.001
26,27	0.000	-0.124	-0.001	0.000	-0.135	-0.001
27,28	0.000	-0.135	-0.001	-0.000	-0.140	0.000
28,29	-0.000	-0.140	0.000	-0.000	-0.135	0.001
29,30	-0.000	-0.135	0.001	-0.000	-0.124	0.001
30,31	-0.000	-0.124	0.001	-0.000	-0.111	0.001

Maximum deformations:

Node 31 moved 0.000 inch to the left.
Node 25 moved 0.000 inch to the right.
Node 28 moved 0.140 inch downwards.
No nodes moved upwards.
Node 26 rotated 0.001 radian clockwise.
Node 30 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
25,26	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
26,27	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
27,28	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
28,29	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
29,30	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
30,31	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
25,26	11401.791	0.000	11401.791	105.572	0.000	105.572
26,27	7601.383	0.000	7601.383	70.383	0.000	70.383
27,28	3800.975	0.000	3800.975	35.194	0.000	35.194
28,29	0.567	-3799.840	-3799.840	0.005	-35.184	-35.184
29,30	0.000	-7600.248	-7600.248	0.000	-70.373	-70.373
30,31	0.000	-11400.656	-11400.656	0.000	-105.562	-105.562

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
25,26	2371.122	-7921.659	-7921.659	175.639	-586.790	-586.790
26,27	8546.794	0.000	8546.794	633.096	0.000	633.096
27,28	10605.358	0.000	10605.358	785.582	0.000	785.582
28,29	10605.358	0.000	10605.358	785.582	0.000	785.582
29,30	8546.814	0.000	8546.814	633.097	0.000	633.097
30,31	2371.161	-7921.601	-7921.601	175.642	-586.785	-586.785

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
25,26	0.000	-0.124	-0.124
26,27	0.000	-0.135	-0.135
27,28	0.000	-0.140	-0.140
28,29	0.000	-0.140	-0.140
29,30	0.000	-0.135	-0.135
30,31	0.000	-0.124	-0.124

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.083	-0.001	-0.124
2.167	-0.001	-0.135
3.250	0.000	-0.140
4.333	0.001	-0.135
5.417	0.001	-0.124

At evenly-spaced intervals:

0.000	-0.001	-0.111
0.650	-0.001	-0.119
1.300	-0.001	-0.127
1.950	-0.001	-0.134
2.600	-0.000	-0.138
3.250	0.000	-0.140
3.900	0.000	-0.138
4.550	0.001	-0.134
5.200	0.001	-0.127
5.850	0.001	-0.119
6.500	0.001	-0.111

FRAME MAC file: 5(21/21) EMBANK; Last modified at 19:12:36 on Wed, May 5, 1993

Node 8
0.500
0.000

Node 9
1.583
0.000

Node 10
2.667
0.000

Node 11
3.750
0.000

Node 12
4.833
0.000

Node 13
5.917
0.000

Node 14
7.000
0.000

Continuous Elements Output Data

FRAME MAC file: 5(21/21) EMBANK.

Last modified at 19:12:36 on Wed, May 5, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

8	-0.000	-0.109	0.001
9	-0.000	-0.096	0.001
10	-0.000	-0.085	0.001
11	-0.000	-0.081	0.000
12	0.000	-0.085	-0.001
13	0.000	-0.096	-0.001
14	0.000	-0.109	-0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	0.000	85.313	15.404	0.000	85.313	-15.404
9,10	0.000	85.312	15.404	0.000	85.312	-15.404
10,11	0.000	85.312	15.404	0.000	85.312	-15.404
11,12	0.000	85.313	15.404	0.000	85.313	-15.404
12,13	0.000	85.313	15.404	0.000	85.313	-15.404
13,14	0.000	85.312	15.404	0.000	85.312	-15.404

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	2100.005	-9880.719	-7859.430	-2100.005	10051.344	-2937.104
9,10	-2679.799	-5535.755	2690.528	2679.799	5706.380	-8780.018
10,11	-2023.652	-1721.528	8778.627	2023.652	1892.153	-10736.037
11,12	-2023.592	1892.561	10736.027	2023.592	-1721.936	-8778.174
12,13	-2679.465	5706.454	8779.551	2679.465	-5535.829	-2689.981
13,14	2100.005	10050.733	2936.515	-2100.005	-9880.108	7859.357

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,9	-0.000	-0.109	0.001	-0.000	-0.096	0.001
9,10	-0.000	-0.096	0.001	-0.000	-0.085	0.001
10,11	-0.000	-0.085	0.001	-0.000	-0.081	0.000
11,12	-0.000	-0.081	0.000	0.000	-0.085	-0.001
12,13	0.000	-0.085	-0.001	0.000	-0.096	-0.001
13,14	0.000	-0.096	-0.001	0.000	-0.109	-0.001

Maximum deformations:

Node 9 moved 0.000 inch to the left.
Node 13 moved 0.000 inch to the right.
Node 8 moved 0.109 inch downwards.
No nodes moved upwards.
Node 13 rotated 0.001 radian clockwise.
Node 9 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
-----	----	----	----	-----	-----	-----

8,9	0.000	-2100.005	-2100.005	0.000	-19.444	-19.444
9,10	2679.799	0.000	2679.799	24.813	0.000	24.813
10,11	2023.652	0.000	2023.652	18.738	0.000	18.738
11,12	2023.592	0.000	2023.592	18.737	0.000	18.737
12,13	2679.465	0.000	2679.465	24.810	0.000	24.810
13,14	0.000	-2100.005	-2100.005	0.000	-19.444	-19.444

Maximum shear and shear stress values:

From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	shear	shear	shear	shr. str.	shr. str.	stress
---	lb	lb	lb	psi	psi	psi

8,9	0.000	-10051.344	-10051.344	0.000	-93.068	-93.068
9,10	0.000	-5706.380	-5706.380	0.000	-52.837	-52.837
10,11	0.000	-1892.153	-1892.153	0.000	-17.520	-17.520
11,12	1892.561	0.000	1892.561	17.524	0.000	17.524
12,13	5706.454	0.000	5706.454	52.838	0.000	52.838
13,14	10050.733	0.000	10050.733	93.062	0.000	93.062

Maximum moment and bending stress values:

From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	moment	moment	moment	ben. str.	ben. str.	stress
---	lb-ft	lb-ft	lb-ft	psi	psi	psi

8,9	7859.430	-2937.104	7859.430	582.180	-217.563	582.180
9,10	0.000	-8780.018	-8780.018	0.000	-650.372	-650.372
10,11	0.000	-10736.037	-10736.037	0.000	-795.262	-795.262
11,12	0.000	-10736.027	-10736.027	0.000	-795.261	-795.261
12,13	0.000	-8779.551	-8779.551	0.000	-650.337	-650.337
13,14	7859.357	-2936.515	7859.357	582.175	-217.520	582.175

Maximum deflection values:

From, To	Maximum defl.	Maximum defl.	Maximum defl.
Node	up (left)	down (rt.)	absolute
---	inch	inch	inch

8,9	0.000	-0.109	-0.109
9,10	0.000	-0.096	-0.096
10,11	0.000	-0.085	-0.085
11,12	0.000	-0.085	-0.085
12,13	0.000	-0.096	-0.096
13,14	0.000	-0.109	-0.109

Deflections along the elements (positive is up or counter-clockwise):

Distance from	Rotation	Deflection
left (bottom)	---	---
ft	radian	inch

At the intermediate nodes:

1.083	0.001	-0.096
2.167	0.001	-0.085
3.250	0.000	-0.081
4.333	-0.001	-0.085
5.417	-0.001	-0.096

At evenly-spaced intervals:

0.000	0.001	-0.109
0.650	0.001	-0.101
1.300	0.001	-0.094
1.950	0.001	-0.087
2.600	0.000	-0.082
3.250	0.000	-0.081
3.900	-0.000	-0.082
4.550	-0.001	-0.087
5.200	-0.001	-0.094
5.850	-0.001	-0.101
6.500	-0.001	-0.109

FRAME MAC file: 5(21/21) EMBANK; Last modified at 19:12:36 on Wed, May 5, 1993

Node 8
0.500
0.000

Node 15
0.500
1.083

Node 17
0.500
2.167

Node 19
0.500
3.250

Node 21
0.500
4.333

Node 23
0.500
5.417

Node 25
0.500
6.500

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000 lb
-12425.541
3191.889

12 Shear

lb
-3230.734

Moment

0.000 lb-ft
-7921.659
0.013

Defl.

inch
-0.000

Distance

```

*****
Continuous Elements Output Data
*****
FRAME MAC file: 5(21/21) EMBANK.
Last modified at 19:12:36 on Wed, May 5, 1993.
All coord. and distances are in ft from the left (bot.) end of the element.
*****
Support reactions: (pos. force is to right or up; pos. moment is ccw.)

```

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
8	-0.000	-0.109	0.001
15	-0.008	-0.109	0.000
17	-0.012	-0.110	0.000
19	-0.013	-0.110	-0.000
21	-0.012	-0.111	-0.000
23	-0.008	-0.111	-0.000
25	0.000	-0.111	-0.001

```

*****
Node deformations: (positive is to right, up, or counterclockwise.)

```

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
8	-0.000	-0.109	0.001
15	-0.008	-0.109	0.000
17	-0.012	-0.110	0.000
19	-0.013	-0.110	-0.000
21	-0.012	-0.111	-0.000
23	-0.008	-0.111	-0.000
25	0.000	-0.111	-0.001

```

*****
Element fixed-end forces & moments: (local coordinate system)

```

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,15	85.313	535.383	96.666	85.313	535.054	-96.666
15,17	85.312	535.383	96.666	85.312	535.054	-96.666
17,19	85.312	535.383	96.666	85.312	535.054	-96.666
19,21	85.313	535.383	96.666	85.313	535.054	-96.666
21,23	85.313	535.383	96.666	85.313	535.054	-96.666
23,25	85.312	535.383	96.666	85.312	535.054	-96.666

```

*****
Actual element end forces & moments: (local coordinate system)

```

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,15	12425.541	3191.889	7794.341	-12254.916	-2121.452	-4916.460
15,17	12254.916	2121.452	4916.460	-12084.291	-1051.015	-3198.219
17,19	12084.291	1051.015	3198.219	-11913.666	19.423	-2639.619
19,21	11913.666	-19.423	2639.619	-11743.041	1089.860	-3240.658
21,23	11743.041	-1089.860	3240.658	-11572.416	2160.297	-5001.338
23,25	11572.416	-2160.297	5001.338	-11401.791	3230.734	-7921.659

```

*****
Member end deformations: (local coordinate system)

```

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,15	-0.109	0.000	0.001	-0.109	0.008	0.000
15,17	-0.109	0.008	0.000	-0.110	0.012	0.000
17,19	-0.110	0.012	0.000	-0.110	0.013	-0.000
19,21	-0.110	0.013	-0.000	-0.111	0.012	-0.000
21,23	-0.111	0.012	-0.000	-0.111	0.008	-0.000
23,25	-0.111	0.008	-0.000	-0.111	-0.000	-0.001

```

*****
Maximum deformations:
Node 19 moved 0.013 inch to the left.
Node 25 moved 0.000 inch to the right.
Node 25 moved 0.111 inch downwards.
No nodes moved upwards.
Node 25 rotated 0.001 radian clockwise.
Node 8 rotated 0.001 radian counter-clockwise.
*****
Maximum reactions:
There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.
*****
Maximum tension and tensile stress values (compression is negative):

```

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
---------------	-----------------	-----------------	-------------------	-------------------	-------------------	------------------

---	lb	lb	lb	psi	psi	psi
8,15	0.000	-12425.541	-12425.541	0.000	-115.051	-115.051
15,17	0.000	-12254.916	-12254.916	0.000	-113.471	-113.471
17,19	0.000	-12084.291	-12084.291	0.000	-111.892	-111.892
19,21	0.000	-11913.666	-11913.666	0.000	-110.312	-110.312
21,23	0.000	-11743.041	-11743.041	0.000	-108.732	-108.732
23,25	0.000	-11572.416	-11572.416	0.000	-107.152	-107.152

Maximum shear and shear stress values:						
From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
8,15	3191.889	0.000	3191.889	29.555	0.000	29.555
15,17	2121.452	0.000	2121.452	19.643	0.000	19.643
17,19	1051.015	-19.423	1051.015	9.732	-0.180	9.732
19,21	0.000	-1089.860	-1089.860	0.000	-10.091	-10.091
21,23	0.000	-2160.297	-2160.297	0.000	-20.003	-20.003
23,25	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914

Maximum moment and bending stress values:						
From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
8,15	0.000	-7794.341	-7794.341	0.000	-577.359	-577.359
15,17	0.000	-4916.460	-4916.460	0.000	-364.182	-364.182
17,19	0.000	-3198.219	-3198.219	0.000	-236.905	-236.905
19,21	0.000	-3240.658	-3240.658	0.000	-240.049	-240.049
21,23	0.000	-5001.338	-5001.338	0.000	-370.470	-370.470
23,25	0.000	-7921.659	-7921.659	0.000	-586.790	-586.790

Maximum deflection values:						
From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
8,15	0.008	0.000	0.008			
15,17	0.012	0.000	0.012			
17,19	0.013	0.000	0.013			
19,21	0.013	0.000	0.013			
21,23	0.012	0.000	0.012			
23,25	0.008	-0.000	0.008			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
At the intermediate nodes:						
1.083	0.000	0.008				
2.167	0.000	0.012				
3.250	-0.000	0.013				
4.333	-0.000	0.012				
5.417	-0.000	0.008				
At evenly-spaced intervals:						
0.000	0.001	0.000				
0.650	0.001	0.006				
1.300	0.000	0.009				
1.950	0.000	0.011				
2.600	0.000	0.013				
3.250	-0.000	0.013				
3.900	-0.000	0.013				
4.550	-0.000	0.011				
5.200	-0.000	0.009				
5.850	-0.001	0.005				
6.500	-0.001	-0.000				

FRAME MAC file: 5(21/21) EMBANK; Last modified at 19:12:36 on Wed, May 5, 1993

Node 14
7.000
0.000

Node 16
7.000
1.083

Node 18
7.000
2.167

Node 20
7.000
3.250

Node 22
7.000
4.333

Node 24
7.000
5.417

Node 31
7.000
6.500

F: lb
D: lb/ft
M: lb-ft
E: psi

Load

Tension

0.000
lb

-12424.406
3230.734

15 Shear

lb

-3191.889
7921.601

Moment

lb-ft
0.000

Defl.

0.000
inch

-0.013

Distance 0.000

$L/6$

1.300 $L/4$

$L/3$

2.600 $L/2$

$3L/4$

3.900 $2L/3$

$3L/4$

5.200 $5L/6$

6.500 ft

Continuous Elements Output Data

FRAME MAC file: 5(21/21) EMBANK.

Last modified at 19:12:36 on Wed, May 5, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	0.000	-0.109	-0.001
16	0.008	-0.109	-0.000
18	0.012	-0.110	-0.000
20	0.013	-0.110	0.000
22	0.012	-0.110	0.000
24	0.008	-0.111	0.000
31	-0.000	-0.111	0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	85.313	-535.383	-96.666	85.313	-535.054	96.666
16,18	85.312	-535.383	-96.666	85.312	-535.054	96.666
18,20	85.312	-535.383	-96.666	85.312	-535.054	96.666
20,22	85.313	-535.383	-96.666	85.313	-535.054	96.666
22,24	85.313	-535.383	-96.666	85.313	-535.054	96.666
24,31	85.312	-535.383	-96.666	85.312	-535.054	96.666

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	12424.406	-3191.889	-7794.283	-12253.781	2121.452	4916.402
16,18	12253.781	-2121.452	-4916.402	-12083.156	1051.015	3198.161
18,20	12083.156	-1051.015	-3198.161	-11912.531	-19.423	2639.561
20,22	11912.531	19.423	-2639.561	-11741.906	-1089.860	3240.600
22,24	11741.906	1089.860	-3240.600	-11571.281	-2160.297	5001.280
24,31	11571.281	2160.297	-5001.280	-11400.656	-3230.734	7921.601

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,16	-0.109	-0.000	-0.001	-0.109	-0.008	-0.000
16,18	-0.109	-0.008	-0.000	-0.110	-0.012	-0.000
18,20	-0.110	-0.012	-0.000	-0.110	-0.013	0.000
20,22	-0.110	-0.013	0.000	-0.110	-0.012	0.000
22,24	-0.110	-0.012	0.000	-0.111	-0.008	0.000
24,31	-0.111	-0.008	0.000	-0.111	0.000	0.001

Maximum deformations:

Node 31 moved 0.000 inch to the left.
Node 20 moved 0.013 inch to the right.
Node 31 moved 0.111 inch downwards.
No nodes moved upwards.
Node 14 rotated 0.001 radian clockwise.
Node 31 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
14,16	0.000	-12424.406	-12424.406	0.000	-115.041	-115.041
16,18	0.000	-12253.781	-12253.781	0.000	-113.461	-113.461
18,20	0.000	-12083.156	-12083.156	0.000	-111.881	-111.881
20,22	0.000	-11912.531	-11912.531	0.000	-110.301	-110.301
22,24	0.000	-11741.906	-11741.906	0.000	-108.721	-108.721
24,31	0.000	-11571.281	-11571.281	0.000	-107.141	-107.141

Maximum shear and shear stress values:						
From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,16	0.000	-3191.889	-3191.889	0.000	-29.555	-29.555
16,18	0.000	-2121.452	-2121.452	0.000	-19.643	-19.643
18,20	19.423	-1051.015	-1051.015	0.180	-9.732	-9.732
20,22	1089.860	0.000	1089.860	10.091	0.000	10.091
22,24	2160.297	0.000	2160.297	20.003	0.000	20.003
24,31	3230.734	0.000	3230.734	29.914	0.000	29.914

Maximum moment and bending stress values:						
From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,16	7794.283	0.000	7794.283	577.354	0.000	577.354
16,18	4916.402	0.000	4916.402	364.178	0.000	364.178
18,20	3198.161	0.000	3198.161	236.901	0.000	236.901
20,22	3240.600	0.000	3240.600	240.044	0.000	240.044
22,24	5001.280	0.000	5001.280	370.465	0.000	370.465
24,31	7921.601	0.000	7921.601	586.785	0.000	586.785

Maximum deflection values:						
From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
14,16	0.000	-0.008	-0.008			
16,18	0.000	-0.012	-0.012			
18,20	0.000	-0.013	-0.013			
20,22	0.000	-0.013	-0.013			
22,24	0.000	-0.012	-0.012			
24,31	0.000	-0.008	-0.008			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
At the intermediate nodes:						
1.083	-0.000	-0.008				
2.167	-0.000	-0.012				
3.250	0.000	-0.013				
4.333	0.000	-0.012				
5.417	0.000	-0.008				
At evenly-spaced intervals:						
0.000	-0.001	-0.000				
0.650	-0.001	-0.006				
1.300	-0.000	-0.009				
1.950	-0.000	-0.011				
2.600	-0.000	-0.013				
3.250	0.000	-0.013				
3.900	0.000	-0.013				
4.550	0.000	-0.011				
5.200	0.000	-0.009				
5.850	0.001	-0.005				
6.500	0.001	0.000				

Output Data

FRAME MAC file: 5(21/21) EMBANK.

Last modified at 19:12:36 on Wed, May 5, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,8	0.000	-2544.822	-2544.822	0.000	-32.626	-32.626
2,9	0.000	-4496.435	-4496.435	0.000	-28.823	-28.823
3,10	0.000	-3982.196	-3982.196	0.000	-25.527	-25.527
4,11	0.000	-3784.714	-3784.714	0.000	-24.261	-24.261
5,12	0.000	-3981.863	-3981.863	0.000	-25.525	-25.525
6,13	0.000	-4495.752	-4495.752	0.000	-28.819	-28.819
7,14	0.000	-2544.298	-2544.298	0.000	-32.619	-32.619
8,9	0.000	-2100.005	-2100.005	0.000	-19.444	-19.444
8,15	0.000	-12425.541	-12425.541	0.000	-115.051	-115.051
9,10	2679.799	0.000	2679.799	24.813	0.000	24.813
10,11	2023.652	0.000	2023.652	18.738	0.000	18.738
11,12	2023.592	0.000	2023.592	18.737	0.000	18.737
12,13	2679.465	0.000	2679.465	24.810	0.000	24.810
13,14	0.000	-2100.005	-2100.005	0.000	-19.444	-19.444
14,16	0.000	-12424.406	-12424.406	0.000	-115.041	-115.041
15,17	0.000	-12254.916	-12254.916	0.000	-113.471	-113.471
16,18	0.000	-12253.781	-12253.781	0.000	-113.461	-113.461
17,19	0.000	-12084.291	-12084.291	0.000	-111.892	-111.892
18,20	0.000	-12083.156	-12083.156	0.000	-111.881	-111.881
19,21	0.000	-11913.666	-11913.666	0.000	-110.312	-110.312
20,22	0.000	-11912.531	-11912.531	0.000	-110.301	-110.301
21,23	0.000	-11743.041	-11743.041	0.000	-108.732	-108.732
22,24	0.000	-11741.906	-11741.906	0.000	-108.721	-108.721
23,25	0.000	-11572.416	-11572.416	0.000	-107.152	-107.152
24,31	0.000	-11571.281	-11571.281	0.000	-107.141	-107.141
25,26	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
26,27	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
27,28	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
28,29	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
29,30	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914
30,31	0.000	-3230.734	-3230.734	0.000	-29.914	-29.914

SOIL ELEMENTS
AVE 29.82 psi = 20.22 psi
= 29.12 psi

*** TRENCH INSTALLATION. SEE FIG 4.2

$$B_c = 8.$$

$$B_d = 14.$$

$$H = 7.63'$$

$$K = \frac{1 - \sin \phi}{1 + \sin \phi} = 0.2948$$

$$\tan \phi =$$

$$\phi = 33^\circ$$

$$W_d = C_d w B_d^2$$

$$W_d = 0.491646 (115) (14)^2$$

$$= 11081 \text{ lb/ft}$$

$$\frac{W_d}{B_d} = 792 \text{ lb/ft}^2$$

$$\sigma_v = 790 \text{ lb/ft}^2$$

$$\sigma_H = 233 \text{ lb/ft}^2$$

$$C_d = \left(\frac{1 - e^{-\frac{2K\mu' H}{B_d}}}{2K\mu} \right)$$

$$C_d = \left(\frac{1 - e^{-\frac{2(0.1914) 7.63}{14}}}{2(0.1914)} \right)$$

$$\left(\frac{1 - e^{-2.097}}{2(0.1914)} \right)$$

$$C_d = 0.491646$$

**** NEGATIVE PROJECTION EMBANKMENT PER FIG 4.2 & FIG 4.32(b)

$$B_c = 8'$$

$$B_d = 14'$$

$$H = 23.25' + 7.63'$$

$$\frac{H}{B_d} = \frac{(23.25 + 7.63)}{14} = 2.2$$

EQN 4.4 OR. 4.7

$$H \leq H_e. (4.27)$$

$$W_n = W. B_d^2 \left(\frac{e^{-2K\mu \frac{H}{B_d}} - 1}{-2K\mu} \right)$$

$$C_n = \left(\frac{e^{-2K\mu \frac{H}{B_d}} - 1}{-2K\mu} \right)$$

$$C_n = \left(\frac{e^{-2K_u \left(\frac{H}{B_d} \right)} - 1}{-2K_u} \right)$$

$$W_n = C_n w \cdot B_d^2$$

$$= 1.48699 (115) (14^2)$$

$$= \frac{e^{-2(0.1914)(2.2)} - 1}{-2(0.1924)}$$

$$C_n = 1.48699$$

$$W_n = 33517 \text{ lb}$$

$$\frac{W_n}{B_d} = 2394 \text{ lb/ft}^2 \checkmark$$

$$V_v = 2394 \text{ lb/ft}^2$$

$$V_H = 706 \text{ lb/ft}^2$$

TUNNEL SECTION	EMBANKMENT. STRUCTURAL ASSESSMENT			
PAGE ____ OF ____	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE	10,336 ft-lbs	10,605 ft-lbs	
	FLOOR STRUCTURE	10,336 ft-lbs	10,736 ft-lbs	
	LEFT INSIDE WALL	6897 ft-lbs	— ft-lbs	
	LEFT OUTSIDE WALL	8672 ft-lbs	7921 ft-lbs	
	RIGHT INSIDE WALL	6897 ft-lbs	— ft-lbs	
	RIGHT OUTSIDE WALL	8672 ft-lbs	7921 ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$	ROOF STRUCTURE	8872 lbs	11401 lbs	No.
	FLOOR STRUCTURE	8872 lbs	10,736 lbs	No.
	LEFT WALL	8872 lbs	3,230 lbs	
	RIGHT WALL	8872 lbs	3,230 lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL	117,116 lbs	12425 lbs	
	RIGHT WALL	117,116 lbs	12,424 lbs	
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$B = 8 \text{ ft.}$ $D_2 = 8 \text{ ft.}$ $D_1 = 30.8 \text{ ft.}$ $D_1 = 4.8 \text{ ft.}$</p> </div> <div style="text-align: center;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$ $k = 0.2948$</p> <p>$\sigma_v = D_1 \rho \quad 2334 \text{ lbs/ft}^2 \times \text{Pressure Efficiency}$ $\sigma_h = k \sigma_v \quad 706 \text{ lbs/ft}^2$</p> </div> </div>				

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-3(21/21)

TITLE: Structural Assessment of Tunnel Section 3(21/21) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 3(21/21)) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft² for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Figure() Section 3(21/21) Compacted Tuff Shield Configuration

Figure() 3(21/21) Trench Excavation and Backfill Configuration

FRAME MAC file: 3(21/21) EMBANK; Last modified at 17:39:01 on Mon, Mar 22, 1993
 Above each load are the magnitudes in lb, lb/ft, and lb-ft.

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FRAME MAC file: 3(21/21) EMBANK; Last modified at 17:39:01 on Mon, Mar 22, 1993

Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54	Node 55	Node 56	Node 57	Node 58	Node 59	Node 60	Node 61
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000
11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000

Continuous Elements Output Data

FRAME MAC file: 3(21/21) EMBANK.

Last modified at 17:39:01 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

47	0.001	-0.240	-0.004
48	0.001	-0.290	-0.005
49	0.001	-0.346	-0.005
50	0.001	-0.401	-0.004
51	0.001	-0.450	-0.004
52	0.000	-0.488	-0.003
53	0.000	-0.512	-0.001
54	0.000	-0.520	0.000
55	-0.000	-0.512	0.001
56	-0.000	-0.488	0.003
57	-0.001	-0.450	0.004
58	-0.001	-0.401	0.004
59	-0.001	-0.346	0.005
60	-0.001	-0.290	0.005
61	-0.001	-0.240	0.004

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
47,48	0.000	2019.500	336.583	0.000	2019.500	-336.583
48,49	0.000	2019.500	336.583	0.000	2019.500	-336.583
49,50	0.000	2019.500	336.583	0.000	2019.500	-336.583
50,51	0.000	2019.500	336.583	0.000	2019.500	-336.583
51,52	0.000	2019.500	336.583	0.000	2019.500	-336.583
52,53	0.000	2019.500	336.583	0.000	2019.500	-336.583
53,54	0.000	2019.500	336.583	0.000	2019.500	-336.583
54,55	0.000	2019.500	336.583	0.000	2019.500	-336.583
55,56	0.000	2019.500	336.583	0.000	2019.500	-336.583
56,57	0.000	2019.500	336.583	0.000	2019.500	-336.583
57,58	0.000	2019.500	336.583	0.000	2019.500	-336.583
58,59	0.000	2019.500	336.583	0.000	2019.500	-336.583
59,60	0.000	2019.500	336.583	0.000	2019.500	-336.583
60,61	0.000	2019.500	336.583	0.000	2019.500	-336.583

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
47,48	6759.984	28273.000	44510.175	-6759.984	-24234.000	-18256.675
48,49	6759.984	24234.000	18256.675	-6759.984	-20195.000	3957.825
49,50	6759.984	20195.000	-3957.825	-6759.984	-16156.000	22133.325
50,51	6759.984	16156.000	-22133.325	-6759.984	-12117.000	36269.825
51,52	6759.984	12117.000	-36269.825	-6759.984	-8078.000	46367.325
52,53	6759.984	8078.000	-46367.325	-6759.984	-4039.000	52425.825
53,54	6759.984	4039.000	-52425.825	-6759.984	0.000	54445.325
54,55	6759.984	0.000	-54445.325	-6759.984	4039.000	52425.825
55,56	6759.984	-4039.000	-52425.825	-6759.984	8078.000	46367.325
56,57	6759.984	-8078.000	-46367.325	-6759.984	12117.000	36269.825
57,58	6759.984	-12117.000	-36269.825	-6759.984	16156.000	22133.325
58,59	6759.984	-16156.000	-22133.325	-6759.984	20195.000	3957.825
59,60	6759.984	-20195.000	-3957.825	-6759.984	24234.000	-18256.675
60,61	6759.984	-24234.000	18256.675	-6759.984	28273.000	-44510.175

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
47,48	0.001	-0.240	-0.004	0.001	-0.290	-0.005
48,49	0.001	-0.290	-0.005	0.001	-0.346	-0.005

49,50	0.001	-0.346	-0.005	0.001	-0.401	-0.004
50,51	0.001	-0.401	-0.004	0.001	-0.450	-0.004
51,52	0.001	-0.450	-0.004	0.000	-0.488	-0.003
52,53	0.000	-0.488	-0.003	0.000	-0.512	-0.001
53,54	0.000	-0.512	-0.001	0.000	-0.520	0.000
54,55	0.000	-0.520	0.000	-0.000	-0.512	0.001
55,56	-0.000	-0.512	0.001	-0.000	-0.488	0.003
56,57	-0.000	-0.488	0.003	-0.001	-0.450	0.004
57,58	-0.001	-0.450	0.004	-0.001	-0.401	0.004
58,59	-0.001	-0.401	0.004	-0.001	-0.346	0.005
59,60	-0.001	-0.346	0.005	-0.001	-0.290	0.005
60,61	-0.001	-0.290	0.005	-0.001	-0.240	0.004

Maximum deformations:

Node 61 moved 0.001 inch to the left.
 Node 47 moved 0.001 inch to the right.
 Node 54 moved 0.520 inch downwards.
 No nodes moved upwards.
 Node 49 rotated 0.005 radian clockwise.
 Node 59 rotated 0.005 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
47,48	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
48,49	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
49,50	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
50,51	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
51,52	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
52,53	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
53,54	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
54,55	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
55,56	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
56,57	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
57,58	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
58,59	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
59,60	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
60,61	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
47,48	28273.000	0.000	28273.000	196.340	0.000	196.340
48,49	24234.000	0.000	24234.000	168.292	0.000	168.292
49,50	20195.000	0.000	20195.000	140.243	0.000	140.243
50,51	16156.000	0.000	16156.000	112.194	0.000	112.194
51,52	12117.000	0.000	12117.000	84.146	0.000	84.146
52,53	8078.000	0.000	8078.000	56.097	0.000	56.097
53,54	4039.000	0.000	4039.000	28.049	0.000	28.049
54,55	0.000	-4039.000	-4039.000	0.000	-28.049	-28.049
55,56	0.000	-8078.000	-8078.000	0.000	-56.097	-56.097
56,57	0.000	-12117.000	-12117.000	0.000	-84.146	-84.146
57,58	0.000	-16156.000	-16156.000	0.000	-112.194	-112.194
58,59	0.000	-20195.000	-20195.000	0.000	-140.243	-140.243
59,60	0.000	-24234.000	-24234.000	0.000	-168.292	-168.292
60,61	0.000	-28273.000	-28273.000	0.000	-196.340	-196.340

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
------------------	----------------------------	----------------------------	------------------------------	-----------------------------	-----------------------------	----------------------------

47,48	0.000	-44510.175	-44510.175	0.000	-1854.591	-1854.591
48,49	3957.825	-18256.675	-18256.675	164.909	-760.695	-760.695
49,50	22133.325	0.000	22133.325	922.222	0.000	922.222
50,51	36269.825	0.000	36269.825	1511.243	0.000	1511.243
51,52	46367.325	0.000	46367.325	1931.972	0.000	1931.972
52,53	52425.825	0.000	52425.825	2184.409	0.000	2184.409
53,54	54445.325	0.000	54445.325	2268.555	0.000	2268.555
54,55	54445.325	0.000	54445.325	2268.555	0.000	2268.555
55,56	52425.825	0.000	52425.825	2184.409	0.000	2184.409
56,57	46367.325	0.000	46367.325	1931.972	0.000	1931.972
57,58	36269.825	0.000	36269.825	1511.243	0.000	1511.243
58,59	22133.325	0.000	22133.325	922.222	0.000	922.222
59,60	3957.825	-18256.675	-18256.675	164.909	-760.695	-760.695
60,61	0.000	-44510.175	-44510.175	0.000	-1854.591	-1854.591

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
47,48	0.000	-0.290	-0.290
48,49	0.000	-0.346	-0.346
49,50	0.000	-0.401	-0.401
50,51	0.000	-0.450	-0.450
51,52	0.000	-0.488	-0.488
52,53	0.000	-0.512	-0.512
53,54	0.000	-0.520	-0.520
54,55	0.000	-0.520	-0.520
55,56	0.000	-0.512	-0.512
56,57	0.000	-0.488	-0.488
57,58	0.000	-0.450	-0.450
58,59	0.000	-0.401	-0.401
59,60	0.000	-0.346	-0.346
60,61	0.000	-0.290	-0.290

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.000	-0.005	-0.290
2.000	-0.005	-0.346
3.000	-0.004	-0.401
4.000	-0.004	-0.450
5.000	-0.003	-0.488
6.000	-0.001	-0.512
7.000	0.000	-0.520
8.000	0.001	-0.512
9.000	0.003	-0.488
10.000	0.004	-0.450
11.000	0.004	-0.401
12.000	0.005	-0.346
13.000	0.005	-0.290
At evenly-spaced intervals:		
0.000	-0.004	-0.240
1.400	-0.005	-0.312
2.800	-0.004	-0.391
4.200	-0.003	-0.459
5.600	-0.002	-0.504
7.000	0.000	-0.520
8.400	0.002	-0.504
9.800	0.003	-0.459
11.200	0.004	-0.391
12.600	0.005	-0.312
14.000	0.004	-0.240

FRAME MAC file: 3(21/21) EMBANK; Last modified at 17:39:01 on Mon, Mar 22, 1993

Node 16	Node 17	Node 18	Node 19	Node 20	Node 21	Node 22	Node 23	Node 24	Node 25	Node 26	Node 27	Node 28	Node 29	Node 30
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000
1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
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Continuous Elements Output Data

FRAME MAC file: 3(21/21) EMBANK.

Last modified at 17:39:01 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
16	-0.001	-0.233	0.003
17	-0.001	-0.191	0.004
18	-0.001	-0.148	0.004
19	-0.001	-0.108	0.003
20	-0.001	-0.074	0.002
21	-0.001	-0.049	0.002
22	-0.000	-0.034	0.001
23	0.000	-0.029	0.000
24	0.000	-0.034	-0.001
25	0.001	-0.049	-0.002
26	0.001	-0.074	-0.002
27	0.001	-0.108	-0.003
28	0.001	-0.148	-0.004
29	0.001	-0.191	-0.004
30	0.001	-0.233	-0.003

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
16,17	0.000	105.000	17.500	0.000	105.000	-17.500
17,18	0.000	105.000	17.500	0.000	105.000	-17.500
18,19	0.000	105.000	17.500	0.000	105.000	-17.500
19,20	0.000	105.000	17.500	0.000	105.000	-17.500
20,21	0.000	105.000	17.500	0.000	105.000	-17.500
21,22	0.000	105.000	17.500	0.000	105.000	-17.500
22,23	0.000	105.000	17.500	0.000	105.000	-17.500
23,24	0.000	105.000	17.500	0.000	105.000	-17.500
24,25	0.000	105.000	17.500	0.000	105.000	-17.500
25,26	0.000	105.000	17.500	0.000	105.000	-17.500
26,27	0.000	105.000	17.500	0.000	105.000	-17.500
27,28	0.000	105.000	17.500	0.000	105.000	-17.500
28,29	0.000	105.000	17.500	0.000	105.000	-17.500
29,30	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
16,17	2449.694	-25243.130	-30512.252	-2449.694	25453.130	5164.123
17,18	-1236.146	-17189.337	-5473.930	1236.146	17399.337	-11820.407
18,19	-4868.621	-11008.391	11516.245	4868.621	11218.391	-22629.636
19,20	-7929.778	-6562.107	22367.773	7929.778	6772.107	-29034.880
20,21	-10223.955	-3567.621	28832.824	10223.955	3777.621	-32505.445
21,22	-11721.504	-1655.198	32369.820	11721.504	1865.198	-34130.018
22,23	-12454.748	-407.166	34062.273	12454.748	617.166	-34574.439
23,24	-12454.748	617.166	34574.439	12454.748	-407.166	-34062.273
24,25	-11721.504	1865.198	34130.018	11721.504	-1655.198	-32369.820
25,26	-10223.955	3777.621	32505.445	10223.955	-3567.621	-28832.824
26,27	-7929.778	6772.107	29034.880	7929.778	-6562.107	-22367.773
27,28	-4868.621	11218.391	22629.636	4868.621	-11008.391	-11516.245
28,29	-1236.146	17399.337	11820.407	1236.146	-17189.337	5473.930
29,30	2449.694	25453.130	-5164.123	-2449.694	-25243.130	30512.252

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
16,17	-0.001	-0.233	0.003	-0.001	-0.191	0.004
17,18	-0.001	-0.191	0.004	-0.001	-0.148	0.004

18,19	-0.001	-0.148	0.004	-0.001	-0.108	0.003
19,20	-0.001	-0.108	0.003	-0.001	-0.074	0.002
20,21	-0.001	-0.074	0.002	-0.001	-0.049	0.002
21,22	-0.001	-0.049	0.002	-0.000	-0.034	0.001
22,23	-0.000	-0.034	0.001	0.000	-0.029	0.000
23,24	0.000	-0.029	0.000	0.000	-0.034	-0.001
24,25	0.000	-0.034	-0.001	0.001	-0.049	-0.002
25,26	0.001	-0.049	-0.002	0.001	-0.074	-0.002
26,27	0.001	-0.074	-0.002	0.001	-0.108	-0.003
27,28	0.001	-0.108	-0.003	0.001	-0.148	-0.004
28,29	0.001	-0.148	-0.004	0.001	-0.191	-0.004
29,30	0.001	-0.191	-0.004	0.001	-0.233	-0.003

Maximum deformations:

Node 17 moved 0.001 inch to the left.
 Node 29 moved 0.001 inch to the right.
 Node 30 moved 0.233 inch downwards.
 No nodes moved upwards.
 Node 29 rotated 0.004 radian clockwise.
 Node 17 rotated 0.004 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
16,17	0.000	-2449.694	-2449.694	0.000	-17.012	-17.012
17,18	1236.146	0.000	1236.146	8.584	0.000	8.584
18,19	4868.621	0.000	4868.621	33.810	0.000	33.810
19,20	7929.778	0.000	7929.778	55.068	0.000	55.068
20,21	10223.955	0.000	10223.955	71.000	0.000	71.000
21,22	11721.504	0.000	11721.504	81.399	0.000	81.399
22,23	12454.748	0.000	12454.748	86.491	0.000	86.491
23,24	12454.748	0.000	12454.748	86.491	0.000	86.491
24,25	11721.504	0.000	11721.504	81.399	0.000	81.399
25,26	10223.955	0.000	10223.955	71.000	0.000	71.000
26,27	7929.778	0.000	7929.778	55.068	0.000	55.068
27,28	4868.621	0.000	4868.621	33.810	0.000	33.810
28,29	1236.146	0.000	1236.146	8.584	0.000	8.584
29,30	0.000	-2449.694	-2449.694	0.000	-17.012	-17.012

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
16,17	0.000	-25453.130	-25453.130	0.000	-176.758	-176.758
17,18	0.000	-17399.337	-17399.337	0.000	-120.829	-120.829
18,19	0.000	-11218.391	-11218.391	0.000	-77.905	-77.905
19,20	0.000	-6772.107	-6772.107	0.000	-47.029	-47.029
20,21	0.000	-3777.621	-3777.621	0.000	-26.233	-26.233
21,22	0.000	-1865.198	-1865.198	0.000	-12.953	-12.953
22,23	0.000	-617.166	-617.166	0.000	-4.286	-4.286
23,24	617.166	0.000	617.166	4.286	0.000	4.286
24,25	1865.198	0.000	1865.198	12.953	0.000	12.953
25,26	3777.621	0.000	3777.621	26.233	0.000	26.233
26,27	6772.107	0.000	6772.107	47.029	0.000	47.029
27,28	11218.391	0.000	11218.391	77.905	0.000	77.905
28,29	17399.337	0.000	17399.337	120.829	0.000	120.829
29,30	25453.130	0.000	25453.130	176.758	0.000	176.758

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
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16,17	30512.252	0.000	30512.252	1271.344	0.000	1271.344
17,18	5473.930	-11820.407	-11820.407	228.080	-492.517	-492.517
18,19	0.000	-22629.636	-22629.636	0.000	-942.902	-942.902
19,20	0.000	-29034.880	-29034.880	0.000	-1209.787	-1209.787
20,21	0.000	-32505.445	-32505.445	0.000	-1354.394	-1354.394
21,22	0.000	-34130.018	-34130.018	0.000	-1422.084	-1422.084
22,23	0.000	-34574.439	-34574.439	0.000	-1440.602	-1440.602
23,24	0.000	-34574.439	-34574.439	0.000	-1440.602	-1440.602
24,25	0.000	-34130.018	-34130.018	0.000	-1422.084	-1422.084
25,26	0.000	-32505.445	-32505.445	0.000	-1354.394	-1354.394
26,27	0.000	-29034.880	-29034.880	0.000	-1209.787	-1209.787
27,28	0.000	-22629.636	-22629.636	0.000	-942.902	-942.902
28,29	5473.930	-11820.407	-11820.407	228.080	-492.517	-492.517
29,30	30512.252	0.000	30512.252	1271.344	0.000	1271.344

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
16,17	0.000	-0.233	-0.233
17,18	0.000	-0.191	-0.191
18,19	0.000	-0.148	-0.148
19,20	0.000	-0.108	-0.108
20,21	0.000	-0.074	-0.074
21,22	0.000	-0.049	-0.049
22,23	0.000	-0.034	-0.034
23,24	0.000	-0.034	-0.034
24,25	0.000	-0.049	-0.049
25,26	0.000	-0.074	-0.074
26,27	0.000	-0.108	-0.108
27,28	0.000	-0.148	-0.148
28,29	0.000	-0.191	-0.191
29,30	0.000	-0.233	-0.233

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
At the intermediate nodes:		
1.000	0.004	-0.191
2.000	0.004	-0.148
3.000	0.003	-0.108
4.000	0.002	-0.074
5.000	0.002	-0.049
6.000	0.001	-0.034
7.000	0.000	-0.029
8.000	-0.001	-0.034
9.000	-0.002	-0.049
10.000	-0.002	-0.074
11.000	-0.003	-0.108
12.000	-0.004	-0.148
13.000	-0.004	-0.191
At evenly-spaced intervals:		
0.000	0.003	-0.233
1.400	0.004	-0.174
2.800	0.003	-0.115
4.200	0.002	-0.068
5.600	0.001	-0.039
7.000	0.000	-0.029
8.400	-0.001	-0.039
9.800	-0.002	-0.068
11.200	-0.003	-0.115
12.600	-0.004	-0.174
14.000	-0.003	-0.233

FRAME MAC file: 3(21/21) EMBANK; Last modified at 17:39:01 on Mon, Mar 22, 1993

Node 16	Node 31	Node 33	Node 35	Node 37	Node 39	Node 41	Node 43	Node 45	Node 47
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.500	2.556	3.611	4.667	5.722	6.778	7.833	8.889	9.944	11.000

Continuous Elements Output Data

FRAME MAC file: 3(21/21) EMBANK.

