(A0006944)

ROUSSEL ENGINEERING, INC.
P. O. BOX 1329, KENNER, LA 70063
4101 CALIFORNIA AVENUE, KENNER, LA 70065
(504) 469-4255
FAX (504) 469-1973

July 27, 1994

Pittman Construction Co., Inc.
110 Veterans Memorial Blvd.
Suite 325
Metairie, LA 70005

Attn: Mr. A.E. Pittman

Re: Sheet pile movement during concrete placement

Dear sir;

The following monoliths were tested under various conditions of support and concrete placement.

<u>Monolith Number 104</u>

The canal side form was set with eight braces and eight struts for support. The braces and struts were supported by W 24 x 131 beam braced horizontally against the cofferdam sheet piling. The bottom was supported by a channel with steel straps welded to the sheet piling at Elevation (-) 0.50 feet, which is the top of the dry bottom on the canal side. All reinforcing was in place.

On Monday, July 18, 1994, concrete was placed on the canal side from Elevation (-) 0.50 feet to Elevation (+) 3.50 feet. The protected side form was set in place, secured and plumbed. Approximately three hours later the remainder of the concrete was placed from Elevation (+) 3.50 feet to Elevation (+) 14.00. Several times while the concrete was being placed I checked the forms for plumbness. The forms were plumb during concrete placement. Upon completion the forms were well within tolerances.

By placing the four feet of concrete on the canal side first and allowing it to begin setup, the force against the sheet pile, which causes it to move during concrete placement, is minimized.

The steel straps, which are welded to the sheet piling, are not the cause of movement during concrete placement since the wet concrete exerts a pressure on the form which is equal and opposite to the pressure exerted on the sheet piling. These forces cause tension in the steel straps. If the steel straps caused the movement of the sheet piling towards the canal side at Elevation (-) 0.50 feet, then the dry bottom at this elevation would resist this movement.

<u>Monolith Number 108</u>

The canal side form was set with eight braces and eight struts for support. The braces and struts were supported by W 24 x 131 beam braced horizontally against the cofferdam sheet piling. The bottom was supported by a channel with steel straps welded to the sheet piling at

Elevation (-) 0.50 feet, which is the top of the dry bottom on the canal side. All reinforcing was in place. The protected side form was set in place, secured and plumbed. This monolith was setup and concrete was to be placed in the same manner as was done for many of the other monoliths of this type, which experienced movement during concrete placement, and which had to be constantly monitored and adjusted during concrete placement.

Horizontal steel rods were welded to the top of the sheet piling at Elevation (+) 6.25 feet at the middle and near each end and extended through a hole in the protected side form. These rods were protected within the forms by steel sleeve which was welded to the sheet piling and was approximately two inches from the inside of the form. This sleeve was there to prevent most of the concrete from bearing on the rod. Attached to the extension of the middle rod was a brass tube, which slipped over the rod and was secured with duct tape. The opposite end was pinned to a brass strip. Two and one half inches above this pin the brass strip was attached to a board. Six and one eight inches below this pin a plotter pen was placed. The board was secured to stakes driven into the ground adjacent to the protected side form. A piece of plotter paper was placed below the plotter pen. This device was to measure any movement of the sheet piling during placement of the concrete. The plotter pen recorded the movement of the sheet pile. Because the plotter pen placement was below the pin at the end of the brass tube, the actual movement of the plotter pen was 3.45 times the actual movement of the sheet piling.

Refer to the attached sheet for the wet concrete pressures that are exerted against the forms and sheet piling. From Elevation (+) 3.50 feet to Elevation (+) 14.00 feet the pressures against the side forms are equal and opposite and result in tension in the she bolts connecting the forms together. From Elevation (-) 0.50 feet to Elevation (+) 3.50 feet the pressures against the canal side form and sheet piling are equal and opposite and result in tension on the steel straps which are welded to the sheet piling. The pressure against the sheet piling, which amounts to 7,250 pounds per linear foot, causes bending in the sheet piling. This bending results in a movement of the top of the sheet piling towards the canal side. Due to the reinforcing, which is supported on the sheet piling and held from the sides of the forms by chairs, and the concrete in the forms, any movement of the top of the sheet piling will be amplified at the top of the forms.

On Thursday, July 21, 1994 concrete was placed and the following test was performed.

Refer to the attached sheet for the recorded movement of the sheet piling during concrete placement. During the first third of concrete placement there may have been some small sheet piling movement but due to the plotter pen that was used there was too much ink to determine any movement. This part of the test will be ignored. A different plotter pen with a smaller point was used for the remainder of the test. During the second third of concrete placement the plotter pen shows a movement of 0.14 inches of the top of the sheet piling towards the canal side. During the remainder of concrete placement the plotter pen shows an additional movement of 0.18 inches of the top of the sheet piling towards the canal side. This results in a movement of the top of the sheet piling towards the canal side = (.32/3.45) = 0.093 inches (3/32 of an inch). The movement of the top of the formwork would be

Point-of-rotation ?

approximately 0.39 inches (13/32 of an inch).

