A0007628 (1)

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

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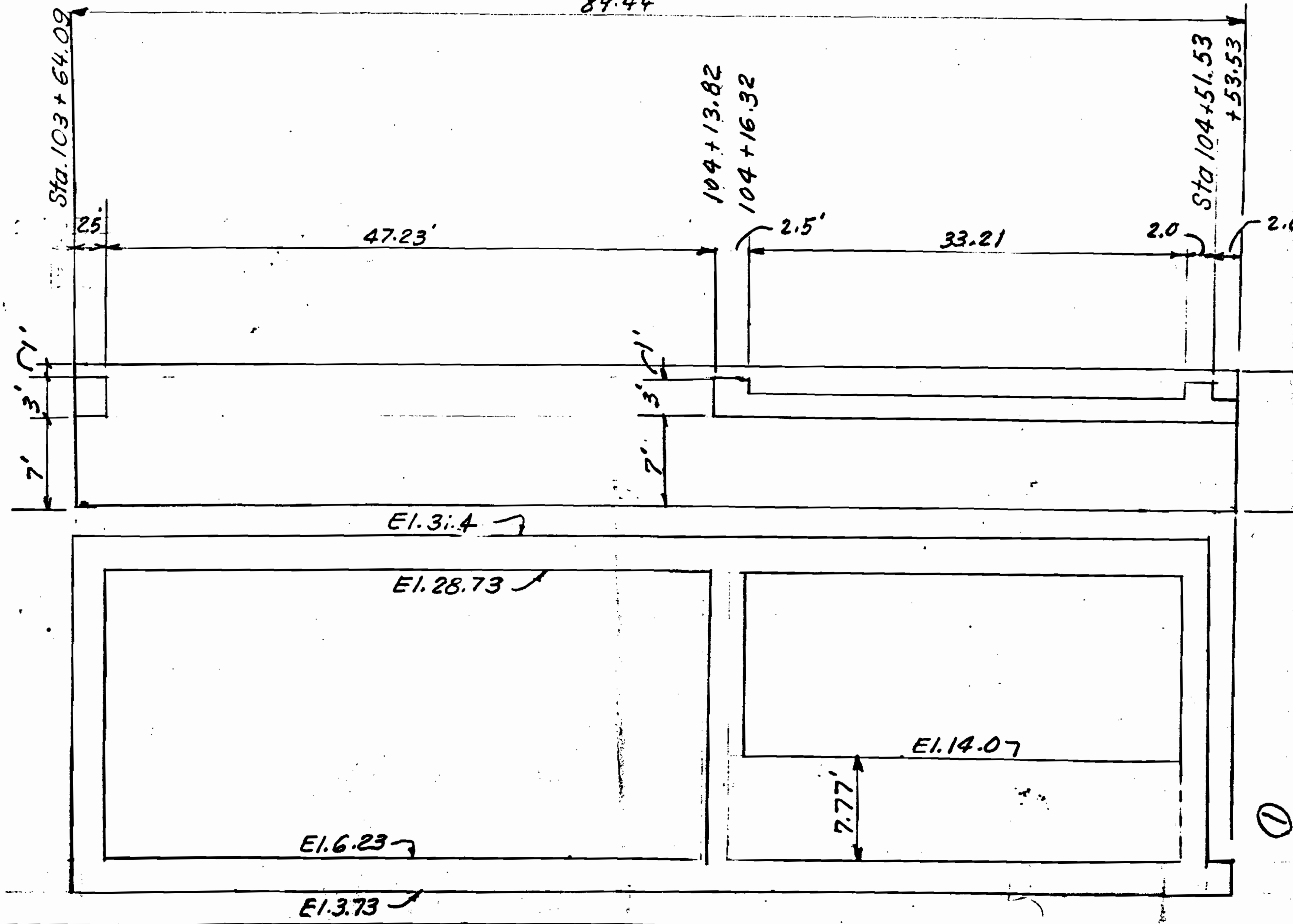
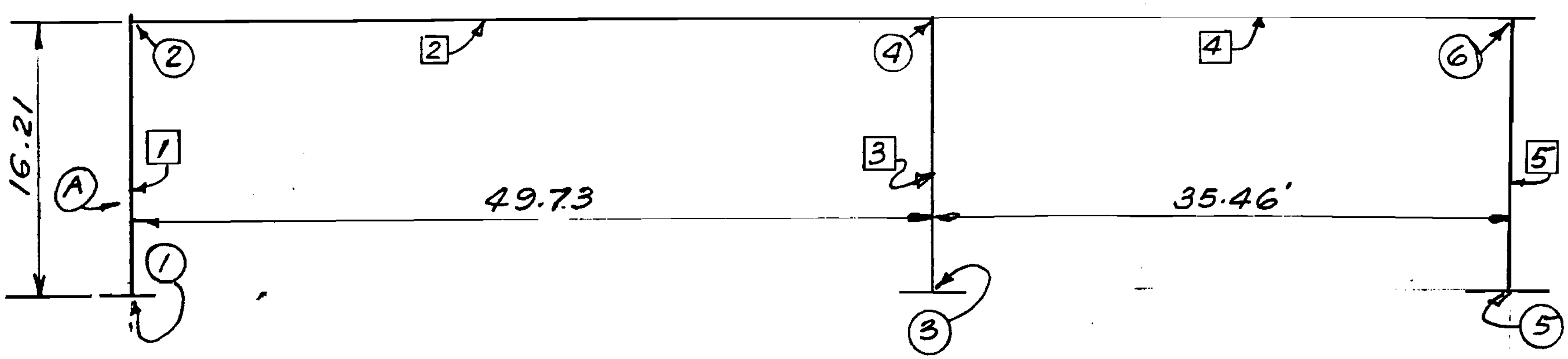
47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)



47.23' OVERHEAD GATE AT HARBOR ROAD (WEST IHNC)



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47.23' OVERHEAD GATE AT HARBOR ROAD (West I.H.N.C.)

(Steel Gate Design) Water to El. 14.0 - No Dynamic H_2O Forces, $F_b = 20{,}000$ psi

REACTIONS

$0.0625 \times 7.77 = 0.486$

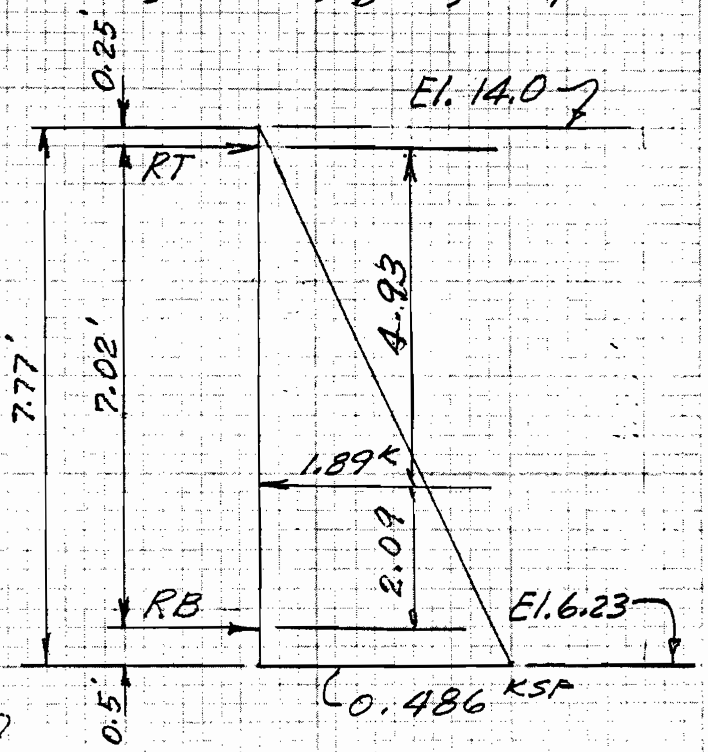
$0.486 \times 7.77 \times 0.5 = 1.89^k$

$\frac{7.77'}{3} - 0.5' = 2.09'$ $\quad 7.02 - 2.09 = 4.93'$

$(7.02 + 0.25) - 2.09 = 5.18'$

$R_T = \frac{1.89 \times 2.09}{7.02} = 0.562\ ^k/_{ft}$

$R_B = \frac{1.89 \times 4.93}{7.02} = 1.327\ ^k/_{ft}$



Girder Design

Top Girder $\quad$ Span $= 47.23' + 0.792' = 48.022'$

Load $= 0.562\ ^k/_l$

Moment $= (0.562)(48.022)^2(0.125) = 162.0'^k$

$S'req'd = \frac{162 \times 12{,}000}{20{,}000} = 97.2\ in^3 < 140$

Try W21 x 68, $S = 140\ in^3$ $\quad I = 1480\ in^4$

$$\frac{5(562 \times 48.022')(48.022 \times 12)^3}{384(29 \times 10^6)(1480)} = 1.567'' = 1.367 \text{ ok}$$

Use W21 x 68

47.23' OVERHEAD GATE AT HARBOR ROAD (West I.H.N.C.)

Steel Gate Design - Cont.

Girder Design (Cont)

Bottom Girder - Span = 48.022' Load = 1.372 K/'

Moment = $(1.372)(48.022)^2(0.125) = 395.5'^K$

$S_{reqd} = \dfrac{395.5 \times 12{,}000}{20{,}000} = 237.3 \text{ in}^3$

Try W27x102 $S = 267 \text{ in}^3$ $I = 3610 \text{ in}^4$

$$\Delta = \frac{5(1.372^{\#} \times 48.022')(48.022 \times 12)^3}{384(29 \times 10^6)(3610)} = \frac{1.57}{1:367} < \frac{1.6''}{1:360}$$

Use W27X102

Skin Plate

Use $\frac{3}{8}$" plate $I = \dfrac{12 \times 0.375^3}{12} = 0.053 \text{ in}^4$

$S = \dfrac{0.053}{(0.5)(0.375)} = 0.283 \text{ in}^3$

Load Max. $= (62.5^{\#})(7.77 - 0.25) = 470\ ^{\#}/\square'$

Moment Max $= 0.283 \text{ in}^3 \times 20{,}000 = 5660$ in lbs

(Interior Span) $M = \dfrac{470^{\#} \times L^2 \times \cancel{12}}{\cancel{12}} = 5660$ in lbs

$L = \sqrt{\dfrac{5660}{470}} = 3.47'$

(End Span) $M = \dfrac{470^{\#} \times L^2 \times 12}{10} = 5660$ in lbs

$L = \sqrt{\dfrac{5660}{\frac{12}{10} \times 470}} = 3.17'$

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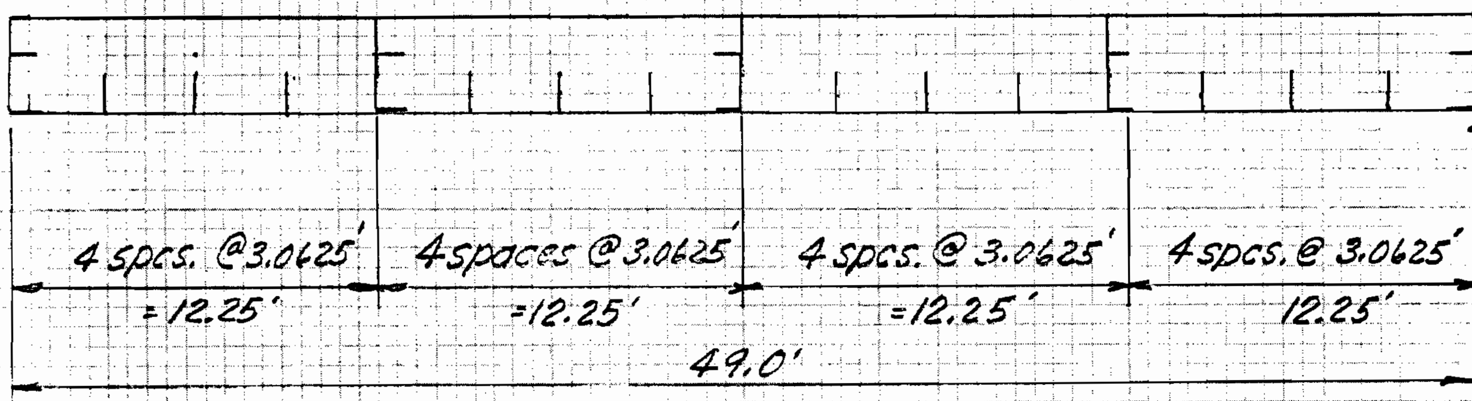
47.23' OVERHEAD GATE AT HARBOR ROAD (West I.H.N.C)
Steel Gate Design. Skin ℞ (cont



(Interior Span) $M = \frac{470^{\#} \times 3.0625^2 \times 12}{12} = 4408$ in lbs < 5660

$f_s = \frac{4408''^{lbs}}{0.283} = 15{,}576$ psi $< 20{,}000$

(End Span) $M = \frac{470^{\#} \times 3.0625^2 \times 12}{10} = 5290$ in lbs < 5660

$f_s = \frac{5290^{\text{in lb}}}{0.283} = 18{,}693$ psi $< 20{,}000$

$62.5^{\#} \times 0.25' = 15.63\ ^{\#}/_{\square'}$

$62.5^{\#} \times 7.02' = 438.75\ ^{\#}/_{\square}$

$W = \frac{438.75^{\#} \times 7.02'}{2} = 1540^{\#}$

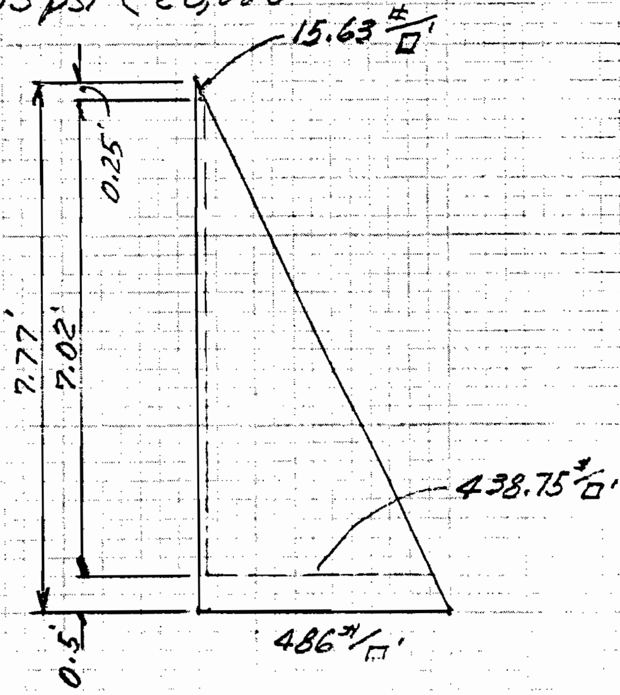
Mom. (Max) @ $\frac{7.02'}{\sqrt{3}} = 4.053'$

Mom. Max

$\left[\frac{(15.63)(4.053)}{2}(7.02-4.053)\right] + \left[(0.1283)(1540)(7.02)\right]$

$= 94'^{\#} + 1387'^{\#}$

$= 1481'^{\#}$



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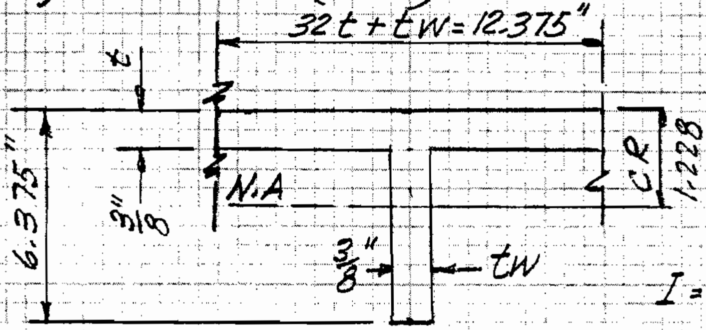
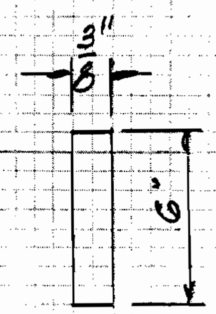
47.23' OVERHEAD GATE AT HARBOR ROAD (West IHNC)

Steel Gate Design - Skin Pl (cont.)





$I = \frac{(0.375)(6)^3}{12} = 6.75 \text{ in.}^4$

Type	Area	y	Ay	Ay²	Io
Pl 12.375 X 0.375	4.641	0.1875	0.870	0.163	—
Pl 0.375 X 6	2.25	3.375	7.594	25.630	6.75
	6.891	3.563	8.464	25.793	6.75

$$\bar{y} = \frac{8.464}{6.891} = 1.228''$$

$$I = I_o + \Sigma Ay^2 - (\Sigma Ay \times \bar{y})$$

$$= 6.75 + 25.793 - (8.464 \times 1.228)$$

$$= 22.149 \text{ in}^4$$

$$S_{TOP} = \frac{22.149}{1.228} = 18.04 \text{ in}^3$$

$$S_{BOTT.} \frac{22.149}{6.375 - 1.228} = 4.3 \text{ in}^4$$

$$f_s = \frac{1481 \times 12}{18.04} = 985 \text{ psi}$$

$$f_s = \frac{1481 \times 12}{4.3} = 4133 \text{ psi}$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of I.H.N.C.)

Steel Gate Design - Skin PL (Cont)

Design of vertical support members (3/8 x 6" PL)

Spacing @ 3.0625

$1.481'^{k} \times 3.0625 = 4.536'^{k}$

$\frac{4536 \times 12}{18.04} = 3017$ psi

$\frac{4536 \times 12}{4.3} = 12659$ psi

S reqd $= \frac{4536 \times 12}{18000} = 3.024$ in^3 < 4.3 in^3 available

"d" min $= \frac{7.02 \times 12}{24} = 3.51$ in.

Check Deflection

$$\Delta = \frac{5 h^4 m}{768 EI}(P_1 + P_2)$$

$$= \frac{(5)\overset{1.7365}{(7.02 \times 12)^4}\overset{1.6593}{(3.0625 \times 12)}}{768\,\cancel{(29 \times 10^6)}\cancel{(22.149)}}\left(\frac{\overset{3.16}{15.63 + 438.75}}{144}\right)$$

$= .06''$ 1 : 1404 ok

Check biaxial stresses

$$\frac{S_1^2 - S_1 S_2 + S_2^2}{f_y^2} \leq (0.75)^2$$

$(0.75)^2 = 0.5625$

$S_1 = 18.693$ ksi — Page 5

$S_2 = 3.017$ ksi — See above

$$\frac{(18.693)^2 - \left[(18.693)(3.017)\right] + \overset{9.1022}{(3.017)^2}}{(36)^2} = 0.219 < 0.5625$$ ok

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Steel Gate Design

Top Girder = W 21 X 68 $L_u = 12.25 \times 12 = 147''$

$$\frac{d}{A_F} = \frac{21.13}{8.27 \times 0.685} = 3.73$$

$$I_F = \frac{bh^3}{12} = \frac{0.685 \times 8.27^3}{12} = 32.286 \text{ in}^4$$

$$A = A_F + \frac{1}{6} AW = \underset{5.665}{(8.27 \times 0.685)} + \left[\frac{21.13 - 2(0.685)}{6}\right](0.44)$$

$$= 7.11$$

$$r_y = \sqrt{\frac{I}{A}} = \left(\frac{32.286}{7.11}\right)^{1/2} = 2.131$$

$$\frac{L}{r_y} = \frac{147}{2.131} = 68.98 > 40 \text{ use Formula (4)}$$

Formula (4) AISC

$$C_b = 1.0 \quad C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = \frac{(2)(\pi)^2(29 \times 10^6)}{36000} = 126.1$$

$$K_2 = \frac{1 - \left(\frac{L}{r_y}\right)^2}{2 C_c^2 C_b} = \frac{1 - (68.98)^2}{(2)(126.1)^2(1)} = 0.85$$

$$F_b = 0.5 \times 0.85 \times 36{,}000 = 15{,}300 \text{ psi}$$

Formula (5) AISC

$$F_b = \frac{10{,}000{,}000}{L_u \frac{d}{A_F}} = \frac{10 \times 10^6}{147\ (3.73)} = 18{,}237 \text{ psi} < .6 F_y$$

21,600 psi

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$$S_{reqd} = \frac{162'^{k} \times 12000}{18{,}237} = 106.6 \text{ in}^3 < 140 \text{ in}^3 \text{ Available}$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Steel Gate

Bottom Girder = W 27 X 102 $L_u = 12.25 \times 12 = 147''$

$$\frac{d}{A_F} = \frac{27.07}{10.018 \times 0.827} = 3.27$$

$$I_F = \frac{bh^3}{12} = \frac{0.827 \times 10.018^3}{12} = 69.29 \text{ in}^4$$

$$A = A_F + \frac{1}{6} A_W = (10.018 \times 0.827) + \left[\frac{27.07 - 2(0.827)}{6}\right](0.44)$$

$$= 10.15$$

$$r_y = \sqrt{\frac{I}{A}} = \left(\frac{69.29}{10.15}\right)^{\frac{1}{2}} = 2.613$$

$$\frac{L}{r_y} = \frac{147}{2.613} = 56.26 > 40 \text{ Use Formula (4)}$$

Formula (4) AISC

$$C_b = 1.0 \quad C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = \frac{2\pi^2 (29 \times 10^6)}{36,000} = 126.1$$

$$K_2 = \frac{1 - \left(\frac{L}{r_y}\right)^2}{2 C_c^2 C_b} = \frac{1 - (56.25)^2}{(2)(126.1)^2(1)} = 0.90$$

$$F_b = 0.5 \times 0.9 \times 36,000 = 16,200 \text{ psi}$$

Formula (5) AISC

$$F_b = \frac{10,000,000}{L_u \frac{d}{A_F}} = \frac{10 \times 10^6}{147(3.27)} = 20,803 \text{ psi} < .6 F_y = 21,600$$

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$$S' req'd = \frac{395.5'^k \times 12,000}{20,803} = 228.14 \text{ in}^3 < 267 \text{ in}^3$$

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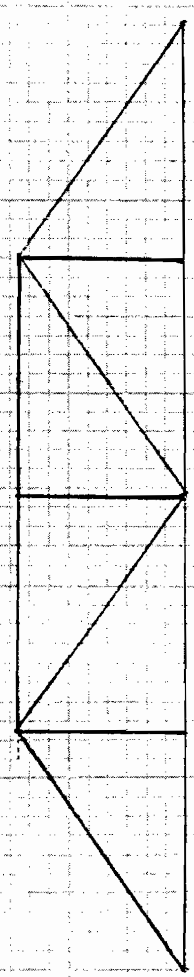

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JOB 47.23' GATE AT HARBOR ROAD (West of IHNC)
ITEM Steel Gate
JOB No

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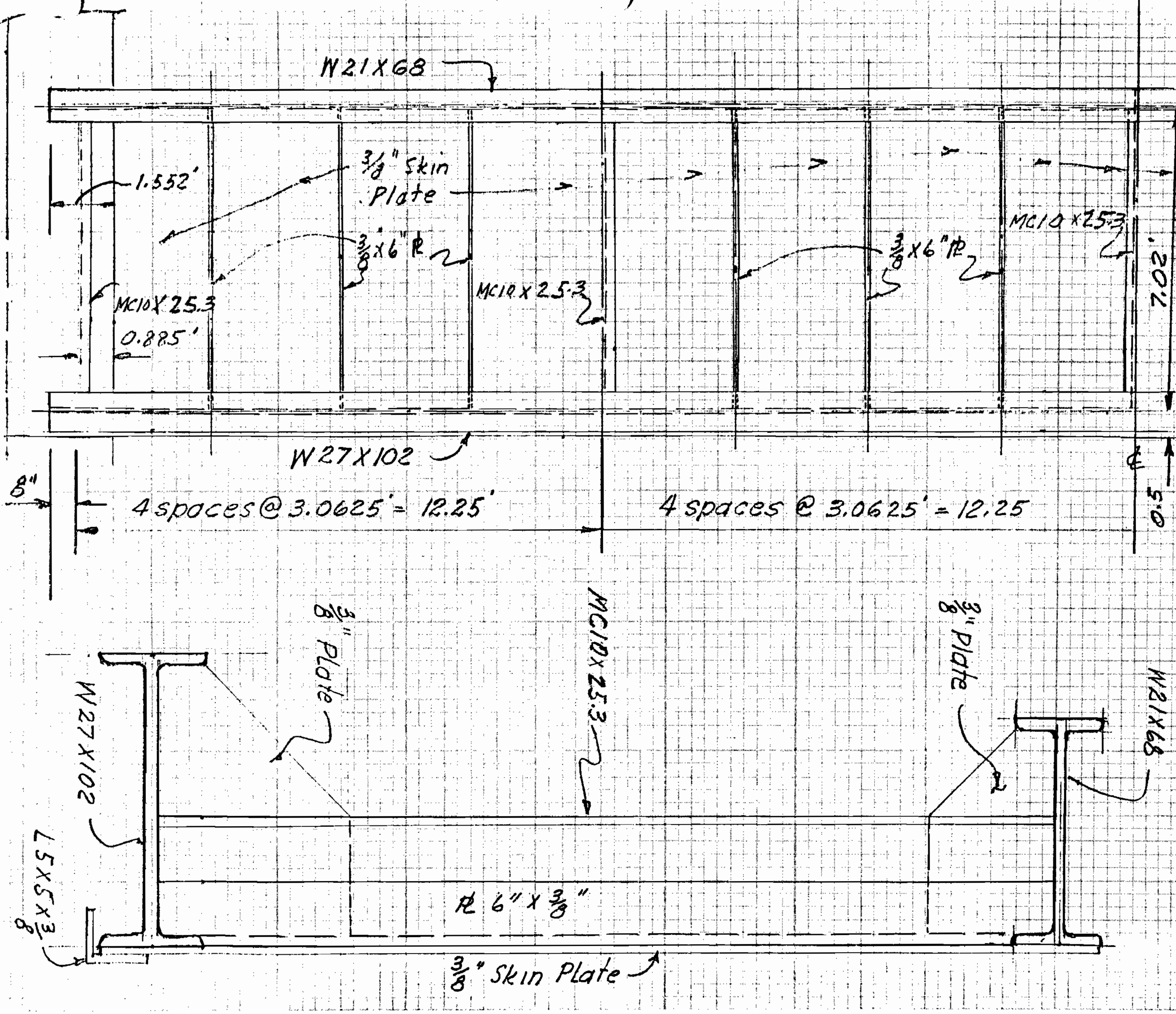

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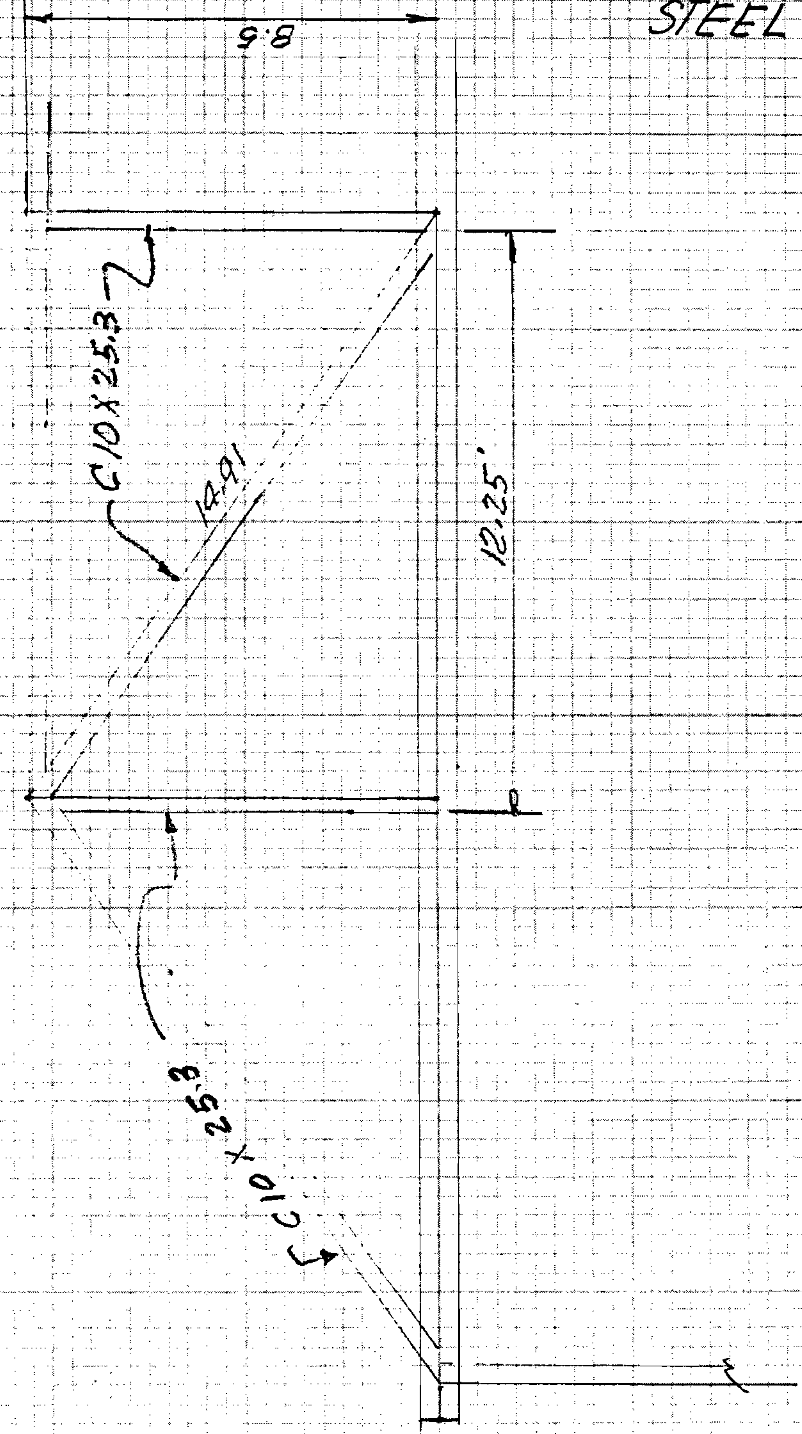
47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)
STEEL GATE



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47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

STEEL GATE

Member	Size	No	Wt/FT	Length	Wt. Total	Arm "	Moment "#
Top Girder	W21X68	1	68	50.33	3422	10.94	37,437
Bott. Girder	W27X102	1	102	50.33	5134	13.91	71,414
Vert. C	C12X25	5	25	7.02	878	6.375	5,597
Horz. C	C12X25	2	25	12.25	613	6.375	3,908
Diag. C	C12X25	4	25	14.91	1491	6.375	9,505
Vert Plates	3/8 X 6	12	7.65	7.02	644	3.375	2,174
Gusset PL's	3/8" X 1.75 □'	5	15.3 #□'	—	134	13.91	1,864
Gusset PL's	3/8 X 1.16 □'	5	15.3 #□'	—	102	10.94	1,116
Skin Plate	3/8 X 7.75'	1	118.6	50.33	5969	0.1875	1,119
Horiz. L	5X5X1/2	1	16.2	50.33	815	0.93	758
Horiz. L	5X5X1/2	1	16.2	50.33	815	7.08	5,770
Bar (both sides)	1 3/4 X 1 3/4	2	10.413	7.75	161	0.88	142
					20,178	6.978	140,804 "#

+ 1,728 Superstructure

21,906

47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Steel Gate (Gate Support Channels)

Total Wt of Gate = 20,178# W/Impact = 1.25 x 20,178 = 25,223#

$\Sigma F_x = 0 = -25{,}223 + F_{AB} \cos\alpha$

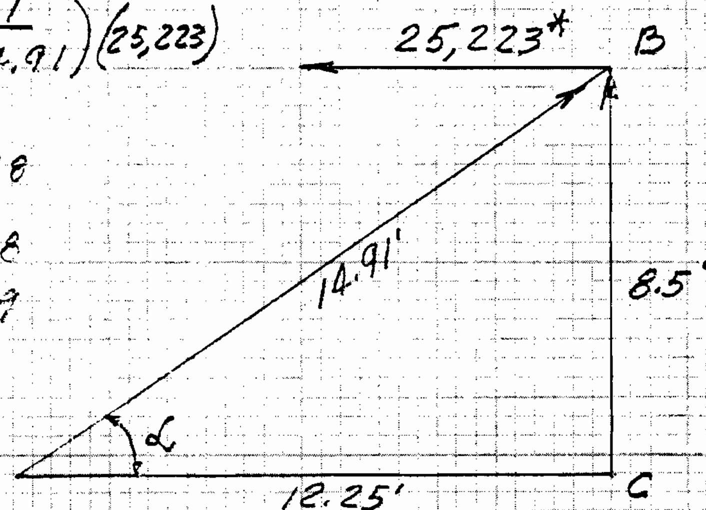
$F_{AB} = \left(\frac{14.91}{\cos\alpha}\right)\left(\frac{1}{14.91}\right)(25{,}223)$

$= 30.7^K$

$\tan\alpha = \frac{8.5}{12.25} = 0.69388$

$\sin = 0.57008$

$\cos = 0.82157$



$F_{CB} = 30.7^K(0.57008) = 17.5^K$

$P = 30.7$

$L = \sqrt{8.5^2 + 12.25^2} = 14.91'$ $K = 1.0$

Try MC10 x 25.3 $r = 1.01$ $A = 7.43$

$\frac{Kl}{r} = \frac{(1)(14.91 \times 12)}{1.01} = 177$

$F_a = 4.77$

$f_a = \frac{30.7}{7.43} = 4.13$ ok

Web thickness = 0.425" − 0.0625" = 0.3625" ≈ 0.375 ok

3/8" fillet weld = $\frac{30.7^K}{3.6^K} = 8.5"$ ok

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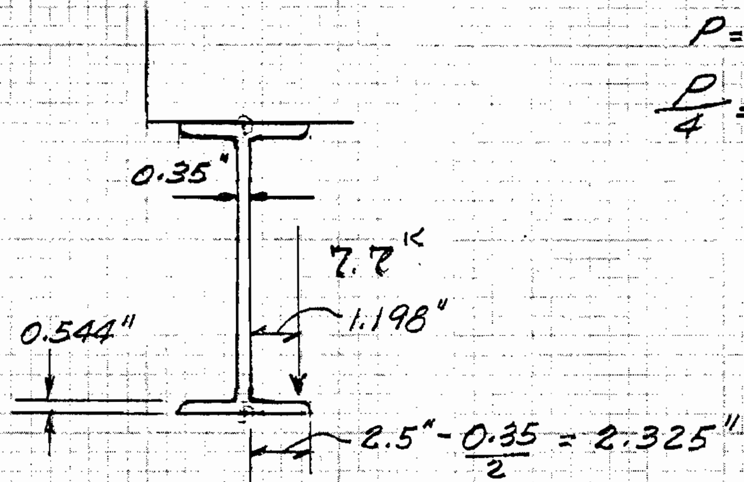
47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Steel Gate (Trolley Beam)

Try S12 x 31.8

$P = 30.7^k$

$\frac{P}{4} = 7.7^k = P_1$



Moment @ web edge $= 7.7^k \times 1.198'' = 9.2246$ in. kips

$S\,req'd = \frac{9.2246''^k}{20^k} = 0.46123$ in^3

Furnished $S = \frac{bh^2}{6} = \frac{12 \times 0.544^2}{6} = 0.592$ in^3 > 0.46123 in^3

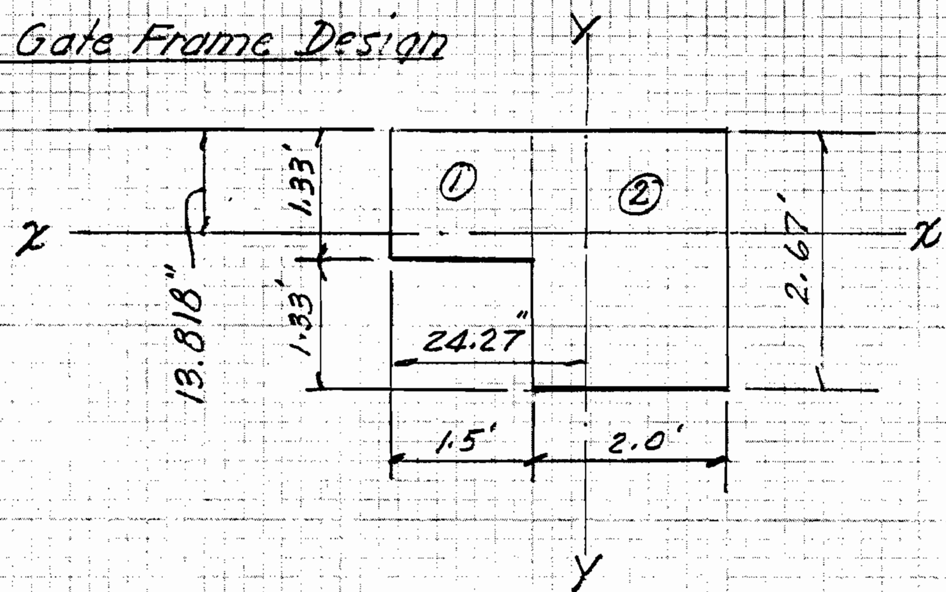
Check Deflection: $\frac{P_1 b^3}{3EI}$ $\quad I = \frac{12 \times 0.544^3}{12} = 0.161$

$b = 1.198 \quad P_1 = 7.7^k = 7{,}700$ lbs

$$\frac{7{,}700\,(1.198)^3}{3\,(29 \times 10^6)(0.161)} = .000945 < \frac{2.325}{360} = .00646 \text{ allowed}$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design



Moment of Inertia - Beam

	Area (A)	Y	AY	$A\bar{Y}^2$	Io	
①	16"X18" = 288	8	2,304	18,432	6144	x-x
②	24"X32" = 768	16	12,288	196,608	65,536	
	1056		14,592	215,040	71,680	

$\bar{y} = \frac{14592}{1056} = 13.818''$

$I = 71{,}680 + 215{,}040 - (14{,}592 \times 13.818)$
$= 85{,}088 \text{ in.}^4$

		x			
①	288	9	2592	23,328	7776
②	768	30	23040	691,200	36864
	1056		25,632	714,528	44,640

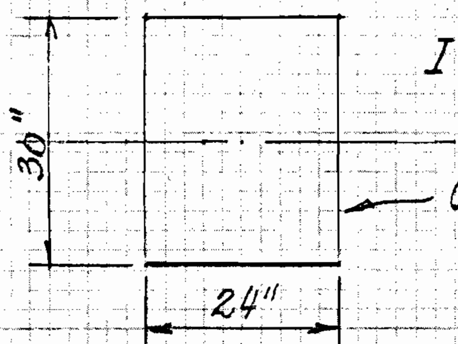
$\bar{x} = \frac{25632}{1056} = 24.27''$

$I = 44{,}640 + 714{,}528 - (25{,}632 \times 24.27)$
$= 137{,}079 \text{ in}^4$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

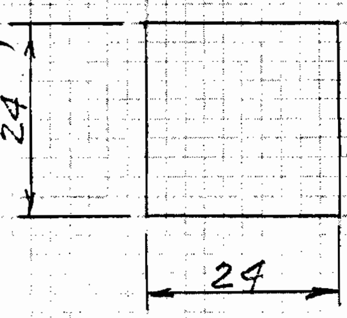
Concrete Gate Frame Design

Moment of Inertia - Columns



$$I = \frac{24(30)^3}{12} = 54000 \text{ in}^4$$

Columns ① and ②



$$I = \frac{24(24)^3}{12} = 27{,}648 \text{ in}^4$$

Col. ③

Loading:

Beam: - Dead Load Conc. $= \frac{1056 \,\square''}{144} \times 0.15^{k} = 1.1 \;{}^{k}/\text{Lin. ft}$

Steel $=$ (S12 × 31.8 $\quad .03$

$1.13 \;{}^{k}$ Lin ft.

Live Load $=$ 2 - 15^{k} loads 24.5' apart

Wind Load - $0.05 \;{}^{k}/\square'$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design

Load Cases considered about X-X Axis

Case 1X - Gate open, no water, no wind, one hanger load placed 5.48 feet from end Column.

Case 2X - Gate closed, no wind.

Case 3X - Gate open, no water, wind from right (75%)

Case 4X - Gate closed, wind from right (75%)

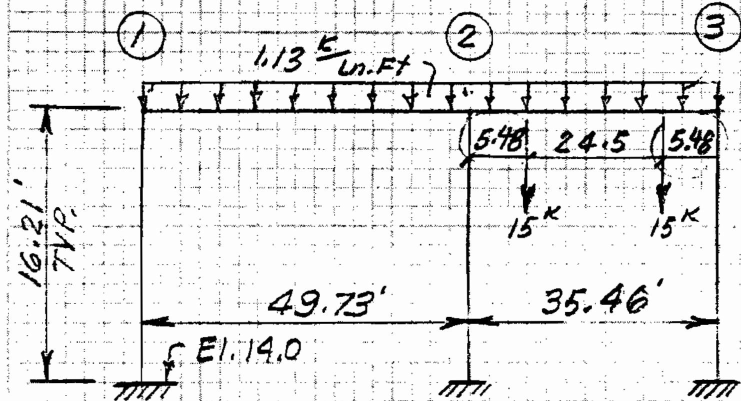
Case 5X - Gate closed, wind from left (75%)

Case 6X - Gate open, no water, no wind, hanger loads placed between center columns.

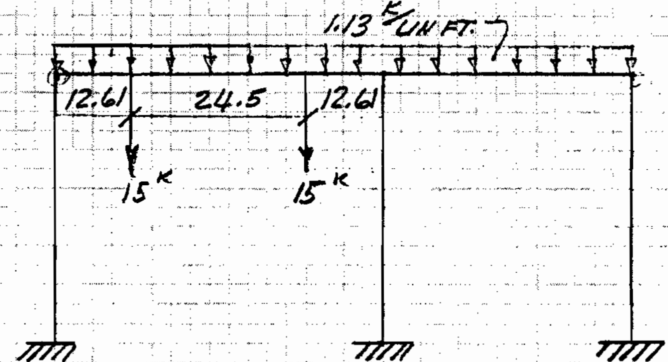
Case 7X - Gate open, no water, no wind, one hanger load placed 0.92' from End Column.

47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

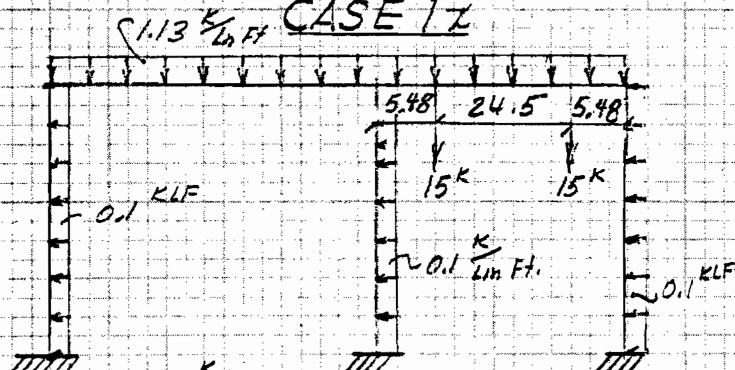
Concrete Frame Design - Loading Conditions



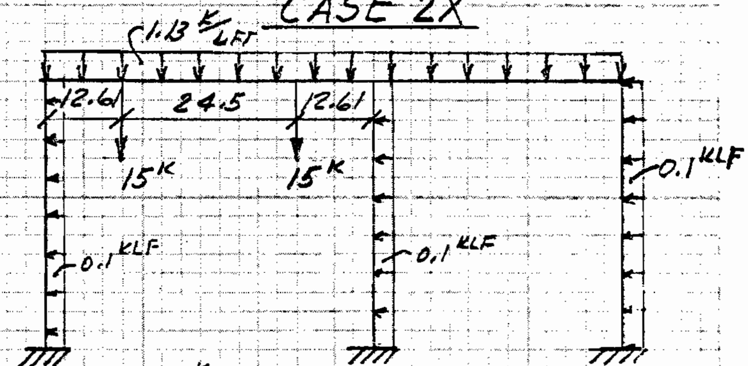
CASE 1X



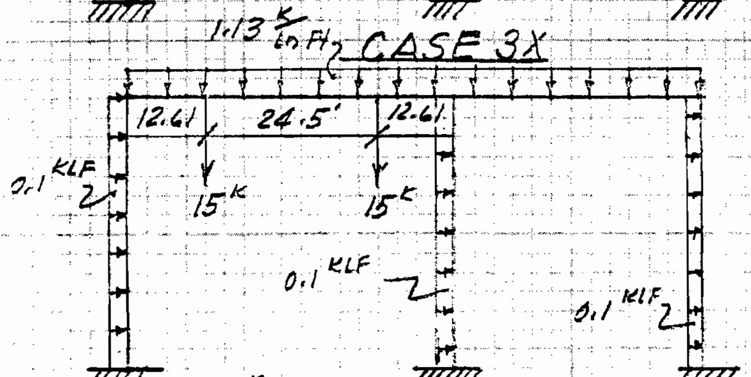
CASE 2X



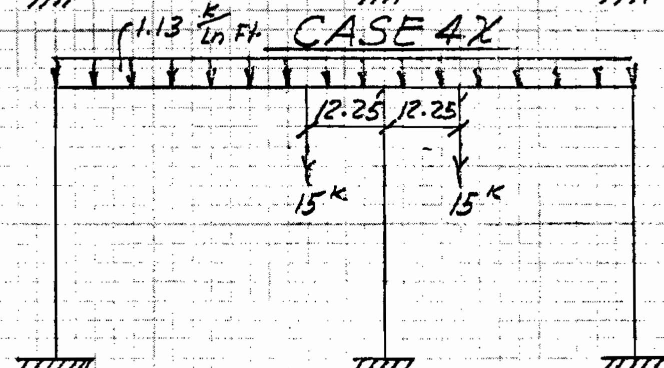
CASE 3X



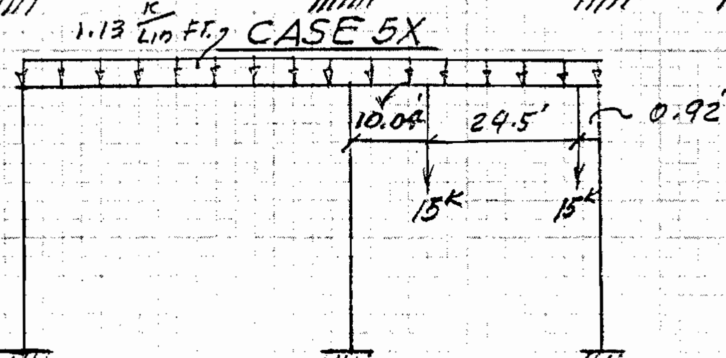
CASE 4X



CASE 5X



CASE 6X



CASE 7X

①

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE IX

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

UNIFORM LOADS:

HL	Y1	Y2
-.1	0	16.21

I = 54000 A = 720

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2

2

1.13	0		0	49.73

I = 85088 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-232.88	232.88	28.09	28.09
LL				

MEMBER TYPE C

LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	35.46

CONCENTRATED LOADS:

DL	LL	X
15	0	5.48
15	0	29.98

I = 85088 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-187.90	187.90	35.03	35.03
LL				

MEMBER TYPE D

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

UNIFORM LOADS:

HL	Y1	Y2
-.1	0	16.21

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION
1	0.0000	0.0000	0.000000	
2	0.0009	0.0001	0.000480	

3	0.0000	0.0000	0.000000
4	0.0008	0.0003	-0.000014
5	0.0000	0.0000	0.000000
6	0.0007	0.0002	-0.000383

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-25.48	-12.33	55.56
		2	-25.48	-12.33	144.41
3	1	3	-70.11	3.98	-30.94
		4	-70.11	3.98	-35.59
TYPE B					
2	1	2	-12.33	25.48	-144.41
		4	-12.33	-30.71	274.35
		MAX.			142.95
TYPE C					
4	1	4	-8.35	39.40	-240.76
		6	-8.35	-30.66	85.86
		MAX.			104.93
TYPE D					
5	1	5	-30.66	8.35	-49.56
		6	-30.66	8.35	-85.86

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 3X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

EXISTING DATA
LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-232.88	232.88	28.09	28.09
LL				

MEMBER TYPE C

EXISTING DATA
LENGTH = 35.46   L(X)= 35.46   L(Y)= 0

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-187.90	187.90	35.03	35.03
LL				

MEMBER TYPE D

EXISTING DATA
LENGTH = 16.21   L(X)= 0   L(Y)= 16.21

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

TYPE

A
'HL' X 1 --LD. COMB 1

B

C

D
'HL' X 1 --LD. COMB 1

JOINT F(X) F(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION
1	0.0000	0.0000	0.000000	
2	0.0006	0.0001	0.000466	
3	0.0000	0.0000	0.000000	
4	0.0005	0.0003	-0.000021	
5	0.0000	0.0000	0.000000	
6	0.0004	0.0002	-0.000387	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-25.60	-13.97	65.70
		2	-25.60	-12.35	147.62

3	1	3	-70.13	2.14	-19.74
		4	-70.13	3.76	-28.19
TYPE B					
2	1	2	-12.35	25.60	-147.68
		4	-12.35	-30.58	271.62
		MAX.			142.41
TYPE C					
4	1	4	-8.58	39.54	-243.43
		6	-8.58	-30.52	83.58
		MAX.			105.28
TYPE D					
5	1	5	-30.52	6.96	-42.45
		6	-30.52	8.58	-83.58

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 7X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

EXISTING DATA
LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-232.88	232.88	28.09	28.09
LL				

MEMBER TYPE C

LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	35.46

CONCENTRATED LOADS:

DL	LL	X
15	0	10.04
15	0	34.54

I = 85088 A = 1056

	FIXED-END MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-196.14	162.06	32.13	37.93
LL				

MEMBER TYPE D

EXISTING DATA

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

	FIXED-END MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT	P(X)	P(Y)	MOMENT	LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0011	0.0001	0.000487	
3	0.0000	0.0000	0.000000	
4	0.0009	0.0003	-0.000008	
5	0.0000	0.0000	0.000000	
6	0.0009	0.0002	-0.000323	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-25.40	-11.99	-52.12
		2	-25.40	-11.99	142.35
3	1	3	-66.56	4.40	-34.86
		4	-66.56	4.40	-36.47

10

TYPE B

2	1	2	-11.99	25.40	-142.35
		4	-11.99	-30.78	276.24
		MAX.			143.23

TYPE C

4	1	4	-7.59	35.77	-239.77
		6	-7.59	-34.29	76.78
		MAX.			101.77

TYPE D

5	1	5	-34.29	7.59	-46.34
		6	-34.29	7.59	-76.78

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 6X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	49.73

CONCENTRATED LOADS:

DL	LL	X
15	0	37.48

I = 85088 A = 1056

FIXED-END	MOMENTS LEFT	RIGHT	LOADS LEFT	RIGHT
DL	-266.99	337.25	30.37	40.81
LL				

MEMBER TYPE C

LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	35.46

CONCENTRATED LOADS:

DL	LL	X
15	0	12.25

I = 85088 A = 1056

FIXED-END	MOMENTS LEFT	RIGHT	LOADS LEFT	RIGHT
DL	-197.12	159.95	30.90	24.16
LL				

MEMBER TYPE D

EXISTING DATA

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS LEFT	RIGHT	LOADS LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0009	0.0001	0.000565	
3	0.0000	0.0000	0.000000	
4	0.0007	0.0004	-0.000158	
5	0.0000	0.0000	0.000000	
6	0.0007	0.0001	-0.000283	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-28.11	-15.29	71.62
		2	-28.11	-15.29	176.23
3	1	3	-78.77	8.73	-56.13
		4	-78.77	8.73	-85.46
TYPE B					
2	1	2	-15.29	28.11	-176.23
		4	-15.29	-43.08	359.22
		MAX.			173.46
TYPE C					
4	1	4	-6.55	35.69	-273.76
		6	-6.55	-19.37	66.58
		MAX.			99.50
TYPE D					
5	1	5	-19.37	6.55	-39.67
		6	-19.37	6.55	-66.58

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 2X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	49.73

CONCENTRATED LOADS:

DL	LL	X
15	0	12.61
15	0	37.11

I = 85088 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-374.11	374.09	43.10	43.09
LL				

MEMBER TYPE C

LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	35.46

I = 85088 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-118.40	118.40	20.03	20.03
LL				

MEMBER TYPE D

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT F(X) F(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW) LOAD COMBINATION 1
1	0.0000	0.0000	0.000000
2	0.0015	0.0002	0.000819
3	0.0000	0.0000	0.000000
4	0.0012	0.0003	-0.000333
5	0.0000	0.0000	0.000000
6	0.0012	0.0001	-0.000121

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					

1	1	1	-40.35	-21.61	99.36
		2	-40.35	-21.61	251.03
3	1	3	-70.82	16.81	-105.37
		4	-70.82	16.81	-167.16
TYPE B					
2	1	2	-21.61	40.35	-251.03
		4	-21.61	-45.83	387.53
		MAX.			222.58
TYPE C					
4	1	4	-4.80	24.98	-220.37
		6	-4.80	-15.08	44.70
		MAX.			55.93
TYPE D					
5	1	5	-15.08	4.80	-33.15
		6	-15.08	4.80	-44.70

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 4X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.21   L(X)= 0   L(Y)= 16.21

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.18	-2.18	-0.81	-0.81

MEMBER TYPE B

EXISTING DATA
LENGTH = 49.73   L(X)= 49.73   L(Y)= 0

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-374.11	374.09	43.10	43.09
LL				

MEMBER TYPE C

EXISTING DATA
LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-118.40	118.40	20.03	20.03
LL				

MEMBER TYPE D

EXISTING DATA
LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.18	-2.18	-0.81	-0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

TYPE

A
'HL' X 1 --LD. COMB 1

B

C

D
'HL' X 1 --LD. COMB 1

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0012	0.0002	0.000806	
3	0.0000	0.0000	0.000000	
4	0.0009	0.0003	-0.000341	
5	0.0000	0.0000	0.000000	
6	0.0009	0.0001	-0.000126	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-40.47	-23.25	109.50
		2	-40.47	-21.63	254.31

3	1	3	-70.84	14.97	-94.17
		4	-70.84	16.59	-161.76
TYPE B					
2	1	2	-21.63	40.47	-254.31
		4	-21.63	-45.71	384.80
		MAX.			222.02
TYPE C					
4	1	4	-5.03	25.12	-223.04
		6	-5.03	-14.94	42.42
		MAX.			56.35
TYPE D					
5	1	5	-14.94	3.41	-26.04
		6	-14.94	5.03	-42.42

* GENERAL FRAME ANALYSIS *

FLA AVE WEST HARBOR ROAD ROLLER GATE CASE 5X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.21
3	49.73	0
4	49.73	16.21
5	85.19	0
6	85.19	16.21

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.21	0.00	+16.21
2	2	4	B	49.73	49.73	+0.00
3	3	4	A	16.21	0.00	+16.21
4	4	6	C	35.46	35.46	+0.00
5	5	6	D	16.21	0.00	+16.21

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

UNIFORM LOADS:

HL	Y1	Y2
.1	0	16.21

I = 54000 A = 720

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.18	2.18	0.81	0.81

MEMBER TYPE B

EXISTING DATA
LENGTH = 49.73 L(X)= 49.73 L(Y)= 0

FIXED-END MOMENTS LOADS

	LEFT	RIGHT	LEFT	RIGHT
DL	-374.11	374.09	43.10	43.09
LL				

MEMBER TYPE C

EXISTING DATA

LENGTH = 35.46 L(X)= 35.46 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-118.40	118.40	20.03	20.03
LL				

MEMBER TYPE D

LENGTH = 16.21 L(X)= 0 L(Y)= 16.21

UNIFORM LOADS:

HL	Y1	Y2
.1	0	16.21

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.18	2.18	0.81	0.81

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

TYPE

A
'HL' X 1 --LD. COMB 1

B

C

D
'HL' X 1 --LD. COMB 1

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0018	0.0002	0.000832	
3	0.0000	0.0000	0.000000	
4	0.0015	0.0003	-0.000326	

(21)

5	0.0000	0.0000	0.000000
6	0.0015	0.0001	-0.000117

MEMBER FORCES

MEMBER	LD. COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-40.23	-19.97	89.23
		2	-40.23	-21.59	247.76
3	1	3	-70.80	18.64	-116.57
		4	-70.80	17.02	-172.56
TYPE B					
2	1	2	-21.59	40.23	-247.76
		4	-21.59	-45.96	390.26
		MAX.			223.15
TYPE C					
4	1	4	-4.57	24.84	-217.69
		6	-4.57	-15.22	46.98
		MAX.			55.52
TYPE D					
5	1	5	-15.22	6.19	-40.27
		6	-15.22	4.57	-46.98

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

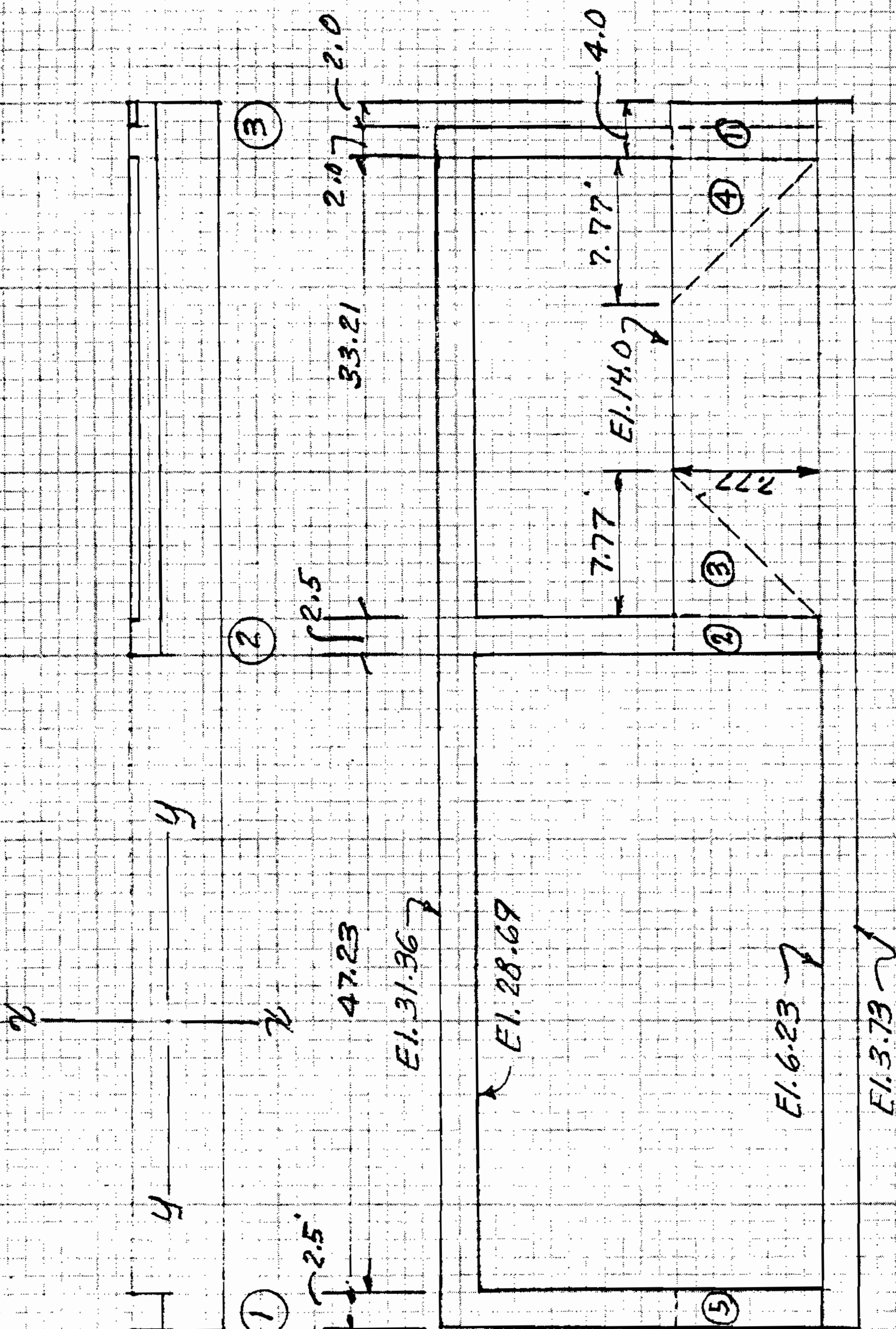
JOB ______
ITEM ______
JOB No 575-79-E
47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

SHEET No 19 OF ______
BY LWC DATE 1-3-80
CHKD. BY ______ DATE ______

LOAD CASES ABOUT X-X AXIS

Case	$M_{1\text{-}2}$	$M_{2\text{-}1}$	$M_{2\text{-}4}$	$M_{4\text{-}2}$	$M_{4\text{-}3}$	$M_{3\text{-}4}$	$M_{4\text{-}6}$	$M_{6\text{-}4}$	$M_{6\text{-}5}$	$M_{5\text{-}6}$	R_1	R_3	R_5	H_1	H_3	H_5
1X	55.6	144.4	-144.4	274.4	-33.6	-30.9	-240.8	85.9	-85.9	-49.6	-25.48	-70.11	-30.66	-12.33	3.98	8.35
2X	99.4	251.0	-251.0	387.5	-167.2	-105.4	-220.4	44.7	-44.7	-33.2	-40.35	-70.82	-15.08	-21.61	16.81	4.80
3X	65.7	147.7	-147.7	271.6	-28.2	-19.7	-243.4	83.58	-83.58	-42.45	-25.60	-70.13	30.52	-13.97	2.14	6.96
4X	109.5	254.3	-254.3	384.8	-161.8	-94.2	223.0	42.4	-42.4	-26.1	-40.47	-70.84	-14.94	-23.25	14.97	3.41
5X	89.2	247.8	-247.8	390.3	-172.6	-116.6	-217.7	47.0	-47.0	-40.3	-40.23	-70.8	-15.22	-19.97	18.64	6.19
6X	71.6	176.2	-176.2	359.22	-85.5	-56.1	-273.8	66.6	-66.6	-39.7	-28.11	78.77	-19.37	-15.29	8.73	6.55
7X	52.1	142.4	-142.4	276.2	-36.5	-34.9	-239.8	76.8	-76.8	-46.3	-25.4	-66.56	-34.29	-11.99	4.40	7.59

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)



Column Load
about Y-Y Axis
Water Loads
Water to El. 14.0

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No 21 OF ____
ITEM ____ BY LWC DATE 12-31-79
JOB No 575-79-E CHKD. BY ____ DATE ____

47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design

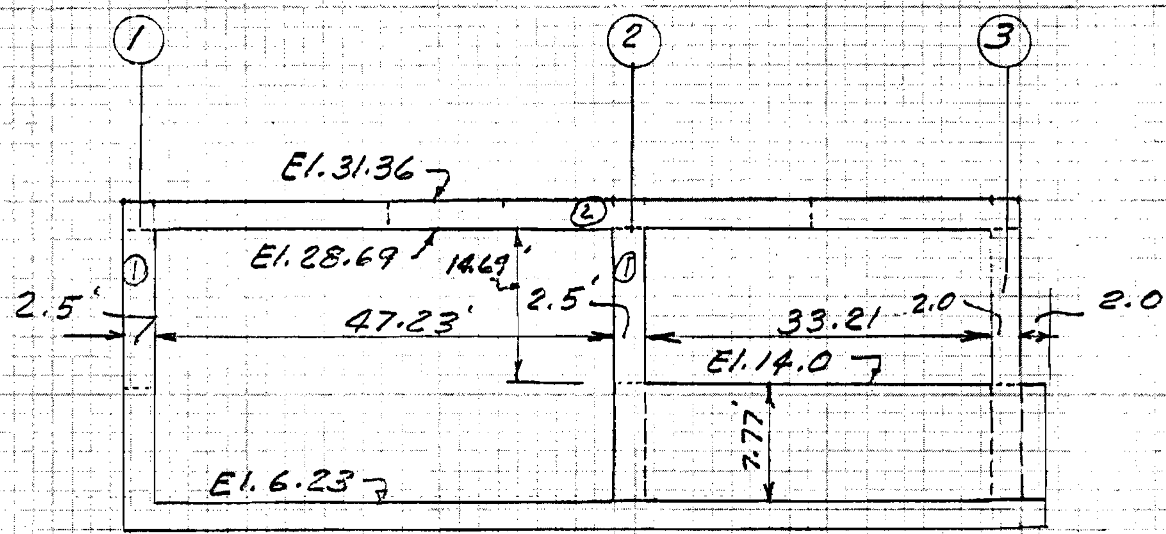
Columns - Load about Y-Y axis - Water to Elev. 14.0

	Force ^{K}	Arm ^{FT}	Moment $^{FT\,K}$
Column ①			
⑤ $(\frac{1}{2})(2.5)(7.77)^2(0.0625) =$	4.72	2.59	12.22
Gate: $\frac{1}{2}(0.0625)(7.77)^2(\frac{47.23}{2}) =$	44.55	2.59	115.38
	49.27^{K}		$127.6\,'^{K}$
Column ②			
② $\frac{1}{2}(2.5)(7.77)^2(0.0625) =$	4.72	2.59	12.22
③ $\frac{1}{3}(\frac{1}{2})(7.77)^3(0.0625) =$	4.89	3.89	19.02
Gate (Same as Col. ①) =	44.55	2.59	115.38
	54.36^{K}		$146.62\,'^{K}$
Column ③			
① $\frac{1}{2}(4)(7.77)^2(0.0625) =$	7.55	2.59	19.55
④ $\frac{1}{3}(\frac{1}{2})(7.77)^2(0.0625) =$	4.89	3.89	19.02
	12.44^{K}		$38.57\,'^{K}$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design · Column Design

Loads about Y-Y Axis · Wind above El. 14.0



Column 1	Force KIPS	Arm FT	Moment FT.KIP
1 (2.5)(14.69)(0.05) =	1.84	15.12	27.82
2 (26.12)(2.67)(0.05) =	3.49	23.80	83.06
	5.33 K		ΣM = 110.88

Column 2	Force	Arm	Moment
1 (2.5)(14.69)(0.05) =	1.84	15.12	27.82
2 (42.72)(2.67)(0.05) =	5.70	23.80	135.66
	7.54 K		ΣM = 163.48 'K

Column 3	Force	Arm	Moment
1 (2.0)(14.69)(0.05) =	1.47	15.12	22.23
2 (18.61)(2.67)(0.05) =	2.48	23.80	59.02
	3.95 K		ΣM = 81.25 'K

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design - Column Design

Load about Y-Y Axis - Wind below El. 14.0

	Force KIPS	Arm FT	Moment FT. KIPS
Column ①			
① (7.77)(2.5)(0.05) =	0.97	3.89	3.77
Gate (23.62)(7.77)(0.05) =	9.17	3.89	35.67
	10.14 K		ΣM = 39.44
Column ②			
① (19.11)(7.77)(0.05) =	7.42	3.89	28.86
Gate (Same as Col ①) =	9.17	3.89	35.67
	16.59 K		ΣM = 64.53 'K
Column ③			
① (20.60)(7.77)(0.05) =	8.00	3.89	31.12
	8.0 K		ΣM = 31.12 'K

Load Cases considered (Bending about Y-Y Axis)

Case 1Y – Gate opened, no water, no wind.