Last modified at 17:39:01 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
16	-0.001	-0.233	0.003
31	-0.036	-0.233	0.002
33	-0.063	-0.234	0.002
35	-0.080	-0.235	0.001
37	-0.090	-0.236	0.000
39	-0.091	-0.237	-0.000
41	-0.084	-0.237	-0.001
43	-0.067	-0.238	-0.002
45	-0.039	-0.239	-0.003
47	0.001	-0.240	-0.004

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
16,31	110.833	585.939	103.082	110.833	585.939	-103.082
31,33	110.833	585.939	103.082	110.833	585.939	-103.082
33,35	110.833	585.939	103.082	110.833	585.939	-103.082
35,37	110.833	585.939	103.082	110.833	585.939	-103.082
37,39	110.833	585.939	103.082	110.833	585.939	-103.082
39,41	110.833	585.939	103.082	110.833	585.939	-103.082
41,43	110.833	585.939	103.082	110.833	585.939	-103.082
43,45	110.833	585.939	103.082	110.833	585.939	-103.082
45,47	110.833	585.939	103.082	110.833	585.939	-103.082

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
16,31	30268.000	3786.916	30388.101	-30046.333	-2615.038	-27009.292
31,33	30046.333	2615.038	27009.292	-29824.667	-1443.160	-24867.465
33,35	29824.667	1443.160	24867.465	-29603.000	-271.283	-23962.620
35,37	29603.000	271.283	23962.620	-29381.333	900.595	-24294.757
37,39	29381.333	-900.595	24294.757	-29159.667	2072.473	-25863.877
39,41	29159.667	-2072.473	25863.877	-28938.000	3244.351	-28669.978
41,43	28938.000	-3244.351	28669.978	-28716.333	4416.229	-32713.062
43,45	28716.333	-4416.229	32713.062	-28494.667	5588.106	-37993.127
45,47	28494.667	-5588.106	37993.127	-28273.000	6759.984	-44510.175

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
16,31	-0.233	0.001	0.003	-0.233	0.036	0.002
31,33	-0.233	0.036	0.002	-0.234	0.063	0.002
33,35	-0.234	0.063	0.002	-0.235	0.080	0.001
35,37	-0.235	0.080	0.001	-0.236	0.090	0.000
37,39	-0.236	0.090	0.000	-0.237	0.091	-0.000
39,41	-0.237	0.091	-0.000	-0.237	0.084	-0.001
41,43	-0.237	0.084	-0.001	-0.238	0.067	-0.002
43,45	-0.238	0.067	-0.002	-0.239	0.039	-0.003
45,47	-0.239	0.039	-0.003	-0.240	-0.001	-0.004

Maximum deformations:

Node 39 moved 0.091 inch to the left.
Node 47 moved 0.001 inch to the right.
Node 47 moved 0.240 inch downwards.
No nodes moved upwards.
Node 47 rotated 0.004 radian clockwise.
Node 16 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
16,31	0.000	-30268.000	-30268.000	0.000	-210.194	-210.194
31,33	0.000	-30046.333	-30046.333	0.000	-208.655	-208.655
33,35	0.000	-29824.667	-29824.667	0.000	-207.116	-207.116
35,37	0.000	-29603.000	-29603.000	0.000	-205.576	-205.576
37,39	0.000	-29381.333	-29381.333	0.000	-204.037	-204.037
39,41	0.000	-29159.667	-29159.667	0.000	-202.498	-202.498
41,43	0.000	-28938.000	-28938.000	0.000	-200.958	-200.958
43,45	0.000	-28716.333	-28716.333	0.000	-199.419	-199.419
45,47	0.000	-28494.667	-28494.667	0.000	-197.880	-197.880

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
16,31	3786.916	0.000	3786.916	26.298	0.000	26.298
31,33	2615.038	0.000	2615.038	18.160	0.000	18.160
33,35	1443.160	0.000	1443.160	10.022	0.000	10.022
35,37	271.283	-900.595	-900.595	1.884	-6.254	-6.254
37,39	0.000	-2072.473	-2072.473	0.000	-14.392	-14.392
39,41	0.000	-3244.351	-3244.351	0.000	-22.530	-22.530
41,43	0.000	-4416.229	-4416.229	0.000	-30.668	-30.668
43,45	0.000	-5588.106	-5588.106	0.000	-38.806	-38.806
45,47	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
16,31	0.000	-30388.101	-30388.101	0.000	-1266.171	-1266.171
31,33	0.000	-27009.292	-27009.292	0.000	-1125.387	-1125.387
33,35	0.000	-24867.465	-24867.465	0.000	-1036.144	-1036.144
35,37	0.000	-24294.757	-24294.757	0.000	-1012.282	-1012.282
37,39	0.000	-25863.877	-25863.877	0.000	-1077.662	-1077.662
39,41	0.000	-28669.978	-28669.978	0.000	-1194.582	-1194.582
41,43	0.000	-32713.062	-32713.062	0.000	-1363.044	-1363.044
43,45	0.000	-37993.127	-37993.127	0.000	-1583.047	-1583.047
45,47	0.000	-44510.175	-44510.175	0.000	-1854.591	-1854.591

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
16,31	0.036	0.000	0.036
31,33	0.063	0.000	0.063
33,35	0.080	0.000	0.080
35,37	0.090	0.000	0.090
37,39	0.092	0.000	0.092
39,41	0.091	0.000	0.091
41,43	0.084	0.000	0.084
43,45	0.067	0.000	0.067
45,47	0.039	-0.001	0.039

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
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At the intermediate nodes:

1.056	0.002	0.036
2.111	0.002	0.063
3.167	0.001	0.080
4.222	0.000	0.090
5.278	-0.000	0.091
6.333	-0.001	0.084
7.389	-0.002	0.067
8.444	-0.003	0.039

At evenly-spaced intervals:

0.000	0.003	0.001
0.950	0.002	0.033
1.900	0.002	0.058
2.850	0.001	0.076
3.800	0.001	0.087
4.750	0.000	0.092
5.700	-0.000	0.090
6.650	-0.001	0.080
7.600	-0.002	0.063
8.550	-0.003	0.036
9.500	-0.004	-0.001

FRAME MAC file: 3(21/21) EMBANK; Last modified at 17:39:01 on Mon, Mar 22, 1993

Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 44	Node 46	Node 61
15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000
1.500	2.556	3.611	4.667	5.722	6.778	7.833	8.889	9.944	11.000
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Continuous Elements Output Data

FRAME MAC file: 3(21/21) EMBANK.

Last modified at 17:39:01 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
30	0.001	-0.233	-0.003
32	0.036	-0.233	-0.002
34	0.063	-0.234	-0.002
36	0.080	-0.235	-0.001
38	0.090	-0.236	-0.000
40	0.091	-0.237	0.000
42	0.084	-0.237	0.001
44	0.067	-0.238	0.002
46	0.039	-0.239	0.003
61	-0.001	-0.240	0.004

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
30,32	110.833	-585.939	-103.082	110.833	-585.939	103.082
32,34	110.833	-585.939	-103.082	110.833	-585.939	103.082
34,36	110.833	-585.939	-103.082	110.833	-585.939	103.082
36,38	110.833	-585.939	-103.082	110.833	-585.939	103.082
38,40	110.833	-585.939	-103.082	110.833	-585.939	103.082
40,42	110.833	-585.939	-103.082	110.833	-585.939	103.082
42,44	110.833	-585.939	-103.082	110.833	-585.939	103.082
44,46	110.833	-585.939	-103.082	110.833	-585.939	103.082
46,61	110.833	-585.939	-103.082	110.833	-585.939	103.082

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL	FyL	MzL	FxR	FyR	MzR
	lb	lb	lb-ft	lb	lb	lb-ft
30,32	30268.000	-3786.916	-30388.101	-30046.333	2615.038	27009.292
32,34	30046.333	-2615.038	-27009.292	-29824.667	1443.160	24867.465
34,36	29824.667	-1443.160	-24867.465	-29603.000	271.283	23962.620
36,38	29603.000	-271.283	-23962.620	-29381.333	-900.595	24294.757
38,40	29381.333	900.595	-24294.757	-29159.667	-2072.473	25863.877
40,42	29159.667	2072.473	-25863.877	-28938.000	-3244.351	28669.978
42,44	28938.000	3244.351	-28669.978	-28716.333	-4416.229	32713.062
44,46	28716.333	4416.229	-32713.062	-28494.667	-5588.106	37993.127
46,61	28494.667	5588.106	-37993.127	-28273.000	-6759.984	44510.175

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
30,32	-0.233	-0.001	-0.003	-0.233	-0.036	-0.002
32,34	-0.233	-0.036	-0.002	-0.234	-0.063	-0.002
34,36	-0.234	-0.063	-0.002	-0.235	-0.080	-0.001
36,38	-0.235	-0.080	-0.001	-0.236	-0.090	-0.000
38,40	-0.236	-0.090	-0.000	-0.237	-0.091	0.000
40,42	-0.237	-0.091	0.000	-0.237	-0.084	0.001
42,44	-0.237	-0.084	0.001	-0.238	-0.067	0.002
44,46	-0.238	-0.067	0.002	-0.239	-0.039	0.003
46,61	-0.239	-0.039	0.003	-0.240	0.001	0.004

Maximum deformations:

Node 61 moved 0.001 inch to the left.
Node 40 moved 0.091 inch to the right.
Node 61 moved 0.240 inch downwards.
No nodes moved upwards.
Node 30 rotated 0.003 radian clockwise.
Node 61 rotated 0.004 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
30,32	0.000	-30268.000	-30268.000	0.000	-210.194	-210.194
32,34	0.000	-30046.333	-30046.333	0.000	-208.655	-208.655
34,36	0.000	-29824.667	-29824.667	0.000	-207.116	-207.116
36,38	0.000	-29603.000	-29603.000	0.000	-205.576	-205.576
38,40	0.000	-29381.333	-29381.333	0.000	-204.037	-204.037
40,42	0.000	-29159.667	-29159.667	0.000	-202.498	-202.498
42,44	0.000	-28938.000	-28938.000	0.000	-200.958	-200.958
44,46	0.000	-28716.333	-28716.333	0.000	-199.419	-199.419
46,61	0.000	-28494.667	-28494.667	0.000	-197.880	-197.880

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
30,32	0.000	-3786.916	-3786.916	0.000	-26.298	-26.298
32,34	0.000	-2615.038	-2615.038	0.000	-18.160	-18.160
34,36	0.000	-1443.160	-1443.160	0.000	-10.022	-10.022
36,38	900.595	-271.283	900.595	6.254	-1.884	6.254
38,40	2072.473	0.000	2072.473	14.392	0.000	14.392
40,42	3244.351	0.000	3244.351	22.530	0.000	22.530
42,44	4416.229	0.000	4416.229	30.668	0.000	30.668
44,46	5588.106	0.000	5588.106	38.806	0.000	38.806
46,61	6759.984	0.000	6759.984	46.944	0.000	46.944

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
30,32	30388.101	0.000	30388.101	1266.171	0.000	1266.171
32,34	27009.292	0.000	27009.292	1125.387	0.000	1125.387
34,36	24867.465	0.000	24867.465	1036.144	0.000	1036.144
36,38	24294.757	0.000	24294.757	1012.282	0.000	1012.282
38,40	25863.877	0.000	25863.877	1077.662	0.000	1077.662
40,42	28669.978	0.000	28669.978	1194.582	0.000	1194.582
42,44	32713.062	0.000	32713.062	1363.044	0.000	1363.044
44,46	37993.127	0.000	37993.127	1583.047	0.000	1583.047
46,61	44510.175	0.000	44510.175	1854.591	0.000	1854.591

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
30,32	0.000	-0.036	-0.036
32,34	0.000	-0.063	-0.063
34,36	0.000	-0.080	-0.080
36,38	0.000	-0.090	-0.090
38,40	0.000	-0.092	-0.092
40,42	0.000	-0.091	-0.091
42,44	0.000	-0.084	-0.084
44,46	0.000	-0.067	-0.067
46,61	0.001	-0.039	-0.039

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.056	-0.002	-0.036
2.111	-0.002	-0.063
3.167	-0.001	-0.080
4.222	-0.000	-0.090
5.278	0.000	-0.091
6.333	0.001	-0.084
7.389	0.002	-0.067
8.444	0.003	-0.039

At evenly-spaced intervals:

0.000	-0.003	-0.001
0.950	-0.002	-0.033
1.900	-0.002	-0.058
2.850	-0.001	-0.076
3.800	-0.001	-0.087
4.750	-0.000	-0.092
5.700	0.000	-0.090
6.650	0.001	-0.080
7.600	0.002	-0.063
8.550	0.003	-0.036
9.500	0.004	0.001

Output Data

FRAME MAC file: 3(21/21) EMBANK.

Last modified at 17:39:01 on Mon, Mar 22, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,16	0.000	-5024.870	-5024.870	0.000	-69.790	-69.790
2,17	0.000	-8263.792	-8263.792	0.000	-57.387	-57.387
3,18	0.000	-6390.946	-6390.946	0.000	-44.382	-44.382
4,19	0.000	-4656.285	-4656.285	0.000	-32.335	-32.335
5,20	0.000	-3204.485	-3204.485	0.000	-22.253	-22.253
6,21	0.000	-2122.423	-2122.423	0.000	-14.739	-14.739
7,22	0.000	-1458.032	-1458.032	0.000	-10.125	-10.125
8,23	0.000	-1234.332	-1234.332	0.000	-8.572	-8.572
9,24	0.000	-1458.032	-1458.032	0.000	-10.125	-10.125
10,25	0.000	-2122.423	-2122.423	0.000	-14.739	-14.739
11,26	0.000	-3204.485	-3204.485	0.000	-22.253	-22.253
12,27	0.000	-4656.285	-4656.285	0.000	-32.335	-32.335
13,28	0.000	-6390.946	-6390.946	0.000	-44.382	-44.382
14,29	0.000	-8263.792	-8263.792	0.000	-57.387	-57.387
15,30	0.000	-5024.870	-5024.870	0.000	-69.790	-69.790
16,31	0.000	-30268.000	-30268.000	0.000	-210.194	-210.194
16,17	0.000	-2449.694	-2449.694	0.000	-17.012	-17.012
17,18	1236.146	0.000	1236.146	8.584	0.000	8.584
18,19	4868.621	0.000	4868.621	33.810	0.000	33.810
19,20	7929.778	0.000	7929.778	55.068	0.000	55.068
20,21	10223.955	0.000	10223.955	71.000	0.000	71.000
21,22	11721.504	0.000	11721.504	81.399	0.000	81.399
22,23	12454.748	0.000	12454.748	86.491	0.000	86.491
23,24	12454.748	0.000	12454.748	86.491	0.000	86.491
24,25	11721.504	0.000	11721.504	81.399	0.000	81.399
25,26	10223.955	0.000	10223.955	71.000	0.000	71.000
26,27	7929.778	0.000	7929.778	55.068	0.000	55.068
27,28	4868.621	0.000	4868.621	33.810	0.000	33.810
28,29	1236.146	0.000	1236.146	8.584	0.000	8.584
29,30	0.000	-2449.694	-2449.694	0.000	-17.012	-17.012
30,32	0.000	-30268.000	-30268.000	0.000	-210.194	-210.194
31,33	0.000	-30046.333	-30046.333	0.000	-208.655	-208.655
32,34	0.000	-30046.333	-30046.333	0.000	-208.655	-208.655
33,35	0.000	-29824.667	-29824.667	0.000	-207.116	-207.116
34,36	0.000	-29824.667	-29824.667	0.000	-207.116	-207.116
35,37	0.000	-29603.000	-29603.000	0.000	-205.576	-205.576
36,38	0.000	-29603.000	-29603.000	0.000	-205.576	-205.576
37,39	0.000	-29381.333	-29381.333	0.000	-204.037	-204.037
38,40	0.000	-29381.333	-29381.333	0.000	-204.037	-204.037
39,41	0.000	-29159.667	-29159.667	0.000	-202.498	-202.498
40,42	0.000	-29159.667	-29159.667	0.000	-202.498	-202.498
41,43	0.000	-28938.000	-28938.000	0.000	-200.958	-200.958
42,44	0.000	-28938.000	-28938.000	0.000	-200.958	-200.958
43,45	0.000	-28716.333	-28716.333	0.000	-199.419	-199.419
44,46	0.000	-28716.333	-28716.333	0.000	-199.419	-199.419
45,47	0.000	-28494.667	-28494.667	0.000	-197.880	-197.880
46,61	0.000	-28494.667	-28494.667	0.000	-197.880	-197.880
47,48	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
48,49	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
49,50	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
50,51	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
51,52	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
52,53	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
53,54	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
54,55	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
55,56	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
56,57	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
57,58	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
58,59	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
59,60	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944
60,61	0.000	-6759.984	-6759.984	0.000	-46.944	-46.944

SOIL ELEMENTS
AVE. 34/1.4 = 24.3 ps.
= 34.3 ps

***. NEGATIVE PROJECTION EMBANKMENT FIG 4.20

$$W_d = C_d W B_d^2 \quad 4.4.$$

$$W_d = 0.520 (115)(21)^2$$

$$W_d = 26375 \text{ lb/ft}$$

$$\frac{W_d}{B_d} = 1256 \text{ lb/ft}^2$$

$$\bar{\sigma}_v = 1256 \text{ lb/ft}^2$$

$$\bar{\sigma}_h = 405 \text{ lb/ft}^2$$

$$C_d = \frac{1 - e^{-2K\mu' \frac{H}{B_d}}}{2K\mu'}$$

$$C_d = \left(\frac{1 - e^{-2(0.1914) \left(\frac{12.18}{21} \right)}}{2(0.1914)} \right)$$

$$C_d = \frac{1 - e^{-0.2220}}{2(0.1914)}$$

$$C_d = 0.52057$$

$$W_n = C_n W_b B_d^2$$

$$H = 19 + 12.18 = 31.18$$

$$W_n = 1.1325 (115) (21)^2$$

$$= 57439$$

$$\frac{W_n}{B_d} = 2735 \text{ lb/ft}^2$$

$$\bar{V} = 2735 \text{ lb/ft}^2$$

$$\bar{V}_H = 793 \text{ lb/ft}^2$$

$$C_n = \left(\frac{e^{\frac{-2K_u H}{B_d} - 1}}{-2K_u} \right)$$

$$C_n = \left(\frac{e^{\frac{-2(0.1914) \left(\frac{31.18}{21} \right) - 1}}{-2(0.1914)}} \right)$$

$$C_n = 1.1325$$

Figure () Structural Assessment Summary

Figure() Section 2(21/21) Compacted Tuff Shield Configuration

Figure() 2(21/21) Trench Excavation and Backfill Configuration

FRAME MAC file: 2(21/21) EMBANK; Last modified at 10:05:43 on Fri, May 7, 1993

FRAME MAC file: 2(21/21) EMBANK; Last modified at 10:05:43 on Fri, May 7, 1993

Node 43	Node 45	Node 46	Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54	Node 55	Node 44
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	10.000	12.000	13.000
10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

F: lb
D: lb/ft
M: lb-ft
E: psi

Load

Continuous Elements Output Data

FRAME MAC file: 2(21/21) EMBANK.

Last modified at 10:05:43 on Fri, May 7, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
43	0.001	-0.165	-0.002
45	0.001	-0.194	-0.003
46	0.000	-0.225	-0.003
47	0.000	-0.255	-0.002
48	0.000	-0.278	-0.002
49	0.000	-0.293	-0.001
50	0.000	-0.298	0.000
51	-0.000	-0.293	0.001
52	-0.000	-0.278	0.002
53	-0.000	-0.255	0.002
54	-0.000	-0.225	0.003
55	-0.001	-0.194	0.003
44	-0.001	-0.165	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
43,45	0.000	1705.200	284.200	0.000	1705.200	-284.200
45,46	0.000	1705.200	284.200	0.000	1705.200	-284.200
46,47	0.000	1705.200	284.200	0.000	1705.200	-284.200
47,48	0.000	1705.200	284.200	0.000	1705.200	-284.200
48,49	0.000	1705.200	284.200	0.000	1705.200	-284.200
49,50	0.000	1705.200	284.200	0.000	1705.200	-284.200
50,51	0.000	1705.200	284.200	0.000	1705.200	-284.200
51,52	0.000	1705.200	284.200	0.000	1705.200	-284.200
52,53	0.000	1705.200	284.200	0.000	1705.200	-284.200
53,54	0.000	1705.200	284.200	0.000	1705.200	-284.200
54,55	0.000	1705.200	284.200	0.000	1705.200	-284.200
55,44	0.000	1705.200	284.200	0.000	1705.200	-284.200

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
43,45	4742.081	20462.400	26707.429	-4742.081	-17052.000	-7950.229
45,46	4742.081	17052.000	7950.229	-4742.081	-13641.600	7396.571
46,47	4742.081	13641.600	-7396.571	-4742.081	-10231.200	19332.971
47,48	4742.081	10231.200	-19332.971	-4742.081	-6820.800	27858.971
48,49	4742.081	6820.800	-27858.971	-4742.081	-3410.400	32974.571
49,50	4742.081	3410.400	-32974.571	-4742.081	0.000	34679.771
50,51	4742.081	0.000	-34679.771	-4742.081	3410.400	32974.571
51,52	4742.081	-3410.400	-32974.571	-4742.081	6820.800	27858.971
52,53	4742.081	-6820.800	-27858.971	-4742.081	10231.200	19332.971
53,54	4742.081	-10231.200	-19332.971	-4742.081	13641.600	7396.571
54,55	4742.081	-13641.600	-7396.571	-4742.081	17052.000	-7950.229
55,44	4742.081	-17052.000	7950.229	-4742.081	20462.400	-26707.429

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
43,45	0.001	-0.165	-0.002	0.001	-0.194	-0.003
45,46	0.001	-0.194	-0.003	0.000	-0.225	-0.003
46,47	0.000	-0.225	-0.003	0.000	-0.255	-0.002
47,48	0.000	-0.255	-0.002	0.000	-0.278	-0.002
48,49	0.000	-0.278	-0.002	0.000	-0.293	-0.001
49,50	0.000	-0.293	-0.001	0.000	-0.298	0.000
50,51	0.000	-0.298	0.000	-0.000	-0.293	0.001
51,52	-0.000	-0.293	0.001	-0.000	-0.278	0.002

52,53	-0.000	-0.278	0.002	-0.000	-0.255	0.002
53,54	-0.000	-0.255	0.002	-0.000	-0.225	0.003
54,55	-0.000	-0.225	0.003	-0.001	-0.194	0.003
55,44	-0.001	-0.194	0.003	-0.001	-0.165	0.002

Maximum deformations:

Node 44 moved 0.001 inch to the left.
 Node 43 moved 0.001 inch to the right.
 Node 50 moved 0.298 inch downwards.
 No nodes moved upwards.
 Node 45 rotated 0.003 radian clockwise.
 Node 55 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
43,45	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
45,46	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
46,47	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
47,48	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
48,49	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
49,50	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
50,51	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
51,52	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
52,53	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
53,54	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
54,55	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
55,44	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
43,45	20462.400	0.000	20462.400	142.100	0.000	142.100
45,46	17052.000	0.000	17052.000	118.417	0.000	118.417
46,47	13641.600	0.000	13641.600	94.733	0.000	94.733
47,48	10231.200	0.000	10231.200	71.050	0.000	71.050
48,49	6820.800	0.000	6820.800	47.367	0.000	47.367
49,50	3410.400	0.000	3410.400	23.683	0.000	23.683
50,51	0.000	-3410.400	-3410.400	0.000	-23.683	-23.683
51,52	0.000	-6820.800	-6820.800	0.000	-47.367	-47.367
52,53	0.000	-10231.200	-10231.200	0.000	-71.050	-71.050
53,54	0.000	-13641.600	-13641.600	0.000	-94.733	-94.733
54,55	0.000	-17052.000	-17052.000	0.000	-118.417	-118.417
55,44	0.000	-20462.400	-20462.400	0.000	-142.100	-142.100

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
43,45	0.000	-26707.429	-26707.429	0.000	-1112.810	-1112.810
45,46	7396.571	-7950.229	-7950.229	308.190	-331.260	-331.260
46,47	19332.971	0.000	19332.971	805.540	0.000	805.540
47,48	27858.971	0.000	27858.971	1160.790	0.000	1160.790
48,49	32974.571	0.000	32974.571	1373.940	0.000	1373.940
49,50	34679.771	0.000	34679.771	1444.990	0.000	1444.990
50,51	34679.771	0.000	34679.771	1444.990	0.000	1444.990
51,52	32974.571	0.000	32974.571	1373.940	0.000	1373.940
52,53	27858.971	0.000	27858.971	1160.790	0.000	1160.790
53,54	19332.971	0.000	19332.971	805.540	0.000	805.540
54,55	7396.571	-7950.229	-7950.229	308.190	-331.260	-331.260
55,44	0.000	-26707.429	-26707.429	0.000	-1112.810	-1112.810

Maximum deflection values:				
From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch	

43,45	0.000	-0.194	-0.194	
45,46	0.000	-0.225	-0.225	
46,47	0.000	-0.255	-0.255	
47,48	0.000	-0.278	-0.278	
48,49	0.000	-0.293	-0.293	
49,50	0.000	-0.298	-0.298	
50,51	0.000	-0.298	-0.298	
51,52	0.000	-0.293	-0.293	
-52,53	0.000	-0.278	-0.278	
53,54	0.000	-0.255	-0.255	
54,55	0.000	-0.225	-0.225	
55,44	0.000	-0.194	-0.194	

Deflections along the elements (positive is up or counter-clockwise):			
Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch	

At the intermediate nodes:			
1.000	-0.003	-0.194	
2.000	-0.003	-0.225	
3.000	-0.002	-0.255	
4.000	-0.002	-0.278	
5.000	-0.001	-0.293	
6.000	0.000	-0.298	
7.000	0.001	-0.293	
8.000	0.002	-0.278	
9.000	0.002	-0.255	
10.000	0.003	-0.225	
11.000	0.003	-0.194	
At evenly-spaced intervals:			
0.000	-0.002	-0.165	
1.200	-0.003	-0.200	
2.400	-0.002	-0.238	
3.600	-0.002	-0.269	
4.800	-0.001	-0.291	
6.000	0.000	-0.298	
7.200	0.001	-0.291	
8.400	0.002	-0.269	
9.600	0.002	-0.238	
10.800	0.003	-0.200	
12.000	0.002	-0.165	

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Node 14	Node 15	Node 16	Node 17	Node 18	Node 19	Node 20	Node 21	Node 22	Node 23	Node 24	Node 25	Node 26
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Continuous Elements Output Data

FRAME MAC file: 2(21/21) EMBANK.

Last modified at 10:05:43 on Fri, May 7, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	-0.001	-0.161	0.002
15	-0.001	-0.135	0.002
16	-0.001	-0.108	0.002
17	-0.001	-0.083	0.002
18	-0.000	-0.064	0.001
19	-0.000	-0.052	0.001
20	0.000	-0.048	0.000
21	0.000	-0.052	-0.001
22	0.000	-0.064	-0.001
23	0.001	-0.083	-0.002
24	0.001	-0.108	-0.002
25	0.001	-0.135	-0.002
26	0.001	-0.161	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	0.000	105.000	17.500	0.000	105.000	-17.500
15,16	0.000	105.000	17.500	0.000	105.000	-17.500
16,17	0.000	105.000	17.500	0.000	105.000	-17.500
17,18	0.000	105.000	17.500	0.000	105.000	-17.500
18,19	0.000	105.000	17.500	0.000	105.000	-17.500
19,20	0.000	105.000	17.500	0.000	105.000	-17.500
20,21	0.000	105.000	17.500	0.000	105.000	-17.500
21,22	0.000	105.000	17.500	0.000	105.000	-17.500
22,23	0.000	105.000	17.500	0.000	105.000	-17.500
23,24	0.000	105.000	17.500	0.000	105.000	-17.500
24,25	0.000	105.000	17.500	0.000	105.000	-17.500
25,26	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	2519.937	-18882.164	-22337.866	-2519.937	19092.164	3350.702
15,16	-551.496	-13266.411	-3576.830	551.496	13476.411	-9794.581
16,17	-3467.692	-8822.854	9578.273	3467.692	9032.854	-18506.127
17,18	-5830.414	-5435.317	18328.088	5830.414	5645.317	-23868.405
18,19	-7457.705	-2871.732	23743.868	7457.705	3081.732	-26720.600
19,20	-8280.908	-828.123	26656.908	8280.908	1038.123	-27590.031
20,21	-8280.908	1038.123	27590.031	8280.908	-828.123	-26656.908
21,22	-7457.705	3081.732	26720.600	7457.705	-2871.732	-23743.868
22,23	-5830.414	5645.317	23868.405	5830.414	-5435.317	-18328.088
23,24	-3467.692	9032.854	18506.127	3467.692	-8822.854	-9578.273
24,25	-551.496	13476.411	9794.581	551.496	-13266.411	3576.830
25,26	2519.937	19092.164	-3350.702	-2519.937	-18882.164	22337.866

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,15	-0.001	-0.161	0.002	-0.001	-0.135	0.002
15,16	-0.001	-0.135	0.002	-0.001	-0.108	0.002
16,17	-0.001	-0.108	0.002	-0.001	-0.083	0.002
17,18	-0.001	-0.083	0.002	-0.000	-0.064	0.001
18,19	-0.000	-0.064	0.001	-0.000	-0.052	0.001
19,20	-0.000	-0.052	0.001	0.000	-0.048	0.000
20,21	0.000	-0.048	0.000	0.000	-0.052	-0.001
21,22	0.000	-0.052	-0.001	0.000	-0.064	-0.001

22,23	0.000	-0.064	-0.001	0.001	-0.083	-0.002
23,24	0.001	-0.083	-0.002	0.001	-0.108	-0.002
24,25	0.001	-0.108	-0.002	0.001	-0.135	-0.002
25,26	0.001	-0.135	-0.002	0.001	-0.161	-0.002

Maximum deformations:

Node 15 moved 0.001 inch to the left.
Node 25 moved 0.001 inch to the right.
Node 14 moved 0.161 inch downwards.
No nodes moved upwards.
Node 25 rotated 0.002 radian clockwise.
Node 15 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
14,15	0.000	-2519.937	-2519.937	0.000	-17.500	-17.500
15,16	551.496	0.000	551.496	3.830	0.000	3.830
16,17	3467.692	0.000	3467.692	24.081	0.000	24.081
17,18	5830.414	0.000	5830.414	40.489	0.000	40.489
18,19	7457.705	0.000	7457.705	51.790	0.000	51.790
19,20	8280.908	0.000	8280.908	57.506	0.000	57.506
20,21	8280.908	0.000	8280.908	57.506	0.000	57.506
21,22	7457.705	0.000	7457.705	51.790	0.000	51.790
22,23	5830.414	0.000	5830.414	40.489	0.000	40.489
23,24	3467.692	0.000	3467.692	24.081	0.000	24.081
24,25	551.496	0.000	551.496	3.830	0.000	3.830
25,26	0.000	-2519.937	-2519.937	0.000	-17.500	-17.500

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,15	0.000	-19092.164	-19092.164	0.000	-132.584	-132.584
15,16	0.000	-13476.411	-13476.411	0.000	-93.586	-93.586
16,17	0.000	-9032.854	-9032.854	0.000	-62.728	-62.728
17,18	0.000	-5645.317	-5645.317	0.000	-39.204	-39.204
18,19	0.000	-3081.732	-3081.732	0.000	-21.401	-21.401
19,20	0.000	-1038.123	-1038.123	0.000	-7.209	-7.209
20,21	1038.123	0.000	1038.123	7.209	0.000	7.209
21,22	3081.732	0.000	3081.732	21.401	0.000	21.401
22,23	5645.317	0.000	5645.317	39.204	0.000	39.204
23,24	9032.854	0.000	9032.854	62.728	0.000	62.728
24,25	13476.411	0.000	13476.411	93.586	0.000	93.586
25,26	19092.164	0.000	19092.164	132.584	0.000	132.584

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,15	22337.866	0.000	22337.866	930.744	0.000	930.744
15,16	3576.830	-9794.581	-9794.581	149.035	-408.108	-408.108
16,17	0.000	-18506.127	-18506.127	0.000	-771.089	-771.089
17,18	0.000	-23868.405	-23868.405	0.000	-994.517	-994.517
18,19	0.000	-26720.600	-26720.600	0.000	-1113.358	-1113.358
19,20	0.000	-27590.031	-27590.031	0.000	-1149.585	-1149.585
20,21	0.000	-27590.031	-27590.031	0.000	-1149.585	-1149.585
21,22	0.000	-26720.600	-26720.600	0.000	-1113.358	-1113.358
22,23	0.000	-23868.405	-23868.405	0.000	-994.517	-994.517
23,24	0.000	-18506.127	-18506.127	0.000	-771.089	-771.089
24,25	3576.830	-9794.581	-9794.581	149.035	-408.108	-408.108
25,26	22337.866	0.000	22337.866	930.744	0.000	930.744

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
14,15	0.000	-0.161	-0.161
15,16	0.000	-0.135	-0.135
16,17	0.000	-0.108	-0.108
17,18	0.000	-0.083	-0.083
18,19	0.000	-0.064	-0.064
19,20	0.000	-0.052	-0.052
20,21	0.000	-0.052	-0.052
21,22	0.000	-0.064	-0.064
22,23	0.000	-0.083	-0.083
23,24	0.000	-0.108	-0.108
24,25	0.000	-0.135	-0.135
25,26	0.000	-0.161	-0.161

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.000	0.002	-0.135
2.000	0.002	-0.108
3.000	0.002	-0.083
4.000	0.001	-0.064
5.000	0.001	-0.052
6.000	0.000	-0.048
7.000	-0.001	-0.052
8.000	-0.001	-0.064
9.000	-0.002	-0.083
10.000	-0.002	-0.108
11.000	-0.002	-0.135

At evenly-spaced intervals:

0.000	0.002	-0.161
1.200	0.002	-0.129
2.400	0.002	-0.097
3.600	0.002	-0.071
4.800	0.001	-0.054
6.000	0.000	-0.048
7.200	-0.001	-0.054
8.400	-0.002	-0.071
9.600	-0.002	-0.097
10.800	-0.002	-0.129
12.000	-0.002	-0.161

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Node 14	Node 27	Node 29	Node 31	Node 33	Node 35	Node 37	Node 39	Node 41	Node 43
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
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Continuous Elements Output Data

FRAME MAC file: 2(21/21) EMBANK.

Last modified at 10:05:43 on Fri, May 7, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	-0.001	-0.161	0.002
27	-0.021	-0.161	0.001
29	-0.035	-0.162	0.001
31	-0.045	-0.162	0.001
33	-0.050	-0.163	0.000
35	-0.050	-0.163	-0.000
37	-0.046	-0.164	-0.001
39	-0.036	-0.164	-0.001
41	-0.021	-0.165	-0.002
43	0.001	-0.165	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,27	105.000	471.800	78.633	105.000	471.800	-78.633
27,29	105.000	471.800	78.633	105.000	471.800	-78.633
29,31	105.000	471.800	78.633	105.000	471.800	-78.633
31,33	105.000	471.800	78.633	105.000	471.800	-78.633
33,35	105.000	471.800	78.633	105.000	471.800	-78.633
35,37	105.000	471.800	78.633	105.000	471.800	-78.633
37,39	105.000	471.800	78.633	105.000	471.800	-78.633
39,41	105.000	471.800	78.633	105.000	471.800	-78.633
41,43	105.000	471.800	78.633	105.000	471.800	-78.633

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,27	22352.400	3750.319	22244.497	-22142.400	-2806.719	-18965.979
27,29	22142.400	2806.719	18965.979	-21932.400	-1863.119	-16631.060
29,31	21932.400	1863.119	16631.060	-21722.400	-919.519	-15239.741
31,33	21722.400	919.519	15239.741	-21512.400	24.081	-14792.022
33,35	21512.400	-24.081	14792.022	-21302.400	967.681	-15287.904
35,37	21302.400	-967.681	15287.904	-21092.400	1911.281	-16727.385
37,39	21092.400	-1911.281	16727.385	-20882.400	2854.881	-19110.466
39,41	20882.400	-2854.881	19110.466	-20672.400	3798.481	-22437.148
41,43	20672.400	-3798.481	22437.148	-20462.400	4742.081	-26707.429

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,27	-0.161	0.001	0.002	-0.161	0.021	0.001
27,29	-0.161	0.021	0.001	-0.162	0.035	0.001
29,31	-0.162	0.035	0.001	-0.162	0.045	0.001
31,33	-0.162	0.045	0.001	-0.163	0.050	0.000
33,35	-0.163	0.050	0.000	-0.163	0.050	-0.000
35,37	-0.163	0.050	-0.000	-0.164	0.046	-0.001
37,39	-0.164	0.046	-0.001	-0.164	0.036	-0.001
39,41	-0.164	0.036	-0.001	-0.165	0.021	-0.002
41,43	-0.165	0.021	-0.002	-0.165	-0.001	-0.002

Maximum deformations:

Node 35 moved 0.050 inch to the left.

Node 43 moved 0.001 inch to the right.

Node 43 moved 0.165 inch downwards.

No nodes moved upwards.

Node 43 rotated 0.002 radian clockwise.

Node 14 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
14,27	0.000	-22352.400	-22352.400	0.000	-155.225	-155.225
27,29	0.000	-22142.400	-22142.400	0.000	-153.767	-153.767
29,31	0.000	-21932.400	-21932.400	0.000	-152.308	-152.308
31,33	0.000	-21722.400	-21722.400	0.000	-150.850	-150.850
33,35	0.000	-21512.400	-21512.400	0.000	-149.392	-149.392
35,37	0.000	-21302.400	-21302.400	0.000	-147.933	-147.933
37,39	0.000	-21092.400	-21092.400	0.000	-146.475	-146.475
39,41	0.000	-20882.400	-20882.400	0.000	-145.017	-145.017
41,43	0.000	-20672.400	-20672.400	0.000	-143.558	-143.558

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
14,27	3750.319	0.000	3750.319	26.044	0.000	26.044
27,29	2806.719	0.000	2806.719	19.491	0.000	19.491
29,31	1863.119	0.000	1863.119	12.938	0.000	12.938
31,33	919.519	-24.081	919.519	6.386	-0.167	6.386
33,35	0.000	-967.681	-967.681	0.000	-6.720	-6.720
35,37	0.000	-1911.281	-1911.281	0.000	-13.273	-13.273
37,39	0.000	-2854.881	-2854.881	0.000	-19.826	-19.826
39,41	0.000	-3798.481	-3798.481	0.000	-26.378	-26.378
41,43	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
14,27	0.000	-22244.497	-22244.497	0.000	-926.854	-926.854
27,29	0.000	-18965.979	-18965.979	0.000	-790.249	-790.249
29,31	0.000	-16631.060	-16631.060	0.000	-692.961	-692.961
31,33	0.000	-15239.741	-15239.741	0.000	-634.989	-634.989
33,35	0.000	-15287.904	-15287.904	0.000	-636.996	-636.996
35,37	0.000	-16727.385	-16727.385	0.000	-696.974	-696.974
37,39	0.000	-19110.466	-19110.466	0.000	-796.269	-796.269
39,41	0.000	-22437.148	-22437.148	0.000	-934.881	-934.881
41,43	0.000	-26707.429	-26707.429	0.000	-1112.810	-1112.810

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
14,27	0.021	0.000	0.021
27,29	0.035	0.000	0.035
29,31	0.045	0.000	0.045
31,33	0.050	0.000	0.050
33,35	0.050	0.000	0.050
35,37	0.050	0.000	0.050
37,39	0.046	0.000	0.046
39,41	0.036	0.000	0.036
41,43	0.021	-0.001	0.021

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---

At the intermediate nodes:

1.000	0.001	0.021
2.000	0.001	0.035
3.000	0.001	0.045
4.000	0.000	0.050
5.000	-0.000	0.050
6.000	-0.001	0.046
7.000	-0.001	0.036
8.000	-0.002	0.021

At evenly-spaced intervals:

0.000	0.002	0.001
0.900	0.001	0.019
1.800	0.001	0.033
2.700	0.001	0.042
3.600	0.000	0.048
4.500	0.000	0.050
5.400	-0.000	0.049
6.300	-0.001	0.043
7.200	-0.001	0.034
8.100	-0.002	0.019
9.000	-0.002	-0.001

FRAME MAC file: 2(21/21) EMBANK; Last modified at 10:05:43 on Fri, May 7, 1993

Node 26	Node 28	Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 44
13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000
---	---	---	---	---	---	---	---	---	---

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb
-22352.400
4742.081

18 Shear

lb
-3750.319
26707.429

Moment

lb-ft
0.000

Defl.

0.001
Inch
-0.050

Distance 0.000

1.800 3.600 5.400 7.200 9.000 ft

Continuous Elements Output Data

FRAME MAC file: 2(21/21) EMBANK.

Last modified at 10:05:43 on Fri, May 7, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
26	0.001	-0.161	-0.002
28	0.021	-0.161	-0.001
30	0.035	-0.162	-0.001
32	0.045	-0.162	-0.001
34	0.050	-0.163	-0.000
36	0.050	-0.163	0.000
38	0.046	-0.164	0.001
40	0.036	-0.164	0.001
42	0.021	-0.165	0.002
44	-0.001	-0.165	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
26,28	105.000	-471.800	-78.633	105.000	-471.800	78.633
28,30	105.000	-471.800	-78.633	105.000	-471.800	78.633
30,32	105.000	-471.800	-78.633	105.000	-471.800	78.633
32,34	105.000	-471.800	-78.633	105.000	-471.800	78.633
34,36	105.000	-471.800	-78.633	105.000	-471.800	78.633
36,38	105.000	-471.800	-78.633	105.000	-471.800	78.633
38,40	105.000	-471.800	-78.633	105.000	-471.800	78.633
40,42	105.000	-471.800	-78.633	105.000	-471.800	78.633
42,44	105.000	-471.800	-78.633	105.000	-471.800	78.633

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
26,28	22352.400	-3750.319	-22244.497	-22142.400	2806.719	18965.979
28,30	22142.400	-2806.719	-18965.979	-21932.400	1863.119	16631.060
30,32	21932.400	-1863.119	-16631.060	-21722.400	919.519	15239.741
32,34	21722.400	-919.519	-15239.741	-21512.400	-24.081	14792.022
34,36	21512.400	24.081	-14792.022	-21302.400	-967.681	15287.904
36,38	21302.400	967.681	-15287.904	-21092.400	-1911.281	16727.385
38,40	21092.400	1911.281	-16727.385	-20882.400	-2854.881	19110.466
40,42	20882.400	2854.881	-19110.466	-20672.400	-3798.481	22437.148
42,44	20672.400	3798.481	-22437.148	-20462.400	-4742.081	26707.429

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
26,28	-0.161	-0.001	-0.002	-0.161	-0.021	-0.001
28,30	-0.161	-0.021	-0.001	-0.162	-0.035	-0.001
30,32	-0.162	-0.035	-0.001	-0.162	-0.045	-0.001
32,34	-0.162	-0.045	-0.001	-0.163	-0.050	-0.000
34,36	-0.163	-0.050	-0.000	-0.163	-0.050	0.000
36,38	-0.163	-0.050	0.000	-0.164	-0.046	0.001
38,40	-0.164	-0.046	0.001	-0.164	-0.036	0.001
40,42	-0.164	-0.036	0.001	-0.165	-0.021	0.002
42,44	-0.165	-0.021	0.002	-0.165	0.001	0.002

Maximum deformations:

Node 44 moved 0.001 inch to the left.
Node 36 moved 0.050 inch to the right.
Node 44 moved 0.165 inch downwards.
No nodes moved upwards.
Node 26 rotated 0.002 radian clockwise.
Node 44 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
26,28	0.000	-22352.400	-22352.400	0.000	-155.225	-155.225
28,30	0.000	-22142.400	-22142.400	0.000	-153.767	-153.767
30,32	0.000	-21932.400	-21932.400	0.000	-152.308	-152.308
32,34	0.000	-21722.400	-21722.400	0.000	-150.850	-150.850
34,36	0.000	-21512.400	-21512.400	0.000	-149.392	-149.392
36,38	0.000	-21302.400	-21302.400	0.000	-147.933	-147.933
38,40	0.000	-21092.400	-21092.400	0.000	-146.475	-146.475
40,42	0.000	-20882.400	-20882.400	0.000	-145.017	-145.017
42,44	0.000	-20672.400	-20672.400	0.000	-143.558	-143.558

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
26,28	0.000	-3750.319	-3750.319	0.000	-26.044	-26.044
28,30	0.000	-2806.719	-2806.719	0.000	-19.491	-19.491
30,32	0.000	-1863.119	-1863.119	0.000	-12.938	-12.938
32,34	24.081	-919.519	-919.519	0.167	-6.386	-6.386
34,36	967.681	0.000	967.681	6.720	0.000	6.720
36,38	1911.281	0.000	1911.281	13.273	0.000	13.273
38,40	2854.881	0.000	2854.881	19.826	0.000	19.826
40,42	3798.481	0.000	3798.481	26.378	0.000	26.378
42,44	4742.081	0.000	4742.081	32.931	0.000	32.931

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
26,28	22244.497	0.000	22244.497	926.854	0.000	926.854
28,30	18965.979	0.000	18965.979	790.249	0.000	790.249
30,32	16631.060	0.000	16631.060	692.961	0.000	692.961
32,34	15239.741	0.000	15239.741	634.989	0.000	634.989
34,36	15287.904	0.000	15287.904	636.996	0.000	636.996
36,38	16727.385	0.000	16727.385	696.974	0.000	696.974
38,40	19110.466	0.000	19110.466	796.269	0.000	796.269
40,42	22437.148	0.000	22437.148	934.881	0.000	934.881
42,44	26707.429	0.000	26707.429	1112.810	0.000	1112.810

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
26,28	0.000	-0.021	-0.021
28,30	0.000	-0.035	-0.035
30,32	0.000	-0.045	-0.045
32,34	0.000	-0.050	-0.050
34,36	0.000	-0.050	-0.050
36,38	0.000	-0.050	-0.050
38,40	0.000	-0.046	-0.046
40,42	0.000	-0.036	-0.036
42,44	0.001	-0.021	-0.021

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.000	-0.001	-0.021
2.000	-0.001	-0.035
3.000	-0.001	-0.045
4.000	-0.000	-0.050
5.000	0.000	-0.050
6.000	0.001	-0.046
7.000	0.001	-0.036
8.000	0.002	-0.021

At evenly-spaced intervals:

0.000	-0.002	-0.001
0.900	-0.001	-0.019
1.800	-0.001	-0.033
2.700	-0.001	-0.042
3.600	-0.000	-0.048
4.500	-0.000	-0.050
5.400	0.000	-0.049
6.300	0.001	-0.043
7.200	0.001	-0.034
8.100	0.002	-0.019
9.000	0.002	0.001

Output Data

FRAME MAC file: 2(21/21) EMBANK.