Refer to the attached calculations which were made for the case of concrete placement as described in the test above. These calculations were made prior to the above test and confirm the movement of the sheet piling and top of the forms. Node 8, which is the top of the sheet piling, moves 0.10 inches and Node 1, which is the top of the formwork, moves 0.40 inches.

Monolith Number 110

The canal side form was set with four braces and four struts for support. The braces and struts were supported by W 24 x 131 beam braced horizontally against the cofferdam sheet piling. The bottom was supported by a channel with anchor bolts set into the dry bottom at Elevation (-) 0.50 feet, which is the top of the dry bottom on the canal side. All reinforcing was in place.

On Monday, July 25, 1994, concrete was placed on the canal side from Elevation (-) 0.50 feet to Elevation (+) 3.50 feet. The protected side form was set in place, secured and plumbed. The next day, Tuesday, July 26, 1994 the remainder of the concrete was placed from Elevation (+) 3.50 feet to Elevation (+) 14.00. Several times while the concrete was being placed I checked the forms for plumbness. The forms were plumb during concrete placement. Upon completion the forms were well within tolerances.

By placing the four feet of concrete on the canal side first and allowing it to setup, the force against the sheet pile, which causes it to move during concrete placement, is minimized.

Again I would like point out that the straps, which are welded to the sheet piling, are not the cause of movement during concrete placement since the wet concrete exerts a pressure on the form which is equal and opposite to the pressure exerted on the sheet piling. This monolith, which did not use the straps, bears this out.

Conclusions:

1. Monoliths 104 and 110 show that movement of the sheet piling can be minimized.

2. Monoliths 104 and 110 show that the steel straps do not influence the movement of the sheet piling.

3. Measurements taken on monolith 108 and calculations show that the wet concrete pressure and not the steel straps cause the sheet piling to move during concrete placement.

4. The movement of the sheet piling during concrete placement cannot be minimized unless the four foot section is first placed.

5. In order to determine sheet pile movement, either during concrete placement or after removal of the formwork, the data contained in the logs of the soil borings and the laboratory test results were necessary. This data was not received until June 22, 1994.

It is my opinion that unless the soil data was made available during the bid process there would be no way to determine if the movement of the sheet piling would be a problem. Also movement of the sheet piling directly influences the placement of concrete and requires additional measures be taken to minimize such movement.

Recommendations:

1. Continue to place monoliths as in the past. This requires that the formwork be continuously monitored and adjusted to maintain tolerances.

2. Use the method of monolith 110 with either welded steel straps or anchor bolts with four braces and four struts for setting the formwork.

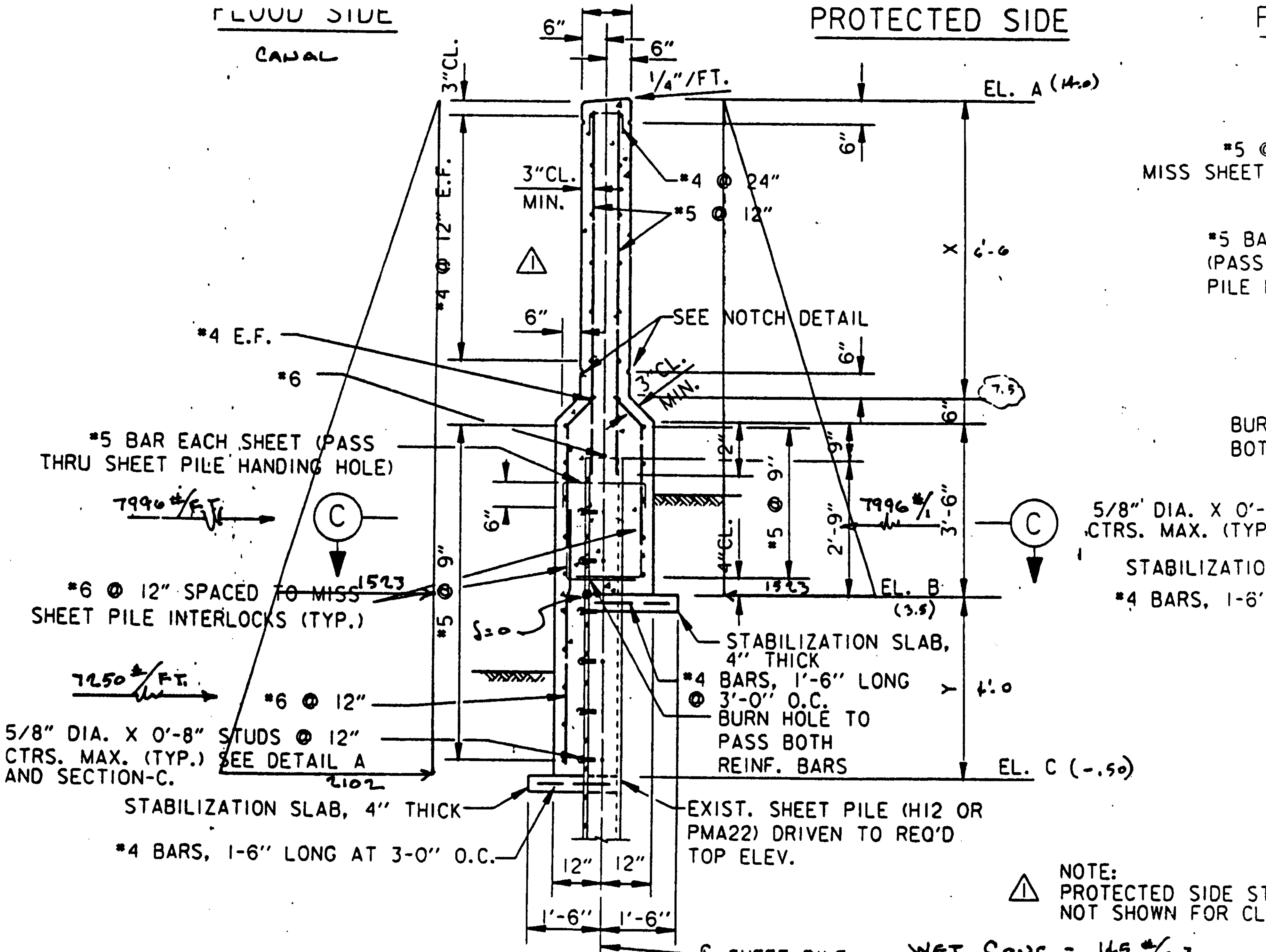
3. Place the four foot section of concrete on the canal side using a smaller form and the follow up using the regular forms.