Case 2Y – Gate closed, water to El. 14.0, no wind

Case 3Y – Gate open, wind from F.S. (75%)

Case 4Y – Gate closed, water to El. 14.0, wind from F.S. (75%)

Case 5Y – Gate opened, no water, wind from P.S. (75%)

Case 6Y – Gate closed, water to El. 14.0, wind from P.S. (75%

Case 1Y - No water, no wind.

$M1Y = 0$

$H1Y = 0$

$M2Y = 0$

$H2Y = 0$

$M3Y = 0$

$H3Y = 0$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design - Column Design
Bending about Y-Y Axis (Cont)

Case 2Y: Water, no wind

$M1Y = 127.6'^{k}$
$H1Y = 49.27^{k}$
$M2Y = 146.62'^{k}$
$H2Y = 54.36^{k}$
$M3Y = 38.57'^{k}$
$H3Y = 12.44^{k}$

Case 3Y: Gate opened, no water, wind from F.S. (75%)

$M1Y = 0.75(110.88 + 39.44) = 0.75(150.32) = 112.74'^{k}$
$H1Y = 0.75(5.33 + 10.14) = 0.75(15.47) = 11.60^{k}$
$M2Y = 0.75(163.48 + 64.53) = 0.75(228.01) = 171.01'^{k}$
$H2Y = 0.75(7.54 + 16.59) = 0.75(24.13) = 18.09^{k}$
$M3Y = 0.75(81.25 + 31.12) = 0.75(112.37) = 84.28'^{k}$
$H3Y = 0.75(3.95 + 8.0) = 0.75(11.95) = 8.96^{k}$

Case 4Y: Gate closed, Water to El.14.0, Wind from F.S. (75%)

$M1Y = 0.75(127.6 + 110.88) = 0.75(238.48) = 178.86'^{k}$
$H1Y = 0.75(49.27 + 5.33) = 0.75(54.6) = 40.95^{k}$
$M2Y = 0.75(146.62 + 163.48) = 0.75(310.1) = 232.58'^{k}$
$H2Y = 0.75(54.36 + 7.54) = 0.75(61.9) = 46.43^{k}$
$M3Y = 0.75(38.57 + 81.25) = 0.75(119.82) = 89.87'^{k}$
$H3Y = 0.75(12.44 + 3.95) = 0.75(16.39) = 12.29^{k}$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)
Concrete Gate Frame Design - Column Design
Bending about Y-Y Axis (cont.)

Case 5Y = Gate opened, no water, wind from P.S. (75%)

$M_{1Y} = 0.75(-110.88 - 39.44) = 0.75(-150.32) = -112.74'^{k}$

$H_{1Y} = 0.75(-5.33 - 10.14) = 0.75(-15.47) = -11.6^{k}$

$M_{2Y} = 0.75(-163.48 - 64.53) = 0.75(-228.01) = -171.06'^{k}$

$H_{2Y} = 0.75(-7.54 - 16.59) = 0.75(-24.13) = -18.09^{k}$

$M_{3Y} = 0.75(-81.25 - 31.12) = 0.75(-112.37) = -84.28'^{k}$

$H_{3Y} = 0.75(-3.95 - 8.0) = 0.75(-11.95) = -8.96^{k}$

Case 6Y = Gate closed, water to El. 14.0, wind from P.S. (75%)

$M_{1Y} = 0.75(127.6 - 150.32) = 0.75(-23.62) = -17.72'^{k}$

$H_{1Y} = 0.75(49.27 - 15.47) = 0.75(+33.8) = 25.35^{k}$

$M_{2Y} = 0.75(146.62 - 228.01) = 0.75(-81.39) = -61.04'^{k}$

$H_{2Y} = 0.75(54.36 - 24.13) = 0.75(+30.23) = 22.67^{k}$

$M_{3Y} = 0.75(38.57 - 112.37) = 0.75(-73.8) = -55.35'^{k}$

$H_{3Y} = 0.75(12.44 - 11.95) = 0.75(+0.49) = 0.37^{k}$

Summary of Resultants (Bending about Y-Y Axis)

Load Case	Column No. 1		Column No. 2		Column No. 3	
	M_{1Y} 'k	H_{1Y} k	M_{2Y} 'k	H_{2Y} k	M_{3Y} 'k	H_{3Y} k
1Y	0	0	0	0	0	0
2Y	127.6	49.27	146.62	54.36	38.57	12.44
3Y	112.74	11.60	171.06	18.09	84.28	8.96
4Y	178.86	40.95	232.58	46.43	89.87	12.29
5Y	-112.74	-11.6	-171.06	-18.09	-84.28	-8.96
6Y	-17.72	25.35	-61.04	22.67	-55.35	0.37

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design - Column Design

Combined Load Cases (Bending about X-X Axis and Y-Y Axis)

The following cases are considered:

Case I - Case 1X (75%) + Case 3Y (75%)
Case II - Case 1X (75%) + Case 5Y (75%)
Case III - Case 2X + Case 2Y
Case IV - Case 2X (75%) + Case 4Y (75%)
Case V - Case 2X (75%) + Case 6Y (75%)
Case VI - Case 3X (75%) + Case 1Y (75%)
Case VII - Case 4X (75%) + Case 2Y (75%)
Case VIII - Case 4X (75%) + Case 6Y (75%)
Case IX - Case 5X (75%) + Case 2Y (75%)
Case X - Case 6X + Case 1Y
Case XI - Case 6X (75%) + Case 3Y (75%)
Case XII - Case 6X (75%) + Case 5Y (75%)
Case XIII - Case 7X + Case 1Y
Case XIV - Case 7X (75%) + Case 3Y (75%)
Case XV - Case 7X (75%) + Case 5Y (75%)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB ______ SHEET No 27 OF ______
ITEM ______ BY LWC DATE 1-2-80
JOB No 575-79-E CHKD. BY ______ DATE ______

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Gate Frame Design - Column Design

Combined Load Cases (Bending about X-X Axis and Y-Y Axis)

Load Case	Column ①					Column ②					Column ③				
	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R
I	108.3	112.7	9.2	11.6	-25.5	-25.2	171.0	3.0	18.9	-70.1	-64.4	84.3	6.3	9.0	-30.7
II	108.3	-112.7	-9.2	-11.6	-25.5	-25.2	-171.0	3.0	-18.9	-70.1	-64.4	-84.3	6.3	-9.0	-30.7
III	251.0	127.6	-21.6	49.3	-40.4	-167.2	146.6	16.8	54.4	70.8	-44.7	38.6	4.8	12.4	-15.1
IV	188.3	176.9	-16.2	41.0	-40.4	-125.4	232.6	12.6	46.4	70.8	-33.5	89.9	3.6	12.3	-15.1
V	188.3	-17.7	-16.2	25.4	-40.4	-125.4	-61.0	12.6	22.7	70.8	-33.5	55.4	3.6	0.4	-15.1
VI	110.8	0	-10.5	0	-25.6	-21.2	0	2.14	0	70.1	-62.7	0	5.2	0	-30.5
VII	190.7	95.7	-17.4	37.0	-40.5	-121.4	109.9	11.2	40.9	70.8	-31.8	29.0	2.6	9.3	-15.0
VIII	190.7	-17.7	-17.4	25.4	-40.5	-121.4	-61.0	11.2	22.7	70.8	-31.8	55.4	2.6	0.4	-15.0
IX	185.9	95.7	-15.0	37.0	-40.2	-129.5	109.9	14.0	40.9	70.8	-35.3	29.0	4.6	9.3	-20.0
X	176.2	0	-15.29	0	-28.1	-85.5	0	8.7	0	70.8	-66.6	0	6.6	0	-19.4
XI	132.2	112.7	-11.5	11.6	28.1	-64.1	171.0	6.5	18.9	78.8	-50.0	84.3	5.0	9.0	-19.4
XII	132.2	-112.7	-11.5	-11.6	-28.1	-64.1	-171.0	6.5	-18.9	78.8	-50.0	-84.3	5.0	-9.0	-19.4
XIII	142.4	0	12.0	0	-25.4	-34.9	0	4.4	0	66.6	-76.8	0	7.6	0	-34.3
XIV	106.8	112.7	9.0	11.6	-25.4	-27.4	171.0	3.3	18.9	66.6	-57.6	84.3	5.7	9.0	-343
XV	106.8	-112.7	9.0	-11.6	25.4	-27.4	-171.0	3.3	22.7	66.6	57.6	-84.3	5.7	-9.0	-343

Wt Col. ① and ②

$(2.5' \times 2' \times 22.46 \times 0.15) + (7.77 \times 1 \times 2.5 \times 0.5 \times 0.15) = 18.3^k$

Wt Col 3

$(2' \times 2 \times 22.46 \times 0.15) + (7.77 \times 1 \times 2.0 \times 0.5 \times 0.15) = 14.6^k$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column ①

Loading Conditions - Mx (Case VII & VIII) My (Case IV) Reaction (Case XI & XII)

$N = 40.5^k + 18.3^k = 58.8$

$M_x = 190.7'^k$

$M_y = 178.9'^k$

$f_y = 40{,}000$ psi

$f'_c = 3000$ psi

$n = 9$

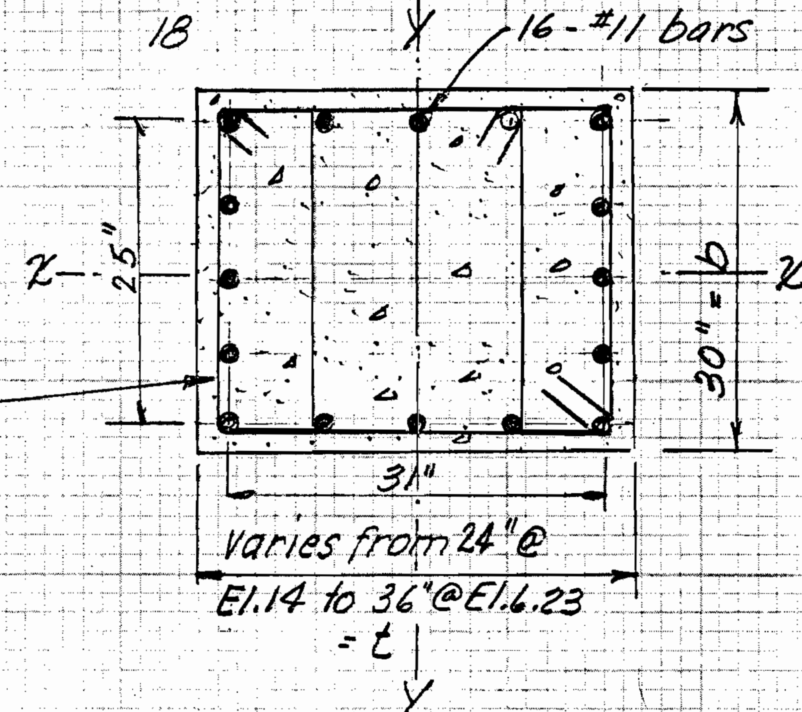
$b = 30''$

$t = 36''$

$g_x = \frac{25}{30} = 0.833$

$g_y = \frac{31}{36} = 0.861$

$A_g = 30'' \times 36'' = 1080 \,\square''$



Compute $\frac{N}{f'_c A_g} = \frac{58.8}{3(1080)} = 0.0181$

Assume 16 #11 bars

$A_s = 24.96 \,\square''$

$P_g = \frac{24.96}{1080} = 0.0231$

ACI-SP3-Table 26
From table
for $g_x = 0.83$
$\frac{P_b}{f'_c A_g} = 0.20 > 0.0181$
for $g_y = 0.86$
$\frac{P_b}{f'_c A_g} = 0.20 > 0.0181$

Tension controls

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 5 \times 1.56 = 15.6 \,\square''$; $P_{y1} = \frac{15.6}{1080} = 0.01444$

$A_{s2} = 2 \times 3 \times 1.56 = 9.36$; $P_{y2} = \frac{9.36}{1080} = 0.00866$

$P'_y = P_{y1} + 0.5 P_{y2}$
$= 0.0144 + 0.00433$
$= 0.0187$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore P'_y = P'_x = 0.0187$

47.23' OVERHEAD GATE AT HARBOUR ROAD (West of IHNC)

Column ① (cont)

Table 34 (ACI-SP3)

$P_g = 0.0231$

For $g_y = 0.86$

$K = \frac{0.0087}{0.0144} = 0.60$

Read $D'_y = 0.157$

For $g_x = 0.83$

$K = 0.60$

Read $D'_x = 0.158$

Table 26

$f_y = 40{,}000\ psi$

$f'_c = 3000\ psi$

For $g_y = 0.86$

Read $C'_y = 1.87$

For $g_x = 0.83$

Read $C'_x = 1.91$

$$M_{x\text{-}x} = N\left(\frac{D'_x b}{12}\right) + P'_x\left(\frac{t b^2}{C'_x}\right)$$

$$= 58.8\left(\frac{\overset{0.395}{0.158(30)}}{12}\right) + 0.0187\left(\frac{36(30)^2}{1.91}\right)$$

$$= 340.4'^{K}$$

$$M_{y\text{-}y} = N\left(\frac{D'_y(t)}{12}\right) + P'_y\left(\frac{b t^2}{C'_y}\right)$$

$$= 58.8\left(\frac{\overset{0.471}{0.157(36)}}{12}\right) + 0.0187\left(\frac{30(36)^2}{1.87}\right)$$

$$= 416.5'^{K}$$

$$\frac{M_x}{M_{x\text{-}x}} + \frac{M_y}{M_{y\text{-}y}} \leq 1$$

$$\frac{190.7'^{K}}{340.4'^{K}} + \frac{178.9'^{K}}{416.5'^{K}} = 0.99 < 1 \quad \%_K$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column ① (cont)

Stresses: X-X direction $d = 27.5"$ $b = 36"$ $As = 5 \times 1.56" = 7.8\square"$ $n = 9$

$x = kd$ about X-X Axis.

$b x \times \frac{1}{2} x = n As (d - x)$

$36x \times \frac{1}{2} x = (9)(7.8)(27.5 - x)$

$18x^2 + 70.2x = 1930.5$

$0.2563x^2 + x = 27.5$

$x = 8.589$

jd = lever arm $= d - \frac{x}{3} = 24.637$

Moment X-X $= 190.7'^{k} = 2,288,400$ "lbs

$2,288,400"^{\#} = C \times 24.637$ $C = 92,884^{\#}$

$92,884^{\#} = \frac{1}{2} fc (36)(8.589)$

$fc = \underline{600 \text{ psi}}$

$C = T = 92,884^{\#}$

$92,884 = 7.8 \times fs$

$\underline{fs = 11,908 \text{ psi}}$

Stresses: Y-Y direction $d = 33.5$ $b = 30"$ $As = 7.8\square"$ $n = 9$

$b x \times \frac{1}{2} x = n As (d - x)$

$30x \times \frac{1}{2} x = (9)(7.8)(33.5 - x)$

$15x^2 + 70.2x = 2412$

$0.21368x^2 + x = 33.5$

$x = 10.398$

jd = lever Arm $= d - \frac{x}{3} = 30.034$

Moment Y-Y $= 178.9'^{k} \times 12,000 = 2,146,800"^{\#}$

$2,146,800 = C \times 30.034$ $C = 71,479^{\#}$

$71,479^{\#} = \frac{1}{2} fc (30)(10.398)$

$fc = \underline{458 \text{ psi}}$

$T = C = 71,479^{\#}$

$71,479^{\#} = 7.8 \times fs$

$fs = \underline{9,164 \text{ psi}}$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column ②

Loading Conditions Mx (Case III) MY (Case IV) Reaction Case XII

$N = 78.8^k + 18.3^k = 97.1^k$

$Mx = 167.2'^k$

$My = 232.6'^k$

$f_y = 40{,}000$ psi

$f'c = 3000$ psi

$n = 9$

$b = 30''$

$t = 36''$

$g_x = \frac{25}{30} = 0.83$

$g_y = \frac{31}{36} = 0.86$

$A_g = 30 \times 36 = 1080$ □"

Note:
for sketch of column and reinforcement see page 28. Col. 1

For tension controls see page 28

0.20 > 0.030

For properties of reinforcement see page 28.

For $D'y = 0.157$
For $D'x = 0.158$
For $C'y = 1.87$
For $C'x = 1.91$
} See page 29

Compute $\frac{N}{f'c\, A_g} = \frac{97.1}{(3)1080} = 0.030$

$$M_{x\text{-}x} = N\left(\frac{D'x\, b}{12}\right) + P'x\left(\frac{t b^2}{C'x}\right)$$

$$= 91.7\left(\frac{\overset{0.395}{0.158(30)}}{12}\right) + 0.0187\left(\frac{36(30)^2}{1.91}\right)$$

$$= 353.4'^k$$

$$M_{y\text{-}y} = N\left(\frac{D'y(t)}{12}\right) + P'y\left(\frac{b t^2}{C'y}\right)$$

$$= 91.7\left(\frac{\overset{0.471}{0.157(36)}}{12}\right) + 0.0187\left(\frac{30(36)^2}{1.87}\right)$$

$$= 432.0'^k$$

$$\frac{Mx}{M_{x\text{-}x}} + \frac{My}{M_{y\text{-}y}} \leq 1$$

$$\frac{167.2}{353.4} + \frac{232.6}{432.4} = 1.01 \approx 1$$

Stresses

x-x direction

$jd = 24.637''$ (See page 30)
$kd = 8.589$

Moment x-x $= 167.2^{'k} \times 12{,}000 = 2{,}006{,}400$ "lbs

$2{,}006{,}400 = C \times 24.637 = 81{,}438$ #

$81{,}438 = \frac{1}{2} f_c (36)(8.589)$

$f_c = 526$ psi

$C = T = 81{,}438$ #

$81{,}438 = 7.8 \times f_s$

$f_s = 10{,}440$ psi

y-y direction

$jd = 30.034$ $kd = 10.398$

Mom. y-y $= 232.6^{'k} \times 12000 = 2{,}791{,}200$ "#

$2{,}791{,}200 = C \times 30.034$

$C = 92{,}935$ # $= \frac{1}{2} f_c (30)(10.398)$

$f_c = 596$ psi

$f_s \times 7.8 = 92{,}935$ # $f_s = 11{,}915$ psi

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column (3)

Loading Conditions - Mx (Case XIII) My (Case IV) Reaction (Case XIII, XIV, XV)

$N = 34.4^k + 14.6^k = 49^k$

$M_x = 76.8'^k$

$M_y = 89.9'^k$

$f_y = 40{,}000$

$f'_c = 3{,}000$

$n = 9$

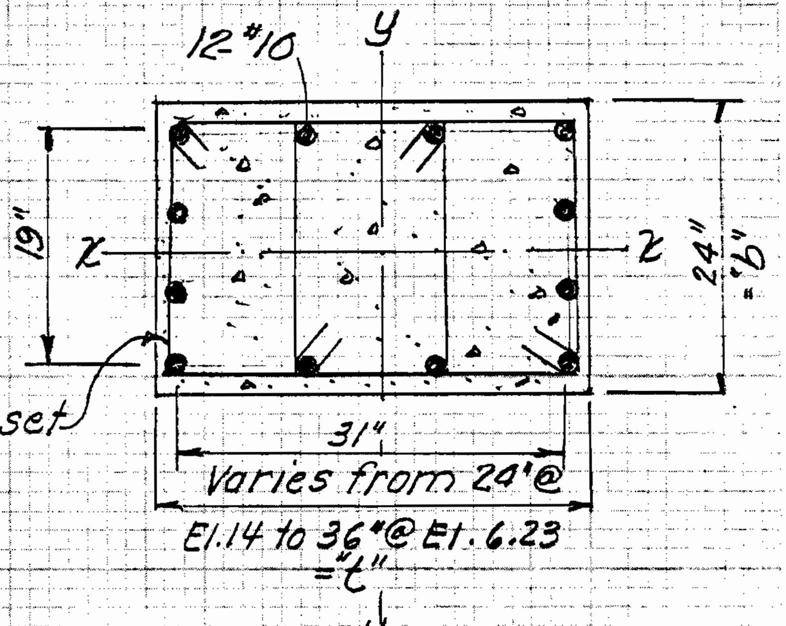
$b = 24''$

$t = 36''$

#3 ties @ 18", 2 per set

$g_x = \frac{19}{24} = 0.80$

$g_y = \frac{31}{36} = 0.86$



$A_g = 24 \times 36 = 864\ \square''$

Compute $\frac{N}{f'_c A_g} = \frac{49}{3(864)} = 0.0189$

Assume 12 - #10 bars

$A_{stl} = 15.24\ \square''$

$P_g = \frac{15.24}{864} = 0.0176$

ACI-SP3
From Table 26
For $g_x = 0.80$
$\frac{P_b}{f'_c A_g} = 0.20 > 0.0189$
For $g_y = 0.86$
$\frac{P_b}{f'_c A_g} = 0.20 > 0.0189$

Tension Controls

Properties of Reinforcement about Y-Y Axis

$A_{s1} = 2 \times 4 \times 1.27 = 10.16\ \square''$; $P_{y1} = \frac{10.16}{864} = 0.0118$

$A_{s2} = 2 \times 2 \times 1.27 = 5.08\ \square''$; $P_{y2} = \frac{5.08}{864} = 0.0059$

$$P'_y = P_{y1} + 0.5 P_{y2}$$
$$= 0.0118 + 0.0030$$
$$= 0.0148$$

Properties of Reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore$ $P'_y = P'_y = 0.0148$

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47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column (3) (cont.)

Table 34 (ACI-SP3)

$Pg = 0.0176$

For $gy = 0.86$

$K = \frac{.0059}{.0118} = 0.50$

Read $D'y = 0.155$

For $gx = 0.80$

$K = 0.50$

Read $D'x = 0.154$

Table 26

$fy = 40{,}000$ psi

$f'c = 3000$

For $gy = 0.86$

Read $C'y = 1.76$

For $gx = 0.80$

Read $C'x = 1.88$

$$M_{x-x} = N\left(\frac{D'x\,b}{12}\right) + P'x\left(\frac{t b^2}{C'x}\right)$$

$$= 49\left(\frac{\overset{0.308}{0.154(24)}}{12}\right) + 0.0148\left(\frac{36(24)^2}{1.88}\right)$$

$$= 178.3'^{k}$$

$$M_{y-y} = N\left(\frac{D'y\,t}{12}\right) + P'y\left(\frac{b t^2}{C'y}\right)$$

$$= 49\left(\frac{\overset{0.465}{0.155(36)}}{12}\right) + 0.0148\left(\frac{24(36)^2}{1.76}\right)$$

$$= 284.3'^{k}$$

$$\frac{M_X}{M_{X-X}} + \frac{M_Y}{M_{Y-Y}} \leq 1$$

$$\frac{76.8}{178.3} + \frac{89.9}{284.3} = 0.747 < 1 \quad \text{o/k}$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Column (3) (Cont.)

Stresses: x-x Direction $d = 21.5''$ $b = 36''$ $As = 5.08$ $n = 9$

$x = kd$

$b x \times \frac{1}{2} x = n As(d - x)$

$36x \times \frac{1}{2} x = (9)(5.08)(21.5 - x)$

$18x^2 + 45.72x = 982.98$

$0.3937x^2 + x = 21.5$

$x = 6.228$

jd = lever Arm $= d - \frac{x}{3} = 19.424''$

Mom. $x = 76.8'^K \times 12000 = 921,600''^{\#}$

$921,600 = C \times 19.424$

$C = 47,446^{\#} = \frac{1}{2} fc(36)\, 6.228$

$fc = 423$ psi

$C = T = 47,446^{\#} = fs \times 5.08$

$fs = 9340$ psi

Stress: Y-Y direction $d = 33.5$ $b = 24$ $As = 5.08$ $n = 9$ $kd = x$

$b x \times \frac{1}{2} x = n As(d - x)$

$24x \times \frac{1}{2} x = (9)(5.08)(33.5 - x)$

$12x^2 + 45.72x = 1531.62$

$0.26247x^2 + x = 33.5$

$x = 9.552$

jd = lever arm $= d - \frac{x}{3} = 30.316$

$My = 89.9'^K \times 12000 = 1,078,800$

$1,078,800 = C \times 30.316$

$C = 35,585^{\#} = \frac{1}{2} fc(24)(9.552)$

$fc = 310$ psi

$C = T = 35,585 = fs \times 5.08$

$fs = 7,004$ psi

47.23' OVERHEAD GATE AT HARBOR ROAD (West IHNC)

Column Design (Cont.) Check shears.

Column ①

$V = 49.3^k$ (Hy Case III)

$v = \frac{49.5}{33.5 \times 30} = 0.049 < .060$ psi provided

No web reinforcement required

Column ②

$V = 54.4^k$ (Hy Case III)

$v = \frac{54.4}{33.5 \times 30}$ $0.054 < 0.60$

No web reinforcement required

Column ③

$V = 12.4^k$ (Hy Case III)

$v = \frac{12.4}{33.5 \times 24} = 0.015 < 60$

No web reinforcement required

Note: Use #3 ties, 2 per set, @ 18" centers, all 3 columns.

Check bond Columns ① and ② $j = \frac{24.637}{27.5} = 0.896$

$j = \frac{30.034}{33.5} = 0.896$

Perimeters: 16 #11's = 70.88

$\frac{54.4^k \times 1000}{(70.88)(0.896)(33.5)} = 25.57 < 187$ psi allowable

Column ③ $j = \frac{19.424}{21.5} = 0.903$

$j = \frac{30.316}{33.5} = 0.905$

Perimeters: 12 #10's = 47.88

$\frac{12.4^k \times 1000}{(47.88)(0.905)(33.5)}$ $8.54 < 207$ psi allowable

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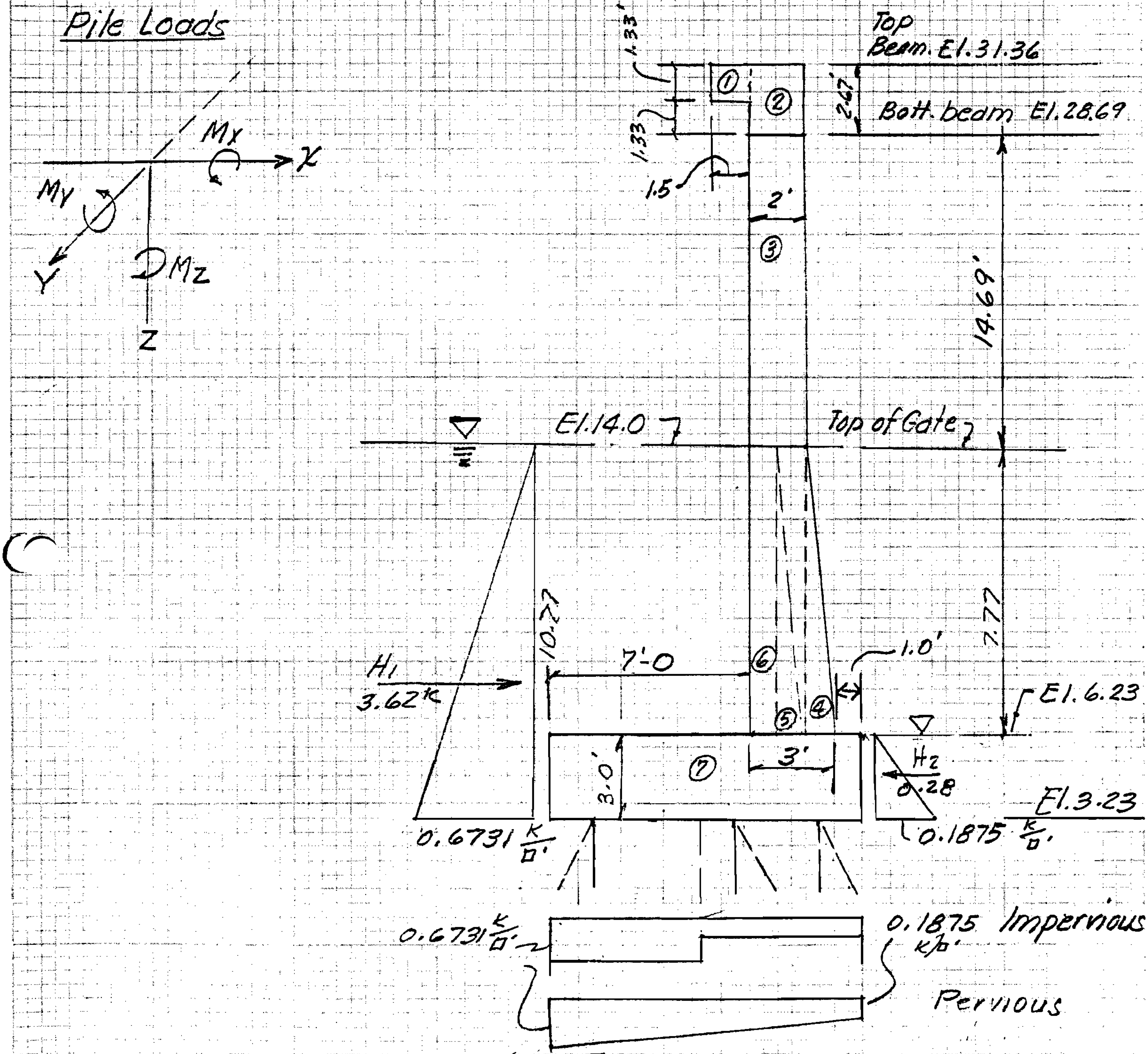
47.23' OVERHEAD GATE AT HARBOR ROAD (West IHNC)

Pile Loads



Load Cases

Case I · Water @ El. 14.0, no wind, impervious soil.

Case II Water @ El. 14.0, no wind, pervious soil.

Case III No water, no wind, truck on edge slab, F.S.

Case IV No water, no wind, truck on edge slab, P.S.

47.23' OVERHEAD GATE AT HARBOR ROAD (West IHNC)

Pile Loads

MOMENTS ABOUT X-X AXIS

Item	Computation	Fz K	FY K	Arm FT	Mx-x FT. K
Gate	Including Misc.	25 K		-6.42	-161
Conc. Bm ①	(1.5)(1.33)(87.44)(0.15)	26.2		-6.25	-164
Conc. Bm ②	(2)(2.67)(87.44)(0.15)	70.0		-8.0	-560
Conc. Col. ③	(2)(2.5)(22.46)(0.15)(2)	33.7		-8.0	-270
Conc. Col. ③	(2)(2)(22.46)(0.15)	13.5		-8.0	-108
Conc. Col. ④	(0.5)(1)(2.5)(7.77)(2)(0.15)	2.9		-9.33	-27
Conc. Col. ④	(0.5)(1)(2.0)(7.77)(0.15)	1.2		-9.33	-11
T-Wall ⑤	(0.5)(0.5)(7.77)(35.21)(0.15)	10.3		-8.17	-84
T-wall ⑥	(1)(7.77)(35.21)(0.15)	41.0		-7.5	-308
Conc. Slab ⑦	(11)(3.0)(89.44)(0.15)	442.7		-5.5	-2435
	Sub-total	666.5			-4128 'K
Imp. Uplift	-(10.77)(89.44)(5.5)(0.0625)	-331.1		-2.75	911
" "	-(3.0)(89.44)(5.5)(0.0625)	-92.2		-8.25	761
Water Wt.	(7.77)(89.44)(7)(0.0625)	304		-3.5	-1064
H_2O For. H_1	$-\frac{1}{2}(10.77)^2(89.44)(0.0625)$		-324.2	3.59	-1164
H_2O For H_2	$\frac{1}{2}(3.0)^2(89.44)(0.0625)$		25.2	1.0	25.2
	Case I Totals (100%)	547.2	-299.0		-4659
Perv. Uplift	-(0.1875)(89.44)(11)	-184.5		-5.5	1015
" "	$-\frac{1}{2}(0.4857)(89.44)(11)$	-238.9		-3.67	887
Water Wt.	(7.77)(89.44)(7)(0.0625)	304		-3.5	-1064
H_2O For. H_1	$-\frac{1}{2}(10.77)^2(89.44)(0.0625)$		-324.2	3.59	-1164
H_2O For. H_2	$\frac{1}{2}(3.0)^2(89.44)(0.0625)$		25.2	1.0	25.2
	Case II totals (100%)	547.1	-299.0		-4439

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47.23' OVERHEAD GATE AT HARBOR ROAD (West IHNC)

Pile Loads

MOMENTS ABOUT X-X AXIS (cont)

Item	Computation	Fz K	Fy K	Arm Ft	Mx-x Ft k
Trucks	(2 trucks) H20 S-16-44	64		—	—
Uplift	-(0.1875)(11)(89.44)	-184.5		-5.5	-1015
	Case III Totals (100%)	546			-3113
Trucks	(2 trucks) H20 S-16-44	64		-11	-704
Uplift	-(0.1875)(11)(89.44)	-184.5		-5.5	1015
	Case IV Totals (100%)	546			-3817

MOMENTS ABOUT Y-Y AXIS

Item	Computation	Fz K	Fx K	Arm Ft	My-y Ft.K
Conc. Sla (7)	(11)(3.0)(89.44)(0.15)	442.7		-44.72	-19,798
Conc. Col. (3)	(2)(2.5)(22.46)(0.15)	16.9		-1.25	-21
Conc. Col. (3)	"	16.9		-50.98	-862
Conc. Col. (3)	(2)(2)(22.46)(0.15)	13.5		-86.44	-1167
Conc. Col. (4)	(0.5)(1)(2.5)(7.77)(0.15)	1.5		-1.25	-2
Conc. Col. (4)	"	1.5		-50.98	-77
Conc. Col. (4)	(0.5)(1)(2.0)(7.77)(0.15)	1.2		-86.49	-104
T-Wall (5)	(0.5)(0.5)(7.77)(33.21)(0.15)	9.7		-68.84	-668
T-Wall (5)	(0.5)(0.5)(7.77)(2)(0.15)	0.6		-88.44	-53
T-Wall (6)	(1)(7.77)(33.21)(0.15)	38.7		-68.84	-2664
T-Wall (6)	(1)(7.77)(2)(0.15)	2.3		-88.44	-206

Sub-total 545.5 -25,622

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47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Pile Loads

MOMENTS ABOUT Y-Y AXIS (Cont.)

Item	Computation	F_z K	F_x K	Arm Ft.	M_{Y-Y} Ft.K.
Gate Bm Wt. Reactions		+545.5			-25,622
①	Page 28	40.5		-1.25	-51
②	Page 31	78.8		-50.98	-4017
③	Page 32	34.4		-86.44	-3077
Water Wt	(7.77)(7)(89.44)(0.0625)	304		-44.72	-13,594
Imp. Uplift	-(10.77)(89.44)(5.5)(0.0625)	-331.1		-44.72	14,807
	-(3.0)(89.44)(5.5)(0.0625)	-92.2		-44.72	4,123
Case I Total (100%)		579.9			-27,431
Gate Bm. WT Reactions					
①	Page 28	40.5		-1.25	-51
②	Page 31	78.8		-50.98	-4017
③	Page 32	34.4		-86.44	-3077
Water Wt	See above	304.0		-44.72	-13,594
Per. Uplift	(-0.1875)(11)(89.44)	-184.5		-44.72	8,251
	(-0.4857)(11)(89.44)(0.5)	-238.9		-44.72	10,683
Case II Totals (100%)		579.8			-27,427
Gate Bm Wt Reactions					
①	See Page 19	25.48		-1.25	-32
②	"	70.11		-50.98	-3574
③	"	30.66		-86.44	-2650
Truck Wt.	2 trucks H20 S16-44	64.0		-26.12	-1672
Cases III & IV Totals (100%)		735.8			-33,550

47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Pile Loads

MOMENTS ABOUT Z-Z AXIS

Item	Computation	Fv K	Fx K	Arm Ft	Mz-z Ft K
Water on Wall, Gate,	$-\frac{1}{2}(10.77)^2(0.0625)(89.44)$	-324.2		44.72	-14,498
Col's, slab	$\frac{1}{2}(3.0)^2(0.0625)(89.49)$	25.2		44.72	1127
Cases I & II Totals (100%)		-349.4			-13,371 'K
Cases III and IV		0			0

Load Tabulation

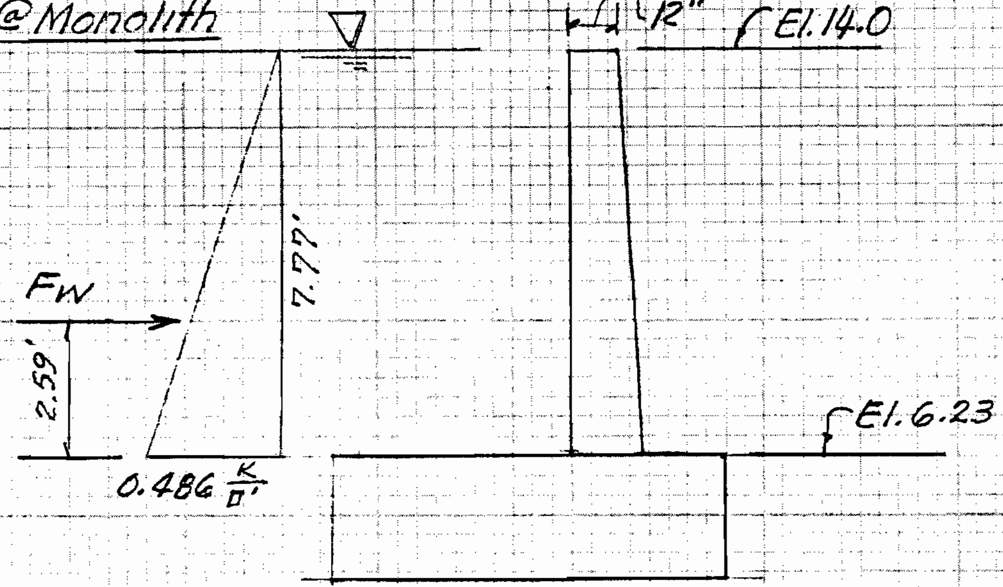
Load No.	Item	Fx K	Fy K	Fz K	Mx Ft.K	My Ft K	Mz Ft.K
1	Concrete + Gate	0	0	665.2	-2128	-32,767	0
2	Water-Vertical	0	0	304.0	-1064	-13,594	0
3	Water-Horizontal	0	299.0	0	-1139	0	-13,371
4	Uplift-Impervious	0	0	-423.3	1672	18,930	0
5	Uplift-Pervious	0	0	-423.4	1672	18,930	0
6	Truck-Case III	0	0	64	0	-1672	0
7	Truck-Case IV	0	0	64	-704	-1672	0

Load Summation

Case	Item	Fx K	Fy K	Fz K	Mx 'K	My 'K	Mz 'K
I	1+2+3+4	0	-299.0	545.9	-2659	-27,431	-13,371
II	1+2+3+5	0	-299.0	545.8	-2659	-27,431	-13,371
III	1+6	0	0	729.2	-2128	-34,438	0
IV	1+7	0	0	729.2	-2832	-34,438	0

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

T-wall design @ Monolith



Horizontal Force on Wall

Water: $F_W = (0.486)(7.77)(0.5) = 1.88^k$

Moment on wall

$M_W = (2.59)(1.88) = 4.87'^k$

Reinforcement required:

$d = 12" + \frac{7.77'}{2} - 2.5" = 13.39"$

$A_s = \frac{4.87'^k}{1.44 \times 13.39} = 0.25 \square"$

Min. $A_s = (0.0025)(12)(13.39) = 0.402 \square"$

Use 6@12 floodside; 5@12 protected side.

Check bond and shear:

$v = \frac{1880^\#}{12 \times 13.39} = 12$ psi < 60 psi ok

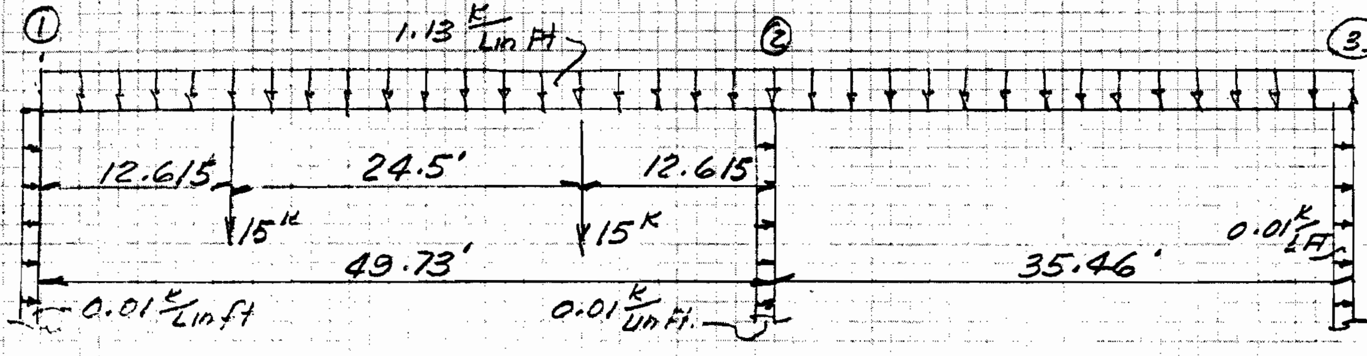
bond $= \frac{1880}{(2.4)(0.875)(13.39)} = 67$ psi < 186 psi o/k

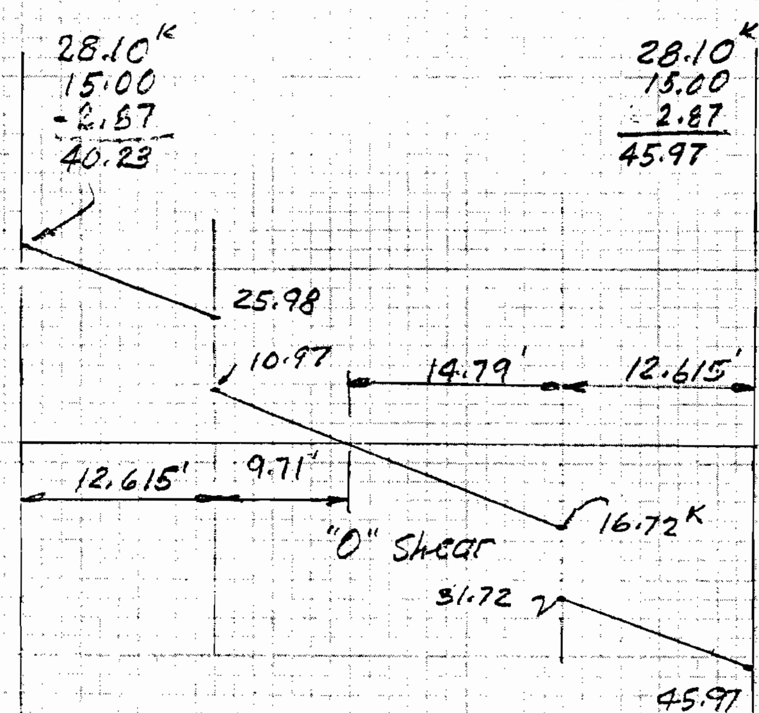
Temp. Steel: $A_s = (0.0020)(12)(13.39 + 2.5) = 0.381 \square"$

Min. $A_s = (0.0025)(12)(13.39) = 0.402 \square"$

Use #6 @ 12 Horiz. each face

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)
Concrete Beam Design (Case 5K, see page 19)





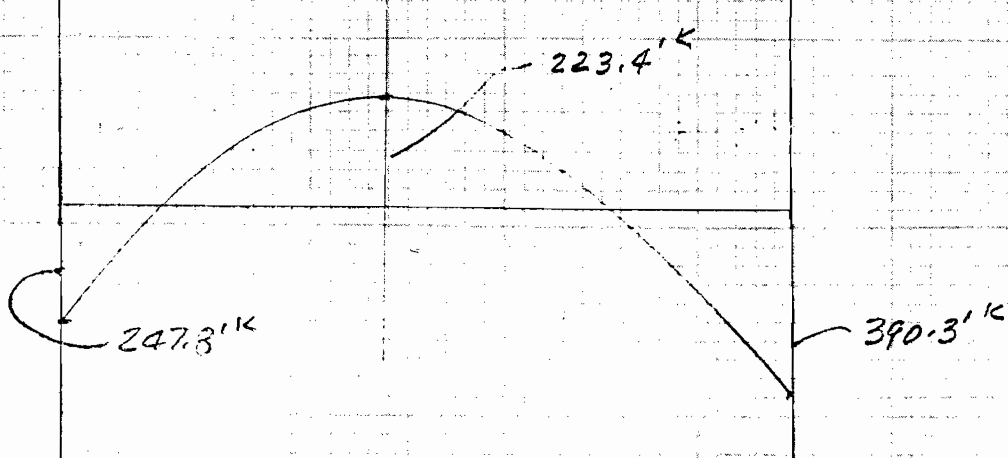
Positive Moment =

$$\left(\frac{14.79 \times 16.72}{2}\right) + (12.615 \times 31.72) + \frac{12.615\,(45.97 - 31.72)}{2} - 390.3'^{k} = \underline{223.4'^{k}}$$

or

$$\left(\frac{9.71 \times 10.97}{2}\right) + (25.98 \times 12.615) + \frac{12.615\,(40.23 - 25.98)}{2} - 247.8'^{k} = 223.1'^{k}$$

ok



47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Beam Design (Cont)

Postive Reinforcement

Moment = $223.4'^{K}$ b = 24" d = 29" K = 152 a = 1.44

$d'req'd = \sqrt{\frac{223.4 \times 12000}{152 \times 24}} = 27.1'' < 29''$ available

$As = \frac{223.4}{1.44 \times 29} = 5.35^{\square''}$ – Use 4 #11 = $6.24^{\square''}$

Negative Reinforcement

$M = 390.3'^{K}$

Moment @ Face of Column 2 = $390.3 - (45.97 \times 1.25) = 332.8'^{K}$

$d'required = \sqrt{\frac{332.8 \times 12000}{152 \times 24}} = 33'' > 29''$ ok with Compressive Reinforcement.

$As = \frac{332.8}{1.44 \times 29} = 7.96^{\square''}$ Add to torsional reinforcement

Stirrups

Shear @ "d" from Support: $V = 45.97^{K} - (1.13 \times 2.5) + (\frac{15}{12.62} \times 2.5)$

$V = 40.17^{K}$

$v = \frac{40{,}170^{\#}}{29 \times 24} = 57.72 < 60$ No stirrups required for shear.

Torsion

Conc. $1.33 \times 1.5 \times 0.15 \times 21'' = 6.28''^{K}$

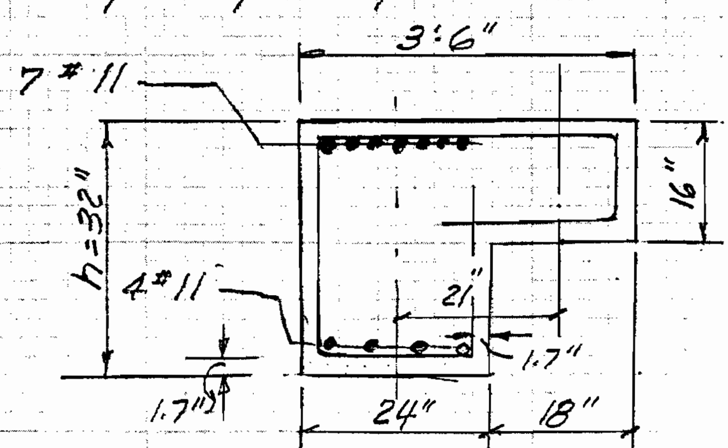
Steel $\frac{(0.0313)\ 21}{512 \times 31.8)}$ $= 0.67''^{K}$

$6.95''^{K}$

$6.95''^{K} \times \frac{47.23}{2} = 164.1''^{K}$

Pt Load $15^{K} \times 21 = 315.0''^{K}$

$479.1''^{K}$



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JOB ______ ITEM ______ JOB Nº 575-79-E

SHEET Nº 44 OF ______ BY LWC DATE 1-8-80 CHKD. BY ______ DATE ______

47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Concrete Beam Design (Cont.)

Mom. $M_f = 332.8'^{k}$ $d = 29''$ $h = 32''$ $b = 24''$ $a = 1.7$

$$C_1 = \frac{h + 0.5b}{(b - 2a_1)\left(1 + \frac{0.5d}{h - 2a_1}\right)}$$

$$= \frac{32 + 12}{(24 - 3.4)\left(1 + \frac{14.5}{32 - 3.4}\right)}$$

$$= \frac{44}{20.6 \times 1.51}$$

$$C_1 = 1.414$$

$$C_2 = \frac{M_t}{M_f} = \frac{479.1''^{k}}{332.8'^{k} \times 12} = 0.12$$

$$1 + C_1 C_2 = 1.169$$

$$\text{Design } M = 1.17 \times 332.8'^{k} = 389.4'^{k}$$

Stirrups required:

$$x_1 = 24'' - (2 \times 1.7) = 20.6''$$

$$y_1 = 32'' - (2 \times 1.7) = 28.6$$

$$\frac{389.4 \times 12{,}000}{(0.8)(20.6)(28.6)(20{,}000)} = 0.496^{\square''} \quad (0.6)$$

$$\frac{0.496^{\square}}{2} = 0.25^{\square''}$$

#5 @ 12 o/k

Longit. Steel Required

$$\frac{389{,}400\,(20.6 + 28.6)}{(0.8)(20.6)(28.6)(20{,}000)} = 2.03^{\square''} \quad (19.47)$$

Combine Flex. + Torsion

$$2.03 + 7.96 = 10^{\square''}$$

7 #11 bars

$$\frac{20.6'' - (7 \times 1.375)}{6} = 1.83''$$

Spacing o/k.

Bond

Max. $V = 45.97^{k}$

$$U = \frac{45{,}970}{(5)(4.43)(0.875)\,29} = 81.78 < 165 \text{ psi o/k}$$

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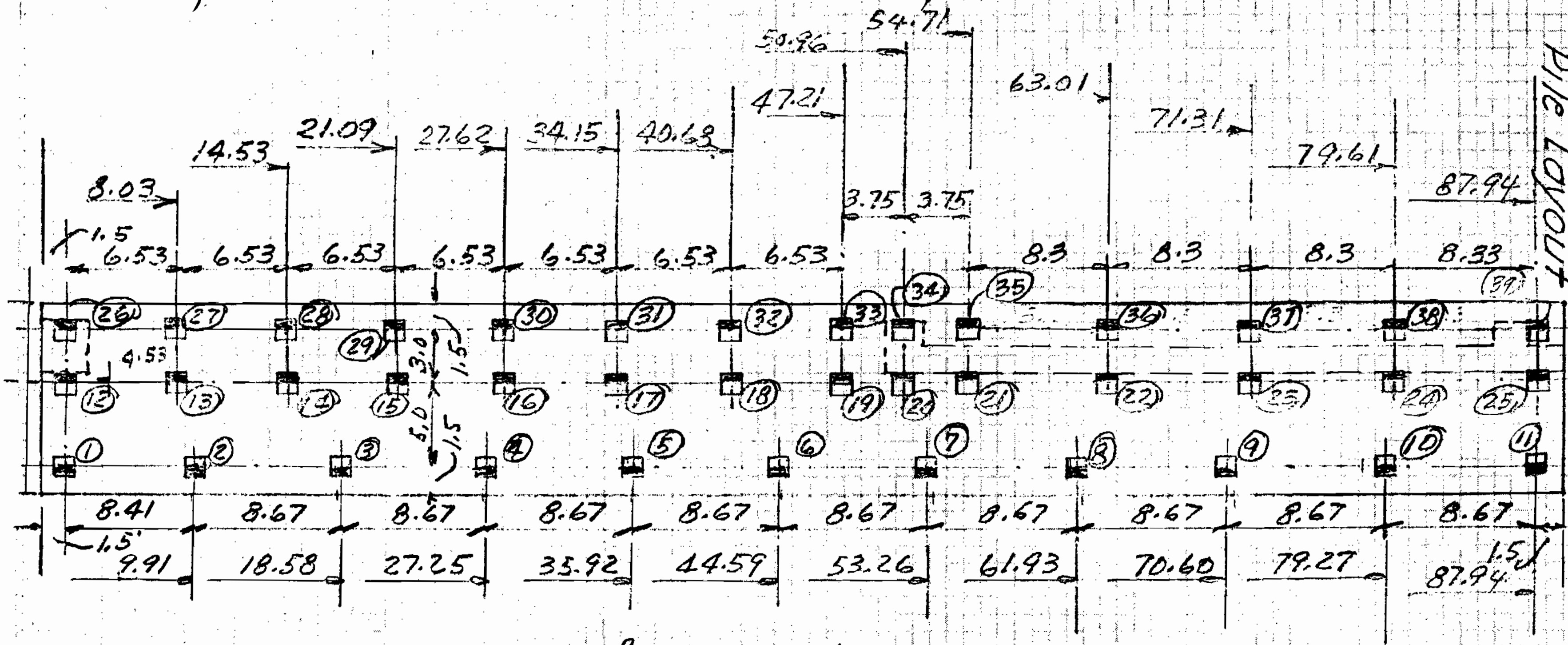
JOB
ITEM
JOB No 575-79-E
SHEET No 45 OF Rev
BY LWC DATE 2-18-80
CHKD. BY DATE

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Pile Layout



Pile Layout.

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Pile Reactions from computer printouts

Case I: Water at El. 14.0, no wind, impervious soil. (100%)

	x^k	Y^k	Z^k
Pile Group "A"	-1.1	0	9.8
Pile Group "B"	0.9	0	70.7
Pile Group "C"	-1.1	0	-27.0

Case II: Water at El. 14.0, no wind, pervious soil (100%)

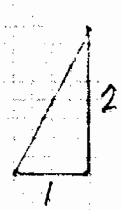
Pile Group "A"	-1.0	0	-29.8
Pile Group "B"	0.9	0	70.7
Pile Group "C"	-1.1	0	-27.0

Case III: No water, no wind, truck on edge slab, flood side (100%)

Pile Group "A"	-0.6	0	44.6
Pile Group "B"	0.5	0	49.4
Pile Group "C"	0.6	0	-21.3

Case IV: No water, no wind, truck on edge slab, Protected side (100%)

Pile Group A	-0.3	0	43.4
Pile Group B	0.1	0	33.6
Pile Group C	0.2	0	-4.8



$$\frac{1}{\sqrt{5}} = 0.4472$$

$$\frac{2}{\sqrt{5}} = 0.8944$$

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Monolith - Top face reinforcement (transverse)

Case II Loading

				Arm		
Pile A_V	$= \frac{(9.8)(0.8944)(11)}{89.44} =$	1.08	X	5.5	=	5.94
Pile χ_{AV}	$\frac{(-0.1)(0.4472)(11)}{89.44} =$	-0.01	X	5.5	=	-0.06
Pile B_V	$\frac{(70.7)(0.8944)(11)}{89.44} =$	7.8	X	0.5	=	3.9
Pile χ_{BV}	$\frac{(0.9)(0.4472)(11)}{89.44} =$	0.05	X	0.5	=	0.25
+ Wt. Water	$= (7.0)(7.77)(0.0625) =$	3.4	X	3.5	=	11.9
- Wt. Water	$= -(4.0)(10.77)(0.0625) =$	-2.7	X	5.0	=	-13.5
Wt. Slab	$= (3)(7)\ 0.15 =$	3.2	X	3.5	=	11.2
		12.84^K				$19.63^{'K}$

$b = 12"$ $f'_c = 3000\,psi$ $f_c = 1050$ $K = 152$ $a = 1.44$ $j = 0.891$ $d = 32"$

$d'\,req'd = \sqrt{\frac{19.63 \times 12}{0.152 \times 12}} = 11.35 < 32"$ ok

$A_s = \frac{M}{ad} = \frac{19.63}{1.44 \times 32} = 0.43\,\square"$

Min $A_s = (0.0025)(12)(32) = 0.96\,\square"$ Use #9 @ 12 transverse $= 1.0\,\square"$

Max shear $= 12.84$

$v = \frac{12{,}840^K}{12 \times 32} = 33.4\,psi < 70\,psi$ o/k

bond: $\frac{12.84^K}{3.544 \times 0.891 \times 32} = 0.149^{KSI} < 0.165^{KSI}$ Top bar

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Monolith - Bott. face reinforcement (Transverse)

Case III Loading

Pile AV $= \frac{(44.6)(0.8944)(11)}{89.44} = 4.9 \quad \times 5.5 = 26.95$

Pile 'K' AV $= \frac{(-0.6)(0.4472)(11)}{89.44} = -0.03 \quad \times 5.5 = -0.2$

Pile BV $= \frac{(49.4)(0.8944)(11)}{89.44} = 5.4 \quad \times 0.5 = 2.7$

Pile 'K' BV $= \frac{(0.5)(0.4472)(11)}{89.44} = 0.03 \quad \times 0.5 = 0.02$

Two truck loads $= \frac{64}{89.44} = -0.72 \quad \times 7.0 = -5.04$

Wt. water $= 3 \times 4 \times 0.0625 = 0.75 \quad \times 5.0 = 3.75$

Wt. slab $= 3 \times 7 \times 0.15 = -3.15 \quad \times 3.5 = -11.03$

$7.18 \qquad 17.15^{'K}$

$b = 12''$ $f'c = 3000$ $fc = 1050$ $K = 152$ $a = 1.44$ $j = 0.891$ $d = 32''$

$d' reqd = \sqrt{\frac{17.15 \times 12}{(0.152)(12)}} = 10.62'' < 32''$ ok

$As = \frac{17.15^{'K}}{1.44 \times 32} = 0.37 \square''$

Min $As = (.0025)(12)(32) = 0.96$ Use #9 @ 12 $= 1.0 \square''$

bottom face transverse

Slab = 3.0 x 11 x 49.73 x 0.15 = 246.2^K   Momen. Arm = $\frac{49.73}{2}$ = 24.865'

Case II - Col. Reaction 40.35^K + Col Wt 18.3^K = 58.65^K   Mom. Arm = 49.73' - 1.25' = 48.48

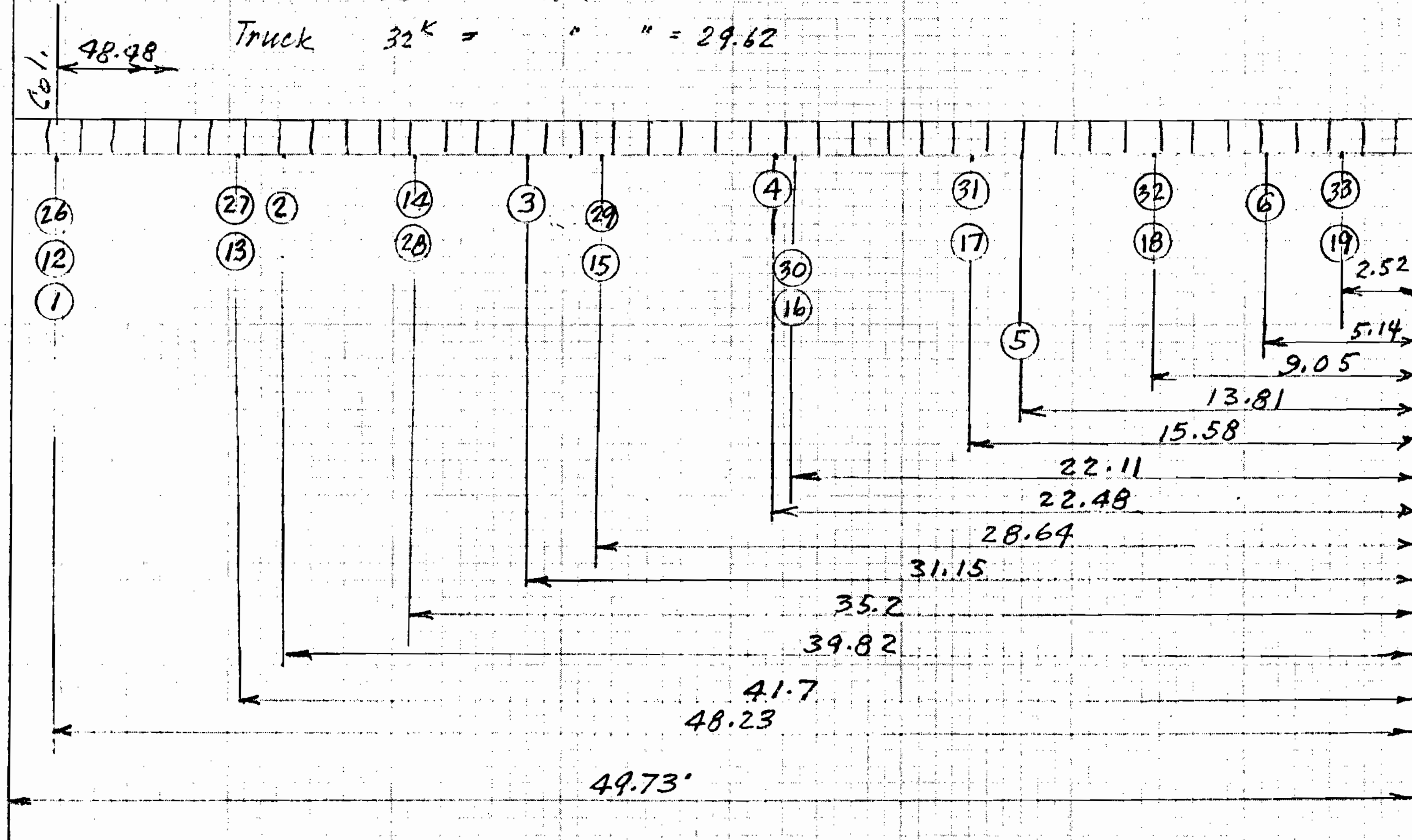
Case III - Col. Reaction 35.5^K + Col Wt 8.3^K = 43.8^K   Mom. Arm = 48.48

Water Wt. = 7.77 x 7 x 0.0625 x 49.73 = 169.1   Mom Arm = 24.865

Uplift. Impervious = -423.4 x $\frac{49.73}{87.49}$ = -235.4   Mom Arm = 24.865

Truck 32^K = Mom Arm = 17.62

Truck 32^K = " " = 29.62



42.23' OVERHEAD GATE AT HARBOR ROAD (West of JHNC)

Monolith (Longit. Reinf.)

Moments about inside face center column.

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 49 OF
BY LWC DATE 2-22-80
CHKD. BY DATE

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 50 OF
BY LWC DATE 2-22-80
CHKD. BY DATE

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Monolith (Longit. Reinf.)

Case II (Moment from piles) about inside face center column.