Last modified at 10:05:43 on Fri, May 7, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,14	0.000	-3470.236	-3470.236	0.000	-48.198	-48.198
2,15	0.000	-5825.753	-5825.753	0.000	-40.457	-40.457
3,16	0.000	-4653.557	-4653.557	0.000	-32.316	-32.316
4,17	0.000	-3597.537	-3597.537	0.000	-24.983	-24.983
5,18	0.000	-2773.584	-2773.584	0.000	-19.261	-19.261
6,19	0.000	-2253.609	-2253.609	0.000	-15.650	-15.650
7,20	0.000	-2076.247	-2076.247	0.000	-14.418	-14.418
8,21	0.000	-2253.609	-2253.609	0.000	-15.650	-15.650
9,22	0.000	-2773.584	-2773.584	0.000	-19.261	-19.261
10,23	0.000	-3597.537	-3597.537	0.000	-24.983	-24.983
11,24	0.000	-4653.557	-4653.557	0.000	-32.316	-32.316
12,25	0.000	-5825.753	-5825.753	0.000	-40.457	-40.457
13,26	0.000	-3470.236	-3470.236	0.000	-48.198	-48.198
14,15	0.000	-2519.937	-2519.937	0.000	-17.500	-17.500
14,27	0.000	-22352.400	-22352.400	0.000	-155.225	-155.225
15,16	551.496	0.000	551.496	3.830	0.000	3.830
16,17	3467.692	0.000	3467.692	24.081	0.000	24.081
17,18	5830.414	0.000	5830.414	40.489	0.000	40.489
18,19	7457.705	0.000	7457.705	51.790	0.000	51.790
19,20	8280.908	0.000	8280.908	57.506	0.000	57.506
20,21	8280.908	0.000	8280.908	57.506	0.000	57.506
21,22	7457.705	0.000	7457.705	51.790	0.000	51.790
22,23	5830.414	0.000	5830.414	40.489	0.000	40.489
23,24	3467.692	0.000	3467.692	24.081	0.000	24.081
24,25	551.496	0.000	551.496	3.830	0.000	3.830
25,26	0.000	-2519.937	-2519.937	0.000	-17.500	-17.500
26,28	0.000	-22352.400	-22352.400	0.000	-155.225	-155.225
27,29	0.000	-22142.400	-22142.400	0.000	-153.767	-153.767
28,30	0.000	-22142.400	-22142.400	0.000	-153.767	-153.767
29,31	0.000	-21932.400	-21932.400	0.000	-152.308	-152.308
30,32	0.000	-21932.400	-21932.400	0.000	-152.308	-152.308
31,33	0.000	-21722.400	-21722.400	0.000	-150.850	-150.850
32,34	0.000	-21722.400	-21722.400	0.000	-150.850	-150.850
33,35	0.000	-21512.400	-21512.400	0.000	-149.392	-149.392
34,36	0.000	-21512.400	-21512.400	0.000	-149.392	-149.392
35,37	0.000	-21302.400	-21302.400	0.000	-147.933	-147.933
36,38	0.000	-21302.400	-21302.400	0.000	-147.933	-147.933
37,39	0.000	-21092.400	-21092.400	0.000	-146.475	-146.475
38,40	0.000	-21092.400	-21092.400	0.000	-146.475	-146.475
39,41	0.000	-20882.400	-20882.400	0.000	-145.017	-145.017
40,42	0.000	-20882.400	-20882.400	0.000	-145.017	-145.017
41,43	0.000	-20672.400	-20672.400	0.000	-143.558	-143.558
42,44	0.000	-20672.400	-20672.400	0.000	-143.558	-143.558
43,45	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
44,55	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
45,46	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
46,47	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
47,48	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
48,49	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
49,50	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
50,51	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
51,52	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
52,53	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
53,54	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931
54,55	0.000	-4742.081	-4742.081	0.000	-32.931	-32.931

SOIL ELEMENTS

AVE 28.93/1.4 = 20.67 psi

= 2976 PSF

*** POSITIVE PROTECTION EMBANKMENT. — INSTALLATION
 $\frac{H}{B_c} = \frac{15}{13} = 1.15$ $\Gamma_{SD}, p = +0.5$ $H \leq H_e$

$$W_c = C_c w B_c^2$$

$$W_c = (0.9303)(115)(13)^2 = 18,080 \text{ lb}$$

$$\frac{W_c}{B_c} = 1,390 \text{ lb/ft}^2 \quad \Gamma_v = 1,390 \text{ lb/ft}^2$$

$$\Gamma_H = 410 \text{ lb/ft}^2$$

$$C_c = \frac{e^{-2K_u \frac{H}{B_c}} - 1}{-2K_u}$$

$$= \frac{e^{-(2)(0.1914)(1.15)} - 1}{-2(0.1914)}$$

$$C_c = 0.9303$$

EMBANKMENT

$$\frac{H}{B_c} = \frac{30}{13} = 2.3$$

$$\Gamma_{SD}, p = +0.5$$

$$W_c = C_c w B_c^2$$

$$W_c = (1.529)(115)(13)^2 = 29,271 \text{ lb}$$

$$\frac{W_c}{B_c} = \frac{29,271}{13} = 2,286 \text{ lb/ft}^2$$

$$\Gamma_v = 2,286 \text{ lb/ft}^2$$

$$\Gamma_H = 674 \text{ lb/ft}^2$$

$$C_c = \frac{e^{-2K_u \frac{H}{B_c}} - 1}{-2K_u}$$

$$= \frac{e^{-(2)(0.1914)(2.3)} - 1}{-2(0.1914)}$$

$$= 1.529$$

TUNNEL SECTION PAGE ____ OF ____	2		EMBANKMENT		STRUCTURAL ASSESSMENT	
	21	21	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE		39,299 ft-lbs	34,679 ft-lbs		
	FLOOR STRUCTURE		39,299 ft-lbs	27,590 ft-lbs		
	LEFT INSIDE WALL		9547 ft-lbs	- ft-lbs		
	LEFT OUTSIDE WALL		35,688 ft-lbs	26,707 ft-lbs		
	RIGHT INSIDE WALL		9547 ft-lbs	- ft-lbs		
RIGHT OUTSIDE WALL		35,688 ft-lbs	26,707 ft-lbs			
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$	ROOF STRUCTURE		12,151 lbs	20,462 lbs	No	
	FLOOR STRUCTURE		12,151 lbs	19,052 lbs	No	
	LEFT WALL		12,151 lbs	4742 lbs		
	RIGHT WALL		12,151 lbs	4742 lbs		
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL		159,667 lbs	22,352 lbs		
	RIGHT WALL		159,667 lbs	22,352 lbs		
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$D_1 = D + D_2$</p> <p>$B = 13 \text{ ft.}$ $D_2 = 10 \text{ ft.}$ $D_1 = 30 \text{ ft.}$ $D_1 = 40 \text{ ft.}$</p> </div> <div style="text-align: center;"> <p>$\sigma_v = D_1 \rho$ $\sigma_h = k \sigma_v$</p> <p>$\sigma_v = D_1 \rho \quad 2286 \text{ lbs/ft}^2$ $\sigma_h = k \sigma_v \quad 674 \text{ lbs/ft}^2$</p> </div> <div style="text-align: right;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$ $k = 0.7348$</p> <p>* BRIDGING (19.36' LIFTS</p> </div> </div>						

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-1(21/21)

TITLE: Structural Assessment of Tunnel section 1(21/21/) when covered with a 30 ft tuff berm used as shielding in the event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D Facilities. Los Alamos Meson Physics Facility, Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 1(21/21)) is subject to vertical and horizontal loads, estimated as 115 lbs/ft² for each 1 ft of overburden and horizontal loads equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm placed over the structure. The profile of the berm is based on preliminary shielding assessments. Shear, axial and bending stresses are determined with the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Figure() Section 1(21/21) Compacted Tuff Shield Configuration

Figure() 1(21/21) Trench Excavation and Backfill Configuration

FRAME MAC file: 1(21/21)INDUCED; Last modified at 8:45:59 on Thu, May 6, 1993

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Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54	Node 55	Node 56	Node 57	Node 58	Node 59
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000	12.000

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-5190.407
20489.399

Shear

lb

-21292.201
35551.370

Moment

lb-ft

-29552.571

Defl.

0.000
inch

-0.317

Distance

Continuous Elements Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

47	0.040	-0.173	-0.002
48	0.040	-0.205	-0.003
49	0.039	-0.239	-0.003
50	0.039	-0.270	-0.002
51	0.039	-0.295	-0.002
52	0.039	-0.311	-0.001
53	0.039	-0.317	-0.000
54	0.039	-0.312	0.001
55	0.039	-0.298	0.002
56	0.039	-0.275	0.002
57	0.038	-0.246	0.003
58	0.038	-0.216	0.002
59	0.038	-0.189	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
47,48	0.000	1740.900	290.150	0.000	1740.900	-290.150
48,49	0.000	1740.900	290.150	0.000	1740.900	-290.150
49,50	0.000	1740.900	290.150	0.000	1740.900	-290.150
50,51	0.000	1740.900	290.150	0.000	1740.900	-290.150
51,52	0.000	1740.900	290.150	0.000	1740.900	-290.150
52,53	0.000	1740.900	290.150	0.000	1740.900	-290.150
53,54	0.000	1740.900	290.150	0.000	1740.900	-290.150
54,55	0.000	1740.900	290.150	0.000	1740.900	-290.150
55,56	0.000	1740.900	290.150	0.000	1740.900	-290.150
56,57	0.000	1740.900	290.150	0.000	1740.900	-290.150
57,58	0.000	1740.900	290.150	0.000	1740.900	-290.150
58,59	0.000	1740.900	290.150	0.000	1740.900	-290.150

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
47,48	5190.407	20489.399	24735.765	-5190.407	-17007.599	-5987.265
48,49	5190.407	17007.599	5987.265	-5190.407	-13525.799	9279.434
49,50	5190.407	13525.799	-9279.434	-5190.407	-10043.999	21064.334
50,51	5190.407	10043.999	-21064.334	-5190.407	-6562.199	29367.433
51,52	5190.407	6562.199	-29367.433	-5190.407	-3080.399	34188.733
52,53	5190.407	3080.399	-34188.733	-5190.407	401.401	35528.232
53,54	5190.407	-401.401	-35528.232	-5190.407	3883.201	33385.932
54,55	5190.407	-3883.201	-33385.932	-5190.407	7365.001	27761.831
55,56	5190.407	-7365.001	-27761.831	-5190.407	10846.801	18655.931
56,57	5190.407	-10846.801	-18655.931	-5190.407	14328.601	6068.230
57,58	5190.407	-14328.601	-6068.230	-5190.407	17810.401	-10001.270
58,59	5190.407	-17810.401	10001.270	-5190.407	21292.201	-29552.571

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
-------------------	-----------------	-----------------	----------------------	-----------------	-----------------	----------------------

47,48	0.040	-0.173	-0.002	0.040	-0.205	-0.003
48,49	0.040	-0.205	-0.003	0.039	-0.239	-0.003
49,50	0.039	-0.239	-0.003	0.039	-0.270	-0.002
50,51	0.039	-0.270	-0.002	0.039	-0.295	-0.002
51,52	0.039	-0.295	-0.002	0.039	-0.311	-0.001
52,53	0.039	-0.311	-0.001	0.039	-0.317	-0.000
53,54	0.039	-0.317	-0.000	0.039	-0.312	0.001
54,55	0.039	-0.312	0.001	0.039	-0.298	0.002
55,56	0.039	-0.298	0.002	0.039	-0.275	0.002
56,57	0.039	-0.275	0.002	0.038	-0.246	0.003
57,58	0.038	-0.246	0.003	0.038	-0.216	0.002
58,59	0.038	-0.216	0.002	0.038	-0.189	0.002

Maximum deformations:

No nodes moved to the left.
 Node 47 moved 0.040 inch to the right.
 Node 53 moved 0.317 inch downwards.
 No nodes moved upwards.
 Node 48 rotated 0.003 radian clockwise.
 Node 57 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
47,48	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
48,49	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
49,50	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
50,51	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
51,52	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
52,53	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
53,54	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
54,55	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
55,56	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
56,57	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
57,58	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
58,59	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
47,48	20489.399	0.000	20489.399	142.287	0.000	142.287
48,49	17007.599	0.000	17007.599	118.108	0.000	118.108
49,50	13525.799	0.000	13525.799	93.929	0.000	93.929
50,51	10043.999	0.000	10043.999	69.750	0.000	69.750
51,52	6562.199	0.000	6562.199	45.571	0.000	45.571
52,53	3080.399	-401.401	3080.399	21.392	-2.788	21.392
53,54	0.000	-3883.201	-3883.201	0.000	-26.967	-26.967
54,55	0.000	-7365.001	-7365.001	0.000	-51.146	-51.146
55,56	0.000	-10846.801	-10846.801	0.000	-75.325	-75.325
56,57	0.000	-14328.601	-14328.601	0.000	-99.504	-99.504
57,58	0.000	-17810.401	-17810.401	0.000	-123.683	-123.683
58,59	0.000	-21292.201	-21292.201	0.000	-147.863	-147.863

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
47,48	0.000	-24735.765	-24735.765	0.000	-1030.657	-1030.657
48,49	9279.434	-5987.265	9279.434	386.643	-249.469	386.643
49,50	21064.334	0.000	21064.334	877.681	0.000	877.681
50,51	29367.433	0.000	29367.433	1223.643	0.000	1223.643
51,52	34188.733	0.000	34188.733	1424.531	0.000	1424.531
52,53	35551.370	0.000	35551.370	1481.307	0.000	1481.307
53,54	35528.232	0.000	35528.232	1480.343	0.000	1480.343
54,55	33385.932	0.000	33385.932	1391.080	0.000	1391.080
55,56	27761.831	0.000	27761.831	1156.743	0.000	1156.743
56,57	18655.931	0.000	18655.931	777.330	0.000	777.330
57,58	6068.230	-10001.270	-10001.270	252.843	-416.720	-416.720
58,59	0.000	-29552.571	-29552.571	0.000	-1231.357	-1231.357

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
47,48	0.000	-0.205	-0.205
48,49	0.000	-0.239	-0.239
49,50	0.000	-0.270	-0.270
50,51	0.000	-0.295	-0.295
51,52	0.000	-0.311	-0.311
52,53	0.000	-0.317	-0.317
53,54	0.000	-0.317	-0.317
54,55	0.000	-0.312	-0.312
55,56	0.000	-0.298	-0.298
56,57	0.000	-0.275	-0.275
57,58	0.000	-0.246	-0.246
58,59	0.000	-0.216	-0.216

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.000	-0.003	-0.205
2.000	-0.003	-0.239
3.000	-0.002	-0.270
4.000	-0.002	-0.295
5.000	-0.001	-0.311
6.000	-0.000	-0.317
7.000	0.001	-0.312
8.000	0.002	-0.298
9.000	0.002	-0.275
10.000	0.003	-0.246
11.000	0.002	-0.216

At evenly-spaced intervals:

0.000	-0.002	-0.173
1.200	-0.003	-0.212
2.400	-0.003	-0.252
3.600	-0.002	-0.286
4.800	-0.001	-0.309
6.000	-0.000	-0.317
7.200	0.001	-0.310
8.400	0.002	-0.289
9.600	0.002	-0.258
10.800	0.003	-0.222
12.000	0.002	-0.189

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Node 8
1.000
1.000

Node 9
2.000
1.000

Node 10
3.000
1.000

Node 11
4.000
1.000

Node 12
5.000
1.000

Node 13
6.000
1.000

Node 14
7.000
1.000

F: lb
D: lb/ft
M: lb-ft
E: psi

Load

Tension

2345.695

lb

-4459.054

10 Shear

0.000

lb

-19405.498

26165.768

Moment

lb-ft

-23152.272

Defl.

0.000
inch

-0.167

Distance 0.000

L/6

1.200

L/4

L/3

2.400

L/2

3.600

2L/3

3L/4

4.800

5L/6

6.000

ft

Continuous Elements Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
8	-0.001	-0.167	0.002
9	-0.001	-0.141	0.002
10	-0.001	-0.113	0.002
11	-0.001	-0.087	0.002
12	-0.001	-0.065	0.002
13	-0.001	-0.048	0.001
14	-0.001	-0.039	0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	0.000	105.000	17.500	0.000	105.000	-17.500
9,10	0.000	105.000	17.500	0.000	105.000	-17.500
10,11	0.000	105.000	17.500	0.000	105.000	-17.500
11,12	0.000	105.000	17.500	0.000	105.000	-17.500
12,13	0.000	105.000	17.500	0.000	105.000	-17.500
13,14	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	4459.054	-19195.498	-26165.768	-4459.054	19405.498	6865.270
9,10	1911.465	-13305.195	-7070.932	-1911.465	13515.195	-6339.263
10,11	-367.592	-8626.063	6144.374	367.592	8836.063	-14875.437
11,12	-1884.893	-5087.259	14723.666	1884.893	5297.259	-19915.925
12,13	-2345.695	-2504.114	19826.936	2345.695	2714.114	-22436.051
13,14	-1524.363	-623.893	22423.379	1524.363	833.893	-23152.272

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,9	-0.001	-0.167	0.002	-0.001	-0.141	0.002
9,10	-0.001	-0.141	0.002	-0.001	-0.113	0.002
10,11	-0.001	-0.113	0.002	-0.001	-0.087	0.002
11,12	-0.001	-0.087	0.002	-0.001	-0.065	0.002
12,13	-0.001	-0.065	0.002	-0.001	-0.048	0.001
13,14	-0.001	-0.048	0.001	-0.001	-0.039	0.001

Maximum deformations:

Node 10 moved 0.001 inch to the left.
 No nodes moved to the right.
 Node 8 moved 0.167 inch downwards.
 No nodes moved upwards.
 No nodes rotated clockwise.
 Node 10 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
8,9	0.000	-4459.054	-4459.054	0.000	-30.966	-30.966
9,10	0.000	-1911.465	-1911.465	0.000	-13.274	-13.274
10,11	367.592	0.000	367.592	2.553	0.000	2.553
11,12	1884.893	0.000	1884.893	13.090	0.000	13.090
12,13	2345.695	0.000	2345.695	16.290	0.000	16.290
13,14	1524.363	0.000	1524.363	10.586	0.000	10.586

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
8,9	0.000	-19405.498	-19405.498	0.000	-134.760	-134.760
9,10	0.000	-13515.195	-13515.195	0.000	-93.856	-93.856
10,11	0.000	-8836.063	-8836.063	0.000	-61.362	-61.362
11,12	0.000	-5297.259	-5297.259	0.000	-36.787	-36.787
12,13	0.000	-2714.114	-2714.114	0.000	-18.848	-18.848
13,14	0.000	-833.893	-833.893	0.000	-5.791	-5.791

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
8,9	26165.768	0.000	26165.768	1090.240	0.000	1090.240
9,10	7070.932	-6339.263	7070.932	294.622	-264.136	294.622
10,11	0.000	-14875.437	-14875.437	0.000	-619.810	-619.810
11,12	0.000	-19915.925	-19915.925	0.000	-829.830	-829.830
12,13	0.000	-22436.051	-22436.051	0.000	-934.835	-934.835
13,14	0.000	-23152.272	-23152.272	0.000	-964.678	-964.678

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
8,9	0.000	-0.167	-0.167
9,10	0.000	-0.141	-0.141
10,11	0.000	-0.113	-0.113
11,12	0.000	-0.087	-0.087
12,13	0.000	-0.065	-0.065
13,14	0.000	-0.048	-0.048

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
---	---	---

At the intermediate nodes:

1.000	0.002	-0.141
2.000	0.002	-0.113
3.000	0.002	-0.087
4.000	0.002	-0.065
5.000	0.001	-0.048

At evenly-spaced intervals:

0.000	0.002	-0.167
0.600	0.002	-0.152
1.200	0.002	-0.136
1.800	0.002	-0.119
2.400	0.002	-0.102
3.000	0.002	-0.087
3.600	0.002	-0.073
4.200	0.002	-0.061
4.800	0.001	-0.051
5.400	0.001	-0.044
6.000	0.001	-0.039

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Node 14
7.000
1.000

Node 16
7.000
2.000

Node 24
7.000
3.000

F: lb
D: lb/ft
M: lb-ft
E: psi

416.469

lb
-3.531

343.854

lb
0.000

0.000
lb-ft

-23190.359
0.003

inch
-0.001

ft
2.000

Load

Tension

13 Shear

Moment

Defl.

Distance 0.000

ft
2.000

```

*****
Continuous Elements Output Data
*****
FRAME MAC file: 1(21/21)INDUCED.
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All coord. and distances are in ft from the left (bot.) end of the element.
*****
Support reactions: (pos. force is to right or up; pos. moment is ccw.)

```

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
14	-0.001	-0.039	0.001
16	-0.003	-0.039	-0.000
24	0.001	-0.039	-0.001

```

*****
Node deformations: (positive is to right, up, or counterclockwise.)

```

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	-0.001	-0.039	0.001
16	-0.003	-0.039	-0.000
24	0.001	-0.039	-0.001

```

*****
Element fixed-end forces & moments: (local coordinate system)

```

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	105.000	0.000	0.000	105.000	0.000	0.000
16,24	105.000	0.000	0.000	105.000	0.000	0.000

```

*****
Actual element end forces & moments: (local coordinate system)

```

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	3.531	343.854	23190.359	206.469	-343.854	-22846.505
16,24	-206.469	343.854	22846.505	416.469	-343.854	-22502.651

```

*****
Member end deformations: (local coordinate system)

```

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,16	-0.039	0.001	0.001	-0.039	0.003	-0.000
16,24	-0.039	0.003	-0.000	-0.039	-0.001	-0.001

```

*****
Maximum deformations:
Node 16 moved 0.003 inch to the left.
Node 24 moved 0.001 inch to the right.
Node 14 moved 0.039 inch downwards.
No nodes moved upwards.
Node 24 rotated 0.001 radian clockwise.
Node 14 rotated 0.001 radian counter-clockwise.
*****
Maximum reactions:
There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.
*****
Maximum tension and tensile stress values (compression is negative):

```

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
14,16	206.469	-3.531	206.469	1.434	-0.025	1.434
16,24	416.469	0.000	416.469	2.892	0.000	2.892

```

*****
Maximum shear and shear stress values:

```

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,16	343.854	0.000	343.854	2.388	0.000	2.388
16,24	343.854	0.000	343.854	2.388	0.000	2.388

```

*****
Maximum moment and bending stress values:

```

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,16	0.000	-23190.359	-23190.359	0.000	-966.265	-966.265
16,24	0.000	-22846.505	-22846.505	0.000	-951.938	-951.938

Maximum deflection values:						
From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
14,16	0.003	0.000	0.003			
16,24	0.003	-0.001	0.003			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
At the intermediate nodes:						
1.000	-0.000	0.003				
At evenly-spaced intervals:						
0.000	0.001	0.001				
0.200	0.000	0.002				
0.400	0.000	0.003				
0.600	0.000	0.003				
0.800	0.000	0.003				
1.000	-0.000	0.003				
1.200	-0.000	0.003				
1.400	-0.000	0.002				
1.600	-0.000	0.002				
1.800	-0.001	0.001				
2.000	-0.001	-0.001				

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Node 24
7.000
3.000

Node 25
8.000
3.000

Node 26
9.000
3.000

Node 27
10.000
3.000

Node 28
11.000
3.000

Node 29
12.000
3.000

Node 30
13.000
3.000

Continuous Elements Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node	Reaction	Reaction	Reaction
No.	lb (FX)	lb (FY)	lb-ft (MZ)

Node deformations: (positive is to right, up, or counterclockwise.)

Node	Deflection	Deflection	Rotation
No.	inch (FX)	inch (FY)	radians (MZ)

24	0.001	-0.039	-0.001
25	0.001	-0.050	-0.001
26	0.001	-0.068	-0.002
27	0.001	-0.092	-0.002
28	0.001	-0.121	-0.003
29	0.001	-0.153	-0.003
30	0.001	-0.184	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To	FxL	FyL	MzL	FxR	FyR	MzR
Nodes	lb	lb	lb-ft	lb	lb	lb-ft
24,25	0.000	105.000	17.500	0.000	105.000	-17.500
25,26	0.000	105.000	17.500	0.000	105.000	-17.500
26,27	0.000	105.000	17.500	0.000	105.000	-17.500
27,28	0.000	105.000	17.500	0.000	105.000	-17.500
28,29	0.000	105.000	17.500	0.000	105.000	-17.500
29,30	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To	FxL	FyL	MzL	FxR	FyR	MzR
Nodes	lb	lb	lb-ft	lb	lb	lb-ft
24,25	-343.854	-416.469	22502.651	343.854	626.469	-23024.120
25,26	-2003.192	1523.309	23006.978	2003.192	-1313.309	-21588.669
26,27	-2236.045	4233.607	21655.127	2236.045	-4023.607	-17526.520
27,28	-1290.070	7989.643	17663.322	1290.070	-7779.643	-9778.679
28,29	524.207	13011.972	9966.521	-524.207	-12801.972	2940.451
29,30	2693.178	19417.927	-2734.039	-2693.178	-19207.927	22046.966

Member end deformations: (local coordinate system)

From, To	dx at L	dy at L	rotZ at L	dx at R	dy at R	rotZ at R
Nodes	inch	inch	radians	inch	inch	radians
24,25	0.001	-0.039	-0.001	0.001	-0.050	-0.001
25,26	0.001	-0.050	-0.001	0.001	-0.068	-0.002
26,27	0.001	-0.068	-0.002	0.001	-0.092	-0.002
27,28	0.001	-0.092	-0.002	0.001	-0.121	-0.003
28,29	0.001	-0.121	-0.003	0.001	-0.153	-0.003
29,30	0.001	-0.153	-0.003	0.001	-0.184	-0.002

Maximum deformations:

No nodes moved to the left.
Node 28 moved 0.001 inch to the right.
Node 30 moved 0.184 inch downwards.
No nodes moved upwards.
Node 29 rotated 0.003 radian clockwise.
No nodes rotated counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	tension	tension	tension	ten. str.	ten. str.	stress

---	lb	lb	lb	psi	psi	psi
24,25	343.854	0.000	343.854	2.388	0.000	2.388
25,26	2003.192	0.000	2003.192	13.911	0.000	13.911
26,27	2236.045	0.000	2236.045	15.528	0.000	15.528
27,28	1290.070	0.000	1290.070	8.959	0.000	8.959
28,29	0.000	-524.207	-524.207	0.000	-3.640	-3.640
29,30	0.000	-2693.178	-2693.178	0.000	-18.703	-18.703

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
24,25	0.000	-626.469	-626.469	0.000	-4.350	-4.350
25,26	1523.309	0.000	1523.309	10.579	0.000	10.579
26,27	4233.607	0.000	4233.607	29.400	0.000	29.400
27,28	7989.643	0.000	7989.643	55.484	0.000	55.484
28,29	13011.972	0.000	13011.972	90.361	0.000	90.361
29,30	19417.927	0.000	19417.927	134.847	0.000	134.847

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
24,25	0.000	-23024.120	-23024.120	0.000	-959.338	-959.338
25,26	0.000	-23006.978	-23006.978	0.000	-958.624	-958.624
26,27	0.000	-21655.127	-21655.127	0.000	-902.297	-902.297
27,28	0.000	-17663.322	-17663.322	0.000	-735.972	-735.972
28,29	2940.451	-9966.521	-9966.521	122.519	-415.272	-415.272
29,30	22046.966	0.000	22046.966	918.624	0.000	918.624

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
24,25	0.000	-0.050	-0.050
25,26	0.000	-0.068	-0.068
26,27	0.000	-0.092	-0.092
27,28	0.000	-0.121	-0.121
28,29	0.000	-0.153	-0.153
29,30	0.000	-0.184	-0.184

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---
At the intermediate nodes:		
1.000	-0.001	-0.050
2.000	-0.002	-0.068
3.000	-0.002	-0.092
4.000	-0.003	-0.121
5.000	-0.003	-0.153

At evenly-spaced intervals:

0.000	-0.001	-0.039
0.600	-0.001	-0.045
1.200	-0.001	-0.053
1.800	-0.002	-0.064
2.400	-0.002	-0.077
3.000	-0.002	-0.092
3.600	-0.002	-0.109
4.200	-0.003	-0.127
4.800	-0.003	-0.147
5.400	-0.003	-0.166
6.000	-0.002	-0.184

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Node 8	Node 15	Node 23	Node 31	Node 33	Node 35	Node 37	Node 39	Node 41	Node 43	Node 45	Node 47
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000
---	---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

8	-0.001	-0.167	0.002
15	-0.020	-0.167	0.001
23	-0.032	-0.168	0.001
31	-0.040	-0.169	0.000
33	-0.043	-0.169	0.000
35	-0.042	-0.170	-0.000
37	-0.038	-0.170	-0.000
39	-0.031	-0.171	-0.001
41	-0.021	-0.171	-0.001
43	-0.006	-0.172	-0.001
45	0.014	-0.172	-0.002
47	0.040	-0.173	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,15	105.000	483.000	80.500	105.000	483.000	-80.500
15,23	105.000	483.000	80.500	105.000	483.000	-80.500
23,31	105.000	483.000	80.500	105.000	483.000	-80.500
31,33	105.000	483.000	80.500	105.000	483.000	-80.500
33,35	105.000	483.000	80.500	105.000	483.000	-80.500
35,37	105.000	483.000	80.500	105.000	483.000	-80.500
37,39	105.000	483.000	80.500	105.000	483.000	-80.500
39,41	105.000	483.000	80.500	105.000	483.000	-80.500
41,43	105.000	483.000	80.500	105.000	483.000	-80.500
43,45	105.000	483.000	80.500	105.000	483.000	-80.500
45,47	105.000	483.000	80.500	105.000	483.000	-80.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL	FyL	MzL	FxR	FyR	MzR
	lb	lb	lb-ft	lb	lb	lb-ft
8,15	22799.399	5435.593	26084.286	-22589.399	-4469.593	-21131.693
15,23	22589.399	4469.593	21131.693	-22379.399	-3503.593	-17145.100
23,31	22379.399	3503.593	17145.100	-22169.399	-2537.593	-14124.508
31,33	22169.399	2537.593	14124.508	-21959.399	-1571.593	-12069.915
33,35	21959.399	1571.593	12069.915	-21749.399	-605.593	-10981.322
35,37	21749.399	605.593	10981.322	-21539.399	360.407	-10858.729
37,39	21539.399	-360.407	10858.729	-21329.399	1326.407	-11702.136
39,41	21329.399	-1326.407	11702.136	-21119.399	2292.407	-13511.543
41,43	21119.399	-2292.407	13511.543	-20909.399	3258.407	-16286.950
43,45	20909.399	-3258.407	16286.950	-20699.399	4224.407	-20028.358
45,47	20699.399	-4224.407	20028.358	-20489.399	5190.407	-24735.765

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,15	-0.167	0.001	0.002	-0.167	0.020	0.001
15,23	-0.167	0.020	0.001	-0.168	0.032	0.001
23,31	-0.168	0.032	0.001	-0.169	0.040	0.000
31,33	-0.169	0.040	0.000	-0.169	0.043	0.000
33,35	-0.169	0.043	0.000	-0.170	0.042	-0.000
35,37	-0.170	0.042	-0.000	-0.170	0.038	-0.000
37,39	-0.170	0.038	-0.000	-0.171	0.031	-0.001
39,41	-0.171	0.031	-0.001	-0.171	0.021	-0.001
41,43	-0.171	0.021	-0.001	-0.172	0.006	-0.001
43,45	-0.172	0.006	-0.001	-0.172	-0.014	-0.002
45,47	-0.172	-0.014	-0.002	-0.173	-0.040	-0.002

Maximum deformations:

Node 33 moved 0.043 inch to the left.
 Node 47 moved 0.040 inch to the right.
 Node 47 moved 0.173 inch downwards.
 No nodes moved upwards.
 Node 47 rotated 0.002 radian clockwise.
 Node 8 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
8,15	0.000	-22799.399	-22799.399	0.000	-158.329	-158.329
15,23	0.000	-22589.399	-22589.399	0.000	-156.871	-156.871
23,31	0.000	-22379.399	-22379.399	0.000	-155.412	-155.412
31,33	0.000	-22169.399	-22169.399	0.000	-153.954	-153.954
33,35	0.000	-21959.399	-21959.399	0.000	-152.496	-152.496
35,37	0.000	-21749.399	-21749.399	0.000	-151.037	-151.037
37,39	0.000	-21539.399	-21539.399	0.000	-149.579	-149.579
39,41	0.000	-21329.399	-21329.399	0.000	-148.121	-148.121
41,43	0.000	-21119.399	-21119.399	0.000	-146.662	-146.662
43,45	0.000	-20909.399	-20909.399	0.000	-145.204	-145.204
45,47	0.000	-20699.399	-20699.399	0.000	-143.746	-143.746

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
8,15	5435.593	0.000	5435.593	37.747	0.000	37.747
15,23	4469.593	0.000	4469.593	31.039	0.000	31.039
23,31	3503.593	0.000	3503.593	24.331	0.000	24.331
31,33	2537.593	0.000	2537.593	17.622	0.000	17.622
33,35	1571.593	0.000	1571.593	10.914	0.000	10.914
35,37	605.593	-360.407	605.593	4.206	-2.503	4.206
37,39	0.000	-1326.407	-1326.407	0.000	-9.211	-9.211
39,41	0.000	-2292.407	-2292.407	0.000	-15.919	-15.919
41,43	0.000	-3258.407	-3258.407	0.000	-22.628	-22.628
43,45	0.000	-4224.407	-4224.407	0.000	-29.336	-29.336
45,47	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
8,15	0.000	-26084.286	-26084.286	0.000	-1086.845	-1086.845
15,23	0.000	-21131.693	-21131.693	0.000	-880.487	-880.487
23,31	0.000	-17145.100	-17145.100	0.000	-714.379	-714.379
31,33	0.000	-14124.508	-14124.508	0.000	-588.521	-588.521
33,35	0.000	-12069.915	-12069.915	0.000	-502.913	-502.913
35,37	0.000	-10981.322	-10981.322	0.000	-457.555	-457.555
37,39	0.000	-11702.136	-11702.136	0.000	-487.589	-487.589
39,41	0.000	-13511.543	-13511.543	0.000	-562.981	-562.981
41,43	0.000	-16286.950	-16286.950	0.000	-678.623	-678.623
43,45	0.000	-20028.358	-20028.358	0.000	-834.515	-834.515
45,47	0.000	-24735.765	-24735.765	0.000	-1030.657	-1030.657

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
-------------------------	------------------------------------	-------------------------------------	-----------------------------------

8,15	0.020	0.000	0.020
15,23	0.032	0.000	0.032
23,31	0.040	0.000	0.040
31,33	0.043	0.000	0.043
33,35	0.043	0.000	0.043
35,37	0.042	0.000	0.042
37,39	0.038	0.000	0.038
39,41	0.031	0.000	0.031
41,43	0.021	0.000	0.021
43,45	0.006	-0.014	-0.014
45,47	0.000	-0.040	-0.040

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	0.001	0.020
2.000	0.001	0.032
3.000	0.000	0.040
4.000	0.000	0.043
5.000	-0.000	0.042
6.000	-0.000	0.038
7.000	-0.001	0.031
8.000	-0.001	0.021
9.000	-0.001	0.006
10.000	-0.002	-0.014

At evenly-spaced intervals:

0.000	0.002	0.001
1.100	0.001	0.021
2.200	0.001	0.034
3.300	0.000	0.041
4.400	-0.000	0.043
5.500	-0.000	0.041
6.600	-0.001	0.035
7.700	-0.001	0.024
8.800	-0.001	0.009
9.900	-0.002	-0.012
11.000	-0.002	-0.040

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Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 44	Node 46	Node 59
13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000
3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000
---	---	---	---	---	---	---	---	---	---

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-23182.201
5190.407

23 Shear

lb

-3503.593

Moment

29552.571

lb-ft
0.000

Defl.

0.000
inch

-0.076

Distance 0.000

L/6 1.800 L/4 L/3 3.600 L/2 5.400 2L/3 3L/4 5L/6 7.200 9.000 ft

Continuous Elements Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

30	0.001	-0.184	-0.002
32	0.026	-0.185	-0.002
34	0.046	-0.185	-0.001
36	0.060	-0.186	-0.001
38	0.070	-0.186	-0.001
40	0.075	-0.187	-0.000
42	0.075	-0.187	0.000
44	0.070	-0.188	0.001
46	0.058	-0.188	0.001
59	0.038	-0.189	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
-------------------	-----------	-----------	--------------	-----------	-----------	--------------

30,32	105.000	-483.000	-80.500	105.000	-483.000	80.500
32,34	105.000	-483.000	-80.500	105.000	-483.000	80.500
34,36	105.000	-483.000	-80.500	105.000	-483.000	80.500
36,38	105.000	-483.000	-80.500	105.000	-483.000	80.500
38,40	105.000	-483.000	-80.500	105.000	-483.000	80.500
40,42	105.000	-483.000	-80.500	105.000	-483.000	80.500
42,44	105.000	-483.000	-80.500	105.000	-483.000	80.500
44,46	105.000	-483.000	-80.500	105.000	-483.000	80.500
46,59	105.000	-483.000	-80.500	105.000	-483.000	80.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
-------------------	-----------	-----------	--------------	-----------	-----------	--------------

30,32	23182.201	-3503.593	-21961.907	-22972.201	2537.593	18941.314
32,34	22972.201	-2537.593	-18941.314	-22762.201	1571.593	16886.721
34,36	22762.201	-1571.593	-16886.721	-22552.201	605.593	15798.128
36,38	22552.201	-605.593	-15798.128	-22342.201	-360.407	15675.535
38,40	22342.201	360.407	-15675.535	-22132.201	-1326.407	16518.942
40,42	22132.201	1326.407	-16518.942	-21922.201	-2292.407	18328.350
42,44	21922.201	2292.407	-18328.350	-21712.201	-3258.407	21103.757
44,46	21712.201	3258.407	-21103.757	-21502.201	-4224.407	24845.164
46,59	21502.201	4224.407	-24845.164	-21292.201	-5190.407	29552.571

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
-------------------	-----------------	-----------------	----------------------	-----------------	-----------------	----------------------

30,32	-0.184	-0.001	-0.002	-0.185	-0.026	-0.002
32,34	-0.185	-0.026	-0.002	-0.185	-0.046	-0.001
34,36	-0.185	-0.046	-0.001	-0.186	-0.060	-0.001
36,38	-0.186	-0.060	-0.001	-0.186	-0.070	-0.001
38,40	-0.186	-0.070	-0.001	-0.187	-0.075	-0.000
40,42	-0.187	-0.075	-0.000	-0.187	-0.075	0.000
42,44	-0.187	-0.075	0.000	-0.188	-0.070	0.001
44,46	-0.188	-0.070	0.001	-0.188	-0.058	0.001
46,59	-0.188	-0.058	0.001	-0.189	-0.038	0.002

Maximum deformations:

No nodes moved to the left.

Node 40 moved 0.075 inch to the right.

Node 59 moved 0.189 inch downwards.

No nodes moved upwards.

Node 30 rotated 0.002 radian clockwise.

Node 59 rotated 0.002 radian counter-clockwise.

Maximum reactions:
There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
30,32	0.000	-23182.201	-23182.201	0.000	-160.988	-160.988
32,34	0.000	-22972.201	-22972.201	0.000	-159.529	-159.529
34,36	0.000	-22762.201	-22762.201	0.000	-158.071	-158.071
36,38	0.000	-22552.201	-22552.201	0.000	-156.613	-156.613
38,40	0.000	-22342.201	-22342.201	0.000	-155.154	-155.154
40,42	0.000	-22132.201	-22132.201	0.000	-153.696	-153.696
42,44	0.000	-21922.201	-21922.201	0.000	-152.238	-152.238
44,46	0.000	-21712.201	-21712.201	0.000	-150.779	-150.779
46,59	0.000	-21502.201	-21502.201	0.000	-149.321	-149.321

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
30,32	0.000	-3503.593	-3503.593	0.000	-24.331	-24.331
32,34	0.000	-2537.593	-2537.593	0.000	-17.622	-17.622
34,36	0.000	-1571.593	-1571.593	0.000	-10.914	-10.914
36,38	360.407	-605.593	-605.593	2.503	-4.206	-4.206
38,40	1326.407	0.000	1326.407	9.211	0.000	9.211
40,42	2292.407	0.000	2292.407	15.919	0.000	15.919
42,44	3258.407	0.000	3258.407	22.628	0.000	22.628
44,46	4224.407	0.000	4224.407	29.336	0.000	29.336
46,59	5190.407	0.000	5190.407	36.044	0.000	36.044

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
30,32	21961.907	0.000	21961.907	915.079	0.000	915.079
32,34	18941.314	0.000	18941.314	789.221	0.000	789.221
34,36	16886.721	0.000	16886.721	703.613	0.000	703.613
36,38	15798.128	0.000	15798.128	658.255	0.000	658.255
38,40	16518.942	0.000	16518.942	688.289	0.000	688.289
40,42	18328.350	0.000	18328.350	763.681	0.000	763.681
42,44	21103.757	0.000	21103.757	879.323	0.000	879.323
44,46	24845.164	0.000	24845.164	1035.215	0.000	1035.215
46,59	29552.571	0.000	29552.571	1231.357	0.000	1231.357

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
30,32	0.000	-0.026	-0.026
32,34	0.000	-0.046	-0.046
34,36	0.000	-0.060	-0.060
36,38	0.000	-0.070	-0.070
38,40	0.000	-0.075	-0.075
40,42	0.000	-0.076	-0.076
42,44	0.000	-0.075	-0.075
44,46	0.000	-0.070	-0.070
46,59	0.000	-0.058	-0.058

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---

At the intermediate nodes:

1.000	-0.002	-0.026
2.000	-0.001	-0.046
3.000	-0.001	-0.060
4.000	-0.001	-0.070
5.000	-0.000	-0.075
6.000	0.000	-0.075
7.000	0.001	-0.070
8.000	0.001	-0.058

At evenly-spaced intervals:

0.000	-0.002	-0.001
0.900	-0.002	-0.024
1.800	-0.002	-0.042
2.700	-0.001	-0.057
3.600	-0.001	-0.067
4.500	-0.000	-0.073
5.400	-0.000	-0.076
6.300	0.000	-0.074
7.200	0.001	-0.068
8.100	0.001	-0.056
9.000	0.002	-0.038

Output Data

FRAME MAC file: 1(21/21)INDUCED.

Last modified at 8:45:59 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,8	0.000	-3603.902	-3603.902	0.000	-50.054	-50.054
2,9	0.000	-6100.303	-6100.303	0.000	-42.363	-42.363
3,10	0.000	-4889.132	-4889.132	0.000	-33.952	-33.952
4,11	0.000	-3748.804	-3748.804	0.000	-26.033	-26.033
5,12	0.000	-2793.145	-2793.145	0.000	-19.397	-19.397
6,13	0.000	-2090.222	-2090.222	0.000	-14.515	-14.515
7,14	0.000	-837.424	-837.424	0.000	-11.631	-11.631
8,9	0.000	-4459.054	-4459.054	0.000	-30.966	-30.966
8,15	0.000	-22799.399	-22799.399	0.000	-158.329	-158.329
9,10	0.000	-1911.465	-1911.465	0.000	-13.274	-13.274
10,11	367.592	0.000	367.592	2.553	0.000	2.553
11,12	1884.893	0.000	1884.893	13.090	0.000	13.090
12,13	2345.695	0.000	2345.695	16.290	0.000	16.290
13,14	1524.363	0.000	1524.363	10.586	0.000	10.586
14,16	206.469	-3.531	206.469	1.434	-0.025	1.434
15,23	0.000	-22589.399	-22589.399	0.000	-156.871	-156.871
16,24	416.469	0.000	416.469	2.892	0.000	2.892
17,25	0.000	-2149.778	-2149.778	0.000	-14.929	-14.929
18,26	0.000	-2920.298	-2920.298	0.000	-20.280	-20.280
19,27	0.000	-3966.036	-3966.036	0.000	-27.542	-27.542
20,28	0.000	-5232.329	-5232.329	0.000	-36.336	-36.336
21,29	0.000	-6615.955	-6615.955	0.000	-45.944	-45.944
22,30	0.000	-3974.274	-3974.274	0.000	-55.198	-55.198
23,31	0.000	-22379.399	-22379.399	0.000	-155.412	-155.412
24,25	343.854	0.000	343.854	2.388	0.000	2.388
25,26	2003.192	0.000	2003.192	13.911	0.000	13.911
26,27	2236.045	0.000	2236.045	15.528	0.000	15.528
27,28	1290.070	0.000	1290.070	8.959	0.000	8.959
28,29	0.000	-524.207	-524.207	0.000	-3.640	-3.640
29,30	0.000	-2693.178	-2693.178	0.000	-18.703	-18.703
30,32	0.000	-23182.201	-23182.201	0.000	-160.988	-160.988
31,33	0.000	-22169.399	-22169.399	0.000	-153.954	-153.954
32,34	0.000	-22972.201	-22972.201	0.000	-159.529	-159.529
33,35	0.000	-21959.399	-21959.399	0.000	-152.496	-152.496
34,36	0.000	-22762.201	-22762.201	0.000	-158.071	-158.071
35,37	0.000	-21749.399	-21749.399	0.000	-151.037	-151.037
36,38	0.000	-22552.201	-22552.201	0.000	-156.613	-156.613
37,39	0.000	-21539.399	-21539.399	0.000	-149.579	-149.579
38,40	0.000	-22342.201	-22342.201	0.000	-155.154	-155.154
39,41	0.000	-21329.399	-21329.399	0.000	-148.121	-148.121
40,42	0.000	-22132.201	-22132.201	0.000	-153.696	-153.696
41,43	0.000	-21119.399	-21119.399	0.000	-146.662	-146.662
42,44	0.000	-21922.201	-21922.201	0.000	-152.238	-152.238
43,45	0.000	-20909.399	-20909.399	0.000	-145.204	-145.204
44,46	0.000	-21712.201	-21712.201	0.000	-150.779	-150.779
45,47	0.000	-20699.399	-20699.399	0.000	-143.746	-143.746
46,59	0.000	-21502.201	-21502.201	0.000	-149.321	-149.321
47,48	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
48,49	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
49,50	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
50,51	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
51,52	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
52,53	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
53,54	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
54,55	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
55,56	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
56,57	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
57,58	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044
58,59	0.000	-5190.407	-5190.407	0.000	-36.044	-36.044

SOIL ELEMENT
AVE 3105/14.02 16
3193 FST

SOIL ELEMENT
AVE 3105/14.02 16
3193 FST

INITIAL INSTALLATION

***** POSITIVE PROJECTION EMBANKMENT FIG 4.2

$$W_c = C_c w B_c^2$$

$$C_c = \frac{e^{+2K_u \left(\frac{H}{B_c} \right)} - 1}{2K_u}$$

$$\frac{H}{B_c} = \frac{4.5}{13}$$

$$W_c = 0.3701 (115) (13)^2$$

$$\sigma_v = 553 \text{ lb/ft}^2$$

$$W_c = 7194 \text{ lb/ft}$$

$$\sigma_H = 163 \text{ lb/ft}^2$$

$$\frac{W_c}{B_c} = 553 \text{ lb/ft}^2$$

$$= \frac{2(0.1914) \left(\frac{4.5}{13} \right) - 1}{2(0.1914)}$$

$$= 0.3701$$

EMBANKMENT

$$\frac{H}{B_c} = \frac{31}{13} = 2.3846$$

$$C_c = \frac{e^{-2K_u \left(\frac{H}{B_c} \right)} - 1}{-2K_u}$$

$$W_c = 1.53770 (115) (13)^2$$

$$= \frac{2(0.1914) (2.3846) - 1}{2(0.1914)}$$

26.5

$$W_c = 30391 \text{ lb/ft}$$

$$= 1.563770$$

$$\frac{W_c}{B_c} = 2337 \text{ lb}$$

$$\sigma_v = 2337 \text{ lb/ft}^2$$

$$\sigma_H = 689 \text{ lb/ft}^2$$

TUNNEL SECTION PAGE ____ OF ____	EMBANKMENT STRUCTURAL ASSESSMENT			
	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE	39108 ft-lbs	35531 ft-lbs	
	FLOOR STRUCTURE	39108 ft-lbs	19405/23024 ft-lbs	
	LEFT INSIDE WALL	9547 ft-lbs	- ft-lbs	
	LEFT OUTSIDE WALL	34,826 ft-lbs	26,084 ft-lbs	
	RIGHT INSIDE WALL	9547 ft-lbs	- ft-lbs	
	RIGHT OUTSIDE WALL	34826 ft-lbs	29552 ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$	ROOF STRUCTURE	12,151 lbs	21,292 lbs	NO.
	FLOOR STRUCTURE	12,151 lbs	19405/19,417 lbs	NO.
	LEFT WALL	12,151 lbs	5436 lbs	
	RIGHT WALL	12,151 lbs	5190 lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL	155,925 lbs	22,799 lbs	
	RIGHT WALL	155,925 lbs	23,182 lbs	
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$D_1 = D + D_2$</p> <p>$B = 13$ ft. $D_2 = 12$ ft. $D_1 = 31$ ft. $D_1 = 43$ ft.</p> </div> <div style="text-align: center;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$ $k = 0.2748$</p> <p>* BRIDGE (20.32') RIGID</p> <p>$\sigma_v = D_1 \rho$ 2337 lbs/ft² $\sigma_h = k \sigma_v$ 690 lbs/ft²</p> </div> </div>				

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-2(21/24)

TITLE: Structural Assessment of Tunnel section 2(21/24) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 2(21/24)) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY: _____

DATE: _____

Number of Pages Including Title Page 24

Figure() 2(21/24) Trench Excavation and Backfill Configuration

FRAME MAC file: 2(21/24) EMBANK; Last modified at 9:39:39 on Thu, May 6, 1993

FRAME MAC file: 2(21/24) EMBANK; Last modified at 9:39:39 on Thu, May 6, 1993

Node 45	Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54	Node 55	Node 56	Node 57	Node 46
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000	11.000
---	---	---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 2(21/24) EMBANK.