Recommendations 2 and 3 above require a construction joint at Elevation (+)3.50 feet. There is no construction joint shown on the drawings. This would require approval by the U.S. Army Corps of Engineers. This construction joint may be a source of problems. If the forms slip or do not match up then some concrete may flow between the form and the existing concrete.

All of the above recommendations will require additional labor which was not envisioned in the bid.

Sincerely,

Herbert J. Roussel, Jr.
Doctor of Engineering, P.E.
President



TYPICAL TYPE I CAP

FLOOD CASE (EL. 3.5 TO EL. 14)

M = 64 x (10.5)^3 = 12.3^k/ / 19.2

WET CONC. = 145 #/FT.^3

H12 CAP. = M = 21.2 x 36 x .6 =

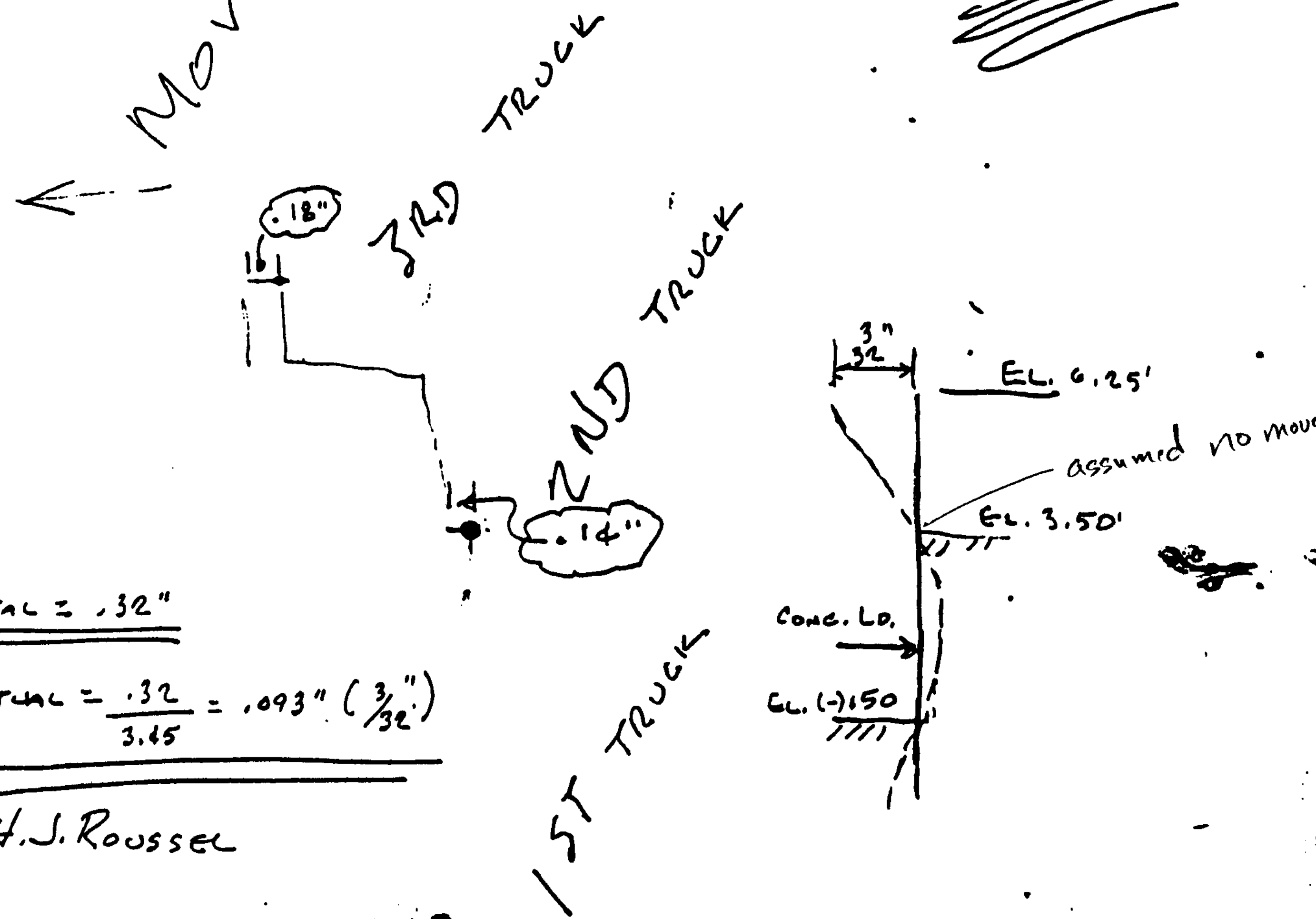
THUR. JULY 21, 1994

12 NOON TO 1:30 PM.

108

CANAL SIDE

MOVEMENT



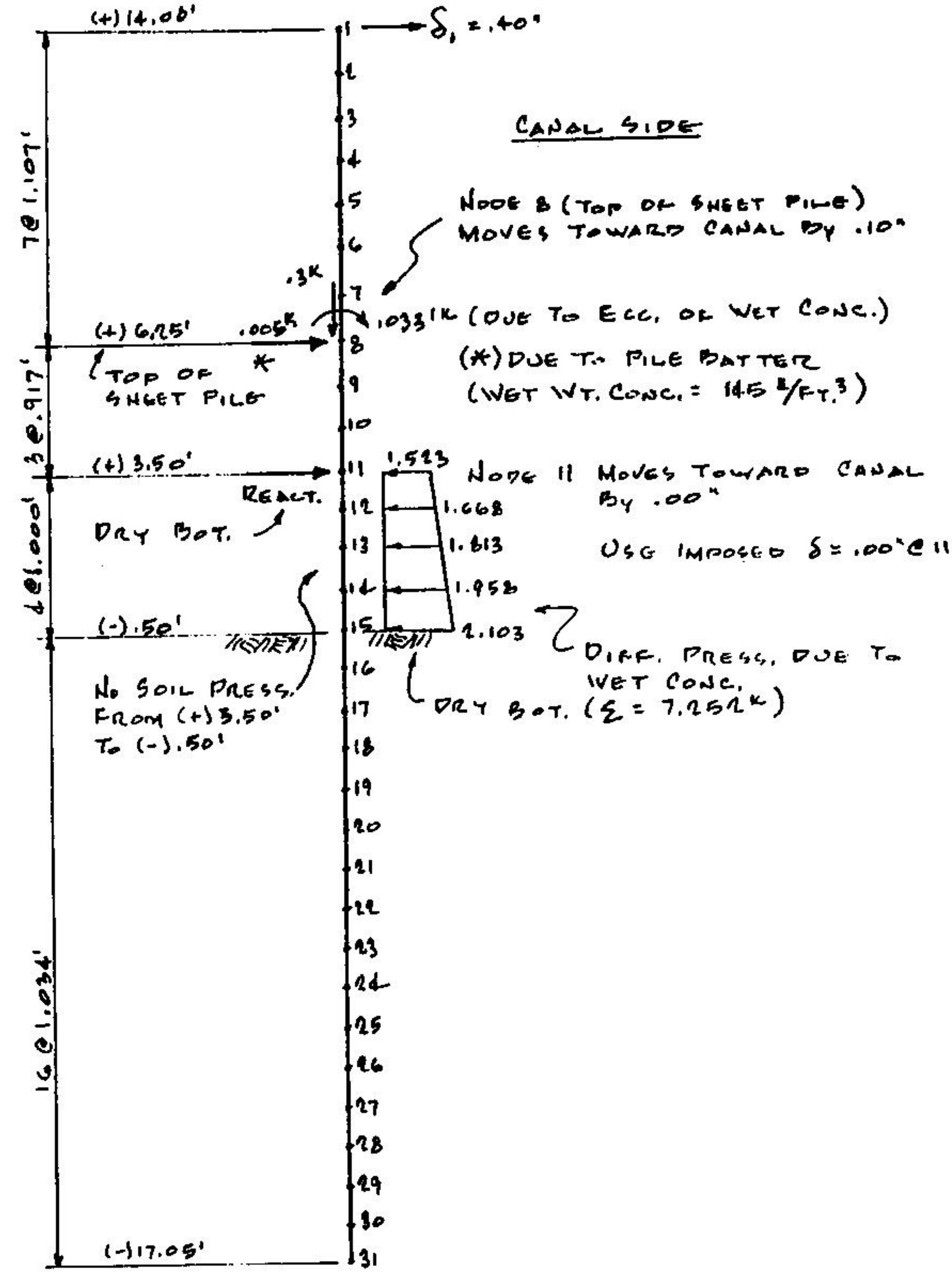
TOTAL = .32"