Pile	Computer Printout	Force F_z K	Lever Arm FT	Moment 'K
Pile #26	-27.0	-24.1	48.23	-1162
#12	57.6	51.5	48.23	+2483
#1	-7.2	-6.4	48.23	-309
#27	-26.0	-23.3	41.7	-972
#13	58.4	52.2	41.7	+2177
#2	-5.5	-4.9	38.82	-190
#28	-25.1	-22.4	35.2	-788
#14	59.6	53.3	35.2	+1876
#3	-3.8	-3.4	31.15	-106
#29	-24.1	-21.6	28.64	-617
#15	60.6	54.2	28.64	+1552
#4	-2.1	-1.9	22.48	-43
#30	-23.1	-20.7	22.11	-458
#16	61.6	55.1	22.11	+1218
#31	-22.1	-19.8	15.58	-308
#17	62.6	56.0	15.58	+872
#5	-0.4	-0.4	13.81	-6
#32	-21.1	-18.9	9.05	-171
#18	63.5	56.8	9.05	+514
#6	1.3	1.2	5.14	+6
#33	-20.1	-18.0	2.52	-45
#19	64.5	57.7	2.52	+145
		252.2		5668

10843
-5175

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB Nº 575-79-E

SHEET Nº 51 OF ____
BY LWC DATE 2-22-80
CHKD. BY ____ DATE ____

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)
Monolith - Longit. Reinf. Moment @ Face Middle Col. (External)
Case II

ITEM	FORCE Z	Arm ft	Moments 'K
Col. Reaction + Wt.	- 58.65 k	48.48	- 2843
Slab	- 246.2 k	24.865	- 6122
Water Wt	- 169.1	24.865	- 4204
Uplift - pervious	+ 235.4	24.865	+ 5853
	- 238.55		- 7316

Final Moment = Σ -7316 + 5668 = 1648 'K

+M = 6.53 X 21 = 137
1.88 X 49.9 = 94
4.62 X 45.0 = 208
4.05 X 75.6 = 306
2.51 X 72.5 = 182
6.16 X 105.1 = 647
0.37 X 103.2 = 38
6.53 X 137.6 = 899
1.77 X 173.8 = 308
4.76 X 173.4 = 825
3.41 X 211.3 = 721
2.62 X 212.5 = 557
2.52 X 252.5 = 636
5568

-M = 23.615 X 58.65 = 1385
24.865 X 238.65 = 5934
7319 ≈ 7316

+37.65 X 6.53 = +246
+ 8.75 X 1.83 = + 25
+13.65 X 4.62 = + 49
-16.95 X 4.05 = - 69
- 13.85 X 2.51 = - 35
- 46.45 X 4.025 = - 187
+133.55 X 2.385 = + 319
+135.45 X 0.37 = + 50
+101.05 X 6.53 = + 660
+ 64.85 X 1.77 = + 115
+ 65.35 X 4.76 = + 311
+ 27.35 X 3.91 = + 107

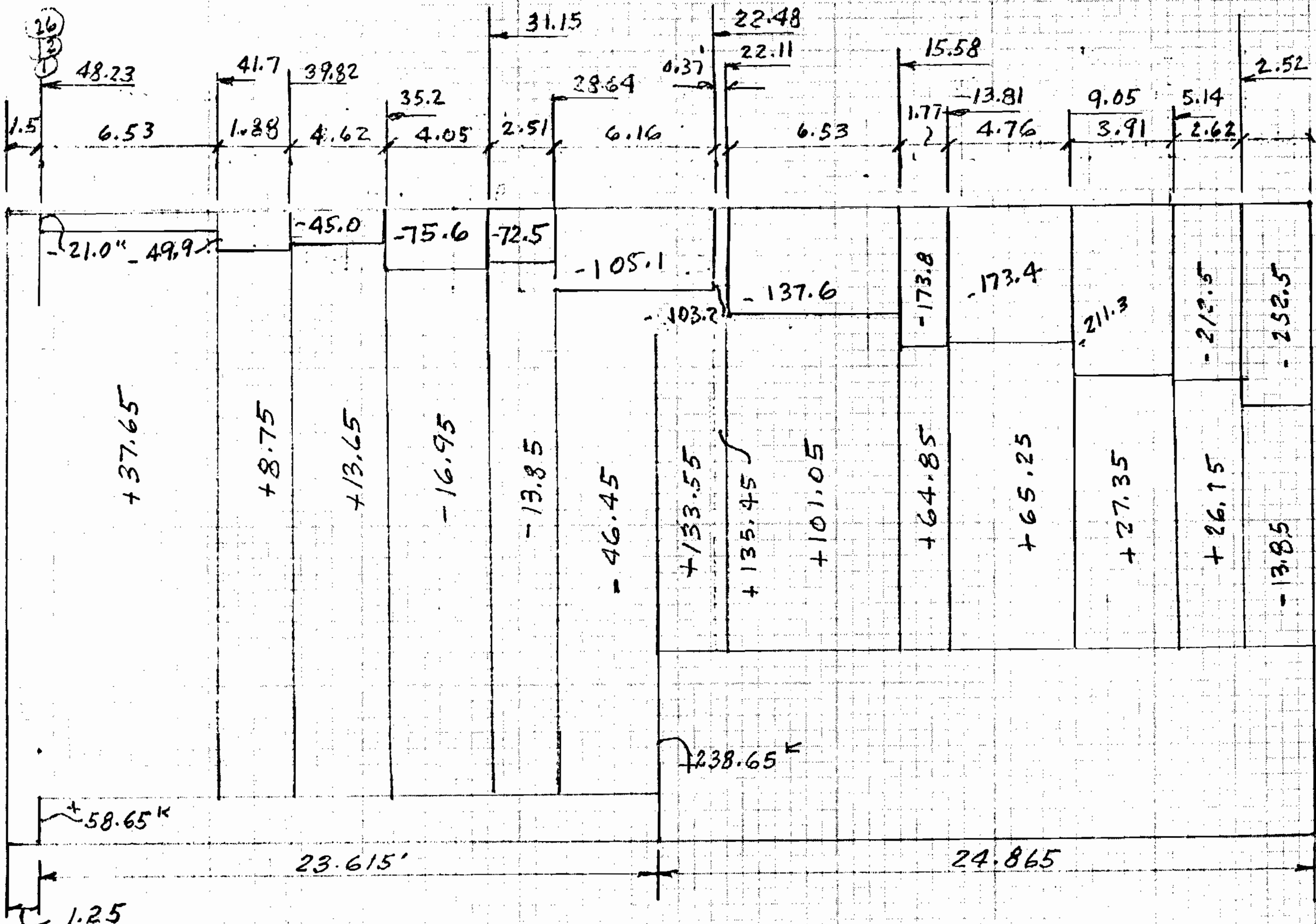
+26.15 X 2.62 = + 69
- 13.85 X 2.52 = - 35
1650 ≈ 1648

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 52 OF ____
ITEM ______ BY LWC DATE 2-22-80
JOB No 575-79-E CHKD. BY ____ DATE ____

47.23' OVERHEAD GATE AT HARBOR ROAD (West of THHC)

Monolith · Longit Reinf - Shear Case II



Max. Shear = +135.45@ 22.48' from inside edge mid-column

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)
Monolith - Longit. Reinforcement - Moments @ Inside face Middle Col.
Case III (Moments from piles)

Pile	Com. Print	Force F_z K	Lever Arm FT.	Moment 'K
Pile #26	-26.1	-23.3	48.23	-1124
12	41.2	36.8	48.23	1775
1	33.9	30.3	48.23	1461
#27	-20.7	-18.5	41.7	-771
#13	41.2	36.8	41.7	1535
#2	34.9	31.2	38.82	1211
#28	-20.1	-18.0	35.2	-634
#14	42.4	37.9	35.2	1334
#3	36.0	32.2	31.15	1003
#29	-19.5	-17.4	28.64	-498
#15	43.0	38.5	28.64	1103
#4	37.1	33.2	22.48	746
#30	-18.9	-16.9	22.11	-374
#16	43.7	39.1	22.11	865
#31	-18.3	-14.6	15.58	-227
#17	44.3	39.6	15.58	617
#5	38.2	34.2	13.81	472
#32	-17.6	-15.7	9.05	-142
#18	44.9	40.2	9.05	364
#6	39.2	35.1	5.14	180
#33	-17.0	-15.2	2.52	-38
#19	45.5	40.7	2.52	103
				+8961

12769
-3808
8961

47.23' OVERHEAD GATE AT HARBOUR ROAD (West of IHNC)

Monolith - Longit. Reinforcement. Moment @ Inside face Middle Column

Case III

ITEM	Force Z^k	Arm ft	Moments '^{k}
Col. R. and Weight	-43.8	48.48	-2123'^{k}
Conc. Slab	-246.2	24.865	-6122
Truck	-32	17.62	-564
Truck	-32	29.62	-948
			-9757'^{k}

Final Moments -9757'^{k} + 8961'^{k} = -796'^{k}

Max. Shear = 155.5^k @ 24.0' from Inside face middle Column

Check + M

43.8 X 6.53 = 286
62.1 X 1.88 = 117
93.3 X 4.62 = 431
113.2 X 4.05 = 458
145.4 X 2.51 = 365
166.5 X 6.16 = 1026
199.7 X 0.37 = 74
221.9 X 6.53 = 1449
246.9 X 1.77 = 437
281.1 X 4.76 = 1338
305.6 X 3.91 = 1195
340.7 X 2.62 = 893
366.2 X 2.52 = 923
8962'^{k} ok

Check - Mom.

43.8 X 18.86 = 826
75.8 X 4.755 = 360
322 X 7.245 = 2333
354 X 17.62 = 6237
9756'^{k} ok

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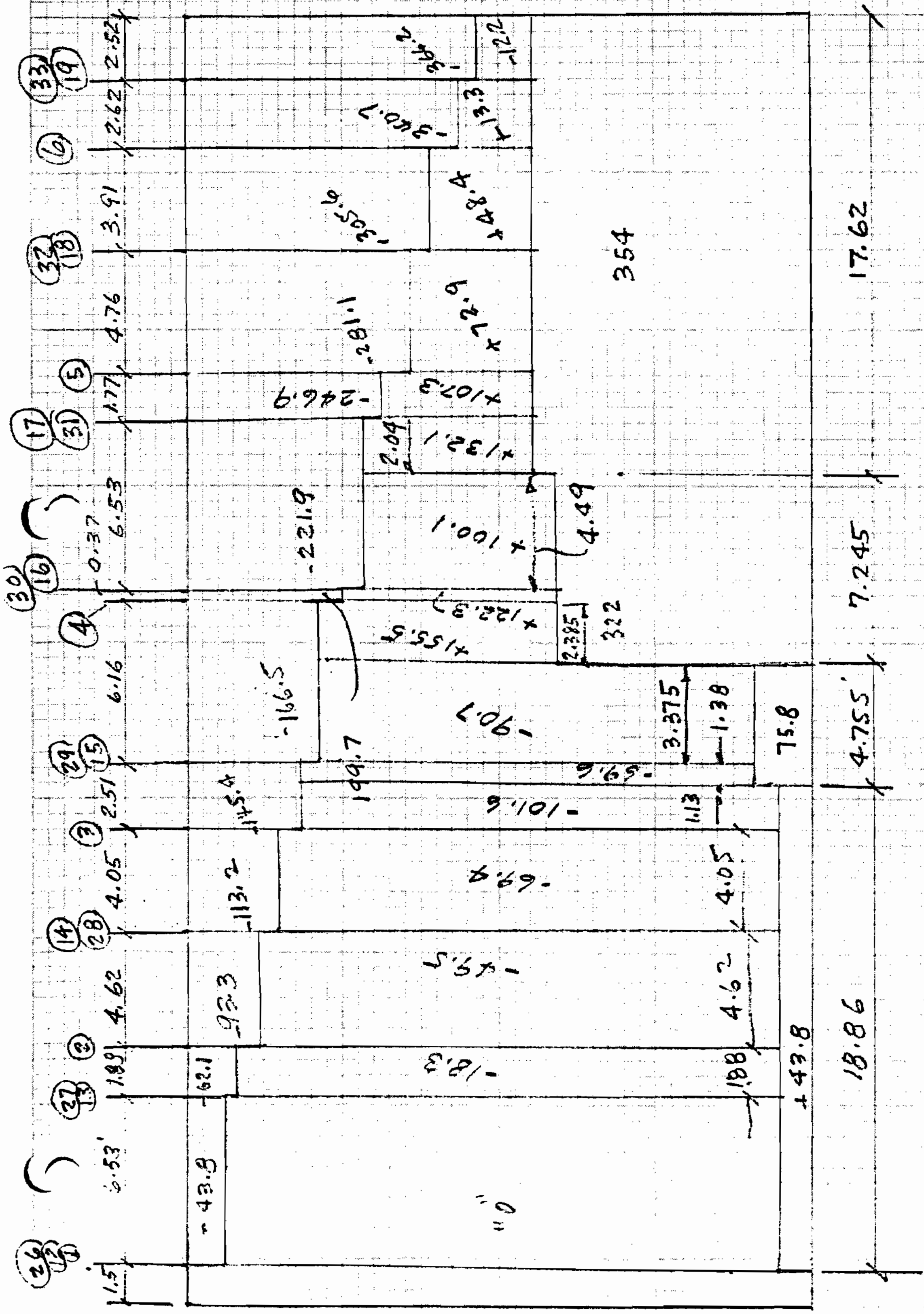
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No 55 OF ____
ITEM ____ BY LWC DATE 2-25-80
JOB No 575-79-E CHKD. BY ____ DATE ____

47.23' OVERHEAD GATE AT HARBOUR ROAD (West of IHNC)

Monolith - Longit. Reinforcement - Moment @ Inside Face Middle Column

Case III - Shear Diagram



47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Monolith - Longit. Reinf. -

$f_s = 20{,}000\,psi$ $f'c = 3000\,psi$ $f_c\ 1050\,psi$ $K = 152$ $a = 1.44$ $J = 0.891$ $d = 32''$

Case II Max Mom. = $1648'^{k}$ Max Shear = 135.45^{k}

Case III Max Mom = $796'^{k}$ Max Shear = 155.5^{k}

$$d\ reqd = \sqrt{\frac{1648 \times 12}{0.152 \times 132}} = 31.39'' < 32''\ ok$$

$$V = \frac{155.5}{32 \times 132} = 0.0368^{KSI} < .070\,psi\ o/c$$

As Bottom face

$$As = \frac{1648'^{k}}{11} = 150'^{k}/\text{per ft of width}$$

$$As = \frac{150'^{k}}{1.44 \times 32} = 3.25\,\square'' \quad \#11 @ 6 = 3.12\,\square''\ o.k$$

Check Bond

23 #11 bars - $4.43 \times 23 = 101.89''$

$$u = \frac{V}{\Sigma_o J d} = \frac{155{,}500}{101.89 \times 0.891 \times 32} = 53.5\,psi < 187\,psi\ o/c$$

Top face reinforcement. (longit.)

Min As = $0.0025 \times 12'' \times 32'' = 0.96$ Use #9@12 = $1.0\,\square''$

Top face reinf. (longit.)

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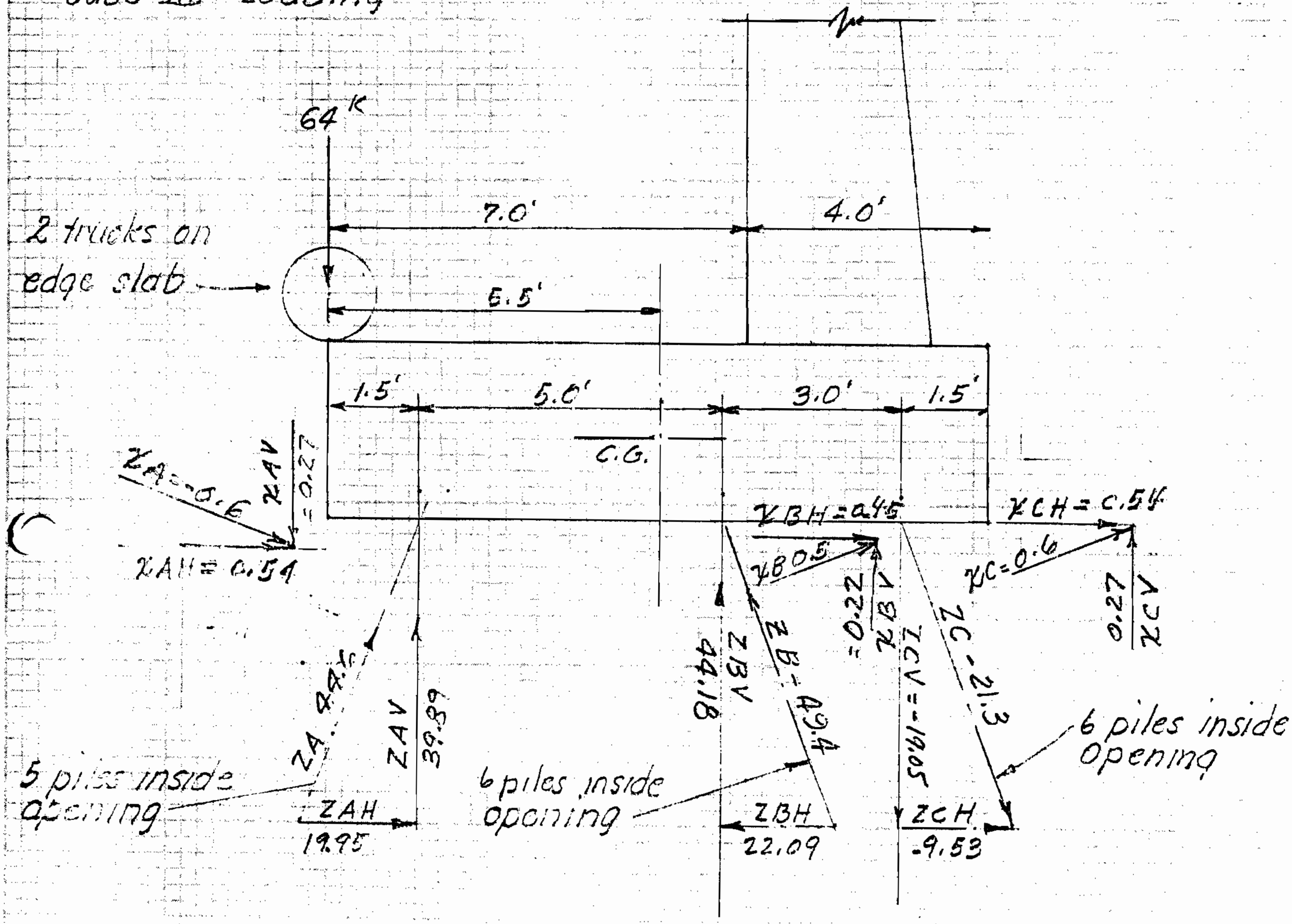
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 57 OF ______
ITEM ______ BY LWC DATE 2-26-80
JOB No 575-79-E CHKD. BY ______ DATE ______

47.23' OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Torsional Analysis - Monolith

Case III Loading



47.23 OVERHEAD GATE AT HARBOR ROAD (West of IHNC)

Torsional Analysis - Monolith (Cont.)

ITEM	V^K	H^K	$\bar{x}$ Ft	Moments $^{'K}$
ZAV = 5 (39.89)	-199.45		4.0	-797.8
ZAH = 5 (19.95)		-99.75	-1.5	149.6
XAV = 5 (-0.27)	-1.35		4.0	-5.4
XAH = 5 (-0.54)		-2.7	-1.5	-4.1
ZBV = 6 (44.18)	-265.08		1.0	-265.0
ZBH = 6 (22.09)		132.54	1.5	198.8
XBV = 6 (-0.22)	-1.32		1.0	-1.32
XBH = 6 (0.45)		-2.7	1.5	-4.05
ZCV = 6 (-19.05)	114.3		4.0	457.2
ZCH = 6 (-9.53)		57.18	1.5	85.77
XCV = 6 (0.27)	-1.62		4.0	-6.48
XCH = 6 (0.54)		-3.24	1.5	-4.86
2 Trucks	64		5.5	352
				M 154.36

Torsional Moment divides equally between Columns

$$Mt = \frac{154.36}{2} = 77.18$$

$b = 3.0 \quad h = 11 \qquad \frac{h}{b} = 3.66$

$K_1 = 3.62$

$$v_t = \frac{K_1 Mt}{b^2 h} = 3.62 \frac{(77,180)(12)}{(36^2)(132)} = 19.6 \text{ psi} < 1.1\sqrt{3000} = 60.25$$

However end column is insufficient (No T-Wall) Use 100% Mom.

Australian Code
Use 5 as factor

$$\frac{3.62(154,360)(12)}{(36)^2(132)} = 39.2 \text{ psi}$$

$$\frac{5}{3.62} \times 39.2 = 54 \text{ psi}$$ (No stirrups reqd.)

59

1

```
*LISTH D29010

02/21/80    11.62

10 FLORIDA AVE WEST.575-79
20 RELOCATED HARBOR ROAD
30 2,4
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,11
110 1.5,9.91,18.58,27.25,35.92,44.59,53.26,61.93,70.6,79.27,87.94
140 11*-1.5
170 11*0.0
200 2,270,28
210 1.5,6.53,14.53,21.09,27.62,34.15,40.68,47.21,50.96,
220 54.71,63.01,71.31,79.61,87.94,1.5,8.03,14.53,
230 21.09,27.62,34.15,40.68,47.21,50.96,54.71,63.01,
235 71.31,79.61,87.94
240 14*-6.5,14*-9.5
270 28*0.0
2000 0,-299,545.9,-2659,-27431,-13371
2010 0,-299,545.8,-2659,-27431,-13371
2020 0,0,729.2,-2128,-34438,0
2030 0,0,729.2,-2832,-34438,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        02/21/80    11.673


    PROG. NO. 713-F3-A2-210    11:40:43  02/21/80    MOD 6B, FEB 80

 FLORIDA AVE WEST 575-79
 RELOCATED HARBOR ROAD

TOTAL NUMBER OF PILES =   39
```

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-299.0	545.9	-2659.0	-27431.0	-13371.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.0	0.0	-7.1
2	-1.0	0.0	-5.5
3	-1.0	0.0	-3.8
4	-1.0	0.0	-2.1
5	-1.0	0.0	-0.4
6	-1.0	0.0	1.3
7	-1.0	0.0	3.0
8	-1.0	0.0	4.7
9	-1.0	0.0	6.4
10	-1.0	0.0	8.1
11	-1.1	0.0	9.8
12	0.9	0.0	57.6
13	0.9	0.0	58.4
14	0.9	0.0	59.6
15	0.9	0.0	60.6
16	0.9	0.0	61.6
17	0.9	0.0	62.6
18	0.9	0.0	63.6
19	0.9	0.0	64.6
20	0.9	0.0	65.1
21	0.9	0.0	65.7
22	0.9	0.0	66.9
23	0.9	0.0	68.2
24	0.9	0.0	69.5
25	0.9	0.0	70.7
26	1.1	0.0	-27.0
27	1.1	0.0	-26.1
28	1.1	0.0	-25.1
29	1.1	0.0	-24.1
30	1.1	0.0	-23.1
31	1.1	0.0	-22.1
32	1.1	0.0	-21.1
33	1.1	0.0	-20.1
34	1.1	0.0	-19.5
35	1.1	0.0	-19.0
36	1.1	0.0	-17.7
37	1.1	0.0	-16.4
38	1.1	0.0	-15.2
39	1.1	0.0	-13.9

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-299.0	545.9	-2659.0	-27431.0	-13371.0

61

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-299.0	545.8	-2659.0	-27431.0	-13371.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.0	0.0	-7.2
2	-1.0	0.0	-5.5
3	-1.0	0.0	-3.8
4	-1.0	0.0	-2.1
5	-1.0	0.0	-0.4
6	-1.0	0.0	1.3
7	-1.0	0.0	3.0
8	-1.0	0.0	4.7
9	-1.0	0.0	6.4
10	-1.0	0.0	8.1
11	-1.0	0.0	9.8
12	0.9	0.0	57.6
13	0.9	0.0	58.4
14	0.9	0.0	59.6
15	0.9	0.0	60.6
16	0.9	0.0	61.6
17	0.9	0.0	62.6
18	0.9	0.0	63.5
19	0.9	0.0	64.5
20	0.9	0.0	65.1
21	0.9	0.0	65.7
22	0.9	0.0	66.9
23	0.9	0.0	68.2
24	0.9	0.0	69.5
25	0.9	0.0	70.7
26	1.1	0.0	-27.0
27	1.1	0.0	-26.0
28	1.1	0.0	-25.1
29	1.1	0.0	-24.1
30	1.1	0.0	-23.1
31	1.1	0.0	-22.1
32	1.1	0.0	-21.1
33	1.1	0.0	-20.1
34	1.1	0.0	-19.5
35	1.1	0.0	-19.0
36	1.1	0.0	-17.7
37	1.1	0.0	-16.4
38	1.1	0.0	-15.2
39	1.1	0.0	-13.9

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 0.0 -299.0 545.8 -2659.0 -27431.0 -13371.0

62 (4

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	729.2	-2128.0	-34438.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	0.0	33.9
2	-0.6	0.0	34.9
3	-0.6	0.0	36.0
4	-0.6	0.0	37.1
5	-0.6	0.0	38.2
6	-0.6	0.0	39.2
7	-0.6	0.0	40.3
8	-0.6	0.0	41.4
9	-0.6	0.0	42.5
10	-0.6	0.0	43.6
11	-0.6	0.0	44.6
12	0.5	0.0	41.2
14	0.5	0.0	42.4
15	0.5	0.0	43.0
16	0.5	0.0	43.7
17	0.5	0.0	44.3
18	0.5	0.0	44.9
19	0.5	0.0	45.5
22	0.5	0.0	47.0
23	0.5	0.0	47.8
24	0.5	0.0	48.6
25	0.5	0.0	49.4
26	0.6	0.0	-21.3
27	0.6	0.0	-20.7
28	0.6	0.0	-20.1
29	0.6	0.0	-19.5
30	0.6	0.0	-18.9
31	0.6	0.0	-18.3
32	0.6	0.0	-17.6
33	0.6	0.0	-17.0
36	0.6	0.0	-15.5
37	0.6	0.0	-14.8
38	0.6	0.0	-14.0
39	0.6	0.0	-13.2

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	0.0	729.2	-2128.0	-34438.0	-0.0

LOAD CONDITION 4

63 5

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	729.2	-2832.0	-34438.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.0	32.4
2	-0.3	0.0	33.5
3	-0.3	0.0	34.6
4	-0.3	0.0	35.7
5	-0.3	0.0	36.8
6	-0.3	0.0	37.9
7	-0.3	0.0	39.0
8	-0.3	0.0	40.1
9	-0.3	0.0	41.2
10	-0.3	0.0	42.3
11	-0.3	0.0	43.4
12	0.2	0.0	25.6
14	0.2	0.0	26.8
15	0.2	0.0	27.4
16	0.2	0.0	28.0
17	0.2	0.0	28.6
18	0.2	0.0	29.2
19	0.2	0.0	29.8
22	0.1	0.0	31.3
23	0.1	0.0	32.1
24	0.1	0.0	32.9
25	0.1	0.0	33.6
26	0.2	0.0	-4.8
27	0.2	0.0	-4.2
28	0.2	0.0	-3.6
29	0.2	0.0	-2.9
30	0.2	0.0	-2.3
31	0.2	0.0	-1.7
32	0.2	0.0	-1.1
33	0.2	0.0	-0.5
36	0.2	0.0	1.0
37	0.2	0.0	1.8
38	0.2	0.0	2.5
39	0.2	0.0	3.3

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	0.0	-0.0	729.2	-2832.0	-34438.0	-0.0

0 11:43:43 02/21/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022

0 PROG NO. 713-F3-A2-210 11:40:43 02/21/80 MOD 6B, FEB

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

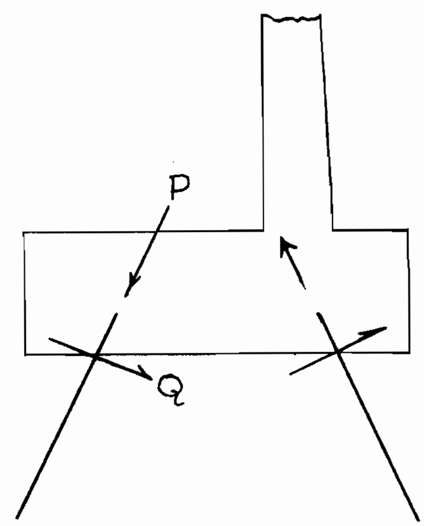
11021	X	Y	Z	RX	RY	RZ
11022	-0.189E-03	-0.143E 00	0.959E-01	0.164E-02	-0.101E-04	0.256E-05
12022	-0.190E-03	-0.143E 00	0.958E-01	0.164E-02	-0.101E-04	0.257E-05
13022	-0.130E-03	-0.776E-01	0.840E-01	0.121E-02	-0.634E-05	0.175E-05
14022	-0.144E-03	-0.305E-01	0.482E-01	0.586E-03	-0.639E-05	0.194E-05

T- WALL MONOLITHS EAST IHNC

1E, 2E, 3E, 4E ← TOTAL NO. OF T-WALL MONOLITHS

$\boxed{3}$, $\boxed{4}$, $\boxed{5}$, $\boxed{6}$ ← TOTAL NO. OF MONOLITHS

COMPUTATION OF ALLOWABLE TRANSVERSE FORCES ON PILES.



COMPUTATIONS BASED ON INTERACTION FORMULA —

$$\frac{f_a}{F_a} \pm \frac{f_b}{F_b} \leq 1.0$$

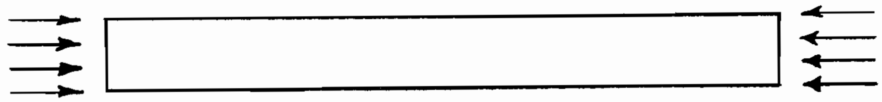
WHERE f_a = ACTUAL AXIAL STRESS = $\frac{P}{A}$

F_a = ALLOWABLE AXIAL STRESS

f_b = ACTUAL FLEXURE STRESS

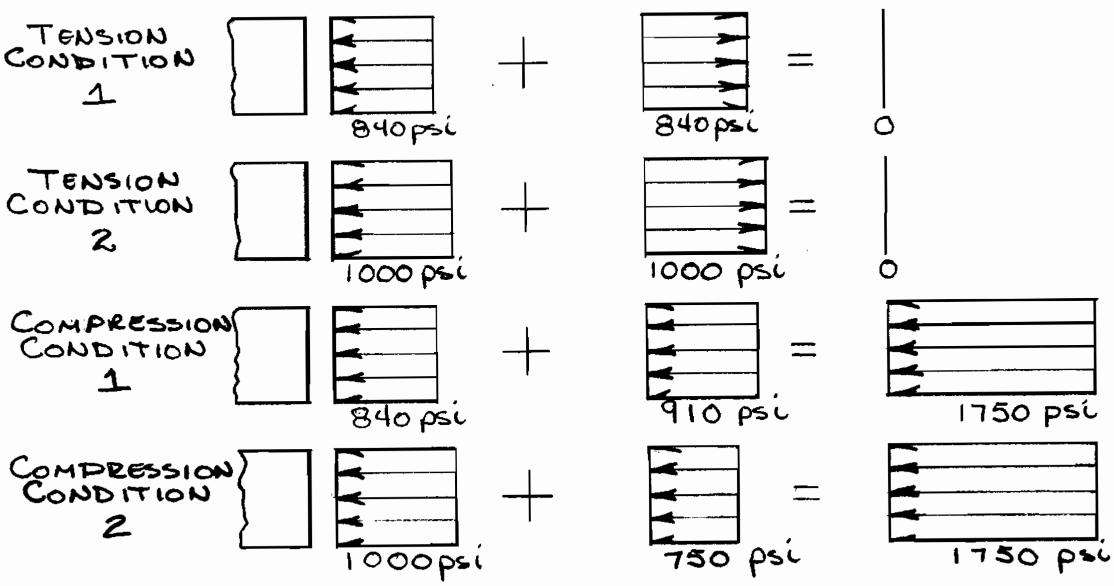
F_b = ALLOWABLE FLEXURE STRESS

PROJECT FLORIDA AVENUE COMPLEX	Page 2 of 6	COMPUTED BY RJG	DATE 5-15-74
SUBJECT EAST IHNC T-WALL DESIGN		CHECKED BY HMB	DATE July '74



PRESTRESSED CONCRETE
BEAM OR COLUMN
(PRESTRESS COMPRESSIVE STRESS CAN
RANGE FROM 840 psi TO 0.2f'c OR
1000 psi.)

INITIAL PRESTRESS COMPRESSIVE STRESS | APPLIED STRESS | NET STRESS



TENSILE STRESS:
THE INITIAL PRESTRESS COMPRESSIVE STRESS PLUS THE APPLIED TENSILE STRESS MUST NOT RESULT IN A NET TENSILE STRESS.

IF CONDITION 1 IS ASSUMED, BUT CONDITION 2 ACTUALLY EXISTS, THE RESULTING NET EXTREME FIBER COMPRESSIVE STRESS IS 160 PSI. IF CONDITION 2 IS ASSUMED, BUT CONDITION 1 ACTUALLY EXISTS, THE RESULTING NET EXTREME FIBER TENSILE STRESS IS 160 PSI. THEREFORE, CONDITION 1 GOVERNS AND WILL BE USED TO CALCULATE Q, THE ALLOWABLE TRANSVERSE FORCE ON THE PILE.

COMPRESSIVE STRESS:

THE INITIAL PRESTRESS COMPRESSIVE STRESS PLUS THE APPLIED COMPRESSIVE STRESS MUST NOT EXCEED $0.35 f'_c$, THE EXTREME FIBER STRESS IN COMPRESSION. (FOR PRESTRESSED CONCRETE BEAMS OR COLUMNS, f'_c IS EQUAL TO 5000 PSI.)

IF CONDITION 1 IS ASSUMED, BUT CONDITION 2 ACTUALLY EXISTS, THE RESULTING NET EXTREME FIBER COMPRESSIVE STRESS OF 1910 PSI WILL EXCEED $0.35 f'_c$. IF CONDITION 2 IS ASSUMED, BUT CONDITION 1 ACTUALLY EXISTS, THE RESULTING NET EXTREME FIBER COMPRESSIVE STRESS WILL NOT EXCEED $0.35 f'_c$. THEREFORE, CONDITION 2 GOVERNS AND WILL BE USED TO CALCULATE Q, THE ALLOWABLE TRANSVERSE FORCE ON THE PILE.

PROJECT Florida Avenue Complex	Page 4 of 6	COMPUTED BY R.J.G.	DATE 5-15-74
SUBJECT East IHNC T-Wall Design		CHECKED BY HMB	DATE July '74

COMPUTATIONS: COMPRESSIVE LOAD

INTERACTION FORMULA —

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

$$f_a = \frac{P}{144}$$

$$F_a = 0.750 \text{ ksi}$$

$$f_b = \frac{M_b}{S}, \quad F_b = 0.750 \text{ ksi}$$

$$M_b = 0.5 R Q$$

R = EFFECTIVE LENGTH

$$= \sqrt[4]{\frac{EI}{K}}$$

E = ELASTIC Modulus = 4,286,826 psi

I = MOMENT OF INERTIA = $\frac{bh^3}{12}$ = 1728 in^4

K = SOIL MODULUS = 100 psi

R = 92.77 in

$$\therefore \quad M_b = 0.5(92.77)\,Q$$

$$= 46.385\,Q$$

$$S = \frac{bh^2}{6} = 288 \text{ in}^3$$

$$\therefore \quad f_b = \frac{46.385\,Q}{288} = 0.1611\,Q$$

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

$$\frac{0.1611}{0.750}Q + \frac{P}{144(0.750)} \leq 1.0$$

PROJECT Florida Avenue Complex	Page 5 of 6	COMPUTED BY R.J.G.	DATE 5-15-74
SUBJECT East IHNC T-Wall Design		CHECKED BY HMB	DATE July '74

Computations: (Continued)...

$$\frac{0.1611}{0.750} Q + \frac{P}{144(0.750)} \leq 1.0$$

$$0.2148 Q + 0.0092 P \leq 1.0$$

$$0.2148 Q_{all} + 0.0092 P_{all} = 1.0$$

For compression loads,

$$P_{all} = 80 \text{ kips}$$

Therefore,

$$0.2148 Q_{all} + 0.0092(80) = 1.0$$

$$Q_{all} = \frac{1.0 - 0.0092(80)}{0.2148}$$

$$= \frac{1.0 - 0.736}{0.2148}$$

$$= \frac{0.264}{0.2148} = \underline{1.229 \text{ kips}},$$ Allowable transverse load in compression

Tension load case:

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

$M_b = 46.385 Q$, $f_a = \frac{P}{144}$

$S = 288 \text{ in}^3$, $F_a = 0.840$

$F_b = 0.840$ ksi,

PROJECT Florida Avenue Complex	Page 6 of 6	COMPUTED BY RJG.	DATE 5-15-74
SUBJECT East IHNC T-Wall Design		CHECKED BY HMB	DATE July '74

COMPUTATIONS: CONTINUED . . .

$$\frac{P}{144(.840)} + \frac{46.385}{(.840)(288)} Q \le 1.0$$

$$0.00826 P + 0.1918 Q \le 1.0$$

$$0.00826 P_{all} + 0.1918 Q_{all} = 1.0$$

FOR TENSION LOADS,

$$P_{all} = 40 \text{ kips.}$$

THEREFORE,

$$0.00826(40) + 0.1918 Q_{all} = 1.0$$

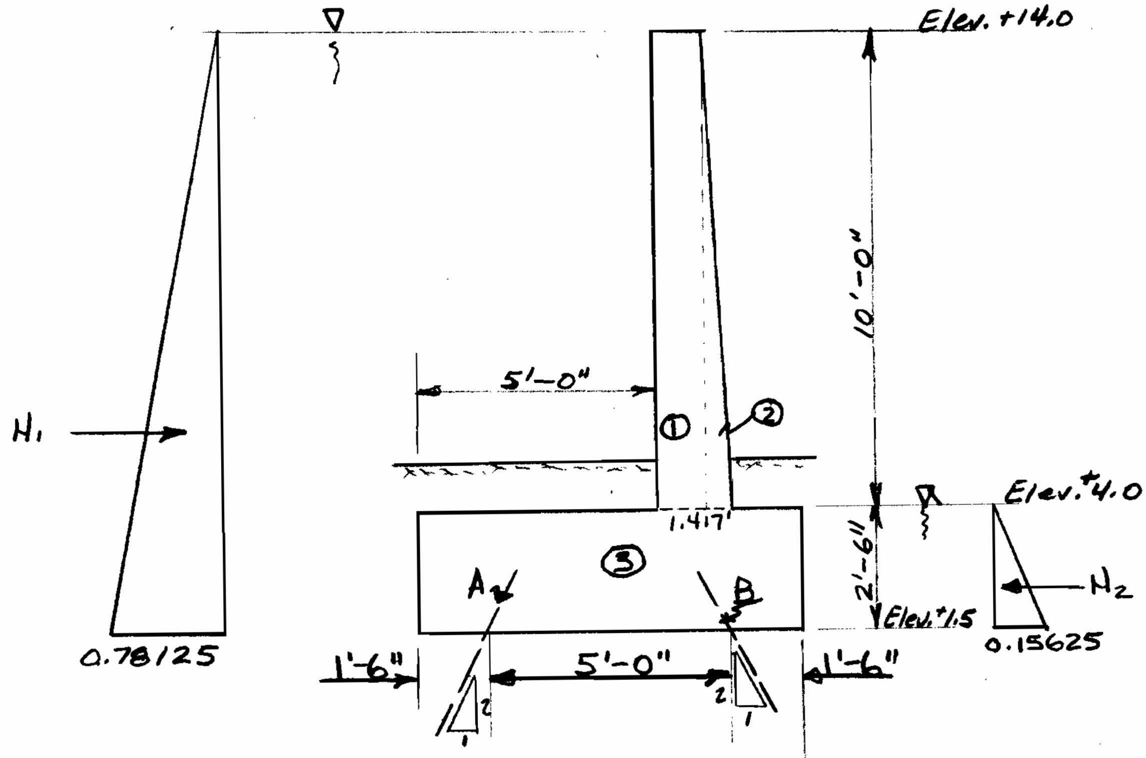
$$0.1918 Q_{all} = 1.0 - 0.3304 = 0.6696$$

$Q_{all} = 3.491$ Kips, ALLOWABLE TRANSVERSE LOAD IN TENSION

PROJECT FLORIDA AVENUE COMPLEX	Page 1 of 3	COMPUTED BY RJGr	DATE 5-15-74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA. 0+60.0 TO 0+91.0		CHECKED BY HMB	DATE June '74

T-WALL MONO 1E

$\boxed{3}$



TYPICAL T-WALL FROM W/L STA. 0+60.0 TO W/L STA. 0+91.0

PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 2 of 3	RJGR	5-15-74
SUBJECT		**CHECKED BY**	**DATE**
EAST IHNC T-WALL DESIGN W/L STA. 0+60.0 TO 0+91.0		HMB	June '74

T-WALL MONO LE

3 Vertical Forces

Item	Computations	F_z +↓	Arm_y	M_x	Arm_x	M_y
	(Concrete Only)					
①	(1.00)(10.0)(31.00)(0.150)	46.50	5.5	255.75	15.5	720.75
②	½(0.417)(10.0)(31.0)(0.150)	9.70	6.14	59.52	15.5	150.27
③	(8.0)(2.5)(31.0)(0.150)	93.00	4.00	372.00	15.5	1441.50
1	SUBTOTAL CONCRETE ONLY	+149.20	—	-687.27	—	-2312.52
	(SUBM. EARTH ONLY)					
2	(1.0)(6.6)(31.0)(0.0575)	+11.76	-3.64	-42.82	15.5	-182.35
	(SAT. EARTH ONLY)					
3	(1.0)(6.6)(31.0)(0.120)	+24.55	3.64	-89.37	15.5	-380.56
	(WATER WT. ONLY)					
4	(5.0)(10.0)(31.0)(0.0625)	+96.88	2.5	-242.19	15.5	-1501.56
	(IMPER. UPLIFT ONLY)					
①	-0.15625(8.0)(31.0)	-38.75	4.0	+155.0	15.5	+600.63
②	-0.625(4.0)(31.0)	-77.50	2.0	+155.0	15.5	+1201.25
5	SUBTOTAL IMP. UPLIFT	-116.25		+310.0		+1801.88

HORIZONTAL FORCES

ITEM	COMPUTATIONS	F_y	Arm_z	M_x	Arm_x	M_z
	HORIZONTAL WAT. FORCES					
①	-½(0.78125)(12.5)(31.0)	-151.37	4.17	-631.21	15.5	-2346.19
②	+½(0.15625)(2.5)(31.0)	+6.05	0.83	+5.02	15.5	+93.85
6	SUBTOTAL HOR. LOAD	-145.32		-626.19		-2252.34

Case	Loadings	F_x	F_y	F_z	M_x	M_y	M_z
I	1 + 2 + 4 + 5 + 6	—	-145.32	+141.59	-1288.47	-2194.55	-2252.34
II	1 + 3	—	—	+173.75	-776.67	-2693.08	—

```
LISTH D29010

06/05/74     13.13
```

MONO 3

```
10 FLA AVE CØMPLEX
20 EAST IHNC T=WALL--MØNØ 1A(TRIAL 034)
30 2,2
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0
100 2.0,270.0,4
110 2.5,11.2,19.8,28.5
140 4*-6.5
170 4*0.0
200 2.0,90.0,4
210 2.5,11.2,19.8,28.5
240 4*-1.5
270 4*0.0
2000 0.0,-145.32,141.59,-1288.47,-2194.55,-2252.34
2010 0.0,0.0,173.75,-776.67,-2693.08,0.0

READY

*RUN X29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED


      ***  ERRØR ENCØUNTERED WHILE ATTEMPTING TØ ACCESS THE
    DATA FILE NAMED: /D29010;               ØN LØGICAL FILE DEVICE  1.
    STATUS CØDE = 403700000000; AND I = 000000000037 (ØCTAL)
    ØR      31 (DECIMAL).
DUPLICATE NAME IN AFT
    FILE DETACHED
    WILL TRY AGAIN



    PRØG. NØ. 713-F3-A2-210           13:10:40   06/05/74


 FLA AVE CØMPLEX
 EAST IHNC T=WALL--MØNØ 1A(TRIAL 034)


TØTAL NUMBER ØF PILES =     8



            LØAD CØNDITIØN   1

          LØADS ØN PILE CAP
      X          Y          Z          MX          MY          MZ
      0.       -145.3      141.6     -1288.5     -2194.5     -2252.3
```

```
          PILE LØADS (PILE AXIS)
PILE
 NØ.       X        Y         Z
  1     0.1      0.0       60.2
  5    -0.1      0.0      -20.7
   1       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1          -0.0  -145.3    141.6    -1288.5    -2194.5    -2252.3


            LØAD CØNDITIØN   2

          LØADS ØN PILE CAP
       X             Y             Z             MX           MY              MZ
       0.            0.         173.8        -776.7      -2693.1             0.

          PILE LØADS (PILE AXIS)
PILE
 NØ.       X        Y         Z
  1    -1.9     -0.0       27.9
  5     1.8      0.0       20.6
   2       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2          -0.0       0.0    173.7     -776.7    -2693.1         0.0


   0   13:11:51   06/05/74    *** END ØF  RUN ***


STØP       EØJ

*
```

```
*ØLD
ØLD FILE?




          D29004
READY
*LISTH

08/14/74     08.15


10 2 0 1
20 2 12.5 1
30 FLØRIDA AVE CØMPLEX
40 EAST IHNC T-WALL MØNØ 1E
50 1
60 1288.47 141.59 145.32
70 12 12 60 80 40
80 1 100
90 1 -2 1 2 0 0
100 1.5 4
110 6.5 4
120 2
130 776.67 173.75 0
140 0 0 0
150 0

READY

*REMØVE D29004
*RUNH D@K29004

        08/14/74     08.177

LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED


   PRØG. NØ. 713-F3-A2-150, MØD 8 - MAY'74; FØR DESCRIPTIØN,
LIST SØURCE FILE --- A2B00/ADP/HRENN/K29003


  SELECT INPUT METHØD:
    1 = BINARY DATA FILE CREATED BY K29002 (713-F3A2-110)
        PLUS KEYBØARD INPUT,
    2 = ALL DATA FRØM USER'S DATA FILE (D29004),
    3 = ALL DATA FRØM KEYBØARD INPUT,
    4 = BINARY DATA FILE CREATED BY K29002 PLUS USER'S
        DATA FILE (D29004).
=2
---------------------------------------------------------------------

FLØRIDA AVE CØMPLEX
EAST IHNC T-WALL MØNØ 1E
```

PILE ARRANGEMENT

PILE GROUP	NO. ROWS	CENTROID DISTANCE	BATTER RATIO	NUMBER PILES
A	1	1.50	-2.00	4.00
B	1	6.50	2.00	4.00

TOTAL NO. OF PILES = 8.

CRITICAL PILE LOADINGS

GROUP A

ROW NO.	DIST. FT.	NO. PILES /ROW		COMP. LOADS KIPS	ALLOW. LOADS KIPS	PERCENT LOAD	CASE NO.	COMP. DEFL. IN.
1	1.50	4.	P =	-20.65	40.00	51.621	10001.00	0.0954
			Q =	1.780	4.761	37.379	20001.00	0.3840

GROUP B

ROW NO.	DIST. FT.	NO. PILES /ROW		COMP. LOADS KIPS	ALLOW. LOADS KIPS	PERCENT LOAD	CASE NO.	COMP. DEFL. IN.
1	6.50	4.	P =	60.19	80.00	75.233	10001.00	0.0954
			Q =	1.873	4.447	42.114	20001.00	0.3840

MAX. DEFL. FOR AT REST SOIL PRESS. = 0.0750

***** END OF JOB *****

```
*OLD D29004
READY
*120 0
*RESAVE D29004
DATA SAVED-D29004
*REMOVE D29004
*RUNH K29004

        08/14/74     08.267

LOADER DIAGNOSTICS
<W> .FFBC  UNDEFINED


  PROG. NO. 713-F3-A2-150, MOD 8 - MAY'74; FOR DESCRIPTION,
LIST SOURCE FILE --- A2B00/ADP/HRENN/K29003


  SELECT INPUT METHOD:
    1 = BINARY DATA FILE CREATED BY K29002 (713-F3A2-110)
        PLUS KEYBOARD INPUT
```

```
     3 = ALL DATA FROM KEYBOARD INPUT,
     4 = BINARY DATA FILE CREATED BY X29002 PLUS USER'S
         DATA FILE (D29004).
=2
----------------------------------------------------------------------

FLORIDA AVE COMPLEX
EAST IHNC T-WALL MONO 1E


         RUN NO.  1  -  CASE    1.00


                        PILE ARRANGEMENT
     PILE   NO.      CENTROID      BATTER     NUMBER
    GROUP   ROWS     DISTANCE      RATIO      PILES
      A      1         1.50        -2.00       4.00
      B      1         6.50         2.00       4.00

         TOTAL NO. OF PILES =    8.


   AREA        AI        E           AL         PC         PT
   144.00   1728.00  4286826.       60.00      30.00      40.00

         AK(1)
       100.000



       MOM.           VERT.          HOR.          CASE
     1288.470        141.590       145.320       10001.00
      DELTA-X        DELTA-Y        ALPHA     (INCHES AND RADIANS)
   0.24230E-01  -0.98908E-02   0.47459E-03

                       PILE LOADINGS FOR GROUP A
ROW    DIST    NP/ROW      AXIAL FORCE      TRANS FORCE        MOM.
 1     1.50     4.00         -20.648          -0.1382           0.

                       PILE LOADINGS FOR GROUP B
ROW    DIST    NP/ROW      AXIAL FORCE      TRANS FORCE        MOM.
 1     6.50     4.00          60.186          -0.0626           0.



       MOM.           VERT.          HOR.          CASE
      776.670        173.750         0.          20001.00
      DELTA-X        DELTA-Y        ALPHA     (INCHES AND RADIANS)
  -0.24804E 00  -0.18643E 00   0.42134E-02

                       PILE LOADINGS FOR GROUP A
ROW    DIST    NP/ROW      AXIAL FORCE      TRANS FORCE        MOM.
 1     1.50     4.00          20.607           1.7798           0.

                       PILE LOADINGS FOR GROUP B
ROW    DIST    NP/ROW      AXIAL FORCE      TRANS FORCE        MOM.
 1     6.50     4.00          27.911           1.8726           0.
```

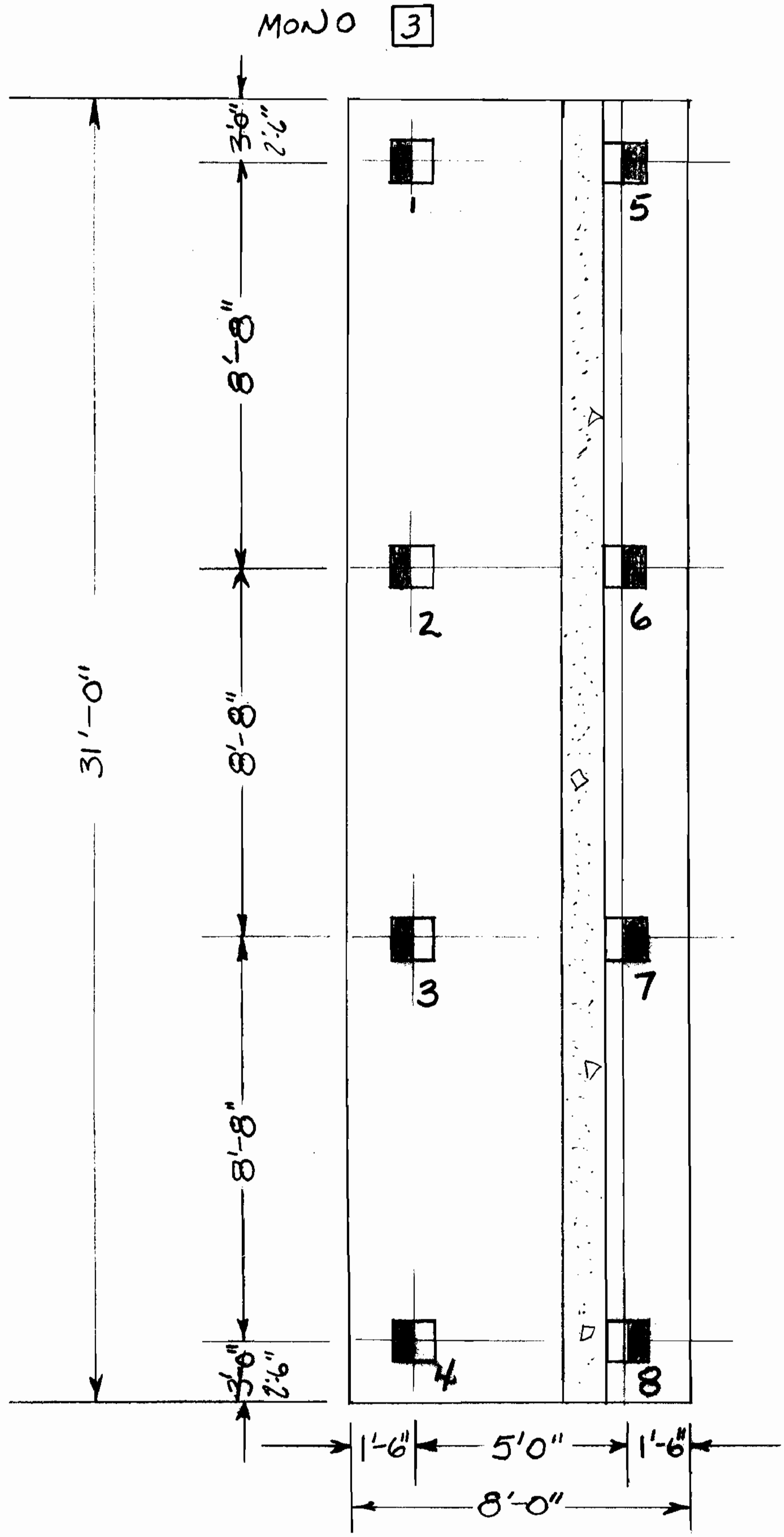
```
MAX. DEFL. FOR AT REST SOIL PRESS. =        0.0750

------------------------------------------------------------------------
                  ***** END OF JOB *****

------------------------------------------------------------------------

*TIME
03:21:39   08/14/74
*BYE
**RESOURCES USED $    5.91, USED TO DATE $  257.11=  6%
**TIME SHARING OFF AT   3.363 ON  08/14/74
```

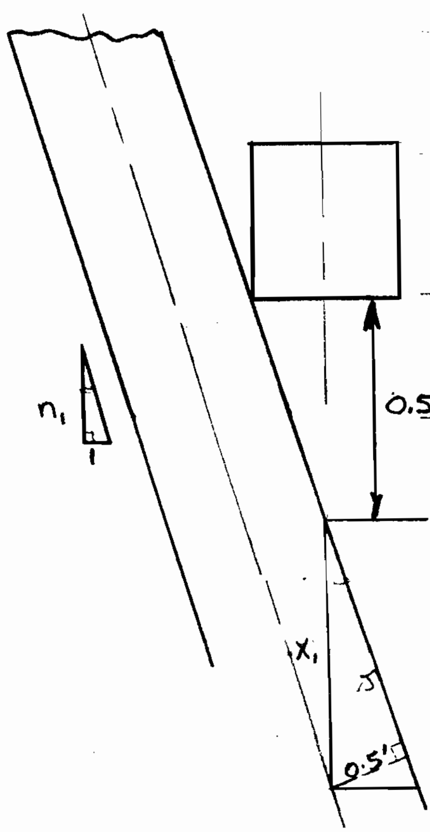
PROJECT Florida Avenue Complex	Page 3 of 3	COMPUTED BY R.J. Gr	DATE 5-15-74
SUBJECT East IHNC T-Wall Design w/L STA. 0+60.0 TO 0+91.0		CHECKED BY HMB	DATE June '74

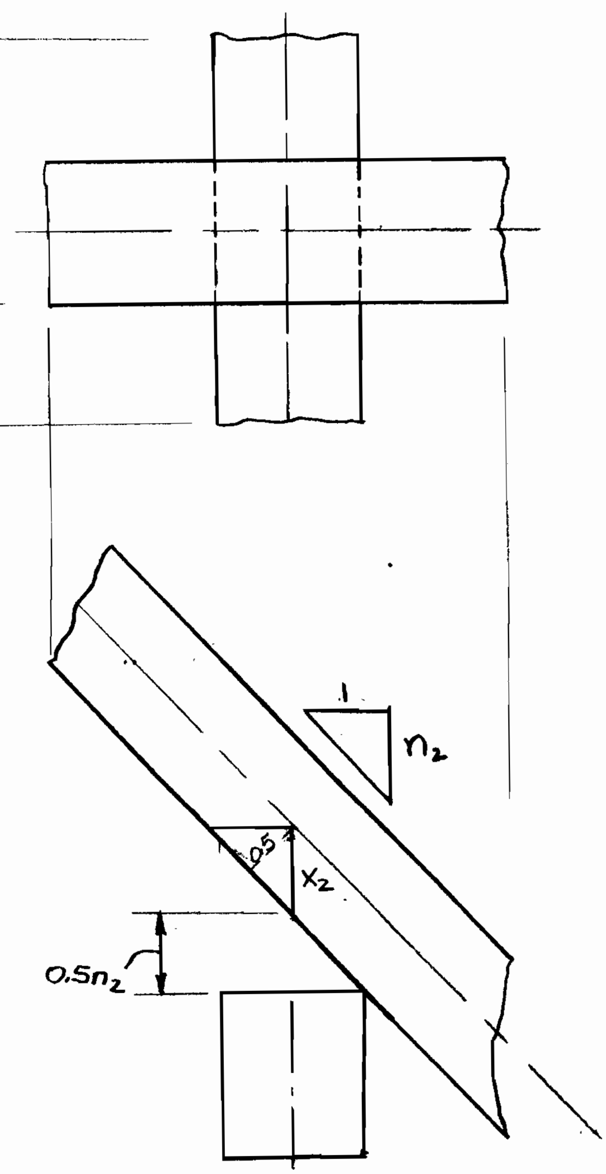


PROJECT	Page 1 of 2	COMPUTED BY	DATE
Florida Avenue Complex		RJGr	July 74
SUBJECT		**CHECKED BY**	**DATE**
East IHNC T-Wall Design		HMB	July '74

The following discussion is limited to 12 inch by 12 inch piles crossing at 90°. The discussion is made to tabulate clearance distances.

Assumptions: piles cross at 90°
12 inch by 12 inch piles
Computed distances along centerline





$$X_1 = \sqrt{(0.5n_1)^2 + (0.5)^2}$$

$$X_2 = \sqrt{(0.5n_2)^2 + (0.5)^2}$$

PROJECT Florida Avenue Complex	Page 2 of 2	COMPUTED BY RJGr	DATE July 74
SUBJECT East INNC T-Wall Design		CHECKED BY HMB	DATE JULY '74

Z_1 = Total distance (no clearance)

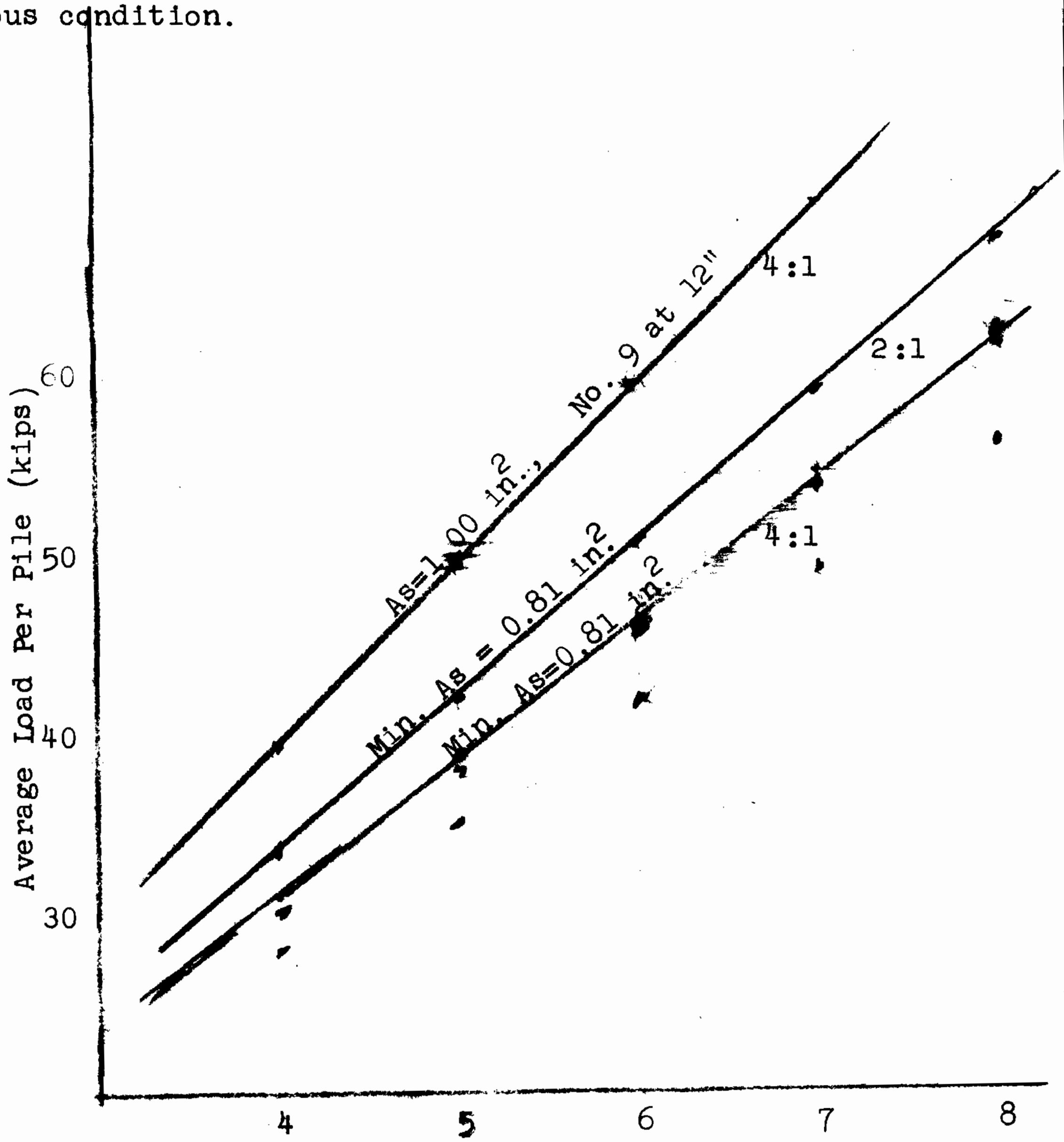
$= X_1 + (0.5)n_1 + x_2 + (0.5)n_2$

$= X_1 + X_2 + 0.5(n_1 + n_2)$

n_2 \ n_1	2.0	2.5	3.0	3.5	4.0	4.5	5.0
2.0	4.236	4.714	5.199	5.688	6.180	6.673	7.168
2.5	4.714	5.192 ~~5.392~~	5.677	6.166	6.658	7.151	7.646
3.0	5.199	5.677	6.162	6.651	7.143	7.636	8.131
3.5	5.688	6.166	6.651	7.140	7.632	8.125	8.620
4.0	6.180	6.658	7.143	7.632	8.124	8.617	9.112
4.5	6.673	7.151	7.636	8.125	8.617	9.110	~~9.625~~ 9.605
5.0	7.168	7.646	8.131	8.620	9.112	9.605 ~~9.625~~	10.10

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL BASE SLAB (8' WIDE)		RJGe	8 Sept 74

<u>TOP TRANSVERSE REINFORCEMENT</u> The amount of reinforcing needed for the average tension pile load in the first row under the pervious condition.