Last modified at 9:39:39 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

45	0.001	-0.168	-0.002
47	0.001	-0.197	-0.003
48	0.001	-0.229	-0.003
49	0.000	-0.258	-0.002
50	0.000	-0.282	-0.002
51	0.000	-0.297	-0.001
52	0.000	-0.302	0.000
53	-0.000	-0.297	0.001
54	-0.000	-0.282	0.002
55	-0.000	-0.258	0.002
56	-0.001	-0.229	0.003
57	-0.001	-0.197	0.003
46	-0.001	-0.168	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
45,47	0.000	1708.000	284.667	0.000	1708.000	-284.667
47,48	0.000	1708.000	284.667	0.000	1708.000	-284.667
48,49	0.000	1708.000	284.667	0.000	1708.000	-284.667
49,50	0.000	1708.000	284.667	0.000	1708.000	-284.667
50,51	0.000	1708.000	284.667	0.000	1708.000	-284.667
51,52	0.000	1708.000	284.667	0.000	1708.000	-284.667
52,53	0.000	1708.000	284.667	0.000	1708.000	-284.667
53,54	0.000	1708.000	284.667	0.000	1708.000	-284.667
54,55	0.000	1708.000	284.667	0.000	1708.000	-284.667
55,56	0.000	1708.000	284.667	0.000	1708.000	-284.667
56,57	0.000	1708.000	284.667	0.000	1708.000	-284.667
57,46	0.000	1708.000	284.667	0.000	1708.000	-284.667

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
45,47	5140.887	20496.000	26528.779	-5140.887	-17080.000	-7740.779
47,48	5140.887	17080.000	7740.779	-5140.887	-13664.000	7631.221
48,49	5140.887	13664.000	-7631.221	-5140.887	-10248.000	19587.221
49,50	5140.887	10248.000	-19587.221	-5140.887	-6832.000	28127.221
50,51	5140.887	6832.000	-28127.221	-5140.887	-3416.000	33251.221
51,52	5140.887	3416.000	-33251.221	-5140.887	0.000	34959.221
52,53	5140.887	0.000	-34959.221	-5140.887	3416.000	33251.221
53,54	5140.887	-3416.000	-33251.221	-5140.887	6832.000	28127.221
54,55	5140.887	-6832.000	-28127.221	-5140.887	10248.000	19587.221
55,56	5140.887	-10248.000	-19587.221	-5140.887	13664.000	7631.221
56,57	5140.887	-13664.000	-7631.221	-5140.887	17080.000	-7740.779
57,46	5140.887	-17080.000	7740.779	-5140.887	20496.000	-26528.779

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
45,47	0.001	-0.168	-0.002	0.001	-0.197	-0.003
47,48	0.001	-0.197	-0.003	0.001	-0.229	-0.003
48,49	0.001	-0.229	-0.003	0.000	-0.258	-0.002
49,50	0.000	-0.258	-0.002	0.000	-0.282	-0.002
50,51	0.000	-0.282	-0.002	0.000	-0.297	-0.001
51,52	0.000	-0.297	-0.001	0.000	-0.302	0.000
52,53	0.000	-0.302	0.000	-0.000	-0.297	0.001
53,54	-0.000	-0.297	0.001	-0.000	-0.282	0.002

54,55	-0.000	-0.282	0.002	-0.000	-0.258	0.002
55,56	-0.000	-0.258	0.002	-0.001	-0.229	0.003
56,57	-0.001	-0.229	0.003	-0.001	-0.197	0.003
57,46	-0.001	-0.197	0.003	-0.001	-0.168	0.002

Maximum deformations:

Node 46 moved 0.001 inch to the left.
Node 45 moved 0.001 inch to the right.
Node 52 moved 0.302 inch downwards.
No nodes moved upwards.
Node 47 rotated 0.003 radian clockwise.
Node 57 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
45,47	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
47,48	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
48,49	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
49,50	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
50,51	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
51,52	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
52,53	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
53,54	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
54,55	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
55,56	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
56,57	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
57,46	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
45,47	20496.000	0.000	20496.000	142.333	0.000	142.333
47,48	17080.000	0.000	17080.000	118.611	0.000	118.611
48,49	13664.000	0.000	13664.000	94.889	0.000	94.889
49,50	10248.000	0.000	10248.000	71.167	0.000	71.167
50,51	6832.000	0.000	6832.000	47.444	0.000	47.444
51,52	3416.000	0.000	3416.000	23.722	0.000	23.722
52,53	0.000	-3416.000	-3416.000	0.000	-23.722	-23.722
53,54	0.000	-6832.000	-6832.000	0.000	-47.444	-47.444
54,55	0.000	-10248.000	-10248.000	0.000	-71.167	-71.167
55,56	0.000	-13664.000	-13664.000	0.000	-94.889	-94.889
56,57	0.000	-17080.000	-17080.000	0.000	-118.611	-118.611
57,46	0.000	-20496.000	-20496.000	0.000	-142.333	-142.333

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
45,47	0.000	-26528.779	-26528.779	0.000	-1105.366	-1105.366
47,48	7631.221	-7740.779	-7740.779	317.968	-322.532	-322.532
48,49	19587.221	0.000	19587.221	816.134	0.000	816.134
49,50	28127.221	0.000	28127.221	1171.968	0.000	1171.968
50,51	33251.221	0.000	33251.221	1385.468	0.000	1385.468
51,52	34959.221	0.000	34959.221	1456.634	0.000	1456.634
52,53	34959.221	0.000	34959.221	1456.634	0.000	1456.634
53,54	33251.221	0.000	33251.221	1385.468	0.000	1385.468
54,55	28127.221	0.000	28127.221	1171.968	0.000	1171.968
55,56	19587.221	0.000	19587.221	816.134	0.000	816.134
56,57	7631.221	-7740.779	-7740.779	317.968	-322.532	-322.532
57,46	0.000	-26528.779	-26528.779	0.000	-1105.366	-1105.366

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Node 14	Node 15	Node 16	Node 17	Node 18	Node 19	Node 20	Node 21	Node 22	Node 23	Node 24	Node 25	Node 26
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Continuous Elements Output Data

FRAME MAC file: 2(21/24) EMBANK.

Last modified at 9:39:39 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	-0.001	-0.163	0.002
15	-0.001	-0.136	0.002
16	-0.001	-0.109	0.002
17	-0.001	-0.084	0.002
18	-0.000	-0.065	0.001
19	-0.000	-0.053	0.001
20	0.000	-0.048	0.000
21	0.000	-0.053	-0.001
22	0.000	-0.065	-0.001
23	0.001	-0.084	-0.002
24	0.001	-0.109	-0.002
25	0.001	-0.136	-0.002
26	0.001	-0.163	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	0.000	105.000	17.500	0.000	105.000	-17.500
15,16	0.000	105.000	17.500	0.000	105.000	-17.500
16,17	0.000	105.000	17.500	0.000	105.000	-17.500
17,18	0.000	105.000	17.500	0.000	105.000	-17.500
18,19	0.000	105.000	17.500	0.000	105.000	-17.500
19,20	0.000	105.000	17.500	0.000	105.000	-17.500
20,21	0.000	105.000	17.500	0.000	105.000	-17.500
21,22	0.000	105.000	17.500	0.000	105.000	-17.500
22,23	0.000	105.000	17.500	0.000	105.000	-17.500
23,24	0.000	105.000	17.500	0.000	105.000	-17.500
24,25	0.000	105.000	17.500	0.000	105.000	-17.500
25,26	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	2958.358	-19083.839	-22469.000	-2958.358	19293.839	3280.161
15,16	-287.728	-13401.677	-3515.018	287.728	13611.677	-9991.660
16,17	-3327.288	-8908.434	9768.900	3327.288	9118.434	-18782.334
17,18	-5773.227	-5485.519	18599.770	5773.227	5695.519	-24190.289
18,19	-7451.636	-2897.378	24062.886	7451.636	3107.378	-27065.264
19,20	-8299.103	-835.916	27000.184	8299.103	1045.916	-27941.101
20,21	-8299.103	1045.916	27941.101	8299.103	-835.916	-27000.184
21,22	-7451.636	3107.378	27065.264	7451.636	-2897.378	-24062.886
22,23	-5773.227	5695.519	24190.289	5773.227	-5485.519	-18599.770
23,24	-3327.288	9118.434	18782.334	3327.288	-8908.434	-9768.900
24,25	-287.728	13611.677	9991.660	287.728	-13401.677	3515.018
25,26	2958.358	19293.839	-3280.161	-2958.358	-19083.839	22469.000

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,15	-0.001	-0.163	0.002	-0.001	-0.136	0.002
15,16	-0.001	-0.136	0.002	-0.001	-0.109	0.002
16,17	-0.001	-0.109	0.002	-0.001	-0.084	0.002
17,18	-0.001	-0.084	0.002	-0.000	-0.065	0.001
18,19	-0.000	-0.065	0.001	-0.000	-0.053	0.001
19,20	-0.000	-0.053	0.001	0.000	-0.048	0.000
20,21	0.000	-0.048	0.000	0.000	-0.053	-0.001
21,22	0.000	-0.053	-0.001	0.000	-0.065	-0.001

22,23	0.000	-0.065	-0.001	0.001	-0.084	-0.002
23,24	0.001	-0.084	-0.002	0.001	-0.109	-0.002
24,25	0.001	-0.109	-0.002	0.001	-0.136	-0.002
25,26	0.001	-0.136	-0.002	0.001	-0.163	-0.002

Maximum deformations:

Node 15 moved 0.001 inch to the left.
Node 25 moved 0.001 inch to the right.
Node 26 moved 0.163 inch downwards.
No nodes moved upwards.
Node 25 rotated 0.002 radian clockwise.
Node 15 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
14,15	0.000	-2958.358	-2958.358	0.000	-20.544	-20.544
15,16	287.728	0.000	287.728	1.998	0.000	1.998
16,17	3327.288	0.000	3327.288	23.106	0.000	23.106
17,18	5773.227	0.000	5773.227	40.092	0.000	40.092
18,19	7451.636	0.000	7451.636	51.747	0.000	51.747
19,20	8299.103	0.000	8299.103	57.633	0.000	57.633
20,21	8299.103	0.000	8299.103	57.633	0.000	57.633
21,22	7451.636	0.000	7451.636	51.747	0.000	51.747
22,23	5773.227	0.000	5773.227	40.092	0.000	40.092
23,24	3327.288	0.000	3327.288	23.106	0.000	23.106
24,25	287.728	0.000	287.728	1.998	0.000	1.998
25,26	0.000	-2958.358	-2958.358	0.000	-20.544	-20.544

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,15	0.000	-19293.839	-19293.839	0.000	-133.985	-133.985
15,16	0.000	-13611.677	-13611.677	0.000	-94.526	-94.526
16,17	0.000	-9118.434	-9118.434	0.000	-63.322	-63.322
17,18	0.000	-5695.519	-5695.519	0.000	-39.552	-39.552
18,19	0.000	-3107.378	-3107.378	0.000	-21.579	-21.579
19,20	0.000	-1045.916	-1045.916	0.000	-7.263	-7.263
20,21	1045.916	0.000	1045.916	7.263	0.000	7.263
21,22	3107.378	0.000	3107.378	21.579	0.000	21.579
22,23	5695.519	0.000	5695.519	39.552	0.000	39.552
23,24	9118.434	0.000	9118.434	63.322	0.000	63.322
24,25	13611.677	0.000	13611.677	94.526	0.000	94.526
25,26	19293.839	0.000	19293.839	133.985	0.000	133.985

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,15	22469.000	0.000	22469.000	936.208	0.000	936.208
15,16	3515.018	-9991.660	-9991.660	146.459	-416.319	-416.319
16,17	0.000	-18782.334	-18782.334	0.000	-782.597	-782.597
17,18	0.000	-24190.289	-24190.289	0.000	-1007.929	-1007.929
18,19	0.000	-27065.264	-27065.264	0.000	-1127.719	-1127.719
19,20	0.000	-27941.101	-27941.101	0.000	-1164.213	-1164.213
20,21	0.000	-27941.101	-27941.101	0.000	-1164.213	-1164.213
21,22	0.000	-27065.264	-27065.264	0.000	-1127.719	-1127.719
22,23	0.000	-24190.289	-24190.289	0.000	-1007.929	-1007.929
23,24	0.000	-18782.334	-18782.334	0.000	-782.597	-782.597
24,25	3515.018	-9991.660	-9991.660	146.459	-416.319	-416.319
25,26	22469.000	0.000	22469.000	936.208	0.000	936.208

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*****
*****
Maximum deflection values:
      From, To      Maximum defl.      Maximum defl.      Maximum defl.
      Node          up (left)         down (rt.)         absolute
      ---          inch              inch              inch
-----
      14,15         0.000             -0.163             -0.163
      15,16         0.000             -0.136             -0.136
      16,17         0.000             -0.109             -0.109
      17,18         0.000             -0.084             -0.084
      18,19         0.000             -0.065             -0.065
      19,20         0.000             -0.053             -0.053
      20,21         0.000             -0.053             -0.053
      21,22         0.000             -0.065             -0.065
      22,23         0.000             -0.084             -0.084
      23,24         0.000             -0.109             -0.109
      24,25         0.000             -0.136             -0.136
      25,26         0.000             -0.163             -0.163
*****
Deflections along the elements (positive is up or counter-clockwise):
      Distance from      Rotation      Deflection
      left (bottom)      ---          ---
      ft              radian          inch
-----
At the intermediate nodes:
      1.000             0.002             -0.136
      2.000             0.002             -0.109
      3.000             0.002             -0.084
      4.000             0.001             -0.065
      5.000             0.001             -0.053
      6.000             0.000             -0.048
      7.000             -0.001             -0.053
      8.000             -0.001             -0.065
      9.000             -0.002             -0.084
      10.000            -0.002             -0.109
      11.000            -0.002             -0.136

At evenly-spaced intervals:
      0.000             0.002             -0.163
      1.200             0.002             -0.131
      2.400             0.002             -0.098
      3.600             0.002             -0.072
      4.800             0.001             -0.054
      6.000             0.000             -0.048
      7.200             -0.001             -0.054
      8.400             -0.002             -0.072
      9.600             -0.002             -0.098
      10.800            -0.002             -0.131
      12.000            -0.002             -0.163
*****

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Node 14	Node 27	Node 29	Node 31	Node 33	Node 35	Node 37	Node 39	Node 41	Node 43	Node 45
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000
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Continuous Elements Output Data

FRAME MAC file: 2(21/24) EMBANK.

Last modified at 9:39:39 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	-0.001	-0.163	0.002
27	-0.021	-0.163	0.001
29	-0.036	-0.164	0.001
31	-0.046	-0.164	0.001
33	-0.053	-0.165	0.000
35	-0.055	-0.165	0.000
37	-0.053	-0.166	-0.000
39	-0.048	-0.166	-0.001
41	-0.037	-0.167	-0.001
43	-0.022	-0.167	-0.002
45	0.001	-0.168	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,27	105.000	472.500	78.750	105.000	472.500	-78.750
27,29	105.000	472.500	78.750	105.000	472.500	-78.750
29,31	105.000	472.500	78.750	105.000	472.500	-78.750
31,33	105.000	472.500	78.750	105.000	472.500	-78.750
33,35	105.000	472.500	78.750	105.000	472.500	-78.750
35,37	105.000	472.500	78.750	105.000	472.500	-78.750
37,39	105.000	472.500	78.750	105.000	472.500	-78.750
39,41	105.000	472.500	78.750	105.000	472.500	-78.750
41,43	105.000	472.500	78.750	105.000	472.500	-78.750
43,45	105.000	472.500	78.750	105.000	472.500	-78.750

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,27	22596.000	4309.113	22369.907	-22386.000	-3364.113	-18533.294
27,29	22386.000	3364.113	18533.294	-22176.000	-2419.113	-15641.681
29,31	22176.000	2419.113	15641.681	-21966.000	-1474.113	-13695.068
31,33	21966.000	1474.113	13695.068	-21756.000	-529.113	-12693.456
33,35	21756.000	529.113	12693.456	-21546.000	415.887	-12636.843
35,37	21546.000	-415.887	12636.843	-21336.000	1360.887	-13525.230
37,39	21336.000	-1360.887	13525.230	-21126.000	2305.887	-15358.617
39,41	21126.000	-2305.887	15358.617	-20916.000	3250.887	-18137.005
41,43	20916.000	-3250.887	18137.005	-20706.000	4195.887	-21860.392
43,45	20706.000	-4195.887	21860.392	-20496.000	5140.887	-26528.779

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,27	-0.163	0.001	0.002	-0.163	0.021	0.001
27,29	-0.163	0.021	0.001	-0.164	0.036	0.001
29,31	-0.164	0.036	0.001	-0.164	0.046	0.001
31,33	-0.164	0.046	0.001	-0.165	0.053	0.000
33,35	-0.165	0.053	0.000	-0.165	0.055	0.000
35,37	-0.165	0.055	0.000	-0.166	0.053	-0.000
37,39	-0.166	0.053	-0.000	-0.166	0.048	-0.001
39,41	-0.166	0.048	-0.001	-0.167	0.037	-0.001
41,43	-0.167	0.037	-0.001	-0.167	0.022	-0.002
43,45	-0.167	0.022	-0.002	-0.168	-0.001	-0.002

Maximum deformations:

Node 35 moved 0.055 inch to the left.

Node 45 moved 0.001 inch to the right.

Node 45 moved 0.168 inch downwards.
 No nodes moved upwards.
 Node 45 rotated 0.002 radian clockwise.
 Node 14 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
14,27	0.000	-22596.000	-22596.000	0.000	-156.917	-156.917
27,29	0.000	-22386.000	-22386.000	0.000	-155.458	-155.458
29,31	0.000	-22176.000	-22176.000	0.000	-154.000	-154.000
31,33	0.000	-21966.000	-21966.000	0.000	-152.542	-152.542
33,35	0.000	-21756.000	-21756.000	0.000	-151.083	-151.083
35,37	0.000	-21546.000	-21546.000	0.000	-149.625	-149.625
37,39	0.000	-21336.000	-21336.000	0.000	-148.167	-148.167
39,41	0.000	-21126.000	-21126.000	0.000	-146.708	-146.708
41,43	0.000	-20916.000	-20916.000	0.000	-145.250	-145.250
43,45	0.000	-20706.000	-20706.000	0.000	-143.792	-143.792

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,27	4309.113	0.000	4309.113	29.924	0.000	29.924
27,29	3364.113	0.000	3364.113	23.362	0.000	23.362
29,31	2419.113	0.000	2419.113	16.799	0.000	16.799
31,33	1474.113	0.000	1474.113	10.237	0.000	10.237
33,35	529.113	-415.887	529.113	3.674	-2.888	3.674
35,37	0.000	-1360.887	-1360.887	0.000	-9.451	-9.451
37,39	0.000	-2305.887	-2305.887	0.000	-16.013	-16.013
39,41	0.000	-3250.887	-3250.887	0.000	-22.576	-22.576
41,43	0.000	-4195.887	-4195.887	0.000	-29.138	-29.138
43,45	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,27	0.000	-22369.907	-22369.907	0.000	-932.079	-932.079
27,29	0.000	-18533.294	-18533.294	0.000	-772.221	-772.221
29,31	0.000	-15641.681	-15641.681	0.000	-651.737	-651.737
31,33	0.000	-13695.068	-13695.068	0.000	-570.628	-570.628
33,35	0.000	-12693.456	-12693.456	0.000	-528.894	-528.894
35,37	0.000	-13525.230	-13525.230	0.000	-563.551	-563.551
37,39	0.000	-15358.617	-15358.617	0.000	-639.942	-639.942
39,41	0.000	-18137.005	-18137.005	0.000	-755.709	-755.709
41,43	0.000	-21860.392	-21860.392	0.000	-910.850	-910.850
43,45	0.000	-26528.779	-26528.779	0.000	-1105.366	-1105.366

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
14,27	0.021	0.000	0.021
27,29	0.036	0.000	0.036
29,31	0.046	0.000	0.046
31,33	0.053	0.000	0.053
33,35	0.055	0.000	0.055
35,37	0.055	0.000	0.055
37,39	0.053	0.000	0.053

39,41	0.048	0.000	0.048
41,43	0.037	0.000	0.037
43,45	0.022	-0.001	-0.022

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	0.001	0.021
2.000	0.001	0.036
3.000	0.001	0.046
4.000	0.000	0.053
5.000	0.000	0.055
6.000	-0.000	0.053
7.000	-0.001	0.048
8.000	-0.001	0.037
9.000	-0.002	0.022
At evenly-spaced intervals:		
0.000	0.002	0.001
1.000	0.001	0.021
2.000	0.001	0.036
3.000	0.001	0.046
4.000	0.000	0.053
5.000	0.000	0.055
6.000	-0.000	0.053
7.000	-0.001	0.048
8.000	-0.001	0.037
9.000	-0.002	0.022
10.000	-0.002	-0.001

39,41	0.048	0.000	0.048
41,43	0.037	0.000	0.037
43,45	0.022	-0.001	0.022

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	0.001	0.021
2.000	0.001	0.036
3.000	0.001	0.046
4.000	0.000	0.053
5.000	0.000	0.055
6.000	-0.000	0.053
7.000	-0.001	0.048
8.000	-0.001	0.037
9.000	-0.002	0.022
At evenly-spaced intervals:		
0.000	0.002	0.001
1.000	0.001	0.021
2.000	0.001	0.036
3.000	0.001	0.046
4.000	0.000	0.053
5.000	0.000	0.055
6.000	-0.000	0.053
7.000	-0.001	0.048
8.000	-0.001	0.037
9.000	-0.002	0.022
10.000	-0.002	-0.001

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Node 26	Node 28	Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 44	Node 46
13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000
1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000

Continuous Elements Output Data

FRAME MAC file: 2(21/24) EMBANK.

Last modified at 9:39:39 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
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26	0.001	-0.163	-0.002
28	0.021	-0.163	-0.001
30	0.036	-0.164	-0.001
32	0.046	-0.164	-0.001
34	0.053	-0.165	-0.000
36	0.055	-0.165	-0.000
38	0.053	-0.166	0.000
40	0.048	-0.166	0.001
42	0.037	-0.167	0.001
44	0.022	-0.167	0.002
46	-0.001	-0.168	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
26,28	105.000	-472.500	-78.750	105.000	-472.500	78.750
28,30	105.000	-472.500	-78.750	105.000	-472.500	78.750
30,32	105.000	-472.500	-78.750	105.000	-472.500	78.750
32,34	105.000	-472.500	-78.750	105.000	-472.500	78.750
34,36	105.000	-472.500	-78.750	105.000	-472.500	78.750
36,38	105.000	-472.500	-78.750	105.000	-472.500	78.750
38,40	105.000	-472.500	-78.750	105.000	-472.500	78.750
40,42	105.000	-472.500	-78.750	105.000	-472.500	78.750
42,44	105.000	-472.500	-78.750	105.000	-472.500	78.750
44,46	105.000	-472.500	-78.750	105.000	-472.500	78.750

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
26,28	22596.000	-4309.113	-22369.907	-22386.000	3364.113	18533.294
28,30	22386.000	-3364.113	-18533.294	-22176.000	2419.113	15641.681
30,32	22176.000	-2419.113	-15641.681	-21966.000	1474.113	13695.068
32,34	21966.000	-1474.113	-13695.068	-21756.000	529.113	12693.456
34,36	21756.000	-529.113	-12693.456	-21546.000	-415.887	12636.843
36,38	21546.000	415.887	-12636.843	-21336.000	-1360.887	13525.230
38,40	21336.000	1360.887	-13525.230	-21126.000	-2305.887	15358.617
40,42	21126.000	2305.887	-15358.617	-20916.000	-3250.887	18137.005
42,44	20916.000	3250.887	-18137.005	-20706.000	-4195.887	21860.392
44,46	20706.000	4195.887	-21860.392	-20496.000	-5140.887	26528.779

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
26,28	-0.163	-0.001	-0.002	-0.163	-0.021	-0.001
28,30	-0.163	-0.021	-0.001	-0.164	-0.036	-0.001
30,32	-0.164	-0.036	-0.001	-0.164	-0.046	-0.001
32,34	-0.164	-0.046	-0.001	-0.165	-0.053	-0.000
34,36	-0.165	-0.053	-0.000	-0.165	-0.055	-0.000
36,38	-0.165	-0.055	-0.000	-0.166	-0.053	0.000
38,40	-0.166	-0.053	0.000	-0.166	-0.048	0.001
40,42	-0.166	-0.048	0.001	-0.167	-0.037	0.001
42,44	-0.167	-0.037	0.001	-0.167	-0.022	0.002
44,46	-0.167	-0.022	0.002	-0.168	0.001	0.002

Maximum deformations:

Node 46 moved 0.001 inch to the left.

Node 36 moved 0.055 inch to the right.

Node 46 moved 0.168 inch downwards.
 No nodes moved upwards.
 Node 26 rotated 0.002 radian clockwise.
 Node 46 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
26,28	0.000	-22596.000	-22596.000	0.000	-156.917	-156.917
28,30	0.000	-22386.000	-22386.000	0.000	-155.458	-155.458
30,32	0.000	-22176.000	-22176.000	0.000	-154.000	-154.000
32,34	0.000	-21966.000	-21966.000	0.000	-152.542	-152.542
34,36	0.000	-21756.000	-21756.000	0.000	-151.083	-151.083
36,38	0.000	-21546.000	-21546.000	0.000	-149.625	-149.625
38,40	0.000	-21336.000	-21336.000	0.000	-148.167	-148.167
40,42	0.000	-21126.000	-21126.000	0.000	-146.708	-146.708
42,44	0.000	-20916.000	-20916.000	0.000	-145.250	-145.250
44,46	0.000	-20706.000	-20706.000	0.000	-143.792	-143.792

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
26,28	0.000	-4309.113	-4309.113	0.000	-29.924	-29.924
28,30	0.000	-3364.113	-3364.113	0.000	-23.362	-23.362
30,32	0.000	-2419.113	-2419.113	0.000	-16.799	-16.799
32,34	0.000	-1474.113	-1474.113	0.000	-10.237	-10.237
34,36	415.887	-529.113	-529.113	2.888	-3.674	-3.674
36,38	1360.887	0.000	1360.887	9.451	0.000	9.451
38,40	2305.887	0.000	2305.887	16.013	0.000	16.013
40,42	3250.887	0.000	3250.887	22.576	0.000	22.576
42,44	4195.887	0.000	4195.887	29.138	0.000	29.138
44,46	5140.887	0.000	5140.887	35.701	0.000	35.701

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
26,28	22369.907	0.000	22369.907	932.079	0.000	932.079
28,30	18533.294	0.000	18533.294	772.221	0.000	772.221
30,32	15641.681	0.000	15641.681	651.737	0.000	651.737
32,34	13695.068	0.000	13695.068	570.628	0.000	570.628
34,36	12693.456	0.000	12693.456	528.894	0.000	528.894
36,38	13525.230	0.000	13525.230	563.551	0.000	563.551
38,40	15358.617	0.000	15358.617	639.942	0.000	639.942
40,42	18137.005	0.000	18137.005	755.709	0.000	755.709
42,44	21860.392	0.000	21860.392	910.850	0.000	910.850
44,46	26528.779	0.000	26528.779	1105.366	0.000	1105.366

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
26,28	0.000	-0.021	-0.021
28,30	0.000	-0.036	-0.036
30,32	0.000	-0.046	-0.046
32,34	0.000	-0.053	-0.053
34,36	0.000	-0.055	-0.055
36,38	0.000	-0.055	-0.055
38,40	0.000	-0.053	-0.053

40,42	0.000	-0.048	-0.048
42,44	0.000	-0.037	-0.037
44,46	0.001	-0.022	-0.022

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	-0.001	-0.021
2.000	-0.001	-0.036
3.000	-0.001	-0.046
4.000	-0.000	-0.053
5.000	-0.000	-0.055
6.000	0.000	-0.053
7.000	0.001	-0.048
8.000	0.001	-0.037
9.000	0.002	-0.022
At evenly-spaced intervals:		
0.000	-0.002	-0.001
1.000	-0.001	-0.021
2.000	-0.001	-0.036
3.000	-0.001	-0.046
4.000	-0.000	-0.053
5.000	-0.000	-0.055
6.000	0.000	-0.053
7.000	0.001	-0.048
8.000	0.001	-0.037
9.000	0.002	-0.022
10.000	0.002	0.001

***** Output Data *****						

FRAME MAC file: 2(21/24) EMBANK.						
Last modified at 9:39:39 on Thu, May 6, 1993.						
All coord. and distances are in ft from the left (bot.) end of the element.						

Maximum tension and tensile stress values (compression is negative):						
From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	tension	tension	tension	ten. str.	ten. str.	stress
---	lb	lb	lb	psi	psi	psi
1,14	0.000	-3512.161	-3512.161	0.000	-48.780	-48.780
2,15	0.000	-5892.162	-5892.162	0.000	-40.918	-40.918
3,16	0.000	-4703.243	-4703.243	0.000	-32.661	-32.661
4,17	0.000	-3632.914	-3632.914	0.000	-25.229	-25.229
5,18	0.000	-2798.141	-2798.141	0.000	-19.432	-19.432
6,19	0.000	-2271.462	-2271.462	0.000	-15.774	-15.774
7,20	0.000	-2091.832	-2091.832	0.000	-14.527	-14.527
8,21	0.000	-2271.462	-2271.462	0.000	-15.774	-15.774
9,22	0.000	-2798.141	-2798.141	0.000	-19.432	-19.432
10,23	0.000	-3632.914	-3632.914	0.000	-25.229	-25.229
11,24	0.000	-4703.243	-4703.243	0.000	-32.661	-32.661
12,25	0.000	-5892.162	-5892.162	0.000	-40.918	-40.918
13,26	0.000	-3512.161	-3512.161	0.000	-48.780	-48.780
14,15	0.000	-2958.358	-2958.358	0.000	-20.544	-20.544
14,27	0.000	-22596.000	-22596.000	0.000	-156.917	-156.917
15,16	287.728	0.000	287.728	1.998	0.000	1.998
16,17	3327.288	0.000	3327.288	23.106	0.000	23.106
17,18	5773.227	0.000	5773.227	40.092	0.000	40.092
18,19	7451.636	0.000	7451.636	51.747	0.000	51.747
19,20	8299.103	0.000	8299.103	57.633	0.000	57.633
20,21	8299.103	0.000	8299.103	57.633	0.000	57.633
21,22	7451.636	0.000	7451.636	51.747	0.000	51.747
22,23	5773.227	0.000	5773.227	40.092	0.000	40.092
23,24	3327.288	0.000	3327.288	23.106	0.000	23.106
24,25	287.728	0.000	287.728	1.998	0.000	1.998
25,26	0.000	-2958.358	-2958.358	0.000	-20.544	-20.544
26,28	0.000	-22596.000	-22596.000	0.000	-156.917	-156.917
27,29	0.000	-22386.000	-22386.000	0.000	-155.458	-155.458
28,30	0.000	-22386.000	-22386.000	0.000	-155.458	-155.458
29,31	0.000	-22176.000	-22176.000	0.000	-154.000	-154.000
30,32	0.000	-22176.000	-22176.000	0.000	-154.000	-154.000
31,33	0.000	-21966.000	-21966.000	0.000	-152.542	-152.542
32,34	0.000	-21966.000	-21966.000	0.000	-152.542	-152.542
33,35	0.000	-21756.000	-21756.000	0.000	-151.083	-151.083
34,36	0.000	-21756.000	-21756.000	0.000	-151.083	-151.083
35,37	0.000	-21546.000	-21546.000	0.000	-149.625	-149.625
36,38	0.000	-21546.000	-21546.000	0.000	-149.625	-149.625
37,39	0.000	-21336.000	-21336.000	0.000	-148.167	-148.167
38,40	0.000	-21336.000	-21336.000	0.000	-148.167	-148.167
39,41	0.000	-21126.000	-21126.000	0.000	-146.708	-146.708
40,42	0.000	-21126.000	-21126.000	0.000	-146.708	-146.708
41,43	0.000	-20916.000	-20916.000	0.000	-145.250	-145.250
42,44	0.000	-20916.000	-20916.000	0.000	-145.250	-145.250
43,45	0.000	-20706.000	-20706.000	0.000	-143.792	-143.792
44,46	0.000	-20706.000	-20706.000	0.000	-143.792	-143.792
45,47	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
46,57	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
47,48	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
48,49	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
49,50	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
50,51	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
51,52	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
52,53	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
53,54	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
54,55	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
55,56	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701
56,57	0.000	-5140.887	-5140.887	0.000	-35.701	-35.701

SOIL ELE: 1.5
 AVE: 29.24/4 = 20.1
 300.000

INITIAL INSTALLATION

***** POSITIVE PROJECTION EMBANKMENT FIG 4.2
(COMPLETE)

$$W_c = C_c W B_c^2$$

$$\frac{H}{B_c} = \frac{5.5}{13}$$

$$W_c = 0.3906 (115) (13)^2$$

$$W_c = 7591 \text{ lb/ft} \quad \sigma_v = 584 \text{ lb/ft}^2 \quad C_c = 0.3906$$

$$\frac{W_c}{B_c} = 584 \text{ lb/ft}^2 \quad \sigma_H = 172 \text{ lb/ft}^2$$

$$C_c = \frac{e^{+2K\mu\left(\frac{H}{B_c}\right)} - 1}{+2K\mu}$$

$$C_c = \frac{e^{2(0.1914)(0.4731)} - 1}{2(0.1914)}$$

EMBANKMENT INSTALLATION

$$\frac{H}{B_c} = \frac{30}{13}$$

$$W_c = C_c W B_c^2$$

$$= 1.5324 (115) (13)^2$$

$$W_c = 29783 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = 2291 \text{ lb/ft}^2$$

$$C_c = \frac{e^{-2K\mu\left(\frac{H}{B_c}\right)} - 1}{-2K\mu}$$

$$C_c = 1.53$$

$$\sigma_v = 2290 \text{ lb/ft}^2$$

$$\sigma_H = 675 \text{ lb/ft}^2$$

TUNNEL SECTION PAGE ____ OF ____	2		EMBANKMENT		STRUCTURAL ASSESSMENT	
	21	24	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE	42,585	ft-lbs	34,959	ft-lbs	
	FLOOR STRUCTURE	42,585	ft-lbs	27,941	ft-lbs	
	LEFT INSIDE WALL	9,547	ft-lbs	—	ft-lbs	No
	LEFT OUTSIDE WALL	25,642	ft-lbs	26,529	ft-lbs	
	RIGHT INSIDE WALL	9,547	ft-lbs	—	ft-lbs	No
	RIGHT OUTSIDE WALL	25,642	ft-lbs	26,529	ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$	ROOF STRUCTURE	12,291	lbs	20,496	lbs	No
	FLOOR STRUCTURE	12,291	lbs	19,294	lbs	No
	LEFT WALL	12,291	lbs	5140	lbs	
	RIGHT WALL	12,291	lbs	5140	lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL	157,900	lbs	22,596	lbs	
	RIGHT WALL	157,900	lbs	22,596	lbs	
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$D_1 = D + D_2$</p> <p>$B = 13$ ft. $D_2 = 11$ ft.</p> <p>$D_1 = 20$ ft. $D_1 = 41$ ft.</p> </div> <div style="text-align: center;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$ $k = 0.2745$</p> <p>$\sigma_v = D_1 \rho$ 2290 lbs/ft² * BENDING (10.7) EFFECT</p> <p>$\sigma_h = k \sigma_v$ 675 lbs/ft²</p> </div> </div>						

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-1(21/24)

TITLE: Structural Assessment of Tunnel Section 1(21/24) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 1(21/24)) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Number of Pages Including Title Page 25

Figure() Section 1(21/24) Compacted Tuff Shield Configuration

Figure() 1(21/24) Trench Excavation and Backfill Configuration

FRAME MAC file: 1(21/24) EMBANK; Last modified at 10:04:34 on Thu, May 6, 1993

Node 43	Node 44	Node 45	Node 46	Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54
2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
10.500	10.500	10.500	10.500	10.500	10.500	10.500	10.500	10.500	10.500	10.500	10.500
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Continuous Elements Output Data

FRAME MAC file: 1(21/24) EMBANK.

Last modified at 10:04:34 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
43	0.001	-0.150	-0.002
44	0.001	-0.172	-0.002
45	0.000	-0.197	-0.002
46	0.000	-0.218	-0.002
47	0.000	-0.235	-0.001
48	0.000	-0.243	-0.000
49	-0.000	-0.243	0.000
50	-0.000	-0.235	0.001
51	-0.000	-0.218	0.002
52	-0.000	-0.197	0.002
53	-0.001	-0.172	0.002
54	-0.001	-0.150	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
43,44	0.000	1689.100	281.517	0.000	1689.100	-281.517
44,45	0.000	1689.100	281.517	0.000	1689.100	-281.517
45,46	0.000	1689.100	281.517	0.000	1689.100	-281.517
46,47	0.000	1689.100	281.517	0.000	1689.100	-281.517
47,48	0.000	1689.100	281.517	0.000	1689.100	-281.517
48,49	0.000	1689.100	281.517	0.000	1689.100	-281.517
49,50	0.000	1689.100	281.517	0.000	1689.100	-281.517
50,51	0.000	1689.100	281.517	0.000	1689.100	-281.517
51,52	0.000	1689.100	281.517	0.000	1689.100	-281.517
52,53	0.000	1689.100	281.517	0.000	1689.100	-281.517
53,54	0.000	1689.100	281.517	0.000	1689.100	-281.517

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
43,44	4855.024	18580.100	21811.020	-4855.024	-15201.900	-4920.020
44,45	4855.024	15201.900	4920.020	-4855.024	-11823.700	8592.780
45,46	4855.024	11823.700	-8592.780	-4855.024	-8445.500	18727.380
46,47	4855.024	8445.500	-18727.380	-4855.024	-5067.300	25483.780
47,48	4855.024	5067.300	-25483.780	-4855.024	-1689.100	28861.980
48,49	4855.024	1689.100	-28861.980	-4855.024	1689.100	28861.980
49,50	4855.024	-1689.100	-28861.980	-4855.024	5067.300	25483.780
50,51	4855.024	-5067.300	-25483.780	-4855.024	8445.500	18727.380
51,52	4855.024	-8445.500	-18727.380	-4855.024	11823.700	8592.780
52,53	4855.024	-11823.700	-8592.780	-4855.024	15201.900	-4920.020
53,54	4855.024	-15201.900	4920.020	-4855.024	18580.100	-21811.020

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
43,44	0.001	-0.150	-0.002	0.001	-0.172	-0.002
44,45	0.001	-0.172	-0.002	0.000	-0.197	-0.002
45,46	0.000	-0.197	-0.002	0.000	-0.218	-0.002
46,47	0.000	-0.218	-0.002	0.000	-0.235	-0.001
47,48	0.000	-0.235	-0.001	0.000	-0.243	-0.000
48,49	0.000	-0.243	-0.000	-0.000	-0.243	0.000
49,50	-0.000	-0.243	0.000	-0.000	-0.235	0.001
50,51	-0.000	-0.235	0.001	-0.000	-0.218	0.002
51,52	-0.000	-0.218	0.002	-0.000	-0.197	0.002
52,53	-0.000	-0.197	0.002	-0.001	-0.172	0.002
53,54	-0.001	-0.172	0.002	-0.001	-0.150	0.002

Maximum deformations:

Node 54 moved 0.001 inch to the left.
 Node 43 moved 0.001 inch to the right.
 Node 48 moved 0.243 inch downwards.
 No nodes moved upwards.
 Node 44 rotated 0.002 radian clockwise.
 Node 53 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
43,44	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
44,45	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
45,46	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
46,47	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
47,48	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
48,49	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
49,50	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
50,51	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
51,52	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
52,53	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
53,54	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
43,44	18580.100	0.000	18580.100	129.028	0.000	129.028
44,45	15201.900	0.000	15201.900	105.569	0.000	105.569
45,46	11823.700	0.000	11823.700	82.109	0.000	82.109
46,47	8445.500	0.000	8445.500	58.649	0.000	58.649
47,48	5067.300	0.000	5067.300	35.190	0.000	35.190
48,49	1689.100	-1689.100	1689.100	11.730	-11.730	11.730
49,50	0.000	-5067.300	-5067.300	0.000	-35.190	-35.190
50,51	0.000	-8445.500	-8445.500	0.000	-58.649	-58.649
51,52	0.000	-11823.700	-11823.700	0.000	-82.109	-82.109
52,53	0.000	-15201.900	-15201.900	0.000	-105.569	-105.569
53,54	0.000	-18580.100	-18580.100	0.000	-129.028	-129.028

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
43,44	0.000	-21811.020	-21811.020	0.000	-908.793	-908.793
44,45	8592.780	-4920.020	8592.780	358.032	-205.001	358.032
45,46	18727.380	0.000	18727.380	780.307	0.000	780.307
46,47	25483.780	0.000	25483.780	1061.824	0.000	1061.824
47,48	28861.980	0.000	28861.980	1202.582	0.000	1202.582
48,49	29284.255	0.000	29284.255	1220.177	0.000	1220.177
49,50	28861.980	0.000	28861.980	1202.582	0.000	1202.582
50,51	25483.780	0.000	25483.780	1061.824	0.000	1061.824
51,52	18727.380	0.000	18727.380	780.307	0.000	780.307
52,53	8592.780	-4920.020	8592.780	358.032	-205.001	358.032
53,54	0.000	-21811.020	-21811.020	0.000	-908.793	-908.793

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
-------------------------	------------------------------------	-------------------------------------	-----------------------------------

43,44	0.000	-0.172	-0.172
44,45	0.000	-0.197	-0.197
45,46	0.000	-0.218	-0.218
46,47	0.000	-0.235	-0.235
47,48	0.000	-0.243	-0.243
48,49	0.000	-0.244	-0.244
49,50	0.000	-0.243	-0.243
50,51	0.000	-0.235	-0.235
51,52	0.000	-0.218	-0.218
52,53	0.000	-0.197	-0.197
53,54	0.000	-0.172	-0.172

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

1.000	-0.002	-0.172
2.000	-0.002	-0.197
3.000	-0.002	-0.218
4.000	-0.001	-0.235
5.000	-0.000	-0.243
6.000	0.000	-0.243
7.000	0.001	-0.235
8.000	0.002	-0.218
9.000	0.002	-0.197
10.000	0.002	-0.172

At evenly-spaced intervals:

0.000	-0.002	-0.150
1.100	-0.002	-0.175
2.200	-0.002	-0.201
3.300	-0.001	-0.224
4.400	-0.001	-0.239
5.500	0.000	-0.244
6.600	0.001	-0.239
7.700	0.001	-0.224
8.800	0.002	-0.201
9.900	0.002	-0.175
11.000	0.062	-0.150

FRAME MAC file: 1(21/24) EMBANK; Last modified at 10:04:34 on Thu, May 6, 1993

Node 13	Node 14	Node 15	Node 16	Node 17	Node 18	Node 19	Node 20	Node 21	Node 22	Node 23	Node 24
2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000
0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
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Continuous Elements Output Data

FRAME MAC file: 1(21/24) EMBANK.