ACTUAL = $\frac{.32}{3.45}$ = .093" (3/32")

H.J. ROUSSEL

IGNORE

ROUSSEL ENGINEERING, INC.	BY	DATE	SHEET
	H.J.R.	7-14-94	OF
	CHECKED	DATE	



PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

SOLUTION FOR SHEET PILE WALL

MODULUS OF ELASTICITY = 4176000.00 KSF
NODES REQUIRING SOIL SPRINGS READ = 0
NODE D.L. SOIL STARTS = 15
MAXIMUM LINEAR SOIL DEFORMATION = .040 FT
SOIL MODULUS = 8.330 + .390*Z** .500 K/FT**3
NUMBER OF NON-ZERO P-MATRIX ENTRIES = 2

NUMBER OF LOAD CONDITIONS = 1
DEPTH INCREMENT = .800 FT
DREDGE LINE REDUCTION FACTOR = .700
NUMBER OF BOUNDARY CONDITIONS = 1
NUMBER OF NP = 62
NUMBER OF MEMBERS = 30
MAXIMUM NUMBER OF ITERATIONS = 5
NON-LINEAR CHECK (IF > 0) = 1

PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

MEMBER AND NODE DATA FOR UNIT WIDTH OF WALL

MEMNO	NP1	NP2	NP3	NP4	LENGTH	INERTIA,FT*4
1	1	2	3	4	1.1070	.00514
2	3	4	5	6	1.1070	.00514
3	5	6	7	8	1.1070	.00514
4	7	8	9	10	1.1070	.00514
5	9	10	11	12	1.1070	.00514
6	11	12	13	14	1.1070	.00514
7	13	14	15	16	1.1070	.00514
8	15	16	17	18	.9170	.00514
9	17	18	19	20	.9170	.00514
10	19	20	21	22	.9170	.00514
11	21	22	23	24	1.0000	.00514
12	23	24	25	26	1.0000	.00514
13	25	26	27	28	1.0000	.00514
14	27	28	29	30	1.0000	.00514
15	29	30	31	32	1.0340	.00514
16	31	32	33	34	1.0340	.00514
17	33	34	35	36	1.0340	.00514
18	35	36	37	38	1.0340	.00514
19	37	38	39	40	1.0340	.00514
20	39	40	41	42	1.0340	.00514
21	41	42	43	44	1.0340	.00514
22	43	44	45	46	1.0340	.00514
23	45	46	47	48	1.0340	.00514
24	47	48	49	50	1.0340	.00514
25	49	50	51	52	1.0340	.00514
26	51	52	53	54	1.0340	.00514
27	53	54	55	56	1.0340	.00514
28	55	56	57	58	1.0340	.00514
29	57	58	59	60	1.0340	.00514
30	59	60	61	62	1.0340	.00514

NODE	KS, K/FT*3	SPRGS--SOIL/A.R.	NODE Q,KSF
1	.000	.000	.0000
2	.000	.000	.0000
3	.000	.000	.0000
4	.000	.000	.0000
5	.000	.000	.0000
6	.000	.000	.0000
7	.000	.000	.0000
8	.000	.000	.0000
9	.000	.000	.0000
10	.000	.000	.0000
11	.000	.000	-1.5230
12	.000	.000	-1.6680
13	.000	.000	-1.8130
14	.000	.000	-1.9580
15	8.330	3.069	-2.1030
16	8.727	9.003	.0000
17	8.891	9.190	
18	9.017	9.322	
19	9.123	9.432	
20	9.217	9.529	
21	9.301	9.617	
22	9.379	9.698	
23	9.452	9.773	
24	9.520	9.843	
25	9.584	9.910	
26	9.645	9.973	
27	9.704	10.033	
28	9.760	10.092	
29	9.814	10.147	
30	9.866	10.201	
31	9.916	5.118	

NZX BOUNDARY CONDITIONS = 22

BOUNDARY VALUES XSPEC = .0000

PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

THE BAND MATRIX CORRECTED FOR ANY BOUNDARY CONDITIONS   P-MATRIX (ADJUSTED FOR NZX)