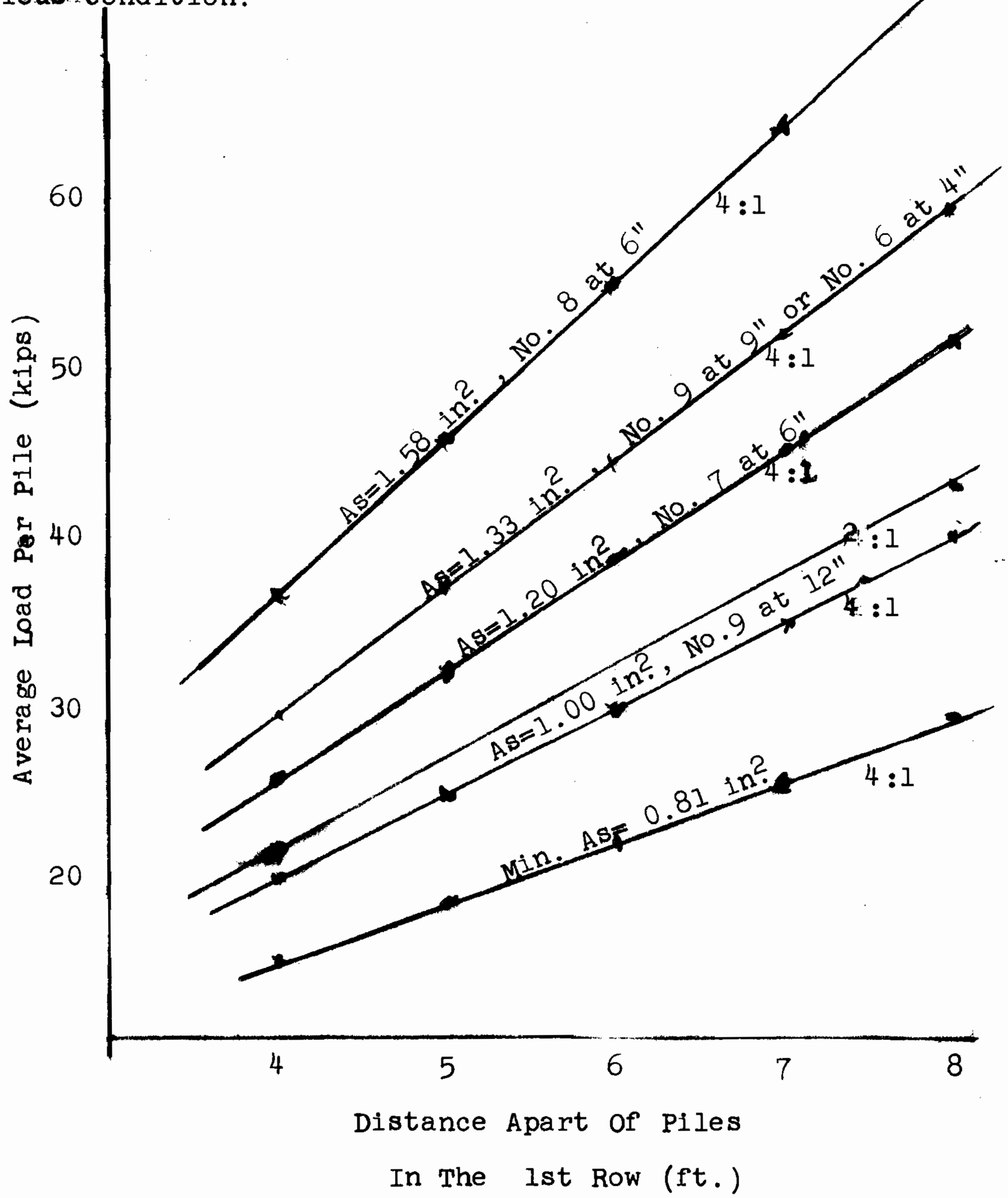


Distance Apart Of Piles
In 1st Row (ft.)

GRAPH 1

PROJECT FLORIDA AVENUE COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL BASE SLAB (11' WIDE)		CHECKED BY RJGe	DATE Sept 74

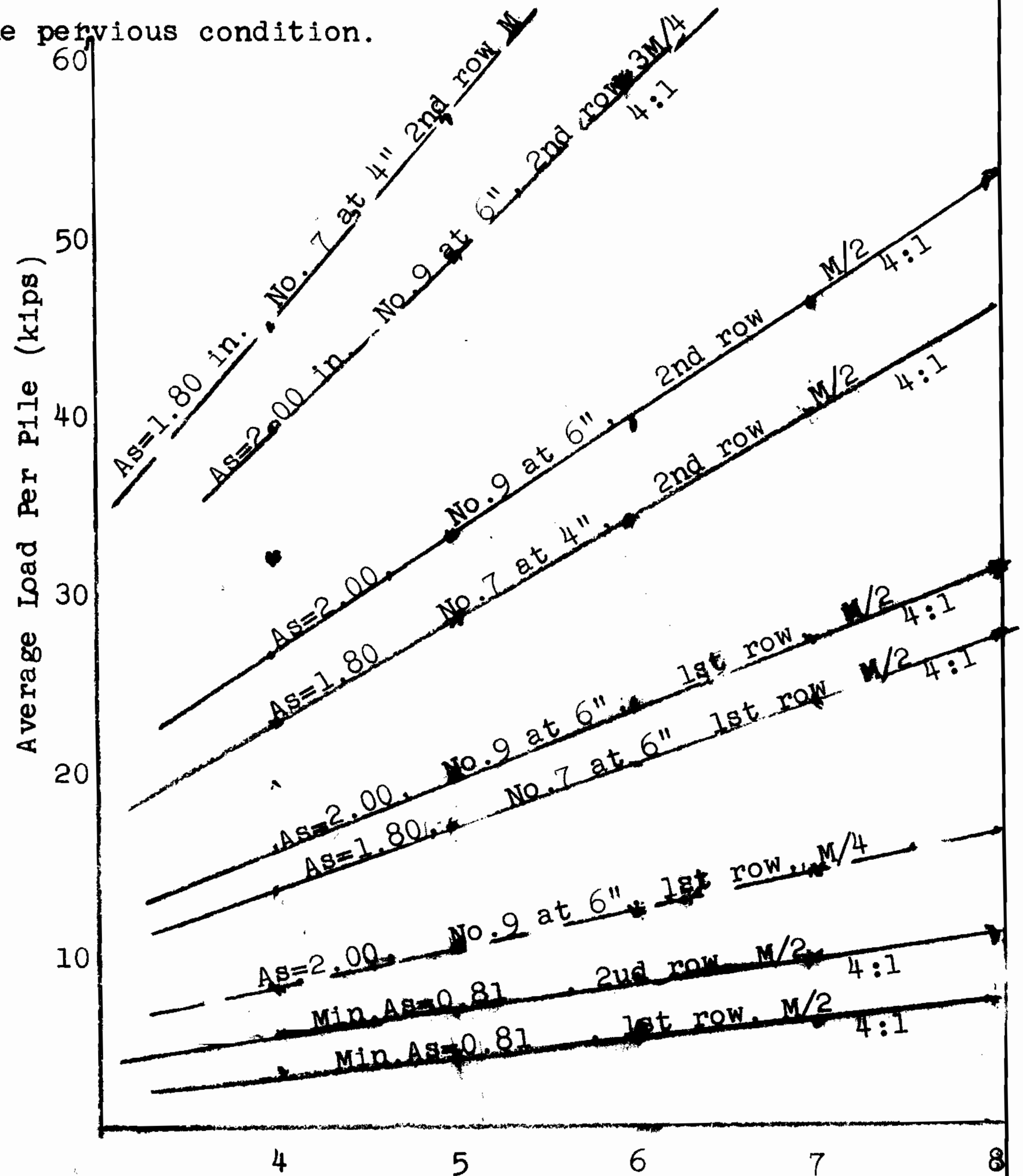
TOP TRANSVERSE REINFORCEMENT The amount of reinforcing needed for the average tension pile load in the first row under the pervious condition.



GRAPH 2

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page — of —	HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL BASE SLAB (14' WIDE)		RJGe	Sept 74

TOP TRANSVERSE REINFORCEMENT The amount of reinforcing needed for the average tension pile load in the first two rows under the pervious condition.



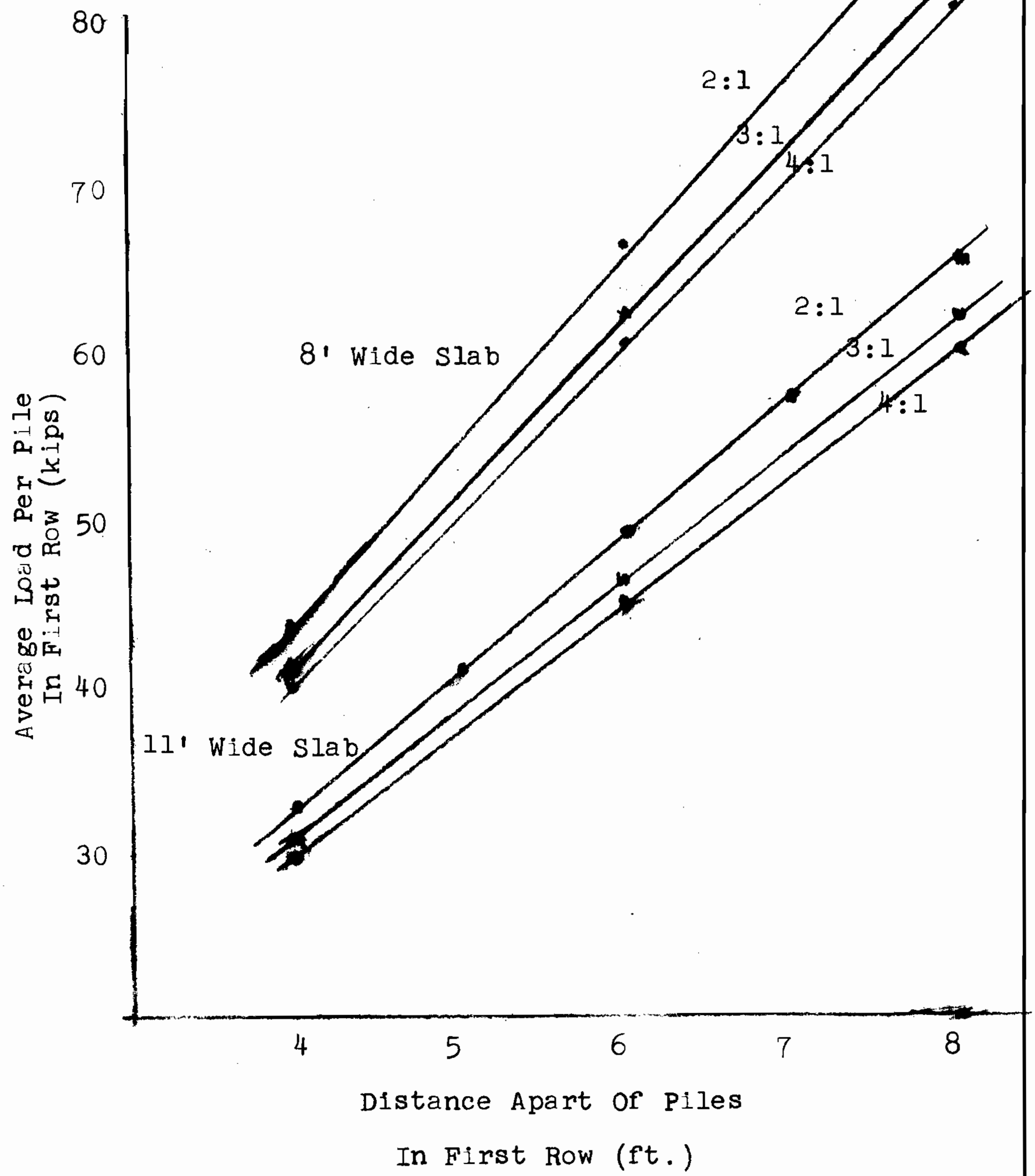
Distance Apart of Piles

In Each Row (ft.)

GRAPH 3

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
		RJGr	Sept '74

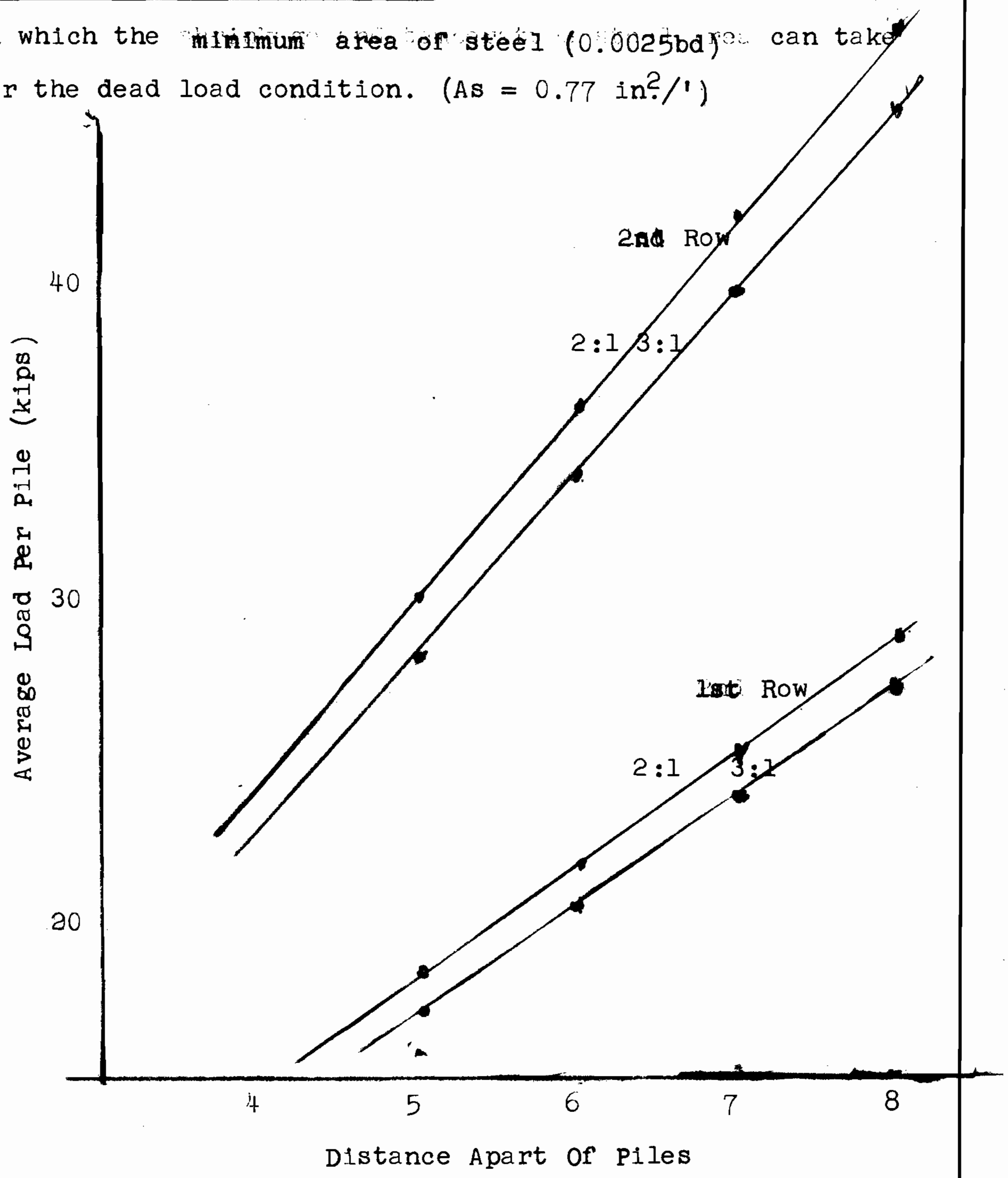
BOTTOM TRANSVERSE REINFORCEMENT The average pile load which the minimum area of steel(0.0025bd) can take under the dead load condition. (Compressive)(Min.As=0.77 in.^{2}/')



GRAPH 4

PROJECT FLORIDA AVENUE COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL BASE SLAB (14' WIDE)		CHECKED BY RJGe	DATE Sept 74

BOTTOM TRANSVERSE REINFORCEMENT The average compressive pile load which the minimum area of steel (0.0025bd) can take under the dead load condition. (As = 0.77 in²/')



GRAPH 5

PROJECT FLORIDA AVWNUE COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL - BASE SLAB REINFORCEMENT		CHECKED BY RJGr	DATE Sept '74

TOP + BOTTOM LONGITUDINAL REINFORCEMENT

Shrinkage and temperature steel area= Min As = 0.0020Bt

Slab Width	8'	11'	14'
Min. As(in^2)	5.76	7.92	10.08
Bars Use On Each Face	9 No.6's	12 No.6's	15 No.6's
or	8 No.6"s	11 NO.6's	14 No.6's

TABLE 1

Minimum steel area with a moment in the longitudinal direction. An example would be a step in the T-Wall.

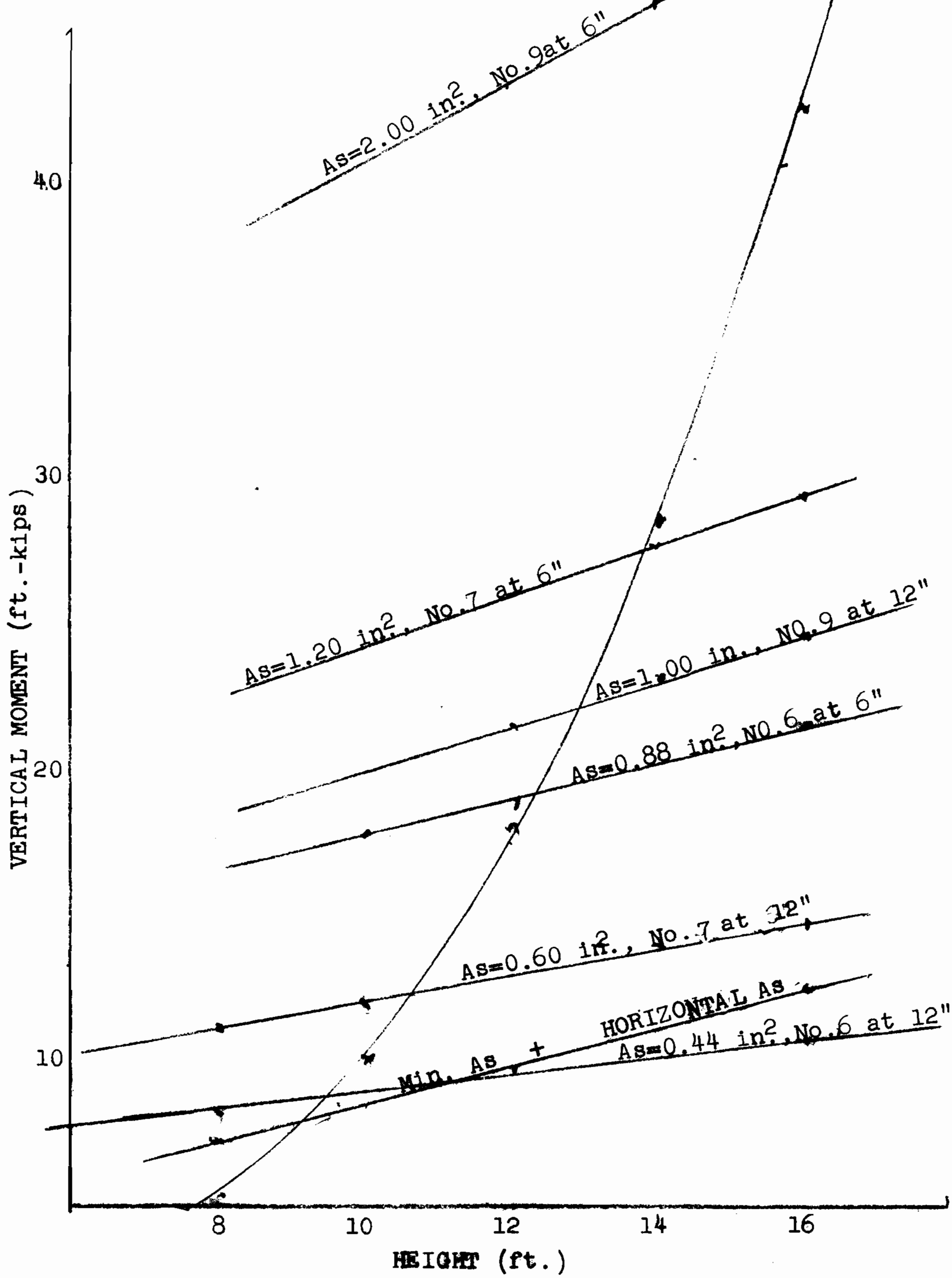
As = 0.0025Bd

Slab Width(ft.)	8	11	14
As (in.)	6.48	8.91	11.34
Bars Use On Each Face	15 No.6's	21 No.6 's	27 No. 6's

TABLE 2

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page — of —	HMB	July '74
SUBJECT T-WALL - WALL STEM DESIGN		CHECKED BY RJGR	DATE Sept 74

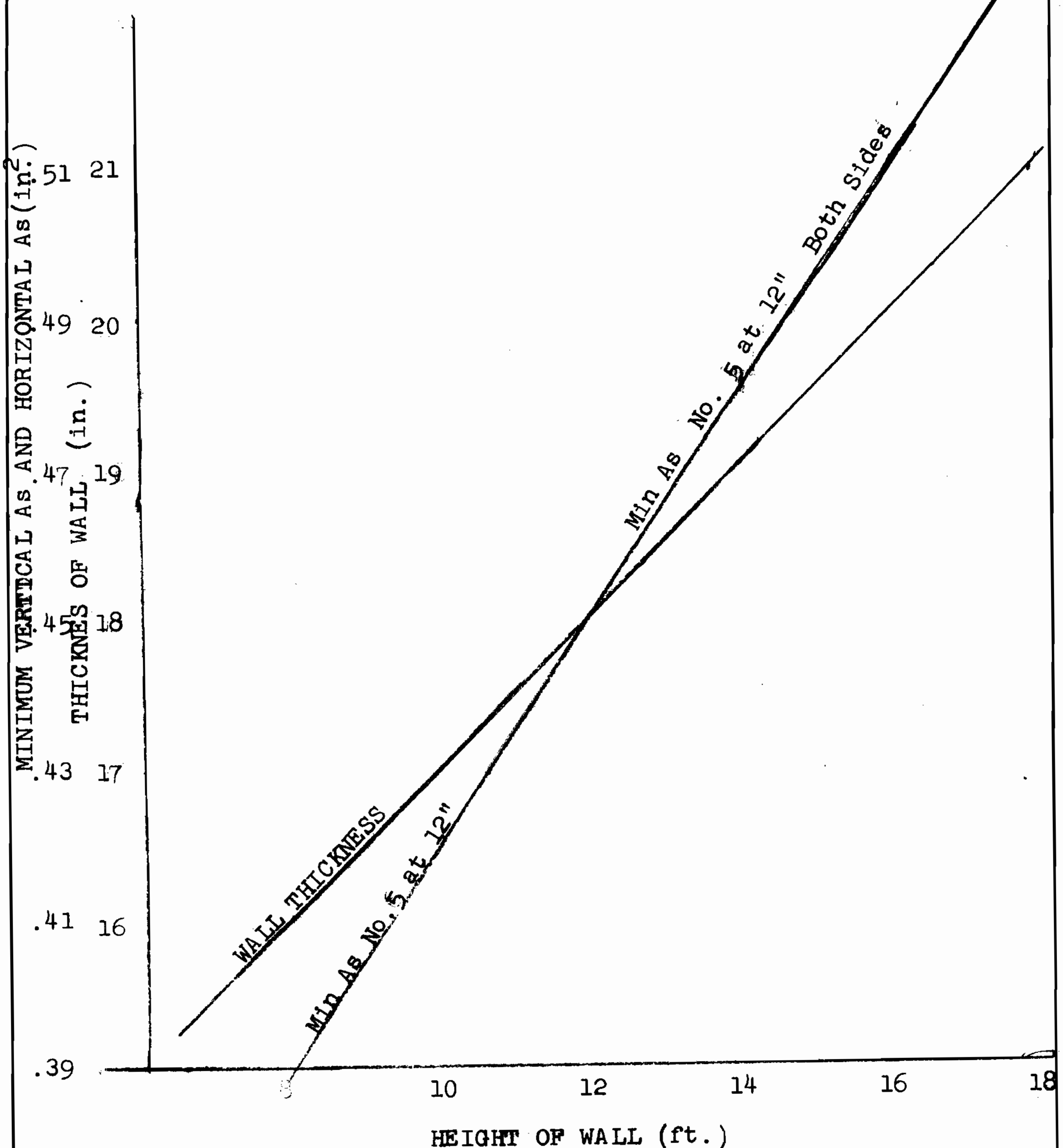
FLOOD SIDE VERTICAL REINFORCEMENT - GRAPH 6



PROJECT FLORIDA AVENUE COMPLEX | Page — of — | COMPUTED BY HMB | DATE July '74

SUBJECT T-WALL - WALL STEM DESIGN | CHECKED BY RJ Ge | DATE Sept 74

WALL STEM THICKNESS AND HORIZONTAL As

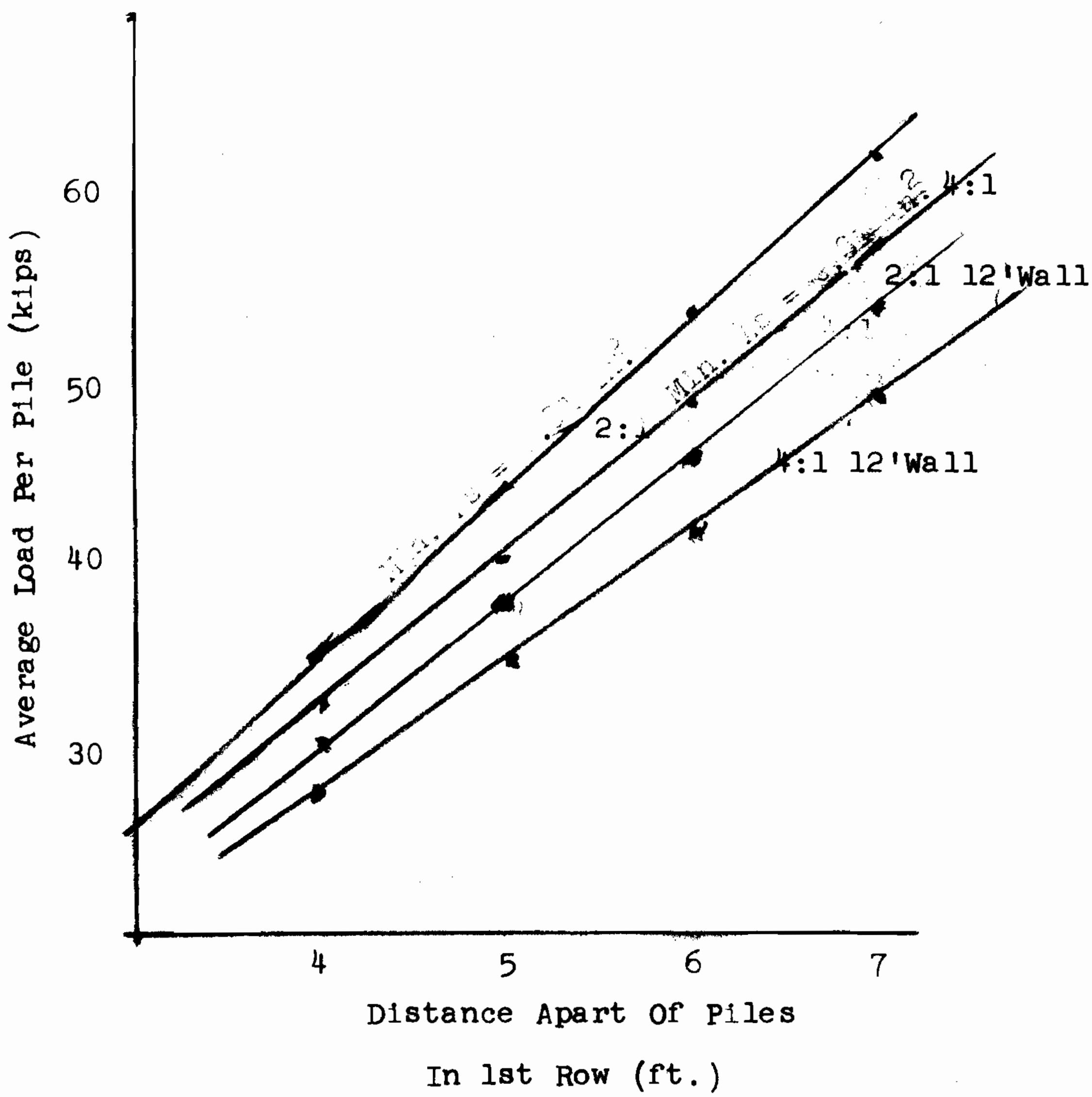


GRAPH 7

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page — of —	HMB	June '76
SUBJECT		CHECKED BY	DATE
T-WALL BASE SLAB (8' WIDE)		RJG	Sep 76

TOP TRANSVERSE REINFORCEMENT The amount of reinforcing needed for the average tension pile load in the first row under the impervious condition. (10' Wall U.N.O.)

(Min. As = 0.81 in^2)



GRAPH 8

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL BASE SLAB (8' WIDE)		RJGe	Sept 74

TOP TRANSVERSE REINFORCEMENT

Impervious Case   Water = 10'

1	Slab	1x2.5x5.0x.150	1.88	2.5	4.70'-k
2	Earth	1x1x5.0x.0575	0.29	2.5	0.73
3	Water Wt.	10.0x5.0x.0625	3.13	2.5	7.82
4	Uplift	-2.5x5.0x.0625	-0.78	2.5	-1.95
		-10x.0625x4	-2.50	3.0	-7.50
					3.80

Pervious Case (1+2+3) -(.2344x5X2.5+.3906x5/2X3.33) -1.95   5.12

As =M/ad, Min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2

M = Asad = 0.81x1.44x27	=	31.49'-k	31.49'-k
Impervious and Pervious Cases	=	-3.80	-5.12
Min. Resisting Moment	=	27.69'-k	26.37'-k

As in^2	RES. MOMENT ft-k	PILE BATTER	WALL DISTANCE ft.	PILE SEPARATION L ft.	PILE LOAD P k	ΔP k
0.81	27.69	4:1	3.40	4	32.6	8.1
0.81	27.69	2:1	3.13	4	35.4	8.8
Pervious Case						
0.81	26.37	4:1	3.40	4	31.0	7.8
0.81	26.37	2:1	3.13	4	33.7	8.4
1.00	33.76	4:1	3.40	4	39.7	9.9
1.00	33.76	2:1	3.13	4	43.1	10.8

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL - BASE SLAB REINFORCEMENT		RJGe	Sept 74

T-Wall Base Slab (11' wide)

Top Transverse Reinforcement

Previous Case (II) Water = 17'

Slab	1x2.5x7x.150	2.625	3.5	9.19'-k
Sub. Soil	1X1x7x.0575	0.40	3.5	1.40
Water Wt.	17x7x.0625	7.44	3.5	26.04
Uplift	-2.5x7x.0625	-1.09	3.5	-3.82
	-.3864x7	-2.70	3.5	-9.45
	-.6761x7/2	-2.37	4.67	-11.07
				12.29

As =M/ad, Min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2

M = Asad = 0.81x1.44x27 = 31.49'-k

Pervious Case (II) = -12.29

Min. Resisting Moment = 19.20'-k

P = Axial pile load, L = distance between piles(In a row)

4.919' distance from 1st row of piles to the wall for a 2:1 batter.

P = ML/4.919 = 19.20x4/4.919 = 15.6 k for L = 4'.

Add ΔP= 3.9 k for every additional foot of L.

5.336' distance from 1st row of pilesto the wall for a 4:1 batter.

P=ML/5.336 = 19.20x4/5.336 = 14.4 k for L = 4'

Add ΔP= 3.6 k for every additional foot of L.

PROJECT FLORIDA AVENUE COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL - BASE SLAB REINFORCEMENT		CHECKED BY RJ Ga	DATE Sept 74

T-Wall Base Slab (11' Wide)

Top Transverse Reinforcement

As in.	RES. MOMENT ft-k	BATTER	DISTANCE ft.	L ft.	P k	ΔP k
1.00	26.59	4:1	5.336	4	19.9	5.0
				5	24.9	
1.00	26.59	2:1	4.919	4	21.6	5.4
				5	27.0	
1.20	34.37	4:1	5.336	5	32.2	6.4
				6	38.6	
1.20	34.37	2:1	4.919	5	34.9	7.0
				6	41.9	
1.33	39.42	4:1	5.336	4	29.6	7.4
				5	37.0	
1.33	39.42	2:1	4.919	4	32.0	8.0
				5	40.0	
1.58	49.14	4:1	5.336	4	36.8	9.2
				5	46.0	
1.58	49.14	2:1	4.919	4	40.0	10.0
				5	50.0	

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT: T-WALL BASE SLAB (14' WIDE) REINFORCEMENT		CHECKED BY: RJGR	DATE: Sept 74

TOP TRANSVERSE REINFORCMENT

Impervious Case

1	Slab 1x2.5x9.0x.150	3.38	4.5	15.21'-k
2	Soil 1x1.0x9.0x.0575	0.52	4.5	2.34
3	Water 17x9.0x.0625	9.56	4.5	43.02
4	Uplift -9.0x2.5x.0625	-1.41	4.5	-6.34
	-17x.0625x7	-7.44	5.5	-40.92
				13.31'-k
	Pervious Case (1+2+3) -6.34			54.23
	-.3795x9	-3.42	4.5	-15.39
	-.6830x9/2	-3.07	6.0	-18.42
				20.42'-k

M = Asad = 0.81x1.44x27	=	31.49 '-k	31.49'-k
Impervious and Pervious Cases	=	-13.31	-20.42
Min. Resisting Moment	=	18.18 '-k	11.07'-k

The resisting moment is assumed to be divided so that half would go to each of the first two row of piles.

P1 = axial pile load for the first row of piles.

P2 = " " " " " second " " " .

L = distance between piles in a row.

PROJECT FLORIDA AVENUE COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL - BASE SLAB (14' WIDE) REINFORCEMENT		CHECKED BY RJGe	DATE Sept 74

As in.	RES. MOMENT M/2 ft-k	PILE BATTER	WALL DISTANCE ft.	L ft.	P_1 k	ΔP_1 k	P_2 k	ΔP_2 k
0.81	5.53	4:1	7.28	4	3.0	0.8		
"	"	"	4.37	"			5.1	1.3
1.80	24.78	4:1	7.28	4	13.6	3.4		
"	"	"	4.37	"			22.7	5.7
2.00	28.67	4:1	7.28	4	15.8	3.9		
"	"	"	4.37	"			26.2	6.6
2.85	45.19*	4:1	7.28	4	24.8	6.2		
"	"	"	4.37	"			41.4	10.3
2.00	M/4** 14.34	4:1	7.28	4	7.9	2.0		
"	3M/4** 43.00	"	4.37	"			39.4	9.8
1.80	M/4** 12.39	"	7.28	4	6.8	1.7		
1.80	3M/4** 37.17	"	4.37	"			34.0	8.5
1.80	M 49.56	4:1	4.37	4			45.4	11.3

*The maximum moment which the 2.5' thickness of concrete can take. (d = ~~VM/kb~~ , d = 27")

**The moment is assumed to be divided so that 1/4 will go to the 1st row and 3/4 to the 2nd row of piles.

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT: FLORIDA AVENUE COMPLEX | Page — of — | COMPUTED BY: HMB | DATE: July '74

SUBJECT: T-WALL - BASE SLAB REINFORCEMENT | CHECKED BY: RJGe | DATE: Sept 74

T-Wall Base Slab (8' wide)

Transverse Reinforcement

Bottom Reinforcement (Compressive loads on piles)

Shrinkage + temperature steel area or Minimum Steel.

Min. As = 0.0025bd = 0.0025x12x25.5 = 0.77 in²/'

M = Asad = 0.77x1.44x25.5 = 28.27 '-k/'

Earth + Slab (DL)

1.0x5.0x.120 X 2.5 = 1.50

2.5x5.0x.150 X 2.5 = 4.69

Total Moment = 34.46 '-k/'

P = Axial pile load, L = distance between piles (Ina row).

M = 3.130P/L, 3.130' distance to wall for 2:1 batter piles.

P = ML/3.130 = 34.46x4/3.130 = 44.0 k for L = 4'

Add P = 11.0 k for every additional foot of L.

3.320' distance to wall for 3:1 batter piles

P = ML/3.320 = 34.46x4/3.320 = 41.5 k for L = 4'

Add P = 10.4 k for every additional foot of L.

3.395' distance to wall for 4:1 batter piles

P = ML/3.395 = 34.46x4/3.395 = 40.6 k for L = 4'

Add P = 10.1 k for every additional foot of L.

PROJECT IHNC AND FLA. AVE. COMPLEX	Page — of —	COMPUTED BY HMB	DATE July '74
SUBJECT T-WALL - BASE SLAB REINFORCEMENT		CHECKED BY RJGR	DATE Sept '74

T-Wall Base Slab (11' wide)

Transverse Reinforcement

Bottom Reinforcement (Compressive loads on piles)

Shrinkage + temperature steel area

Min. As = 0.0025bd = 0.0025x12x25.5 = 0.77 in^2

As = M/ad

M = Asad = 0.77x1.44x25.5 = 28.27 '-k/'

Earth + Slab(2.5' thick) DL = 12.13

Total Moment = 40.40

P = Axial pile load, L = distance between piles

M = 4.919P/L , 4.919' distance to wall for 2:1 batter piles.

P = ML/4.919 = 40.40x4/4.919 = 32.8 k for L = 4'

P = 41.1 k for L = 5', P = 57.5 k for L = 7'

P = 49.3 k for L = 6', P = 65.7 k for L = 8'

Add P = 8.2 k for every additional foot of L.

P = 40.40L/5.218, 5.218 distance to wall for 3:1 batter piles

P = 31.0 k for L = 4'

Add P = 7.7 k for every additional foot of L.

P = 40.40L/5.336, 5.336' distance to wall for 4:1 batter piles

P = 30.3 k for L = 4'

Add P = 7.6 k for every additional foot of L.

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL - BASE SLAB REINFORCEMENT		RJ Ge	Sept 74

BOTTOM TRANSVERSE REINFORCEMENT The pile loads that the shrinkage and temperature steel area can take under dead load conditions.

BASE SLAB

Batter Of Piles

No. Of Ft. Apart Of Piles In The First Row	(8' Wide) 2:1	3:1	4:1	(11' Wide) 2:1	3:1	4:1
10				82.1	77.2	75.3
9						
8	88.0	83.1	81.0	65.7	61.8	60.3
7				57.5		
6	66.0	62.3	60.8	49.3	46.4	45.3
5				41.1		
4	44.0	41.5	40.6	32.8	31.0	30.3

(14' Wide)

No. of Ft. Apart of Piles in Each Row	First Row		Second Row	
8	28.8	27.2	48.0	45.4
7	25.2	23.8	42.0	39.7
6	21.6	20.4	36.0	34.0
5	18.0	17.0	30.0	28.3

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page — of —	HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL - BASE SLAB REINFORCEMENT		RJGa	Sept 74

T-Wall Base Slab (14' wide)

Moment resisted by minimum reinforcement = 28.27 '-k/'

Dead Load Case III

Earth	1x1x9x.120	X	4.5	=	4.86
Slab	1x2.5x9x.150	X	4.5	=	15.19
				Total Moment =	48.32 '-k/'

P1 = axial pile load for the first row of piles.

P2 = " " " " " second " " "

6.708' = distance to wall for 2:1 batter piles in 1st row.

4.025' = distance to wall for 2:1 batter piles in 2nd row.

L = distance between piles in a row.

$M/2 = 6.708P1/L$ $\qquad$ $M/2 = 4.025P2/L$

$P1 = ML/2x6.708$ $\qquad$ $P2 = ML/2x4.025$

$P1 = 18.0$ k for $L = 5'$ $\qquad$ $P2 = 30.0$ k for $L = 5'$

$\Delta P1 = 3.6$ k for additional foot of L. $\qquad$ $\Delta P2 = 6.0$ k for additional foot of L.

7.115' = distance to wall for 3:1 batter piles in 1st row.

4.269' = distance to wall for 3:1 batter piles in 2nd row.

$P1 = ML/2x7.115$ $\qquad$ $P2 = ML/2x4.269$

$P1 = 17.0$ k for $L = 5'$ $\qquad$ $P2 = 28.3$ k for $L = 5'$

$\Delta P1 = 3.4$ k for additional foot of L. $\qquad$ $\Delta P2 = 5.7$ k for additional foot of L.

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	Aug. '74
SUBJECT		**CHECKED BY**	**DATE**
T-WALL DESIGN - BASE SLAB (14' Wide) REINFORCEMENT		RJG	Sept 74

The moment is assumed to be divided so that 1/4 will go to the 1st row and 3/4 to the second row of piles.

Both rows of piles are on 2:1 batters.

$M/4 = 6.708 P1/L$

$P1 = ML/4 \times 6.708$

$P1 = 9.0$ k for L = 5'

$\Delta P1 = 1.8$ k for every additional foot of L.

$3M/4 = 4.025 P2/L$

$P2 = 3ML/4 \times 4.025$

$P2 = 45.0$ k for L = 5'

$\Delta P2 = 9.0$ k for every additional foot of L.

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	Aug. 76
SUBJECT		CHECKED BY	DATE
T-WALL DESIGN - BASE SLAB REINFORCEMENT (8' WIDE)		RLG	Sep 76

TOP TRANSVERSE REINFORCEMENT (Tension loads on piles)

Pervious Case Water = 12'

1	Slab 1x2.5x5.0x.150	1.88	2.5	4.70'-k
2	Earth 1x4x5.0x00575	1.15	2.5	2.88
3	Water Wt. 12.0x5.0x00625	3.75	2.5	9.38
4	Uplift -2.5x5.0x.0625	-0.78	2.5	-1.95
	-5/8x12x.0625x5/2	-1.17	3.33	-3.90
	-(12x.0625-.4688)5	-1.41	2.5	-3.52
				7.59

Min. As = 0.0025bd = 0.0025x12x27 = 0.81 in.^{2}

As = M/ad

M = Asad = 0.81x1.44x27 = 31.49 '-k

Pervious Case = -7.59

Min. Resisting Moment = 23.90 '-k

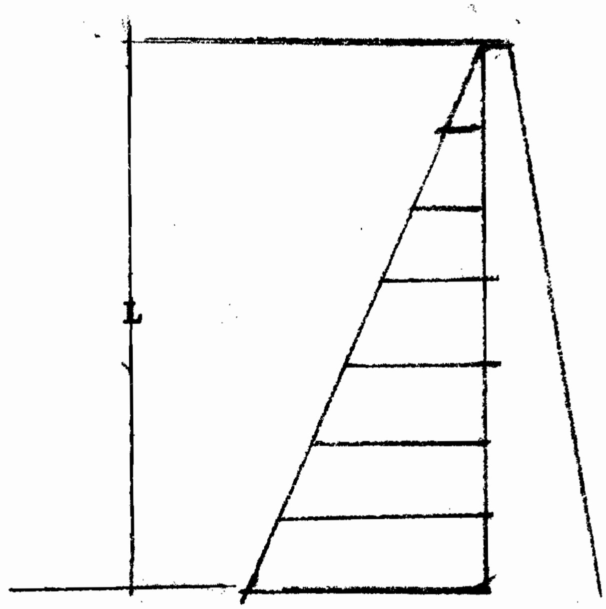
M = Asad = 1.00x1.44x27 = 38.88

Pervious Case = -7.59

Min. Resisting Moment = 31.29 '-k

As in.^{2}	RES. MOMENT ft-k	PILE BATTER	WALL DISTANCE ft.	PILE SEPARETION L ft.	PILE LOAD P k	PILE LOAD CHANGE ΔP k
0.81	23.90	2:1	3.13	4	30.5	7.7
1.00	31.29	2:1	3.13	4	40.0	10.0
0.81	23.90	4:1	3.40	4	28.1	7.0
1.00	31.29	4:1	3.40	4	36.8	9.2

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL - WALL STEM DESIGN		RJGa	Sept 74



L ft.	COMPUTATION	FORCE kips	ARM ft.	MOMENT ft.-kips
14	$0.0625 \times 14^2/2$	6.125	14/3	28.60
15	$0.0625 \times 15^2/2$	7.031	15/3	35.16
16	$0.0625 \times 16^2/2$	8.000	16/3	42.67
17	$0.0625 \times 17^2/2$	9.031	17/3	51.18

14 $d_{req'd} = \sqrt{M/kb} = \sqrt{28600/152} = 13.7''$

$< d_{prov'd} = t - 2.5 - 0.5 - 0.5 = t - 3.0 = 19.0 - 3.0 = 16.0''$

15 $d_{req'd} = \sqrt{35160/152} = 15.2'' < d_{prov'd} = 19.5 - 3.0 = 16.5''$

16 $d_{req'd} = \sqrt{42670/152} = 16.8'' > d_{prov'd} = 20.0 - 3.0 = 17.0''$

17 $d_{req'd} = \sqrt{51210/152} = 18.4'' > d_{prov'd} = 20.5 - 3.0 = 17.5''$

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FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
T-WALL - WALL STEM DESIGN		RJGR	Sept 74

WALL THICKNESS Minimum wall thickness is 12" increasing 1/24' or 0.5" for every foot of height.

HEIGHT This is the height of the wall and water.

MINIMUM HORIZONTAL As = 0.0020bt

VERTICAL FORCE = $0.0625H^2/2$

VERTICAL MOMENT is the flood side vertical moment.

H HEIGHT ft.	WALL THICKNESS in.	MINIMUM HOR. As in^2	VER* FORCE k	ARM ft.	VER. MOMENT ft-k	VER. As in^2
8	16.0	0.39	2.00	2.67	5.34	0.29
9	16.5	0.40	2.53	3.00	7.59	0.39
9.5	16.75	0.40	2.82	3.17	8.94	0.45
10	17.0	0.41	3.12	3.33	10.39	0.52
12	18.0	0.43	4.50	4.00	18.00	0.83
14	19.0	0.46	6.12	4.67	28.58	1.24
16	20.0	0.48	8.00	5.33	42.64	1.74
17	20.5	0.50	9.03	5.67	51.20	
18	21.0	0.50	10.12	6.00	60.72	

VERTICAL REINFORCEMENT ON THE PROTECTED SIDE

For all wall thicknesses

Min. As = 0.0025bd' = 0.0025x12x3 = 0.09 in^2 Use No. 6 at 12"

*Shear is within limits. (v=V/bd < .060 ksi)

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX		HMB	July '74
SUBJECT: T-WALL - WALL STEM DESIGN		CHECKED BY: RJGr	DATE: Sept 74

HEIGHT ft.	8	9	10	12	14	16
d in.	13.0	13.5	14.0	15.0	16.0	17.0
Min. As in^2	0.39	0.41	0.42	0.45	0.48	0.51
Min. M ft-k	7.30	7.97	8.47	9.72	11.06	12.48

As in^2	HEIGHT ft.	d in.	RES. MOMENT ft-k	ΔRES. MOMENT ft-k
0.44	8	13.0	8.24	0.32
"	10	14.0	8.87	
0.60	8	13.0	11.23	0.43
"	10	14.0	12.10	
0.88	10	14.0	17.74	0.63
"	12	15.0	19.00	
1.20	12	15.0	25.92	0.86
"	14	16.0	27.64	
1.00	12	15.0	21.60	0.72
"	14	16.0	23.04	
2.00	14	16.0	46.08	1.44
"	16	17.0	48.96	

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 4 of —	HMB	July '74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA.0+60.00 to 0+91		CHECKED BY 0	DATE

BASE SLAB REINFORCEMENT

BASE SLAB (Mono 1E) 3 (Width = 8')

Top Transverse Reinforcement

Using graph minimum steel governs.

As = 0.81 in^2 ; Use No. 8 at 12"

Bottom Transverse Reinforcement

According to the graph use min. As = 0.77 in^2

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

Min. As = 0.0020Bt = 0.0020x96x30 = 5.76 in^2

Use 2.88 in^2 for each face

Use 9 No. 6's Top + Bottom

WALL STEM DESIGN 10'

Flood Side Vertical Reinforcement

According to the graph use: As. = 0.60 in^2

Use No. 7 at 12"

Protected Side Vertical Reinforcement

Min. As = .09 in. Use No. 6 at 12"

Both Sides Horizontal Reinforcement

As = 0.41 in^2

Use No.5 at 12" each face 2x0.31 = 0.62 in^2

Base Wall Thichness = 17"

PROJECT
IHNC AND FLORIDA AVE. COMPLEX

Page — of —

COMPUTED BY HMB | DATE July '74

SUBJECT
EAST IHNC T-WALL DESIGN W/L STA 0+91.0to1+19.35

CHECKED BY RJGr | DATE Sept 74

BASE SLAB REINFORCEMENT

BASE SLAB (Mono 2E) - 4 (Width = 8') Corner

Top Transverse Reinforcement

According to GRAPH 1 Min As = 0.81 in^2

Use No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Min As = 0.77 in. Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 As = 6.48 in^2

Use 15 No. 6's top + bottom.

STEM WALL DESIGN

WALL STEM 10' Wall Thickness = 17 in.

Flood Side Vertical Reinforcement

According to GRAPH 6 use: As = 0.60 in., No. 7 at 12"

Protected Side Vertical Reinforcement

Min. As = 0.09 in^2 < No. 6 at 12

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: As = 0.42 in^2

Use No. 5 at 12" on Both Sides.

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 4 of —	COMPUTED BY HMB	DATE July '74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA.1+19.35 to 1+40.35		CHECKED BY RJGr	DATE Sept '74

BASE SLAB REINFORCEMENT

BASE SLAB (Mono 3E) 5 (Width = 8')

Top Transverse Reinforcement

According to GRAPH 1 Min. As = 0.81 in^2

Use No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 Min. As = 5.76 in^2

Use 10 No. 6's Top + Bottom.

WALL STEM DESIGN

WALL STEM 10'

Flood Side Vertical Reinforcement

According to GRAPH 6 use: As = 0.60 in. , No. 7 at 12"

Protected Side Vertical Reinforcement

Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: As = 0.42 in^2

Use No. 5 at 12" on Both Sides

Base Wall Thickness = 17 in.

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 7 of —	COMPUTED BY HMB	DATE July '74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA.1+40.35 to 1+80.8b		CHECKED BY RJGe	DATE Sept

BASE SLAB REINFORCEMENT

BASE SLAB (Mono 4E) 6 (Width = 11') Step

Top Transverse Reinforcement

According to GRAPH 2 As = 1.00 in^2

Use No. 9 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 As = 8.91

Use 21 No. 6's Top + Bottom

WALL STEM DESIGN

WALL STEM 14'

Flood Side Vertical Reinforcement

According to GRAPH 6 use: 1.20 in^2 Should be As = 1.24 in^2

Use No. 7 at 6" bottom half + No. 7 at 12" top half of wall

Protected Side Vertical Reinforcement

As = .44 in^2 Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: As =0.31 in^2

Use No. 5 at 12" on Both Sides.

Wall Tihckness = 19 in.

BASE SLAB REINFORCEMENT

BASE SLAB (Mono 5E) 8 11' Wide Step

Top Transverse Reinforcement

According to GRAPH 2 As = 1.58 in²

Use No. 8 at 6".

Bottom Transverse Reinforcement

Using GRAPH 4s minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 , As = 8.91 in²

Use 21 No. 6's on Top + Bottom.

STEM WALL DESIGN

WALL STEM 14'

Flood Side Vertical Reinforcement

According to GRAPH 6 use: As = 1.20*in²

Use No. 7 at 6" in the bottom half + No. 7 at 12" in the top

Protected Side Vertical Reinforcement

Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12" Both Sides.

Wall Thickness = 19 in.

PROJECT		COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page 5 of —	HMB	Aug. '74
SUBJECT		CHECKED BY	DATE
EAST IHNC T-WALL DESIGN - 2+77.12 to 3+22.90		RJGe	Sept 74

T-WALL 6E 9 Center

BASE SLAB (Wide = 11') REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 2 As = 1.58 in^2

Use No. 8 at 6"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12".

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 As = 8.91 in^2

21 No. 6 Both Top + Bottom.

WALL STEM DESIGN

WALL STEM (Height = 17')

Flood Side Vertical Reinforcement

According to GRAPH use:
The same as Mone 11E 15 Use No. 9 at 6"

Protected Side Vertical Reinforcement

Use No. 6 at 12" > As = 0.41 in^2

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12" Both Sides

~~xThexsamexasxMonex11Exxxx15~~ As = 2x.31 = 0.62 > 0.53 in^2

Base Wall Thickness = 20.5 in.

PROJECT		COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page __ of __	HMB	Sept. '74
SUBJECT		CHECKED BY	DATE
EAST IHNC T-WALL DESIGN-3+22.90 to 3+67.90		RJGr	Sept 74

BASE SLAB REINFORCEMENT

BASE SLAB (Wide = 11') (Mono 7E) 10

Top Transverse Reinforcement

According to GRAPH 2 As = 1.58 in^2

Use No. 8 at 6".

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12" Min. As = 0.77 in^2

Top + Bottom Longitudinal Reinforcement

According to TABLE 1

Use 12 No. 6's Top + Bottom.

STEM WALL DESIGN

WALL STEM (Height = 17') Base Wall Thickness = 20.5 in.

Flood Side Vertical Reinforcement

According to GRAPH use:

The same as Mono 11E 15 Use No. 9 at 6"

Protected Side Vertical Reinforcement - Negative Reinforcement

Use No. 6 at 12" > As = 0.41 in^2

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12" Both Sides

As = 2x0.31 = 0.62 > 0.53 in^2

Base Wall Thickness = 20.5 in.

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page — of —	COMPUTED BY HMB	DATE Aug. '74
SUBJECT BARRIER PLAN - EAST OF IHNC - 367.90 to 411.90		CHECKED BY RJGe	DATE Sept 74

T-WALL Mono 8E 11

BASE SLAB (Wide = 14') REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 3 As = 2.00 in^2

Use No. 9 at 6"

Bottom Transverse Reinforcement

Using GRAPH 5 minimum steel is enough.

Use No 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 As = 10.08 in^2

Use 15 No. 6's Top + Bottom

WALL STEM DESIGN

WALL STEM (Height = 17')

Flood Side Vertical Reinforcement

According to GRAPH use:

The same as Mono 11E 15 Use No. 9 at 6"

Protected Side Vertical Reinforcement - Negative Reinforcement

Use No. 6 at 12" > As = 0.41 in^2

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12" Both Sides

As = 2x0.31 = 0.62 > 0.53 in.^{2}

Base Wall Thickness = 20.5 in.

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 5 of —	COMPUTED BY HMB	DATE Aug. '74
SUBJECT EAST IHNC T-WALL DESIGN - 4+11.90 to 4+29.81		CHECKED BY RJGr	DATE Sept 74

T-WALL Mono 9E 12

BASE SLAB (Wide = 14' Corner) REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 3 As = 2.00 in^2 or As = 1.80 in^2

Use No. 9 at 6" or Use No. 7 at 4"

Bottom Transverse Reinforcement

Using GRAPH 5 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 As = 11.34 in^2

Use 27 No. 6's Top + Bottom.

STEM WALL DESIGN

WALL STEM (Height = 17')

Flood Side Vertical Reinforcement

According to GRAPH use:

The same as Mono 11E 15 Use No. 9 at 6"

Protected Side Vertical Reinforcement - Negative Reinforcement

Use No. 6 at 12" > As = 0.41 in^2

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12" Both Sides

$$As = 2x0.31 = 0.62 > 0.53 \text{ in}^2$$

Base Wall Thickness = 20.5 in.

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 5 of —	COMPUTED BY HMB	DATE Aug. '74
SUBJECT EAST IHNC T-WALL DESIGN - 4+29.81 to 4+73.81		CHECKED BY RJGr	DATE Sept 74

T-WALL MONO 10E 13

BASE SLAB (Wide = 14') REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 3 $A_s = 2.00$ in^2

Use No.9 at 6"

Bottom Transverse Reinforcement

Using GRAPH 5 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 $A_s = 10.08$ in^2

Use 15 No. 6's Top + Bottom

WALL STEM DESIGN

WALL STEM (Height = 17') The same as T-Wall Mono 8E 11

Flood Side Vertical Reinforcement

According to GRAPH use:

Protected Side Vertical Reinforcement

Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH 7 use:

Base Wall Thickness =

PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page 3 of	HMB	Aug. '74
SUBJECT		CHECKED BY	DATE
CHALMETTE PLAN - EAST OF IHNC		Sep RJ9n	Sept '74

T-WALL At Transmission Tower 13E 27

BASE SLAB (Wide = 8') REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 1 Min As = 0.81 in^2

Use No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 As = 5.76 in^2

Use 9 no. 6's Top + Bottom

WALL STEM DESIGN

WALL STEM (Height = 7.5')

Flood Side Vertical Reinforcement

According to GRAPH 6 use: Min. As = 0.44 in^2

Use No. 6 at 12"

Protected Side Vertical Reinforcement

Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH ~~7~~ use: No. 4 at 12" Both Sides.

Base Wall Thickness = 15.75 in.

T-WALL ~~UNE~~ 28

BASE SLAB (Wide = 8') REINFORCEMENT

Top Transverse Reinforcement

According to GRAPH 1 Min. As = 0.81 in^2

USE No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2 As = 6.48 in^2

Use 15 No. 6's Top + Bottom

WALL STEM DESIGN

WALL STEM (Height = 7.5')

Flood Side Vertical Reinforcement

According to GRAPH 6 use: Min. As = 0.44 in^2

Use No. 6 at 12"

Protected Side Vertical Reinforcement

Use No. 6 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH X use: No. 4 at 12" Both Sides

Base Wall Thickness = 15.75 in.

PROJECT | Page __ of __ | COMPUTED BY | DATE

SUBJECT | CHECKED BY | DATE

T-WALL MONOLITHS
EAST IHNC

MONOLITH $\boxed{4}$

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

MONO $\boxed{4}$

```
LISTH D29010

06/05/74     13.34

20 EAST IHNC T-WALL--MØNØ 2A
30 5,3
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0
100 3.0,90.0,4
110 5.5,12.83,20.16,27.49
140 4*-1.5
170 4*0.0
200 2.5,270.0,1
210 27.49
240 -6.5
270 0.0
300 2,270.0,3
310 7.5,14.5,21.5
340 3*-6.5
370 3*0.0
400 3.0,180.0,1
410 1.5
440 -5.5
470 0.0
500 3.0,270.0,1
510 1.5
540 -1.5
570 0.0
2000 23.44,-128.20,132.36,-1144.84,-2177.28,-2009.45
2010 23.44,-128.20,142.36,-1127.40,-2223.98,-2009.45
2020 0.0,0.0,164.75,-734.74,-2577.01,0.0

READY

*10 FLØRIDA AVENUE CØMPLEX
*RESAVE D29010
DATA SAVED-D29010
*REMØVE D29010
*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED
```

PRØG. NØ. 713-F3-A2-210   13:24:41 06/05/74

FLØRIDA AVENUE CØMPLEX
EAST IHNC T-WALL--MØNØ 2A

TØTAL NUMBER ØF PILES =   10

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
23.4	-128.2	132.4	-1144.8	-2177.3	-2009.4

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.1	-1.2	-2.1
2	-0.0	-1.2	-11.6
3	-0.0	-1.2	-21.2
4	0.0	-1.2	-30.7
5	-0.0	1.2	46.6
6	-0.1	1.2	74.3
7	-0.1	1.2	64.3
8	-0.1	1.2	54.2
9	-1.3	0.1	-35.4
10	0.0	1.2	12.6

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1 23.4 -128.2 132.4 -1144.8 -2177.3 -2009.4

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
23.4	-128.2	142.4	-1127.4	-2224.0	-2009.4

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.1	-1.2	2.2
2	-0.1	-1.2	-9.1
3	-0.1	-1.2	-20.4
4	-0.1	-1.2	-31.7
5	0.1	1.1	47.9
6	-0.0	1.1	68.7
7	0.0	1.1	62.2
8	0.1	1.1	55.6
9	-1.2	0.1	-37.9
10	0.1	1.2	23.8

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2 23.4 -128.2 142.4 -1127.4 -2224.0 -2009.4

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	164.8	-734.7	-2577.0	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	[illegible]	[illegible]	[illegible]
6	-0.5	0.6	40.8
7	[illegible]	0.6	26.2
8	-0.6	0.6	11.5
9	-0.7	-0.3	19.5
10	-0.3	0.6	-22.6

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3 0.0 0.0 164.7 -734.7 -2577.0 0.0

0 13:25:38 06/05/74 *** END ØF RUN ***

STØP EØJ

*TIME
13:29:48 06/05/74
*BYE
**RESØURCES USED $ 13.66, USED TØ DATE $ 1500.90= 15%
**TIME SHARING ØFF AT 13.498 ØN 06/05/74

PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 1 of 1	RAg	06-1-74
SUBJECT: EAST IHNC T-WALL DESIGN - INTERFERENCE DIAGRAM		CHECKED BY: HMB	DATE: June '74

MONO 1E [3], 2E [4], 3E [5]:

BASE ELEV. = +1.5'

PILE ELEV = -53.0'

PILE LENGTH = 55.25'

HORIZONTAL DIST @ 2:1 = 27.625'

HORIZONTAL DIST @ 2.5:1 = 22.10'

MONO 4E: [6]

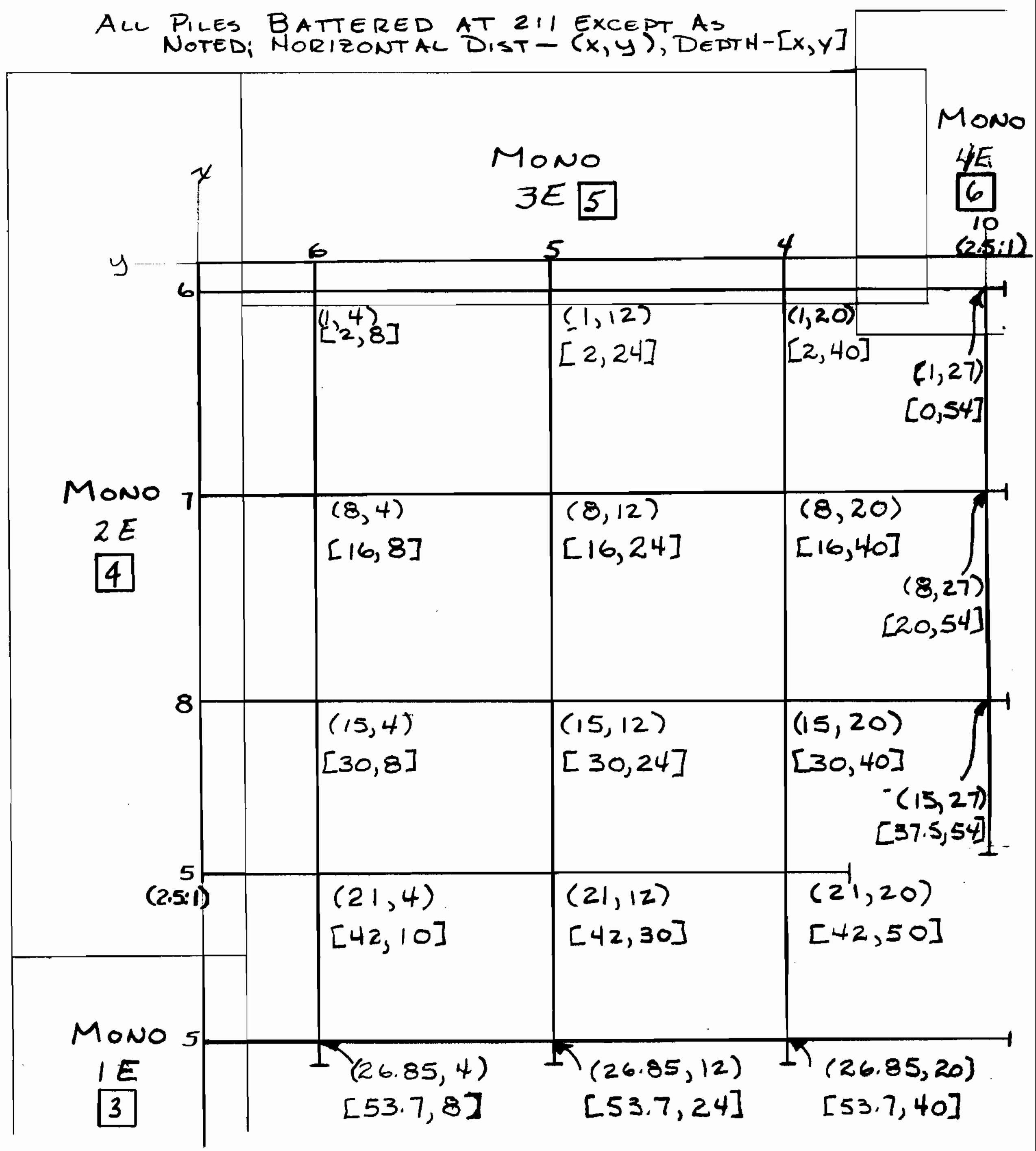
BASE ELEV. = -2.5'

PILE ELEV = -53.0'

PILE LENGTH = 51.25'

HORIZONTAL DIST @ 2.5:1 = 20.5'

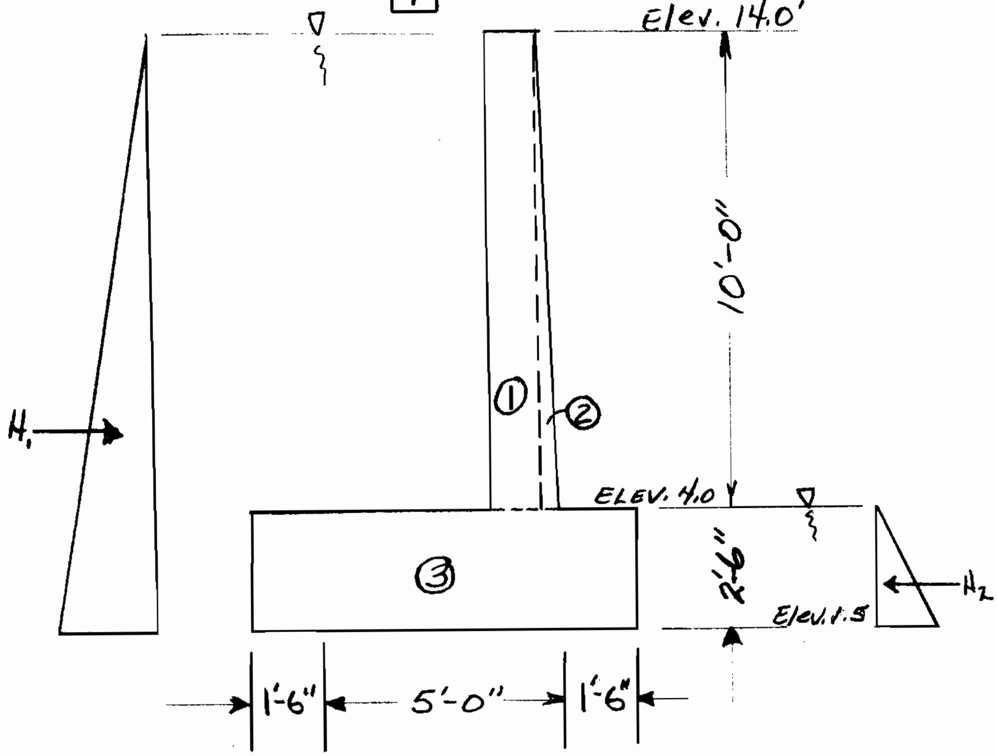
ALL PILES BATTERED AT 2:1 EXCEPT AS NOTED; HORIZONTAL DIST — (x, y), DEPTH — [x, y]



PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 2 of 8	RJGr	5/15/74
SUBJECT: EAST IHNC – T-WALL DESIGN W/L STA. 0+91.0 TO 1+19.35		CHECKED BY: HMB	DATE: June '74

MONO ZE

4



TYPICAL T-WALL FROM W/L STA. 0+91.0 TO W/L STA. 1+19.35.