Last modified at 10:04:34 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
13	-0.000	-0.145	0.002
14	-0.000	-0.123	0.002
15	-0.000	-0.101	0.002
16	-0.000	-0.082	0.001
17	-0.000	-0.067	0.001
18	-0.000	-0.060	0.000
19	0.000	-0.060	-0.000
20	0.000	-0.067	-0.001
21	0.000	-0.082	-0.001
22	0.000	-0.101	-0.002
23	0.000	-0.123	-0.002
24	0.000	-0.145	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
13,14	0.000	105.000	17.500	0.000	105.000	-17.500
14,15	0.000	105.000	17.500	0.000	105.000	-17.500
15,16	0.000	105.000	17.500	0.000	105.000	-17.500
16,17	0.000	105.000	17.500	0.000	105.000	-17.500
17,18	0.000	105.000	17.500	0.000	105.000	-17.500
18,19	0.000	105.000	17.500	0.000	105.000	-17.500
19,20	0.000	105.000	17.500	0.000	105.000	-17.500
20,21	0.000	105.000	17.500	0.000	105.000	-17.500
21,22	0.000	105.000	17.500	0.000	105.000	-17.500
22,23	0.000	105.000	17.500	0.000	105.000	-17.500
23,24	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
13,14	3122.826	-17554.626	-20041.942	-3122.826	17764.626	2382.316
14,15	13.416	-12433.492	-2593.020	-13.416	12643.492	-9945.472
15,16	-2808.258	-8275.877	9750.725	2808.258	8485.877	-18131.602
16,17	-4981.382	-4962.882	17978.976	4981.382	5172.882	-23046.858
17,18	-6332.204	-2266.985	22950.719	6332.204	2476.985	-25322.703
18,19	-6788.729	105.000	25289.979	6788.729	105.000	-25289.979
19,20	-6332.204	2476.985	25322.703	6332.204	-2266.985	-22950.719
20,21	-4981.382	5172.882	23046.858	4981.382	-4962.882	-17978.976
21,22	-2808.258	8485.877	18131.602	2808.258	-8275.877	-9750.725
22,23	13.416	12643.492	9945.472	-13.416	-12433.492	2593.020
23,24	3122.826	17764.626	-2382.316	-3122.826	-17554.626	20041.942

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
13,14	-0.000	-0.145	0.002	-0.000	-0.123	0.002
14,15	-0.000	-0.123	0.002	-0.000	-0.101	0.002
15,16	-0.000	-0.101	0.002	-0.000	-0.082	0.001
16,17	-0.000	-0.082	0.001	-0.000	-0.067	0.001
17,18	-0.000	-0.067	0.001	-0.000	-0.060	0.000
18,19	-0.000	-0.060	0.000	0.000	-0.060	-0.000
19,20	0.000	-0.060	-0.000	0.000	-0.067	-0.001
20,21	0.000	-0.067	-0.001	0.000	-0.082	-0.001
21,22	0.000	-0.082	-0.001	0.000	-0.101	-0.002
22,23	0.000	-0.101	-0.002	0.000	-0.123	-0.002
23,24	0.000	-0.123	-0.002	0.000	-0.145	-0.002

Maximum deformations:

Node 15 moved 0.000 inch to the left.
 Node 22 moved 0.000 inch to the right.
 Node 24 moved 0.145 inch downwards.
 No nodes moved upwards.
 Node 23 rotated 0.002 radian clockwise.
 Node 14 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
13,14	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686
14,15	0.000	-13.416	-13.416	0.000	-0.093	-0.093
15,16	2808.258	0.000	2808.258	19.502	0.000	19.502
16,17	4981.382	0.000	4981.382	34.593	0.000	34.593
17,18	6332.204	0.000	6332.204	43.974	0.000	43.974
18,19	6788.729	0.000	6788.729	47.144	0.000	47.144
19,20	6332.204	0.000	6332.204	43.974	0.000	43.974
20,21	4981.382	0.000	4981.382	34.593	0.000	34.593
21,22	2808.258	0.000	2808.258	19.502	0.000	19.502
22,23	0.000	-13.416	-13.416	0.000	-0.093	-0.093
23,24	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
13,14	0.000	-17764.626	-17764.626	0.000	-123.365	-123.365
14,15	0.000	-12643.492	-12643.492	0.000	-87.802	-87.802
15,16	0.000	-8485.877	-8485.877	0.000	-58.930	-58.930
16,17	0.000	-5172.882	-5172.882	0.000	-35.923	-35.923
17,18	0.000	-2476.985	-2476.985	0.000	-17.201	-17.201
18,19	105.000	-105.000	-105.000	0.729	-0.729	-0.729
19,20	2476.985	0.000	2476.985	17.201	0.000	17.201
20,21	5172.882	0.000	5172.882	35.923	0.000	35.923
21,22	8485.877	0.000	8485.877	58.930	0.000	58.930
22,23	12643.492	0.000	12643.492	87.802	0.000	87.802
23,24	17764.626	0.000	17764.626	123.365	0.000	123.365

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
13,14	20041.942	0.000	20041.942	835.081	0.000	835.081
14,15	2593.020	-9945.472	-9945.472	108.042	-414.395	-414.395
15,16	0.000	-18131.602	-18131.602	0.000	-755.483	-755.483
16,17	0.000	-23046.858	-23046.858	0.000	-960.286	-960.286
17,18	0.000	-25322.703	-25322.703	0.000	-1055.113	-1055.113
18,19	0.000	-25289.979	-25289.979	0.000	-1053.749	-1053.749
19,20	0.000	-25322.703	-25322.703	0.000	-1055.113	-1055.113
20,21	0.000	-23046.858	-23046.858	0.000	-960.286	-960.286
21,22	0.000	-18131.602	-18131.602	0.000	-755.483	-755.483
22,23	2593.020	-9945.472	-9945.472	108.042	-414.395	-414.395
23,24	20041.942	0.000	20041.942	835.081	0.000	835.081

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
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13,14	0.000	-0.145	-0.145
14,15	0.000	-0.123	-0.123
15,16	0.000	-0.101	-0.101
16,17	0.000	-0.082	-0.082
17,18	0.000	-0.067	-0.067
18,19	0.000	-0.060	-0.060
19,20	0.000	-0.067	-0.067
20,21	0.000	-0.082	-0.082
21,22	0.000	-0.101	-0.101
22,23	0.000	-0.123	-0.123
23,24	0.000	-0.145	-0.145

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	0.002	-0.123
2.000	0.002	-0.101
3.000	0.001	-0.082
4.000	0.001	-0.067
5.000	0.000	-0.060
6.000	-0.000	-0.060
7.000	-0.001	-0.067
8.000	-0.001	-0.082
9.000	-0.002	-0.101
10.000	-0.002	-0.123
At evenly-spaced intervals:		
0.000	0.002	-0.145
1.100	0.002	-0.121
2.200	0.002	-0.097
3.300	0.001	-0.077
4.400	0.001	-0.063
5.500	0.000	-0.059
6.600	-0.001	-0.063
7.700	-0.001	-0.077
8.800	-0.002	-0.097
9.900	-0.002	-0.121
11.000	-0.002	-0.145

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Node	F: lb	D: lb/ft	E: psi
Node 13	2.000	0.500	
Node 25	2.000	1.500	
Node 27	2.000	2.500	
Node 29	2.000	3.500	
Node 31	2.000	4.500	
Node 33	2.000	5.500	
Node 35	2.000	6.500	
Node 37	2.000	7.500	
Node 39	2.000	8.500	
Node 41	2.000	9.500	
Node 43	2.000	10.500

Continuous Elements Output Data

FRAME MAC file: 1(21/24) EMBANK.

Last modified at 10:04:34 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
13	-0.000	-0.145	0.002
25	-0.017	-0.145	0.001
27	-0.028	-0.146	0.001
29	-0.036	-0.146	0.000
31	-0.040	-0.147	0.000
33	-0.042	-0.147	0.000
35	-0.041	-0.148	-0.000
37	-0.036	-0.148	-0.000
39	-0.029	-0.149	-0.001
41	-0.017	-0.149	-0.001
43	0.001	-0.150	-0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
13,25	105.000	466.900	77.817	105.000	466.900	-77.817
25,27	105.000	466.900	77.817	105.000	466.900	-77.817
27,29	105.000	466.900	77.817	105.000	466.900	-77.817
29,31	105.000	466.900	77.817	105.000	466.900	-77.817
31,33	105.000	466.900	77.817	105.000	466.900	-77.817
33,35	105.000	466.900	77.817	105.000	466.900	-77.817
35,37	105.000	466.900	77.817	105.000	466.900	-77.817
37,39	105.000	466.900	77.817	105.000	466.900	-77.817
39,41	105.000	466.900	77.817	105.000	466.900	-77.817
41,43	105.000	466.900	77.817	105.000	466.900	-77.817

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
13,25	20680.100	4482.976	19950.785	-20470.100	-3549.176	-15934.708
25,27	20470.100	3549.176	15934.708	-20250.100	-2615.376	-12852.432
27,29	20260.100	2615.376	12852.432	-20050.100	-1681.576	-10703.955
29,31	20050.100	1681.576	10703.955	-19840.100	-747.776	-9489.279
31,33	19840.100	747.776	9489.279	-19630.100	186.024	-9208.403
33,35	19630.100	-186.024	9208.403	-19420.100	1119.824	-9861.326
35,37	19420.100	-1119.824	9861.326	-19210.100	2053.624	-11448.050
37,39	19210.100	-2053.624	11448.050	-19000.100	2987.424	-13968.573
39,41	19000.100	-2987.424	13968.573	-18790.100	3921.224	-17422.897
41,43	18790.100	-3921.224	17422.897	-18580.100	4855.024	-21811.020

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
13,25	-0.145	0.000	0.002	-0.145	0.017	0.001
25,27	-0.145	0.017	0.001	-0.146	0.028	0.001
27,29	-0.146	0.028	0.001	-0.146	0.036	0.000
29,31	-0.146	0.036	0.000	-0.147	0.040	0.000
31,33	-0.147	0.040	0.000	-0.147	0.042	0.000
33,35	-0.147	0.042	0.000	-0.148	0.041	-0.000
35,37	-0.148	0.041	-0.000	-0.148	0.036	-0.000
37,39	-0.148	0.036	-0.000	-0.149	0.029	-0.001
39,41	-0.149	0.029	-0.001	-0.149	0.017	-0.001
41,43	-0.149	0.017	-0.001	-0.150	-0.001	-0.002

Maximum deformations:

Node 33 moved 0.042 inch to the left.

Node 43 moved 0.001 inch to the right.

Node 43 moved 0.150 inch downwards.
 No nodes moved upwards.
 Node 43 rotated 0.002 radian clockwise.
 Node 13 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
13,25	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
25,27	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
27,29	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
29,31	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
31,33	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
33,35	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
35,37	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
37,39	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
39,41	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
41,43	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
13,25	4482.976	0.000	4482.976	31.132	0.000	31.132
25,27	3549.176	0.000	3549.176	24.647	0.000	24.647
27,29	2615.376	0.000	2615.376	18.162	0.000	18.162
29,31	1681.576	0.000	1681.576	11.678	0.000	11.678
31,33	747.776	-186.024	747.776	5.193	-1.292	5.193
33,35	0.000	-1119.824	-1119.824	0.000	-7.777	-7.777
35,37	0.000	-2053.624	-2053.624	0.000	-14.261	-14.261
37,39	0.000	-2987.424	-2987.424	0.000	-20.746	-20.746
39,41	0.000	-3921.224	-3921.224	0.000	-27.231	-27.231
41,43	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
13,25	0.000	-19950.785	-19950.785	0.000	-831.283	-831.283
25,27	0.000	-15934.708	-15934.708	0.000	-663.946	-663.946
27,29	0.000	-12852.432	-12852.432	0.000	-535.518	-535.518
29,31	0.000	-10703.955	-10703.955	0.000	-445.998	-445.998
31,33	0.000	-9489.279	-9489.279	0.000	-395.387	-395.387
33,35	0.000	-9861.326	-9861.326	0.000	-410.889	-410.889
35,37	0.000	-11448.050	-11448.050	0.000	-477.002	-477.002
37,39	0.000	-13968.573	-13968.573	0.000	-582.024	-582.024
39,41	0.000	-17422.897	-17422.897	0.000	-725.954	-725.954
41,43	0.000	-21811.020	-21811.020	0.000	-908.793	-908.793

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
13,25	0.017	0.000	0.017
25,27	0.028	0.000	0.028
27,29	0.036	0.000	0.036
29,31	0.040	0.000	0.040
31,33	0.042	0.000	0.042
33,35	0.042	0.000	0.042
35,37	0.041	0.000	0.041

37,39	0.036	0.000	0.036
39,41	0.029	0.000	0.029
41,43	0.017	-0.001	0.017

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.000	0.001	0.017
2.000	0.001	0.028
3.000	0.000	0.036
4.000	0.000	0.040
5.000	0.000	0.042
6.000	-0.000	0.041
7.000	-0.000	0.036
8.000	-0.001	0.029
9.000	-0.001	0.017
At evenly-spaced intervals:		
0.000	0.002	0.000
1.000	0.001	0.017
2.000	0.001	0.028
3.000	0.000	0.036
4.000	0.000	0.040
5.000	0.000	0.042
6.000	-0.000	0.041
7.000	-0.000	0.036
8.000	-0.001	0.029
9.000	-0.001	0.017
10.000	-0.002	-0.001

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Node 24	Node 28	Node 28	Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 54
13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000	13.000
0.500	1.500	2.500	3.500	4.500	5.500	6.500	7.500	8.500	9.500	10.500
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Continuous Elements Output Data

FRAME MAC file: 1(21/24) EMBANK.

Last modified at 10:04:34 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
24	0.000	-0.145	-0.002
26	0.017	-0.145	-0.001
28	0.028	-0.146	-0.001
30	0.036	-0.146	-0.000
32	0.040	-0.147	-0.000
34	0.042	-0.147	-0.000
36	0.041	-0.148	0.000
38	0.036	-0.148	0.000
40	0.029	-0.149	0.001
42	0.017	-0.149	0.001
54	-0.001	-0.150	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
24,26	105.000	-466.900	-77.817	105.000	-466.900	77.817
26,28	105.000	-466.900	-77.817	105.000	-466.900	77.817
28,30	105.000	-466.900	-77.817	105.000	-466.900	77.817
30,32	105.000	-466.900	-77.817	105.000	-466.900	77.817
32,34	105.000	-466.900	-77.817	105.000	-466.900	77.817
34,36	105.000	-466.900	-77.817	105.000	-466.900	77.817
36,38	105.000	-466.900	-77.817	105.000	-466.900	77.817
38,40	105.000	-466.900	-77.817	105.000	-466.900	77.817
40,42	105.000	-466.900	-77.817	105.000	-466.900	77.817
42,54	105.000	-466.900	-77.817	105.000	-466.900	77.817

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
24,26	20680.100	-4482.976	-19950.785	-20470.100	3549.176	15934.708
26,28	20470.100	-3549.176	-15934.708	-20260.100	2615.376	12852.432
28,30	20260.100	-2615.376	-12852.432	-20050.100	1681.576	10703.955
30,32	20050.100	-1681.576	-10703.955	-19840.100	747.776	9489.279
32,34	19840.100	-747.776	-9489.279	-19630.100	-186.024	9208.403
34,36	19630.100	186.024	-9208.403	-19420.100	-1119.824	9861.326
36,38	19420.100	1119.824	-9861.326	-19210.100	-2053.624	11448.050
38,40	19210.100	2053.624	-11448.050	-19000.100	-2987.424	13968.573
40,42	19000.100	2987.424	-13968.573	-18790.100	-3921.224	17422.897
42,54	18790.100	3921.224	-17422.897	-18580.100	-4855.024	21811.020

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
24,26	-0.145	-0.000	-0.002	-0.145	-0.017	-0.001
26,28	-0.145	-0.017	-0.001	-0.146	-0.028	-0.001
28,30	-0.146	-0.028	-0.001	-0.146	-0.036	-0.000
30,32	-0.146	-0.036	-0.000	-0.147	-0.040	-0.000
32,34	-0.147	-0.040	-0.000	-0.147	-0.042	-0.000
34,36	-0.147	-0.042	-0.000	-0.148	-0.041	0.000
36,38	-0.148	-0.041	0.000	-0.148	-0.036	0.000
38,40	-0.148	-0.036	0.000	-0.149	-0.029	0.001
40,42	-0.149	-0.029	0.001	-0.149	-0.017	0.001
42,54	-0.149	-0.017	0.001	-0.150	0.001	0.002

Maximum deformations:

Node 54 moved 0.001 inch to the left.

Node 34 moved 0.042 inch to the right.

Node 54 moved 0.150 inch downwards.
 No nodes moved upwards.
 Node 24 rotated 0.002 radian clockwise.
 Node 54 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
24,26	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
26,28	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
28,30	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
30,32	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
32,34	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
34,36	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
36,38	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
38,40	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
40,42	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
42,54	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
24,26	0.000	-4482.976	-4482.976	0.000	-31.132	-31.132
26,28	0.000	-3549.176	-3549.176	0.000	-24.647	-24.647
28,30	0.000	-2615.376	-2615.376	0.000	-18.162	-18.162
30,32	0.000	-1681.576	-1681.576	0.000	-11.678	-11.678
32,34	186.024	-747.776	-747.776	1.292	-5.193	-5.193
34,36	1119.824	0.000	1119.824	7.777	0.000	7.777
36,38	2053.624	0.000	2053.624	14.261	0.000	14.261
38,40	2987.424	0.000	2987.424	20.746	0.000	20.746
40,42	3921.224	0.000	3921.224	27.231	0.000	27.231
42,54	4855.024	0.000	4855.024	33.715	0.000	33.715

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
24,26	19950.785	0.000	19950.785	831.283	0.000	831.283
26,28	15934.708	0.000	15934.708	663.946	0.000	663.946
28,30	12852.432	0.000	12852.432	535.518	0.000	535.518
30,32	10703.955	0.000	10703.955	445.998	0.000	445.998
32,34	9489.279	0.000	9489.279	395.387	0.000	395.387
34,36	9861.326	0.000	9861.326	410.889	0.000	410.889
36,38	11448.050	0.000	11448.050	477.002	0.000	477.002
38,40	13968.573	0.000	13968.573	582.024	0.000	582.024
40,42	17422.897	0.000	17422.897	725.954	0.000	725.954
42,54	21811.020	0.000	21811.020	908.793	0.000	908.793

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
24,26	0.000	-0.017	-0.017
26,28	0.000	-0.028	-0.028
28,30	0.000	-0.036	-0.036
30,32	0.000	-0.040	-0.040
32,34	0.000	-0.042	-0.042
34,36	0.000	-0.042	-0.042
36,38	0.000	-0.041	-0.041

38,40	0.000	-0.036	-0.036
40,42	0.000	-0.029	-0.029
42,54	0.001	-0.017	-0.017

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom)	Rotation	Deflection
ft	radian	inch

At the intermediate nodes:		
1.000	-0.001	-0.017
2.000	-0.001	-0.028
3.000	-0.000	-0.036
4.000	-0.000	-0.040
5.000	-0.000	-0.042
6.000	0.000	-0.041
7.000	0.000	-0.036
8.000	0.001	-0.029
9.000	0.001	-0.017
At evenly-spaced intervals:		
0.000	-0.002	-0.000
1.000	-0.001	-0.017
2.000	-0.001	-0.028
3.000	-0.000	-0.036
4.000	-0.000	-0.040
5.000	-0.000	-0.042
6.000	0.000	-0.041
7.000	0.000	-0.036
8.000	0.001	-0.029
9.000	0.001	-0.017
10.000	0.002	0.001

```

*****
                        Output Data
*****
FRAME MAC file: 1(21/24) EMBANK.
Last modified at 10:04:34 on Thu, May 6, 1993.
All coord. and distances are in ft from the left (bot.) end of the element.
*****
Maximum tension and tensile stress values (compression is negative):

```

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,13	0.000	-3125.474	-3125.474	0.000	-43.409	-43.409
2,14	0.000	-5331.133	-5331.133	0.000	-37.022	-37.022
3,15	0.000	-4367.615	-4367.615	0.000	-30.331	-30.331
4,16	0.000	-3522.995	-3522.995	0.000	-24.465	-24.465
5,17	0.000	-2905.898	-2905.898	0.000	-20.180	-20.180
6,18	0.000	-2581.985	-2581.985	0.000	-17.930	-17.930
7,19	0.000	-2581.985	-2581.985	0.000	-17.930	-17.930
8,20	0.000	-2905.898	-2905.898	0.000	-20.180	-20.180
9,21	0.000	-3522.995	-3522.995	0.000	-24.465	-24.465
10,22	0.000	-4367.615	-4367.615	0.000	-30.331	-30.331
11,23	0.000	-5331.133	-5331.133	0.000	-37.022	-37.022
12,24	0.000	-3125.474	-3125.474	0.000	-43.409	-43.409
13,14	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686
13,25	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
14,15	0.000	-13.416	-13.416	0.000	-0.093	-0.093
15,16	2808.258	0.000	2808.258	19.502	0.000	19.502
16,17	4981.382	0.000	4981.382	34.593	0.000	34.593
17,18	6332.204	0.000	6332.204	43.974	0.000	43.974
18,19	6788.729	0.000	6788.729	47.144	0.000	47.144
19,20	6332.204	0.000	6332.204	43.974	0.000	43.974
20,21	4981.382	0.000	4981.382	34.593	0.000	34.593
21,22	2808.258	0.000	2808.258	19.502	0.000	19.502
22,23	0.000	-13.416	-13.416	0.000	-0.093	-0.093
23,24	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686
24,26	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
25,27	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
26,28	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
27,29	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
28,30	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
29,31	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
30,32	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
31,33	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
32,34	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
33,35	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
34,36	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
35,37	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
36,38	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
37,39	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
38,40	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
39,41	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
40,42	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
41,43	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487
42,54	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487
43,44	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
44,45	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
45,46	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
46,47	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
47,48	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
48,49	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
49,50	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
50,51	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
51,52	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
52,53	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
53,54	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715

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*****

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SOIL ELEM 217
 FILE 1-1
 12-1

***** Output Data *****						
FRAME MAC file: 1(21/24) EMBANK.						
Last modified at 21:14:36 on Mon, Mar 22, 1993.						
All coord. and distances are in ft from the left (bot.) end of the element.						

Maximum tension and tensile stress values (compression is negative):						
From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	tension	tension	tension	ten. str.	ten. str.	stress
---	lb	lb	lb	psi	psi	psi
1,13	0.000	-3125.474	-3125.474	0.000	-43.409	-43.409
2,14	0.000	-5331.133	-5331.133	0.000	-37.022	-37.022
3,15	0.000	-4367.615	-4367.615	0.000	-30.331	-30.331
4,16	0.000	-3522.995	-3522.995	0.000	-24.465	-24.465
5,17	0.000	-2905.898	-2905.898	0.000	-20.180	-20.180
6,18	0.000	-2581.985	-2581.985	0.000	-17.930	-17.930
7,19	0.000	-2581.985	-2581.985	0.000	-17.930	-17.930
8,20	0.000	-2905.898	-2905.898	0.000	-20.180	-20.180
9,21	0.000	-3522.995	-3522.995	0.000	-24.465	-24.465
10,22	0.000	-4367.615	-4367.615	0.000	-30.331	-30.331
11,23	0.000	-5331.133	-5331.133	0.000	-37.022	-37.022
12,24	0.000	-3125.474	-3125.474	0.000	-43.409	-43.409
13,14	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686
13,25	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
14,15	0.000	-13.416	-13.416	0.000	-0.093	-0.093
15,16	2808.258	0.000	2808.258	19.502	0.000	19.502
16,17	4981.382	0.000	4981.382	34.593	0.000	34.593
17,18	6332.204	0.000	6332.204	43.974	0.000	43.974
18,19	6788.729	0.000	6788.729	47.144	0.000	47.144
19,20	6332.204	0.000	6332.204	43.974	0.000	43.974
20,21	4981.382	0.000	4981.382	34.593	0.000	34.593
21,22	2808.258	0.000	2808.258	19.502	0.000	19.502
22,23	0.000	-13.416	-13.416	0.000	-0.093	-0.093
23,24	0.000	-3122.826	-3122.826	0.000	-21.686	-21.686
24,26	0.000	-20680.100	-20680.100	0.000	-143.612	-143.612
25,27	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
26,28	0.000	-20470.100	-20470.100	0.000	-142.153	-142.153
27,29	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
28,30	0.000	-20260.100	-20260.100	0.000	-140.695	-140.695
29,31	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
30,32	0.000	-20050.100	-20050.100	0.000	-139.237	-139.237
31,33	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
32,34	0.000	-19840.100	-19840.100	0.000	-137.778	-137.778
33,35	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
34,36	0.000	-19630.100	-19630.100	0.000	-136.320	-136.320
35,37	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
36,38	0.000	-19420.100	-19420.100	0.000	-134.862	-134.862
37,39	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
38,40	0.000	-19210.100	-19210.100	0.000	-133.403	-133.403
39,41	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
40,42	0.000	-19000.100	-19000.100	0.000	-131.945	-131.945
41,43	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487
42,54	0.000	-18790.100	-18790.100	0.000	-130.487	-130.487
43,44	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
44,45	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
45,46	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
46,47	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
47,48	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
48,49	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
49,50	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
50,51	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
51,52	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
52,53	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715
53,54	0.000	-4855.024	-4855.024	0.000	-33.715	-33.715

SOIL ELEMENTS
 AVE = 25.58 14 = 2.11
 = 2.11

*** POSITIVE PROJECTION EMBANKMENT. FIG 4.2 (COMPLETE)

$$W_c = C_c w B_c^2$$

$$\frac{H}{B_c} = \frac{1}{12}$$

$$W_c = 0.08467 (115)(12)^2$$

$$= 1402$$

$$\frac{W_c}{B_c} = 116.8 \text{ lb/ft}^2$$

$$C_c = \frac{e^{+2K\mu\left(\frac{H}{B_c}\right)} - 1}{+2K\mu}$$

$$C_c = \frac{e^{2(0.1914)\left(\frac{1}{12}\right)} - 1}{2(0.1914)}$$

$$C_c = 0.08467$$

$$W_c = C_c w B_c^2$$

$$= 1.6397 (115)(12)^2$$

$$= 27154 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = \frac{27154}{12} = 2263 \text{ lb/ft}^2$$

INCOMPLETE

$$C_c = \frac{e^{-2K\mu\left(\frac{H}{B_c}\right)} - 1}{+2K\mu}$$

$$C_c = \frac{e^{-2(0.1914)\left(\frac{31.25}{12}\right)} - 1}{2(0.1914)}$$

$$= \frac{e^{-0.9969} - 1}{2(0.1914)}$$

$$C_c = 1.6397$$

$$\sigma_v = 2263 \text{ lb/ft}^2$$

$$\sigma_h = 667 \text{ lb/ft}^2$$

TUNNEL SECTION PAGE ____ OF ____	TUNNEL ELEMENT	STRUCTURAL ASSESSMENT		
		ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE	42,585 ft-lbs	29,284 ft-lbs	
	FLOOR STRUCTURE	42,585 ft-lbs	25,322 ft-lbs	
	LEFT INSIDE WALL	9547 ft-lbs	— ft-lbs	
	LEFT OUTSIDE WALL	25,642 ft-lbs	21,811 ft-lbs	
	RIGHT INSIDE WALL	9547 ft-lbs	— ft-lbs	
	RIGHT OUTSIDE WALL	25,642 ft-lbs	21,811 ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B_w d$	ROOF STRUCTURE	12,291 lbs	18,580 lbs	NO
	FLOOR STRUCTURE	12,291 lbs	17,764 lbs	NO
	LEFT WALL	12,291 lbs	4855 lbs	
	RIGHT WALL	12,291 lbs	4855 lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL	157,900 lbs	20,680 lbs	
	RIGHT WALL	157,900 lbs	20,680 lbs	
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$B = 12$ ft. $D_2 = 11$ ft. $D_1 = 31.25$ ft. $D_1 = 42.25$ ft.</p> </div> <div style="text-align: center;"> <p>$\sigma_v = D_1 \rho$ 2,263 lbs/ft² * BRIDGING (19.68') $\sigma_h = k \sigma_v$ 667 lbs/ft² LITECT</p> </div> <div style="text-align: right;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$ $k = 0.2748$</p> </div> </div>				

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-3 (23/23)

TITLE: Structural Assessment of Tunnel Section 3(23/23) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 3(23/23)) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Number of Pages Including Title Page 28

Figure() 3(23/23) Trench Excavation and Backfill Configuration

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993
 Above each load are the magnitudes in lb, lb/ft, and lb-ft.

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993
 Above each load are the magnitudes in lb, lb/ft, and lb-ft.

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993

Node 62	Node 63	Node 64	Node 65	Node 66	Node 67	Node 68	Node 69	Node 70	Node 71	Node 72	Node 73	Node 74	Node 75	Node 76	Node 77	Node 78	N
0.000	2.000	4.000	6.000	8.000	9.500	11.000	11.500	12.000	14.250	16.500	18.750	21.000	22.417	23.833	26.666	29.500	32.333
18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	18.000	1

Continuous Elements Output Data

FRAME MAC file: 3(23/23) EMBANK.

Last modified at 22:12:50 on Thu, Mar 25, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

62	0.020	-0.131	-0.000
63	0.020	-0.145	-0.001
64	0.020	-0.148	0.000
65	0.019	-0.129	0.001
66	0.019	-0.098	0.001
67	0.019	-0.077	0.001
68	0.019	-0.058	0.001
88	0.019	-0.053	0.001
69	0.019	-0.047	0.001
70	0.019	-0.028	0.001
71	0.019	-0.016	0.000
72	0.019	-0.010	0.000
73	0.019	-0.013	-0.000
87	0.019	-0.019	-0.000
74	0.019	-0.024	-0.000
75	0.018	-0.042	-0.001
76	0.018	-0.066	-0.001
77	0.018	-0.088	-0.001
78	0.018	-0.109	-0.001
79	0.018	-0.121	-0.001
80	0.018	-0.133	-0.001
81	0.018	-0.150	-0.001
82	0.018	-0.165	-0.001
83	0.018	-0.174	-0.000
84	0.018	-0.178	-0.000
85	0.017	-0.176	0.000
86	0.017	-0.171	0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
62,63	0.000	4550.000	1516.667	0.000	4550.000	-1516.667
63,64	0.000	4550.000	1516.667	0.000	4550.000	-1516.667
64,65	0.000	4550.000	1516.667	0.000	4550.000	-1516.667
65,66	0.000	4550.000	1516.667	0.000	4550.000	-1516.667
66,67	0.000	3570.000	892.500	0.000	3570.000	-892.500
67,68	0.000	3570.000	892.500	0.000	3570.000	-892.500
68,88	0.000	1229.375	102.448	0.000	1229.375	-102.448
88,69	0.000	1229.375	102.448	0.000	1229.375	-102.448
69,70	0.000	5355.000	2008.125	0.000	5355.000	-2008.125
70,71	0.000	5355.000	2008.125	0.000	5355.000	-2008.125
71,72	0.000	5355.000	2008.125	0.000	5355.000	-2008.125
72,73	0.000	5355.000	2008.125	0.000	5355.000	-2008.125
73,87	0.000	3817.737	901.368	0.000	3817.737	-901.368
87,74	0.000	3817.737	901.368	0.000	3817.737	-901.368
74,75	0.000	6743.016	3184.052	0.000	6729.128	-3184.030
75,76	0.000	6743.016	3184.052	0.000	6729.128	-3184.030
76,77	0.000	6743.016	3184.052	0.000	6729.128	-3184.030
77,78	0.000	6743.016	3184.052	0.000	6729.128	-3184.030
78,79	0.000	4042.500	1010.625	0.000	4042.500	-1010.625
79,80	0.000	4042.500	1010.625	0.000	4042.500	-1010.625
80,81	0.000	4859.167	1653.466	0.000	4859.167	-1653.466
81,82	0.000	4859.167	1653.466	0.000	4859.167	-1653.466
82,83	0.000	4859.167	1653.466	0.000	4859.167	-1653.466
83,84	0.000	4859.167	1653.466	0.000	4859.167	-1653.466
84,85	0.000	4859.167	1653.466	0.000	4859.167	-1653.466
85,86	0.000	4859.167	1653.466	0.000	4859.167	-1653.466

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
62,63	3748.931	18538.321	17595.626	-3748.931	-9438.321	10381.016
63,64	3748.931	9438.321	-10381.016	-3748.931	-338.321	20157.657
64,65	3748.931	338.321	-20157.657	-3748.931	8761.679	11734.299
65,66	3748.931	-8761.679	-11734.299	-3748.931	17861.679	-14889.060
66,67	3748.931	-17861.679	14889.060	-3748.931	25001.679	-47036.579
67,68	3748.931	-25001.679	47036.579	-3748.931	32141.679	-89894.098
68,88	3748.931	-32141.679	89894.098	-3748.931	34600.429	-106579.625
88,69	3537.861	21475.757	105252.120	-3537.861	-19017.007	-95128.929
69,70	3537.861	19017.007	95128.929	-3537.861	-8307.007	-64389.414
70,71	3537.861	8307.007	64389.414	-3537.861	2402.993	-57747.399
71,72	3537.861	-2402.993	57747.399	-3537.861	13112.993	-75202.885
72,73	3537.861	-13112.993	75202.885	-3537.861	23822.993	-116755.870
73,87	3537.861	-23822.993	116755.870	-3537.861	31458.467	-155911.728
87,74	3569.963	41187.612	157363.660	-3569.963	-33552.138	-104425.496
74,75	3569.963	33552.138	104425.496	-3569.963	-20079.994	-28469.870
75,76	3569.963	20079.994	28469.870	-3569.963	-6607.850	9316.477
76,77	3569.963	6607.850	-9316.477	-3569.963	6864.294	8933.546
77,78	3569.963	-6864.294	-8933.546	-3569.963	20336.438	-29618.663
78,79	3569.963	-20336.438	29618.663	-3569.963	28421.438	-66187.071
79,80	5165.219	37984.970	75640.883	-5165.219	-29899.970	-24727.178
80,81	5165.219	29899.970	24727.178	-5165.219	-20181.637	26397.796
81,82	5165.219	20181.637	-26397.796	-5165.219	-10463.303	57681.172
82,83	5165.219	10463.303	-57681.172	-5165.219	-744.970	69122.951
83,84	5165.219	744.970	-69122.951	-5165.219	8973.363	60723.133
84,85	5165.219	-8973.363	-60723.133	-5165.219	18691.697	32481.717
85,86	5165.219	-18691.697	-32481.717	-5165.219	28410.030	-15601.295

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
62,63	0.020	-0.131	-0.000	0.020	-0.145	-0.001
63,64	0.020	-0.145	-0.001	0.020	-0.148	0.000
64,65	0.020	-0.148	0.000	0.019	-0.129	0.001
65,66	0.019	-0.129	0.001	0.019	-0.098	0.001
66,67	0.019	-0.098	0.001	0.019	-0.077	0.001
67,68	0.019	-0.077	0.001	0.019	-0.058	0.001
68,88	0.019	-0.058	0.001	0.019	-0.053	0.001
88,69	0.019	-0.053	0.001	0.019	-0.047	0.001
69,70	0.019	-0.047	0.001	0.019	-0.028	0.001
70,71	0.019	-0.028	0.001	0.019	-0.016	0.000
71,72	0.019	-0.016	0.000	0.019	-0.010	0.000
72,73	0.019	-0.010	0.000	0.019	-0.013	-0.000
73,87	0.019	-0.013	-0.000	0.019	-0.019	-0.000
87,74	0.019	-0.019	-0.000	0.019	-0.024	-0.000
74,75	0.019	-0.024	-0.000	0.018	-0.042	-0.001
75,76	0.018	-0.042	-0.001	0.018	-0.066	-0.001
76,77	0.018	-0.066	-0.001	0.018	-0.088	-0.001
77,78	0.018	-0.088	-0.001	0.018	-0.109	-0.001
78,79	0.018	-0.109	-0.001	0.018	-0.121	-0.001
79,80	0.018	-0.121	-0.001	0.018	-0.133	-0.001
80,81	0.018	-0.133	-0.001	0.018	-0.150	-0.001
81,82	0.018	-0.150	-0.001	0.018	-0.165	-0.001
82,83	0.018	-0.165	-0.001	0.018	-0.174	-0.000
83,84	0.018	-0.174	-0.000	0.018	-0.178	-0.000
84,85	0.018	-0.178	-0.000	0.017	-0.176	0.000
85,86	0.017	-0.176	0.000	0.017	-0.171	0.000

Maximum deformations:

No nodes moved to the left.
Node 62 moved 0.020 inch to the right.
Node 84 moved 0.178 inch downwards.
No nodes moved upwards.
Node 76 rotated 0.001 radian clockwise.
Node 65 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
62,63	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
63,64	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
64,65	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
65,66	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
66,67	0.000	-3748.931	-3748.931	0.000	-13.017	-13.017
67,68	0.000	-3748.931	-3748.931	0.000	-13.017	-13.017
68,88	0.000	-3748.931	-3748.931	0.000	-9.467	-9.467
88,69	0.000	-3537.861	-3537.861	0.000	-8.934	-8.934
69,70	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
70,71	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
71,72	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
72,73	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
73,87	0.000	-3537.861	-3537.861	0.000	-4.914	-4.914
87,74	0.000	-3569.963	-3569.963	0.000	-4.958	-4.958
74,75	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
75,76	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
76,77	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
77,78	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
78,79	0.000	-3569.963	-3569.963	0.000	-4.958	-4.958
79,80	0.000	-5165.219	-5165.219	0.000	-7.174	-7.174
80,81	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
81,82	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
82,83	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
83,84	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
84,85	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
85,86	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
62,63	18538.321	0.000	18538.321	128.738	0.000	128.738
63,64	9438.321	0.000	9438.321	65.544	0.000	65.544
64,65	338.321	-8761.679	-8761.679	2.349	-60.845	-60.845
65,66	0.000	-17861.679	-17861.679	0.000	-124.039	-124.039
66,67	0.000	-25001.679	-25001.679	0.000	-86.811	-86.811
67,68	0.000	-32141.679	-32141.679	0.000	-111.603	-111.603
68,88	0.000	-34600.429	-34600.429	0.000	-87.375	-87.375
88,69	21475.757	0.000	21475.757	54.232	0.000	54.232
69,70	19017.007	0.000	19017.007	66.031	0.000	66.031
70,71	8307.007	-2402.993	8307.007	28.844	-8.344	28.844
71,72	0.000	-13112.993	-13112.993	0.000	-45.531	-45.531
72,73	0.000	-23822.993	-23822.993	0.000	-82.719	-82.719
73,87	0.000	-31458.467	-31458.467	0.000	-43.692	-43.692
87,74	41187.612	0.000	41187.612	57.205	0.000	57.205
74,75	33552.138	0.000	33552.138	116.500	0.000	116.500
75,76	20079.994	0.000	20079.994	69.722	0.000	69.722
76,77	6607.850	-6864.294	-6864.294	22.944	-23.834	-23.834
77,78	0.000	-20336.438	-20336.438	0.000	-70.613	-70.613
78,79	0.000	-28421.438	-28421.438	0.000	-39.474	-39.474
79,80	37984.970	0.000	37984.970	52.757	0.000	52.757
80,81	29899.970	0.000	29899.970	103.819	0.000	103.819
81,82	20181.637	0.000	20181.637	70.075	0.000	70.075
82,83	10463.303	0.000	10463.303	36.331	0.000	36.331
83,84	744.970	-8973.363	-8973.363	2.587	-31.158	-31.158
84,85	0.000	-18691.697	-18691.697	0.000	-64.902	-64.902
85,86	0.000	-28410.030	-28410.030	0.000	-98.646	-98.646

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
62,63	10381.016	-17595.626	-17595.626	432.542	-733.151	-733.151
63,64	20157.657	0.000	20157.657	839.902	0.000	839.902
64,65	20170.235	0.000	20170.235	840.426	0.000	840.426
65,66	11734.299	-14889.060	-14889.060	488.929	-620.377	-620.377

66,67	0.000	-47036.579	-47036.579	0.000	-419.969	-419.969
67,68	0.000	-89894.098	-89894.098	0.000	-802.626	-802.626
68,88	0.000	-106579.625	-106579.625	0.000	-433.838	-433.838
88,69	0.000	-105252.120	-105252.120	0.000	-428.435	-428.435
69,70	0.000	-95128.929	-95128.929	0.000	-849.365	-849.365
70,71	0.000	-64389.414	-64389.414	0.000	-574.905	-574.905
71,72	0.000	-75202.885	-75202.885	0.000	-671.454	-671.454
72,73	0.000	-116755.870	-116755.870	0.000	-1042.463	-1042.463
73,87	0.000	-155911.728	-155911.728	0.000	-163.159	-163.159
87,74	0.000	-157363.660	-157363.660	0.000	-164.678	-164.678
74,75	0.000	-104425.496	-104425.496	0.000	-932.370	-932.370
75,76	9316.477	-28469.870	-28469.870	83.183	-254.195	-254.195
76,77	13902.998	0.000	13902.998	124.134	0.000	124.134
77,78	8933.546	-29618.663	-29618.663	79.764	-264.452	-264.452
78,79	0.000	-66187.071	-66187.071	0.000	-69.264	-69.264
79,80	0.000	-75640.883	-75640.883	0.000	-79.157	-79.157
80,81	26397.796	-24727.178	26397.796	235.695	-220.778	235.695
81,82	57681.172	0.000	57681.172	515.010	0.000	515.010
82,83	69122.951	0.000	69122.951	617.169	0.000	617.169
83,84	69181.247	0.000	69181.247	617.690	0.000	617.690
84,85	60723.133	0.000	60723.133	542.171	0.000	542.171
85,86	32481.717	-15601.295	32481.717	290.015	-139.297	290.015

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
62,63	0.000	-0.145	-0.145
63,64	0.000	-0.150	-0.150
64,65	0.000	-0.148	-0.148
65,66	0.000	-0.129	-0.129
66,67	0.000	-0.098	-0.098
67,68	0.000	-0.077	-0.077
68,88	0.000	-0.058	-0.058
88,69	0.000	-0.053	-0.053
69,70	0.000	-0.047	-0.047
70,71	0.000	-0.028	-0.028
71,72	0.000	-0.016	-0.016
72,73	0.000	-0.013	-0.013
73,87	0.000	-0.019	-0.019
87,74	0.000	-0.024	-0.024
74,75	0.000	-0.042	-0.042
75,76	0.000	-0.066	-0.066
76,77	0.000	-0.088	-0.088
77,78	0.000	-0.109	-0.109
78,79	0.000	-0.121	-0.121
79,80	0.000	-0.133	-0.133
80,81	0.000	-0.150	-0.150
81,82	0.000	-0.165	-0.165
82,83	0.000	-0.174	-0.174
83,84	0.000	-0.178	-0.178
84,85	0.000	-0.178	-0.178
85,86	0.000	-0.176	-0.176

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
2.000	-0.001	-0.145
4.000	0.000	-0.148
6.000	0.001	-0.129
8.000	0.001	-0.098
9.500	0.001	-0.077
11.000	0.001	-0.058
11.500	0.001	-0.053
12.000	0.001	-0.047
14.250	0.001	-0.028
16.500	0.000	-0.016
18.750	0.000	-0.010
21.000	-0.000	-0.013
22.417	-0.000	-0.019
23.833	-0.000	-0.024

26.666	-0.001	-0.042
29.500	-0.001	-0.066
32.333	-0.001	-0.088
35.166	-0.001	-0.109
36.666	-0.001	-0.121
38.166	-0.001	-0.133
40.208	-0.001	-0.150
42.249	-0.001	-0.165
44.291	-0.000	-0.174
46.333	-0.000	-0.178
48.374	0.000	-0.176

At evenly-spaced intervals:

0.000	-0.000	-0.131
5.042	0.001	-0.141
10.083	0.001	-0.069
15.125	0.000	-0.023
20.166	-0.000	-0.011
25.208	-0.001	-0.032
30.250	-0.001	-0.072
35.291	-0.001	-0.110
40.333	-0.001	-0.151
45.374	-0.000	-0.177
50.416	0.000	-0.171

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993

Node 27	Node 28	Node 29	Node 30	Node 31	Node 32	Node 33	Node 34	Node 35	Node 36	Node 37	Node 38	Node 39	Node 40	Node 41	Node 42	Node 43	Node 44	Node 45 N
0.000	2.000	4.000	6.000	8.000	9.500	11.000	11.500	12.000	14.250	16.500	18.750	21.000	22.417	23.833	26.666	29.500	32.333	35.166 3
8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000

Continuous Elements Output Data

FRAME MAC file: 3(23/23) EMBANK.