1	77530.	105054.	38765.	-105054.	1	.0000
2	189799.	105054.	-189799.	0.	2	.0000
3	155059.	0.	38765.	-105054.	3	.0000
4	379597.	105054.	-189799.	0.	4	.0000
5	155059.	0.	38765.	-105054.	5	.0000
6	379597.	105054.	-189799.	0.	6	.0000
7	155059.	0.	38765.	-105054.	7	.0000
8	379597.	105054.	-189799.	0.	8	.0000
9	155059.	0.	38765.	-105054.	9	.0000
10	379597.	105054.	-189799.	0.	10	.0000
11	155059.	0.	38765.	-105054.	11	.0000
12	379597.	105054.	-189799.	0.	12	.0000
13	155059.	0.	38765.	-105054.	13	.0000
14	379597.	105054.	-189799.	0.	14	.0000
15	171123.	48044.	46797.	-153097.	15	-.0330
16	523707.	153097.	-333909.	0.	16	.0050
17	187187.	0.	46797.	-153097.	17	.0000
18	667818.	153097.	-333909.	0.	18	.0000
19	187187.	0.	46797.	0.	19	.0000
20	667818.	153097.	0.	0.	20	-.2328
21	179419.	0.	42913.	-128738.	21	.0000
22	1.	0.	0.	0.	22	.0000
23	171650.	0.	42913.	-128738.	23	.0000
24	514951.	128738.	-257475.	0.	24	-1.6680
25	171650.	0.	42913.	-128738.	25	.0000
26	514951.	128738.	-257475.	0.	26	-1.8130
27	171650.	0.	42913.	-128738.	27	.0000
28	514951.	128738.	-257475.	0.	28	-1.9580
29	168828.	-8327.	41502.	-120411.	29	.0000
30	490381.	120411.	-232903.	0.	30	-1.7522
31	166006.	0.	41502.	-120411.	31	.0000
32	465814.	120411.	-232903.	0.	32	.0000
33	166006.	0.	41502.	-120411.	33	.0000
34	465814.	120411.	-232903.	0.	34	.0000
35	166006.	0.	41502.	-120411.	35	.0000
36	465814.	120411.	-232903.	0.	36	.0000
37	166006.	0.	41502.	-120411.	37	.0000
38	465814.	120411.	-232903.	0.	38	.0000
39	166006.	0.	41502.	-120411.	39	.0000
40	465815.	120411.	-232903.	0.	40	.0000
41	166006.	0.	41502.	-120411.	41	.0000
42	465815.	120411.	-232903.	0.	42	.0000
43	166006.	0.	41502.	-120411.	43	.0000
44	465815.	120411.	-232903.	0.	44	.0000
45	166006.	0.	41502.	-120411.	45	.0000
46	465815.	120411.	-232903.	0.	46	.0000
47	166006.	0.	41502.	-120411.	47	.0000
48	465815.	120411.	-232903.	0.	48	.0000
49	166006.	0.	41502.	-120411.	49	.0000
50	465815.	120411.	-232903.	0.	50	.0000
51	166006.	0.	41502.	-120411.	51	.0000
52	465815.	120411.	-232903.	0.	52	.0000
53	166006.	0.	41502.	-120411.	53	.0000
54	465815.	120411.	-232903.	0.	54	.0000
55	166006.	0.	41502.	-120411.	55	.0000
56	465815.	120411.	-232903.	0.	56	.0000
57	166006.	0.	41502.	-120411.	57	.0000
58	465815.	120411.	-232903.	0.	58	.0000
59	166006.	0.	41502.	-120411.	59	.0000
60	465815.	120411.	-232903.	0.	60	.0000
61	83003.	-120411.	0.	0.	61	.0000
62	232908.	0.	0.	0.	62	.0000

CYCLE NO = 1   D.L. DEFL: PREVIOUS = .00000   CURRENT = .01045

PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

· MEMBER AND NODE DATA FOR UNIT WIDTH OF WALL

MEMNO	NP1	NP2	NP3	NP4	LENGTH	INERTIA,FT*4
1	1	2	3	4	1.1070	.00514
2	3	4	5	6	1.1070	.00514
3	5	6	7	8	1.1070	.00514
4	7	8	9	10	1.1070	.00514
5	9	10	11	12	1.1070	.00514
6	11	12	13	14	1.1070	.00514
7	13	14	15	16	1.1070	.00514
8	15	16	17	18	.9170	.00514
9	17	18	19	20	.9170	.00514
10	19	20	21	22	.9170	.00514
11	21	22	23	24	1.0000	.00514
12	23	24	25	26	1.0000	.00514
13	25	26	27	28	1.0000	.00514
14	27	28	29	30	1.0000	.00514
15	29	30	31	32	1.2844	.00514
16	31	32	33	34	1.2844	.00514
17	33	34	35	36	1.2844	.00514
18	35	36	37	38	1.2844	.00514
19	37	38	39	40	1.2844	.00514
20	39	40	41	42	1.2844	.00514
21	41	42	43	44	1.2844	.00514
22	43	44	45	46	1.2844	.00514
23	45	46	47	48	1.2844	.00514
24	47	48	49	50	1.2844	.00514
25	49	50	51	52	1.2844	.00514
26	51	52	53	54	1.2844	.00514
27	53	54	55	56	1.2844	.00514
28	55	56	57	58	1.2844	.00514
29	57	58	59	60	1.2844	.00514
30	59	60	61	62	1.2844	.00514