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 2 of 8	RJG	4-24-74
SUBJECT: EAST IHNC – T-WALL DESIGN W/L Sta 0+91.0 to 1+16.35		CHECKED BY: HMB	DATE: June '74

T-WALL MONO 2E

$\boxed{4}$

T-WALL DESIGN — EAST IHNC W/L Sta. 0+91.0 to 1+16.35

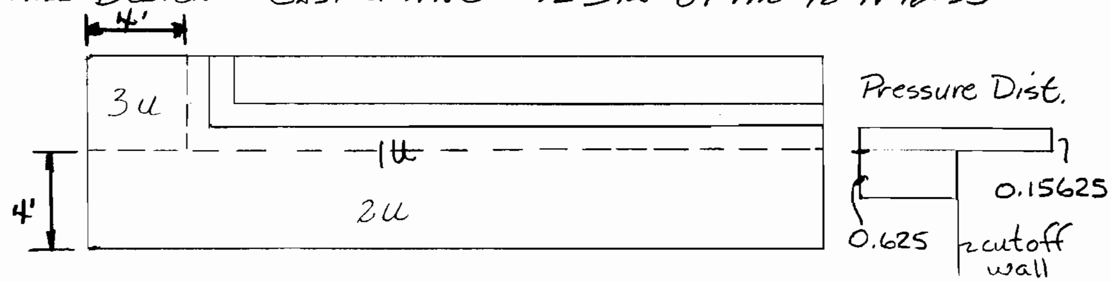
Item	Computations (Concrete)	Fz	Army	Mx	Armx	My
1	(1.0)(10.0)(25.35)(0.150)	+38.03	-5.5	209.14	17.68	-672.28
2	½(0.417)(10.0)(23.933)(0.150)	+7.48	6.14	-45.96	18.39	-137.65
3	(1.0)(10.0)(2.0)(0.150)	+3.00	7.00	-21.00	5.50	-16.50
4	½(0.417)(10.0)(2.0)(0.150)	+0.63	7.00	-4.41	6.14	[illegible]
5	(8.00)(2.5)(30.35)(0.150)	+91.05	4.0	-364.20	15.18	-1382.14
$\boxed{1}$	Sub Total – Concrete Only	+140.19		-644.71		-2212.44
EARTH SUBM.						
5 +	(30.35)(8.0)(1.0)(0.0575)	+13.96	4.00	-55.84	15.18	-211.93
-1 -	(25.35)(1.0)(.0575)(1.0)	-1.46	-5.5	+8.02	17.68	+25.77
-2 -	(0.417)(1.0)(23.933)(0.575)	-0.57	-6.14	+3.52	18.39	+10.55
-3 -	(1.0)(10.)(2.0)(0.0575)	-0.1150	-7.00	+0.81	5.50	+0.63
-4 -	(0.417)(1.0)(2.0)(0.0575)	-0.05	-7.00	+0.35	6.14	+0.29
$\boxed{2}$	Subtotal – SUBM EARTH	+11.77		-43.14		-174.69
EARTH Sat.	$\frac{0.120}{0.0575} \times \boxed{2}$	+24.56		-90.03		-364.57
$\boxed{3}$	SUBTOTAL – Sat EARTH	+24.56		-90.03		-364.57
Water Wt						
5W	(5.0)(10.0)(30.35)(0.0625)	+94.84	2.5	-237.11	15.18	-1439.67
6W	(5.0)(10.0)(3.0)(0.0625)	+9.38	6.5	-60.97	2.5	-23.45
$\boxed{4}$	SUBTOTAL – WATER WT	+104.22		-298.08		-1463.12

PROJECT		COMPUTED BY	DATE
Florida Avenue Complex	Page 3 of 8	RJG	4-24-74
SUBJECT		CHECKED BY	DATE
East IHNC - T-Wall Design W/L Sta 0+91.0 to 1+16.35		HMB	June '74

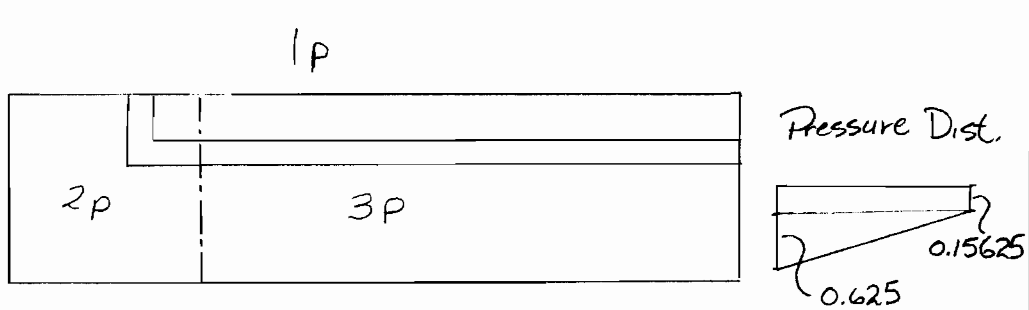
T-Wall Mono. 2E $\boxed{4}$

Uplift Computations

T-Wall Design - East IHNC W/L Sta 0+91.0 to 1+16.35



Item	Computation	Fz	Arm y	M x	Arm x	M y
IMP. Uplift						
1u	(0.15625)(8.0)(30.35)	-37.94	4.0	+151.75	15.18	+575.89
2u	(0.625)(4.0)(30.35)	-75.88	2.0	+151.75	15.18	+1151.78
3u	(0.625)(4.0)(4.0)	-10.00	6.0	+60.00	2.0	+20.00
$\boxed{5}$	Subtotal - IMP. Uplift	-123.82		+363.50		+1747.67
Per. Uplift						
1p	(0.15625)(8.0)(30.35)	-37.94	+4.00	+151.75	+15.18	+575.88
2p	(1/2)(0.625)(8.0)(8.0)	-20.00	+4.00	+80.00	+2.67	+53.40
3p	(1/2)(0.625)(8.0)(22.35)	-55.88	+2.67	+149.19	+19.18	+1071.68
$\boxed{6}$	Subtotal - Pervious Uplift	-113.82		+380.94		+1700.98

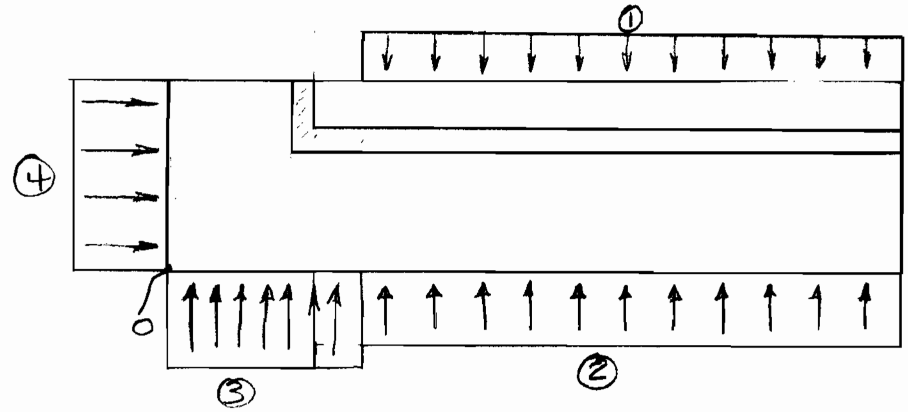


LMV FORM 1 AUG 68 107a COMPUTATION SHEET

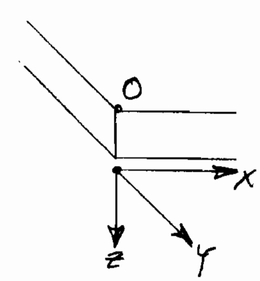
PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 4 of 8	RJG	4-24-74
SUBJECT		**CHECKED BY**	**DATE**
EAST IHNC - T-WALL DESIGN W/L Sta. 0+91.0 to 1+16.35		HMB	June '74

T-WALL MONO. 2E [4]

Horizontal Water Pressure Computations



① — +y direction
② — −y direction ½(0.625)(2.5)+(0.625)(10)
③ — −y direction
④ — +x direction
Ⅰ — −y direction
Ⅱ — +x direction



Item	Computations	$F_{x,y}$	$Arm_{x,y}$	M_z	Arm_z	$M_{x,y}$
①	(½)(0.15625)(2.5)(22.35)	+4.37 (y)	19.18	+83.73	0.83	+3.63 x
②	(½)(0.0625)(2.5)(2.5)(22.35)	−4.37 (y)	19.18	−83.73	0.83	−3.63 x
	(0.0625)(10.0)(2.5)(22.35)	−34.92 (y)	19.18	−669.80	1.25	−43.65
③	(½)(0.0625)(2.5)(2.5)(8.0)	−1.56 (y)	4.0	−6.25	0.83	−1.29 x
	(0.0625)(10.0)(2.5)(8.0)	−12.50 (y)	4.0	−50.00	1.25	−15.62 x
④	(½)(0.0625)(2.5)(8.0)(2.5)	+1.56 (x)	4.0	+6.25	0.83	−1.29 y
	(0.0625)(10.0)(2.5)(8.0)	+12.50 (x)	4.0	+50.00	1.25	−15.62
Ⅰ	(½)(10.0)²(0.0625)(25.35)	−79.22 (y)	17.68	−1400.59	5.83	−461.85 x
Ⅱ	(½)(10.0)²(0.0625)(3.0)	+9.38 (x)	6.5 x	+60.94	5.83	−54.69 y
[7]	y	−128.20		−2009.45		−71.60
	x	+23.44		−		−522.41

PROJECT		COMPUTED BY	DATE
Florida Avenue Complex	Page 5 of 9	RJG	4-24-74
SUBJECT		**CHECKED BY**	**DATE**
East IHNC – T-Wall Design W/L Sta 0+91.0 to 1+16.35		HMB	June '74

T-Wall Mono. 2E

$\boxed{4}$

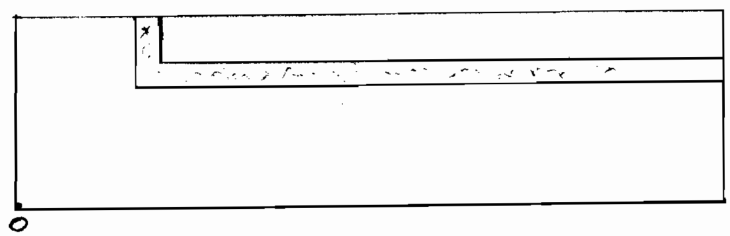
Case		F_z	F_y	F_x	M_x	M_y	M_z
I	$\boxed{1} + \boxed{2} + \boxed{4} + \boxed{5} + \boxed{7}$	+132.36	-128.20	+23.44	-1144.84	-2177.28	-2009.45
II	$\boxed{1} + \boxed{2} + \boxed{4} + \boxed{6} + \boxed{7}$	+142.36	-128.20	+23.44	-1127.40	-2223.98	-2009.45
III	$\boxed{1} + \boxed{3}$	+164.75	—	—	-734.74	-2577.01	—

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

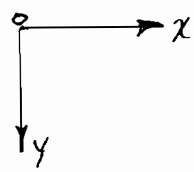
PROJECT Florida Avenue Complex	Page 6 of 8	COMPUTED BY RJG	DATE 4-24-74
SUBJECT T-Wall Design - East IHNC W/L Sta. 0+[illegible].0 to 4+16.35		CHECKED BY HMB	DATE June '74

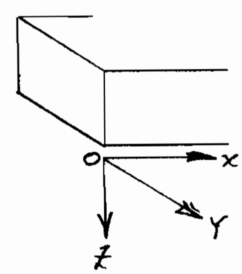
T-WALL MONO. 7E

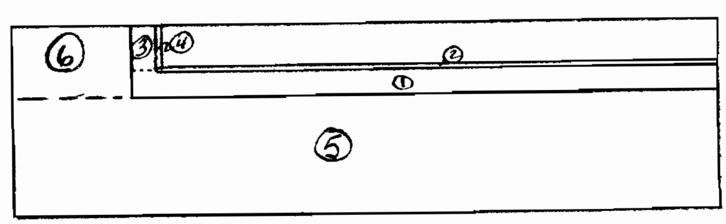
$\boxed{4}$



Length 30.35'







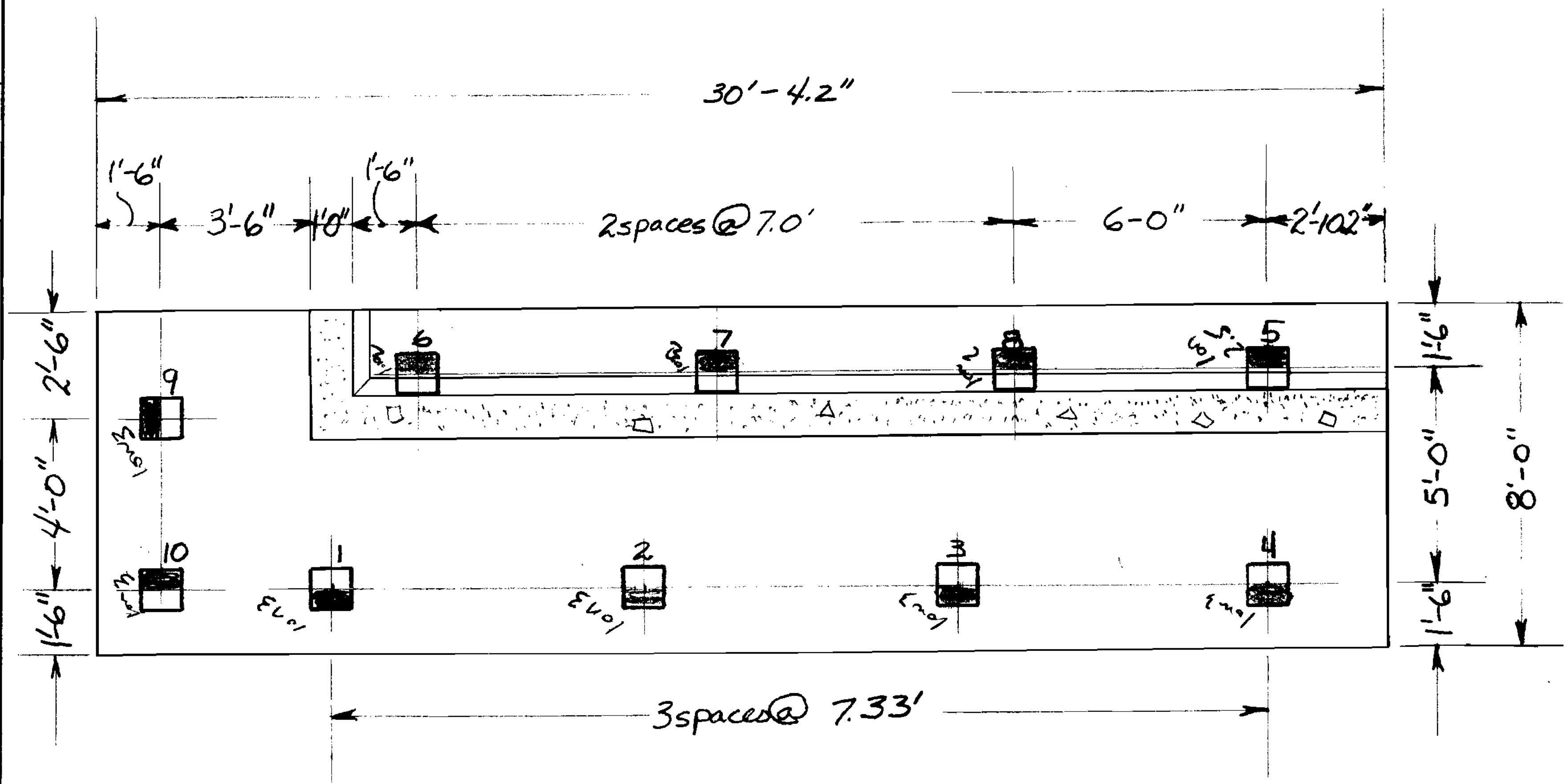
PROJECT FLORIDA AVENUE COMPLEX

SUBJECT EAST IHNC T-WALL DESIGN W/L STA. 049+07.00/+19.35

Page 2 of 8

COMPUTED BY RJGe DATE 5/1?/74

CHECKED BY HMB DATE June '74



MONO 26 $\boxed{4}$

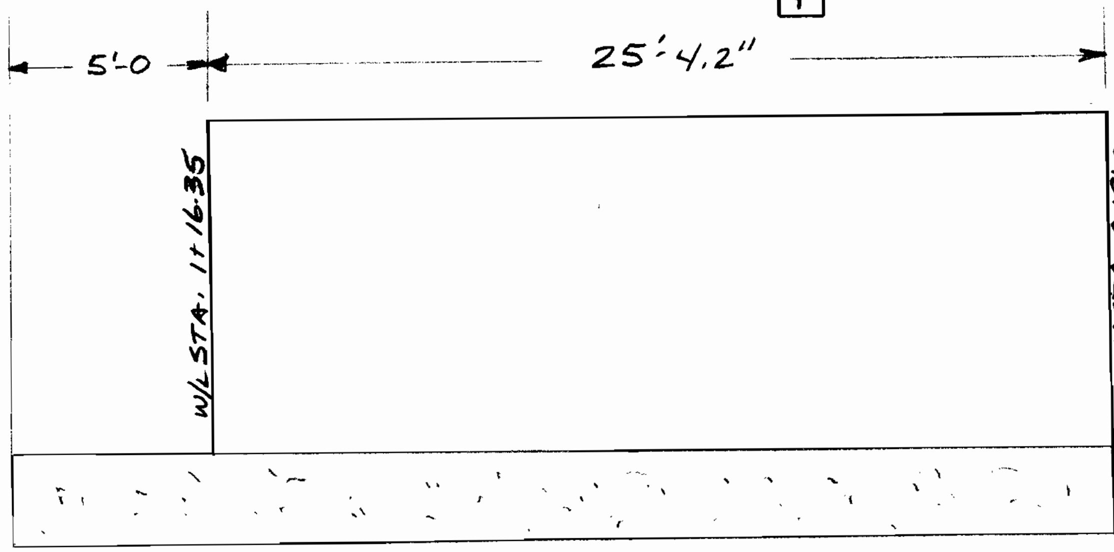
COMPUTATION SHEET

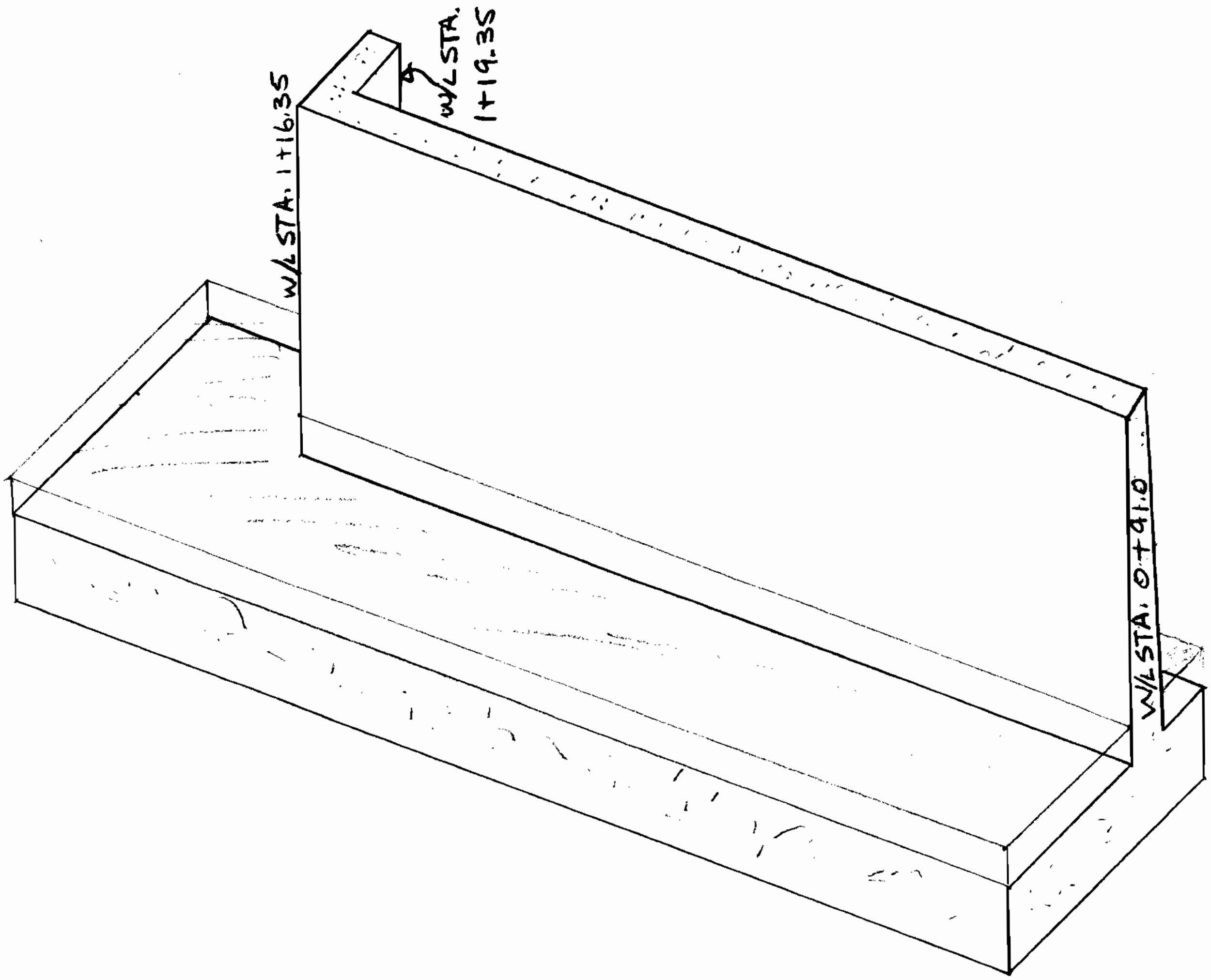
PROJECT: Florida Avenue Complex | Page 8 of 8 | COMPUTED BY: RJGr | DATE: 5-15-74

SUBJECT: East IHNC T-Wall Design W/L STA. 0+91.0 TO 1+19.35 | CHECKED BY: HMB | DATE: June '74

T-WALL MONO 2E

$\boxed{4}$





PROJECT	Page — of —	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

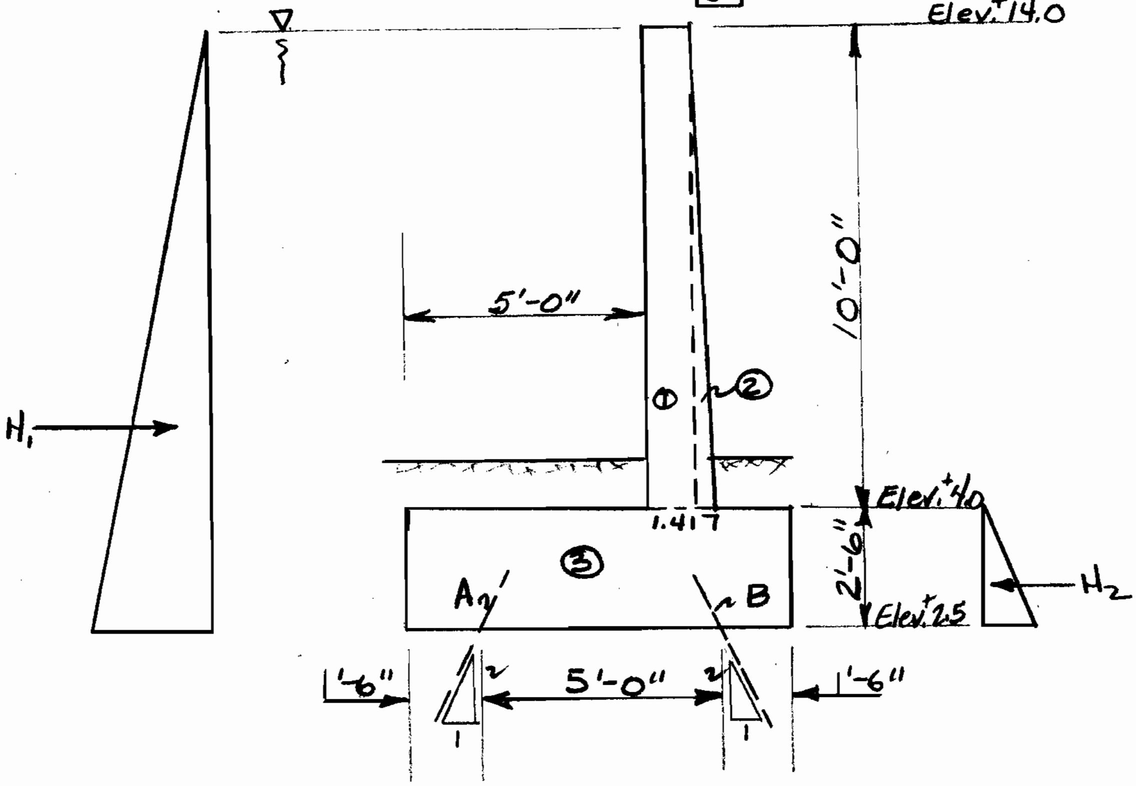
EAST IHNC

MONOLITH $\boxed{5}$

PROJECT FLORIDA AVENUE COMPLEX	Page 1 of 3	COMPUTED BY RJGr	DATE 5/15/74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA. 1+19.35 TO 1+40.35		CHECKED BY HMB	DATE June '74

T-WALL MONO 3E

5



T-WALL SECTION FROM W/L STA. 1+19.35
TO W/L STA. 1+40.35.

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 2 of 3	RJGr	6/5/74
SUBJECT		**CHECKED BY**	**DATE**
EAST IHNC T-WALL DESIGN W/L STA. 1+19.35 TO 1+40.35		HMB	June '74

T- WALL MONO 3E

$\boxed{5}$

ITEM	COMPUTATIONS	F_z	ARM_y	M_x	ARM_x	M_y
	CONCRETE ONLY					
1	(1.0)(10.0)(21.0)(0.150)	+31.50	5.5	-173.25	10.5	-330.75
2	½(0.417)(10.0)(21.0)(0.150)	+6.57	6.139	-40.33	10.5	-68.99
3	(8.0)(2.5)(21.0)(0.150)	+63.00	4.0	-252.00	10.5	-661.50
$\boxed{1}$	SUBTOTAL CONCRETE	+101.07		-465.58		-1061.24
	WATER WEIGHT					
$\boxed{2}$	(5.0)(10.0)(21.0)(0.0625	+65.63	2.5	-164.06	10.5	-689.12
	SUBMERGED EARTH					
$\boxed{3}$	(1.0)(6.6)(21.0)(0.0575)	+7.97	3.64	-29.01	10.5	-83.69
	SATURATED EARTH					
$\boxed{4}$	(1.0)(6.6)(21.0)(0.120)	+16.63	3.64	-60.54	10.5	-174.64
	IMPERVIOUS UPLIFT					
4	-(0.15625)(8.0)(21.0)	-26.25	4.0	+105.0	10.5	+275.63
5	-(0.625)(4.0)(21.0)	-52.50	2.0	+105.0	10.5	+551.25
$\boxed{5}$	SUBTOTAL IMP. UPLIFT	-78.75		+210.0		+826.88
	PERVIOUS UPLIFT					
6	-(0.15625)(8.0)(21.0)	-26.25	4.0	+105.00	10.5	+275.63
7	-(0.625)(½)(8.0)(21.0)	-52.50	2.67	140.18	10.5	+551.25
$\boxed{6}$	SUBTOTAL PER. UPLIFT	-78.75		245.18		+826.88

ITEM	COMPUTATIONS - HOR. LOAD	$F_{x,y}$	ARM_z	$M_{x,y}$	$ARM_{x,y}$	M_z
	HORIZONTAL LOAD	F_y		M_x	x-dir	
8	½(0.78125)(12.5)(21.0)	-102.54	4.17	-427.59	10.5	-1076.67
9	-(½)(0.15625)(2.5)(21.0)	+4.10	0.83	+3.40	10.5	+43.05
$\boxed{7}$	SUBTOTAL HOR. LOADS	-98.44		-424.19		-1033.62

CASE	LOADINGS	F_x	F_y	F_z	M_x	M_y	M_z
I	$\boxed{1}+\boxed{2}+\boxed{3}+\boxed{5}+\boxed{7}$	0.0	-98.44	+95.92	-872.84	-1007.11	-1033.62
II	$\boxed{1}+\boxed{2}+\boxed{3}+\boxed{6}+\boxed{7}$	0.0	-98.44	+95.92	-837.66	-1007.11	-1033.62
III	$\boxed{1}+\boxed{4}$	0.0	0.0	+117.70	-526.12	-1235.88	0.0

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

MONO $\boxed{5}$

```
LISTH D29010

06/03/74     09.54

10 FLA AVE CØMPLEX
20 EAST IHNC T-WALL-- MØNØ 3A
30 2,3
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0
100 2,90.0,3
110 2.5, 10.5,18.5
140 3*-1.5
170 3*0.0
200 2,270.0,3
210 2.5,10.5,18.5
240 3*-6.5
270 3*0.0
2000 0.0,-98.44,95.92,-872.84,-1007.11,-1033.62
2010 0.0,-98.44,95.92,-837.66,-1007.11,-1033.62
2020 0.0,0.0,117.70,-526.12,-1235.88,0.0

READY

*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED


      ***  ERRØR ENCØUNTERED WHILE ATTEMPTING TØ ACCESS THE
    DATA FILE NAMED: /D29010;              ØN LØGICAL FILE DEVICE  I.
    STATUS CØDE = 403700000000; AND I = 000000000037 (ØCTAL)
    ØR      31 (DECIMAL).
DUPLICATE NAME IN AFT
    FILE DETACHED
    WILL TRY AGAIN


    PRØG. NØ. 713-F3-A2-210               9:34:34  06/03/74


 FLA AVE CØMPLEX
 EAST IHNC T-WALL-- MØNØ 3A


TØTAL NUMBER ØF PILES =     6


            LØAD CØNDITIØN  1
```

```
   X          Y          Z         MX        MY        MZ
   0.       -98.4       95.9     -872.8    -1007.1   -1033.6

        PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1    -0.1     0.0     -18.6
  4     0.1    -0.0      54.4
   1      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1           0.0    -98.4     95.9     -872.8    -1007.1    -1033.6


         LØAD CØNDITIØN  2

       LØADS ØN PILE CAP
   X          Y          Z         MX        MY        MZ
   0.       -98.4       95.9     -837.7    -1007.1   -1033.6

        PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1    -1.2     0.0     -16.5
  4     1.1    -0.0      52.3
   2      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2           0.0    -98.4     95.9     -837.7    -1007.1    -1033.6


         LØAD CØNDITIØN  3

       LØADS ØN PILE CAP
   X          Y          Z         MX        MY        MZ
   0.         0.       117.7     -526.1    -1235.9       0.

        PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1     1.6     0.0      18.6
  4    -1.7    -0.0      25.2
   3      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3           0.0      0.0    117.7     -526.1    -1235.9        0.0

   0     9:34:45  06/03/74    *** END ØF  RUN ***

STØP       EØJ

*
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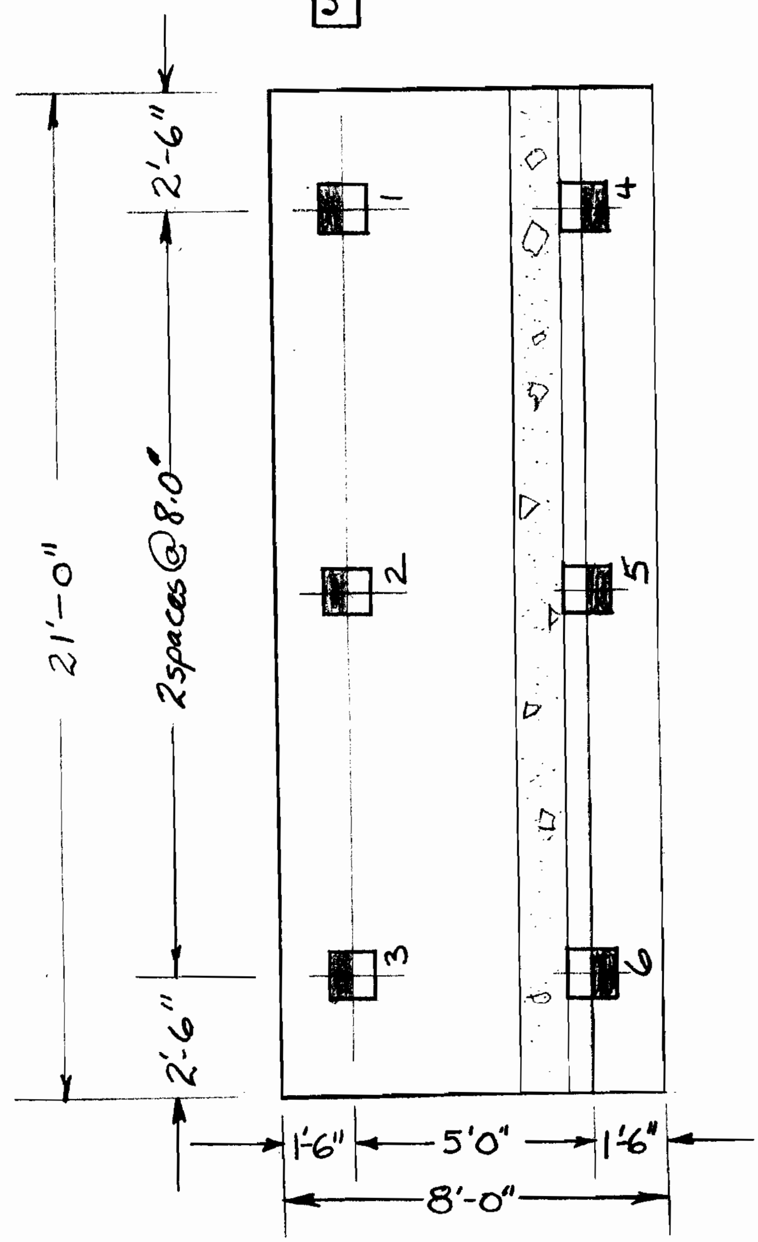
FLORIDA AVENUE COMPLEX	Page 3 of 3	RJGe	5/15/74
SUBJECT		CHECKED BY	DATE
EAST IHNC T-WALL DESIGN W/L STA. 1+19.35 To 1+40.35		HMB	June '74

MONO 3E

5



LMV FORM
1 AUG 68 107a

COMPUTATION SHEET

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

EAST IHNC

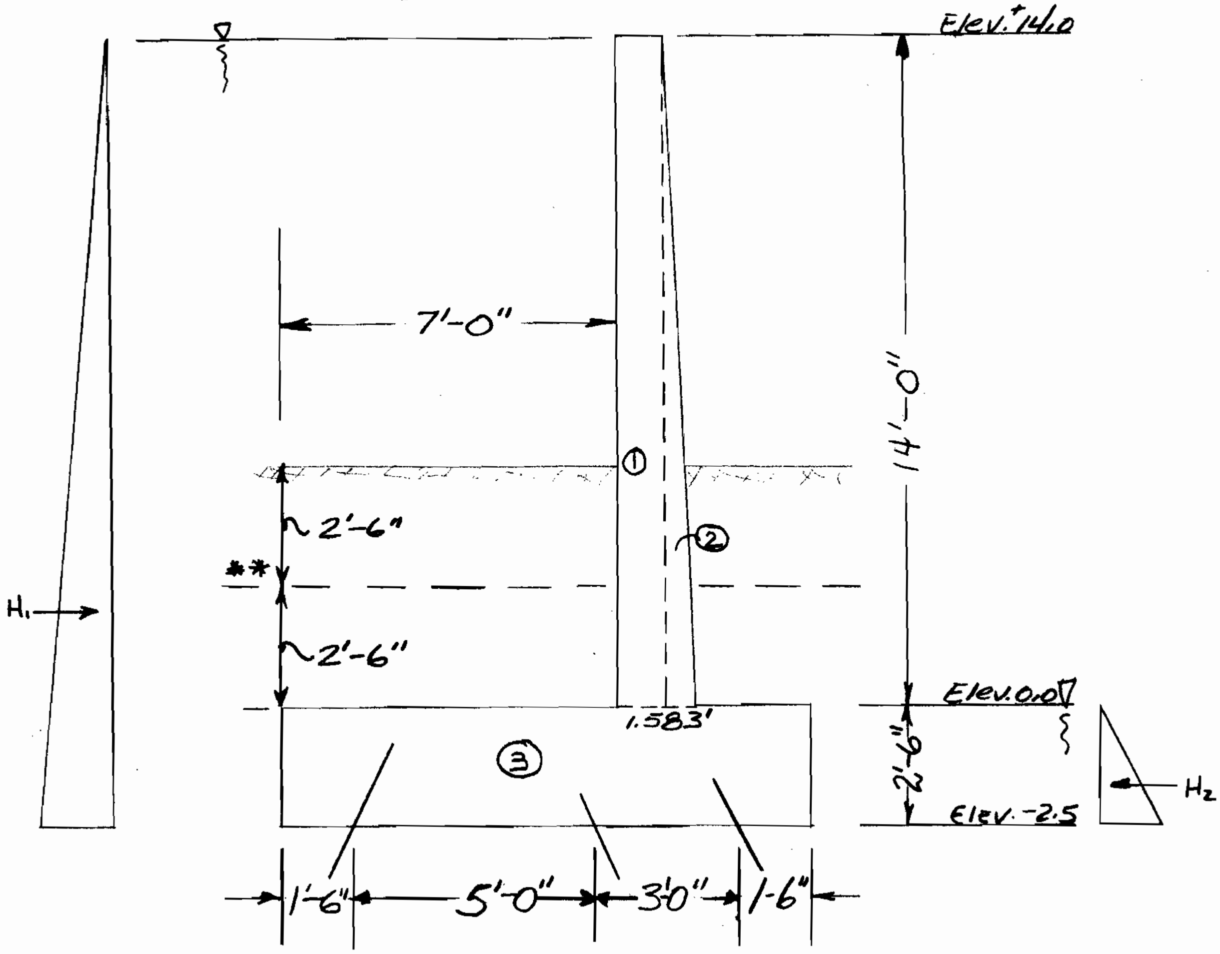
MONOLITH $\boxed{6}$

PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 1 of 6	RJGR	5/15/74
SUBJECT: EAST IHNC T-WALL DESIGN W/L STA. 1+40.35 TO 1+80.82*		CHECKED BY: HMB	DATE: June '74

MONO 4E

6

1+79.50



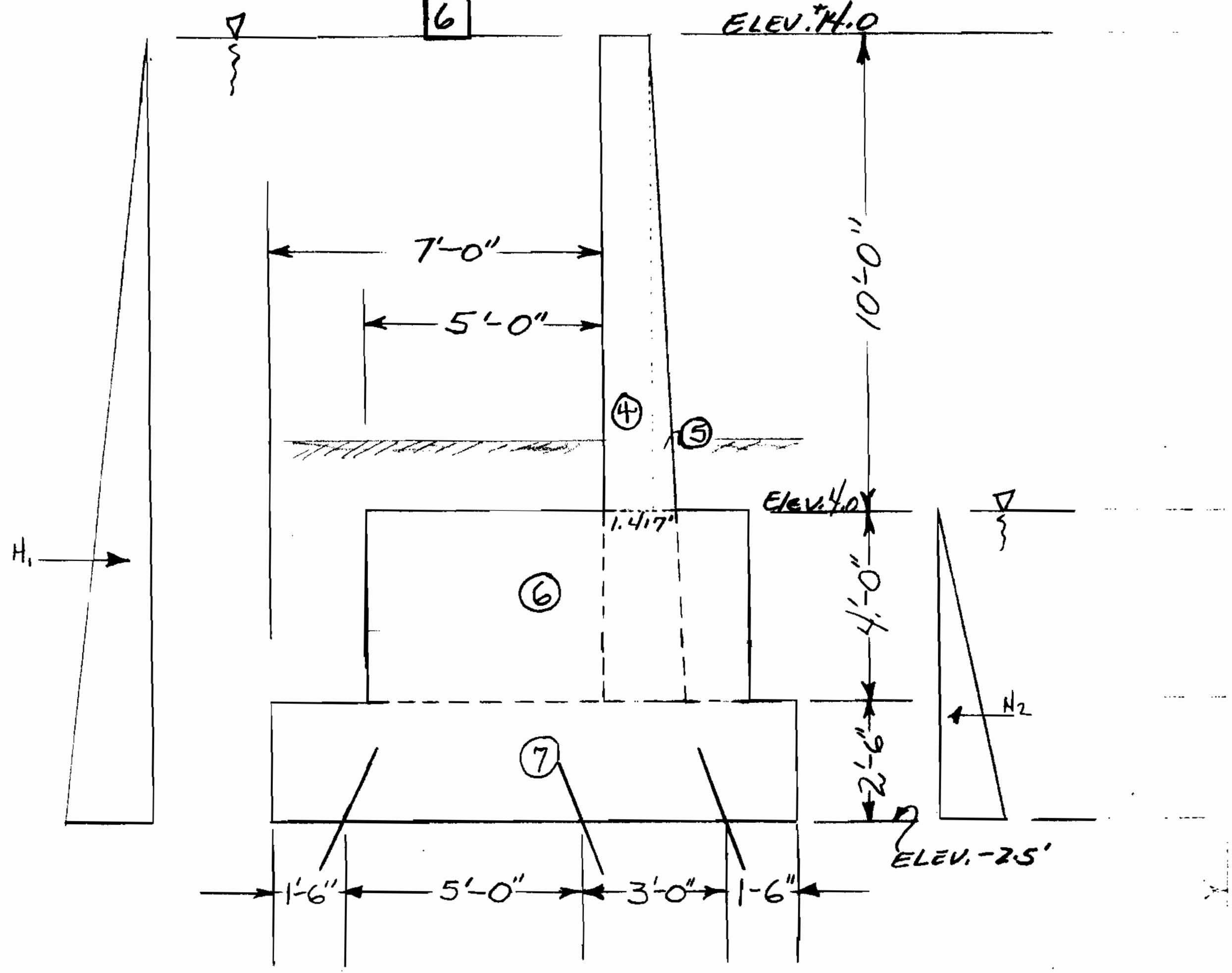
** SOIL VOLUME IS TRIANGULAR-SHAPED FROM W/L STA. 1+42.85 TO 1+80.82. FOR COMPUTATIONS THE TRIANGULAR-SHAPED VOLUME IS APPROXIMATED BY A RECTANGULAR-SHAPE 2.5' HIGH BY 30.0' LONG.

* Station revised 6-21-74, not considered significant to warrant revision of computations.

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 2 of 6	RJGr.	5/15/74
SUBJECT		**CHECKED BY**	**DATE**
EAST IHNC T-WALL DESIGN W/L STA. 1+40.35 to 1+80.82 / 1+79.50		[illegible]	June '74

MONO 4E

$\boxed{6}$



TRANSITION FROM BASE SLAB ELEV. -2.5 TO BASE SLAB ELEV. 0.0. AT W/L STA. 1+40.35 TO W/L STA. 1+42.85.

PROJECT FLORIDA AVENUE COMPLEX	Page 3 of 6	COMPUTED BY RJGR	DATE 5/15/74
SUBJECT EAST IHNC T-WALL DESIGN W/L STA. 1+40.35 to 1+80.82		CHECKED BY HMB	DATE June '74

1+79.50

T-WALL MONO 4E

$\boxed{6}$

VERTICAL FORCES

ITEM	COMPUTATIONS	Fz +↓	Army	Mx	Armx	My
	CONCRETE ONLY	+				(−)
1	(1.0)(14.0)(37.97)(0.150)	79.74	7.5	−598.03	18.99	−1514.21
2	(½)(0.583)(14.0)(37.97)(0.15)	+23.24	8.19	−190.34	18.99	−441.33
3	(11.0)(2.5)(37.97)(0.150)	+156.63	5.5	−861.44	18.99	−2974.33
4	(1.0)(10.0)(2.5)(0.150)	+3.75	7.5	−28.13	39.22	−147.08
5	(½)(0.417)(10.0)(2.5)(0.150)	+0.78	8.13	−6.34	39.22	−30.59
6	(8.00)(4.0)(2.5)(0.150)	+12.00	6.0	−72.00	39.22	−470.64
7	(11.0)(2.5)(2.5)(0.150)	+10.31	5.5	−56.72	39.22	−404.36
$\boxed{1}$	SUBTOTAL CONCRETE ONLY	+286.45	—	−1813.0	—	−5975.28
	SUBMERGED EARTH					(−)
8	(2.5)(9.417)(30.0)(0.0575)	+40.61	5.11	−207.52	22.97	−932.83
9	(1.0)(6.583)(2.5)(0.0575)	+0.95	5.63	−5.35	39.22	−37.11
10	(5.0)(3.0)(2.5)(0.0575)	+2.15	4.17	−9.00	39.22	−84.55
$\boxed{2}$	SUBTOTAL SUBM. EARTH	+43.69	—	−221.87		−1054.49
$\boxed{3}$	SUBTOTAL SAT. EARTH $\frac{0.120}{0.0575} \times \boxed{2}$	+91.18	—	−463.72		−2200.72
	WATER WEIGHT					−
11	(7.0)(14.0)(37.97)(0.0625)	+232.57	3.5	−813.98	18.99	−4416.43
12	(2.0)(14.0)(2.5)(0.0625)	+4.38	1.0	−4.38	39.22	−171.59
13	(5.0)(10.0)(2.5)(0.0625)	+7.81	4.5	−35.16	39.22	−306.41
$\boxed{4}$	SUBTOTAL WATER WT.	+244.76	—	−853.52		−4894.43
	IMPERVIOUS UPLIFT ONLY					
14	(0.15625)(11.00)(37.97)	−65.26	5.5	+358.94	18.99	+1239.31
15	(0.875)(4.0)(37.97)	−132.90	2.0	+265.79	18.99	+2523.68
16	(0.40625)(11.00)(2.5)	−11.17	5.5	+61.45	39.22	+438.16
17	(0.625)(4.0)(2.5)	−6.25	2.0	+12.50	39.22	+245.13
$\boxed{5}$	SUBTOTAL IMP. UPLIFT	−215.58		+698.68		+4446.28

PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 4 of 6	RJ GR	5/15/74
SUBJECT: EAST IHNC T-WALL DESIGN W/L STA. 1+40.35 TO 1+80.82		CHECKED BY: HMB	DATE: June '74

1+79.30*

T-WALL MONO 4E

$\boxed{6}$

HORIZONTAL FORCES

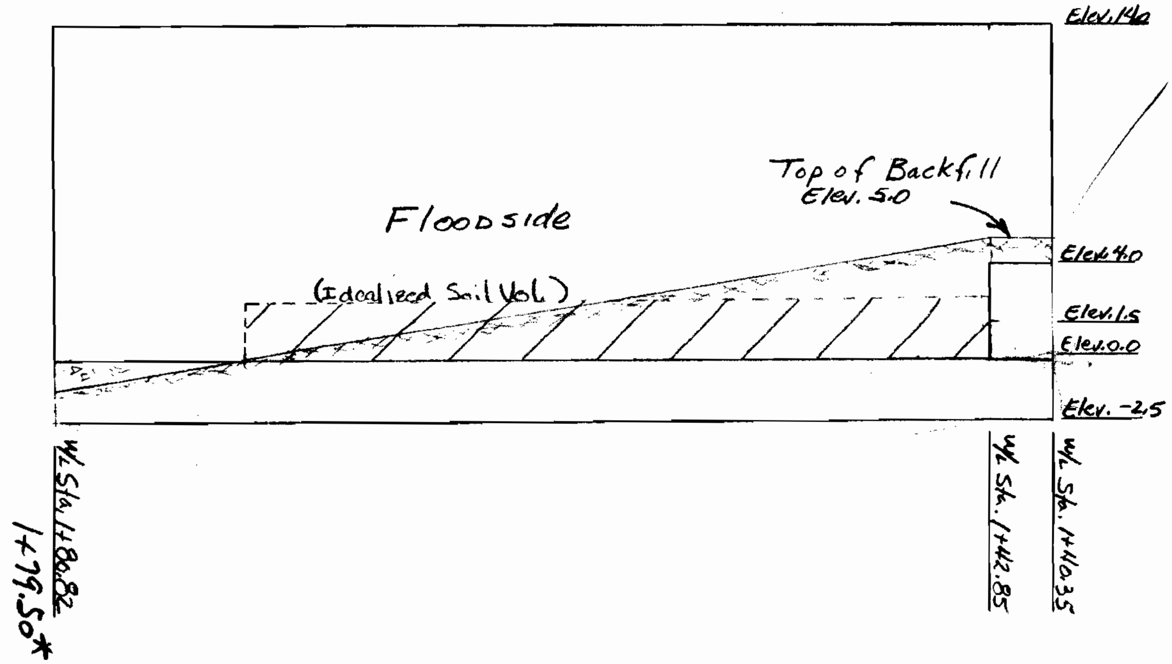
ITEM	COMPUTATIONS	$F_{x,y}$	Arm_{xy}	M_z	Arm_z	$M_{x,y}$
	HORIZONTAL WATER FORCE	y-DIR.	(x)			(Mx)
18	(1/2)(1.03125)(16.5)(37.97)	-323.04	18.99	-6134.56	5.5	-1776.73
	(-1/2)(0.15625)(2.5)(37.97)	+7.42	18.99	+140.83	0.83	+6.16
19	(1/2)(1.03125)(16.5)(2.5)	-21.27	39.22	-834.19	5.5	-116.98
	(-1/2)(0.40625)(6.5)(2.5)	+3.30	39.22	+129.46	2.17	+7.16
$\boxed{6}$	SUBTOTAL HORIZ. FORCES	-333.59	—	-6698.46	—	-1880.39

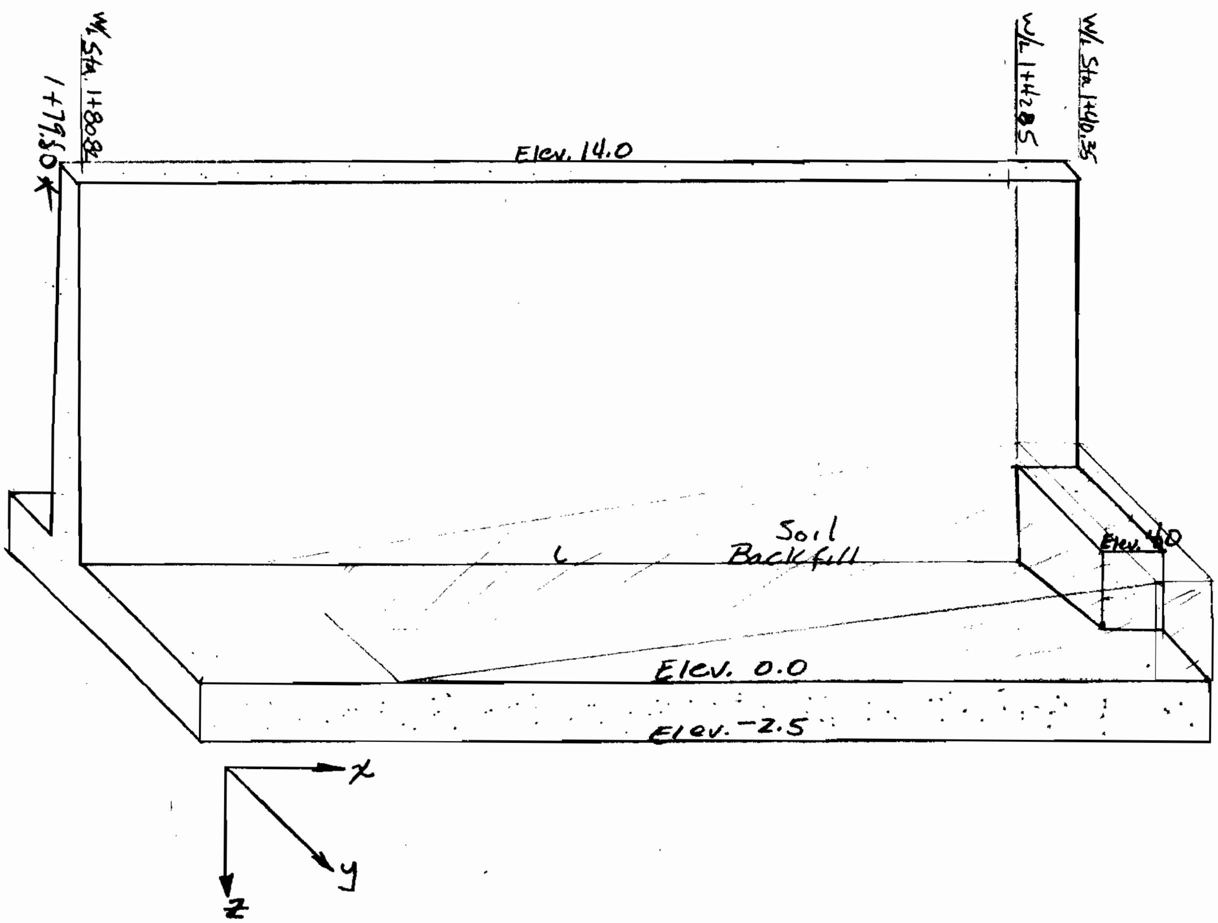
CASE	LOADINGS	Fx	Fy	Fz	Mx	My	Mz
I	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{5}+\boxed{6}$	—	-333.59	+359.32	-4070.10	[illegible]	-6698.46
II	$\boxed{1}+\boxed{3}$	—	—	+377.63	-2276.72	-8189.71	—
III	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{6}+\boxed{7}$	—	-333.59	+306.97	-3646.23	-6439.63	-66[illegible]

ITEM	COMPUTATIONS	F_z	ARM_x	M_y	ARM_x	M_x
	PERVIOUS UPLIFT					
1	(0.15625)(11.0)(37.97)	-65.26	18.99	+1239.32	5.5	358.94
2	(1/2)(0.875)(11.0)(37.97)	-182.73	18.99	+3470.05	3.67	670.62
3	(0.40625)(11.0)(2.5)	-11.17	39.22	+438.16	5.5	61.45
4	(1/2)(0.625)(11.0)(2.5)	-8.59	39.22	+337.05	3.67	31.54
$\boxed{7}$	SUBTOTAL PERVIOUS UPLIFT	-267.75		+5484.57		+1122.55

PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 5 of 6	RJGR	5/15/74
SUBJECT		**CHECKED BY**	**DATE**
EAST IHNC T-WALL DESIGN W/L STA. 1+40.35 TO 1+80.82		HMB	June '74

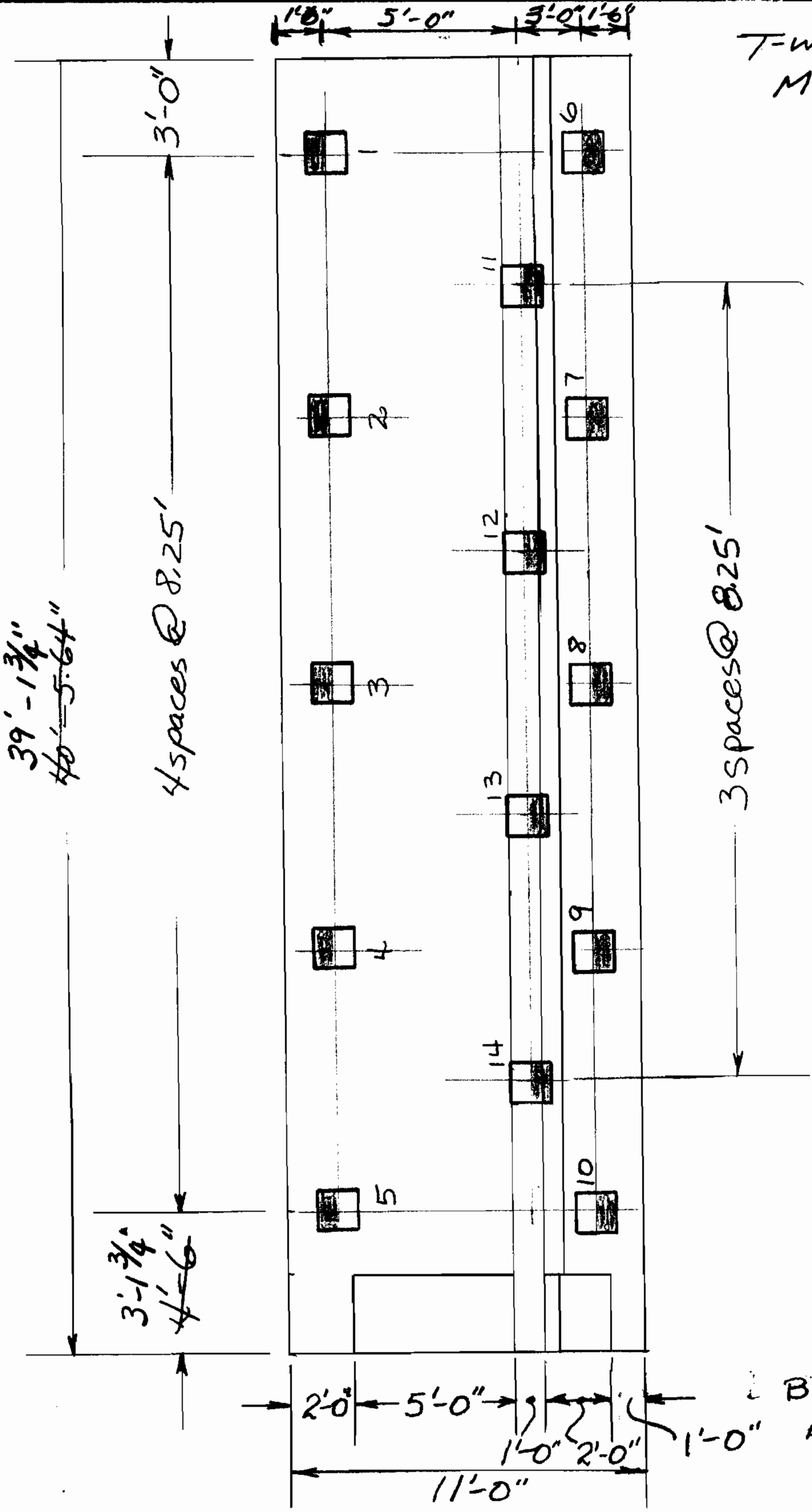
T-WALL MONO 4E $\boxed{6}$ .1+19.50*





PROJECT		COMPUTED BY	DATE
FLORIDA AVENUE COMPLEX	Page 6 of 6	RJ.Ga	5/15/74
SUBJECT		**CHECKED BY**	**DATE**
EAST INNC T-WALL DESIGN W/L STA. 1+46.35 TO 1+80.82		IMB	June '74

T-WALL
MONO 4.E
$\boxed{6}$



BATTER ON ALL PILES 2:1

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

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LISTH D29010

06/03/74     09.84

10 FLØRIDA AVENUE CØMPLEX
20 EAST IHNC T-WALL--MØNØ 4A
30 4,3
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0
100 2,90.0,5
110 2.97,11.22,19.47,27.72,35.97
140 5*-1.5
170 5*0.0
200 2,270.0,4
210 2.97,11.22,19.47,27.72
240 4*-9.5
270 4*0.0
300 2.5,270.0,1
310 35.97
340 -9.5
370 0.0
400 2.0,270.0,4
410 7.1,15.4,23.6,31.9
440 4*-6.5
470 4*0.0
2000 0.0,-333.59,359.32,-4070.10,-7485.18,-6698.46
2010 0.0,-333.59,306.97,-3646.23,-6439.63,-6698.46
2020 0.0,0.0,377.63,-2276.72,-8183.71,0.0

READY

*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED


     ***  ERRØR ENCØUNTERED WHILE ATTEMPTING TØ ACCESS THE
    DATA FILE NAMED: /D29010;                    ØN LØGICAL FILE DEVICE  1.
    STATUS CØDE = 403700000000; AND I = 000000000037 (ØCTAL)
    ØR      31 (DECIMAL).
DUPLICATE NAME IN AFT
    FILE DETACHED
    WILL TRY AGAIN


    PRØG. NØ. 713-F3-A2-210              9:54: 2   06/03/74


FLØRIDA AVENUE CØMPLEX
EAST IHNC T-WALL--MØNØ 4A
```

MONO 6

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-333.6	359.3	-4070.1	-7485.2	-6698.5

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.2	-0.0	-33.4
2	-0.2	-0.0	-34.4
3	-0.3	-0.0	-35.4
4	-0.3	-0.0	-36.3
5	-0.3	-0.0	-37.3
6	0.1	-0.0	60.5
7	0.2	-0.0	65.8
8	0.2	-0.0	71.1
9	0.2	-0.0	76.4
11	0.2	-0.0	48.4
12	0.2	-0.0	53.8
13	0.2	-0.0	59.0
14	0.2	-0.0	64.4

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	-0.0	-333.6	359.3	-4070.1	-7485.2	-6698.5

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-333.6	307.0	-3646.2	-6439.6	-6698.5

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.4	-0.0	-38.6
2	-0.5	-0.0	-39.4
3	-0.5	-0.0	-40.1
4	-0.5	-0.0	-40.9
5	-0.5	-0.0	-41.7
6	0.4	-0.0	46.9
7	0.4	-0.0	52.7
8	0.4	-0.0	58.5
9	0.5	-0.0	64.2
10	0.5	-0.0	59.2
11	0.4	-0.0	56.6
12	0.4	-0.0	62.4
13	0.4	-0.0	68.1
14	0.5	-0.0	73.9

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	-0.0	-333.6	307.0	-3646.2	-6439.6	-6698.5

LØAD

X	Y	Z	MX	MY	MZ
0.	0.	377.6	-2276.7	-8183.7	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.6	0.0	30.4
2	0.6	0.0	34.6
3	0.6	0.0	38.8
4	0.6	0.0	43.0
5	0.6	0.0	47.3
6	-0.7	0.0	42.5
7	-0.7	0.0	44.7
8	-0.7	0.0	46.9
9	-0.7	0.0	49.1
10	-0.7	0.0	67.6
11	-0.6	0.0	-10.0
12	-0.6	0.0	-7.8
13	-0.6	0.0	-5.6
14	-0.7	0.0	-3.4

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3 -0.0 -0.0 377.6 -2276.7 -8183.7 -0.0

0 9:55:18 06/03/74 *** END ØF RUN ***

STØP EØJ

*TIME
10:00:15 06/03/74
*BYE
**RESØURCES USED $ 9.94, USED TØ DATE $ 1062.09= 11%
**TIME SHARING ØFF AT 10.006 ØN 06/03/74

T-WALL MONOLITHS EAST IHNC

5E, 6E, 7E, 8E, 9E, 10E ← TOTAL NO. OF T-WALL MONOLITHS

$\boxed{8}$, $\boxed{9}$, $\boxed{10}$, $\boxed{11}$, $\boxed{12}$, $\boxed{13}$ ← TOTAL NO. OF MONOLITHS