Last modified at 22:12:50 on Thu, Mar 25, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
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27	0.000	-0.129	0.000
28	-0.000	-0.104	0.002
29	-0.000	-0.064	0.002
30	-0.000	-0.031	0.001
31	-0.000	-0.016	0.000
32	-0.000	-0.012	0.000
33	-0.000	-0.010	0.000
34	-0.000	-0.009	0.000
35	-0.000	-0.009	0.000
36	-0.000	-0.008	0.000
37	0.000	-0.009	-0.000
38	0.000	-0.013	-0.000
39	0.000	-0.020	-0.000
40	0.000	-0.026	-0.000
41	0.000	-0.031	-0.000
42	0.000	-0.045	-0.000
43	0.000	-0.063	-0.001
44	0.000	-0.083	-0.001
45	0.000	-0.099	-0.000
46	0.000	-0.104	-0.000
47	0.000	-0.110	-0.000
48	0.000	-0.115	-0.000
49	0.000	-0.119	-0.000
50	0.000	-0.125	-0.000
51	0.000	-0.136	-0.001
52	-0.000	-0.150	-0.001
53	-0.000	-0.166	-0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
27,28	0.000	210.000	70.000	0.000	210.000	-70.000
28,29	0.000	210.000	70.000	0.000	210.000	-70.000
29,30	0.000	210.000	70.000	0.000	210.000	-70.000
30,31	0.000	210.000	70.000	0.000	210.000	-70.000
31,32	0.000	315.000	78.750	0.000	315.000	-78.750
32,33	0.000	315.000	78.750	0.000	315.000	-78.750
33,34	0.000	144.375	12.031	0.000	144.375	-12.031
34,35	0.000	144.375	12.031	0.000	144.375	-12.031
35,36	0.000	472.500	177.188	0.000	472.500	-177.188
36,37	0.000	472.500	177.188	0.000	472.500	-177.188
37,38	0.000	472.500	177.188	0.000	472.500	-177.188
38,39	0.000	472.500	177.188	0.000	472.500	-177.188
39,40	0.000	743.663	175.566	0.000	743.663	-175.566
40,41	0.000	743.663	175.566	0.000	743.663	-175.566
41,42	0.000	594.983	280.956	0.000	594.983	-280.956
42,43	0.000	594.983	280.956	0.000	594.983	-280.956
43,44	0.000	594.983	280.956	0.000	594.983	-280.956
44,45	0.000	594.982	280.956	0.000	594.982	-280.956
45,46	0.000	787.500	196.875	0.000	787.500	-196.875
46,47	0.000	787.500	196.875	0.000	787.500	-196.875
47,48	0.000	428.750	145.894	0.000	428.750	-145.894
48,49	0.000	428.750	145.894	0.000	428.750	-145.894
49,50	0.000	428.750	145.894	0.000	428.750	-145.894
50,51	0.000	428.750	145.894	0.000	428.750	-145.894
51,52	0.000	428.750	145.894	0.000	428.750	-145.894
52,53	0.000	428.750	145.894	0.000	428.750	-145.894

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
27,28	8013.326	-17185.466	-44140.371	-8013.326	17605.466	9349.439
28,29	2470.282	-8653.023	-9715.711	-2470.282	9073.023	-8010.336
29,30	-1818.347	-3569.401	7692.333	1818.347	3989.401	-15251.136
30,31	-3682.336	-1301.038	15083.618	3682.336	1721.038	-18105.694
31,32	-3184.185	-1038.109	18117.363	3184.185	1668.109	-20147.026
32,33	-2330.085	-51.436	20161.989	2330.085	681.436	-20711.644
33,34	-2330.085	-681.436	20711.644	2330.085	970.186	-21124.550
34,35	-2196.347	-560.199	21125.858	2196.347	848.949	-21478.145
35,36	-2095.729	-415.657	21477.822	2095.729	1360.657	-23476.176
36,37	-2093.157	-621.664	23475.995	2093.157	1566.664	-25937.864
37,38	-2225.286	-707.803	25941.687	2225.286	1652.803	-28597.368
38,39	-2471.994	-401.009	28607.038	2471.994	1346.009	-30572.433
39,40	-2668.633	-373.801	30579.980	2668.633	1861.126	-32162.867
40,41	-790.488	1275.780	32281.930	790.488	211.545	-31528.185
41,42	-1227.824	1692.943	31530.159	1227.824	-502.978	-28419.362
42,43	-3902.307	6012.556	28366.083	3902.307	-4822.591	-13016.743
43,44	894.973	12596.990	13290.133	-894.973	-11407.025	20714.555
44,45	3803.384	21611.464	-20523.023	-3803.384	-20421.499	80067.971
45,46	3130.844	26478.523	-80077.186	-3130.844	-24903.523	118613.720
46,47	515.467	-30822.277	-112121.111	-515.467	32397.277	64706.446
47,48	143.549	-27560.630	-64709.245	-143.549	28418.130	7564.261
48,49	4387.005	-18286.818	-7372.065	-4387.005	19144.318	-30838.886
49,50	-1444.006	-8650.885	30611.582	1444.006	9508.385	-49149.169
50,51	-834.065	1533.643	49204.837	834.065	-676.143	-46949.014
51,52	7465.829	12683.515	47342.596	-7465.829	-11826.015	-22322.451
52,53	4577.724	25085.618	22256.815	-4577.724	-24228.118	28084.290

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
27,28	0.000	-0.129	0.000	-0.000	-0.104	0.002
28,29	-0.000	-0.104	0.002	-0.000	-0.064	0.002
29,30	-0.000	-0.064	0.002	-0.000	-0.031	0.001
30,31	-0.000	-0.031	0.001	-0.000	-0.016	0.000
31,32	-0.000	-0.016	0.000	-0.000	-0.012	0.000
32,33	-0.000	-0.012	0.000	-0.000	-0.010	0.000
33,34	-0.000	-0.010	0.000	-0.000	-0.009	0.000
34,35	-0.000	-0.009	0.000	-0.000	-0.009	0.000
35,36	-0.000	-0.009	0.000	-0.000	-0.008	0.000
36,37	-0.000	-0.008	0.000	0.000	-0.009	-0.000
37,38	0.000	-0.009	-0.000	0.000	-0.013	-0.000
38,39	0.000	-0.013	-0.000	0.000	-0.020	-0.000
39,40	0.000	-0.020	-0.000	0.000	-0.026	-0.000
40,41	0.000	-0.026	-0.000	0.000	-0.031	-0.000
41,42	0.000	-0.031	-0.000	0.000	-0.045	-0.000
42,43	0.000	-0.045	-0.000	0.000	-0.063	-0.001
43,44	0.000	-0.063	-0.001	0.000	-0.083	-0.001
44,45	0.000	-0.083	-0.001	0.000	-0.099	-0.000
45,46	0.000	-0.099	-0.000	0.000	-0.104	-0.000
46,47	0.000	-0.104	-0.000	0.000	-0.110	-0.000
47,48	0.000	-0.110	-0.000	0.000	-0.115	-0.000
48,49	0.000	-0.115	-0.000	0.000	-0.119	-0.000
49,50	0.000	-0.119	-0.000	0.000	-0.125	-0.000
50,51	0.000	-0.125	-0.000	0.000	-0.136	-0.001
51,52	0.000	-0.136	-0.001	-0.000	-0.150	-0.001
52,53	-0.000	-0.150	-0.001	-0.000	-0.166	-0.001

Maximum deformations:

Node 29 moved 0.000 inch to the left.
Node 43 moved 0.000 inch to the right.
Node 53 moved 0.166 inch downwards.
No nodes moved upwards.
Node 52 rotated 0.001 radian clockwise.
Node 29 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
27,28	0.000	-8013.326	-8013.326	0.000	-55.648	-55.648
28,29	0.000	-2470.282	-2470.282	0.000	-17.155	-17.155
29,30	1818.347	0.000	1818.347	12.627	0.000	12.627
30,31	3682.336	0.000	3682.336	25.572	0.000	25.572
31,32	3184.185	0.000	3184.185	11.056	0.000	11.056
32,33	2330.085	0.000	2330.085	8.091	0.000	8.091
33,34	2330.085	0.000	2330.085	5.884	0.000	5.884
34,35	2196.347	0.000	2196.347	5.546	0.000	5.546
35,36	2095.729	0.000	2095.729	7.277	0.000	7.277
36,37	2093.157	0.000	2093.157	7.268	0.000	7.268
37,38	2225.286	0.000	2225.286	7.727	0.000	7.727
38,39	2471.994	0.000	2471.994	8.583	0.000	8.583
39,40	2668.633	0.000	2668.633	3.706	0.000	3.706
40,41	790.488	0.000	790.488	1.098	0.000	1.098
41,42	1227.824	0.000	1227.824	4.263	0.000	4.263
42,43	3902.307	0.000	3902.307	13.550	0.000	13.550
43,44	0.000	-894.973	-894.973	0.000	-3.108	-3.108
44,45	0.000	-3803.384	-3803.384	0.000	-13.206	-13.206
45,46	0.000	-3130.844	-3130.844	0.000	-4.348	-4.348
46,47	0.000	-515.467	-515.467	0.000	-0.716	-0.716
47,48	0.000	-143.549	-143.549	0.000	-0.498	-0.498
48,49	0.000	-4387.005	-4387.005	0.000	-15.233	-15.233
49,50	1444.006	0.000	1444.006	5.014	0.000	5.014
50,51	834.065	0.000	834.065	2.896	0.000	2.896
51,52	0.000	-7465.829	-7465.829	0.000	-25.923	-25.923
52,53	0.000	-4577.724	-4577.724	0.000	-15.895	-15.895

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
27,28	0.000	-17605.466	-17605.466	0.000	-122.260	-122.260
28,29	0.000	-9073.023	-9073.023	0.000	-63.007	-63.007
29,30	0.000	-3989.401	-3989.401	0.000	-27.704	-27.704
30,31	0.000	-1721.038	-1721.038	0.000	-11.952	-11.952
31,32	0.000	-1668.109	-1668.109	0.000	-5.792	-5.792
32,33	0.000	-681.436	-681.436	0.000	-2.366	-2.366
33,34	0.000	-970.186	-970.186	0.000	-2.450	-2.450
34,35	0.000	-848.949	-848.949	0.000	-2.144	-2.144
35,36	0.000	-1360.657	-1360.657	0.000	-4.725	-4.725
36,37	0.000	-1566.664	-1566.664	0.000	-5.440	-5.440
37,38	0.000	-1652.803	-1652.803	0.000	-5.739	-5.739
38,39	0.000	-1346.009	-1346.009	0.000	-4.674	-4.674
39,40	0.000	-1861.126	-1861.126	0.000	-2.585	-2.585
40,41	1275.780	-211.545	1275.780	1.772	-0.294	1.772
41,42	1692.943	0.000	1692.943	5.878	0.000	5.878
42,43	6012.556	0.000	6012.556	20.877	0.000	20.877
43,44	12596.990	0.000	12596.990	43.740	0.000	43.740
44,45	21611.464	0.000	21611.464	75.040	0.000	75.040
45,46	26478.523	0.000	26478.523	36.776	0.000	36.776
46,47	0.000	-32397.277	-32397.277	0.000	-44.996	-44.996
47,48	0.000	-28418.130	-28418.130	0.000	-98.674	-98.674
48,49	0.000	-19144.318	-19144.318	0.000	-66.473	-66.473
49,50	0.000	-9508.385	-9508.385	0.000	-33.015	-33.015
50,51	1533.643	0.000	1533.643	5.325	0.000	5.325
51,52	12683.515	0.000	12683.515	44.040	0.000	44.040
52,53	25085.618	0.000	25085.618	87.103	0.000	87.103

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
27,28	44140.371	0.000	44140.371	1839.182	0.000	1839.182
28,29	9715.711	-8010.336	9715.711	404.821	-333.764	404.821
29,30	0.000	-15251.136	-15251.136	0.000	-635.464	-635.464
30,31	0.000	-18105.694	-18105.694	0.000	-754.404	-754.404

31,32	0.000	-20147.026	-20147.026	0.000	-179.884	-179.884
32,33	0.000	-20711.644	-20711.644	0.000	-184.925	-184.925
33,34	0.000	-21124.550	-21124.550	0.000	-85.989	-85.989
34,35	0.000	-21478.145	-21478.145	0.000	-87.428	-87.428
35,36	0.000	-23476.176	-23476.176	0.000	-209.609	-209.609
36,37	0.000	-25937.864	-25937.864	0.000	-231.588	-231.588
37,38	0.000	-28597.368	-28597.368	0.000	-255.334	-255.334
38,39	0.000	-30572.433	-30572.433	0.000	-272.968	-272.968
39,40	0.000	-32162.867	-32162.867	0.000	-33.658	-33.658
40,41	0.000	-32281.930	-32281.930	0.000	-33.782	-33.782
41,42	0.000	-31530.159	-31530.159	0.000	-281.519	-281.519
42,43	0.000	-28366.083	-28366.083	0.000	-253.269	-253.269
43,44	20714.555	-13290.133	20714.555	184.951	-118.662	184.951
44,45	80067.971	0.000	80067.971	714.893	0.000	714.893
45,46	118613.720	0.000	118613.720	124.127	0.000	124.127
46,47	112121.111	0.000	112121.111	117.333	0.000	117.333
47,48	64709.245	0.000	64709.245	577.761	0.000	577.761
48,49	7372.065	-30838.886	-30838.886	65.822	-275.347	-275.347
49,50	0.000	-49149.169	-49149.169	0.000	-438.832	-438.832
50,51	0.000	-49204.837	-49204.837	0.000	-439.329	-439.329
51,52	0.000	-47342.596	-47342.596	0.000	-422.702	-422.702
52,53	28084.290	-22256.815	28084.290	250.753	-198.722	250.753

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
27,28	0.000	-0.129	-0.129
28,29	0.000	-0.104	-0.104
29,30	0.000	-0.064	-0.064
30,31	0.000	-0.031	-0.031
31,32	0.000	-0.016	-0.016
32,33	0.000	-0.012	-0.012
33,34	0.000	-0.010	-0.010
34,35	0.000	-0.009	-0.009
35,36	0.000	-0.009	-0.009
36,37	0.000	-0.009	-0.009
37,38	0.000	-0.013	-0.013
38,39	0.000	-0.020	-0.020
39,40	0.000	-0.026	-0.026
40,41	0.000	-0.031	-0.031
41,42	0.000	-0.045	-0.045
42,43	0.000	-0.063	-0.063
43,44	0.000	-0.083	-0.083
44,45	0.000	-0.099	-0.099
45,46	0.000	-0.104	-0.104
46,47	0.000	-0.110	-0.110
47,48	0.000	-0.115	-0.115
48,49	0.000	-0.119	-0.119
49,50	0.000	-0.125	-0.125
50,51	0.000	-0.136	-0.136
51,52	0.000	-0.150	-0.150
52,53	0.000	-0.166	-0.166

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
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At the intermediate nodes:

2.000	0.002	-0.104
4.000	0.002	-0.064
6.000	0.001	-0.031
8.000	0.000	-0.016
9.500	0.000	-0.012
11.000	0.000	-0.010
11.500	0.000	-0.009
12.000	0.000	-0.009
14.250	0.000	-0.008
16.500	-0.000	-0.009
18.750	-0.000	-0.013
21.000	-0.000	-0.020
22.417	-0.000	-0.026
23.833	-0.000	-0.031

26.666	-0.000	-0.045
29.500	-0.001	-0.063
32.333	-0.001	-0.083
35.166	-0.000	-0.099
36.666	-0.000	-0.104
38.166	-0.000	-0.110
40.208	-0.000	-0.115
42.249	-0.000	-0.119
44.291	-0.000	-0.125
46.333	-0.001	-0.136
48.374	-0.001	-0.150

At evenly-spaced intervals:

0.000	0.000	-0.129
5.042	0.001	-0.045
10.083	0.000	-0.011
15.125	-0.000	-0.008
20.166	-0.000	-0.017
25.208	-0.000	-0.037
30.250	-0.001	-0.069
35.291	-0.000	-0.099
40.333	-0.000	-0.115
45.374	-0.000	-0.130
50.416	-0.001	-0.166

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993

Node 27
0.000
8.000

Node 54
0.000
10.000

Node 56
0.000
12.000

Node 58
0.000
14.000

Node 60
0.000
16.000

Node 62
0.000
18.000

Continuous Elements Output Data

FRAME MAC file: 3(23/23) EMBANK.

Last modified at 22:12:50 on Thu, Mar 25, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
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27	0.000	-0.129	0.000
54	-0.002	-0.129	-0.000
56	-0.000	-0.130	-0.000
58	0.004	-0.130	-0.000
60	0.011	-0.131	-0.000
62	0.020	-0.131	-0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
27,54	420.000	1279.600	426.533	420.000	1279.600	-426.533
54,56	420.000	1279.600	426.533	420.000	1279.600	-426.533
56,58	420.000	1279.600	426.533	420.000	1279.600	-426.533
58,60	420.000	1279.600	426.533	420.000	1279.600	-426.533
60,62	420.000	1279.600	426.533	420.000	1279.600	-426.533

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
27,54	22738.321	9047.069	44086.315	-21898.321	-6487.869	-28551.378
54,56	21898.321	6487.869	28551.378	-21058.321	-3928.669	-18134.840
56,58	21058.321	3928.669	18134.840	-20218.321	-1369.469	-12836.702
58,60	20218.321	1369.469	12836.702	-19378.321	1189.731	-12656.964
60,62	19378.321	-1189.731	12656.964	-18538.321	3748.931	-17595.626

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
27,54	-0.129	-0.000	0.000	-0.129	0.002	-0.000
54,56	-0.129	0.002	-0.000	-0.130	0.000	-0.000
56,58	-0.130	0.000	-0.000	-0.130	-0.004	-0.000
58,60	-0.130	-0.004	-0.000	-0.131	-0.011	-0.000
60,62	-0.131	-0.011	-0.000	-0.131	-0.020	-0.000

Maximum deformations:

Node 54 moved 0.002 inch to the left.
Node 62 moved 0.020 inch to the right.
Node 62 moved 0.131 inch downwards.
No nodes moved upwards.
Node 62 rotated 0.000 radian clockwise.
Node 27 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
27,54	0.000	-22738.321	-22738.321	0.000	-78.953	-78.953
54,56	0.000	-21898.321	-21898.321	0.000	-76.036	-76.036

56,58	0.000	-21058.321	-21058.321	0.000	-73.119	-73.119
58,60	0.000	-20218.321	-20218.321	0.000	-70.203	-70.203
60,62	0.000	-19378.321	-19378.321	0.000	-67.286	-67.286

Maximum shear and shear stress values:						
From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
27,54	9047.069	0.000	9047.069	31.413	0.000	31.413
54,56	6487.869	0.000	6487.869	22.527	0.000	22.527
56,58	3928.669	0.000	3928.669	13.641	0.000	13.641
58,60	1369.469	-1189.731	1369.469	4.755	-4.131	4.755
60,62	0.000	-3748.931	-3748.931	0.000	-13.017	-13.017

Maximum moment and bending stress values:						
From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
27,54	0.000	-44086.315	-44086.315	0.000	-459.232	-459.232
54,56	0.000	-28551.378	-28551.378	0.000	-297.410	-297.410
56,58	0.000	-18134.840	-18134.840	0.000	-188.905	-188.905
58,60	0.000	-12836.702	-12836.702	0.000	-133.716	-133.716
60,62	0.000	-17595.626	-17595.626	0.000	-183.288	-183.288

Maximum deflection values:						
From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
27,54	0.002	-0.000	0.002			
54,56	0.002	0.000	0.002			
56,58	0.000	-0.004	-0.004			
58,60	0.000	-0.011	-0.011			
60,62	0.000	-0.020	-0.020			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
At the intermediate nodes:						
2.000	-0.000	0.002				
4.000	-0.000	0.000				
6.000	-0.000	-0.004				
8.000	-0.000	-0.011				
At evenly-spaced intervals:						
0.000	0.000	-0.000				
1.000	0.000	0.002				
2.000	-0.000	0.002				
3.000	-0.000	0.002				
4.000	-0.000	0.000				
5.000	-0.000	-0.002				
6.000	-0.000	-0.004				
7.000	-0.000	-0.008				
8.000	-0.000	-0.011				
9.000	-0.000	-0.015				
10.000	-0.000	-0.020				

FRAME MAC file: 3(23/23) EMBANK; Last modified at 22:12:50 on Thu, Mar 25, 1993

Node 53
50.416
8.000

Node 55
50.416
10.000

Node 57
50.416
12.000

Node 59
50.416
14.000

Node 61
50.416
16.000

Node 88
50.416
18.000

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

20 Shear

Moment

Defl.

Distance 0.000

L/6 2.000

L/3

4.000

L/2

6.000

2L/3

3L/4

8.000

5L/6

10.000

ft

Continuous Elements Output Data

FRAME MAC file: 3(23/23) EMBANK.

Last modified at 22:12:50 on Thu, Mar 25, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
53	-0.000	-0.166	-0.001
55	0.011	-0.167	-0.000
57	0.016	-0.168	-0.000
59	0.019	-0.169	-0.000
61	0.020	-0.170	0.000
86	0.017	-0.171	0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
53,55	315.000	-1279.600	-426.533	315.000	-1279.600	426.533
55,57	315.000	-1279.600	-426.533	315.000	-1279.600	426.533
57,59	315.000	-1279.600	-426.533	315.000	-1279.600	426.533
59,61	315.000	-1279.600	-426.533	315.000	-1279.600	426.533
61,86	315.000	-1279.600	-426.533	315.000	-1279.600	426.533

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
53,55	31560.030	-7630.781	-27929.102	-30930.030	5071.581	15226.740
55,57	30930.030	-5071.581	-15226.740	-30300.030	2512.381	7642.779
57,59	30300.030	-2512.381	-7642.779	-29670.030	-46.819	5177.218
59,61	29670.030	46.819	-5177.218	-29040.030	-2606.019	7830.057
61,86	29040.030	2606.019	-7830.057	-28410.030	-5165.219	15601.295

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
53,55	-0.166	0.000	-0.001	-0.167	-0.011	-0.000
55,57	-0.167	-0.011	-0.000	-0.168	-0.016	-0.000
57,59	-0.168	-0.016	-0.000	-0.169	-0.019	-0.000
59,61	-0.169	-0.019	-0.000	-0.170	-0.020	0.000
61,86	-0.170	-0.020	0.000	-0.171	-0.017	0.000

Maximum deformations:

Node 53 moved 0.000 inch to the left.
Node 61 moved 0.020 inch to the right.
Node 86 moved 0.171 inch downwards.
No nodes moved upwards.
Node 53 rotated 0.001 radian clockwise.
Node 86 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
53,55	0.000	-31560.030	-31560.030	0.000	-146.111	-146.111
55,57	0.000	-30930.030	-30930.030	0.000	-143.195	-143.195

57,59	0.000	-30300.030	-30300.030	0.000	-140.278	-140.278
59,61	0.000	-29670.030	-29670.030	0.000	-137.361	-137.361
61,86	0.000	-29040.030	-29040.030	0.000	-134.445	-134.445

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
53,55	0.000	-7630.781	-7630.781	0.000	-35.328	-35.328
55,57	0.000	-5071.581	-5071.581	0.000	-23.480	-23.480
57,59	46.819	-2512.381	-2512.381	0.217	-11.631	-11.631
59,61	2606.019	0.000	2606.019	12.065	0.000	12.065
61,86	5165.219	0.000	5165.219	23.913	0.000	23.913

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
53,55	27929.102	0.000	27929.102	517.206	0.000	517.206
55,57	15226.740	0.000	15226.740	281.977	0.000	281.977
57,59	7642.779	0.000	7642.779	141.533	0.000	141.533
59,61	7830.057	0.000	7830.057	145.001	0.000	145.001
61,86	15601.295	0.000	15601.295	288.913	0.000	288.913

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
53,55	0.000	-0.011	-0.011
55,57	0.000	-0.016	-0.016
57,59	0.000	-0.019	-0.019
59,61	0.000	-0.020	-0.020
61,86	0.000	-0.020	-0.020

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
At the intermediate nodes:		
2.000	-0.000	-0.011
4.000	-0.000	-0.016
6.000	-0.000	-0.019
8.000	0.000	-0.020
At evenly-spaced intervals:		
0.000	-0.001	0.000
1.000	-0.000	-0.006
2.000	-0.000	-0.011
3.000	-0.000	-0.014
4.000	-0.000	-0.016
5.000	-0.000	-0.018
6.000	-0.000	-0.019
7.000	-0.000	-0.020
8.000	0.000	-0.020
9.000	0.000	-0.019
10.000	0.000	-0.017

Output Data

FRAME MAC file: 3(23/23) EMBANK.

Last modified at 22:12:50 on Thu, Mar 25, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,27	0.000	-5552.854	-5552.854	0.000	-38.561	-38.561
2,28	0.000	-8952.443	-8952.443	0.000	-31.085	-31.085
3,29	0.000	-5503.622	-5503.622	0.000	-19.110	-19.110
4,30	0.000	-2688.363	-2688.363	0.000	-9.335	-9.335
5,31	0.000	-682.929	-682.929	0.000	-4.743	-4.743
6,32	0.000	-1616.672	-1616.672	0.000	-3.742	-3.742
7,34	0.000	-409.987	-409.987	0.000	-2.847	-2.847
7,88	0.000	-56649.676	-56649.676	0.000	-1452.556	-1452.556
8,35	0.000	-433.292	-433.292	0.000	-2.675	-2.675
9,36	0.000	-738.993	-738.993	0.000	-2.281	-2.281
10,37	0.000	-858.862	-858.862	0.000	-2.651	-2.651
11,38	0.000	-1251.794	-1251.794	0.000	-3.864	-3.864
12,39	0.000	-972.207	-972.207	0.000	-6.001	-6.001
13,40	0.000	-3125.582	-3125.582	0.000	-7.661	-7.661
13,87	0.000	-74763.579	-74763.579	0.000	-519.192	-519.192
14,41	0.000	-1904.488	-1904.488	0.000	-9.336	-9.336
15,42	0.000	-5501.530	-5501.530	0.000	-13.484	-13.484
16,43	0.000	-7745.479	-7745.479	0.000	-18.984	-18.984
17,44	0.000	-10195.669	-10195.669	0.000	-24.989	-24.989
18,45	0.000	-6057.023	-6057.023	0.000	-29.691	-29.691
19,46	0.000	-12780.608	-12780.608	0.000	-31.325	-31.325
20,47	0.000	-4836.647	-4836.647	0.000	-32.902	-32.902
21,48	0.000	-10114.259	-10114.259	0.000	-34.402	-34.402
22,49	0.000	-10470.027	-10470.027	0.000	-35.612	-35.612
23,50	0.000	-11042.027	-11042.027	0.000	-37.558	-37.558
24,51	0.000	-11974.080	-11974.080	0.000	-40.728	-40.728
25,52	0.000	-13247.945	-13247.945	0.000	-45.061	-45.061
26,53	0.000	-7331.912	-7331.912	0.000	-49.877	-49.877
27,54	0.000	-22738.321	-22738.321	0.000	-78.953	-78.953
27,28	0.000	-8013.326	-8013.326	0.000	-55.648	-55.648
28,29	0.000	-2470.282	-2470.282	0.000	-17.155	-17.155
29,30	1818.347	0.000	1818.347	12.627	0.000	12.627
30,31	3682.336	0.000	3682.336	25.572	0.000	25.572
31,32	3184.185	0.000	3184.185	11.056	0.000	11.056
32,33	2330.085	0.000	2330.085	8.091	0.000	8.091
33,34	2330.085	0.000	2330.085	5.884	0.000	5.884
34,35	2196.347	0.000	2196.347	5.546	0.000	5.546
35,36	2095.729	0.000	2095.729	7.277	0.000	7.277
36,37	2093.157	0.000	2093.157	7.268	0.000	7.268
37,38	2225.286	0.000	2225.286	7.727	0.000	7.727
38,39	2471.994	0.000	2471.994	8.583	0.000	8.583
39,40	2668.633	0.000	2668.633	3.706	0.000	3.706
40,41	790.488	0.000	790.488	1.098	0.000	1.098
41,42	1227.824	0.000	1227.824	4.263	0.000	4.263
42,43	3902.307	0.000	3902.307	13.550	0.000	13.550
43,44	0.000	-894.973	-894.973	0.000	-3.108	-3.108
44,45	0.000	-3803.384	-3803.384	0.000	-13.206	-13.206
45,46	0.000	-3130.844	-3130.844	0.000	-4.348	-4.348
46,47	0.000	-515.467	-515.467	0.000	-0.716	-0.716
46,79	0.000	-68506.408	-68506.408	0.000	-475.739	-475.739
47,48	0.000	-143.549	-143.549	0.000	-0.498	-0.498
48,49	0.000	-4387.005	-4387.005	0.000	-15.233	-15.233
49,50	1444.006	0.000	1444.006	5.014	0.000	5.014
50,51	834.065	0.000	834.065	2.896	0.000	2.896
51,52	0.000	-7465.829	-7465.829	0.000	-25.923	-25.923
52,53	0.000	-4577.724	-4577.724	0.000	-15.895	-15.895
53,55	0.000	-31560.030	-31560.030	0.000	-146.111	-146.111
54,56	0.000	-21898.321	-21898.321	0.000	-76.036	-76.036
55,57	0.000	-30930.030	-30930.030	0.000	-143.195	-143.195
56,58	0.000	-21058.321	-21058.321	0.000	-73.119	-73.119
57,59	0.000	-30300.030	-30300.030	0.000	-140.278	-140.278
58,60	0.000	-20218.321	-20218.321	0.000	-70.203	-70.203
59,61	0.000	-29670.030	-29670.030	0.000	-137.361	-137.361
60,62	0.000	-19378.321	-19378.321	0.000	-67.286	-67.286

Soil Element

Age 1960

2000

61,86	0.000	-29040.030	-29040.030	0.000	-134.445	-134.445
62,63	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
63,64	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
64,65	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
65,66	0.000	-3748.931	-3748.931	0.000	-26.034	-26.034
66,67	0.000	-3748.931	-3748.931	0.000	-13.017	-13.017
67,68	0.000	-3748.931	-3748.931	0.000	-13.017	-13.017
68,88	0.000	-3748.931	-3748.931	0.000	-9.467	-9.467
69,70	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
69,88	0.000	-3537.861	-3537.861	0.000	-8.934	-8.934
70,71	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
71,72	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
72,73	0.000	-3537.861	-3537.861	0.000	-12.284	-12.284
73,87	0.000	-3537.861	-3537.861	0.000	-4.914	-4.914
74,75	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
74,87	0.000	-3569.963	-3569.963	0.000	-4.958	-4.958
75,76	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
76,77	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
77,78	0.000	-3569.963	-3569.963	0.000	-12.396	-12.396
78,79	0.000	-3569.963	-3569.963	0.000	-4.958	-4.958
79,80	0.000	-5165.219	-5165.219	0.000	-7.174	-7.174
80,81	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
81,82	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
82,83	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
83,84	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
84,85	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935
85,86	0.000	-5165.219	-5165.219	0.000	-17.935	-17.935

SECTION 3
23/23

EMBANKMENT

*** POSITIVE PROJECTION EMBANKMENT FIG 4.2

$$W_c = C_c w B_c^2$$

$$\frac{H}{B_c} = \frac{22}{52.85} = 0.41627$$

$$W_c = (0.45127)(115)(52.85)^2$$

$$W_c = 144952 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = 2743 \text{ lb/ft}^2$$

$$\sigma_v = 2743 \text{ lb/ft}^2, 808.6 \text{ psi}$$

$$\sigma_H = 808 \text{ lb/ft}^2, 5.61 \text{ psi}$$

$$C_c = \frac{e^{2K\mu \left(\frac{H}{B_c}\right)} - 1}{2K\mu}$$

$$C_c = \frac{e^{(2)(0.1914)(0.41627)} - 1}{(2)(0.1914)}$$

$$C_c = 0.45127$$

SECTION $\frac{3}{23/23}$ EMBANKMENT

10 S. SQUARE
100 S. SQUARE
25 110 200 311 12 5 SQUARE
MAXIMUM

$$W_c = C_c W B_c^2$$

$$\frac{H}{B_c} = \frac{30}{52.85} = 0.5676$$

$$W_c = (0.5102)(115)(52.85)^2$$

$$= 163871 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = 3100 \text{ lb/ft}^2 (21.53 \text{ psi})$$

$$\sigma_v = 3100 \text{ lb/ft}^2$$

$$\sigma_H = 914 \text{ lb/ft}^2$$

$$C_c = \frac{e^{-2K\mu\left(\frac{H}{B_c}\right)} - 1}{-2K\mu}$$

$$= \frac{e^{-(2)(0.1914)(0.5676)} - 1}{-2(0.1914)}$$

$$= 0.5102$$

SECTION $\frac{3}{32|32}$ EMBANKMENT

COLUMNS 2.

$$2 \times 18 \times 18 = \frac{648 \text{ m}^2}{21.5}$$

$$30.14 \text{ m}^2/\text{ft}$$

$$\frac{30}{13} \checkmark$$

$$\frac{17}{17} \times 11.5 = 1955 \text{ lb}$$

$$W_c = C_c W B_c^2$$

$$\frac{H}{B_c} = \frac{17}{52.85}$$

$$C_c = \frac{e^{2(0.1914)(0.321665)}}{2(0.1914)} - 1$$

$$C_c = 0.3423$$

$$W_c = 0.3423(11.5)(52.85)^2$$

$$W_c = 109952 \text{ lb}$$

$$W_c = 2080 \text{ lb/ft}^2 / 613 \text{ lb/ft}$$

$$C_c = \frac{-2(0.1914)\left(\frac{31}{52.85}\right)}{-2(0.1914)} - 1$$

$$W_c = 168755.8 \text{ lb/ft}$$

$$W_c = 3193 \text{ lb/ft}^2 / 941$$

$$C_c = 0.525$$

$$\left[\begin{array}{l} \sigma_v = 3193 \\ \sigma_h = 941 \end{array} \right]$$

TUNNEL SECTION		STRUCTURAL ASSESSMENT			
PAGE ____ OF ____		PRELIMINARY			
3 23/23		TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$		ROOF STRUCTURE	161,380 ft-lbs	157,363 ft-lbs	
		FLOOR STRUCTURE	121,745 ft-lbs	118,613 ft-lbs	
		LEFT INSIDE WALL	45,179 ft-lbs	44,086 ft-lbs	
		LEFT OUTSIDE WALL	32,332 ft-lbs	31,560 ft-lbs	
		RIGHT INSIDE WALL	42,258 ft-lbs	41,187 ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B_w d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_n = (0.85) 2\sqrt{f'_c} B_w d$		ROOF STRUCTURE	33,223 lbs	32,327 lbs	
		FLOOR STRUCTURE	9283 lbs	9047 lbs	
		LEFT WALL	7837 lbs	7630 lbs	
		RIGHT WALL	23,295 lbs	22,738 lbs	
		RIGHT WALL	28604 lbs	27929 lbs	
Axial Capacity Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1) $\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl}{32h} \right)^2 \right]$					

Loading Conditions

* BRIDGEMAN EFFECTS

$$\text{where } k = \frac{1 - \sin \theta}{1 + \sin \theta}$$

$$k = 0.294$$

Figure () Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-4(22/22)

TITLE: Structural Assessment of Tunnel Section 4(22/22) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 4(22/22) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Number of Pages Including Title Page 23

Figure() Section 4(22/22) Trench Excavation and Backfill Configuration

FRAME MAC file: 4(22/22) S/EMBank; Last modified at 22:28:07 on Thu, May 6, 1993

FRAME. MAC file: 4(22/22) S/EMBANK; Last modified at 22:28:07 on Thu, May 6, 1993

FRAME MAC file: 4(22/22) S/EMBANK; Last modified at 22:28:07 on Thu, May 6, 1993

Node 45	Node 46	Node 47	Node 48	Node 49	Node 50	Node 51	Node 52	Node 53	Node 54	Node 55
1.500	3.050	4.600	6.150	7.700	9.250	11.000	12.500	14.000	15.450	17.000
14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250	14.250
---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 4(22/22) S/EMBAK.

Last modified at 22:28:07 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
45	0.032	-0.125	-0.003
46	0.032	-0.181	-0.003
47	0.031	-0.241	-0.003
48	0.031	-0.290	-0.002
49	0.031	-0.320	-0.001
50	0.031	-0.325	0.001
51	0.031	-0.295	0.002
52	0.030	-0.255	0.002
53	0.030	-0.214	0.002
54	0.030	-0.171	0.003
55	0.030	-0.128	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
45,46	0.000	1655.710	427.725	0.000	1655.710	-427.725
46,47	0.000	1655.710	427.725	0.000	1655.710	-427.725
47,48	0.000	1655.710	427.725	0.000	1655.710	-427.725
48,49	0.000	1655.710	427.725	0.000	1655.710	-427.725
49,50	0.000	1655.710	427.725	0.000	1655.710	-427.725
50,51	0.000	1869.350	545.227	0.000	1869.350	-545.227
51,52	0.000	1917.300	479.325	0.000	1917.300	-479.325
52,53	0.000	1917.300	479.325	0.000	1917.300	-479.325
53,54	0.000	1548.890	374.315	0.000	1548.890	-374.315
54,55	0.000	1655.710	427.725	0.000	1655.710	-427.725

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
45,46	5106.080	17028.459	28314.655	-5106.080	-13717.039	-4486.894
46,47	5106.080	13717.039	4486.894	-5106.080	-10405.619	14208.166
47,48	5106.080	10405.619	-14208.166	-5106.080	-7094.199	27770.524
48,49	5106.080	7094.199	-27770.524	-5106.080	-3782.779	36200.182
49,50	5106.080	3782.779	-36200.182	-5106.080	-471.359	39497.139
50,51	5106.080	471.359	-39497.139	-5106.080	3267.341	37050.655
51,52	5106.080	-3267.341	-37050.655	-5106.080	7101.941	29273.693
52,53	5106.080	-7101.941	-29273.693	-5106.080	10936.541	15744.832
53,54	5106.080	-10936.541	-15744.832	-5106.080	14034.321	-2359.043
54,55	5106.080	-14034.321	2359.043	-5106.080	17345.741	-26678.592

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
45,46	0.032	-0.125	-0.003	0.032	-0.181	-0.003
46,47	0.032	-0.181	-0.003	0.031	-0.241	-0.003
47,48	0.031	-0.241	-0.003	0.031	-0.290	-0.002
48,49	0.031	-0.290	-0.002	0.031	-0.320	-0.001
49,50	0.031	-0.320	-0.001	0.031	-0.325	0.001
50,51	0.031	-0.325	0.001	0.031	-0.295	0.002
51,52	0.031	-0.295	0.002	0.030	-0.255	0.002
52,53	0.030	-0.255	0.002	0.030	-0.214	0.002
53,54	0.030	-0.214	0.002	0.030	-0.171	0.003
54,55	0.030	-0.171	0.003	0.030	-0.128	0.002

Maximum deformations:

No nodes moved to the left.

Node 45 moved 0.032 inch to the right.

Node 50 moved 0.325 inch downwards.
 No nodes moved upwards.
 Node 46 rotated 0.003 radian clockwise.
 Node 54 rotated 0.003 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative!):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
45,46	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
46,47	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
47,48	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
48,49	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
49,50	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
50,51	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
51,52	0.000	-5106.080	-5106.080	0.000	-11.820	-11.820
52,53	0.000	-5106.080	-5106.080	0.000	-11.820	-11.820
53,54	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
54,55	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
45,46	17028.459	0.000	17028.459	118.253	0.000	118.253
46,47	13717.039	0.000	13717.039	95.257	0.000	95.257
47,48	10405.619	0.000	10405.619	72.261	0.000	72.261
48,49	7094.199	0.000	7094.199	49.265	0.000	49.265
49,50	3782.779	0.000	3782.779	26.269	0.000	26.269
50,51	471.359	-3267.341	-3267.341	3.273	-22.690	-22.690
51,52	0.000	-7101.941	-7101.941	0.000	-16.440	-16.440
52,53	0.000	-10936.541	-10936.541	0.000	-25.316	-25.316
53,54	0.000	-14034.321	-14034.321	0.000	-97.461	-97.461
54,55	0.000	-17345.741	-17345.741	0.000	-120.457	-120.457

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
45,46	0.000	-28314.655	-28314.655	0.000	-1179.777	-1179.777
46,47	14208.166	-4486.894	14208.166	592.007	-186.954	592.007
47,48	27770.524	0.000	27770.524	1157.105	0.000	1157.105
48,49	36200.182	0.000	36200.182	1508.341	0.000	1508.341
49,50	39497.139	0.000	39497.139	1645.714	0.000	1645.714
50,51	39549.138	0.000	39549.138	1647.881	0.000	1647.881
51,52	37050.655	0.000	37050.655	122.522	0.000	122.522
52,53	29273.693	0.000	29273.693	96.805	0.000	96.805
53,54	15744.832	-2359.043	15744.832	656.035	-98.293	656.035
54,55	0.000	-26678.592	-26678.592	0.000	-1111.608	-1111.608

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
45,46	0.000	-0.181	-0.181
46,47	0.000	-0.241	-0.241
47,48	0.000	-0.290	-0.290
48,49	0.000	-0.320	-0.320
49,50	0.000	-0.326	-0.326
50,51	0.000	-0.325	-0.325
51,52	0.000	-0.295	-0.295

52,53	0.000	-0.255	-0.255
53,54	0.000	-0.214	-0.214
54,55	0.000	-0.171	-0.171

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.550	-0.003	-0.181
3.100	-0.003	-0.241
4.650	-0.002	-0.290
6.200	-0.001	-0.320
7.750	0.001	-0.325
9.500	0.002	-0.295
11.000	0.002	-0.255
12.500	0.002	-0.214
13.950	0.003	-0.171
At evenly-spaced intervals:		
0.000	-0.003	-0.125
1.550	-0.003	-0.181
3.100	-0.003	-0.241
4.650	-0.002	-0.290
6.200	-0.001	-0.320
7.750	0.001	-0.325
9.300	0.002	-0.300
10.850	0.002	-0.259
12.400	0.002	-0.217
13.950	0.003	-0.171
15.500	0.002	-0.128

FRAME MAC file: 4(22/22) S/EMBANK; Last modified at 22:28:07 on Thu, May 6, 1993

[illegible]

Continuous Elements Output Data

FRAME MAC file: 4(22/22) S/EMBAK.

Last modified at 22:28:07 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
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Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
-------------	-------------------------	-------------------------	--------------------------

14	-0.000	-0.142	0.001
15	-0.000	-0.118	0.001
16	-0.000	-0.092	0.001
17	-0.000	-0.068	0.001
18	-0.000	-0.049	0.001
19	-0.000	-0.037	0.000
20	0.000	-0.033	-0.000
21	0.000	-0.037	-0.000
22	0.000	-0.049	-0.001
23	0.000	-0.069	-0.001
24	0.000	-0.094	-0.001
25	0.000	-0.121	-0.001
26	0.000	-0.147	-0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	0.000	3386.250	846.562	0.000	3386.250	-846.562
15,16	0.000	244.125	63.066	0.000	244.125	-63.066
16,17	0.000	244.125	63.066	0.000	244.125	-63.066
17,18	0.000	244.125	63.066	0.000	244.125	-63.066
18,19	0.000	244.125	63.066	0.000	244.125	-63.066
19,20	0.000	244.125	63.066	0.000	244.125	-63.066
20,21	0.000	244.125	63.066	0.000	244.125	-63.066
21,22	0.000	244.125	63.066	0.000	244.125	-63.066
22,23	0.000	244.125	63.066	0.000	244.125	-63.066
23,24	0.000	244.125	63.066	0.000	244.125	-63.066
24,25	0.000	244.125	63.066	0.000	244.125	-63.066
25,26	0.000	3386.250	846.562	0.000	3386.250	-846.562

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,15	-755.286	3712.977	-66.648	755.286	3059.523	556.738
15,16	56.082	-15192.391	-14002.163	-56.082	15680.641	-9924.437
16,17	-2228.808	-9528.171	9736.487	2228.808	10016.421	-24883.546
17,18	-4112.786	-5480.551	24725.617	4112.786	5968.801	-33598.865
18,19	-5408.243	-2709.904	33487.921	5408.243	3198.154	-38066.665
19,20	-6071.338	-746.621	38009.636	6071.338	1234.871	-39545.292
20,21	-6101.035	946.316	39544.534	6101.035	-458.066	-38456.138
21,22	-5492.377	2928.523	38512.031	5492.377	-2440.273	-34351.214
22,23	-4236.039	5743.342	34462.165	4236.039	-5255.092	-25938.379
23,24	-2364.336	9872.588	26098.235	2364.336	-9384.338	-11174.117
24,25	-51.947	15672.985	11366.674	51.947	-15184.735	12548.058
25,26	-782.415	2945.445	-730.745	782.415	3827.055	69.538

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,15	-0.000	-0.142	0.001	-0.000	-0.118	0.001
15,16	-0.000	-0.118	0.001	-0.000	-0.092	0.001
16,17	-0.000	-0.092	0.001	-0.000	-0.068	0.001
17,18	-0.000	-0.068	0.001	-0.000	-0.049	0.001
18,19	-0.000	-0.049	0.001	-0.000	-0.037	0.000
19,20	-0.000	-0.037	0.000	0.000	-0.033	-0.000
20,21	0.000	-0.033	-0.000	0.000	-0.037	-0.000
21,22	0.000	-0.037	-0.000	0.000	-0.049	-0.001

22,23	0.000	-0.049	-0.001	0.000	-0.069	-0.001
23,24	0.000	-0.069	-0.001	0.000	-0.094	-0.001
24,25	0.000	-0.094	-0.001	0.000	-0.121	-0.001
25,26	0.000	-0.121	-0.001	0.000	-0.147	-0.001

Maximum deformations:

Node 14 moved 0.000 inch to the left.
Node 26 moved 0.000 inch to the right.
Node 26 moved 0.147 inch downwards.
No nodes moved upwards.
Node 24 rotated 0.001 radian clockwise.
Node 16 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
14,15	755.286	0.000	755.286	3.497	0.000	3.497
15,16	0.000	-56.082	-56.082	0.000	-0.260	-0.260
16,17	2228.808	0.000	2228.808	10.319	0.000	10.319
17,18	4112.786	0.000	4112.786	19.041	0.000	19.041
18,19	5408.243	0.000	5408.243	25.038	0.000	25.038
19,20	6071.338	0.000	6071.338	28.108	0.000	28.108
20,21	6101.035	0.000	6101.035	28.246	0.000	28.246
21,22	5492.377	0.000	5492.377	25.428	0.000	25.428
22,23	4236.039	0.000	4236.039	19.611	0.000	19.611
23,24	2364.336	0.000	2364.336	10.946	0.000	10.946
24,25	51.947	0.000	51.947	0.240	0.000	0.240
25,26	782.415	0.000	782.415	3.622	0.000	3.622

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
14,15	3712.977	-3059.523	3712.977	17.190	-14.164	17.190
15,16	0.000	-15680.641	-15680.641	0.000	-72.596	-72.596
16,17	0.000	-10016.421	-10016.421	0.000	-46.372	-46.372
17,18	0.000	-5968.801	-5968.801	0.000	-27.633	-27.633
18,19	0.000	-3198.154	-3198.154	0.000	-14.806	-14.806
19,20	0.000	-1234.871	-1234.871	0.000	-5.717	-5.717
20,21	946.316	0.000	946.316	4.381	0.000	4.381
21,22	2928.523	0.000	2928.523	13.558	0.000	13.558
22,23	5743.342	0.000	5743.342	26.590	0.000	26.590
23,24	9872.588	0.000	9872.588	45.706	0.000	45.706
24,25	15672.985	0.000	15672.985	72.560	0.000	72.560
25,26	2945.445	-3827.055	-3827.055	13.636	-17.718	-17.718

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
14,15	1593.358	0.000	1593.358	19.671	0.000	19.671
15,16	14002.163	-9924.437	14002.163	172.866	-122.524	172.866
16,17	0.000	-24883.546	-24883.546	0.000	-307.204	-307.204
17,18	0.000	-33598.865	-33598.865	0.000	-414.801	-414.801
18,19	0.000	-38066.665	-38066.665	0.000	-469.959	-469.959
19,20	0.000	-39545.292	-39545.292	0.000	-488.213	-488.213
20,21	0.000	-39544.534	-39544.534	0.000	-488.204	-488.204
21,22	0.000	-38512.031	-38512.031	0.000	-475.457	-475.457
22,23	0.000	-34462.165	-34462.165	0.000	-425.459	-425.459
23,24	0.000	-26098.235	-26098.235	0.000	-322.200	-322.200
24,25	12548.058	-11366.674	12548.058	154.914	-140.329	154.914
25,26	1691.503	0.000	1691.503	20.883	0.000	20.883

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
14,15	0.000	-0.142	-0.142
15,16	0.000	-0.118	-0.118
16,17	0.000	-0.092	-0.092
17,18	0.000	-0.068	-0.068
18,19	0.000	-0.049	-0.049
19,20	0.000	-0.037	-0.037
20,21	0.000	-0.037	-0.037
21,22	0.000	-0.049	-0.049
22,23	0.000	-0.069	-0.069
23,24	0.000	-0.094	-0.094
24,25	0.000	-0.121	-0.121
25,26	0.000	-0.147	-0.147

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.500	0.001	-0.118
3.050	0.001	-0.092
4.600	0.001	-0.068
6.150	0.001	-0.049
7.700	0.000	-0.037
9.250	-0.000	-0.033
10.800	-0.000	-0.037
12.350	-0.001	-0.049
13.900	-0.001	-0.069
15.450	-0.001	-0.094
17.000	-0.001	-0.121

At evenly-spaced intervals:

0.000	0.001	-0.142
1.850	0.001	-0.112
3.700	0.001	-0.081
5.550	0.001	-0.055
7.400	0.001	-0.038
9.250	-0.000	-0.033
11.100	-0.001	-0.039
12.950	-0.001	-0.056
14.800	-0.001	-0.083
16.650	-0.001	-0.115
18.500	-0.001	-0.147