NODE	KS, K/FT*3	SPRGS--SOIL/A.R.	NODE Q,KSF
1	.000	.000	.0000
2	.000	.000	.0000
3	.000	.000	.0000
4	.000	.000	.0000
5	.000	.000	.0000
6	.000	.000	.0000
7	.000	.000	.0000
8	.000	.000	.0000
9	.000	.000	.0000
10	.000	.000	.0000
11	.000	.000	-1.5230
12	.000	.000	-1.6680
13	.000	.000	-1.8130
14	.000	.000	-1.9580
15	8.330	3.821	-2.1030
16	8.772	11.239	.0000
17	8.955	11.497	
18	9.096	11.680	
19	9.214	11.833	
20	9.318	11.967	
21	9.413	12.089	
22	9.499	12.200	
23	9.580	12.304	
24	9.656	12.401	
25	9.728	12.494	
26	9.796	12.581	
27	9.861	12.665	
28	9.924	12.745	
29	9.984	12.823	
30	10.042	12.897	
31	10.098	6.473	

PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

THE BAND MATRIX CORRECTED FOR ANY BOUNDARY CONDITIONS   P-MATRIX (ADJUSTED FOR NZX)

1	77530.	105054.	38765.	-105054.	1	.0000
2	189799.	105054.	-189799.	0.	2	.0000
3	155059.	0.	38765.	-105054.	3	.0000
4	379597.	105054.	-189799.	0.	4	.0000
5	155059.	0.	38765.	-105054.	5	.0000
6	379597.	105054.	-189799.	0.	6	.0000
7	155059.	0.	38765.	-105054.	7	.0000
8	379597.	105054.	-189799.	0.	8	.0000
9	155059.	0.	38765.	-105054.	9	.0000
10	379597.	105054.	-189799.	0.	10	.0000
11	155059.	0.	38765.	-105054.	11	.0000
12	379597.	105054.	-189799.	0.	12	.0000
13	155059.	0.	38765.	-105054.	13	.0000
14	379597.	105054.	-189799.	0.	14	.0000
15	171123.	48044.	46797.	-153097.	15	-.0330
16	523707.	153097.	-333909.	0.	16	.0050
17	187187.	0.	46797.	-153097.	17	.0000
18	667818.	153097.	-333909.	0.	18	.0000
19	187187.	0.	46797.	0.	19	.0000
20	667818.	153097.	0.	0.	20	-.2328
21	179419.	0.	42913.	-128738.	21	.0000
22	1.	0.	0.	0.	22	.0000
23	171650.	0.	42913.	-128738.	23	.0000
24	514951.	128738.	-257475.	0.	24	-1.6680
25	171650.	0.	42913.	-128738.	25	.0000
26	514951.	128738.	-257475.	0.	26	-1.8130
27	171650.	0.	42913.	-128738.	27	.0000
28	514951.	128738.	-257475.	0.	28	-1.9580
29	152648.	-50697.	33411.	-78041.	29	.0000
30	379003.	78041.	-121524.	0.	30	-1.7522
31	133645.	0.	33411.	-78041.	31	.0000
32	243058.	78041.	-121524.	0.	32	.0000
33	133645.	0.	33411.	-78041.	33	.0000
34	243059.	78041.	-121524.	0.	34	.0000
35	133645.	0.	33411.	-78041.	35	.0000
36	243059.	78041.	-121524.	0.	36	.0000
37	133645.	0.	33411.	-78041.	37	.0000
38	243059.	78041.	-121524.	0.	38	.0000
39	133645.	0.	33411.	-78041.	39	.0000
40	243059.	78041.	-121524.	0.	40	.0000
41	133645.	0.	33411.	-78041.	41	.0000
42	243059.	78041.	-121524.	0.	42	.0000
43	133645.	0.	33411.	-78041.	43	.0000
44	243059.	78041.	-121524.	0.	44	.0000
45	133645.	0.	33411.	-78041.	45	.0000
46	243059.	78041.	-121524.	0.	46	.0000
47	133645.	0.	33411.	-78041.	47	.0000
48	243059.	78041.	-121524.	0.	48	.0000
49	133645.	0.	33411.	-78041.	49	.0000
50	243060.	78041.	-121524.	0.	50	.0000
51	133645.	0.	33411.	-78041.	51	.0000
52	243060.	78041.	-121524.	0.	52	.0000
53	133645.	0.	33411.	-78041.	53	.0000
54	243060.	78041.	-121524.	0.	54	.0000
55	133645.	0.	33411.	-78041.	55	.0000
56	243060.	78041.	-121524.	0.	56	.0000
57	133645.	0.	33411.	-78041.	57	.0000
58	243060.	78041.	-121524.	0.	58	.0000
59	133645.	0.	33411.	-78041.	59	.0000
60	243060.	78041.	-121524.	0.	60	.0000
61	66823.	-78041.	0.	0.	61	.0000
62	121530.	0.	0.	0.	62	.0000