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

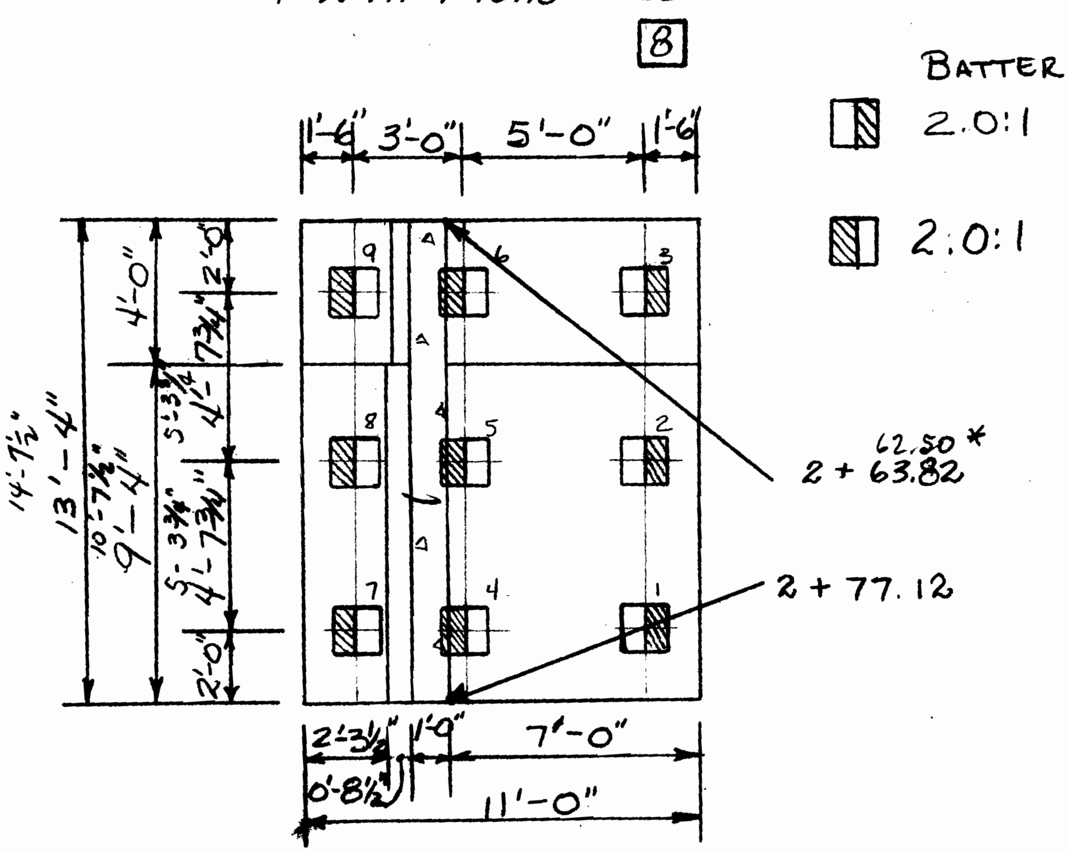
EAST IHNC

MONOLITH $\boxed{8}$

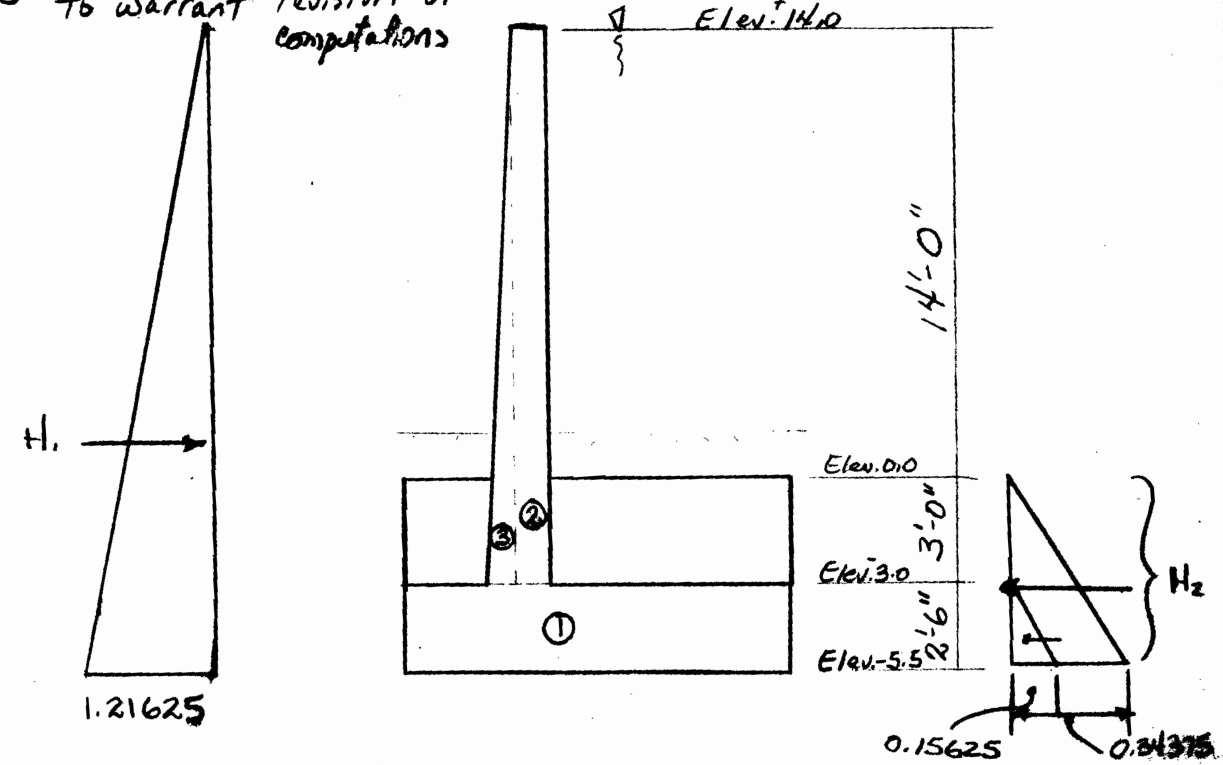
PROJECT Florida Avenue Complex	Page 7 of 3	COMPUTED BY RJG	DATE 6-15-74
SUBJECT East IHNC T-Wall Design- ~~2+63.82~~ 2+62.50 To 2+77.12		CHECKED BY HMB	DATE June '74

T-Wall Mono SE

8



* Length revised 6-24-74.
Change not significant to warrant revision of computations



PROJECT: Florida Avenue Complex

SUBJECT: East IHNC T-Wall Design - Sta. ~~2+63.82~~ 2+62.90 to 2+77.12

Page 1 of —

COMPUTED BY: RH | DATE: 6-15-74

CHECKED BY: HMB | DATE: June '74

T-WALL MONO SE

$\boxed{8}$

ITEM	COMPUTATIONS	Fz	ARMx	My	ARMy	Mx
	CONCRETE ONLY					
①	(11.0)(2.5)(9.3)(0.150)	38.36	4.65	178.39	5.5	210.99
②	(11.0)(5.5)(4.0)(0.150)	36.30	11.30	410.19	5.5	199.65
③	(1.0)(17.0)(9.3)(0.150)	23.72	4.65	110.27	7.5	177.86
④	(1.0)(14.0)(4.0)(0.150)	8.40	11.30	94.92	7.5	63.00
⑤	(½)(0.708)(17.0)(9.3)(0.150)	8.40	4.65	39.04	8.236	69.14
⑥	(½)(0.583)(14.0)(4.0)(0.150)	2.45	11.30	27.67	8.194	20.06
$\boxed{1}$	SUBTOTAL CONCRETE	+117.63		-860.48		-740.70
$\boxed{2}$	SUBMERGED SOIL (2.0)(9.3)(9.292)(0.0575)	+9.94	4.65	-46.21	5.067	-50.35
$\boxed{3}$	SATURATED SOIL $\frac{0.120}{0.0575} \times \boxed{2}$	+20.74	—	-96.44	—	-105.08
$\boxed{4}$	WATER WEIGHT					
	(7.0)(14.0)(4.0)(0.0625)	+24.50	11.30	-276.85	3.5	-85.75
	(7.0)(17.0)(9.3)(0.0625)	+69.17	4.65	-321.64	3.5	-242.09
	IMPERVIOUS UPLIFT					
⑦	(.034375)(4.0)(11.0)	-15.13	11.30	+170.91	5.5	+83.19
	(0.875)(4.0)(4.0)	-14.00	11.30	+158.20	2.0	+28.00
⑧	(0.15625)(9.3)(11.0)	-15.98	4.65	+74.33	5.5	+87.91
	(1.0625)(9.3)(4.0)	-39.53	4.65	183.79	2.0	+79.05
$\boxed{5}$	SUBTOTAL IMP. UPLIFT	-84.64		+587.23		+278.15
	PERVIOUS UPLIFT					
⑨	(0.34375)(4.0)(11.0)	-15.13	11.30	+170.91	5.5	+83.19
	(0.875)(½)(11.0)(4.0)	-19.25	11.30	+217.53	3.67	+70.65
⑩	(0.15625)(9.3)(11.0)	-15.98	4.65	+74.33	5.5	+87.91
	(1.0625)(½)(9.3)(11.0)	-54.35	4.65	+252.71	3.67	+199.45
$\boxed{6}$	SUBTOTAL PER. UPLIFT	-104.71		+715.48		+441.20

PROJECT Florida Avenue Complex | Page 3 of __ | COMPUTED BY [illegible] | DATE

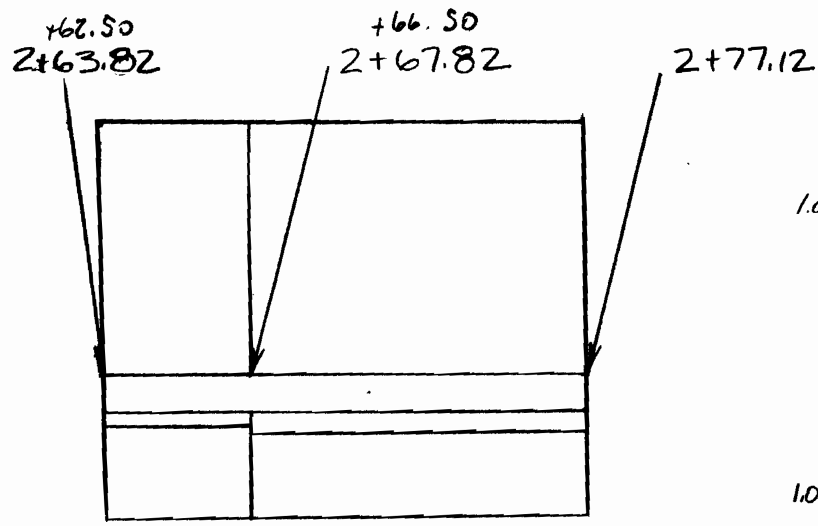
SUBJECT East IHNC T-Wall Design - ~~2+63.82~~ 2+62.50 To 2+77.12 | CHECKED BY HMB | DATE June '74

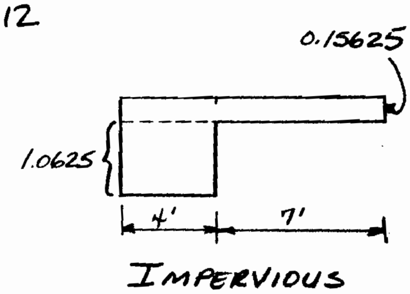
T-Wall Mono 5E

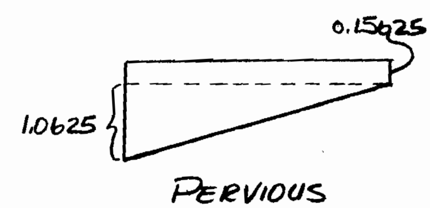
$\boxed{8}$

ITEM	COMPUTATIONS	$F_{x,y}$	Arm_z	$M_{x,y}$	$Arm_{Mx,y}$	M_z
	HORIZONTAL FORCE	y-dir		M_x		
11	$-(\frac{1}{2})(19.5)^2(13.3)(0.0625)$	-158.04	6.5	-1027.27	6.65	-1050.98
12	$+(\frac{1}{2})(2.5)^2(9.3)(0.0625)$	+1.82	0.83	+1.51	4.65	+8.45
	$+(\frac{1}{2})(5.5)^2(4.0)(0.0625)$	+3.78	1.83	+6.92	11.30	+42.73
$\boxed{7}$	SUBTOTAL HOR. FOR.	-152.44		-1018.84		-999.80

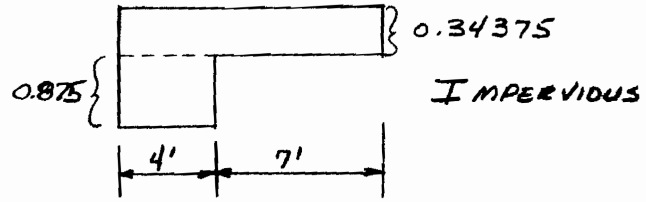
CASE	LOCATION	F_x	F_y	F_z	M_x	M_y	M_z
I	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{5}+\boxed{7}$	0.0	-152.44	+136.71	-1859.58	-917.95	-999.80
II	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{6}+\boxed{7}$	0.0	-152.44	+116.53	-1696.53	-789.10	-999.80
III	$\boxed{1}+\boxed{3}$	0.0	0.0	+138.37	-845.78	-956.92	0.0

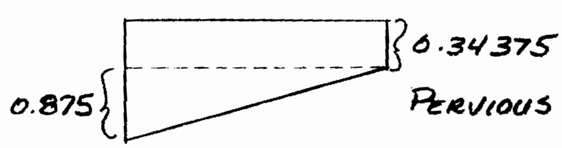






UPLIFT CONDITIONS FROM 2+67.82 TO 2+77.12





UPLIFT CONDITIONS FROM 2+63.82 TO 2+67.82

LISTN D29010

05/28/74   13.21

MONO $\boxed{8}$

```
10 FLØRIDA AVENUE CØMPLEX
20 EAST IHNC T-WALL--MØNØ 5E
30 3,3
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0
100 2.0,90.0,3
110 2.0,6.65,11.3
140 3*-1.5
170 3*0.0
200 2.0,270.0,3
210 2.0,6.65,11.3
240 3*-6.5
270 3*0.0
300 2.0,270.0,3
310 2.0,6.65,11.3
340 3*-9.5
370 3*0.0
2000 0.0,-152.44,136.71,-1859.58,-917.95,-999.80
2010 0.0,-152.44,116.53,-1696.53,-789.70,-999.80
2020 0.0,0.0,138.37,-845.78,-956.92,0.0
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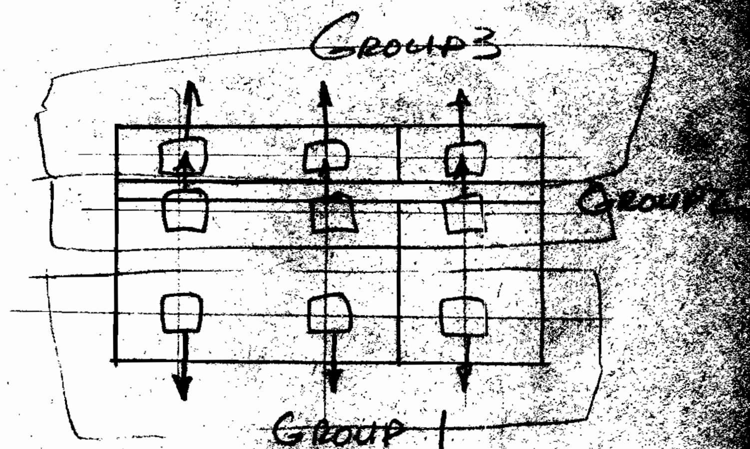
Revise

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READY

*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC   UNDEFINED


      ***   ERRØR ENCØUNTERED WHILE ATTEMPTING TØ ACCESS THE
    DATA FILE NAMED: /D29010;                ØN LØGICAL FILE DEVICE  1.
    STATUS CØDE = 403700000000; AND I = 000000000037 (ØCTAL)
    ØR      31 (DECIMAL).
DUPLICATE NAME IN AFT
    FILE DETACHED
    WILL TRY AGAIN


    PRØG. NØ. 713-F3-A2-210          13:14: 3  05/28/74


 FLØRIDA AVENUE CØMPLEX
 EAST IHNC T-WALL--MØNØ 5E


TØTAL NUMBER ØF PILES =     9


                LØAD CØNDITIØN  1
```

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-152.4	136.7	-1859.6	-917.9	-999.8

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.2	0.0	-34.3
2	0.2	0.0	-32.1
3	0.2	0.0	-30.0
4	-0.2	0.0	16.8
5	-0.2	0.0	16.2
6	-0.2	0.0	15.7
7	-0.3	0.0	67.3
8	-0.3	0.0	66.7
9	-0.3	0.0	66.2

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	0.0	-152.4	136.7	-1859.6	-917.9	-999.8

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-152.4	116.5	-1696.5	-789.7	-999.8

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.1	0.0	-37.9
2	0.1	0.0	-35.4
3	0.1	0.0	-32.9
4	-0.0	0.0	21.6
7	-0.1	0.0	57.9

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	0.0	-152.4	116.5	-1696.5	-789.7	-999.8

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	138.4	-845.8	-956.9	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.4	0.0	22.1
2	0.4	0.0	24.3
3	0.4	0.0	26.4
4	-0.4	0.0	-7.3
5	-0.4	0.0	-6.1
6	-0.5	0.0	-5.0
7	-0.5	0.0	32.1
8	-0.5	0.0	33.2
9	-0.5	0.0	34.3

3	0.0	0.0	138.4	-845.8	-956.9	0.0

0 13:16:36 05/[illegible]/74 *** END ØF RUN ***

STØP EØ

PROJECT | Page __ of __ | COMPUTED BY | DATE

SUBJECT | CHECKED BY | DATE

EAST IHNC

MINOLITH $\boxed{9}$

LMV FORM
1 AUG 68 107a

COMPUTATION SHEET

PROJECT		COMPUTED BY	DATE
Florida Avenue Complex	Page L of 4	Rsg	06-15-74
SUBJECT		CHECKED BY	DATE
East IHNC T-Wall Design — 2+77.12 To 3+22.90		HMB	June '74

T-WALL MONO ~~66~~ 9 – W/L STA 2+77.12 TO 3+22.90

ITEM	COMPUTATIONS	F_z	ARM_y	M_x	ARM_x	M_y
	CONCRETE ONLY					
①	(11.0)(2.5)(42.78)(0.150)	+176.47	5.5	-970.57	21.39	-3774.64
②	(1.0)(17.0)(39.78)(0.150)	101.44	7.5	760.79	19.89	2017.62
③	(1.0)(17.0)(7.0)(0.150)	17.85	3.5	62.48	39.28	701.15
④	½(0.708)(17.0)(39.78)(0.15)	35.91	8.236	295.75	19.89	714.24
⑤	½(0.708)(17.0)(8.708)(0.150)	7.86	4.354	34.23	40.016	314.55
1	SUBTOTAL CONCRETE	+339.53		-2123.82		-7522.20
	SUBMERGED EARTH					
⑥	(1.0)(38.78)(7.0)(0.0575)	+15.61	3.5	-54.63	19.39	-302.66
⑦	(1.0)(42.78)(2.292)(0.0575)	5.64	9.854	55.56	21.39	120.60
⑧	(1.0)(8.728)(2.292)(0.0575)	1.15	4.364	5.02	41.634	47.89
2	SUBTOTAL SUBM. EARTH	+22.40		-115.21		-471.15
	SATURATED EARTH					
3	$\frac{0.120}{0.0575}$ × 2	+46.75	—	-240.44	—	-983.27
	WATER WEIGHT					
4	(7.0)(17.0)(38.78)(0.0625)	+288.43	3.5	-1009.49	19.39	-5592.58
	IMPERVIOUS UPLIFT					
⑨	(1.0625)(35.78)(4.0)	-152.07	2.0	+304.13	17.89	+2720.44
⑩	(0.15625)(42.78)(11.0)	-73.53	5.5	404.40	21.39	1572.77
5	SUBTOTAL IMP. UPLIFT	-225.60		+708.53		+4293.21
	PERVIOUS UPLIFT					
⑪	(0.15625)(42.78)(11.0)	-73.53	5.5	+404.40	21.39	+1572.77
⑫	½(1.0625)(11.0)(11.0)	-64.28	3.67	235.91	35.45	2278.77
	½(1.0625)(31.78)(11.0)	185.71	3.67	681.57	15.89	2951.00
6	SUBTOTAL PER. UPLIFT	-323.52		+1321.88		+6802.54

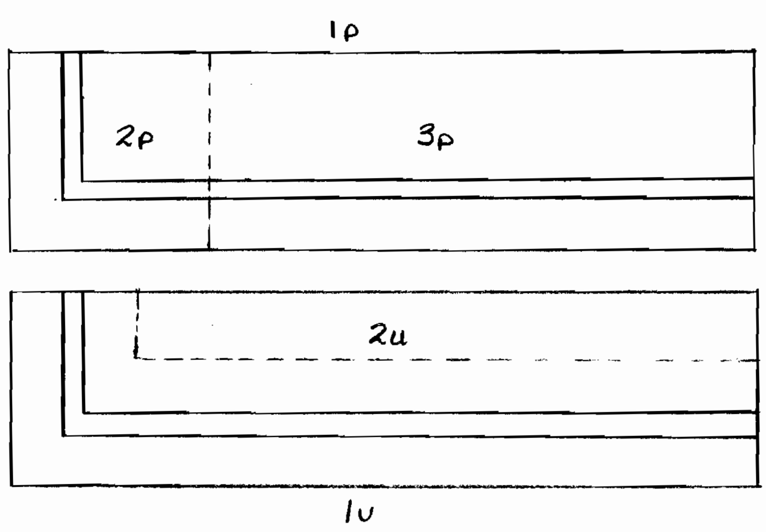
PROJECT Florida Avenue Complex	Page 2 of 4	COMPUTED BY RJG	DATE 06-15-74
SUBJECT East IHNC T-Wall Design - 2+77.12 To 3+22.90		CHECKED BY HMB	DATE June '74

T-Wall Mono 6E

9

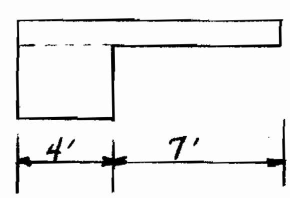
ITEM	COMPUTATIONS	$F_{x,y}$	$ARM_{x,y}$	M_z	ARM_z	$M_{x,y}$
	HORIZONTAL FORCES					
1	$+\frac{1}{2}(1.21875)(19.5)(38.78)$	-460.82 y	19.39 y	-8935.21	6.5	-2995.30 Mx
2	$+\frac{1}{2}(1.21875)(19.5)(7.0)$	$+83.18$ x	3.5	-291.13	6.5	-540.67 My
3	$+\frac{1}{2}(0.15625)(2.5)(42.78)$	$+8.36$ y	21.39	$+178.72$	0.83	$+6.94$ Mx
4	$+\frac{1}{2}(0.15625)(2.5)(11.0)$	-2.15 x	5.5	$+11.82$	0.83	$+1.78$ My
7	SUBTOTAL HOR. X	$+81.03$		-9035.8		-2988.36
	Y	-452.46				-538.89

CASE	LOADINGS	F_x	F_y	F_z	M_x	M_y	M_z
I	1 + 2 + 4 + 5 + 7	$+81.03$	-452.46	$+424.76$	-5528.35	-8031.61	-9035.8
II	1 + 2 + 4 + 6 + 7	$+81.03$	-452.46	$+326.84$	-4915.00	-7322.78	-9035.8
III	1 + 3	0.0	0.0	$+386.28$	-2364.26	-8505.47	0.0



PERVIOUS

IMPERVIOUS

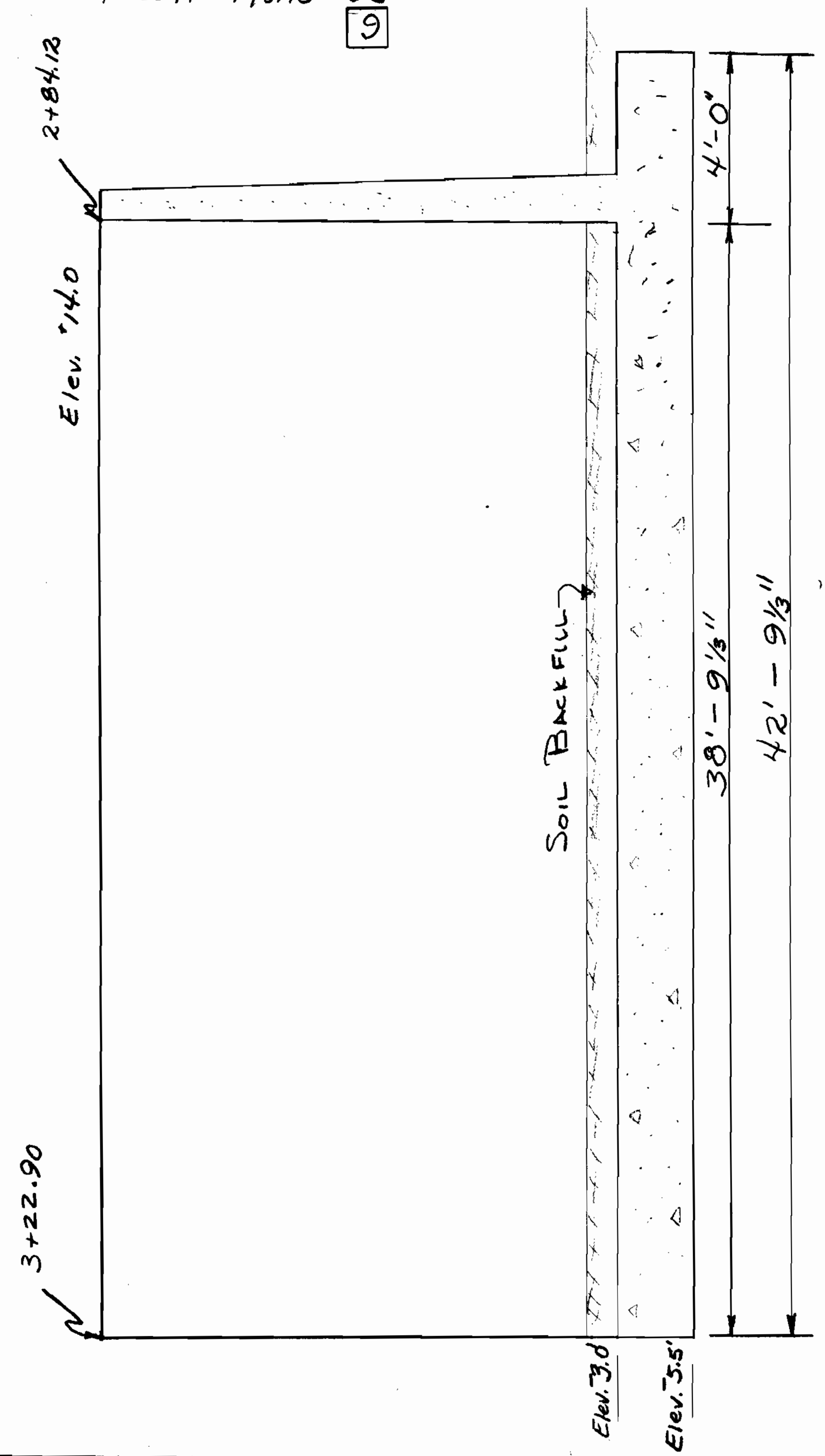


PROJECT Florida Avenue Complex | Page 3 of 4 | COMPUTED BY RJH | DATE 06-15-74

SUBJECT East IHNC T-Wall Design 2+77.12 To 3+22.90 | CHECKED BY HMB | DATE June '74

7-Wall Mono 6E

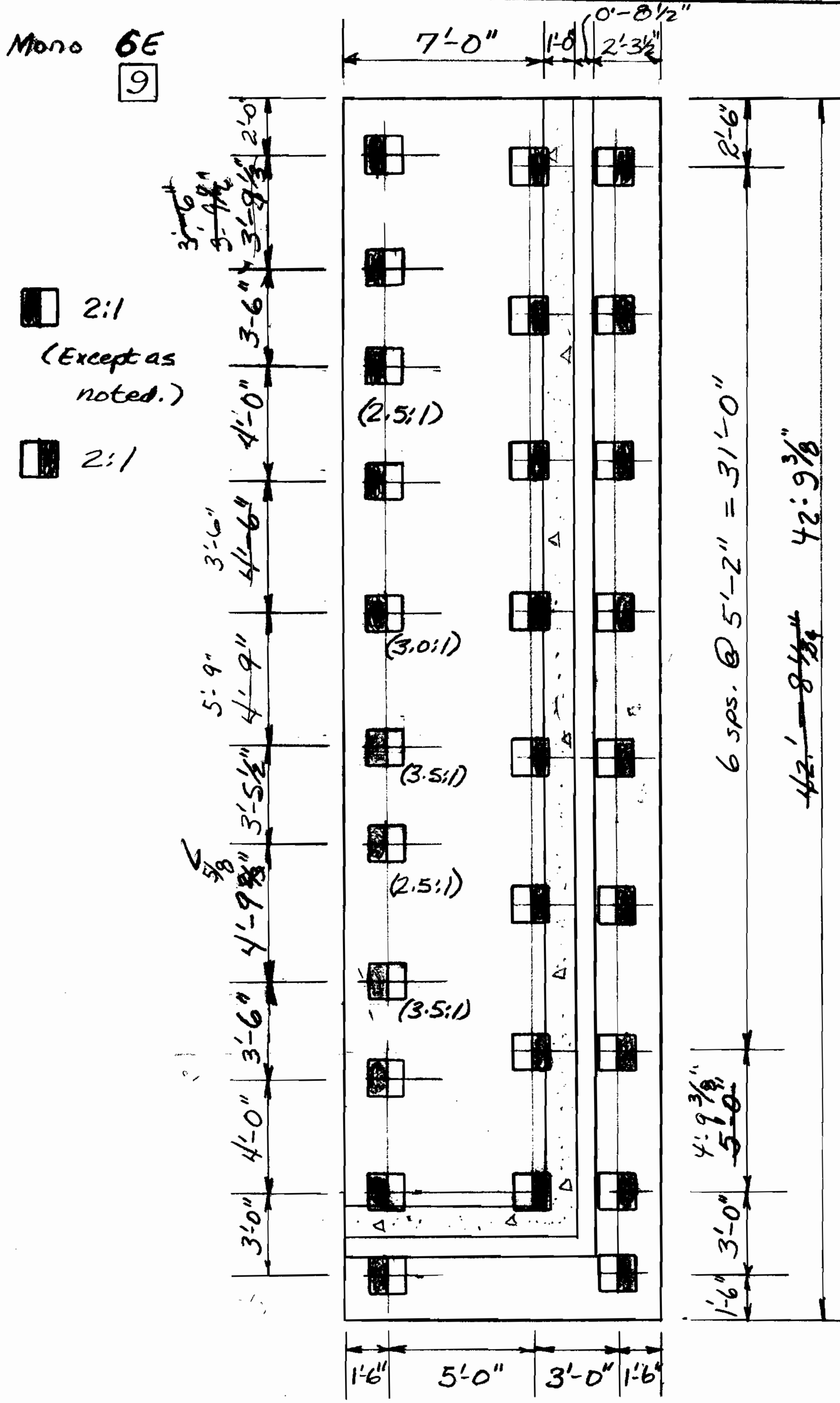
$\boxed{9}$



PROJECT Florida Avenue Complex	Page 4 of 4	COMPUTED BY RJg	DATE 6-16-74
SUBJECT East IHNC T-Wall Design - 2+77.12 To 3+22.90		CHECKED BY JBB	DATE 6-25-74

Mono 6E

9



LMV FORM
1 AUG 68 107a

COMPUTATION SHEET

```
LISTH D29010

06/25/74    08.15

10 FLØRIDA AVENUE CØM.-MØNØ 6E, 2+77.12 TØ 3+26.90
20 EAST IHNC T-WALL ANALYSIS-L = 42.78 FT., H = 19.5 FT.
30 5,3
40 2,0.0,60
50 1,12,12
60 1,5.0
70 0 450
80 0.0 0.0 0.0
100 2.0,90.0,6
110 2.0,5.78,13.28,34.28,38.28,41.28
140 6*-1.5
170 6*0.0
200 2.5,90.0,2
210 9.28,26.0
240 2*-1.5
270 2*0.0
300 3.0,90.0,1
310 16.78
340 -1.5
370 0.0
400 3.5,90.0,2
410 28.53,30.78
440 2*-1.5
470 2*0.0
500 2.0,270.0,17
505 2.28,12.61,28.1
510 2.28,7.45,12.61,17.78,22.95,28.11,33.28,38.28,
520 2.28,7.45,12.61,17.78,22.95,28.11,33.28,38.28,41.28
540 8*-6.5,9*-9.5
570 17*0.0
2000 81.03,-452.46,424.76,-5528.35,-9832.61,-9035.80
2010 81.03,-452.46,326.84,-4915.00,-7328.28,-9035.80
2020 0.0,0.0,386.28,-2364.26,-8505.47,0.0

READY

*0 DEL
505
*RESAVE D29010
DATA SAVED-D29010
*LIST500
INVALID INPUT -- RETYPE

*LIST 500

500 2.0,270.0,17
510 2.28,7.45,12.61,17.TG''GVF'GG76F&G7*W V

*REMOVE D29010
*
```

MONO 9

*** •FUSC UNDEFINED

PROG. NO. 713-F3-A2-210 8:12:33 06/25/7[illegible]

FLORIDA AVENUE COM.-MONO 6E, 2+77.12 TO 3+26.90
EAST IHNC T-WALL ANALYSIS-L = 42.76 FT., H = 19.5 FT.

TOTAL NUMBER OF PILES = 28

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
81.0	-452.5	424.8	-5528.3	-9832.6	-9035.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	-2.9	-33.7
2	0.0	-2.9	-32.1
3	0.0	-2.9	-28.9
4	0.1	-2.9	-20.0
5	0.1	-2.9	-18.3
6	0.1	-2.9	-17.0
7	0.0	-2.9	-31.1
8	0.0	-2.9	-24.6
9	0.0	-2.9	-28.6
10	0.0	-2.9	-27.0
11	0.0	-2.9	-24.2
12	-0.0	2.9	29.9
20	-0.1	2.9	62.0

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	81.0	-452.5	424.8	-5528.4	-9832.6	-9035.8

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
81.0	-452.5	326.8	-4915.0	-7322.3	-9035.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	-2.9	-37.9
2	-0.1	-2.9	-36.8
3	-0.1	-2.9	-34.5
4	-0.1	-2.9	-28.2
5	-0.0	-2.9	-27.0
6	-0.0	-2.9	-26.1
7	-0.1	-2.9	[illegible]
8	[illegible]	[illegible]	[illegible]

11	-0.1	[illegible]	[illegible]
12	0.1	2.9	[illegible]
13	0.1	2.9	32.6
14	0.1	2.9	31.9
15	0.1	2.9	31.2
16	0.1	2.9	30.5
17	0.1	2.9	29.8
18	0.1	2.9	29.1
19	0.0	2.9	28.4
20	0.1	2.9	54.4
21	0.1	2.9	53.7
22	0.0	2.9	53.0
23	0.0	2.9	52.3
24	0.0	2.9	51.6
25	0.0	2.9	50.9
26	0.0	2.9	50.2
27	0.0	2.9	49.5

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2 81.0 -452.5 326.8 -4915.0 -7322.3 -9035.8

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	386.3	-2364.3	-8505.5	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.4	0.0	25.0
4	0.4	0.0	26.4
7	[illegible]	[illegible]	[illegible]
9	0.4	0.0	9.4
10	0.4	0.0	4.4
12	-0.5	0.0	-6.2
13	-0.5	0.0	-6.8
14	-0.5	0.0	-7.3
15	-0.5	0.0	-7.9
16	-0.5	0.0	-8.4
17	-0.5	0.0	-9.0
18	-0.5	0.0	-9.6
19	-0.5	0.0	-10.1
20	-0.5	0.0	34.0
21	-0.5	0.0	33.5
22	-0.5	0.0	32.9
23	-0.5	0.0	32.4
24	-0.5	0.0	31.8
25	-0.5	0.0	31.3
26	-0.6	0.0	30.7
27	-0.6	0.0	30.2

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3 -0.0 -0.0 386.3 -2364.3 -8505.5 -0.0

0 8:12:50 06/25/74 *** END ØF RUN ***

STØP EØJ

TIME
[illegible]19:07 06/25/74
[illegible]
[illegible]

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

EAST IHNC

MONOLITH 10

LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

PROJECT Florida Avenue Complex | Page 1 of 1 | COMPUTED BY RJgr | DATE July '74

SUBJECT Interference Diagram for 5E, 6E | CHECKED BY HMB | DATE July '74

Base elev. = −5.5'
Reqd. elev. = −53.0'
Depth in concrete = 0.75'

Reqd Depth = 48.25'

* Base elev. = −2.5
Reqd elev = −53.0
Depth in concrete = 0.75'

Reqd. Depth = 51.25

y (x,y) x

2+77.12

2+84.12

(All at 2:1)

2+62.50

GATE

5E

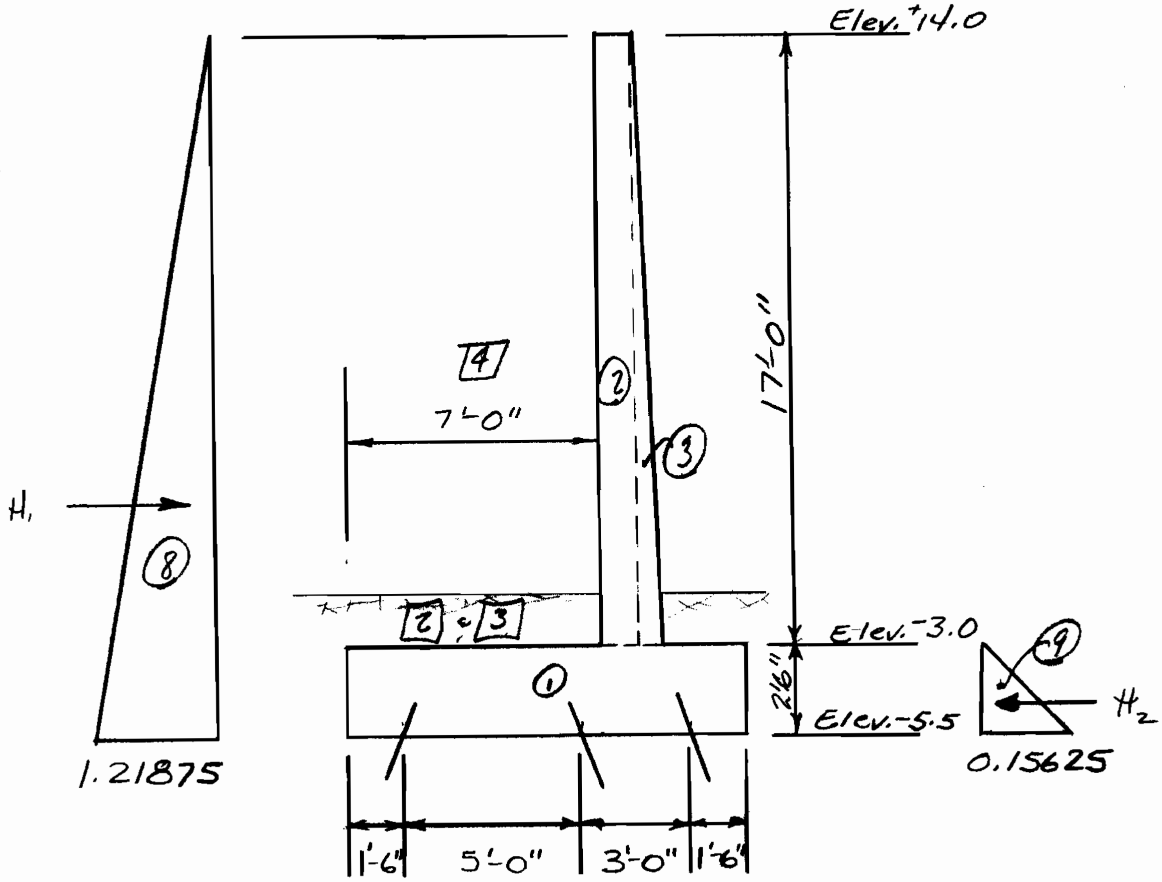
6E

x		3.5'	8.81'	14.12'	18.62' *	27.12' *
2.5	(3.5:1) →	(5, 12.25)	(5, 30.83)	(5, 49.42)	(11, 65.17)	(11, 94.92)
7.29	(2.5:1) →	(14.58, 8.75)	(14.58, 22.03)	(14.58, 35.3)	(20.58, 46.55)	(20.58, 67.8)
10.75	(3.5:1) →	(21.50, 12.25)	(21.50, 30.83)	(21.50, 49.42)	(27.50, 65.17)	(27.50, 94.92)
16.50	(3:1) →	(33, 10.5)	(33, 26.43)	(33, 42.36)	(39, 55.86)	(39, 81.36)
20.0	(2:1) →	(40, 7)	(40, 17.62)	(40, 28.24)	(46, 37.24)	(46, 54.24)
24.0	(2.5:1) →	(48, 8.75)	(48, 22.03)	(48, 35.3)	(54, 46.55)	(54, 67.8)
27.5	(2:1) →	(55, 7)	(55, 17.62)	(55, 28.24)	(61, 37.24)	(61, 54.24)
31.0	(2:1) →	(62.0, 7)	(62, 17.62	(62, 28.24)	(68, 37.24)	(68, 54.24)
3+22.90						

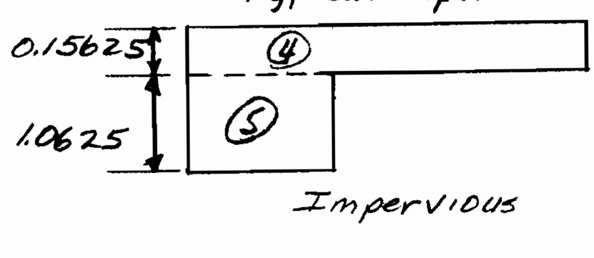
PROJECT		COMPUTED BY	DATE
Florida Avenue Complex	Page 2 of 3	RJG	Ju
SUBJECT		CHECKED BY	DATE
East IHNC T-Wall Design - 3+22.90 To 3+67.90		HMB	Ju

T-Wall Mono 7E

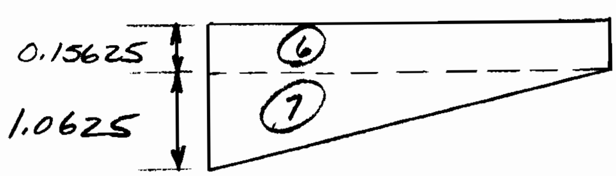
10



Typical Uplift



Impervious



Pervious

PROJECT Florida Avenue Complex	Page 2 of 3	COMPUTED BY RJge	DATE June 74
SUBJECT East IHNC T-Wall Design - 3+22.90 To 3+67.90		CHECKED BY HMB	DATE July '74

T-WALL MONO 7E

$\boxed{10}$

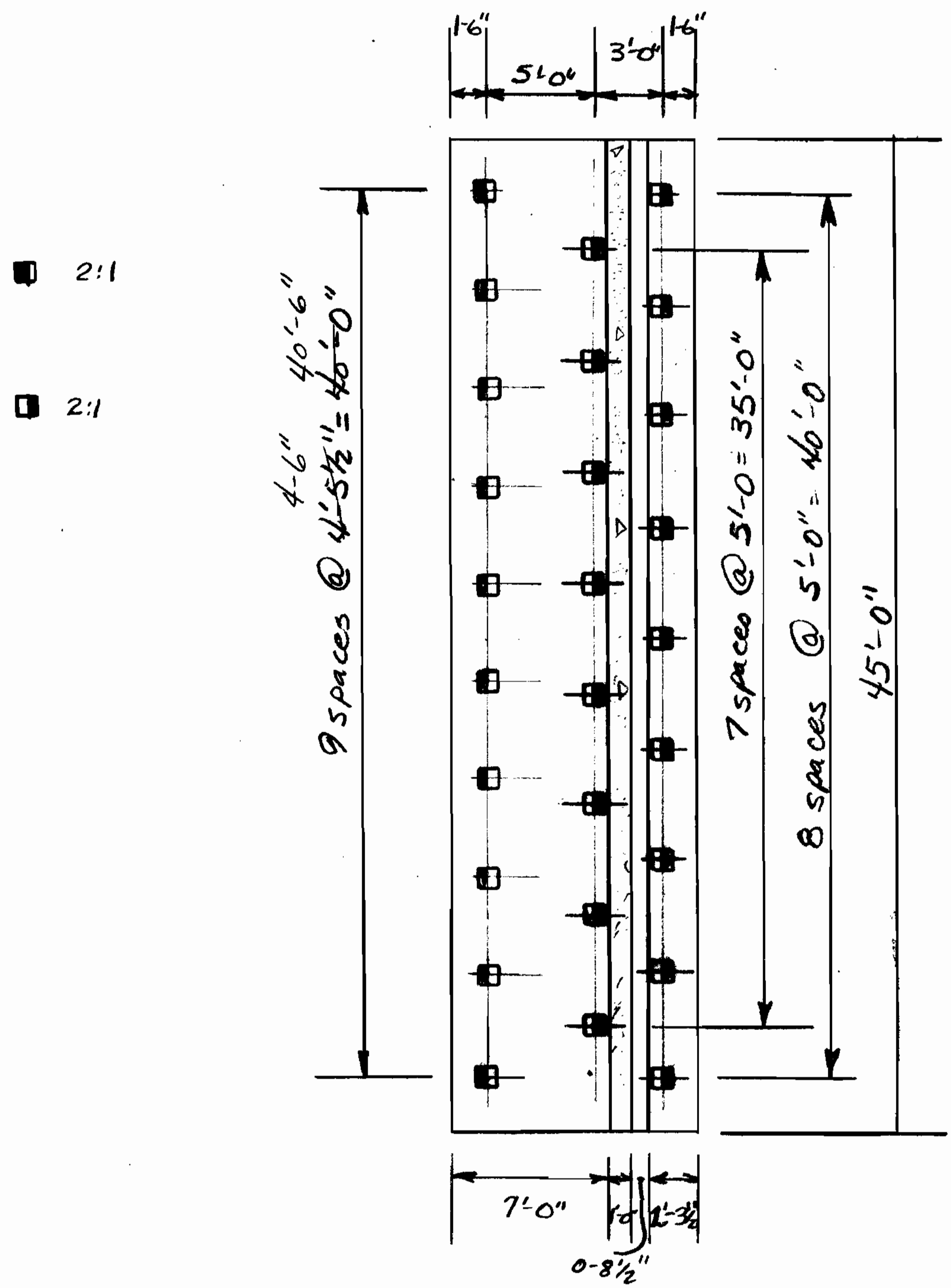
ITEM	COMPUTATIONS	Fz	ARMy	Mx	ARMx	My
	CONCRETE ONLY					
①	(2.5)(11.0)(45.0)(0.150)	+185.63	5.5	−1020.94	22.5	−4176.56
②	(1.0)(17.0)(45.0)(0.150)	114.75	7.5	860.63	22.5	2581.88
③	(½)(17.0)(0.708)(45.0)(0.15)	40.62	8.236	334.56	22.5	913.98
$\boxed{1}$	SUBTOTAL CONCRETE	+341.00		−2216.13		−7672.42
$\boxed{2}$	SUBMERGED SOIL (1.0)(9.292)(45.0)(0.0575)	+24.04	5.07	−121.90	22.5	−540.97
$\boxed{3}$	SATURATED SOIL $\frac{0.120}{0.0575} \times \boxed{2}$	+50.18	—	−254.40	—	−1128.98
$\boxed{4}$	WATER WEIGHT (7.0)(17.0)(45.0)(0.0625)	+334.69	3.5	−1171.41	22.5	−7530.47
	IMPERVIOUS UPLIFT					
④	−(1.0625)(4.0)(45.0)	−191.25	2.0	+382.50	22.5	+4303.13
⑤	−(0.15625)(11.0)(45.0)	77.34	5.5	425.39	22.5	1740.23
$\boxed{5}$	SUBTOTAL IMP. UPLIFT	−268.59		+807.89		+6043.36
	PERVIOUS UPLIFT					
⑥	−(½)(1.0625)(11.0)(45.0)	−262.97	3.67	+965.10	22.5	+5916.80
⑦	−(0.15625)(11.0)(45.0)	77.34	5.5	425.39	22.5	1740.23
$\boxed{6}$	SUBTOTAL PER. UPLIFT	−340.31		+1390.44		+7657.03
	HORIZONTAL LOAD	Fy	ARMz	Mx	ARMx	Mz
⑧	−(½)(1.21875)(19.5)(45.0)	−534.73	6.5	−3475.72	22.5	−12031.35
⑨	+(½)(0.15625)(2.5)(45.0)	+8.79	0.83	+7.29	22.5	+197.75
$\boxed{7}$	SUBTOTAL HOR. LOAD	−525.94		−3468.43		−11833.60

CASE	LOADINGS	Fx	Fy	Fz	Mx	My	Mz
I	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{5}+\boxed{7}$	0.0	−525.94	+431.14	−6169.98	−9700.50	−11833.60
II	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{6}+\boxed{7}$	0.0	−525.94	+359.42	−5587.3[illegible]	−8086.83	−11833.60
III	$\boxed{1}+\boxed{3}$	0.0	0.0	+391.18	−2470.53	−8801.40	0.0

PROJECT Florida Avenue Complex	Page 3 of 3	COMPUTED BY RJG	DATE June 74
SUBJECT East IHNC T-Wall Design - 3+22.90 To 3+67.90		CHECKED BY HMB	DATE July '74

T-Wall Mono 7E

$\boxed{10}$



MONO

10

```
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[illegible]
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[illegible] 0,250
90 0.0[illegible].0,0,0
100 2.0,90.0,10
110 2.5,7.0,11.4,15.8,20.3,24.7,29.1,33.6,38.0,42.5      — 12 V1 3rd
140 10*-1.8
170 10*0.0
200 2.0,270.0,17
210 5.0,10.0,15.0,20.0,25.0,30.0,35.0,40.0,
220 2.5,7.5,12.5,17.5,22.5,27.5,32.5,37.5,42.5
240 8*-6.0,9*-9.5
270 17*0.0
[illegible] 0.0,-525.94,431.14,-6170.[illegible],-9700.50,-11[illegible]
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[illegible] 0.0,[illegible],-[illegible],0.0
READY

*RESAVE D89010
DATA SAVED-D89010
*REMOVE D89010
*RUN K89010
LOADER DIAGNOSTICS
<W> .FFBC  UNDEFINED
```

PROG. NO. 713-F3-A2-210   8:40:42   06/20/74

FLORIDA AVENUE COMPLEX-MONO 7E, 10E, 3+22.90 TO 3+67.90
EAST BHNC T-WALL ANALYSIS-LENGTH = 45.0 FT.,HEIGHT = 19.5 FT

TOTAL NUMBER OF PILES =   27

d
45
9
40.5

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-525.9	431.1	-6170.0	-9700.5	-11833.6

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	-0.0	-35.3
11	-0.2	-0.0	21.5
19	-0.3	-0.0	73.6

1   SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1   -0.0   -525.9   431.1   -6170.0   [illegible]

```
        LOAD CONDITION  2

      LOADS ON PILE CAP
    X           Y           Z          MX          MY          MZ
    0.       -525.9       359.4     -5587.4     -8086.8    -11833.6

        PILE LOADS (PILE AXIS)
PILE
 NO.     X       Y        Z
  1     0.0    -0.0     -38.8
 11    -0.0    -0.0      28.2
 19    -0.1    -0.0      68.7
   2     SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2       -0.0   -525.9    359.4    -5587.4    -8086.8   -11833.6

        LOAD CONDITION  3

      LOADS ON PILE CAP
    X           Y           Z          MX          MY          MZ
    0.          0.        391.2     -2470.5     -8801.4         0.

        PILE LOADS (PILE AXIS)
PILE
 NO.     X       Y        Z
  1     0.5     0.0      20.4
 11    -0.5     0.0      -9.5
 19    -0.6     0.0      34.1
   3     SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   3       -0.0      0.0    391.2    -2470.5    -8801.4        0.0


   0     8:41:25  06/20/74    *** END OF  RUN ***


STOP      EOJ

*LIST P29010

0          PROG NO. 713-F3-A2-210        8:40:42   06/20/74
1          TABLE OF CONTENTS
2
3          PROJECT ID                                      LINE 10100
4          ELASTIC PILE CONSTANT MATRIX(C)                      10110
5          PILE COORDINATES/BATTER                              10150
6          LOAD CONDITION 1 OUTPUT                              11000
7               LOADS ON PILE CAP                               11010
8               DEFLECTION OF PILE CAP                          11020
9               PILE LOADS (PILE AXIS)                          11100
10              SUMMATION OF LOADS (STRUCTURE AXIS)             11900
11         LOAD CONDITION 2 OUTPUT                              12000...ETC.
12
13
14
15
[illegible] 7K, 10K. 3+22.98 TO 3+67.94
[illegible] FT
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0.	0.	0.171E 04	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.

INPUT COORDINATES/BATTER

GROUP NO. 1

10 PILES ON 2.0 BATTER AT 90.0 DEG.

NO.	X	Y	Z
1	2.5	-1.5	0.
2	7.0	-1.5	0.
3	11.4	-1.5	0.
4	15.8	-1.5	0.
5	20.3	-1.5	0.
6	24.7	-1.5	0.
7	29.1	-1.5	0.
8	33.6	-1.5	0.
9	38.0	-1.5	0.
10	42.5	-1.5	0.

GROUP NO. 2

17 PILES ON 2.0 BATTER AT 270.0 DEG.

NO.	X	Y	Z
11	5.0	-6.5	0.
12	10.0	-6.5	0.
13	15.0	-6.5	0.
14	20.0	-6.5	0.
15	25.0	-6.5	0.
16	30.0	-6.5	0.
17	35.0	-6.5	0.
18	40.0	-6.5	0.
19	2.5	-9.5	0.
20	7.5	-9.5	0.
21	12.5	-9.5	0.
22	17.5	-9.5	0.
23	22.5	-9.5	0.
24	27.5	-9.5	0.
25	32.5	-9.5	0.
26	37.5	-9.5	0.
27	42.5	-9.5	0.

LOAD CONDITION 1

LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)

X	Y	Z	MX	MY	MZ
0.	-525.9	431.1	-6170.0	-9700.5	-11833.6

DEFLECTION OF PILE CAP (INCHES & RADIANS)

X	Y	Z	RX	RY	RZ
0.763E-05	0.196E-01	0.498E-01	0.944E-03	0.607E-07	0.113E-06

PILE LOADS (PILE AXIS)

NO.	X	Y	Z	MX	MY	MZ
1	0.211	-0.000	-35.320	0.	0.	0.
2	0.211	-0.000	-35.320	0.	0.	0.
3	0.211	[illegible]	[illegible]	0.	0.	0.

```
[illegible] 6   [illegible]  -0.000   [illegible]   0.     0.     [illegible]
[illegible] 7   0.211   -0.000   [illegible]    0.     0.     [illegible]
11110    8   0.211   -0.000   -35.387    0.     0.     [illegible]
11111    9   0.211   -0.000   -35.396    0.     0.     [illegible]
11112   10   0.211   -0.000   -35.406    0.     0.     0.
11113   11  -0.185   -0.000    21.513    0.     0.     0.
11114   12  -0.185   -0.000    21.513    0.     0.     0.
11115   13  -0.185   -0.000    21.512    0.     0.     0.
11116   14  -0.185   -0.000    21.512    0.     0.     0.
11117   15  -0.184   -0.000    21.512    0.     0.     0.
11118   16  -0.184   -0.000    21.511    0.     0.     0.
11119   17  -0.184   -0.000    21.511    0.     0.     0.
11120   18  -0.184   -0.000    21.510    0.     0.     0.
11121   19  -0.284   -0.000    73.624    0.     0.     0.
11122   20  -0.284   -0.000    73.623    0.     0.     0.
11123   21  -0.284   -0.000    73.623    0.     0.     0.
11124   22  -0.284   -0.000    73.623    0.     0.     0.
11125   23  -0.284   -0.000    73.622    0.     0.     0.
11126   24  -0.284   -0.000    73.622    0.     0.     0.
11127   25  -0.284   -0.000    73.622    0.     0.     0.
11128   26  -0.284   -0.000    73.621    0.     0.     0.
11129   27  -0.284   -0.000    73.621    0.     0.     0.
11130
11900      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)
11901        -0.0  -525.9   431.1    -6170.0    -9700.5  -11833.6
11902
12000   LØAD CØNDITIØN   2
12010   LØADS ØN PILE CAP (X,Y,Z,MX,MY,MZ)
12011         0.       -525.9      359.4    -5587.4    -8086.8   -11833.6
12012
12020   DEFLECTIØN ØF PILE CAP (INCHES & RADIANS)
12021        X           Y           Z           RX          RY          RZ
12022 0.845E-05 0.625E-02 0.334E-01 0.624E-03 0.660E-07 0.125E-06
12023
12100   PILE LØADS (PILE AXIS)
12101   NØ.      X        Y          Z          MX         MY         MZ
12102
12103    1   0.028   -0.000   -38.774    0.     0.     0.
12104    2   0.028   -0.000   -38.785    0.     0.     0.
12105    3   0.028   -0.000   -38.796    0.     0.     0.
12106    4   0.028   -0.000   -38.806    0.     0.     0.
12107    5   0.028   -0.000   -38.817    0.     0.     0.
12108    6   0.028   -0.000   -38.827    0.     0.     0.
12109    7   0.028   -0.000   -38.837    0.     0.     0.
12110    8   0.028   -0.000   -38.848    0.     0.     0.
12111    9   0.028   -0.000   -38.858    0.     0.     0.
12112   10   0.028   -0.000   -38.869    0.     0.     0.
12113   11  -0.008   -0.000    28.226    0.     0.     0.
12114   12  -0.008   -0.000    28.226    0.     0.     0.
12115   13  -0.008   -0.000    28.226    0.     0.     0.
12116   14  -0.008   -0.000    28.225    0.     0.     0.
12117   15  -0.008   -0.000    28.225    0.     0.     0.
12118   16  -0.008   -0.000    28.225    0.     0.     0.
12119   17  -0.008   -0.000    28.224    0.     0.     0.
12120   18  -0.008   -0.000    28.224    0.     0.     0.
12121   19  -0.074   -0.000    62.672    0.     0.     0.
12122   20  -0.074   -0.000    62.672    0.     0.     0.
[illegible] [illegible] [illegible] [illegible] 62.671 0. [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] 62.671 0. [illegible] [illegible]
[illegible]
```

```
[illegible]
[illegible]
[illegible]
13009  LOAD CONDITION   3
13010  LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
13011         0.          0.        391.2    -2470.5    -5501.4        0.
13012
13020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
13021         X           Y          Z          RX          RY          RZ
13022 0.464E-05 0.670E-01 0.344E-01 0.791E-03 0.316E-07 0.654E-07
13023
13100   PILE LOADS (PILE AXIS)
13101   NO.       X         Y          Z           MX          MY          MZ
13102
13103     1     0.452     0.000     20.404       0.          0.          0.
13104     2     0.452     0.000     20.410       0.          0.          0.
13105     3     0.452     0.000     20.415       0.          0.          0.
13106     4     0.452     0.000     20.420       0.          0.          0.
13107     5     0.453     0.000     20.426       0.          0.          0.
13108     6     0.453     0.000     20.431       0.          0.          0.
13109     7     0.453     0.000     20.436       0.          0.          0.
13110     8     0.453     0.000     20.442       0.          0.          0.
13111     9     0.453     0.000     20.447       0.          0.          0.
13112    10     0.453     0.000     20.453       0.          0.          0.
13113    11    -0.473     0.000     -9.547       0.          0.          0.
13114    12    -0.473     0.000     -9.547       0.          0.          0.
13115    13    -0.473     0.000     -9.547       0.          0.          0.
13116    14    -0.473     0.000     -9.547       0.          0.          0.
13117    15    -0.473     0.000     -9.548       0.          0.          0.
13118    16    -0.473     0.000     -9.548       0.          0.          0.
13119    17    -0.473     0.000     -9.548       0.          0.          0.
13120    18    -0.473     0.000     -9.548       0.          0.          0.
13121    19    -0.557     0.000     34.147       0.          0.          0.
13122    20    -0.557     0.000     34.146       0.          0.          0.
13123    21    -0.557     0.000     34.146       0.          0.          0.
13124    22    -0.557     0.000     34.146       0.          0.          0.
13125    23    -0.557     0.000     34.146       0.          0.          0.
13126    24    -0.557     0.000     34.145       0.          0.          0.
13127    25    -0.557     0.000     34.145       0.          0.          0.
13128    26    -0.557     0.000     34.145       0.          0.          0.
13129    27    -0.557     0.000     34.145       0.          0.          0.
13130
13900     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
13901       -0.0       0.0    391.2    -2470.5    -5501.4       0.0
13902
13903    8:41:25  06/20/74    *** END OF FILE ***