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Node 15	Node 27	Node 29	Node 31	Node 33	Node 35	Node 37	Node 39	Node 41	Node 43	Node 45
1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500
0.000	1.425	2.850	4.275	5.700	7.125	8.550	9.975	11.400	12.825	14.250
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*****
Continuous Elements Output Data
*****
FRAME MAC file: 4(22/22) S/EMBAK.
Last modified at 22:28:07 on Thu, May 6, 1993.
All coord. and distances are in ft from the left (bot.) end of the element.
*****
Support reactions: (pos. force is to right or up; pos. moment is ccw.)
Node      Reaction      Reaction      Reaction
No.       lb (FX)       lb (FY)       lb-ft (MZ)
-----
Node deformations: (positive is to right, up, or counterclockwise.)
Node      Deflection      Deflection      Rotation
No.       inch (FX)       inch (FY)       radians (MZ)
-----
15        -0.000        -0.118        0.001
27        -0.020        -0.119        0.001
29        -0.034        -0.119        0.001
31        -0.043        -0.120        0.000
33        -0.049        -0.121        0.000
35        -0.051        -0.121        0.000
37        -0.050        -0.122        -0.000
39        -0.043        -0.123        -0.001
41        -0.029        -0.123        -0.001
43        -0.005        -0.124        -0.002
45        0.032        -0.125        -0.003
*****
Element fixed-end forces & moments: (local coordinate system)
From, To  FxL      FyL      MzL      FxR      FyR      MzR
Nodes     lb       lb       lb-ft    lb       lb       lb-ft
-----
15,27    149.625   404.985   96.184   149.625   404.985  -96.184
27,29    149.625   404.985   96.184   149.625   404.985  -96.184
29,31    149.625   404.985   96.184   149.625   404.985  -96.184
31,33    149.625   404.985   96.184   149.625   404.985  -96.184
33,35    149.625   404.985   96.184   149.625   404.985  -96.184
35,37    149.625   404.985   96.184   149.625   404.985  -96.184
37,39    149.625   404.985   96.184   149.625   404.985  -96.184
39,41    149.625   404.985   96.184   149.625   404.985  -96.184
41,43    149.625   404.985   96.184   149.625   404.985  -96.184
43,45    149.625   404.985   96.184   149.625   404.985  -96.184
*****
Actual element end forces & moments: (local coordinate system)
From, To  FxL      FyL      MzL      FxR      FyR      MzR
Nodes     lb       lb       lb-ft    lb       lb       lb-ft
-----
15,27    20020.959  2993.620  13263.377 -19721.709 -2183.650 -9574.572
27,29    19721.709  2163.650  9574.572  -19422.459 -1373.680 -7039.975
29,31    19422.459  1373.680  7039.975  -19123.209 -563.710  -5659.585
31,33    19123.209   563.710  5659.585  -18623.959  246.260  -5433.401
33,35    18823.959  -246.260  5433.401  -18524.709  1056.230 -6361.426
35,37    18524.709 -1056.230  6361.426  -18225.459  1866.200  -8443.657
37,39    18225.459 -1866.200  8443.657  -17926.209  2676.170 -11680.096
39,41    17926.209 -2676.170  11680.096 -17626.959  3486.140 -16070.742
41,43    17626.959 -3486.140  16070.742 -17327.709  4296.110 -21615.595
43,45    17327.709 -4296.110  21615.595 -17028.459  5106.080 -28314.655
*****
Member end deformations: (local coordinate system)
From, To  dx at L  dy at L  rotZ at L  dx at R  dy at R  rotZ at R
Nodes     inch     inch     radians    inch     inch     radians
-----
15,27    -0.118    0.000    0.001     -0.119    0.020    0.001
27,29    -0.119    0.020    0.001     -0.119    0.034    0.001
29,31    -0.119    0.034    0.001     -0.120    0.043    0.000
31,33    -0.120    0.043    0.000     -0.121    0.049    0.000
33,35    -0.121    0.049    0.000     -0.121    0.051    0.000
35,37    -0.121    0.051    0.000     -0.122    0.050    -0.000
37,39    -0.122    0.050    -0.000     -0.123    0.043    -0.001
39,41    -0.123    0.043    -0.001     -0.123    0.029    -0.001
41,43    -0.123    0.029    -0.001     -0.124    0.005    -0.002
43,45    -0.124    0.005    -0.002     -0.125    -0.032    -0.003
*****
Maximur deformations:
Node 35 moved 0.051 inch to the left.
Node 45 moved 0.032 inch to the right.

```

Node 45 moved 0.125 inch downwards.
 No nodes moved upwards.
 Node 45 rotated 0.003 radian clockwise.
 Node 15 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
15,27	0.000	-20020.959	-20020.959	0.000	-139.034	-139.034
27,29	0.000	-19721.709	-19721.709	0.000	-136.956	-136.956
29,31	0.000	-19422.459	-19422.459	0.000	-134.878	-134.878
31,33	0.000	-19123.209	-19123.209	0.000	-132.800	-132.800
33,35	0.000	-18823.959	-18823.959	0.000	-130.722	-130.722
35,37	0.000	-18524.709	-18524.709	0.000	-128.644	-128.644
37,39	0.000	-18225.459	-18225.459	0.000	-126.566	-126.566
39,41	0.000	-17926.209	-17926.209	0.000	-124.488	-124.488
41,43	0.000	-17626.959	-17626.959	0.000	-122.409	-122.409
43,45	0.000	-17327.709	-17327.709	0.000	-120.331	-120.331

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
15,27	2993.620	0.000	2993.620	20.789	0.000	20.789
27,29	2183.650	0.000	2183.650	15.164	0.000	15.164
29,31	1373.680	0.000	1373.680	9.539	0.000	9.539
31,33	563.710	-246.260	563.710	3.915	-1.710	3.915
33,35	0.000	-1056.230	-1056.230	0.000	-7.335	-7.335
35,37	0.000	-1866.200	-1866.200	0.000	-12.960	-12.960
37,39	0.000	-2676.170	-2676.170	0.000	-18.585	-18.585
39,41	0.000	-3486.140	-3486.140	0.000	-24.209	-24.209
41,43	0.000	-4296.110	-4296.110	0.000	-29.834	-29.834
43,45	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
15,27	0.000	-13263.377	-13263.377	0.000	-552.641	-552.641
27,29	0.000	-9574.572	-9574.572	0.000	-398.941	-398.941
29,31	0.000	-7039.975	-7039.975	0.000	-293.332	-293.332
31,33	0.000	-5659.585	-5659.585	0.000	-235.816	-235.816
33,35	0.000	-6361.426	-6361.426	0.000	-265.059	-265.059
35,37	0.000	-8443.657	-8443.657	0.000	-351.819	-351.819
37,39	0.000	-11680.096	-11680.096	0.000	-486.671	-486.671
39,41	0.000	-16070.742	-16070.742	0.000	-669.614	-669.614
41,43	0.000	-21615.595	-21615.595	0.000	-900.650	-900.650
43,45	0.000	-28314.655	-28314.655	0.000	-1179.777	-1179.777

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
15,27	0.020	0.000	0.020
27,29	0.034	0.000	0.034
29,31	0.043	0.000	0.043
31,33	0.049	0.000	0.049
33,35	0.051	0.000	0.051
35,37	0.051	0.000	0.051
37,39	0.050	0.000	0.050

39,41	0.043	0.000	0.043
41,43	0.029	0.000	0.029
43,45	0.005	-0.032	-0.032

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch
At the intermediate nodes:		
1.425	0.001	0.020
2.850	0.001	0.034
4.275	0.000	0.043
5.700	0.000	0.049
7.125	0.000	0.051
8.550	-0.000	0.050
9.975	-0.001	0.043
11.400	-0.001	0.029
12.825	-0.002	0.005
At evenly-spaced intervals:		
0.000	0.001	0.000
1.425	0.001	0.020
2.850	0.001	0.034
4.275	0.000	0.043
5.700	0.000	0.049
7.125	0.000	0.051
8.550	-0.000	0.050
9.975	-0.001	0.043
11.400	-0.001	0.029
12.825	-0.002	0.005
14.250	-0.003	-0.032

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Node 25	Node 28	Node 30	Node 32	Node 34	Node 36	Node 38	Node 40	Node 42	Node 44	Node 55
17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000	17.000
0.000	1.425	2.850	4.275	5.700	7.125	8.550	9.975	11.400	12.825	14.250
---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 4(22/22) S/EMBANK.

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All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
25	0.000	-0.121	-0.001
28	0.022	-0.122	-0.001
30	0.038	-0.123	-0.001
32	0.051	-0.123	-0.001
34	0.062	-0.124	-0.001
36	0.070	-0.125	-0.000
38	0.075	-0.125	-0.000
40	0.076	-0.126	0.000
42	0.071	-0.127	0.001
44	0.056	-0.127	0.001
55	0.030	-0.128	0.002

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
25,28	149.625	-404.985	-96.184	149.625	-404.985	96.184
28,30	149.625	-404.985	-96.184	149.625	-404.985	96.184
30,32	149.625	-404.985	-96.184	149.625	-404.985	96.184
32,34	149.625	-404.985	-96.184	149.625	-404.985	96.184
34,36	149.625	-404.985	-96.184	149.625	-404.985	96.184
36,38	149.625	-404.985	-96.184	149.625	-404.985	96.184
38,40	149.625	-404.985	-96.184	149.625	-404.985	96.184
40,42	149.625	-404.985	-96.184	149.625	-404.985	96.184
42,44	149.625	-404.985	-96.184	149.625	-404.985	96.184
44,55	149.625	-404.985	-96.184	149.625	-404.985	96.184

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
25,28	20338.241	-2993.620	-11627.314	-20038.991	2183.650	7938.509
28,30	20038.991	-2183.650	-7938.509	-19739.741	1373.680	5403.911
30,32	19739.741	-1373.680	-5403.911	-19440.491	563.710	4023.521
32,34	19440.491	-563.710	-4023.521	-19141.241	-246.260	3797.338
34,36	19141.241	246.260	-3797.338	-18841.991	-1056.230	4725.362
36,38	18841.991	1056.230	-4725.362	-18542.741	-1866.200	6807.593
38,40	18542.741	1866.200	-6807.593	-18243.491	-2676.170	10044.032
40,42	18243.491	2676.170	-10044.032	-17944.241	-3486.140	14434.678
42,44	17944.241	3486.140	-14434.678	-17644.991	-4296.110	19979.531
44,55	17644.991	4296.110	-19979.531	-17345.741	-5106.080	26678.592

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
25,28	-0.121	-0.000	-0.001	-0.122	-0.022	-0.001
28,30	-0.122	-0.022	-0.001	-0.123	-0.038	-0.001
30,32	-0.123	-0.038	-0.001	-0.123	-0.051	-0.001
32,34	-0.123	-0.051	-0.001	-0.124	-0.062	-0.001
34,36	-0.124	-0.062	-0.001	-0.125	-0.070	-0.000
36,38	-0.125	-0.070	-0.000	-0.125	-0.075	-0.000
38,40	-0.125	-0.075	-0.000	-0.126	-0.076	0.000
40,42	-0.126	-0.076	0.000	-0.127	-0.071	0.001
42,44	-0.127	-0.071	0.001	-0.127	-0.056	0.001
44,55	-0.127	-0.056	0.001	-0.128	-0.030	0.002

Maximum deformations:

No nodes moved to the left.

Node 40 moved 0.076 inch to the right.

Node 55 moved 0.128 inch downwards.
 No nodes moved upwards.
 Node 25 rotated 0.001 radian clockwise.
 Node 55 rotated 0.002 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
25,28	0.000	-20338.241	-20338.241	0.000	-141.238	-141.238
28,30	0.000	-20038.991	-20038.991	0.000	-139.160	-139.160
30,32	0.000	-19739.741	-19739.741	0.000	-137.082	-137.082
32,34	0.000	-19440.491	-19440.491	0.000	-135.003	-135.003
34,36	0.000	-19141.241	-19141.241	0.000	-132.925	-132.925
36,38	0.000	-18841.991	-18841.991	0.000	-130.847	-130.847
38,40	0.000	-18542.741	-18542.741	0.000	-128.769	-128.769
40,42	0.000	-18243.491	-18243.491	0.000	-126.691	-126.691
42,44	0.000	-17944.241	-17944.241	0.000	-124.613	-124.613
44,55	0.000	-17644.991	-17644.991	0.000	-122.535	-122.535

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
25,28	0.000	-2993.620	-2993.620	0.000	-20.789	-20.789
28,30	0.000	-2183.650	-2183.650	0.000	-15.164	-15.164
30,32	0.000	-1373.680	-1373.680	0.000	-9.539	-9.539
32,34	246.260	-563.710	-563.710	1.710	-3.915	-3.915
34,36	1056.230	0.000	1056.230	7.335	0.000	7.335
36,38	1866.200	0.000	1866.200	12.960	0.000	12.960
38,40	2676.170	0.000	2676.170	18.585	0.000	18.585
40,42	3486.140	0.000	3486.140	24.209	0.000	24.209
42,44	4296.110	0.000	4296.110	29.834	0.000	29.834
44,55	5106.080	0.000	5106.080	35.459	0.000	35.459

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
25,28	11627.314	0.000	11627.314	484.471	0.000	484.471
28,30	7938.509	0.000	7938.509	330.771	0.000	330.771
30,32	5403.911	0.000	5403.911	225.163	0.000	225.163
32,34	4023.521	0.000	4023.521	167.647	0.000	167.647
34,36	4725.362	0.000	4725.362	196.890	0.000	196.890
36,38	6807.593	0.000	6807.593	283.650	0.000	283.650
38,40	10044.032	0.000	10044.032	418.501	0.000	418.501
40,42	14434.678	0.000	14434.678	601.445	0.000	601.445
42,44	19979.531	0.000	19979.531	832.480	0.000	832.480
44,55	26678.592	0.000	26678.592	1111.608	0.000	1111.608

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
25,28	0.000	-0.022	-0.022
28,30	0.000	-0.038	-0.038
30,32	0.000	-0.051	-0.051
32,34	0.000	-0.062	-0.062
34,36	0.000	-0.070	-0.070
36,38	0.000	-0.075	-0.075
38,40	0.000	-0.076	-0.076

40,42	0.000	-0.076	-0.076
42,44	0.000	-0.071	-0.071
44,55	0.000	-0.056	-0.056

 Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom)	Rotation	Deflection
ft	--- radian	--- inch
At the intermediate nodes:		
1.425	-0.001	-0.022
2.850	-0.001	-0.038
4.275	-0.001	-0.051
5.700	-0.001	-0.062
7.125	-0.000	-0.070
8.550	-0.000	-0.075
9.975	0.000	-0.076
11.400	0.001	-0.071
12.825	0.001	-0.056
At evenly-spaced intervals:		
0.000	-0.001	-0.000
1.425	-0.001	-0.022
2.850	-0.001	-0.038
4.275	-0.001	-0.051
5.700	-0.001	-0.062
7.125	-0.000	-0.070
8.550	-0.000	-0.075
9.975	0.000	-0.076
11.400	0.001	-0.071
12.825	0.001	-0.056
14.250	0.002	-0.030

Output Data

FRAME MAC file: 4(22/22) S/EMBAK.

Last modified at 22:28:07 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,14	0.000	-3712.977	-3712.977	0.000	-42.678	-42.678
2,15	0.000	-7888.091	-7888.091	0.000	-35.373	-35.373
3,16	0.000	-6152.470	-6152.470	0.000	-27.590	-27.590
4,17	0.000	-4535.870	-4535.870	0.000	-20.340	-20.340
5,18	0.000	-3258.898	-3258.898	0.000	-14.614	-14.614
6,19	0.000	-2451.533	-2451.533	0.000	-10.993	-10.993
7,20	0.000	-2181.187	-2181.187	0.000	-9.781	-9.781
8,21	0.000	-2470.457	-2470.457	0.000	-11.078	-11.078
9,22	0.000	-3303.068	-3303.068	0.000	-14.812	-14.812
10,23	0.000	-4617.497	-4617.497	0.000	-20.706	-20.706
11,24	0.000	-6288.646	-6288.646	0.000	-28.200	-28.200
12,25	0.000	-8098.952	-8098.952	0.000	-36.318	-36.318
13,26	0.000	-3827.055	-3827.055	0.000	-43.989	-43.989
14,15	755.286	0.000	755.286	3.497	0.000	3.497
15,16	0.000	-56.082	-56.082	0.000	-0.260	-0.260
15,27	0.000	-20020.959	-20020.959	0.000	-139.034	-139.034
16,17	2228.808	0.000	2228.808	10.319	0.000	10.319
17,18	4112.786	0.000	4112.786	19.041	0.000	19.041
18,19	5408.243	0.000	5408.243	25.038	0.000	25.038
19,20	6071.338	0.000	6071.338	28.108	0.000	28.108
20,21	6101.035	0.000	6101.035	28.246	0.000	28.246
21,22	5492.377	0.000	5492.377	25.428	0.000	25.428
22,23	4236.039	0.000	4236.039	19.611	0.000	19.611
23,24	2364.336	0.000	2364.336	10.946	0.000	10.946
24,25	51.947	0.000	51.947	0.240	0.000	0.240
25,26	782.415	0.000	782.415	3.622	0.000	3.622
25,28	0.000	-20338.241	-20338.241	0.000	-141.238	-141.238
27,29	0.000	-19721.709	-19721.709	0.000	-136.956	-136.956
28,30	0.000	-20038.991	-20038.991	0.000	-139.160	-139.160
29,31	0.000	-19422.459	-19422.459	0.000	-134.878	-134.878
30,32	0.000	-19739.741	-19739.741	0.000	-137.082	-137.082
31,33	0.000	-19123.209	-19123.209	0.000	-132.800	-132.800
32,34	0.000	-19440.491	-19440.491	0.000	-135.003	-135.003
33,35	0.000	-18823.959	-18823.959	0.000	-130.722	-130.722
34,36	0.000	-19141.241	-19141.241	0.000	-132.925	-132.925
35,37	0.000	-18524.709	-18524.709	0.000	-128.644	-128.644
36,38	0.000	-18841.991	-18841.991	0.000	-130.847	-130.847
37,39	0.000	-18225.459	-18225.459	0.000	-126.566	-126.566
38,40	0.000	-18542.741	-18542.741	0.000	-128.769	-128.769
39,41	0.000	-17926.209	-17926.209	0.000	-124.488	-124.488
40,42	0.000	-18243.491	-18243.491	0.000	-126.691	-126.691
41,43	0.000	-17626.959	-17626.959	0.000	-122.409	-122.409
42,44	0.000	-17944.241	-17944.241	0.000	-124.613	-124.613
43,45	0.000	-17327.709	-17327.709	0.000	-120.331	-120.331
44,55	0.000	-17644.991	-17644.991	0.000	-122.535	-122.535
45,46	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
46,47	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
47,48	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
48,49	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
49,50	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
50,51	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
51,52	0.000	-5106.080	-5106.080	0.000	-11.820	-11.820
52,53	0.000	-5106.080	-5106.080	0.000	-11.820	-11.820
53,54	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459
54,55	0.000	-5106.080	-5106.080	0.000	-35.459	-35.459

SOIL ELEMENT
AVL 24.34/1.4 = 17.39
= 2504 PSI

***** POSITIVE PROJECTION - INCOMPLETE

$$\frac{H}{B_c} = \frac{10.57}{16.5} = 0.6406$$

$$W_c = C_c w B_c^2$$

$$W_c = (0.7260)(115)(16.5)^2$$

$$= 22,729 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = \frac{22,729}{16.5} = 1376 \text{ lb/ft}^2$$

$$\bar{V} = 1376 \text{ lb/ft}^2$$

$$\bar{V}_H = 406 \text{ lb/ft}^2$$

$$C_c = \frac{e^{+2K\mu \left(\frac{H}{E_c} \right)} - 1}{2K\mu}$$

$$C_c = \frac{e^{2(0.1912)(0.6406)} - 1}{2(0.1914)}$$

$$C_c = 0.7260$$

TUNNEL SECTION

4

PAGE ____ OF ____

22 27

EMBANKMENT

STRUCTURAL ASSESSMENT

Moment Capacity

Design of beam for flexural loads is based on:

$$\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$$

for nominal beam strength and where $\phi = 0.9$

$$\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$$

Shear Capacity

Design shear load is computed by ACI 318-89 (11-3)

$$V_c = 2 \sqrt{f'_c} B d$$

When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$

$$\phi V_c = (0.85) 2 \sqrt{f'_c} B d$$

Axial Capacity

Design axial load ϕP_{nw} is computed by ACI 318-89 (14-1)

$$\phi P_{nw} = 0.55 \phi f'_c A_g \left[1 - \left(\frac{k l_c}{32 h} \right)^2 \right]$$

where $\phi = 0.7$

TUNNEL ELEMENT

~~ACI 318-89~~
PRELIMINARY

VALUE FROM MODEL

COMPLIANCE

ROOF STRUCTURE

34,208 ft-lbs

39549 ft-lbs

FLOOR STRUCTURE

36,186 ft-lbs

39545 ft-lbs

LEFT INSIDE WALL

— ft-lbs

— ft-lbs

LEFT OUTSIDE WALL

24,623 ft-lbs

28,315 ft-lbs

RIGHT INSIDE WALL

— ft-lbs

— ft-lbs

RIGHT OUTSIDE WALL

23,100 ft-lbs

26,679 ft-lbs

ROOF STRUCTURE

14,995 lbs

17,346 lbs

FLOOR STRUCTURE

14,995 lbs

15680 lbs

LEFT WALL

4487 lbs

5160 lbs

RIGHT WALL

4487 lbs

5106 lbs

LEFT WALL

17,916 lbs

20,021 lbs

RIGHT WALL

17,916 lbs

20,338 lbs

Loading Conditions

$$B = 16.5 \text{ ft.}$$

$$D_2 = 15.5 \text{ ft.}$$

$$D_1 = 10.57 \text{ ft.}$$

$$D_1 = 26.07 \text{ ft.}$$

$$\sigma_v = D_1 \rho \quad 1376 \text{ lbs/ft}^2$$

$$\sigma_h = k \sigma_v \quad 406 \text{ lbs/ft}^2$$

No. BRIDGING
EFFECTS

$$\text{where } k = \frac{1 - \sin \theta}{1 + \sin \theta}$$

$$k = 0.2748$$

(11.97)

Figure () Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-5(21/21)S

TITLE: Structural Assessment of Tunnel Section 5(21/21) South when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 5(21/21)South is subject to vertical and horizontal loads,
estimated as 115 lbs/ft^2 for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY:

DATE:

Figure() Section 5(21/21) Trench Excavation and Backfill Configuration

FRAME MAC file: 5(21/21) S/ EMBANK ; Last modified at 17:10:31 on Thu, May 6, 1993

FRAME MAC file: 5(21/21) S/ EMBANK ; Last modified at 17:10:31 on Thu, May 6, 1993

Node 25	Node 26	Node 27	Node 28	Node 29	Node 30	Node 31
1.000	2.083	3.167	4.250	5.333	6.417	7.500
6.500	6.500	6.500	6.500	6.500	6.500	6.500
---	---	---	---	---	---	---