D. L. DEFL CONVERGED ON CYCLE = 2

DEFLS ARE: PREVIOUS = .01045 CURRENT = .01042 FOR EMBED DEPTH = 20.55 FT

PITTMAN SHEET PILE - CASE REMOLDED RATIO = .45
WET CONCRETE FROM (+)14.0 DOWN TO (-)0.5 - CANAL SIDE

MEMBER MOMENTS, NODE REACTIONS, DEFLECTIONS, SOIL PRESSURE, AND LAST USED P-MATRIX FOR LC = 1

MEMNO	MOMENTS--NEAR END	1ST, K-FT	NODE	SPG FORCE, KIPS	ROT, RADS	DEFL, FT	SOIL Q, KSF	P-, K-FT	P-, KIPS
1	.000	.000	1	.0000	-.00317	.03326 .40"	.0000	.0000	.0000
2	14.00 .000	.000	2	.0000	-.00317	.02975	.0000	.0000	.0000
3	.000	.000	3	.0000	-.00317	.02625	.0000	.0000	.0000
4	.000	-.001	4	.0000	-.00317	.02274	.0000	.0000	.0000
5	.001	-.001	5	.0000	-.00317	.01923	.0000	.0000	.0000
6	.001	-.001	6	.0000	-.00317	.01573	.0000	.0000	.0000
7	.001	-.001	7	.0000	-.00317	.01222	.0000	.0000	.0000
8	-.032	.036	8	.0000	-.00317	.00871 .10"	.0000	-.0330	.0050
9	6.25' -.036	.041	9	.0000	-.00317	.00581	.0000	.0000	.0000
10	-.041	-.168	10	.0000	-.00317	.00290	.0000	.0000	-.2328
* 11	.168	5.449	11	.0000	-.00317	.00000 .00"	.0000	.0000	-1.2512
12	3.50' -5.449	9.398	12	.0000	-.00304	-.00313	.0000	.0000	-1.6680
13	-9.398	11.534	13	.0000	-.00270	-.00602	.0000	.0000	-1.8130
14	-11.534	11.712	14	.0000	-.00221	-.00848	.0000	.0000	-1.9580
* 15	-11.712	9.742	15	-.0398	-.00167	-.01042 .125"	-.0868	.0000	-1.7522
16	-.50' -9.742	7.946	16	-.1364	-.00103	-.01214	-.1065	.0000	.0000
17	-7.946	6.344	17	-.1507	-.00050	-.01311	-.1174	.0000	.0000
18	-6.344	4.945	18	-.1572	-.00007	-.01346	-.1224	.0000	.0000
19	-4.945	3.747	19	-.1577	.00027	-.01333	-.1228	.0000	.0000
20	-3.747	2.747	20	-.1533	.00053	-.01281	-.1193	.0000	.0000
21	-2.747	1.933	21	-.1450	.00072	-.01200	-.1129	.0000	.0000
22	-1.933	1.291	22	-.1339	.00086	-.01098	-.1043	.0000	.0000
23	-1.291	.804	23	-.1206	.00096	-.00980	-.0939	.0000	.0000
24	-.804	.453	24	-.1057	.00102	-.00853	-.0823	.0000	.0000
25	-.453	.217	25	-.0898	.00106	-.00719	-.0699	.0000	.0000
26	-.217	.075	26	-.0731	.00108	-.00581	-.0570	.0000	.0000
27	-.075	.005	27	-.0560	.00109	-.00442	-.0436	.0000	.0000
28	-.005	-.016	28	-.0385	.00109	-.00302	-.0300	.0000	.0000
29	.016	-.010	29	-.0208	.00109	-.00162	-.0162	.0000	.0000
30	.010	.000	30	-.0029	.00109	-.00022	-.0022	.0000	.0000
			31	.0076	.00109	.00118	.0119	.0000	.0000

SUM SPRING FORCES = -1.5739 VS SUM APPLIED FORCES = -8.6701 KIPS (DOES NOT INCL. REACT. @ NODE 11)

APPLIED FORCES ADJUSTED FOR NON LINEAR SOIL REACTIONS WHEN SPRINGS ARE ZEROED

* DRY BOTTOM