READY

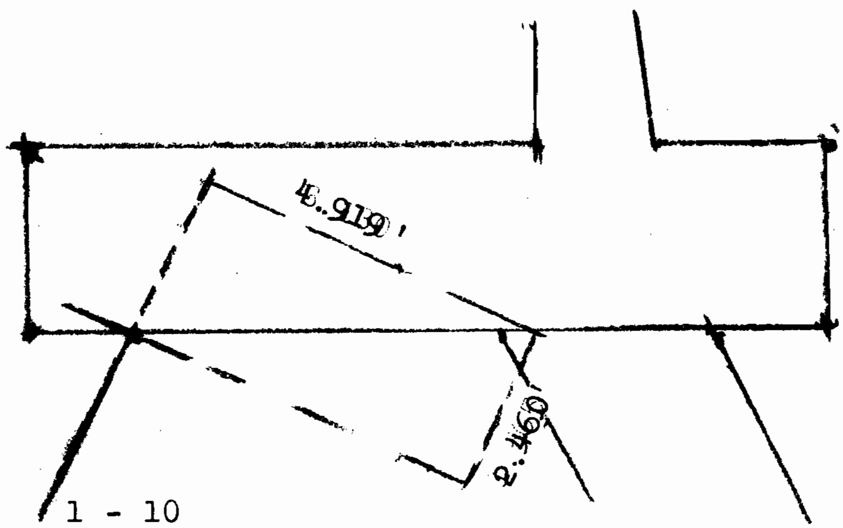
*TIME
09:08:34   06/20/74
*BYE
**RESOURCES USED $    6.22, USED TO DATE $ 3514.46= 35%
**TIME SHARING OFF AT    9.044 ON   06/20/74
```

T-Wall Mono. 7E

10

BASE SLAB

Transverse Reinforcement



Pile loads from the Hrennikoff 3-D Pile Analysis.

PROJECT IHNC AND FLA. AVE. COMPLEX	Page — of —	COMPUTED BY HMB	DATE June '74
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RJgn	DATE July 74

10

Transverse Reinforcement

Case II

Moment About Face Of Wall	FORCE	ARM	MOMENT
Piles 1-10 Axial 10(38.8)	388.0	4.919	1908.57
Water 7.0x17.0x45.0x.0625	334.69	3.500	1171.42
Earth 1.0x7.0x45.0x.0575	18.11	3.500	63.38
Slab 2.5x7.0x45.0x.150	118.12	3.500	413.42
Uplift -.15625x7.0x45.0	-49.22	3.500	-172.27
-45.0x7.0 $\left(\frac{1.0625+.3864}{2}\right)$	-228.19	4.046	-923.26
			Σ 2461.26'-k

Top Reinforcement

M=2461.26 '-k, M(per ft. slab)=2461.26/45 = 54.69'-k/'

$d = \sqrt{M/kb} = \sqrt{54690/152} = 19.0$"

$d_{provided} = 27.0$"

$As = M/ad = 54.69/1.44x27 = 1.41 \text{ in}^2$

$\text{Min. } As = 0.0025bd = 0.0025x12x27 = 0.81 \text{ in}^2$

Use No. 8 at 6"

PROJECT	Page — of —	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	June '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC		RSY	July 74

10

Transverse Reinforcement

Bottom Reinforcement

Case III

Moment About Face Of Wall	FORCE	ARM	MOMENT
Piles 1-10 Axial 10(20.4)	204.0	4.919	1003.48
" 1-10 Q 10(0.45)	-4.5	2.460	-11.07
Earth 1.0x7.0x45.0x.120	-37.8	3.500	-132.30
Slab 2.5x7.0x45.0x.150	-118.1	3.500	-413.35
			Σ 446.76 '-k

M =446.76'-k, M(per ft.slab)=446.76/45 = 9.93'-k/'

$d = \sqrt{M/kb} = \sqrt{9930/152} = 8.1"$

$d_{provided} = 25.5"$

As = M/ad = 9.93/1.44x25.5 = 0.27 in^2

Min. As = 0.0025bd = 0.0025x12x25.5 = 0.77 in^2

Use No. 8 at 12"

Longitudinal Reinforcement

Min. As = 0.0020Bt = 0.0020x132x30 = 7.92 in^2

Use 3.96 in. for each face

Use 10 No. 6's top + bottom (12.5" spacing)

PROJECT

SUBJECT

Page __ of __

COMPUTED BY | DATE

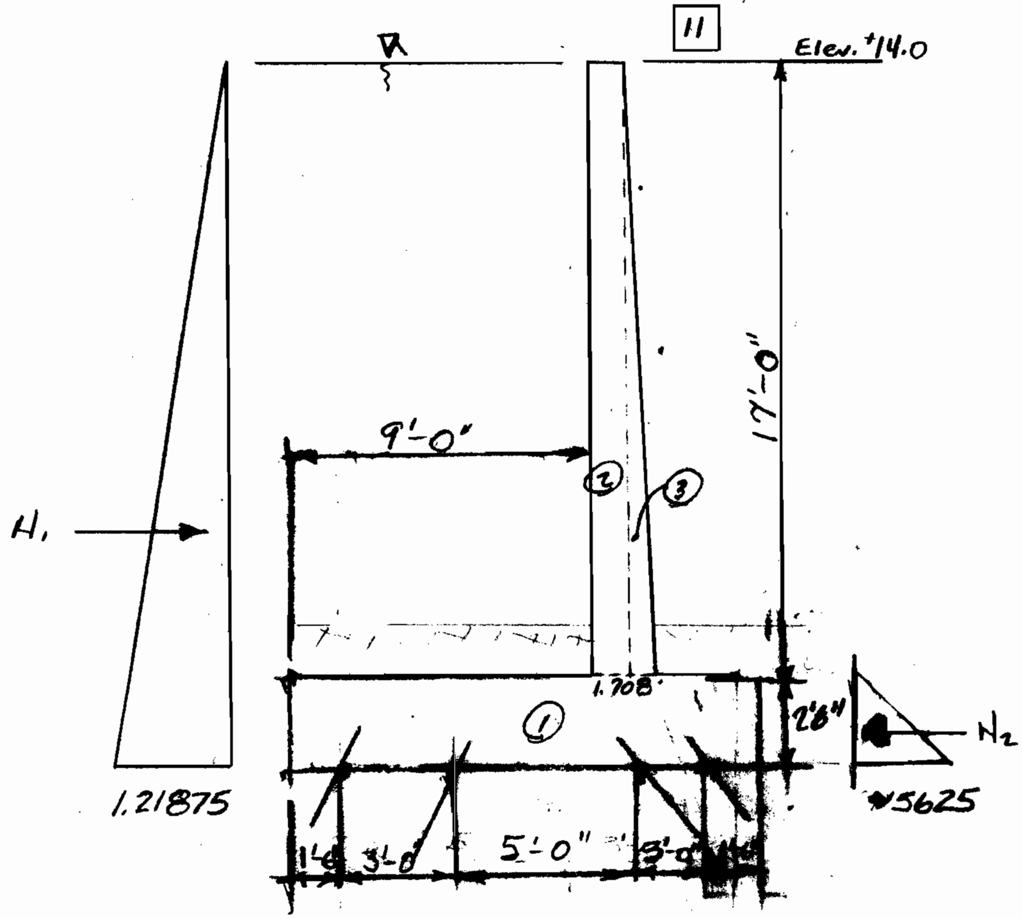
CHECKED BY | DATE

EAST IHNC

MONOLITH $\boxed{11}$

PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 1 of 3	HMB	July '74
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN EAST OF IHNC 268.90 to 412.90		RJg.	July 74

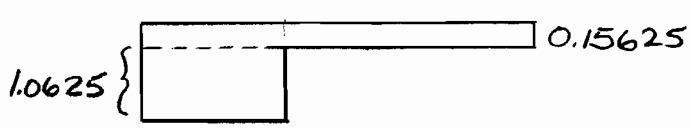
T-WALL MONO 8E



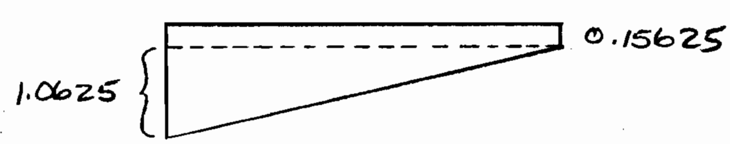
* Mono 10E
Change in length to 44'-0" not Considered significant to recompute.

Typical Cross-section

Uplift Conditions

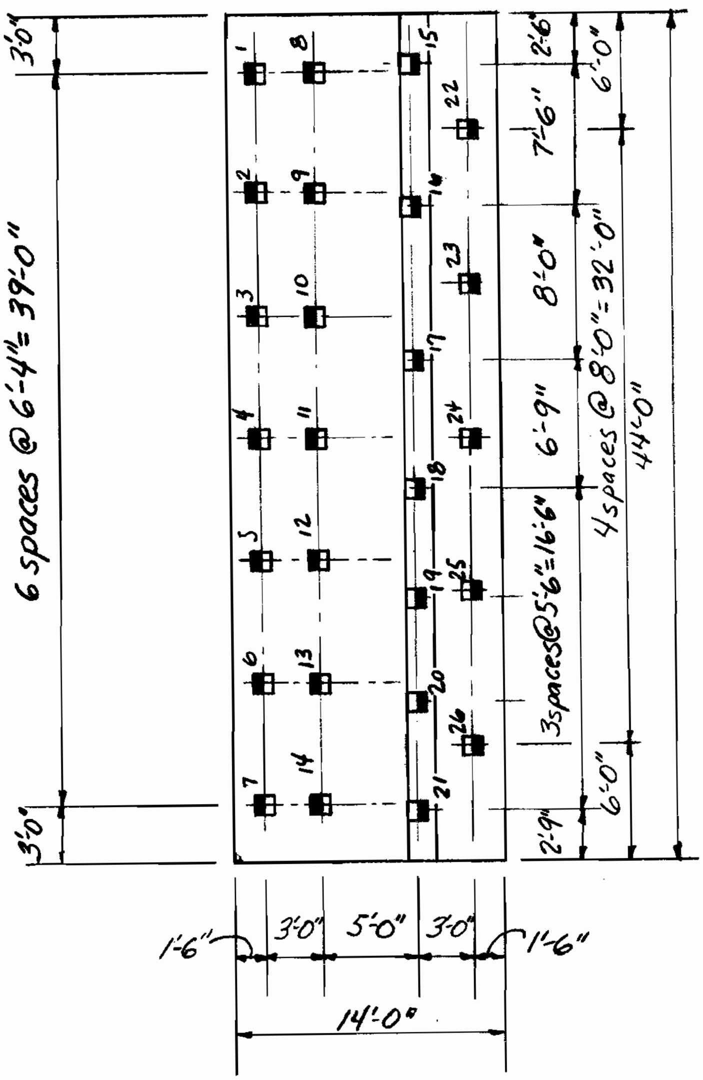


Impervious



Pervious

PROJECT	Page — of —	COMPUTED BY	DATE
Florida Avenue Complex-East		RJGr	Sep 76
SUBJECT		**CHECKED BY**	**DATE**
Monolith 11E - w/L sta. 3+67.9 to 4+11.9			



Batter 2:1 unless otherwise noted.

Protected Side

Flood Side

Max. Pile load, $P = {}^{+}79.98^{k}$ (Case 2 - Pervious)

$Q = -0.651^{k}$ (Case 2 - Pervious)

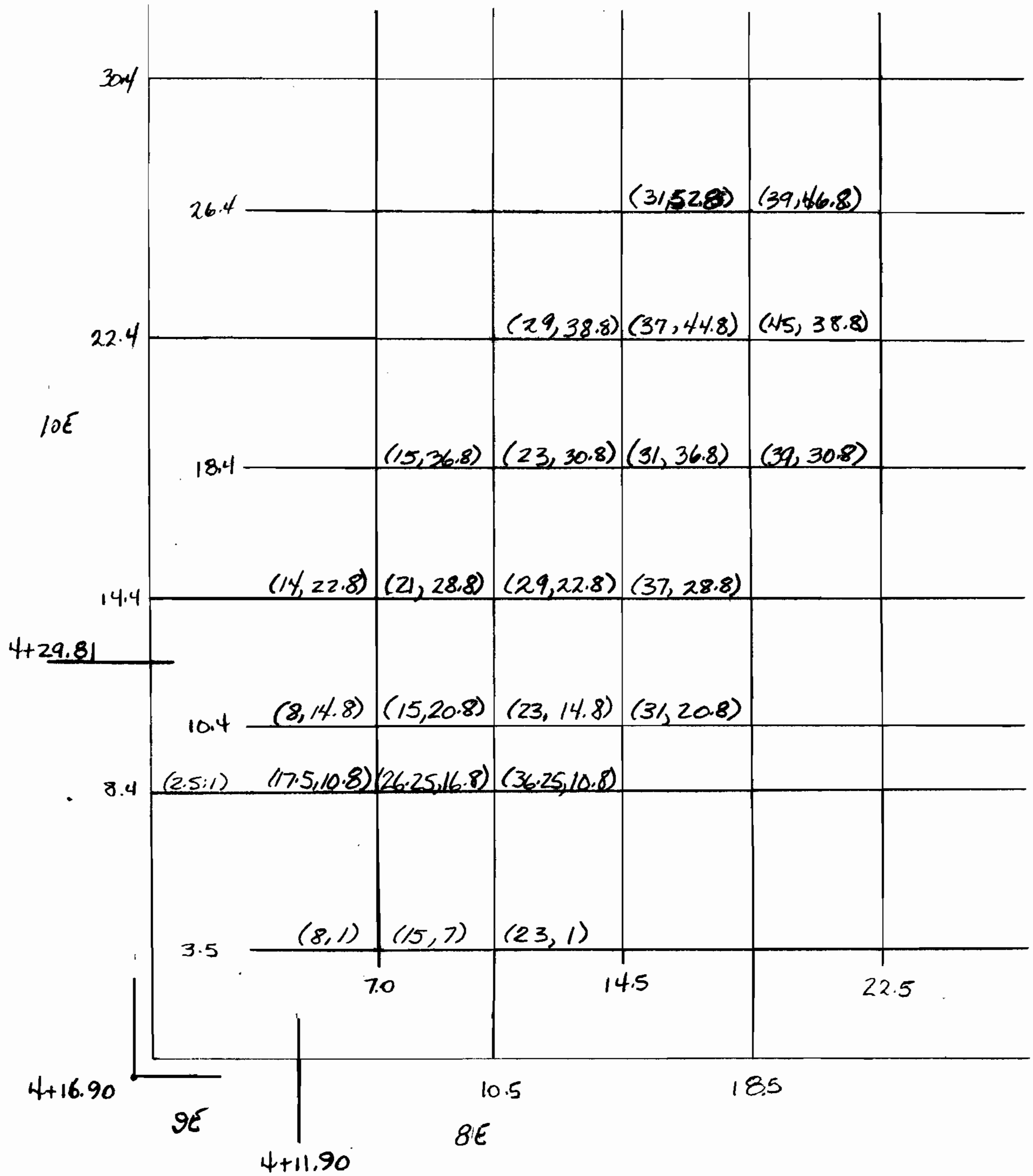
PROJECT	Page	COMPUTED BY	DATE
Florida Avenue Complex	Page 1 of 1	RJgr.	July 74
SUBJECT		**CHECKED BY**	**DATE**
East IHNC T-Wall Design - Interference Diag		HMB	July '74

Reqd. Depth = -53.0 (Elev.)

Depth in Concrete = 0.75

Depth Con. Base = -5.5 (Elev.)

∴ Depth of Pile = 48.25'



PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 2 of 3	HMB	July '74
SUBJECT: BARRIER PLAN - EAST OF IHNC 367.90 to 412.90		CHECKED BY: RJ gr.	DATE: June 74

T-Wall Mono 8E

$\boxed{11}$

ITEM	COMPUTATION	Fz	ARMy	Mx	ARMx	My
1	2.5x14x44.0x.150	231.00	7.0	-1617.00	22.0	-5082.00
2	1.0x17.0x44.0x.150	112.20	9.5	-1065.90	22.0	-2468.40
3	17x.708x44.0x.150/2	39.72	10.24	406.73	22.0	-873.84
	Concrete	382.92		-3089.63		-8424.24
Sub. Soil	1x12.292x44x.0575	31.10	6.60	-205.26	22.0	-684.20
Sat. Soil	31.10x.120/.0575	64.90	6.60	-428.34	22.0	-1427.80
Wt.water	9x17x44.0x.0625	420.75	4.5	-1893.38	22.0	-9256.50
Impervious Uplift	-.15625x14x44.0	-96.25	7.0	673.75	22.0	2117.50
	-1.0625xx7.0x44.0	-327.25	3.5	1145.38	22.0	7199.50
	Imp. Uplift	-423.50		1819.13		9317.00
Perviouse Uplift	-.15625x14x44.0	-96.25	7.0	673.75	22.0	2117.50
	-1.0625x14x44.0/2	-327.25	4.67	1528.26	22.0	7199.50
	Per. Uplift	-423.50		2202.01		9317.00

	HORIZONTAL LOAD	Fy	ARMz	Mx	ARMx	Mz
H1	-1.21875x19.5x44.0/2	-522.84	6.5	-3398.46	22.0	-11502.48
H2	.15625x2.5x44.0/2	8.59	0.83	7.13	22.0	188.98
	Hor. Load	-514.25		-3391.33		-11313.50

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
I	Impervious	0	-514.25	411.27	-6760.47	-9047.94	-11313.50
II	Pervious	0	-514.25	411.27	-6377.59	-9047.94	-11313.50
III	Dead Loads	0	0	447.82	-3517.97	-9852.04	0

```
SYSTEM ?FØRT ØLD D29010
READY
*LIS
CØMMAND UNKNØWN
*LIST

10 FLA. AVE. CØMPLEX IHNC EAST
20 T-WALL MØNØ    E8
30 4 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 6
110 4 11 18 25 32 39
140 6*-1.5
170 6*0
200 2 90 7
210 3 11 17 23 29 35 42
240 7*-4.5
270 7*0
300 2 270 6
310 2.5 10 18 26 34 42
340 6*-9.5
370 6*0
400 2 270 5
410 6 14 22 30 38
440 5*-12.5
470 5*0
2000 0 -514 411 -6760 -9048 -11314
2010 0 -514 411 -6378 -9048 -11314
2020 0 0 448 -3518 -9852 0

READY

*340 6*-12.5
*440 5*-9.5
*RESAVE D29010
DATA SAVED-D29010
*REMØVE D29010
*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED
```

MONO 11

```
    PRØG. NØ. 713-F3-A2-210            14:48:43   07/01/74

 FLA. AVE. CØMPLEX IHNC EAST
 T-WALL MØNØ    E8

TØTAL NUMBER ØF PILES =    24


           LØAD CØNDITIØN  1

         LØADS ØN PILE CAP
       X            Y            Z
```

```
          PILE LØADS (PILE AXIS)
PILE
 NØ.      X       Y        Z
  1    -0.6     0.0     -20.7
  7    -0.6     0.0     -32.0
 14     0.5     0.0      67.1
 20     0.5     0.0      78.3
   1       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1        -0.0  -514.0   411.0   -6760.0   -9048.0  -11314.0


           LØAD CØNDITIØN  2

         LØADS ØN PILE CAP
      X          Y          Z           MX          MY          MZ
      0.       -514.0      411.0    -6378.0    -9048.0   -11314.0

          PILE LØADS (PILE AXIS)
PILE
 NØ.      X       Y        Z
  1    -0.9     0.0     -10.0
  2    -0.9     0.0      -9.3
  3    -0.9     0.0      -8.5
  4    -0.9     0.0      -7.8
  5    -0.8     0.0      -7.0
  6    -0.8     0.0      -6.3
  7    -0.8     0.0     -41.8
  8    -0.8     0.0     -41.0
  9    -0.8     0.0     -40.3
 10    -0.8     0.0     -39.7
 11    -0.8     0.0     -39.1
 12    -0.8     0.0     -38.4
 13    -0.8     0.0     -37.7
 14     0.8     0.0      57.2
 20     0.7     0.0      88.8
   2       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2        -0.0  -514.0   411.0   -6378.0   -9048.0  -11314.0


           LØAD CØNDITIØN  3

         LØADS ØN PILE CAP
      X          Y          Z           MX          MY          MZ
      0.         0.        448.0    -3518.0    -9852.0         0.

          PILE LØADS (PILE AXIS)
PILE
 NØ.      X       Y        Z
  1     0.2    -0.0      10.6
  7     0.2    -0.0      28.3
  8     0.2    -0.0      27.8
 14    -0.3    -0.0      31.4
 20    -0.2    -0.0      13.8
   3       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3         -0.0     -0.0   448.0   -3518.0   -9852.0       0.0


   0    14:49:26   07/01/74    *** END ØF  RUN ***


STØP       EØJ

*TIME
14:53:24   07/01/74
*BYE
**RESØURCES USED $    4.36, USED TØ DATE $   205.85=   4%
**TIME SHARING ØFF AT  14.891 ØN   07/01/74
```

8	-0.4	0.0	-23.3
15	0.3	0.0	71.8
16	0.3	0.0	69.5
17	0.3	0.0	67.1
18	0.3	0.0	65.1
19	0.3	0.0	63.5
20	0.3	0.0	61.8
21	0.3	0.0	60.1
22	0.3	0.0	72.1
23	0.3	0.0	69.7
24	0.3	0.0	67.3
25	0.3	0.0	64.9
26	0.3	0.0	62.5

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-514.0	411.0	-6760.0	-9048.0	-11314.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-514.0	411.0	-6378.0	-9048.0	-11314.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.7	0.0	-14.7
8	-0.6	0.0	-32.5
	0.5	0.0	80.0
16	0.5	0.0	77.5
17	0.5	0.0	74.8
18	0.5	0.0	72.5
19	0.5	0.0	70.6
20	0.5	0.0	68.8
21	0.5	0.0	66.9
22	0.6	0.0	61.0
23	0.5	0.0	58.3
24	0.5	0.0	55.6
25	0.5	0.0	52.9
26	0.5	0.0	50.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-514.0	411.0	-6378.0	-9048.0	-11314.0

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	448.0	-3518.0	-9852.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	0.0	6.4
8	0.2	0.0	28.5
15	-0.3	0.0	13.4
22	-0.3	0.0	35.2

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	0.0	448.0	-3518.0	-9852.0	0.0

0 15:50:18 09/28/76 *** END OF RUN ***

STOP EOJ

```
LIA9STH D29010

0 3/76    15.69


10 FLORIDA AVENUE COMPLEX-EAST
20 MONO 11E,W/L STA. 3+67.9-4+11.9
30 3 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 14
110 3 9.33 15.67 22 28.33 34.67 41,
120 3 9.33 15.67 22 28.33 34.67 41
130 7*-1.5 7*-4.5
140 14*0
150 2 270 7
160 2.5 10 18 24.75 30.25 35.75 41.25
170 7*-9.5
180 7*0
190 2 270 5
200 6 14 22 30 38
210 5*-12.5
220 5*0
230 0 -514 411 -6760 -9048 -11314
2  0 -514 411 -6378 -9048 -11314
250 0 0 448 -3518 -9852 0

READY

*CLEAR
 AFT CLEARED

*RUN A2K90/K29010,E


    PROG. NO. 713-F3-A2-210          15:45: 5  09/28/76


 FLORIDA AVENUE COMPLEX-EAST
 MONO 11E,W/L STA. 3+67.9-4+11.9


TOTAL NUMBER OF PILES =   26



            LOAD CONDITION  1

          LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.       -514.0      411.0    -6760.0     -9048.0    -11314.0

           PILE LOADS (PILE AXIS)
PILE
 NO.     X     Y     Z
```

```
OLD P29010
READY
*LIST 12103-5@12129

12103        1  -0.651    0.007    -14.692       0.           0.           0.
12104        2  -0.641    0.007    -14.702       0.           0.           0.
12105        3  -0.631    0.007    -14.712       0.           0.           0.
12106        4  -0.620    0.007    -14.722       0.           0.           0.
12107        5  -0.610    0.007    -14.732       0.           0.           0.
12108        6  -0.600    0.007    -14.742       0.           0.           0.
12109        7  -0.590    0.007    -14.752       0.           0.           0.
12110        8  -0.617    0.003    -32.498       0.           0.           0.
12111        9  -0.607    0.003    -32.508       0.           0.           0.
12112       10  -0.597    0.003    -32.518       0.           0.           0.
12113       11  -0.586    0.003    -32.528       0.           0.           0.
12114       12  -0.576    0.003    -32.538       0.           0.           0.
12115       13  -0.566    0.003    -32.548       0.           0.           0.
12116       14  -0.556    0.003    -32.558       0.           0.           0.
12117       15   0.527    0.004     79.982       0.           0.           0.
12118       16   0.520    0.004     77.459       0.           0.           0.
12119       17   0.512    0.004     74.768       0.           0.           0.
12120       18   0.506    0.004     72.497       0.           0.           0.
12121       19   0.500    0.004     70.647       0.           0.           0.
12122       20   0.495    0.004     68.796       0.           0.           0.
1[illegible]3       21   0.490    0.004     66.946       0.           0.           0.
12124       22   0.558    0.008     60.998       0.           0.           0.
12125       23   0.550    0.008     58.307       0.           0.           0.
12126       24   0.542    0.008     55.615       0.           0.           0.
12127       25   0.535    0.008     52.924       0.           0.           0.
12128       26   0.527    0.008     50.233       0.           0.           0.
12129

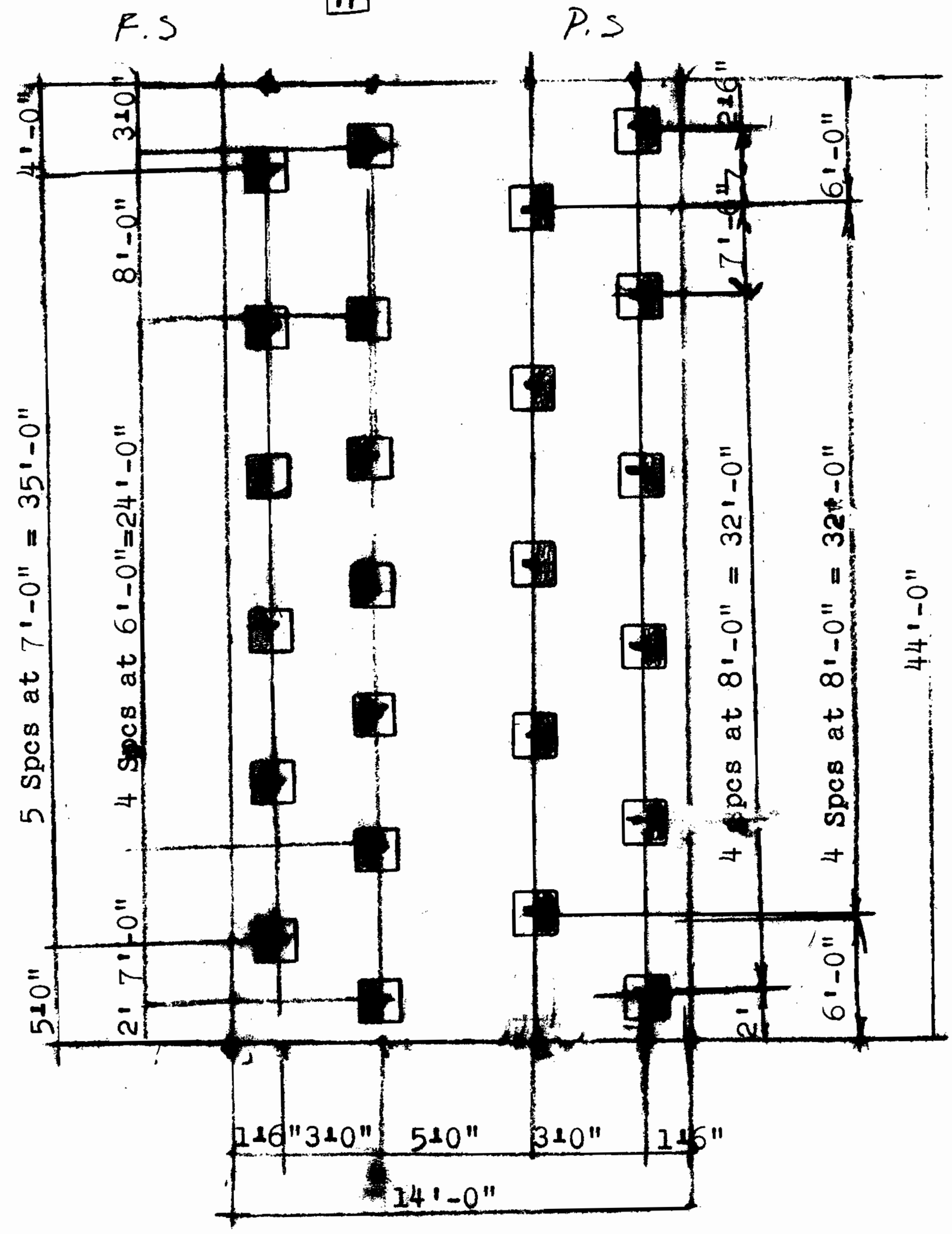
READY

*


STAT
PARITY ERROR
BYE
**RESOURCES USED $    6.92; USED TO DATE $   110.94=  2%
**TIME SHARING OFF AT   15.999 ON   09/28/76
```

PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	3 of —	HMB	July '74
SUBJECT BARRIER PLAN EAST OF IHNC 368.90 to 412.90		CHECKED BY RJG	DATE July 74

T-Wall Mono 8E



LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

Page — of —		
SUBJECT	CHECKED BY	DATE

EAST IHNC

MONOLITH $\boxed{12}$

```
  JH D29010

09/30/76     11.34


10 FLORIDA AVENUE COMPLEX-EAST
20 MONO 12E,W/L STA. 4+12.9-4+29.81
30 4 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 14
110 2 5 8 11 14 17.2 20.4 2 5 8 11 14 17.2 20.4
120 7*-1.5 7*-4.5
130 14*0
140 2 270 4
150 2 8.9 20.4 20.4
160 3*-12.5 -9.5
170 4*0
180 2 180 3
190 7.5 2*13.4
200 2*-9.5 -12.5
210 3*0
[illegible] 2.5 270 1
2[illegible] 4
240 -9.5
250 0
260 -85 -177 182 -2561 -1738 -2193
270 -85 -177 234 -2917 -2697 -2193
280 0 0 205 -1610 -2176 0

READY

* CLEAR
 AFT CLEARED

*RUN A2K90/K29010,E


    PROG. NO. 713-F3-A2-210          11:22:43  09/30/76


 FLORIDA AVENUE COMPLEX-EAST
 MONO 12E,W/L STA. 4+12.9-4+29.81


TOTAL NUMBER OF PILES =    22



              LOAD CONDITION   1

            LOADS ON PILE CAP
         X          Y          Z
READY
```

-85.0 -177.0 182.0 -25[illegible]

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.0	0.8	-0.2
[illegible]	-0.9	0.8	2.8
3	-0.9	0.8	5.7
4	-0.8	0.8	8.7
5	-0.8	0.8	11.6
6	-0.7	0.8	14.8
7	-0.7	0.8	17.9
8	-0.9	0.8	-41.2
9	-0.9	0.8	-38.2
10	-0.8	0.8	-35.3
11	-0.8	0.8	-32.3
12	-0.7	0.8	-29.4
13	-0.6	0.8	-26.2
14	-0.6	0.8	-23.1
15	0.9	-0.7	57.2
16	0.8	-0.7	35.8
17	0.6	-0.7	0.3
18	0.6	-0.7	41.3
19	0.7	0.8	70.8
20	0.7	0.7	64.6
21	0.7	0.7	17.5
22	0.8	-0.7	74.8

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-85.0	-177.0	182.0	-2561.0	-1738.0	-2193.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-85.0	-177.0	234.0	-2917.0	-2697.0	-2193.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.0	0.8	-1.3
2	-1.0	0.8	2.9
3	-0.9	0.8	7.0
4	-0.9	0.8	11.2
5	-0.8	0.8	15.4
6	-0.8	0.8	19.8
7	-0.7	0.8	24.3
8	-0.9	0.8	-43.4
9	-0.9	0.8	-39.2
10	-0.8	0.8	-35.0
11	-0.8	0.8	-30.8
12	-0.7	0.8	-26.7
13	-0.7	0.8	-22.2
14	-0.6	0.8	-17.7
15	0.9	-0.6	56.6
	0.8	-0.6	39.7
17	0.7	-0.6	11.4
18	0.6	-0.7	53.4
19	0.6	0.8	69.4
20	0.6	0.7	66.3
21	0.7	0.7	18.5

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-85.0	-177.0	234.0	-2917.0	-2697.0	-2193.0

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	205.0	-1610.0	-2176.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	-0.2	4.5
8	-0.0	-0.2	11.6
15	-0.1	0.2	27.3
16	-0.1	0.2	25.6
17	-0.1	0.2	22.7
18	-0.1	0.2	15.7
19	-0.2	-0.0	1.1
20	-0.2	-0.0	0.2
21	-0.2	-0.0	6.9
22	-0.0	0.2	20.9

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	-0.0	0.0	205.0	-1610.0	-2176.0	0.0

0 11:24:11 09/30/76 *** END OF RUN ***

STOP EOJ

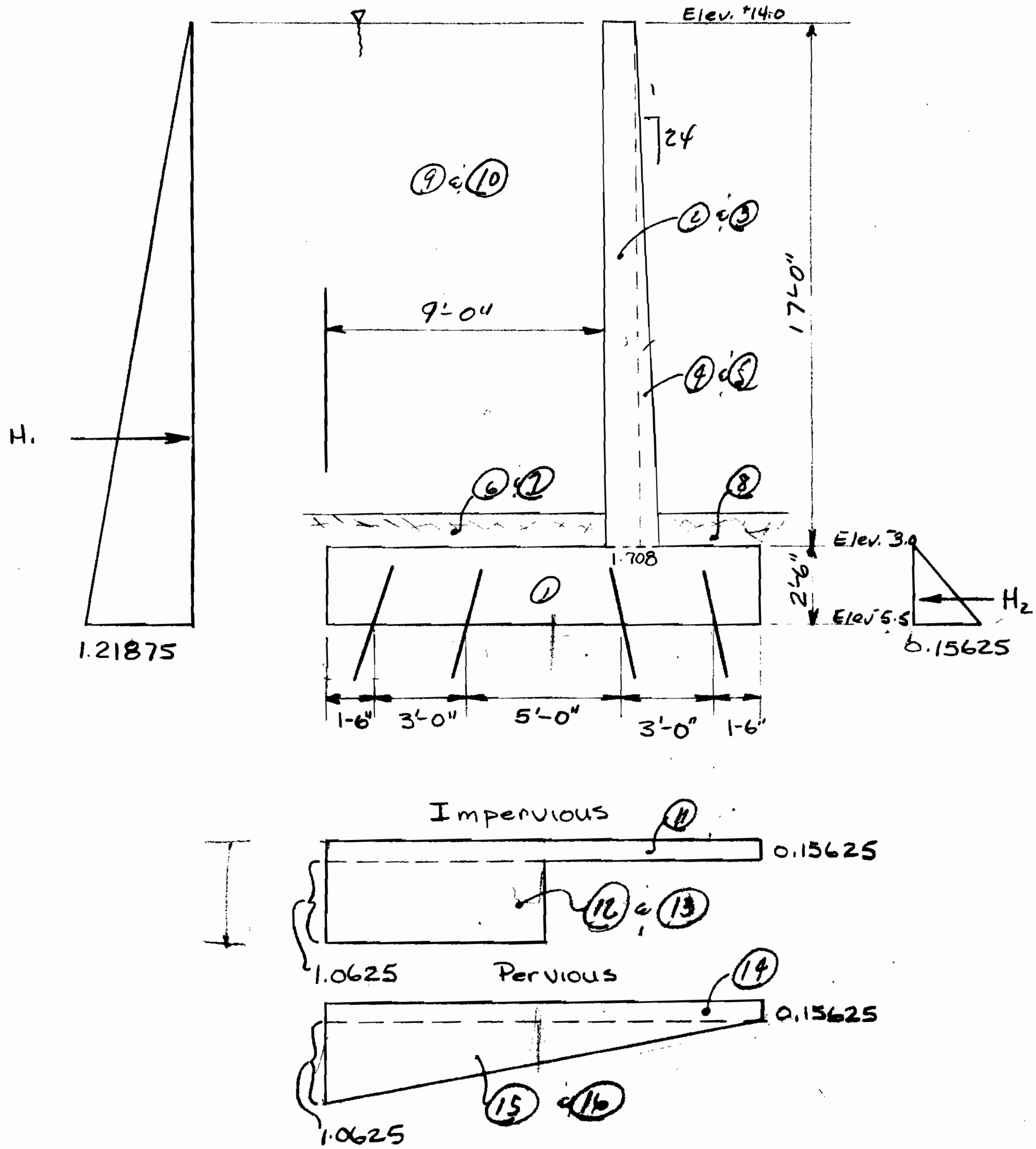
*OLD P29010
READY
*LIST 12103-12125

12103	1	-1.012	0.814	-1.314	0.	0.	0.
12104	2	-0.965	0.814	2.863	0.	0.	0.
12105	3	-0.917	0.814	7.039	0.	0.	0.
12106	4	-0.870	0.814	11.216	0.	0.	0.
12107	5	-0.823	0.814	15.393	0.	0.	0.
12108	6	-0.772	0.814	19.848	0.	0.	0.
12109	7	-0.722	0.814	24.303	0.	0.	0.
12110	8	-0.932	0.765	-43.365	0.	0.	0.
12111	9	-0.884	0.765	-39.188	0.	0.	0.
12112	10	-0.837	0.765	-35.011	0.	0.	0.
12113	11	-0.790	0.765	-30.834	0.	0.	0.
12114	12	-0.742	0.765	-26.658	0.	0.	0.
12115	13	-0.692	0.765	-22.203	0.	0.	0.
12116	14	-0.641	0.765	-17.748	0.	0.	0.
12117	15	0.906	-0.633	56.645	0.	0.	0.
12118	16	0.811	-0.633	39.661	0.	0.	0.
12119	17	0.654	-0.633	11.354	0.	0.	0.
1[illegible]20	18	0.573	-0.682	53.405	0.	0.	0.
1[illegible]21	19	0.630	0.817	69.440	0.	0.	0.
12122	20	0.636	0.719	66.286	0.	0.	0.
12123	21	0.672	0.719	18.455	0.	0.	0.
12124	22	0.825	-0.682	76.120	0.	0.	0.
12125							

PROJECT Florida Avenue Complex	Page 1 of 4	COMPUTED BY RJg	DATE 6-21-74
SUBJECT East IHNC T-Wall Design - 4+11.90 To 4+29.81		CHECKED BY HMB	DATE June '74

T-Wall Mono 9E

12



PROJECT Florida Avenue Complex	Page 2 of 4	COMPUTED BY RJQ	DATE 6-21-74
SUBJECT East IHNC T-Wall Design- 4+11.90 To 4+29.81		CHECKED BY HMB	DATE June '74

T-Wall Mono 9E

$\boxed{12}$

ITEM	COMPUTATIONS	Fz	Army	Mx	Armx	My
1	Concrete Only					
①	(2.5)(14.0)(21.91)(0.150)	115.03	7.0	805.19	10.955	1260.13
②	(1.0)(12.91)(17.0)(0.150)	32.92	9.5	312.74	6.455	212.50
③	(1.0)(4.0)(17.0)(0.150)	10.20	12.0	122.40	12.41	126.58
④	(½)(17.0)(0.708)(11.20)(0.150)	10.11	10.236	103.49	5.6	56.62
⑤	(½)(17.0)(0.708)(4.0)(0.150)	3.61	12.0	43.32	11.67	42.13
$\boxed{1}$	SUBTOTAL CONCRETE ONLY	+171.87		−1387.14		−1697.96
	Submerged Soil					
⑥	(1.0)(21.91)(9.0)(0.0575)	11.34	4.5	51.02	10.955	124.21
⑦	(1.0)(9.0)(5.0)(0.0575)	2.58	11.5	29.76	17.41	45.05
⑧	(1.0)(11.20)(3.292)(0.0575)	2.12	12.354	26.19	5.6	11.87
$\boxed{2}$	SUBTOTAL SUBM. SOIL	+16.04		−106.97		181.13
$\boxed{3}$	Saturated Soil $\frac{0.120}{0.0575} \times \boxed{2}$	+33.47		−223.24		−378.01
	Water Weight					
⑨	(9.0)(21.91)(17.0)(0.0625)	209.51	4.5	942.81	10.955	2295.23
⑩	(9.0)(5.0)(17.0)(0.0625)	47.81	11.5	549.84	17.41	832.42
$\boxed{4}$	SUBTOTAL WATER WT.	+257.32		−1492.65		3127.65
	Impervious Uplift					
⑪	−(0.15625)(21.91)(14.0)	47.93	7.0	335.50	10.955	525.05
⑫	−(1.0625)(7.0)(7.0)	52.06	10.5	546.63	18.41	958.47
⑬	−(1.0625)(7.0)(21.91)	162.96	3.5	570.34	10.955	1785.18
$\boxed{5}$	SUBTOTAL IMPER. UPLIFT	−262.95		+1452.4[illegible]		+3268.70
	PERVIOUS UPLIFT					
⑭	−(0.15625)(21.91)(14.0)	47.93	7.0	335.50	10.955	525.05
⑮	−(½)(1.0625)(14.0)(7.91)	58.83	4.67	274.74	3.955	232.68
⑯	−(½)(1.0625)(14.0)(14.0)	104.13	4.67	486.24	14.91	1552.50
$\boxed{6}$	SUBTOTAL PER. UPLIFT	−210.89		+1096.50		+2310.23

PROJECT Florida Avenue Complex

Page 3 of 4

COMPUTED BY RJG DATE 6-21-74

SUBJECT East IHNC T-Wall Design - 4+11.90 To 4+29.81

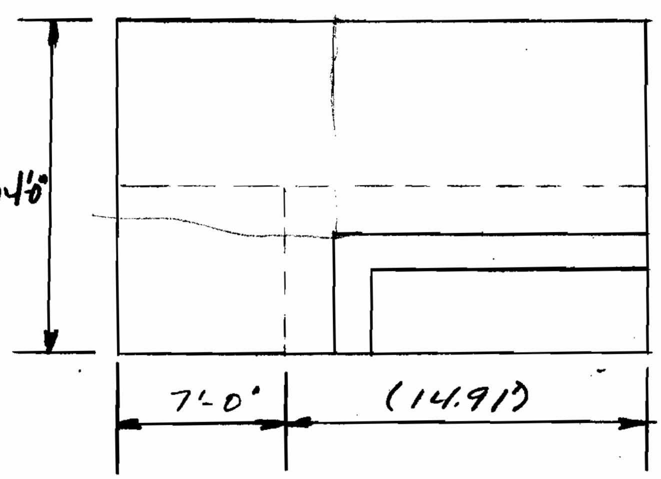
CHECKED BY HMB DATE June '74

T-Wall Mono 9E

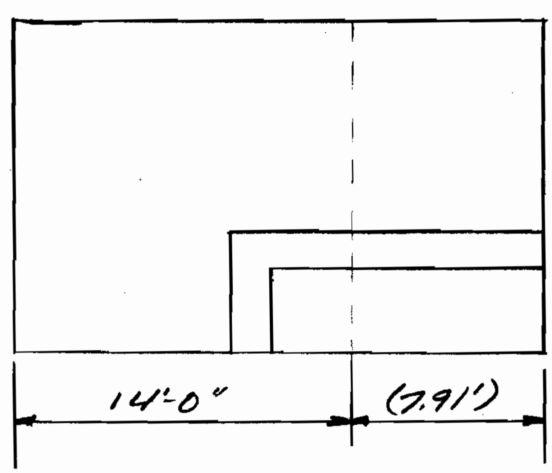
12

Item	Computations	$F_{x,y}$	Arm_z	$M_{x,y}$	$Arm_{x,y}$	M_z
	Horizontal Loads					
17	½(1.21875)(19.5)(12.91)	‾153.41 $^{-y}$	6.5	‾997.15 ^{x}	6.455	‾980.24
18	½(1.21875)(19.5)(5.0)	-59.41 $^{-x}$	6.5	+386.19 ^{y}	11.5	‾683.26
19	½(0.15625)(2.5)(7.91)	+ 1.54 ^{y}	0.83	+1.28 ^{x}	4.455	+6.86
20	½(9.0)(0.15625)(17+19.5)	-25.66 ^{x}	1.22	+31.31 ^{y}	4.50	‾115.47
21	½(9.0)(0.15625)(17+19.5)	-25.66 ^{y}	1.22	-31.31 ^{x}	16.41	‾421.08
7	Subtotal Horizontal x	‾85.07		‾1027.18		‾2193.19
	Forces y	‾177.33		+417.50		

Case	Loadings	F_x	F_y	F_z	M_x	M_y	M_z
I	Impervious	‾85.07	‾177.33	+182.28	‾2561.45	‾[illegible]	‾2193.19
II	Pervious	‾85.07	‾177.33	+234.34	‾2917.44	[illegible]	‾2193.[illegible]
III	Dead Load	0.0	0.0	+205.34	7610.38	‾2175.97	0.0



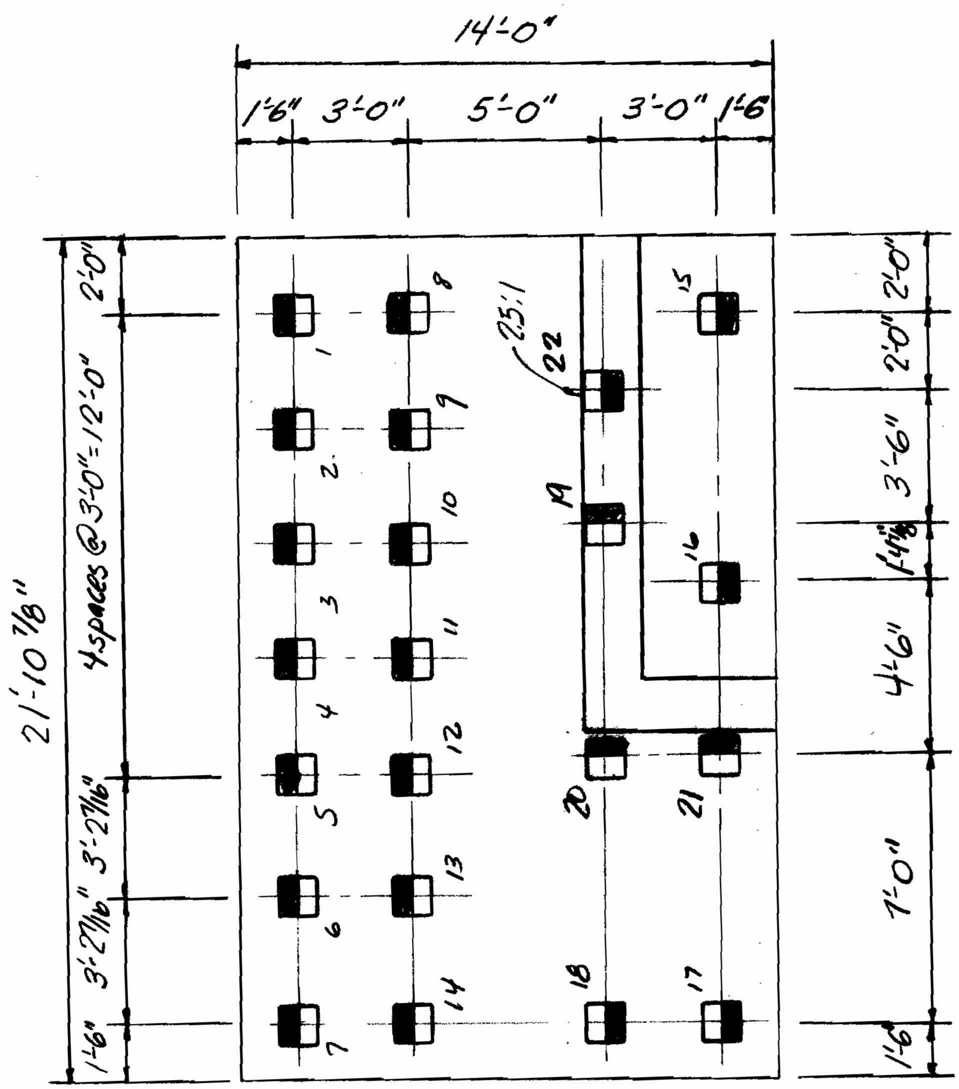
Impervious



Pervious

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT Florida Avenue Complex - East	Page 4 of 4	COMPUTED BY RJGr	DATE Sep 76
SUBJECT Mono 12E - W/L sta. 4+11.9 to 4+29.81		CHECKED BY	DATE



Batter 2:1 unless otherwise noted.

Flood Side

Protected Side

Protected Side

Max. Pile load, $P = -43.37^K$ (Case 2 - pervious)

$Q = -1.012^K$ (Case 2 - pervious)

06/28/74 15.50

MONO 12

11

10 FLØRIDA AVENUE CØM.-MØNØ 9E, 4+~~12~~.90 TØ 429.81
20 EAST IHNC T-WALL ANALYSIS-L = 21.91 FT., H = 19.5 FT.
30 4,3
40 2,0,60
50 1,12,12
60 1,5.0
70 0,450
80 0.0,0.0,0.0,0.0
100 2.0,90.0,10
110 2.0,6.0,10.0,15.5,20.4,✓
120 2.0,6.0,10.0,15.5,20.4 ✓
140 5*-1.5,5*-4.5
170 10*0.0
200 2.0,270.0,4
210 2.0,8.9,20.4,20.4
240 3*-12.5,-9.5
270 4*0.0
300 2.0,180.0,3
310 7.5,2*13.4
340 2*-9.5,-12.5
370 3*0.0
400 2.5,270.0,1
410 4.0
440 -9.5
470 0.0 - 2137 -2453
2000 -85.07,-171.63,182.28,~~-2554.35~~,-2155.54,-2108.76
2010 -85.07,-171.63,234.34,~~-2910.32~~,-3114.01,-2108.76
2020 0.0,0.0,205.34,-1610.38,-2175.97,0.0

READY

void

*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC UNDEFINED

PRØG. NØ. 713-F3-A2-210 15:31:59 06/28/74

FLØRIDA AVENUE CØM.-MØNØ 9E, 4+12.90 TØ 429.81
EAST IHNC T-WALL ANALYSIS-L = 21.91 FT., H = 19.5 FT.

TØTAL NUMBER ØF PILES = 18

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
-85.1	-171.6	182.3	-2554.4	-2155.5	-2108.8

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-1.1	1.0	-6.4

2	-1.0	1.0	0.4
3	-1.0	1.0	7.3
4	-0.9	1.0	16.7
5	-0.8	1.0	25.0
6	-1.0	0.9	-55.6
7	-1.0	0.9	-48.8
8	-0.9	0.9	-41.9
9	-0.8	0.9	-32.5
10	-0.7	0.9	-24.2
11	1.0	-0.8	48.7
12	0.9	-0.8	30.8
13	0.7	-0.8	1.1
14	0.7	-0.8	50.3
15	0.8	0.9	72.3
16	0.8	0.8	69.7
17	0.8	0.8	14.1
18	0.9	-0.8	72.7

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	-85.1	-171.6	182.3	-2554.3	-2155.5	-2108.8

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
-85.1	-171.6	234.3	-2910.3	-3114.0	-2108.8

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-1.1	0.9	-7.3
2	-1.1	0.9	1.6
3	-1.0	0.9	10.4
4	-0.9	0.9	22.6
5	-0.8	0.9	33.5
6	-1.0	0.9	-57.9
7	-1.0	0.9	-49.0
8	-0.9	0.9	-40.1
9	-0.8	0.9	-27.9
10	-0.8	0.9	-17.0
11	1.1	-0.7	48.1
12	0.9	-0.7	34.6
13	0.8	-0.7	12.1
14	0.7	-0.8	62.7
15	0.7	0.9	70.8
16	0.7	0.8	71.6
17	0.8	0.8	14.8
18	1.0	-0.8	74.2

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	-85.1	-171.6	234.3	-2910.3	-3114.0	-2108.8

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	205.3	-1610.4	-2176.0	0.

PILE LØADS (PILE AXIS)

PILE

NØ.	X	Y	Z
1	0.0	-0.2	6.5
6	0.0	-0.2	14.8
11	-0.1	0.2	27.7
12	-0.1	0.2	26.1
13	-0.1	0.2	23.4
14	-0.1	0.2	15.2
15	-0.2	-0.0	0.4
16	-0.2	-0.1	-0.2
17	-0.2	-0.1	7.7
18	-0.1	0.2	20.7

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3 -0.0 0.0 205.3 -1610.4 -2176.0 -0.0

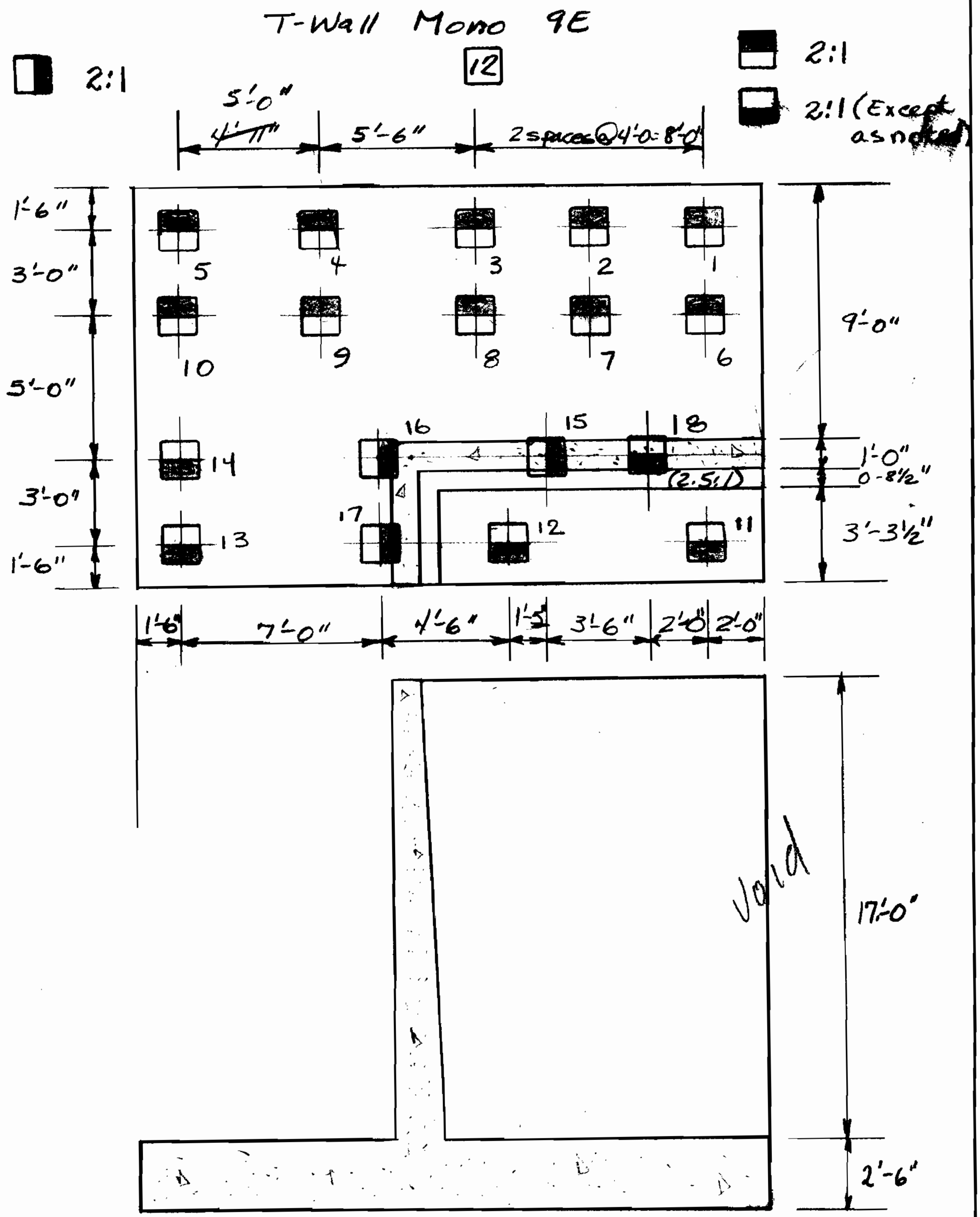
0 15:32:47 06/28/74 *** END ØF RUN ***

STØP EØJ

*TIME
15:37:54 06/28/74
*BYE
**RESØURCES USED $ 20.48, USED TØ DATE $ 157.93= 3%
**TIME SHARING ØFF AT 15.633 ØN 06/28/74

PROJECT Florida Avenue Complex	Page 4 of 4	COMPUTED BY RJG	DATE 6-21-74
SUBJECT East IHNC T-Wall Design – 4+16.90 To 4+29.81		CHECKED BY HMB	DATE June '74

T-Wall Mono 9E



PROJECT | Page __ of __ | COMPUTED BY | DATE

SUBJECT | CHECKED BY | DATE

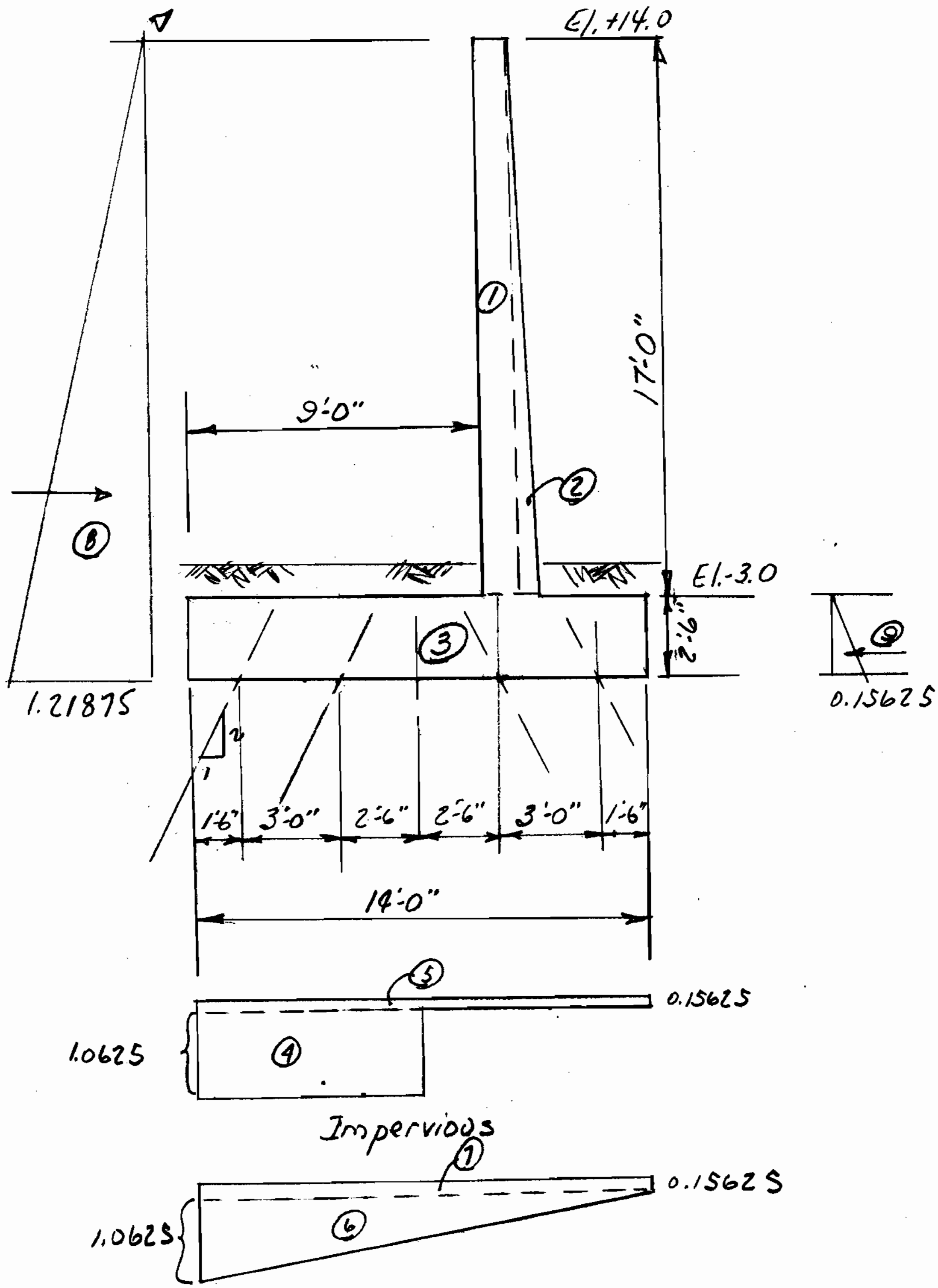
EAST IHNC

MONOLITH $\boxed{13}$

PROJECT FLORIDA AVENUE COMPLEX	Page 1 of 4	COMPUTED BY JGB	DATE 9 JUL 74
SUBJECT EAST IHNC T-WALL DESIGN - 4+29.81 TO 4+73.81		CHECKED BY PJM	DATE 26 Jul 74

T-WALL MONO 10E

$\boxed{13}$



PROJECT FLORIDA AVENUE COMPLEX	Page 2 of 4	COMPUTED BY JGB	DATE 21 JUN 74
SUBJECT EAST IHNC T-WALL DESIGN - 4+29.81 to 4+73.81		CHECKED BY RDG	DATE 1 Jul 74

T-WALL MONO 10 E $\boxed{13}$

14'-0" Base Slab

Item	Computation F_z	Arm_y	M_x	Arm_x	M_y
	Concrete				
①	(2.5)(14.0)(45.0*)(0.150) = 236.25	7.0	1653.75	22.5	5315.63
②	(1.0) (17.0) (45.0) (0.150) = 114.75	9.5	1090.13	22.5	2581.88
③	½ (17.0)(0.708)(45.0)(0.150) = 40.62	10.236	415.80	22.5	913.98
$\boxed{1}$	SUBTOTAL CONCRETE 391.62		-3159.68		-8811.49
	Submerged Soil				
$\boxed{2}$	(1.0)(12.292)(45.0)(0.0515) = 31.81	6.60	-209.92	22.5	-715.62
$\boxed{3}$	Saturated Soil $\frac{0.120}{0.0515} \times \boxed{2}$ = 66.39		-438.09		-1493.47
$\boxed{4}$	Water weight (9.0)(17.0)(45.0)(0.0625) = 430.31	4.5	-1936.41	22.5	-9682.03
	Impervious Uplift				
④	− (1.0625)(7.0)(45.0) = − 334.69	3.5	+1171.41	22.5	+7530.47
⑤	- (0.15625)(14.0)(45.0) = − 98.44	7.0	+689.06	22.5	+2214.84
$\boxed{5}$	SUBTOTAL IMP. UPLIFT -433.13		+1869.47		+9745.31
	Pervious Uplift				
⑥	− ½(1.0625)(14.0)(45.0) = -334.69	4.67	+1562.99	22.5	+7530.47
⑦	− (0.15625)(14.0)(45.0) − 98.44	7.0	+689.06	22.5	+2214.84
$\boxed{6}$	SUBTOTAL PERV. UPLIFT − 433.13		+2252.05		+9745.31

*Monolith Length changed to 44'-0". Revision not significant to warrant revision of comps.

PROJECT FLORIDA AVENUE COMPLEX	Page 3 of 4	COMPUTED BY JGB	DATE 21 JUN 74
SUBJECT EAST INWC T-WALL DESIGN 4+29.81 to 4+73.81		CHECKED BY RJg	DATE 1 Jul 74

T-WALL MONO 10E
14'-0" Base Slab $\boxed{13}$

Item	Computation F_y	Arm_z	M_x	Arm_x	M_z
	Horizontal Load				
8	$-\frac{1}{2}(1.21875)(19.5)(45.0) = -534.73$	6.5	-3475.72	22.5	-12031.35
9	$+\frac{1}{2}(0.1565)(2.5)(45.0) = +8.79$	0.83	+ 7.29	22.5	+197.75
$\boxed{7}$	SUBTOTAL HOR. LOAD -525.94		-3468.43		-11833.60

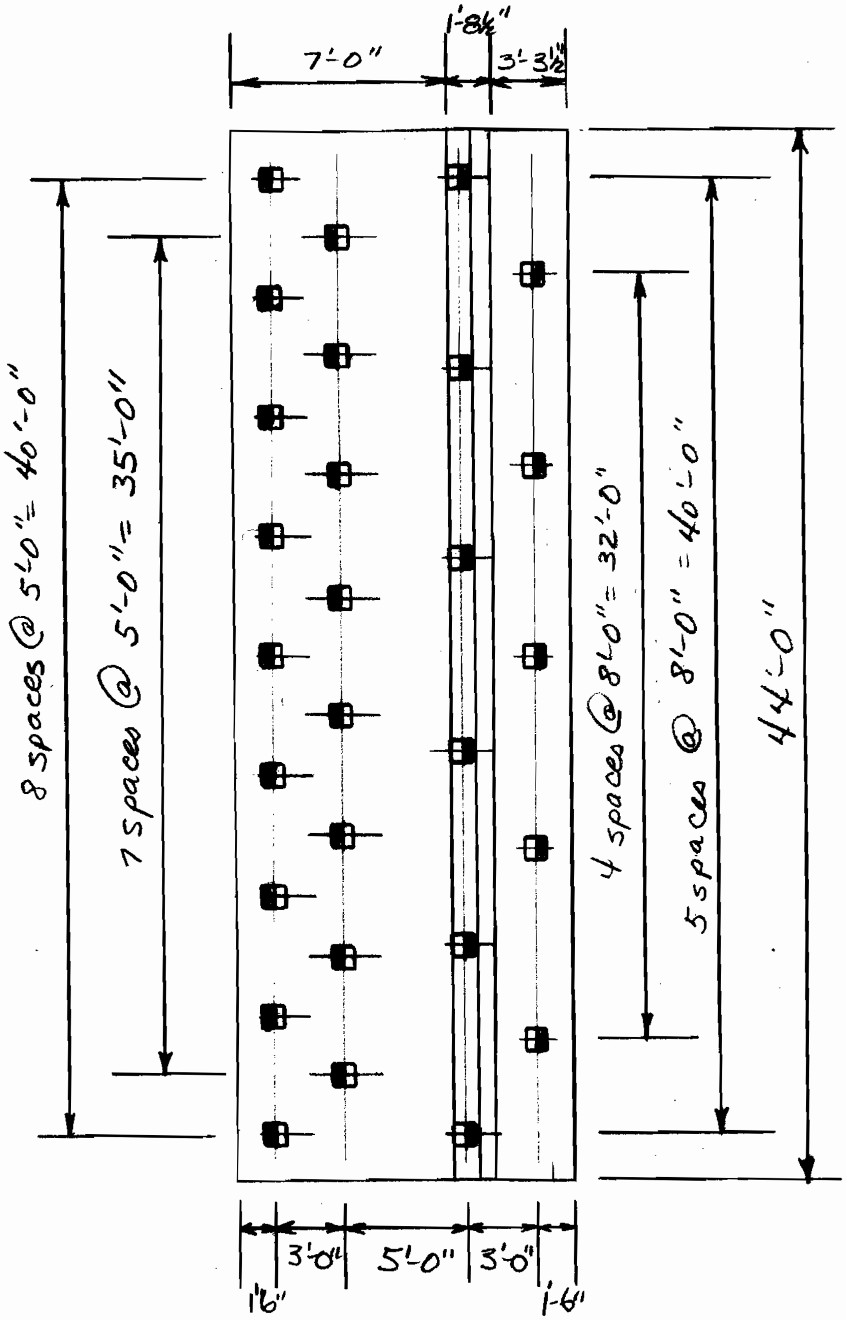
CASE	LOADINGS	F_x	F_y	F_z	M_x	M_y	M_z
I	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{5}+\boxed{7}$	0	-525.94	420.61	-6904.97	-9463.93	-11833.60
II	$\boxed{1}+\boxed{2}+\boxed{4}+\boxed{6}+\boxed{7}$	0	-525.94	420.61	-6522.39	-9463.93	-11833.60
III	$\boxed{1}+\boxed{3}$	0	0	458.01	-3591.77	-10304.66	0

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT Florida Avenue Complex	Page 4 of 4	COMPUTED BY RJG	DATE July 74
SUBJECT East IHNC T-Wall Design - 4+29.81 To 4+73.81		CHECKED BY HMB	DATE July '74

T-WALL MONO 10E

13



2:1

2:1

Vouf

```
LISTH D29010

09/29/76    13.05


10 FLORIDA AVENUE COMPLEX-EAST
20 MONO 13E;W/L STA. 4+29.81-4+)79.81
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 17
110 2 7 12 17 22 27 32 37 42;
120 4.5 9.5 14.5 19.5 24.5 29.5 34.5 39.5
130 9*-1.5 8*-4.5
140 17*0
150 2 270 13
160 2 7.33 12.67 18 23.33 28.67 34 42;
170 6 14 22 30 38
180 8*-9.5 5*-12.5
190 13*0
200 0 -526 421 -6905 -9464 -11834
210 0 -526 421 -6522 -9464 -11834
220 0 0 458 -3598 -10305 0

READY

*C EAR
 h f CLEARED

*RUN A2K90/K29010;E


    PROG. NO. 713-F3-A2-210            13: 4:50  09/29/76


 FLORIDA AVENUE COMPLEX-EAST
 MONO 13E;W/L STA. 4+29.81-4+)79.81


TOTAL NUMBER OF PILES =   30




            LOAD CONDITION  1

          LOADS ON PILE CAP
      X         Y         Z          MX         MY         MZ
      0.      -526.0     421.0    -6905.0    -9464.0   -11834.0

           PILE LOADS (PILE AXIS)
PILE
          X        Y         Z
  1    -0.3     -0.0     -20.1
 10    -0.3     -0.0     -17.8
 18     0.2     -0.0      52.8
 19     0.2     -0.0      55.2
 20     0.2     -0.0      57.7
```

21	0.2	-0.0	60.1
22	0.3	-0.0	62.5
23	0.3	-0.0	65.0
24	0.3	-0.0	67.4
25	0.3	-0.0	71.1
	0.2	-0.0	57.1
27	0.2	-0.0	60.8
28	0.2	-0.0	64.4
29	0.3	-0.0	68.1
30	0.3	-0.0	71.8

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1 0.0 -526.0 421.0 -6905.0 -9464.0 -11834.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-526.0	421.0	-6522.0	-9464.0	-11834.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	-0.0	-11.8
10	-0.5	-0.0	-26.3
18	0.4	-0.0	58.3
19	0.4	-0.0	60.9
20	0.4	-0.0	63.4
21	0.4	-0.0	66.0
	0.4	-0.0	68.6
23	0.5	-0.0	71.2
24	0.5	-0.0	73.7
25	0.5	-0.0	77.6
26	0.4	-0.0	45.9
27	0.5	-0.0	49.8
28	0.5	-0.0	53.6
29	0.5	-0.0	57.5
30	0.5	-0.0	61.3

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 0.0 -526.0 421.0 -6522.0 -9464.0 -11834.0

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	458.0	-3598.0	-10305.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	-0.0	3.4
	0.2	-0.0	25.3
18	-0.3	-0.0	9.7
19	-0.3	-0.0	10.3
20	-0.3	-0.0	10.9
21	-0.3	-0.0	11.5
22	-0.3	-0.0	12.1

```
 25    -0.3    -0.0      14.2
 26    -0.3    -0.0      31.9
 27    -0.3    -0.0      32.8
 28    -0.3    -0.0      33.7
 29    -0.3    -0.0      34.6
 30    -0.3    -0.0      35.5
   3      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   3         0.0       0.0    458.0    -3598.0   -10305.0        0.0


   0   13: 5:57  09/29/76    *** END OF  RUN ***


STOP        EOJ

*






OLD P29010
READY
*LIST 12103-12132

12103        1  -0.495  -0.011    -11.823      0.         0.         0.
12104        2  -0.508  -0.011    -12.164      0.         0.         0.
12105        3  -0.520  -0.011    -12.506      0.         0.         0.
12106        4  -0.533  -0.011    -12.847      0.         0.         0.
12107        5  -0.545  -0.011    -13.189      0.         0.         0.
12108        6  -0.558  -0.011    -13.530      0.         0.         0.
12109        7  -0.570  -0.011    -13.872      0.         0.         0.
12110        8  -0.583  -0.011    -14.213      0.         0.         0.
12111        9  -0.595  -0.011    -14.554      0.         0.         0.
12112       10  -0.474  -0.004    -26.298      0.         0.         0.
12113       11  -0.486  -0.004    -26.640      0.         0.         0.
12114       12  -0.499  -0.004    -26.981      0.         0.         0.
12115       13  -0.511  -0.004    -27.322      0.         0.         0.
12116       14  -0.524  -0.004    -27.664      0.         0.         0.
12117       15  -0.537  -0.004    -28.005      0.         0.         0.
12118       16  -0.549  -0.004    -28.347      0.         0.         0.
12119       17  -0.562  -0.004    -28.688      0.         0.         0.
12120       18   0.406  -0.008     58.282      0.         0.         0.
12121       19   0.415  -0.008     60.854      0.         0.         0.
12122       20   0.424  -0.008     63.431      0.         0.         0.
12123       21   0.434  -0.008     66.002      0.         0.         0.
12124       22   0.443  -0.008     68.574      0.         0.         0.
12125       23   0.452  -0.008     71.150      0.         0.         0.
12126       24   0.461  -0.008     73.722      0.         0.         0.
12127       25   0.475  -0.008     77.582      0.         0.         0.
12128       26   0.440  -0.015     45.908      0.         0.         0.
12129       27   0.454  -0.015     49.768      0.         0.         0.
12130       28   0.468  -0.015     53.628      0.         0.         0.
12131       29   0.481  -0.015     57.488      0.         0.         0.
12132       30   0.495  -0.015     61.347      0.         0.         0.