```

*****
Continuous Elements Output Data
*****
FRAME MAC file: 5(21/21) S/ EMBANK .
Last modified at 17:10:31 on Thu, May 6, 1993.
All coord. and distances are in ft from the left (bot.) end of the element.
*****
Support reactions: (pos. force is to right or up; pos. moment is ccw.)
Node      Reaction      Reaction      Reaction
No.       lb (FX)       lb (FY)       lb-ft (MZ)
-----
Node deformations: (positive is to right, up, or counterclockwise.)
Node      Deflection      Deflection      Rotation
No.       inch (FX)       inch (FY)       radians (MZ)
-----
25         0.000         -0.054         -0.000
26         0.000         -0.060         -0.000
27         0.000         -0.065         -0.000
28        -0.000         -0.067         0.000
29        -0.000         -0.065         0.000
30        -0.000         -0.060         0.000
31        -0.000         -0.054         0.000
*****
Element fixed-end forces & moments: (local coordinate system)
From, To   FxL      FyL      MzL      FxR      FyR      MzR
Nodes      lb       lb       lb-ft    lb       lb       lb-ft
-----
25,26     0.000    801.179   144.657   0.000    800.739  -144.657
26,27     0.000    801.179   144.657   0.000    800.739  -144.657
27,28     0.000    801.179   144.657   0.000    800.739  -144.657
28,29     0.000    801.179   144.657   0.000    800.739  -144.657
29,30     0.000    801.179   144.657   0.000    800.739  -144.657
30,31     0.000    801.179   144.657   0.000    800.739  -144.657
*****
Actual element end forces & moments: (local coordinate system)
From, To   FxL      FyL      MzL      FxR      FyR      MzR
Nodes      lb       lb       lb-ft    lb       lb       lb-ft
-----
25,26    1207.374  4805.977  3219.969  -1207.374  -3204.059  1118.562
26,27    1207.374  3204.059  -1118.562  -1207.374  -1602.142  3721.682
27,28    1207.374  1602.142  -3721.682  -1207.374   -0.224  4589.392
28,29    1207.374    0.224  -4589.392  -1207.374  1601.694  3721.690
29,30    1207.374 -1601.694  -3721.690  -1207.374  3203.612  1118.577
30,31    1207.374 -3203.612  -1118.577  -1207.374  4805.530  -3219.946
*****
Member end deformations: (local coordinate system)
From, To   dx at L   dy at L   rotZ at L   dx at R   dy at R   rotZ at R
Nodes      inch      inch      radians     inch      inch      radians
-----
25,26     0.000    -0.054    -0.000      0.000    -0.060    -0.000
26,27     0.000    -0.060    -0.000      0.000    -0.065    -0.000
27,28     0.000    -0.065    -0.000      0.000    -0.067    0.000
28,29     -0.000    -0.067    0.000      0.000    -0.065    0.000
29,30     -0.000    -0.065    0.000      0.000    -0.060    0.000
30,31     -0.000    -0.060    0.000      0.000    -0.054    0.000
*****
Maximum deformations:
Node 31 moved 0.000 inch to the left.
Node 25 moved 0.000 inch to the right.
Node 28 moved 0.067 inch downwards.
No nodes moved upwards.
Node 26 rotated 0.000 radian clockwise.
Node 30 rotated 0.000 radian counter-clockwise.
*****
Maximum reactions:
There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.
*****
Maximum tension and tensile stress values (compression is negative):
From, To   Maximum   Minimum   Max. abs.   Maximum   Minimum   Max. abs.
Node      tension   tension   tension     ten. str.  ten. str.  stress

```

---	lb	lb	lb	psi	psi	psi
25,26	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
26,27	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
27,28	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
28,29	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
29,30	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
30,31	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
25,26	4805.977	0.000	4805.977	44.500	0.000	44.500
26,27	3204.059	0.000	3204.059	29.667	0.000	29.667
27,28	1602.142	0.000	1602.142	14.835	0.000	14.835
28,29	0.224	-1601.694	-1601.694	0.002	-14.831	-14.831
29,30	0.000	-3203.612	-3203.612	0.000	-29.663	-29.663
30,31	0.000	-4805.530	-4805.530	0.000	-44.496	-44.496

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
25,26	1118.562	-3219.969	-3219.969	82.856	-238.516	-238.516
26,27	3721.682	0.000	3721.682	275.680	0.000	275.680
27,28	4589.392	0.000	4589.392	339.955	0.000	339.955
28,29	4589.392	0.000	4589.392	339.955	0.000	339.955
29,30	3721.690	0.000	3721.690	275.681	0.000	275.681
30,31	1118.577	-3219.946	-3219.946	82.858	-238.515	-238.515

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
25,26	0.000	-0.060	-0.060
26,27	0.000	-0.065	-0.065
27,28	0.000	-0.067	-0.067
28,29	0.000	-0.067	-0.067
29,30	0.000	-0.065	-0.065
30,31	0.000	-0.060	-0.060

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---
At the intermediate nodes:		
1.083	-0.000	-0.060
2.167	-0.000	-0.065
3.250	0.000	-0.067
4.333	0.000	-0.065
5.417	0.000	-0.060

At evenly-spaced intervals:

0.000	-0.000	-0.054
0.650	-0.000	-0.058
1.300	-0.000	-0.061
1.950	-0.000	-0.064
2.600	-0.000	-0.066
3.250	0.000	-0.067
3.900	0.000	-0.066
4.550	0.000	-0.064
5.200	0.000	-0.061
5.850	0.000	-0.058
6.500	0.000	-0.054

Continuous Elements Output Data

FRAME MAC file: 5(21/21) S/ EMBANK .

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All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
8	-0.000	-0.053	0.000
9	-0.000	-0.047	0.000
10	-0.000	-0.042	0.000
11	-0.000	-0.040	0.000
12	0.000	-0.042	-0.000
13	0.000	-0.047	-0.000
14	0.000	-0.053	-0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	0.000	85.313	15.404	0.000	85.313	-15.404
9,10	0.000	85.312	15.404	0.000	85.312	-15.404
10,11	0.000	85.312	15.404	0.000	85.312	-15.404
11,12	0.000	85.313	15.404	0.000	85.313	-15.404
12,13	0.000	85.313	15.404	0.000	85.313	-15.404
13,14	0.000	85.312	15.404	0.000	85.312	-15.404

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	840.404	-4587.511	-3620.423	-840.404	4758.136	-1441.803
9,10	-1415.239	-2548.198	1325.239	1415.239	2718.823	-4178.209
10,11	-1044.955	-760.753	4180.016	1044.955	931.378	-5096.567
11,12	-1044.932	931.539	5096.583	1044.932	-760.914	-4179.838
12,13	-1415.107	2718.852	4178.024	1415.107	-2548.227	-1325.024
13,14	840.404	4757.896	1441.570	-840.404	-4587.271	3620.395

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,9	-0.000	-0.053	0.000	-0.000	-0.047	0.000
9,10	-0.000	-0.047	0.000	-0.000	-0.042	0.000
10,11	-0.000	-0.042	0.000	-0.000	-0.040	0.000
11,12	-0.000	-0.040	0.000	0.000	-0.042	-0.000
12,13	0.000	-0.042	-0.000	0.000	-0.047	-0.000
13,14	0.000	-0.047	-0.000	0.000	-0.053	-0.000

Maximum deformations:

Node 9 moved 0.000 inch to the left.

Node 13 moved 0.000 inch to the right.

Node 8 moved 0.053 inch downwards.

No nodes moved upwards.

Node 13 rotated 0.000 radian clockwise.

Node 9 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.

There were no reactions to the right.

There were no downwards reactions.

There were no upwards reactions.

There were no clockwise reactions.

There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
8,9	0.000	-840.404	-840.404	0.000	-7.782	-7.782
9,10	1415.239	0.000	1415.239	13.104	0.000	13.104
10,11	1044.955	0.000	1044.955	9.676	0.000	9.676
11,12	1044.932	0.000	1044.932	9.675	0.000	9.675
12,13	1415.107	0.000	1415.107	13.103	0.000	13.103
13,14	0.000	-840.404	-840.404	0.000	-7.782	-7.782

Maximum shear and shear stress values:

From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	shear	shear	shear	shr. str.	shr. str.	stress
---	lb	lb	lb	psi	psi	psi
8,9	0.000	-4758.136	-4758.136	0.000	-44.057	-44.057
9,10	0.000	-2718.823	-2718.823	0.000	-25.174	-25.174
10,11	0.000	-931.378	-931.378	0.000	-8.624	-8.624
11,12	931.539	0.000	931.539	8.625	0.000	8.625
12,13	2718.852	0.000	2718.852	25.175	0.000	25.175
13,14	4757.896	0.000	4757.896	44.055	0.000	44.055

Maximum moment and bending stress values:

From, To	Maximum	Minimum	Max. abs.	Maximum	Minimum	Max. abs.
Node	moment	moment	moment	ben. str.	ben. str.	stress
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
8,9	3620.423	-1441.803	3620.423	268.180	-106.800	268.180
9,10	0.000	-4178.209	-4178.209	0.000	-309.497	-309.497
10,11	0.000	-5096.587	-5096.587	0.000	-377.525	-377.525
11,12	0.000	-5096.583	-5096.583	0.000	-377.525	-377.525
12,13	0.000	-4178.024	-4178.024	0.000	-309.483	-309.483
13,14	3620.395	-1441.570	3620.395	268.177	-106.783	268.177

Maximum deflection values:

From, To	Maximum defl.	Maximum defl.	Maximum defl.
Node	up (left)	down (rt.)	absolute
---	inch	inch	inch
8,9	0.000	-0.053	-0.053
9,10	0.000	-0.047	-0.047
10,11	0.000	-0.042	-0.042
11,12	0.000	-0.042	-0.042
12,13	0.000	-0.047	-0.047
13,14	0.000	-0.053	-0.053

Deflections along the elements (positive is up or counter-clockwise):

Distance from	Rotation	Deflection
left (bottom)	---	---
ft	radian	inch
At the intermediate nodes:		
1.083	0.000	-0.047
2.167	0.000	-0.042
3.250	0.000	-0.040
4.333	-0.000	-0.042
5.417	-0.000	-0.047
At evenly-spaced intervals:		
0.000	0.000	-0.053
0.650	0.000	-0.050
1.300	0.000	-0.046
1.950	0.000	-0.043
2.600	0.000	-0.041
3.250	0.000	-0.040
3.900	-0.000	-0.041
4.550	-0.000	-0.043
5.200	-0.000	-0.046
5.850	-0.000	-0.050
6.500	-0.000	-0.053

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Node 8
1.000
0.000

Node 9
2.083
0.000

Node 10
3.167
0.000

Node 11
4.250
0.000

Node 12
5.333
0.000

Node 13
6.417
0.000

Node 14
7.500
0.000

Continuous Elements Output Data

FRAME MAC file: 5(21/21) S/ EMBANK .

Last modified at 17:10:31 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
8	-0.000	-0.053	0.000
9	-0.000	-0.047	0.000
10	-0.000	-0.042	0.000
11	-0.000	-0.040	0.000
12	0.000	-0.042	-0.000
13	0.000	-0.047	-0.000
14	0.000	-0.053	-0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	0.000	85.313	15.404	0.000	85.313	-15.404
9,10	0.000	85.312	15.404	0.000	85.312	-15.404
10,11	0.000	85.312	15.404	0.000	85.312	-15.404
11,12	0.000	85.313	15.404	0.000	85.313	-15.404
12,13	0.000	85.313	15.404	0.000	85.313	-15.404
13,14	0.000	85.312	15.404	0.000	85.312	-15.404

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,9	840.404	-4587.511	-3620.423	-840.404	4758.136	-1441.803
9,10	-1415.239	-2548.198	1325.239	1415.239	2718.823	-4178.209
10,11	-1044.955	-760.753	4180.016	1044.955	931.378	-5096.587
11,12	-1044.932	931.539	5096.583	1044.932	-760.914	-4179.838
12,13	-1415.107	2718.852	4178.024	1415.107	-2548.227	-1325.024
13,14	840.404	4757.896	1441.570	-840.404	-4587.271	3620.395

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,9	-0.000	-0.053	0.000	-0.000	-0.047	0.000
9,10	-0.000	-0.047	0.000	-0.000	-0.042	0.000
10,11	-0.000	-0.042	0.000	-0.000	-0.040	0.000
11,12	-0.000	-0.040	0.000	0.000	-0.042	-0.000
12,13	0.000	-0.042	-0.000	0.000	-0.047	-0.000
13,14	0.000	-0.047	-0.000	0.000	-0.053	-0.000

Maximum deformations:

Node 9 moved 0.000 inch to the left.
Node 13 moved 0.000 inch to the right.
Node 8 moved 0.053 inch downwards.
No nodes moved upwards.
Node 13 rotated 0.000 radian clockwise.
Node 9 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
8,9	0.000	-840.404	-840.404	0.000	-7.782	-7.782
9,10	1415.239	0.000	1415.239	13.104	0.000	13.104
10,11	1044.955	0.000	1044.955	9.676	0.000	9.676
11,12	1044.932	0.000	1044.932	9.675	0.000	9.675
12,13	1415.107	0.000	1415.107	13.103	0.000	13.103
13,14	0.000	-840.404	-840.404	0.000	-7.782	-7.782

Maximum shear and shear stress values:						
From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
8,9	0.000	-4758.136	-4758.136	0.000	-44.057	-44.057
9,10	0.000	-2718.823	-2718.823	0.000	-25.174	-25.174
10,11	0.000	-931.378	-931.378	0.000	-8.624	-8.624
11,12	931.539	0.000	931.539	8.625	0.000	8.625
12,13	2718.852	0.000	2718.852	25.175	0.000	25.175
13,14	4757.896	0.000	4757.896	44.055	0.000	44.055

Maximum moment and bending stress values:						
From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
8,9	3620.423	-1441.803	3620.423	268.180	-106.800	268.180
9,10	0.000	-4178.209	-4178.209	0.000	-309.497	-309.497
10,11	0.000	-5096.587	-5096.587	0.000	-377.525	-377.525
11,12	0.000	-5096.583	-5096.583	0.000	-377.525	-377.525
12,13	0.000	-4178.024	-4178.024	0.000	-309.483	-309.483
13,14	3620.395	-1441.570	3620.395	268.177	-106.783	268.177

Maximum deflection values:						
From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
---	inch	inch	inch			
8,9	0.000	-0.053	-0.053			
9,10	0.000	-0.047	-0.047			
10,11	0.000	-0.042	-0.042			
11,12	0.000	-0.042	-0.042			
12,13	0.000	-0.047	-0.047			
13,14	0.000	-0.053	-0.053			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
---	---	---				
At the intermediate nodes:						
1.083	0.000	-0.047				
2.167	0.000	-0.042				
3.250	0.000	-0.040				
4.333	-0.000	-0.042				
5.417	-0.000	-0.047				
At evenly-spaced intervals:						
0.000	0.000	-0.053				
0.650	0.000	-0.050				
1.300	0.000	-0.046				
1.950	0.000	-0.043				
2.600	0.000	-0.041				
3.250	0.000	-0.040				
3.900	-0.000	-0.041				
4.550	-0.000	-0.043				
5.200	-0.000	-0.046				
5.850	-0.000	-0.050				
6.500	-0.000	-0.053				

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Node 8
1.000
0.000

Node 15
1.000
1.083

Node 17
1.000
2.167

Node 19
1.000
3.250

Node 21
1.000
4.333

Node 23
1.000
5.417

Node 25
1.000
6.500

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-5829.727
1321.647

13 Shear

lb

-1207.374

Moment

0.000
lb-ft

-3590.935
0.006

Defl.

Inch
-0.000

Distance 0.000

L/6

1.300

L/4

L/3

2.600

L/2

3.900

2L/3

3L/4

5L/6

5.200

6.500

ft

Continuous Elements Output Data

FRAME MAC file: 5(21/21) S/ EMBANK .

Last modified at 17:10:31 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
8	-0.000	-0.053	0.000
15	-0.004	-0.053	0.000
17	-0.006	-0.054	0.000
19	-0.006	-0.054	-0.000
21	-0.006	-0.054	-0.000
23	-0.004	-0.054	-0.000
25	0.000	-0.054	-0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,15	85.313	210.817	38.064	85.313	210.687	-38.064
15,17	85.312	210.817	38.064	85.312	210.687	-38.064
17,19	85.312	210.817	38.064	85.312	210.687	-38.064
19,21	85.313	210.817	38.064	85.313	210.687	-38.064
21,23	85.313	210.817	38.064	85.313	210.687	-38.064
23,25	85.312	210.817	38.064	85.312	210.687	-38.064

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
8,15	5829.727	1321.647	3590.935	-5659.102	-900.144	-2387.535
15,17	5659.102	900.144	2387.535	-5488.477	-478.640	-1640.764
17,19	5488.477	478.640	1640.764	-5317.852	-57.137	-1350.622
19,21	5317.852	57.137	1350.622	-5147.227	364.367	-1517.109
21,23	5147.227	-364.367	1517.109	-4976.602	785.871	-2140.224
23,25	4976.602	-785.871	2140.224	-4805.977	1207.374	-3219.969

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
8,15	-0.053	0.000	0.000	-0.053	0.004	0.000
15,17	-0.053	0.004	0.000	-0.054	0.006	0.000
17,19	-0.054	0.006	0.000	-0.054	0.006	-0.000
19,21	-0.054	0.006	-0.000	-0.054	0.006	-0.000
21,23	-0.054	0.006	-0.000	-0.054	0.004	-0.000
23,25	-0.054	0.004	-0.000	-0.054	-0.000	-0.000

Maximum deformations:

Node 19 moved 0.006 inch to the left.

Node 25 moved 0.000 inch to the right.

Node 25 moved 0.054 inch downwards.

No nodes moved upwards.

Node 25 rotated 0.000 radian clockwise.

Node 8 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.

There were no reactions to the right.

There were no downwards reactions.

There were no upwards reactions.

There were no clockwise reactions.

There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
8,15	0.000	-5829.727	-5829.727	0.000	-53.979	-53.979
15,17	0.000	-5659.102	-5659.102	0.000	-52.399	-52.399
17,19	0.000	-5488.477	-5488.477	0.000	-50.819	-50.819
19,21	0.000	-5317.852	-5317.852	0.000	-49.239	-49.239
21,23	0.000	-5147.227	-5147.227	0.000	-47.660	-47.660
23,25	0.000	-4976.602	-4976.602	0.000	-46.080	-46.080

Maximum shear and shear stress values:						
From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
8,15	1321.647	0.000	1321.647	12.237	0.000	12.237
15,17	900.144	0.000	900.144	8.335	0.000	8.335
17,19	478.640	0.000	478.640	4.432	0.000	4.432
19,21	57.137	-364.367	-364.367	0.529	-3.374	-3.374
21,23	0.000	-785.871	-785.871	0.000	-7.277	-7.277
23,25	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179

Maximum moment and bending stress values:						
From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
8,15	0.000	-3590.935	-3590.935	0.000	-265.995	-265.995
15,17	0.000	-2387.535	-2387.535	0.000	-176.854	-176.854
17,19	0.000	-1640.764	-1640.764	0.000	-121.538	-121.538
19,21	0.000	-1517.109	-1517.109	0.000	-112.378	-112.378
21,23	0.000	-2140.224	-2140.224	0.000	-158.535	-158.535
23,25	0.000	-3219.969	-3219.969	0.000	-238.516	-238.516

Maximum deflection values:						
From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
---	inch	inch	inch			
8,15	0.004	0.000	0.004			
15,17	0.006	0.000	0.006			
17,19	0.006	0.000	0.006			
19,21	0.006	0.000	0.006			
21,23	0.006	0.000	0.006			
23,25	0.004	-0.000	0.004			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
---	---	---				
At the intermediate nodes:						
1.083	0.000	0.004				
2.167	0.000	0.006				
3.250	-0.000	0.006				
4.333	-0.000	0.006				
5.417	-0.000	0.004				
At evenly-spaced intervals:						
0.000	0.000	0.000				
0.650	0.000	0.003				
1.300	0.000	0.004				
1.950	0.000	0.006				
2.600	0.000	0.006				
3.250	-0.000	0.006				
3.900	-0.000	0.006				
4.550	-0.000	0.005				
5.200	-0.000	0.004				
5.850	-0.000	0.002				
6.500	-0.000	-0.000				

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Node 14
7.500
0.000

Node 16
7.500
1.083

Node 18
7.500
2.167

Node 20
7.500
3.250

Node 22
7.500
4.333

Node 24
7.500
5.417

Node 31
7.500
6.500

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-5829.280

1207.374

16 Shear

lb

-1321.647

3590.912

Moment

lb-ft

0.000

Defl.

0.000
inch

-0.006

Distance 0.000

L/6

1.300

L/3

2.600

L/2

3.900

2L/3

3L/4

5L/6

5.200

ft

6.500

Continuous Elements Output Data

FRAME MAC file: 5(21/21) S/ EMBANK .

Last modified at 17:10:31 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
14	0.000	-0.053	-0.000
16	0.004	-0.053	-0.000
18	0.006	-0.053	-0.000
20	0.006	-0.054	0.000
22	0.006	-0.054	0.000
24	0.004	-0.054	0.000
31	-0.000	-0.054	0.000

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	85.313	-210.817	-38.064	85.313	-210.687	38.064
16,18	85.312	-210.817	-38.064	85.312	-210.687	38.064
18,20	85.312	-210.817	-38.064	85.312	-210.687	38.064
20,22	85.313	-210.817	-38.064	85.313	-210.687	38.064
22,24	85.313	-210.817	-38.064	85.313	-210.687	38.064
24,31	85.312	-210.817	-38.064	85.312	-210.687	38.064

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
14,16	5829.280	-1321.647	-3590.912	-5658.655	900.144	2387.512
16,18	5658.655	-900.144	-2387.512	-5486.030	478.640	1640.741
18,20	5486.030	-478.640	-1640.741	-5317.405	57.137	1350.599
20,22	5317.405	-57.137	-1350.599	-5146.780	-364.367	1517.086
22,24	5146.780	364.367	-1517.086	-4976.155	-785.871	2140.202
24,31	4976.155	785.871	-2140.202	-4805.530	-1207.374	3219.946

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
14,16	-0.053	-0.000	-0.000	-0.053	-0.004	-0.000
16,18	-0.053	-0.004	-0.000	-0.053	-0.006	-0.000
18,20	-0.053	-0.006	-0.000	-0.054	-0.006	0.000
20,22	-0.054	-0.006	0.000	-0.054	-0.006	0.000
22,24	-0.054	-0.006	0.000	-0.054	-0.004	0.000
24,31	-0.054	-0.004	0.000	-0.054	0.000	0.000

Maximum deformations:

Node 31 moved 0.000 inch to the left.
Node 20 moved 0.006 inch to the right.
Node 31 moved 0.054 inch downwards.
No nodes moved upwards.
Node 14 rotated 0.000 radian clockwise.
Node 31 rotated 0.000 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension	Minimum tension	Max. abs. tension	Maximum ten. str.	Minimum ten. str.	Max. abs. stress
------------------	--------------------	--------------------	----------------------	----------------------	----------------------	---------------------

---	lb	lb	lb	psi	psi	psi
14,16	0.000	-5829.280	-5829.280	0.000	-53.975	-53.975
16,18	0.000	-5658.655	-5658.655	0.000	-52.395	-52.395
18,20	0.000	-5488.030	-5488.030	0.000	-50.815	-50.815
20,22	0.000	-5317.405	-5317.405	0.000	-49.235	-49.235
22,24	0.000	-5146.780	-5146.780	0.000	-47.655	-47.655
24,31	0.000	-4976.155	-4976.155	0.000	-46.076	-46.076

Maximum shear and shear stress values:						
From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
14,16	0.000	-1321.647	-1321.647	0.000	-12.237	-12.237
16,18	0.000	-900.144	-900.144	0.000	-8.335	-8.335
18,20	0.000	-478.640	-478.640	0.000	-4.432	-4.432
20,22	364.367	-57.137	364.367	3.374	-0.529	3.374
22,24	785.871	0.000	785.871	7.277	0.000	7.277
24,31	1207.374	0.000	1207.374	11.179	0.000	11.179

Maximum moment and bending stress values:						
From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
14,16	3590.912	0.000	3590.912	265.993	0.000	265.993
16,18	2387.512	0.000	2387.512	176.853	0.000	176.853
18,20	1640.741	0.000	1640.741	121.536	0.000	121.536
20,22	1517.086	0.000	1517.086	112.377	0.000	112.377
22,24	2140.202	0.000	2140.202	158.533	0.000	158.533
24,31	3219.946	0.000	3219.946	238.515	0.000	238.515

Maximum deflection values:						
From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch			
---	inch	inch	inch			
14,16	0.000	-0.004	-0.004			
16,18	0.000	-0.006	-0.006			
18,20	0.000	-0.006	-0.006			
20,22	0.000	-0.006	-0.006			
22,24	0.000	-0.006	-0.006			
24,31	0.000	-0.004	-0.004			

Deflections along the elements (positive is up or counter-clockwise):						
Distance from left (bottom) ft	Rotation radian	Deflection inch				
---	---	---				
At the intermediate nodes:						
1.083	-0.000	-0.004				
2.167	-0.000	-0.006				
3.250	0.000	-0.006				
4.333	0.000	-0.006				
5.417	0.000	-0.004				
At evenly-spaced intervals:						
0.000	-0.000	-0.000				
0.650	-0.000	-0.003				
1.300	-0.000	-0.004				
1.950	-0.000	-0.006				
2.600	-0.000	-0.006				
3.250	0.000	-0.006				
3.900	0.000	-0.006				
4.550	0.000	-0.005				
5.200	0.000	-0.004				
5.850	0.000	-0.002				
6.500	0.000	0.000				

Output Data

FRAME MAC file: 5(21/21) S/ EMBANK .

Last modified at 17:10:31 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,8	0.000	-1242.216	-1242.216	0.000	-15.926	-15.926
2,9	0.000	-2200.899	-2200.899	0.000	-14.108	-14.108
3,10	0.000	-1956.573	-1956.573	0.000	-12.542	-12.542
4,11	0.000	-1862.916	-1862.916	0.000	-11.942	-11.942
5,12	0.000	-1956.442	-1956.442	0.000	-12.541	-12.541
6,13	0.000	-2200.630	-2200.630	0.000	-14.107	-14.107
7,14	0.000	-1242.009	-1242.009	0.000	-15.923	-15.923
8,9	0.000	-840.404	-840.404	0.000	-7.782	-7.782
8,15	0.000	-5829.727	-5829.727	0.000	-53.979	-53.979
9,10	1415.239	0.000	1415.239	13.104	0.000	13.104
10,11	1044.955	0.000	1044.955	9.676	0.000	9.676
11,12	1044.932	0.000	1044.932	9.675	0.000	9.675
12,13	1415.107	0.000	1415.107	13.103	0.000	13.103
13,14	0.000	-840.404	-840.404	0.000	-7.782	-7.782
14,16	0.000	-5829.280	-5829.280	0.000	-53.975	-53.975
15,17	0.000	-5659.102	-5659.102	0.000	-52.399	-52.399
16,18	0.000	-5658.655	-5658.655	0.000	-52.395	-52.395
17,19	0.000	-5488.477	-5488.477	0.000	-50.819	-50.819
18,20	0.000	-5488.030	-5488.030	0.000	-50.815	-50.815
19,21	0.000	-5317.852	-5317.852	0.000	-49.239	-49.239
20,22	0.000	-5317.405	-5317.405	0.000	-49.235	-49.235
21,23	0.000	-5147.227	-5147.227	0.000	-47.660	-47.660
22,24	0.000	-5146.780	-5146.780	0.000	-47.655	-47.655
23,25	0.000	-4976.602	-4976.602	0.000	-46.080	-46.080
24,31	0.000	-4976.155	-4976.155	0.000	-46.076	-46.076
25,26	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
26,27	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
27,28	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
28,29	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
29,30	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179
30,31	0.000	-1207.374	-1207.374	0.000	-11.179	-11.179

Soil - 2.0.1.1
RUE = 13.1
= 1.427

SOUTH SIDE $\frac{5}{2121} S$

*** POSITIVE PROJECTION EMBANKMENT. FIG 4.2. INCOMPLETE

$$W_c = C_c W B_c^2$$

$$\frac{H}{B_c} = \frac{10.43}{8} = 1.30375$$

$$W_c = (1.026) (115) (8)^2$$

$$W_c = 7550 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = \frac{7550}{8} = 944 \text{ lb/ft}^2$$

$$\sigma_v = 944 \text{ lb/ft}^2$$

$$\sigma_h = 278 \text{ lb/ft}^2$$

$$C_c = \frac{e^{\frac{\pm 2K\mu(H/B_c)}{\pm 2K\mu}} - 1}{\pm 2K\mu}$$

$$= \frac{e^{-2(0.1914)(1.30375)} - 1}{-2(0.1914)}$$

(COMPLETE PROJECTION FIG 4.11)
 $C_c \approx 2.1$

$$C_c = 1.026$$

TUNNEL SECTION 5 21 21	STRUCTURAL ASSESSMENT			
	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
Moment Capacity Design of beam for flexural loads is based on: $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ for nominal beam strength and where $\phi = 0.9$ $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	ROOF STRUCTURE	<u>10,336</u> ft-lbs	<u>4587</u> ft-lbs	
	FLOOR STRUCTURE	<u>10,336</u> ft-lbs	<u>5097</u> ft-lbs	
	LEFT INSIDE WALL	<u>6877</u> ft-lbs	<u>-</u> ft-lbs	
	LEFT OUTSIDE WALL	<u>8672</u> ft-lbs	<u>3591</u> ft-lbs	
	RIGHT INSIDE WALL	<u>6877</u> ft-lbs	<u>-</u> ft-lbs	
	RIGHT OUTSIDE WALL	<u>8672</u> ft-lbs	<u>3591</u> ft-lbs	
Shear Capacity Design shear load is computed by ACI 318-89 (11-3) $V_c = 2\sqrt{f'_c} B \cdot d$ When factored $\phi V_n = \phi V_c$ where $\phi = 0.85$ $\phi V_c = (0.85) 2\sqrt{f'_c} B \cdot d$	ROOF STRUCTURE	<u>8872</u> lbs	<u>4805</u> lbs	
	FLOOR STRUCTURE	<u>8872</u> lbs	<u>4758</u> lbs	
	LEFT WALL	<u>8872</u> lbs	<u>1322</u> lbs	
	RIGHT WALL	<u>8872</u> lbs	<u>1322</u> lbs	
Axial Capacity Design axial load ϕP_n is computed by ACI 318-89 (14-1) $\phi P_n = 0.55 \phi f'_c A_g \left[1 - \left(\frac{kl_c}{32h} \right)^2 \right]$ where $\phi = 0.7$	LEFT WALL	<u>115,116</u> lbs	<u>5827</u> lbs	
	RIGHT WALL	<u>115,116</u> lbs	<u>5827</u> lbs	
Loading Conditions <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>$D_1 = D + D_2$</p> <p>$B = \underline{8}$ ft. $D_2 = \underline{8}$ ft.</p> <p>$D_1 = \underline{10.42}$ ft. $D = \underline{18.42}$ ft.</p> </div> <div style="text-align: center;"> <p>$\sigma_v = D_1 \rho$</p> <p>$\sigma_h = k \sigma_v$</p> <p>$B = \underline{8}$ ft.</p> </div> <div style="text-align: right;"> <p>where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$</p> <p>$k = \underline{0.2948}$</p> <p>* BUILDING (820') ELEVATION</p> <p>$\sigma_v = D_1 \rho$ <u>944</u> lbs/ft²</p> <p>$\sigma_h = k \sigma_v$ <u>278</u> lbs/ft²</p> </div> </div>				

Figure() Structural Assessment Summary

Pye Construction Technologies, Inc.

COMPUTATIONAL BRIEF

No: CB-1010-5(2/8)

TITLE: Structural Assessment of Tunnel Section 5(2/1) when
covered with a 30 ft tuff berm used as shielding in the
event of a beam spill in this section of tunnel.

PROJECT: Remedial Shielding Concepts for Line D and Line D
Facilities. Los Alamos Meson Physics Facility,
Los Alamos National Laboratory, Los Alamos N.M.

TECHNICAL SUMMARY OF COMPUTATIONAL BRIEF

Tunnel Section 5(2/8) is subject to vertical and horizontal loads,
estimated as 115 lbs/ft² for each 1 ft of overburden and horizontal loads
equivalent to 0.2948 of the vertical load, due to the weight of a tuff berm
placed over the structure. The profile of the berm is based on preliminary
shielding assessments. Shear, axial and bending stresses are determined with
the associated tunnel deformations

PREPARED BY: John H. Pye

DATE: 5/6/93

CHECKED BY: _____

DATE: _____

Number of Pages Including Title Page 24

Figure() Section 5(2/8) Trench Excavation and Backfill Configuration

FRAME MAC file: 5(2/8) S EMBANK; Last modified at 21:34:19 on Thu, May 6, 1993

FRAME MAC file: 5(2/8) S EMBANK; Last modified at 21:34:19 on Thu, May 6, 1993

FRAME MAC file: 5(2/8) S EMBANK; Last modified at 21:34:19 on Thu, May 6, 1993

Node 35	Node 36	Node 37	Node 38	Node 39	Node 40	Node 41	Node 42	Node 43	Node 44	Node 45
4.500	5.500	6.500	7.500	8.500	9.500	10.500	11.500	12.500	13.500	14.500
14.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000	14.000
---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 5(2/8) S EMBANK.

Last modified at 21:34:19 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
35	0.001	-0.088	-0.001
36	0.000	-0.098	-0.001
37	0.000	-0.108	-0.001
38	0.000	-0.117	-0.001
39	0.000	-0.124	-0.000
40	0.000	-0.126	0.000
41	-0.000	-0.124	0.000
42	-0.000	-0.117	0.001
43	-0.000	-0.108	0.001
44	-0.000	-0.098	0.001
45	-0.001	-0.088	0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
35,36	0.000	1134.000	189.000	0.000	1134.000	-189.000
36,37	0.000	1134.000	189.000	0.000	1134.000	-189.000
37,38	0.000	1134.000	189.000	0.000	1134.000	-189.000
38,39	0.000	1134.000	189.000	0.000	1134.000	-189.000
39,40	0.000	1134.000	189.000	0.000	1134.000	-189.000
40,41	0.000	1134.000	189.000	0.000	1134.000	-189.000
41,42	0.000	1134.000	189.000	0.000	1134.000	-189.000
42,43	0.000	1134.000	189.000	0.000	1134.000	-189.000
43,44	0.000	1134.000	189.000	0.000	1134.000	-189.000
44,45	0.000	1134.000	189.000	0.000	1134.000	-189.000

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
35,36	4268.090	11340.000	13706.303	-4268.090	-9072.000	-3500.303
36,37	4268.090	9072.000	3500.303	-4268.090	-6804.000	4437.697
37,38	4268.090	6804.000	-4437.697	-4268.090	-4536.000	10107.697
38,39	4268.090	4536.000	-10107.697	-4268.090	-2268.000	13509.697
39,40	4268.090	2268.000	-13509.697	-4268.090	0.000	14643.697
40,41	4268.090	0.000	-14643.697	-4268.090	2268.000	13509.697
41,42	4268.090	-2268.000	-13509.697	-4268.090	4536.000	10107.697
42,43	4268.090	-4536.000	-10107.697	-4268.090	6804.000	4437.697
43,44	4268.090	-6804.000	-4437.697	-4268.090	9072.000	-3500.303
44,45	4268.090	-9072.000	3500.303	-4268.090	11340.000	-13706.303

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
35,36	0.001	-0.088	-0.001	0.000	-0.098	-0.001
36,37	0.000	-0.098	-0.001	0.000	-0.108	-0.001
37,38	0.000	-0.108	-0.001	0.000	-0.117	-0.001
38,39	0.000	-0.117	-0.001	0.000	-0.124	-0.000
39,40	0.000	-0.124	-0.000	0.000	-0.126	0.000
40,41	0.000	-0.126	0.000	-0.000	-0.124	0.000
41,42	-0.000	-0.124	0.000	-0.000	-0.117	0.001
42,43	-0.000	-0.117	0.001	-0.000	-0.108	0.001
43,44	-0.000	-0.108	0.001	-0.000	-0.098	0.001
44,45	-0.000	-0.098	0.001	-0.001	-0.088	0.001

Maximum deformations:

Node 45 moved 0.001 inch to the left.

Node 35 moved 0.001 inch to the right.

Node 40 moved 0.126 inch downwards.
 No nodes moved upwards.
 Node 36 rotated 0.001 radian clockwise.
 Node 44 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
35,36	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
36,37	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
37,38	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
38,39	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
39,40	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
40,41	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
41,42	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
42,43	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
43,44	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
44,45	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
35,36	11340.000	0.000	11340.000	78.750	0.000	78.750
36,37	9072.000	0.000	9072.000	63.000	0.000	63.000
37,38	6804.000	0.000	6804.000	47.250	0.000	47.250
38,39	4536.000	0.000	4536.000	31.500	0.000	31.500
39,40	2268.000	0.000	2268.000	15.750	0.000	15.750
40,41	0.000	-2268.000	-2268.000	0.000	-15.750	-15.750
41,42	0.000	-4536.000	-4536.000	0.000	-31.500	-31.500
42,43	0.000	-6804.000	-6804.000	0.000	-47.250	-47.250
43,44	0.000	-9072.000	-9072.000	0.000	-63.000	-63.000
44,45	0.000	-11340.000	-11340.000	0.000	-78.750	-78.750

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
35,36	0.000	-13706.303	-13706.303	0.000	-571.096	-571.096
36,37	4437.697	-3500.303	4437.697	184.904	-145.846	184.904
37,38	10107.697	0.000	10107.697	421.154	0.000	421.154
38,39	13509.697	0.000	13509.697	562.904	0.000	562.904
39,40	14643.697	0.000	14643.697	610.154	0.000	610.154
40,41	14643.697	0.000	14643.697	610.154	0.000	610.154
41,42	13509.697	0.000	13509.697	562.904	0.000	562.904
42,43	10107.697	0.000	10107.697	421.154	0.000	421.154
43,44	4437.697	-3500.303	4437.697	184.904	-145.846	184.904
44,45	0.000	-13706.303	-13706.303	0.000	-571.096	-571.096

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
35,36	0.000	-0.098	-0.098
36,37	0.000	-0.108	-0.108
37,38	0.000	-0.117	-0.117
38,39	0.000	-0.124	-0.124
39,40	0.000	-0.126	-0.126
40,41	0.000	-0.126	-0.126
41,42	0.000	-0.124	-0.124

42,43	0.000	-0.117	-0.117
43,44	0.000	-0.108	-0.108
44,45	0.000	-0.098	-0.098

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	-0.001	-0.098
2.000	-0.001	-0.108
3.000	-0.001	-0.117
4.000	-0.000	-0.124
5.000	0.000	-0.126
6.000	0.000	-0.124
7.000	0.001	-0.117
8.000	0.001	-0.108
9.000	0.001	-0.098
At evenly-spaced intervals:		
0.000	-0.001	-0.088
1.000	-0.001	-0.098
2.000	-0.001	-0.108
3.000	-0.001	-0.117
4.000	-0.000	-0.124
5.000	0.000	-0.126
6.000	0.000	-0.124
7.000	0.001	-0.117
8.000	0.001	-0.108
9.000	0.001	-0.098
10.000	0.001	-0.088

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Node 12	Node 13	Node 14	Node 15	Node 16	Node 17	Node 18	Node 19	Node 20	Node 21	Node 22
4.500	5.500	6.500	7.500	8.500	9.500	10.500	11.500	12.500	13.500	14.500
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
---	---	---	---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 5(2/8) S EMBANK.

Last modified at 21:34:19 on Thu, May 6, 1993.

All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
12	-0.000	-0.084	0.001
13	-0.000	-0.075	0.001
14	-0.000	-0.065	0.001
15	-0.000	-0.056	0.001
16	-0.000	-0.051	0.000
17	0.000	-0.049	0.000
18	0.000	-0.051	-0.000
19	0.000	-0.056	-0.001
20	0.000	-0.065	-0.001
21	0.000	-0.075	-0.001
22	0.000	-0.084	-0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
12,13	0.000	105.000	17.500	0.000	105.000	-17.500
13,14	0.000	105.000	17.500	0.000	105.000	-17.500
14,15	0.000	105.000	17.500	0.000	105.000	-17.500
15,16	0.000	105.000	17.500	0.000	105.000	-17.500
16,17	0.000	105.000	17.500	0.000	105.000	-17.500
17,18	0.000	105.000	17.500	0.000	105.000	-17.500
18,19	0.000	105.000	17.500	0.000	105.000	-17.500
19,20	0.000	105.000	17.500	0.000	105.000	-17.500
20,21	0.000	105.000	17.500	0.000	105.000	-17.500
21,22	0.000	105.000	17.500	0.000	105.000	-17.500

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
12,13	2611.115	-10655.858	-13454.604	-2611.115	10865.858	2693.746
13,14	779.500	-7629.768	-2805.821	-779.500	7839.768	-4928.947
14,15	-848.930	-5034.298	4826.470	848.930	5244.298	-9965.768
15,16	-2033.911	-2811.840	9889.770	2033.911	3021.840	-12806.610
16,17	-2651.928	-838.270	12766.523	2651.928	1048.270	-13709.793
17,18	-2651.928	1048.270	13709.793	2651.928	-838.270	-12766.523
18,19	-2033.911	3021.840	12806.610	2033.911	-2811.840	-9889.770
19,20	-848.930	5244.298	9965.768	848.930	-5034.298	-4826.470
20,21	779.500	7839.768	4928.947	-779.500	-7629.768	2805.821
21,22	2611.115	10865.858	-2693.746	-2611.115	-10655.858	13454.604

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
12,13	-0.000	-0.084	0.001	-0.000	-0.075	0.001
13,14	-0.000	-0.075	0.001	-0.000	-0.065	0.001
14,15	-0.000	-0.065	0.001	-0.000	-0.056	0.001
15,16	-0.000	-0.056	0.001	-0.000	-0.051	0.000
16,17	-0.000	-0.051	0.000	0.000	-0.049	0.000
17,18	0.000	-0.049	0.000	0.000	-0.051	-0.000
18,19	0.000	-0.051	-0.000	0.000	-0.056	-0.001
19,20	0.000	-0.056	-0.001	0.000	-0.065	-0.001
20,21	0.000	-0.065	-0.001	0.000	-0.075	-0.001
21,22	0.000	-0.075	-0.001	0.000	-0.084	-0.001

Maximum deformations:

Node 14 moved 0.000 inch to the left.

Node 20 moved 0.000 inch to the right.

Node 12 moved 0.084 inch downwards.
 No nodes moved upwards.
 Node 21 rotated 0.001 radian clockwise.
 Node 13 rotated 0.001 radian counter-clockwise.

 Maximum reactions:

There were no reactions to the left.
 There were no reactions to the right.
 There were no downwards reactions.
 There were no upwards reactions.
 There were no clockwise reactions.
 There were no counter-clockwise reactions.

 Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
12,13	0.000	-2611.115	-2611.115	0.000	-18.133	-18.133
13,14	0.000	-779.500	-779.500	0.000	-5.413	-5.413
14,15	848.930	0.000	848.930	5.895	0.000	5.895
15,16	2033.911	0.000	2033.911	14.124	0.000	14.124
16,17	2651.928	0.000	2651.928	18.416	0.000	18.416
17,18	2651.928	0.000	2651.928	18.416	0.000	18.416
18,19	2033.911	0.000	2033.911	14.124	0.000	14.124
19,20	848.930	0.000	848.930	5.895	0.000	5.895
20,21	0.000	-779.500	-779.500	0.000	-5.413	-5.413
21,22	0.000	-2611.115	-2611.115	0.000	-18.133	-18.133

 Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	lb	lb	lb	psi	psi	psi
12,13	0.000	-10865.858	-10865.858	0.000	-75.457	-75.457
13,14	0.000	-7839.768	-7839.768	0.000	-54.443	-54.443
14,15	0.000	-5244.298	-5244.298	0.000	-36.419	-36.419
15,16	0.000	-3021.840	-3021.840	0.000	-20.985	-20.985
16,17	0.000	-1048.270	-1048.270	0.000	-7.280	-7.280
17,18	1048.270	0.000	1048.270	7.280	0.000	7.280
18,19	3021.840	0.000	3021.840	20.985	0.000	20.985
19,20	5244.298	0.000	5244.298	36.419	0.000	36.419
20,21	7839.768	0.000	7839.768	54.443	0.000	54.443
21,22	10865.858	0.000	10865.858	75.457	0.000	75.457

 Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	lb-ft	lb-ft	lb-ft	psi	psi	psi
12,13	13454.604	0.000	13454.604	560.608	0.000	560.608
13,14	2805.821	-4928.947	-4928.947	116.909	-205.373	-205.373
14,15	0.000	-9965.768	-9965.768	0.000	-415.240	-415.240
15,16	0.000	-12806.610	-12806.610	0.000	-533.609	-533.609
16,17	0.000	-13709.793	-13709.793	0.000	-571.241	-571.241
17,18	0.000	-13709.793	-13709.793	0.000	-571.241	-571.241
18,19	0.000	-12806.610	-12806.610	0.000	-533.609	-533.609
19,20	0.000	-9965.768	-9965.768	0.000	-415.240	-415.240
20,21	2805.821	-4928.947	-4928.947	116.909	-205.373	-205.373
21,22	13454.604	0.000	13454.604	560.608	0.000	560.608

 Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	inch	inch	inch
12,13	0.000	-0.084	-0.084
13,14	0.000	-0.075	-0.075
14,15	0.000	-0.065	-0.065
15,16	0.000	-0.056	-0.056
16,17	0.000	-0.051	-0.051
17,18	0.000	-0.051	-0.051
18,19	0.000	-0.056	-0.056

19,20	0.000	-0.065	-0.065
20,21	0.000	-0.075	-0.075
21,22	0.000	-0.084	-0.084

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation --- radian	Deflection --- inch

At the intermediate nodes:		
1.000	0.001	-0.075
2.000	0.001	-0.065
3.000	0.001	-0.056
4.000	0.000	-0.051
5.000	0.000	-0.049
6.000	-0.000	-0.051
7.000	-0.001	-0.056
8.000	-0.001	-0.065
9.000	-0.001	-0.075
At evenly-spaced intervals:		
0.000	0.001	-0.084
1.000	0.001	-0.075
2.000	0.001	-0.065
3.000	0.001	-0.056
4.000	0.000	-0.051
5.000	0.000	-0.049
6.000	-0.000	-0.051
7.000	-0.001	-0.056
8.000	-0.001	-0.065
9.000	-0.001	-0.075
10.000	-0.001	-0.084

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Node 12	Node 23	Node 25	Node 27	Node 29	Node 31	Node 33	Node 35
4.500	4.500	4.500	4.500	4.500	4.500	4.500	4.500
0.000	2.000	4.000	6.000	8.000	10.000	12.000	14.000
---	---	---	---	---	---	---	---

Continuous Elements Output Data

FRAME MAC file: 5(2/8) S EMBANK.

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All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
12	-0.000	-0.084	0.001
23	-0.009	-0.085	0.000
25	-0.009	-0.085	-0.000
27	-0.008	-0.086	-0.000
29	-0.009	-0.087	0.000
31	-0.009	-0.087	0.000
33	-0.008	-0.088	-0.000
35	0.001	-0.088	-0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
12,23	210.000	606.200	202.067	210.000	606.200	-202.067
23,25	210.000	606.200	202.067	210.000	606.200	-202.067
25,27	210.000	606.200	202.067	210.000	606.200	-202.067
27,29	210.000	606.200	202.067	210.000	606.200	-202.067
29,31	210.000	606.200	202.067	210.000	606.200	-202.067
31,33	210.000	606.200	202.067	210.000	606.200	-202.067
33,35	210.000	606.200	202.067	210.000	606.200	-202.067

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
12,23	14280.000	4218.710	13360.637	-13860.000	-3006.310	-6135.618
23,25	13860.000	3006.310	6135.618	-13440.000	-1793.910	-1335.398
25,27	13440.000	1793.910	1335.398	-13020.000	-581.510	1040.021
27,29	13020.000	581.510	-1040.021	-12600.000	630.890	990.640
29,31	12600.000	-630.890	-990.640	-12180.000	1843.290	-1483.541
31,33	12180.000	-1843.290	1483.541	-11760.000	3055.690	-6382.522
33,35	11760.000	-3055.690	6382.522	-11340.000	4268.090	-13706.303

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
12,23	-0.084	0.000	0.001	-0.085	0.009	0.000
23,25	-0.085	0.009	0.000	-0.085	0.009	-0.000
25,27	-0.085	0.009	-0.000	-0.086	0.008	-0.000
27,29	-0.086	0.008	-0.000	-0.087	0.009	0.000
29,31	-0.087	0.009	0.000	-0.087	0.009	0.000
31,33	-0.087	0.009	0.000	-0.088	0.008	-0.000
33,35	-0.088	0.008	-0.000	-0.088	-0.001	-0.001

Maximum deformations:

Node 31 moved 0.009 inch to the left.
Node 35 moved 0.001 inch to the right.
Node 35 moved 0.088 inch downwards.
No nodes moved upwards.
Node 35 rotated 0.001 radian clockwise.
Node 12 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
12,23	0.000	-14280.000	-14280.000	0.000	-99.167	-99.167
23,25	0.000	-13860.000	-13860.000	0.000	-96.250	-96.250
25,27	0.000	-13440.000	-13440.000	0.000	-93.333	-93.333
27,29	0.000	-13020.000	-13020.000	0.000	-90.417	-90.417
29,31	0.000	-12600.000	-12600.000	0.000	-87.500	-87.500
31,33	0.000	-12180.000	-12180.000	0.000	-84.583	-84.583
33,35	0.000	-11760.000	-11760.000	0.000	-81.667	-81.667

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
12,23	4218.710	0.000	4218.710	29.297	0.000	29.297
23,25	3006.310	0.000	3006.310	20.877	0.000	20.877
25,27	1793.910	0.000	1793.910	12.458	0.000	12.458
27,29	581.510	-630.890	-630.890	4.038	-4.381	-4.381
29,31	0.000	-1843.290	-1843.290	0.000	-12.801	-12.801
31,33	0.000	-3055.690	-3055.690	0.000	-21.220	-21.220
33,35	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640

Maximum moment and bending stress values:

From, To Node ---	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
12,23	0.000	-13360.637	-13360.637	0.000	-556.693	-556.693
23,25	0.000	-6135.618	-6135.618	0.000	-255.651	-255.651
25,27	1040.021	-1335.398	-1335.398	43.334	-55.642	-55.642
27,29	1318.933	0.000	1318.933	54.956	0.000	54.956
29,31	990.640	-1483.541	-1483.541	41.277	-61.814	-61.814
31,33	0.000	-6382.522	-6382.522	0.000	-265.938	-265.938
33,35	0.000	-13706.303	-13706.303	0.000	-571.096	-571.096

Maximum deflection values:

From, To Node ---	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
12,23	0.009	0.000	0.009
23,25	0.010	0.000	0.010
25,27	0.009	0.000	0.009
27,29	0.009	0.000	0.009
29,31	0.009	0.000	0.009
31,33	0.010	0.000	0.010
33,35	0.008	-0.001	0.008

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
--------------------------------------	--------------------	--------------------

At the intermediate nodes:

2.000	0.000	0.009
4.000	-0.000	0.009
6.000	-0.000	0.008
8.000	0.000	0.009
10.000	0.000	0.009
12.000	-0.000	0.008

At evenly-spaced intervals:

0.000	0.001	0.000
1.400	0.000	0.007
2.800	0.000	0.009
4.200	-0.000	0.009
5.600	-0.000	0.009
7.000	0.000	0.008

8.400	0.000	0.009
9.800	0.000	0.009
11.200	-0.000	0.009
12.600	-0.000	0.007
14.000	-0.001	-0.001

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Node 22
14.500
0.000

Node 24
14.500
2.000

Node 26
14.500
4.000

Node 28
14.500
6.000

Node 30
14.500
8.000

Node 32
14.500
10.000

Node 34
14.500
12.000

Node 45
14.500
14.000

Load

F: lb
D: lb/ft
M: lb-ft
E: psi

Tension

0.000
lb

-14280.000
4268.090

17

Shear

lb

-4218.710
13706.303

Moment

lb-ft
-1318.933

Defl.

0.001
Inch

-0.010

Distance 0.000

L/6

2.800

L/4

L/3

5.600

L/2

8.400

2L/3

11.200

3L/4

14.000

ft

Continuous Elements Output Data

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All coord. and distances are in ft from the left (bot.) end of the element.

Support reactions: (pos. force is to right or up; pos. moment is ccw.)

Node No.	Reaction lb (FX)	Reaction lb (FY)	Reaction lb-ft (MZ)
-------------	---------------------	---------------------	------------------------

Node deformations: (positive is to right, up, or counterclockwise.)

Node No.	Deflection inch (FX)	Deflection inch (FY)	Rotation radians (MZ)
22	0.000	-0.084	-0.001
24	0.009	-0.085	-0.000
26	0.009	-0.085	0.000
28	0.008	-0.086	0.000
30	0.009	-0.087	-0.000
32	0.009	-0.087	-0.000
34	0.008	-0.088	0.000
45	-0.001	-0.088	0.001

Element fixed-end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
22,24	210.000	-606.200	-202.067	210.000	-606.200	202.067
24,26	210.000	-606.200	-202.067	210.000	-606.200	202.067
26,28	210.000	-606.200	-202.067	210.000	-606.200	202.067
28,30	210.000	-606.200	-202.067	210.000	-606.200	202.067
30,32	210.000	-606.200	-202.067	210.000	-606.200	202.067
32,34	210.000	-606.200	-202.067	210.000	-606.200	202.067
34,45	210.000	-606.200	-202.067	210.000	-606.200	202.067

Actual element end forces & moments: (local coordinate system)

From, To Nodes	FxL lb	FyL lb	MzL lb-ft	FxR lb	FyR lb	MzR lb-ft
22,24	14280.000	-4218.710	-13360.637	-13860.000	3006.310	6135.618
24,26	13860.000	-3006.310	-6135.618	-13440.000	1793.910	1335.398
26,28	13440.000	-1793.910	-1335.398	-13020.000	581.510	-1040.021
28,30	13020.000	-581.510	1040.021	-12600.000	-630.890	-990.640
30,32	12600.000	630.890	990.640	-12180.000	-1843.290	1483.541
32,34	12180.000	1843.290	-1483.541	-11760.000	-3055.690	6382.522
34,45	11760.000	3055.690	-6382.522	-11340.000	-4268.090	13706.303

Member end deformations: (local coordinate system)

From, To Nodes	dx at L inch	dy at L inch	rotZ at L radians	dx at R inch	dy at R inch	rotZ at R radians
22,24	-0.084	-0.000	-0.001	-0.085	-0.009	-0.000
24,26	-0.085	-0.009	-0.000	-0.085	-0.009	0.000
26,28	-0.085	-0.009	0.000	-0.086	-0.008	0.000
28,30	-0.086	-0.008	0.000	-0.087	-0.009	-0.000
30,32	-0.087	-0.009	-0.000	-0.087	-0.009	-0.000
32,34	-0.087	-0.009	-0.000	-0.088	-0.008	0.000
34,45	-0.088	-0.008	0.000	-0.088	0.001	0.001

Maximum deformations:

Node 45 moved 0.001 inch to the left.
Node 32 moved 0.009 inch to the right.
Node 45 moved 0.088 inch downwards.
No nodes moved upwards.
Node 22 rotated 0.001 radian clockwise.
Node 45 rotated 0.001 radian counter-clockwise.

Maximum reactions:

There were no reactions to the left.
There were no reactions to the right.
There were no downwards reactions.
There were no upwards reactions.
There were no clockwise reactions.
There were no counter-clockwise reactions.

Maximum tension and tensile stress values (compression is negative):

From, To Node	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
---	---	---	---	---	---	---
22,24	0.000	-14280.000	-14280.000	0.000	-99.167	-99.167
24,26	0.000	-13860.000	-13860.000	0.000	-96.250	-96.250
26,28	0.000	-13440.000	-13440.000	0.000	-93.333	-93.333
28,30	0.000	-13020.000	-13020.000	0.000	-90.417	-90.417
30,32	0.000	-12600.000	-12600.000	0.000	-87.500	-87.500
32,34	0.000	-12180.000	-12180.000	0.000	-84.583	-84.583
34,45	0.000	-11760.000	-11760.000	0.000	-81.667	-81.667

Maximum shear and shear stress values:

From, To Node	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
---	---	---	---	---	---	---
22,24	0.000	-4218.710	-4218.710	0.000	-29.297	-29.297
24,26	0.000	-3006.310	-3006.310	0.000	-20.877	-20.877
26,28	0.000	-1793.910	-1793.910	0.000	-12.458	-12.458
28,30	630.890	-581.510	630.890	4.381	-4.038	4.381
30,32	1843.290	0.000	1843.290	12.801	0.000	12.801
32,34	3055.690	0.000	3055.690	21.220	0.000	21.220
34,45	4268.090	0.000	4268.090	29.640	0.000	29.640

Maximum moment and bending stress values:

From, To Node	Maximum moment lb-ft	Minimum moment lb-ft	Max. abs. moment lb-ft	Maximum ben. str. psi	Minimum ben. str. psi	Max. abs. stress psi
---	---	---	---	---	---	---
22,24	13360.637	0.000	13360.637	556.693	0.000	556.693
24,26	6135.618	0.000	6135.618	255.651	0.000	255.651
26,28	1335.398	-1040.021	1335.398	55.642	-43.334	55.642
28,30	0.000	-1318.933	-1318.933	0.000	-54.956	-54.956
30,32	1483.541	-990.640	1483.541	61.814	-41.277	61.814
32,34	6382.522	0.000	6382.522	265.938	0.000	265.938
34,45	13706.303	0.000	13706.303	571.096	0.000	571.096

Maximum deflection values:

From, To Node	Maximum defl. up (left) inch	Maximum defl. down (rt.) inch	Maximum defl. absolute inch
---	---	---	---
22,24	0.000	-0.009	-0.009
24,26	0.000	-0.010	-0.010
26,28	0.000	-0.009	-0.009
28,30	0.000	-0.009	-0.009
30,32	0.000	-0.009	-0.009
32,34	0.000	-0.010	-0.010
34,45	0.001	-0.008	-0.008

Deflections along the elements (positive is up or counter-clockwise):

Distance from left (bottom) ft	Rotation radian	Deflection inch
---	---	---

At the intermediate nodes:

2.000	-0.000	-0.009
4.000	0.000	-0.009
6.000	0.000	-0.008
8.000	-0.000	-0.009
10.000	-0.000	-0.009
12.000	0.000	-0.008

At evenly-spaced intervals:

0.000	-0.001	-0.000
1.400	-0.000	-0.007
2.800	-0.000	-0.009
4.200	0.000	-0.009
5.600	0.000	-0.009
7.000	-0.000	-0.008

8.400	-0.000	-0.009
9.800	-0.000	-0.009
11.200	0.000	-0.009
12.600	0.000	-0.007
14.000	0.001	0.001

Output Data

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All coord. and distances are in ft from the left (bot.) end of the element.

Maximum tension and tensile stress values (compression is negative):

From, To Node ---	Maximum tension lb	Minimum tension lb	Max. abs. tension lb	Maximum ten. str. psi	Minimum ten. str. psi	Max. abs. stress psi
1,12	0.000	-3624.142	-3624.142	0.000	-25.168	-25.168
2,13	0.000	-3236.090	-3236.090	0.000	-22.473	-22.473
3,14	0.000	-2805.470	-2805.470	0.000	-19.482	-19.482
4,15	0.000	-2432.458	-2432.458	0.000	-16.892	-16.892
5,16	0.000	-2183.570	-2183.570	0.000	-15.164	-15.164
6,17	0.000	-2096.540	-2096.540	0.000	-14.559	-14.559
7,18	0.000	-2183.570	-2183.570	0.000	-15.164	-15.164
8,19	0.000	-2432.458	-2432.458	0.000	-16.892	-16.892
9,20	0.000	-2805.470	-2805.470	0.000	-19.482	-19.482
10,21	0.000	-3236.090	-3236.090	0.000	-22.473	-22.473
11,22	0.000	-3624.142	-3624.142	0.000	-25.168	-25.168
12,13	0.000	-2611.115	-2611.115	0.000	-18.133	-18.133
12,23	0.000	-14280.000	-14280.000	0.000	-99.167	-99.167
13,14	0.000	-779.500	-779.500	0.000	-5.413	-5.413
14,15	848.930	0.000	848.930	5.895	0.000	5.895
15,16	2033.911	0.000	2033.911	14.124	0.000	14.124
16,17	2651.928	0.000	2651.928	18.416	0.000	18.416
17,18	2651.928	0.000	2651.928	18.416	0.000	18.416
18,19	2033.911	0.000	2033.911	14.124	0.000	14.124
19,20	848.930	0.000	848.930	5.895	0.000	5.895
20,21	0.000	-779.500	-779.500	0.000	-5.413	-5.413
21,22	0.000	-2611.115	-2611.115	0.000	-18.133	-18.133
22,24	0.000	-14280.000	-14280.000	0.000	-99.167	-99.167
23,25	0.000	-13860.000	-13860.000	0.000	-96.250	-96.250
24,26	0.000	-13860.000	-13860.000	0.000	-96.250	-96.250
25,27	0.000	-13440.000	-13440.000	0.000	-93.333	-93.333
26,28	0.000	-13440.000	-13440.000	0.000	-93.333	-93.333
27,29	0.000	-13020.000	-13020.000	0.000	-90.417	-90.417
28,30	0.000	-13020.000	-13020.000	0.000	-90.417	-90.417
29,31	0.000	-12600.000	-12600.000	0.000	-87.500	-87.500
30,32	0.000	-12600.000	-12600.000	0.000	-87.500	-87.500
31,33	0.000	-12180.000	-12180.000	0.000	-84.583	-84.583
32,34	0.000	-12180.000	-12180.000	0.000	-84.583	-84.583
33,35	0.000	-11760.000	-11760.000	0.000	-81.667	-81.667
34,45	0.000	-11760.000	-11760.000	0.000	-81.667	-81.667
35,36	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
36,37	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
37,38	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
38,39	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
39,40	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
40,41	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
41,42	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
42,43	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
43,44	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
44,45	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640

SOIL ELEMENT
AVL: 19.17/1 = 13.70P
1972 : 7

Maximum shear and shear stress values:

From, To Node ---	Maximum shear lb	Minimum shear lb	Max. abs. shear lb	Maximum shr. str. psi	Minimum shr. str. psi	Max. abs. stress psi
1,12	1607.594	0.000	1607.594	11.164	0.000	11.164
2,13	1831.615	0.000	1831.615	12.720	0.000	12.720
3,14	1628.430	0.000	1628.430	11.309	0.000	11.309
4,15	1184.981	0.000	1184.981	8.229	0.000	8.229
5,16	618.017	0.000	618.017	4.292	0.000	4.292
6,17	0.000	0.000	0.000	0.000	0.000	0.000
7,18	0.000	-618.017	-618.017	0.000	-4.292	-4.292
8,19	0.000	-1184.981	-1184.981	0.000	-8.229	-8.229
9,20	0.000	-1628.430	-1628.430	0.000	-11.309	-11.309
10,21	0.000	-1831.615	-1831.615	0.000	-12.720	-12.720
11,22	0.000	-1607.594	-1607.594	0.000	-11.164	-11.164
12,13	0.000	-10865.858	-10865.858	0.000	-75.457	-75.457
12,23	4218.710	0.000	4218.710	29.297	0.000	29.297

13,14	0.000	-7839.768	-7839.768	0.000	-54.443	-54.443
14,15	0.000	-5244.298	-5244.298	0.000	-36.419	-36.419
15,16	0.000	-3021.840	-3021.840	0.000	-20.985	-20.985
16,17	0.000	-1048.270	-1048.270	0.000	-7.280	-7.280
17,18	1048.270	0.000	1048.270	7.280	0.000	7.280
18,19	3021.840	0.000	3021.840	20.985	0.000	20.985
19,20	5244.298	0.000	5244.298	36.419	0.000	36.419
20,21	7839.768	0.000	7839.768	54.443	0.000	54.443
21,22	10865.858	0.000	10865.858	75.457	0.000	75.457
22,24	0.000	-4218.710	-4218.710	0.000	-29.297	-29.297
23,25	3006.310	0.000	3006.310	20.877	0.000	20.877
24,26	0.000	-3006.310	-3006.310	0.000	-20.877	-20.877
25,27	1793.910	0.000	1793.910	12.458	0.000	12.458
26,28	0.000	-1793.910	-1793.910	0.000	-12.458	-12.458
27,29	581.510	-630.890	-630.890	4.038	-4.381	-4.381
28,30	630.890	-581.510	630.890	4.381	-4.038	4.381
29,31	0.000	-1843.290	-1843.290	0.000	-12.801	-12.801
30,32	1843.290	0.000	1843.290	12.801	0.000	12.801
31,33	0.000	-3055.690	-3055.690	0.000	-21.220	-21.220
32,34	3055.690	0.000	3055.690	21.220	0.000	21.220
33,35	0.000	-4268.090	-4268.090	0.000	-29.640	-29.640
34,45	4268.090	0.000	4268.090	29.640	0.000	29.640
35,36	11340.000	0.000	11340.000	78.750	0.000	78.750
36,37	9072.000	0.000	9072.000	63.000	0.000	63.000
37,38	6804.000	0.000	6804.000	47.250	0.000	47.250
38,39	4536.000	0.000	4536.000	31.500	0.000	31.500
39,40	2268.000	0.000	2268.000	15.750	0.000	15.750
40,41	0.000	-2268.000	-2268.000	0.000	-15.750	-15.750
41,42	0.000	-4536.000	-4536.000	0.000	-31.500	-31.500
42,43	0.000	-6804.000	-6804.000	0.000	-47.250	-47.250
43,44	0.000	-9072.000	-9072.000	0.000	-63.000	-63.000
44,45	0.000	-11340.000	-11340.000	0.000	-78.750	-78.750

SOUTH SECTION
5(2/8)

*** POSITIVE PROJECTION EMBANKMENT FIG 4.2

$$W_c = C_c W B_c^2$$

$$\frac{H}{B_c} = \frac{10.57}{11} = 0.9609$$

$$W_c = 0.8 (115)(11)^2$$

$$= 11187.5 \text{ lb/ft}$$

$$\frac{W_c}{B_c} = 1017 \text{ lb/ft}^2$$

$$\sigma_v = 1017 \text{ lb/ft}^2$$

$$\sigma_H = 300 \text{ lb/ft}^2$$

$$C_c = \frac{e^{-2K\mu(H/B_c)} - 1}{-2K\mu}$$

$$= \frac{e^{-(2 \times 0.1914)(0.9609)} - 1}{-2(0.1914)}$$

$$C_c = 0.804$$

INCOMPLETE PROJ.

$$W_c = 1.16 (115)(11)^2$$

$$\text{FOR } \frac{H}{B_c} = \frac{10.57}{11} = 0.96$$

$$C_c = \frac{e^{+2K\mu(H/B_c)} - 1}{2K\mu}$$

$$W_c = 16161$$

$$\frac{W_c}{B_c} = 1469 \text{ lb/ft}^2$$

$$= \frac{e^{2(0.1914)(0.9609)} - 1}{2(0.1914)}$$

$$C_c = 1.16 \checkmark$$

$$\left\{ \begin{array}{l} \sigma_v = 1470 \text{ lb/ft}^2 \\ \sigma_H = 433 \text{ lb/ft}^2 \end{array} \right\}$$

TUNNEL SECTION	EMBANKMENT			
PAGE ____ OF ____	TUNNEL ELEMENT	ACI 318-89	VALUE FROM MODEL	COMPLIANCE
<div style="text-align: center; border: 1px solid black; width: 40px; margin: 0 auto; padding: 5px;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto; display: flex; align-items: center; justify-content: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; display: flex; align-items: center; justify-content: center;">5</div> <div style="width: 10px; height: 10px; border: 1px solid black; display: flex; align-items: center; justify-content: center;">8</div> </div> </div> <p>Moment Capacity</p> <p>Design of beam for flexural loads is based on:</p> $\phi M_n = \phi \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$ <p>for nominal beam strength and where $\phi = 0.9$</p> $\phi M_n = 0.9 \left[A_s f_y \left(d - \frac{a}{2} \right) \right]$	<p>ROOF STRUCTURE</p> <p>FLOOR STRUCTURE</p> <p>LEFT INSIDE WALL</p> <p>LEFT OUTSIDE WALL</p> <p>RIGHT INSIDE WALL</p> <p>RIGHT OUTSIDE WALL</p>	<p>29,094 ft-lbs</p> <p>29,094 ft-lbs</p> <p>14,686 ft-lbs</p> <p>12,820 ft-lbs</p> <p>14,686 ft-lbs</p> <p>12,820 ft-lbs</p>	<p>14,643 ft-lbs</p> <p>13,709 ft-lbs</p> <p>— ft-lbs</p> <p>13,706 ft-lbs</p> <p>— ft-lbs</p> <p>13,706 ft-lbs</p>	
<p>Shear Capacity</p> <p>Design shear load is computed by ACI 318-89 (11-3)</p> $V_c = 2 \sqrt{f'_c} B d$ <p>When factored $\phi V_n = \phi V_c$</p> <p>where $\phi = 0.85$</p> $\phi V_c = (0.85) 2 \sqrt{f'_c} B d$	<p>ROOF STRUCTURE</p> <p>FLOOR STRUCTURE</p> <p>LEFT WALL</p> <p>RIGHT WALL</p>	<p>12,222 lbs</p> <p>12,222 lbs</p> <p>12,222 lbs</p> <p>12,222 lbs</p>	<p>11,343 lbs</p> <p>10,866 lbs</p> <p>4268 lbs</p> <p>4268 lbs</p>	
<p>Axial Capacity</p> <p>Design axial load ϕP_n is computed by ACI 318-89 (14-1)</p> $\phi P_n = 0.55 \phi f'_c A_g \left[1 - \left(\frac{k l_c}{32 h} \right)^2 \right]$ <p>where $\phi = 0.7$</p>	<p>LEFT WALL</p> <p>RIGHT WALL</p>	<p>148,752 lbs</p> <p>148,752 lbs</p>	<p>142,800 lbs</p> <p>142,800 lbs</p>	

Loading Conditions

$D_1 = D + D_2$

$B = 10 \text{ ft.}$

$D_2 = 15 \text{ ft.}$

$D_1 = 10.57 \text{ ft.}$

$D_2 = 25.67 \text{ ft.}$

$\sigma_v = D_1 \rho$

$\sigma_h = k \sigma_v$

$B = 10 \text{ ft.}$

$\sigma_v = D_1 \rho \quad 1470 \text{ lbs/ft}^2$

$\sigma_h = k \sigma_v \quad 433 \text{ lbs/ft}^2$

where $k = \frac{1 - \sin \theta}{1 + \sin \theta}$

$k = 0.2748$

Figure() Structural Assessment Summary