READY

*
```

```
LISTH D29010

07/02/74     12.07

10 FLØRIDA AVENUE CØMPLEX
20 EAST IHNC T-WALL ANALYSIS MØNØ10E
30 2,3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 290 17
110 2.5 7.5 12.5 17.5 22.5 27.5 32.5 37.5 42.5,
120 5.0 10.0,15.0,20.0,25.0 30.0 35.0 40.0
130 9*-1.5,8*-4.5
140 17*0
150 2 270 11
160 2.5,10.5 18.5 26.5 34.5 42.5,
170 6.5 14.5 22.5 30.5 38.5
180 6*-9.5 5*-12.5
190 11*0
200 0 -526 421 -6905 -9464 -11834
300 0 -526 421 -6522 -9464 -11834
400 0   0  458 -3598 -10305    0

READY

*100 2 90 17
*RESAVE D29010
DATA SAVED-D29010
*REMØVE D29010
*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED
```

MONO 13

```
    PRØG. NØ. 713-F3-A2-210              12: 6:17  07/02/74

 FLØRIDA AVENUE CØMPLEX
 EAST IHNC T-WALL ANALYSIS MØNØ10E

TØTAL NUMBER ØF PILES =   28

           LØAD CØNDITIØN   1

         LØADS ØN PILE CAP
      X          Y          Z          MX          MY          MZ
      0.      -526.0      421.0     -6905.0     -9464.0    -11834.0

          PILE LØADS (PILE AXIS)
PILE
```

```
  1    -0.5      0.0      -1[illegible].2
 10    -0.5      0.0      -22.2
 18     0.4      0.0       75.5
 24     0.4      0.0       71.6
   1      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1         0.0  -526.0    421.0    -6905.0    -9464.0  -11834.0


           LØAD CØNDITIØN   2

         LØADS ØN PILE CAP
       X           Y           Z            MX           MY          MZ
       0.       -526.0      421.0     -6522.0      -9464.0   -11834.0

           PILE LØADS (PILE AXIS)
PILE
 NØ.       X         Y          Z
  1     -0.7       0.0       -9.6
 10     -0.7       0.0      -31.1
 18      0.6       0.0       82.9
 24      0.6       0.0       61.5
   2      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2         0.0  -526.0    421.0    -6522.0    -9464.0  -11834.0


           LØAD CØNDITIØN   3

         LØADS ØN PILE CAP
       X           Y           Z            MX           MY          MZ
       0.          0.       458.0     -3598.0    -10305.0          0.

           PILE LØADS (PILE AXIS)
PILE
 NØ.       X         Y          Z
  1      0.2       0.0        4.9
 10      0.2       0.0       25.7
 18     -0.2      -0.0       14.4
 24     -0.3      -0.0       35.2
   3      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3         0.0     -0.0   458.0    -3598.0   -10305.0       -0.0


   0    12: 6:29   07/02/74    *** END ØF   RUN ***


STØP       EØJ

*TIME
12:10:08   07/02/74
*BYE
**RESØURCES USED $    4.98, USED TØ DATE $  218.02=   4%
**TIME SHARING ØFF AT  12.170 ØN   07/02/74
```

Void

T-WALL MONOLITHS EAST IHNC

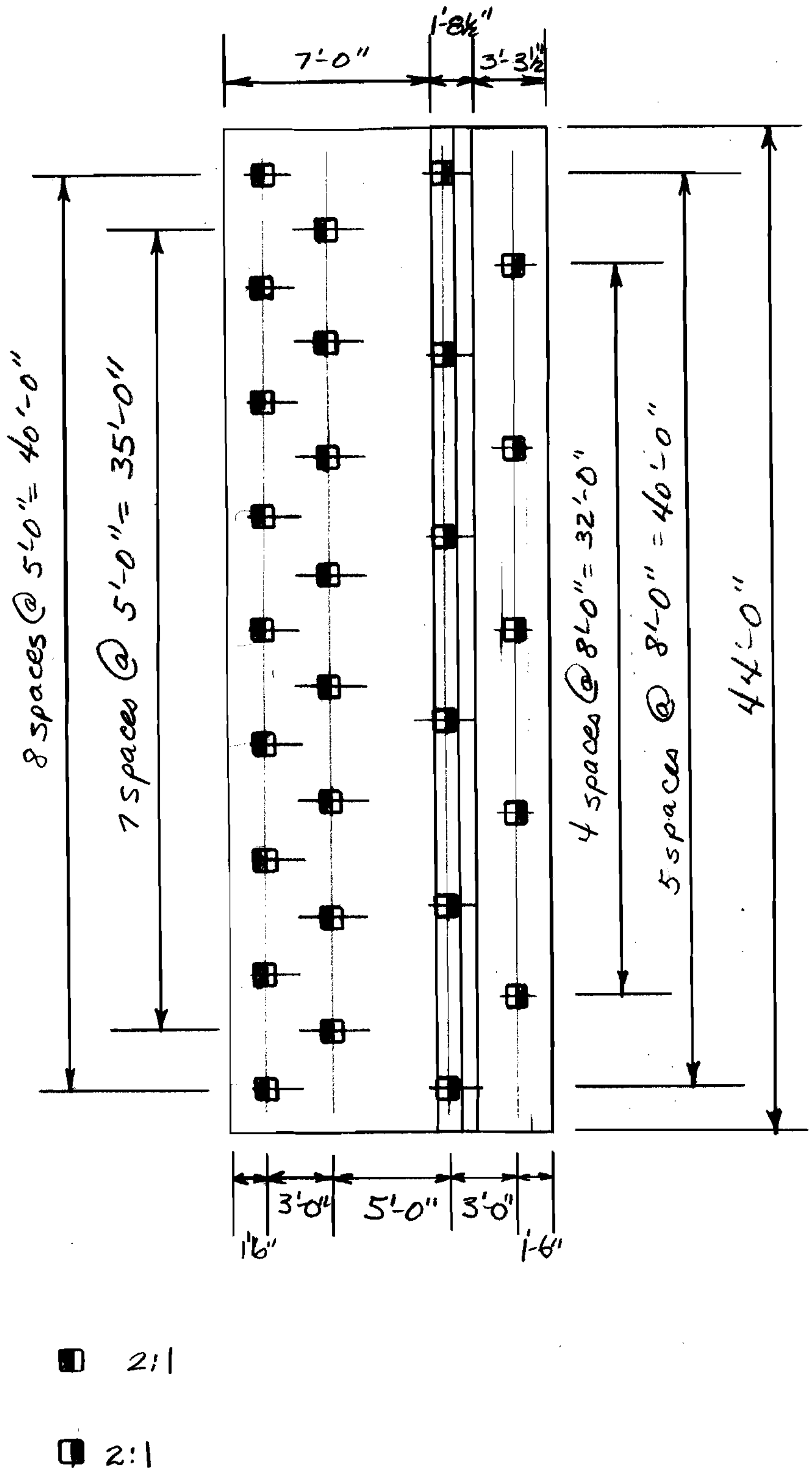
11E, 12E, 13E ← TOTAL NO. OF T-WALL MONOLITHS

$\boxed{15}$, $\boxed{16}$, $\boxed{18}$ ← TOTAL NO. OF MONOLITHS

PROJECT Florida Avenue Complex	Page 4 of 4	COMPUTED BY RJG	DATE July 74
SUBJECT East IHNC T-Wall Design - 4+29.81 To 4+73.81		CHECKED BY HMB	DATE July '74

T-WALL MONO 10E

$\boxed{13}$



Void

PROJECT | Page __ of __ | COMPUTED BY | DATE

SUBJECT | CHECKED BY | DATE

EAST IHNC

MONOLITH $\boxed{15}$

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT	Page — of —	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN - EAST OF IHNC		RJG	6-26-74

T-Wall At The Right Of The Railroad Gate

T-Wall Mono 13E $\boxed{18}$

6+50.49

6+40.49 End of Railroad Gate Monolith

10.00

T-Wall 12E $\boxed{16}$

T-Wall Between The Drainage Canal And Railroad Gates

5+94.99 Beginning of the Railroad Gate Monolith

5+77.49

17.50

T-Wall At The Right Of The Drainage Canal Gate

T-Wall Mono 11E $\boxed{15}$

5+15.31 Center of the drainage canal gate

26.5 Right end of the drainage canal gate.

5+41.81 (at base)

5+77.49 Left end of the above T-Wall

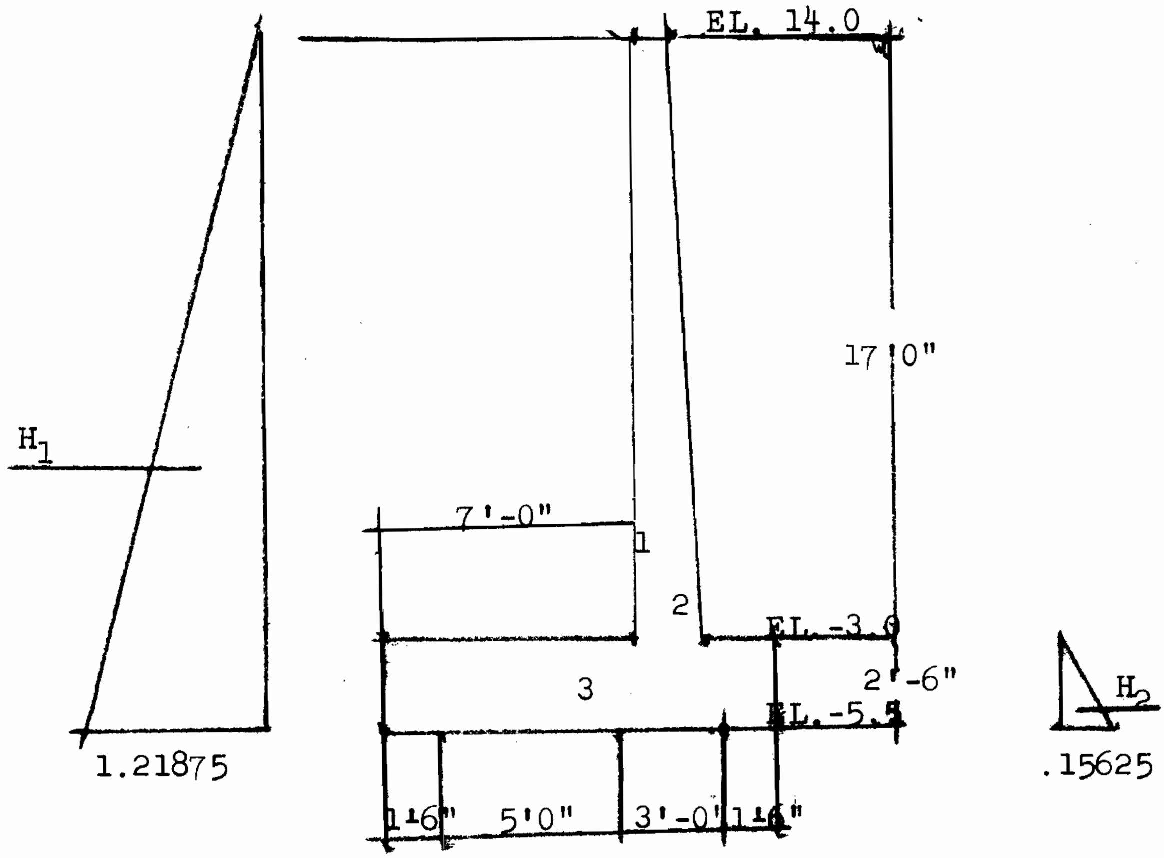
5+41.81

35.68

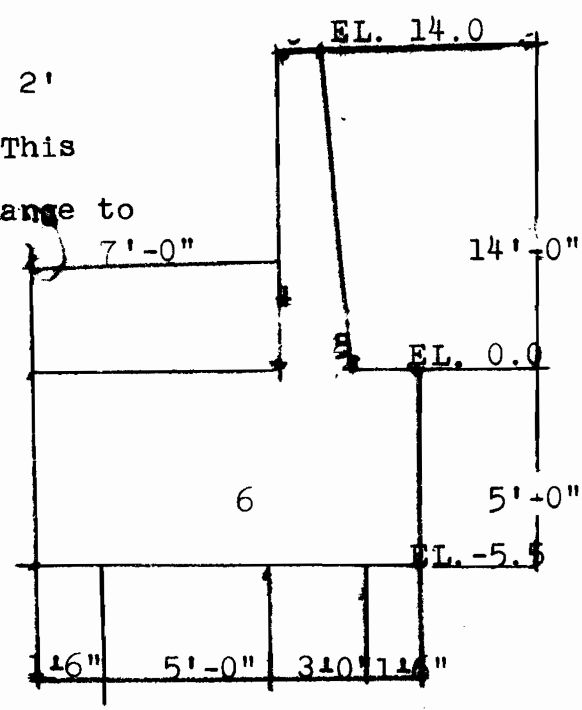
PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 1 of 12	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC 5+40.31-5+77.49		RJG	6-26-74

T-Wall Mono 11E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate



This monolith was made 2' longer to 37'-2 1/8". This is not enough of a change to recalculate.



PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 2 of 12	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC 5+40.31-5+77.49		RJG	6-26-74

T-Wall Mono 11E 15

T-Wall At The Right Of The Drainage Canal Gate

Moment About X - X Axis

ITEM	COMPUTATION	+ V	+ H	ARM	MOMENT
1	1.0x17.0x33.18x.150	84.61		7.50	634.58
4	1.0x14.0x2.5x.150	5.25		7.50	39.38
2	.708x17x33.18x.150/2	29.95		8.24	246.79
5	.583x14x2.5x.150/2	1.53		8.19	12.53
3	11.0x2.5x33.18x.150	136.87		5.5	752.78
6	11.0x5.5x2.5x.150	22.69		5.5	124.80
	SUBTOTAL	280.90			1810.86
Impervios Uplift	-0.15625x11x35.68	-61.32		5.5	-337.26
	-1.0625x4.0x35.68	-151.64		2.0	-303.28
Pervious Uplift	-0.15625x11x35.68	-61.32		5.5	-337.26
	-1.0625x11x35.68/2	-208.50		3.67	-765.20
Wt.Water	7x17x33.18x.0625	246.78		3.5	863.73
	7x14x2.5x.0625	15.31		3.5	53.58
Earth	4x9.29x33.18x.0575	70.90		5.07	359.46
	1x9.29x2.5x.0575	1.34		5.07	6.79
H_1	1.21875x19.5x35.68/2		423.98	6.50	2755.87
H_2	-0.15625x2.5x35.68/2		-6.97	0.82	-5.79
	Impervious Case I	402.27	417.01		5203.96
	Pervious Case II	345.41	417.01		4742.04
Earth	4x9.29x33.18x.120	147.96		5.07	750.16
	1x9.29x2.5x.120	2.79		5.07	14.15
	Dead Loads Case III	431.65			2575.17

T-Wall Mono 11 E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate

Moment About Z - Z

ITEM	COMPUTATION	H	ARM	MOMENT
Wall+Base Above EL. -3.0	$35.68 \times .0625 \times 17^2/2$	322.24	17.84	5748.76
Base Below EL. -3.0	35.68x17x.0625x2.5	94.78	17.84	1690.88
	Impervious + Pervious Case I + Case II	417.02		7439.64

Summary Of Loads

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
1	Impervious	0	417.02	402.27	5203.96	7230.24	7439.64
2	Pervious	0	417.02	345.41	4742.04	6215.86	7439.64
3	Dead Loads	0	0	431.65	2575.17	7736.60	0

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 3 of 12	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RJG.	DATE 6-26-74

T-Wall Mono 11E 15

T-Wall At The Right Of The Drainage Canal Gate

Moment About Y - Y Axis

ITEM	COMPUTATION	+ V	ARM	MOMENT
1	See Page 2	84.61	16.59	1403.68
4	" " "	5.25	34.43	180.76
2	" " "	29.95	16.59	496.87
5	" " "	1.53	34.43	52.68
3	" " "	136.87	16.59	2270.67
6	" " "	22.69	34.43	781.22
	SUBTOTAL	280.90		5185.88
Impervious Uplift	-61.32-151.64	-212.96	17.84	-3799.21
Pervious Uplift	-61.32-208.50	-269.82	17.84	-4813.59
Wt.Water		246.78	16.59	4094.08
		15.31	34.43	527.12
Wt.Earth		70.90	16.59	1176.23
		1.34	34.43	46.14
	Impervious Case I	402.27		7230.24
	Pervious Case II	345.41		6215.86
Wt.Earth		147.96	16.59	2454.66
		2.79	34.43	96.06
	Dead Loads Case III	431.65		7736.60

T-Wall Mono 11E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate

Allowable And Percentage Of Allowables On Prestress

Concrete Piles

Axial Loads = P = X

Allow. Axial Load = 80 kips (Compression)

" " " = 40 kips (Tension)

Case I (Maximum percentage of the three cases.)

Pile 15 % Of Allow. = 71.5/80 = 89.4 % (Compression)

Case II

Pile 1 % Of Allow. = 36.8/40 = 92.0 % (tension

Perpendicular Loads = Q = X

$fa/Fa + fb/Fb \le 1$ Fa = Fb = .75 ksi

$R = (EI/K)^{1/4} = 92.77$

$\frac{P/A}{.75} + \frac{QR/2S}{.75} \le 1$

$S = I/C = 288$

$\frac{P/144}{.75} + \frac{92.77Q/2x288}{.75} \le 1$

$.00926P + .215Q = 1$

$.00926(37.2) + .215Q = 1$

$Q = (1 -..344)/.215 = 3.051$

Case III

Pile 15 % Of Allow. = 0.6/3.051 = 19.7 %

PRØG. NØ. 713-F3-A2-210 13:47:47 05/13/74

FLA. AVE COMPLEX IHNC EAST MONO 11E
T-WALL RIGHT ØF DRAIN. CANAL GATE

TØTAL NUMBER ØF PILES = 22

MONO $\boxed{15}$

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-417.0	402.0	-5204.0	-7230.0	-7440.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.1	0.0	-33.1
2	0.2	0.0	-32.4
3	0.2	0.0	-31.8
4	0.2	0.0	-31.1
5	0.2	0.0	-30.4
6	0.2	0.0	-29.7
7	0.2	0.0	-29.1
8	0.2	0.0	-28.4
9	-0.1	0.0	25.7
10	-0.1	0.0	24.8
11	-0.1	0.0	23.9
12	-0.2	0.0	23.1
13	-0.2	0.0	22.2
14	-0.2	0.0	21.4
15	-0.2	0.0	71.5
16	-0.2	0.0	70.8
17	-0.2	0.0	70.2
18	-0.2	0.0	69.5
19	-0.2	0.0	68.9
20	-0.2	0.0	68.2
21	-0.3	0.0	67.6
22	-0.3	0.0	66.9

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1 0.0 -417.0 402.0 -5204.0 -7230.0 -7440.0

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-417.0	345.0	-4742.0	-6216.0	-7440.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.0	0.0	-36.8

```
  5   -0.0     0.0     -33.8
  6   -0.0     0.0     -33.1
  7   -0.0     0.0     -32.3
  8    0.0     0.0     -31.5
  9    0.0     0.0      32.5
 10    0.0     0.0      31.7
 11    0.0     0.0      30.9
 12    0.0     0.0      30.2
 13    0.0     0.0      29.4
 14    0.0     0.0      28.7
 15   -0.0     0.0      61.4
 16   -0.0     0.0      60.9
 17   -0.0     0.0      60.3
 18   -0.0     0.0      59.7
 19   -0.0     0.0      59.2
 20   -0.0     0.0      58.6
 21   -0.0     0.0      58.0
 22   -0.1     0.0      57.5
   2      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2         0.0  -417.0   345.0   -4742.0   -6216.0   -7440.0


            LØAD CØNDITIØN  3

          LØADS ØN PILE CAP
      X          Y          Z          MX          MY          MZ
      0.         0.       432.0    -2575.0     -7737.0         0.

            PILE LØADS (PILE AXIS)
PILE
 NØ.       X        Y          Z
  1      0.5     -0.0       30.2
  9     -0.5     -0.0       -5.4
 15     -0.6     -0.0       37.2
   3      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3         0.0      0.0   432.0   -2575.0   -7737.0        0.0


   0    13:53:30   05/13/74    *** END ØF  RUN ***


STØP        EØJ

*ØLD D29010
READY
*LISTH

05/13/74     13.90


10 FLA. AVE  CØMPLEX IHNC EAST
20 T-WALL RIGHT ØF DRAIN. CANAL GATE
30 3 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
```

```
80 0 0 0
100 2 90 8
110 2.5 7 11.5 16 20.5 25 29.5 34
140 8*-1.5
170 8*0
200 2 270 6
210 3 9 15 21 27 33
240 6*-6.5
270 6*0
300 2 270 8
310 2.5 7 11.5 16 20.5 25 29.5 34
340 8*-9.5
370 8*0
2000 0 -417 402 -5204 -7230 -7440
2010 0 -417 345 -4742 -6216 -7440
2020 0 0 432 -2575 -7737 0

READY
```

PROJECT IHNC AND FLA. AVE. COMPLEX

SUBJECT BARRIER PLAN - EAST OF IHNC 5+40.31-5+77.49

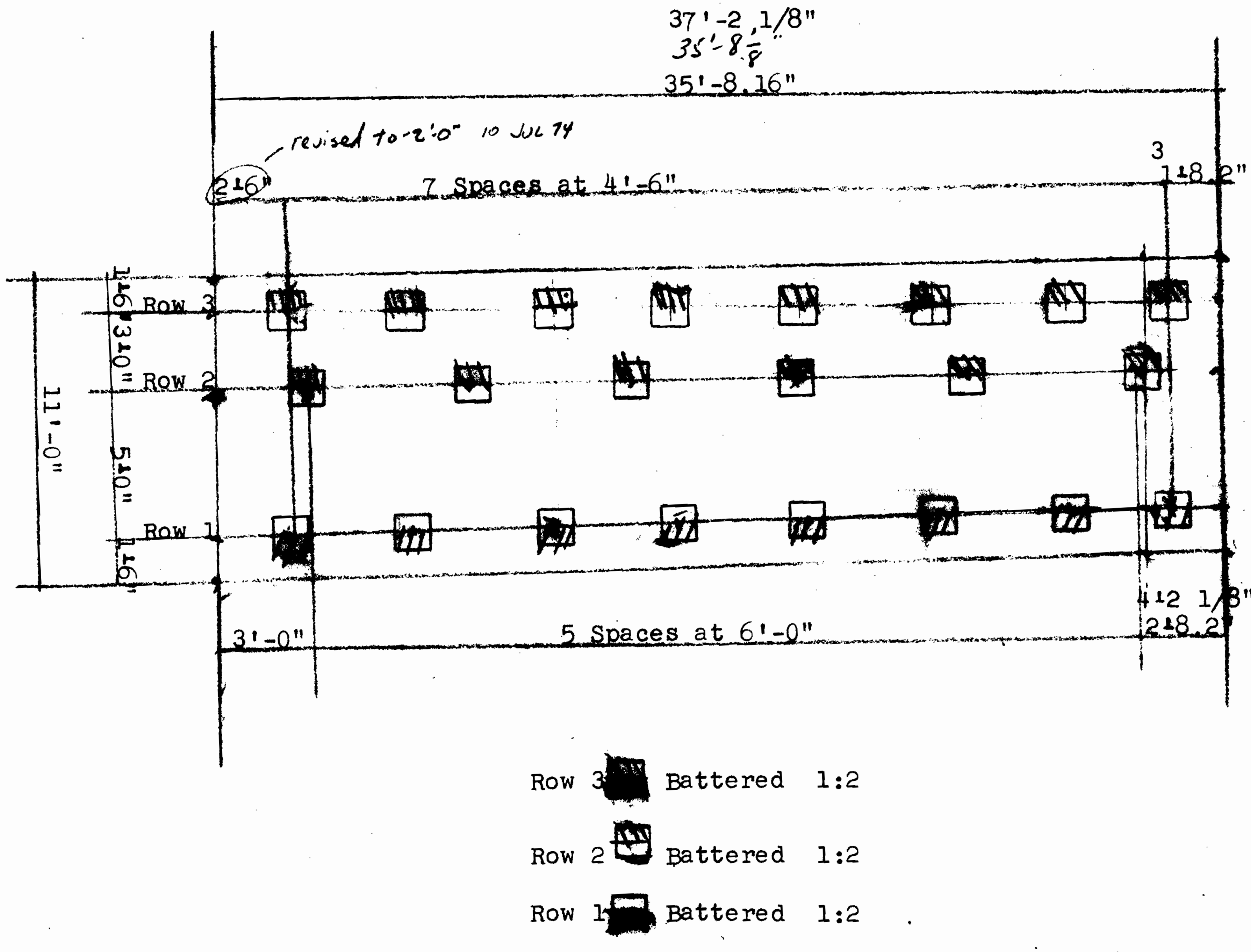
T-Wall Mono 11E 15

T-Wall At The Right Of The Drainage Canal Gate

Page 5 of 12

COMPUTED BY HMB DATE

CHECKED BY RJG DATE 6-26-74



COMPUTATION SHEET

LMV FORM 107a
1 AUG 68

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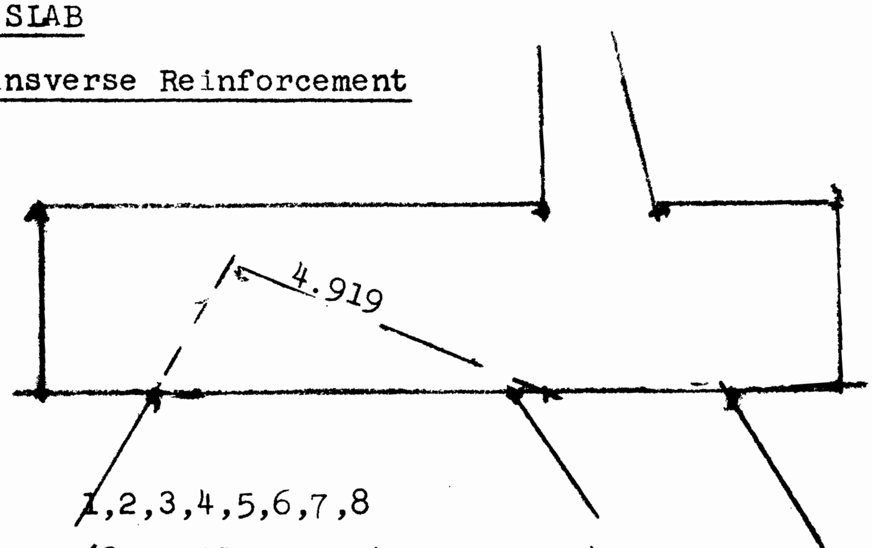
IHNC AND FLA. AVE. COMPLEX	Page 6 of 12	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC		RJG	6-26-74

T-Wall Mono 11E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate

BASE SLAB

Transverse Reinforcement



Case II (3-D pile computer program)

Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile 1 Axial	36.8	36.8	4.919	181.02
2	36.1	36.1	"	177.58
3	35.3	35.3	"	173.64
4	34.6	34.6	"	170.20
5	33.8	33.8	"	166.26
6	33.1	33.1	"	162.82
7	32.3	32.3	"	158.88
8	31.5	31.5	"	154.95
Water	246.78+15.31	262.09	3.5	917.32
Earth	4x7.0x33.18x.0575	53.42	3.5	186.97
Slab	7(136.87+22.69)/11	101.54	3.5	355.39
Uplift	-0.15625x7x35.68	-39.02	3.5	-136.57
	$-7\times35.68\left(\frac{1.0625+.67614}{2}\right)$	-217.12	3.760	-816.37

Σ 1852.09 '-k

*There were no Q forces on this first row of piles. The second row of piles were too close to the wall face to take into account. Also these were compression piles.

T-Wall Mono 11 E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate

BASE SLAB

Top Reinforcement

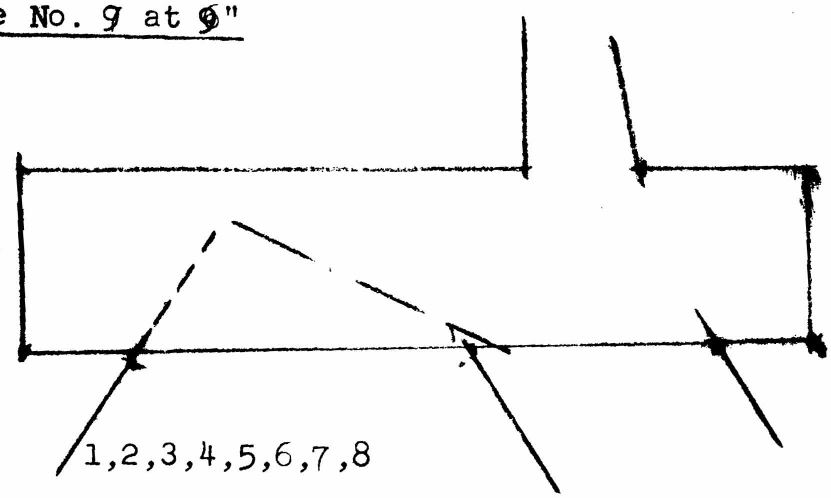
M= 1852'-k' M(per ft.slab)= 1852.09/35.68 = 51.91 '-k

d = $\sqrt{M/kb}$ = $\sqrt{51910/152}$ = 18.5", $d_{provided}$ =27.0"

As = M/ad = 51.91/1.44x27 = 1.34 in^2

min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2

Use No. 9 at 9"



Case III

Moment About Face Of Wall	FORCE	ARM	MOMENT
Pile 1-8 Axial 8(30.2)	241.6	4.919	1188.43
Earth 4x7x33.18x0.120	111.5	3.500	-390.25
Slab 7(136.87+22.69)/11	101.5	3.500	-355.25
		Σ	442.93

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 8 of 12	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RJgr.	DATE 6-24-74

T-Wall Mono 11E $\boxed{15}$

T-Wall At The Right Of The Drainage Canal Gate

BASE SLAB

Bottom Reinforcement

M = 442.93'-k, M(per ft.slab)= 442.93/35.68 = 12.42'-k

$d = \sqrt{M/kb} = \sqrt{12420/152} = 9.0"$, $d_{provided} = 25.5"$

As = M/ad = 12.42/1.44x25.5 = 0.34 in^2

Min. AS = 0.0025bd = 0.0025x12x25.5 = 0.77 in^2

Use No. 8 at 12"

Longitudinal Reinforcement

Due to the step in the T-Wall, There is a small longitudinal moment. Therefore, 0.0025 is used.

Min. As = 0.0025bd = 0.0025x132x27 = 8.91 in^2

Use 8.91 in^2 for each face

Use 21 No. 6's top + bottom (6.05" spacing)

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT	Page	COMPUTED BY	DATE
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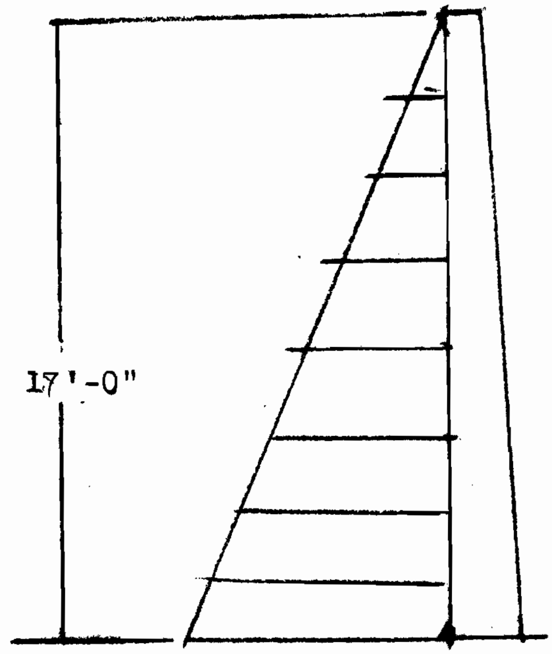
BARRIER PLAN - EAST OF IHNC		JGB	10 JUL 74

T-Wall At The Right Of The Drainage Canal Gate

WALL STEM



	FORCE	ARM	MOMENT
$0.0625 \times 17^2/2$	9.031	17/3	51.21 '-k

$d_{req'd} = \sqrt{M/kb} = \sqrt{51210/152} = 18.4"$

$d_{prov'd} = 20.5 - 2.5 - 0.5 = 17.5"$

fs = 20,000 psi, f'c = 3,000 psi, fc = 1,050 psi

k = 0.326, j = 0.891

$M = \frac{fc}{2} kjbd^2 = \frac{1.05}{2} x0.326x0.891x12x17.5 = 560.42'\text{-k}$ or 46.70'-k

46.70'-k < 51.21'-k Indicating the necessity for compression steel. M1 = 46.70'-k,

$M_2 = M - M1 = 51.21 - 46.70 = 4.51'\text{-k}$

T-Wall At The Right Of The Drainage Canal Gate

Depth at which No. 9 at 12" are adequate

$$As = 1.00 \text{ in}^2$$

$$M = Asad = 1.00 \times 1.44 \times 9.0 = 12.96 \text{ '-k}$$

$$0.0625y^3/6 = 12.96$$

$$y = 10.76'$$

CHECK

17'-0" Height

Depth at which No. 9 at 6" and compressive steel are adequate.

$$As = 2.00 + 0.44 \times 9.2/20 = 2.00 + 0.20 = 2.20 \text{ in}^2$$

$$M = Asad = 2.20 \times 1.44 \times 17.5 = 55.44 \text{ '-k}$$

$$0.0625y^3/6 = 55.44$$

$y = 17.46'$ from top or EL. -3.46'

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IHNC AND FLA. AVE. COMPLEX	Page 10 of 12	HMB	
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BARRIER PLAN - EAST OF IHNC		RJg	6-24-74

T-Wall At The Right Of The Drainage Canal Gate

WALL STEM

Vertical Steel

$As1 = M_1/fsjd = 46.70x12/20x.891x17.5 \quad = \quad 1.80 \text{ in}^2$

$As \quad = M_2/fs(d-d') = 4.51x12/20x14.5 \quad = \quad \underline{0.19}$

1.99 in^2

f's = Stress in the compressive steel

f's = 2fs(k-(d'/d))/(1-k) = 2x20(.326-(3/17.5)/1-.326

f's = 9.2 ksi < 20 ksi O.K.

A's = compressive steel

A's = M /f's(d-d') = 4.51x12/9.2(17.5-3) = 0.41 in^2

Protected Side

Min. As = .0025bd = .0025x12x3.0= 0.09 in < 0.41 in^2

Use No. 6 at 12" As = 0.44 in^2

Flood Side

Use No. 9 at 6" 2.00 > 1.80 in^2

Shear: v = V/bd = 9.031/12x17.5=.043 < .060 ksi O.K.

Horizontal Steel

Min. As = .0020bt = .0020x12x20.5 = 0.50 in^2

Use No. 6 at 12" each face 2x.44 = 0.88 in^2

Shear:

v = V/bd = 9.031/12x17.5 = .043 < .060 ksi

No shear reinf. req'd.

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 12 of 12	COMPUTED BY HMB	DATE
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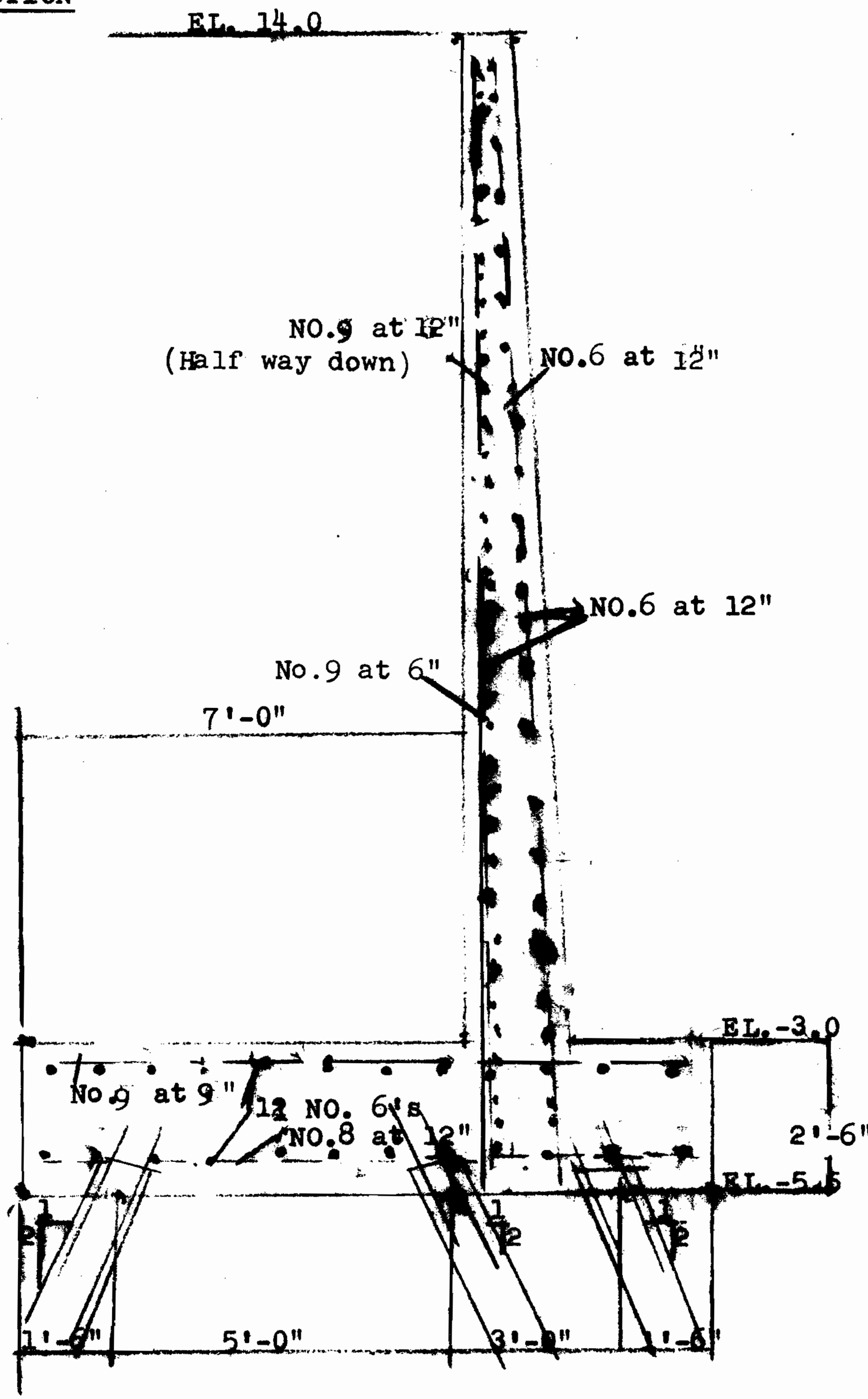
T-Wall At The Right Of The Drainage Canal Gate

CROSS-SECTION



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SUBJECT		CHECKED BY	DATE

EAST IHNC

MONOLITH $\boxed{16}$

LMV FORM 107a
1 AUG 68

COMPUTATION SHEET

PROJECT IHNC AND FLA. AVE. COMPLEX

COMPUTED BY HMB DATE

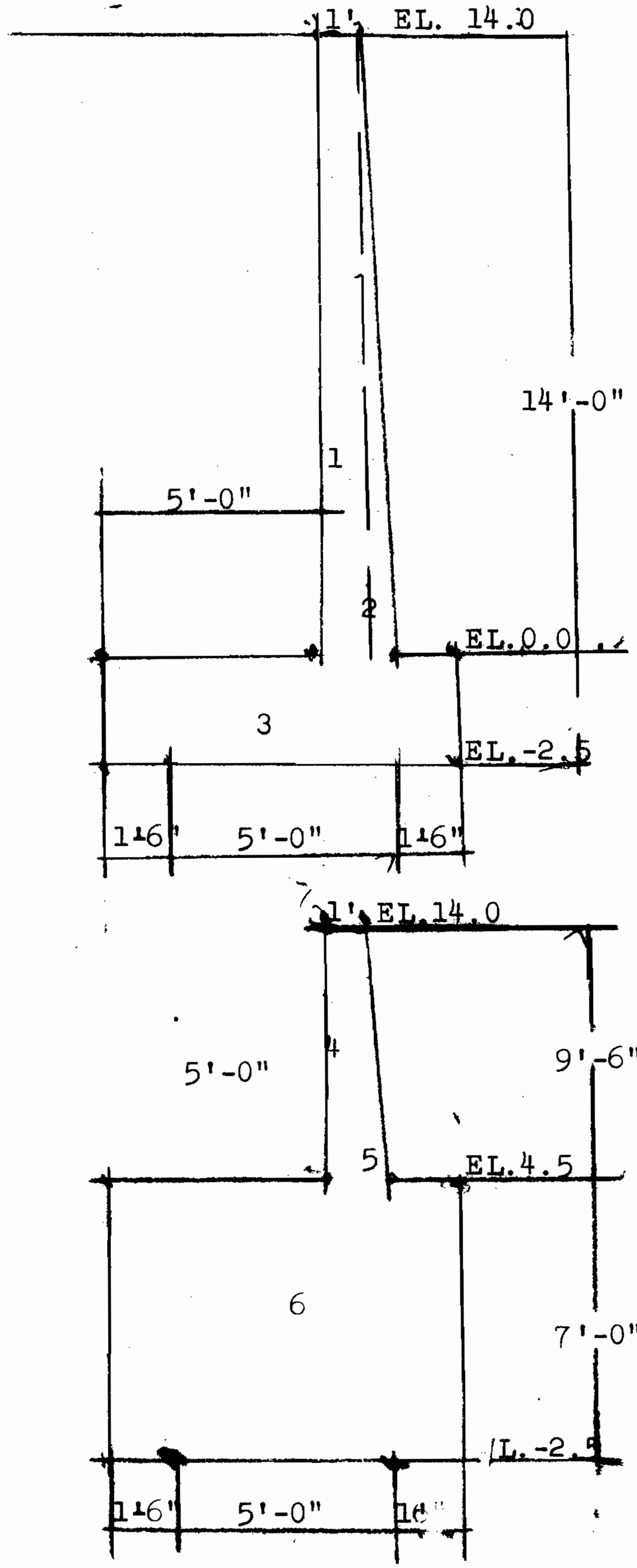
SUBJECT BARRIER PLAN EAST OF IHNC

CHECKED BY Pkg DATE 26 Jul 74

T-Wall At The Left Of The Railroad Gate Monolith

Mono 12 E

16



```
10 FLA. AVE. COMPLEX IHNC EAST
20 T-WALL LEFT OF RAILROAD MONO.
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 4 90 4
110 3 7 11 15
120 4*-1.5
170 4*0
200 2 270 4
210 3 7 11 15
240 4*-6.5
270 4*0
2000 0 -145 106 -1324 -937 -1273
2010 0 -145 106 -1283 -973 -1273
2020 0 0 122 -557 -1133 0
```

MONO 126

revised

revised

MONO 16

```
READY

*RUN K29010
ILLEGAL CHARACTER IN FIELD FOLLOWING          DESCRIPTION
*REMOVE D29010
*RUN D29010
SOURCE LINE     10
SYSTEM ?FORT
OLD OR NEW-OLD
OLD FILE? D29010
READY
[illegible] K29010
*STAT


CHANNEL 3151
USER STATUS ON MAY 1,1974 AT 9:38:14  LOG-ON AT 9:23:44
PROC TIME USED  2.29 SEC., 179 FILE I/O  1176 CHAR KEY I/O
LIST OF OPEN FILES: D29010

*RUN K29010
*OLD
OLD FILE? D29010
READY
*LIST

10 FLA. AVE. COMPLEX IHNC EAST
*REMOVE D29010
*RY
COMMAND UNKNOWN
*RUN K29010
LOADER DIAGNOSTICS
<W> .FFBC  UNDEFINED


    PROG. NO. 713-F3-A2-210           9:45: 3  05/01/74


 FLA. AVE. COMPLEX IHNC EAST
 T-WALL LEFT OF RAILROAD MONO.
```

[illegible] ØF PILES = 8

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-145.0	106.0	-1324.0	-937.0	-1273.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.3	0.0	-35.0
2	0.3	0.0	-33.4
3	0.3	0.0	-31.9
4	0.4	0.0	-30.3
5	-0.4	0.0	68.8
6	-0.4	0.0	66.2
7	-0.4	0.0	63.6
8	-0.5	0.0	61.0

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	-0.0	-145.0	106.0	-1324.0	-937.0	-1273.0

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-145.0	106.0	-1283.0	-973.0	-1273.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.4	0.0	-34.9
2	-0.4	0.0	-32.1
3	-0.4	0.0	-29.3
4	-0.3	0.0	-26.6
5	0.3	0.0	65.9
6	0.3	0.0	64.0
7	0.3	0.0	62.0
8	0.3	0.0	60.1

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	-0.0	-145.0	106.0	-1283.0	-973.0	-1273.0

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	122.0	-557.0	-1133.0	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	2.8	0.0	11.1
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
4	2.8	0.0	14.7
5	-3.1	0.0	18.4
6	-3.1	0.0	19.0
7	-3.1	0.0	19.7
8	-3.1	0.0	20.3

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3	0.0	-0.0	122.0	-557.0	-1133.0	-0.0

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 2 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RJG	DATE July 74

T-Wall Mono 12 E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

Moment About X - X Axis

ITEM	COMPUTATION	+ V	+ H	ARM	MOMENT
1	1.0x14.0x15.0x0.150	31.50		5.50	173.25
4	1.0x9.5x2.50x0.150	3.56		5.50	19.58
2	0.583x14.0x15.0x.150/2	9.18		6.19	56.82
5	0.396x9.5x2.5x.150/2	0.71		6.13	4.32
3	8.0x2.5x15.0x0.150	45.00		4.00	180.00
6	8.0x7.0x2.5x0.150	21.00		4.00	84.00
	SUBTOTAL	110.95			517.97
Impervious Uplift	-0.15625x8.0x17.50	-21.88		4.00	-87.52
	-0.875x4.0x17.5	-61.25		2.00	-122.50
Pervious Uplift	-0.15625x8.0x17.50	-21.88		4.00	-87.52
	-0.875x8.0x17.5/2	-61.25		2.67	-163.54
Wt. Water	5.0x14.0x15.0x.0625	65.62		2.50	164.05
	5.0x9.5x2.5x.0625	7.42		2.50	18.55
Earth	1.0x6.42x15.0x.0575	5.54		3.56	19.72
H_1	1.03125x16.5x17.5/2		148.89	5.50	818.90
H_2	-0.15625x2.5x17.5/2		-3.42	0.83	-2.84
	Impervious Case I	106.40	145.47		1326.33
	Pervious Case II	106.40	145.47		1285.29
Earth	1.0x6.42x15.0x.120	11.56		3.56	41.15
	Dead Loads	122.51			559.12

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 3 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN EAST OF IHNC		CHECKED BY RJg	DATE 7-74

T-Wall At The Left Of The Railroad Gate Monolith

T-Wall Mono 12E $\boxed{16}$

Moment About Y-Y Axis

ITEM	COMPUTATION	+V	ARM	MOMENT
1	See Page 2	31.50	7.50	236.25
4	" " "	3.56	16.25	57.85
2	" " "	9.18	7.50	68.85
5	" " "	0.71	16.25	11.54
3	" " "	45.00	7.50	337.50
6	" " "	21.00	16.25	341.25
	SUBTOTAL	110.95		1053.24
Impervious Uplift or	See Page 2	-21.88	8.75	-191.45
Pervious Uplift	" " "	-61.25	8.75	-535.94
Wt. Water	" " "	65.62	7.50	492.15
	" " "	7.42	16.25	120.58
Earth	" " "	5.54	7.50	41.55
	Impervious or Pervious	-4.55		-73.11
	Case I or Case II	106.40		980.13
Earth	" " "	11.56	7.50	86.70
	Dead Loads Case III	122.51		1139.94

PROJECT	Page 4 of	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	
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BARRIER PLAN - EAST OF IHNC		RJgr	7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolift

Moment About Z-Z Axis

ITEM	COMPUTATION	H	ARM	MOMENT
Wall+Base Above EL. 0.0	$17.50 \times .0625 \times 14^2/2$	107.19	8.75	937.91
Base Below EL. 0.0	$17.50 \times .0625 \times 14 \times 2.5$	38.28	8.75	334.95
	Case I or Case II	145.47		1272.86

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
1	Impervious	0	145.47	106.40	1326.33	980.17	1272.86
2	Pervious	0	145.47	106.40	1285.29	980.17	1272.86
3	Dead Loads	0	0	122.51	559.12	1139.94	0

PROJECT IHNC AND FLA. AVE. COMPLEX

SUBJECT BARRIER PLAN - EAST OF IHNC

T-Wall Mono 12E 16

T-Wall At The Left Of The Railroad Gate Monolith

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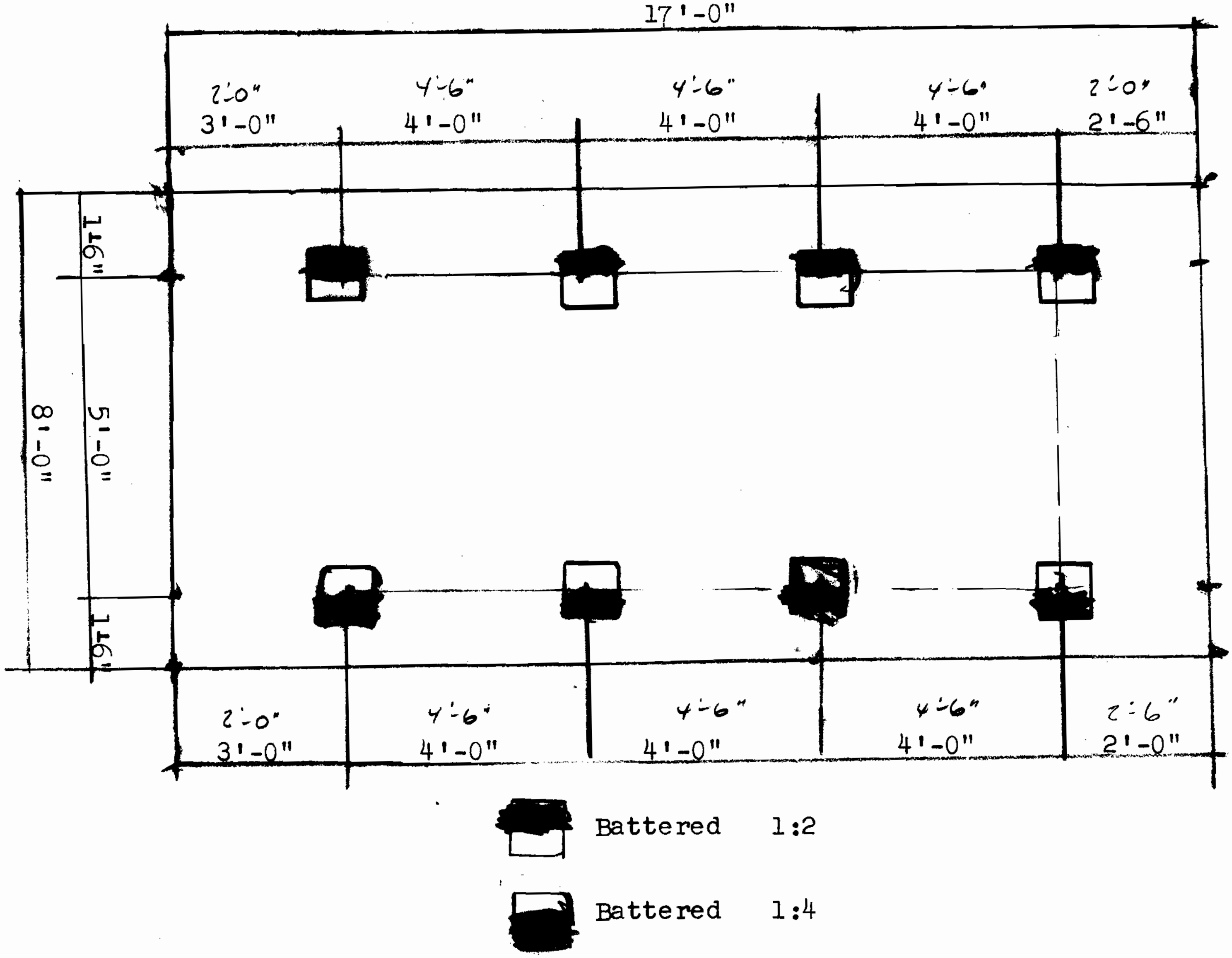
COMPUTED BY HMB DATE

CHECKED BY RJG DATE 7-74

revised to 17'-6" 10 JUL 74



LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

PROJECT IHNC AND FLA. AVE. COMPLEX | Page 4b of — | COMPUTED BY HMB | DATE

SUBJECT BARRIER PLAN EAST OF IHNC | CHECKED BY RJG | DATE 7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

Allowables And Percentage Of Allowables On Prestress Concrete Piles

Axial Loads = P = X

Allow. Axial Load = 80 kips (Compression)

" " " = 40 kips (Tension)

Case I (Maximum percentage of the three cases.)

Pile 1 % Of Allow. = 35/40 = 87.5 % (Tension)

" 8 % Of Allow. = 61/80 = 76.3 % (Compression)

Perpendicular Loads = Q = X

$fa/Fa + fb/Fb \leq 1 \qquad Fa = Fb = .75$ ksi

$$\frac{P/A}{.75} + \frac{R(Q)/2S}{.75} \leq 1 \qquad R = (EI/K)^{1/4} = 92.77$$

$$S = I/C = 288$$

$$\frac{P/144}{.75} + \frac{92.77Q/2x288}{.75} \leq 1$$

$$.00926P + .215Q \leq 1$$

$$.00926(20.3) + .215Q = 1$$

$$Q = (1 - .188)/.215 = 3.777$$

Case III (Maximum)

Pile 8 % Of Allow. = 3.1/3.777 = 82.1 %

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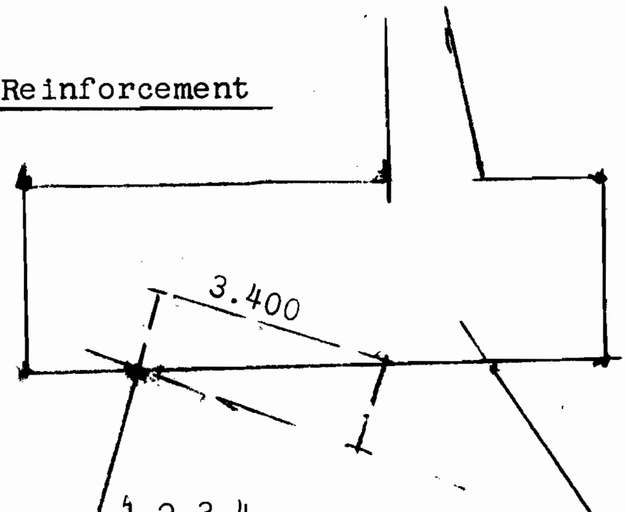
IHNC AND FLA. AVE. COMPLEX	Page 5 of —	HMB	
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RJG	DATE 7-74

T-Wall Mono 12 E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

BASE SLAB

Transverse Reinforcement



Case I (3-D pile computer program)

Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile '1' Axial	35.0	35.0	3.400	119.00
2	33.4	33.4	3.400	113.56
3	31.9	31.9	3.400	108.46
4	30.3	30.3	3.4	103.02
Water	65.62+7.42	73.04	2.5	182.60
Earth	1.0x5.0x15.0x.0575	4.31	2.5	10.78
Slab	5(45.00+21.00)/8	41.25	2.5	103.12
Uplift	-0.15625x5x17.5	-13.67	2.5	-34.18
	-0.875x4.0x17.5	-61.25	3.0	-183.75

Σ 522.61

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IHNC AND FLA. AVE. COMPLEX		HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN EAST OF IHNC		RJgr	7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

BASE SLAB

Top Reinforcement

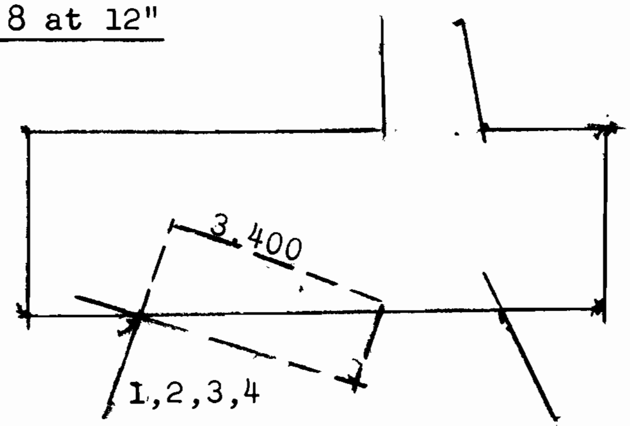
M = 522.61 '-k, M(per ft. slab)=522.61/17.5= 29.86'-k

$d = \sqrt{M/kb} = \sqrt{29860/152} = 14.0"$, $d_{provided} = 27.0"$

$As = M/ad = 29.86/1.44x27 = 0.77\ in^2$

min. $As = 0.0025bd = 0.0025x12x27 = 0.81\ in^2$

Use No. 8 at 12"



Case III

Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile 1 Axial	11.1	11.1	3.400	37.74
2	12.3	12.3	3.400	41.82
3	13.5	13.5	3.400	45.90
4	14.7	14.7	3.400	49.98
Earth	1x5x15.0x.120	9.0	2.500	-22.50
Slab	5(45.00+21.00)/8	41.25	2.500	-103.12
			Σ	49.82

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 3 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - WEST OF IHNC		CHECKED BY RJG	DATE 7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

BASE SLAB

Bottom Reinforcement

M = 49.82'-k, M(per ft. slab)=49.82/17.5= 2.85'-k

$d = \sqrt{M/kb} = \sqrt{2850/152} = 4.3"$, $d_{provided} = 25.5"$

As = M/ad = 2.85/1.44x25.5 = 0.08 in^2

Min As = 0.0025bd = 0.0025x12x25.5 = 0.77 in^2

Use No. 8 at 12"

Longitudinal Reinforcement

Due to the step in the T-Wall, there is a small longitudinal moment. Therefore, 0.0025 is used.

min. As = 0.0025bd = 0.0025x96x27 = 6.48 in^2

Use 6.48 in^2 for each face

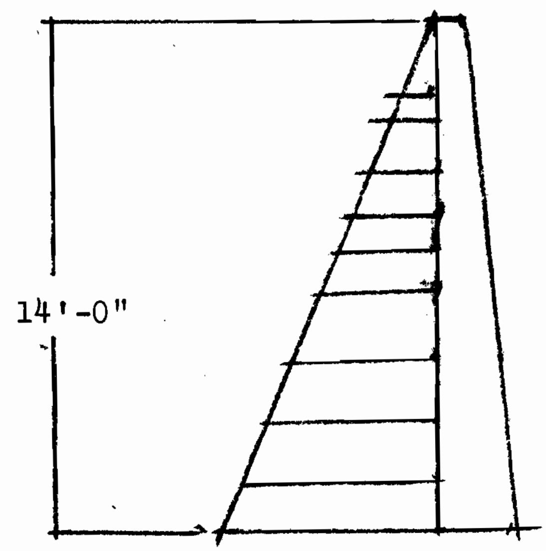
Use 15 No. 6 's top + bottom (16" spacing)

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

WALL STEM



	FORCE	ARM	MOMENT
$0.0625 \times 14^2/2$	6.125	14/3	28.58'-k/'

$d_{req'd} = \sqrt{M/kb} = \sqrt{28580/152} = 13.7"$

$d_{prov'd} = 19.0 - 2.5 - 0.5 - 0.5 = 15.5"$

Vertical Steel

$As = M/ad = 28.58/1.44 \times 15.5 = 1.28\ in^2$

$\min As = 0.0025bd = 0.0025 \times 12 \times 15.5 = 0.47\ in^2$

Use No. 9 at 9" Flood Side $As = 1.33\ in^2$

Use No. 7 at 12" Protected Side $As = 0.60\ in^2$

$v = V/bd = 6.125/12 \times 15.5 = .033 < .060$ ksi

No shear reinf. req'd.

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 9 of —	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC		RJg	7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The ~~Right~~ Left Of The Railroad Gate Monolith

WALL STEM

Horizontal Steel

$As = 0.0020bt = 0.0020 x 12 x 19.0 = 0.46\ in^2$

Use No. 6 at 12" each face

$2 x 0.44 = 0.88\ in^2$

Depth at which No. 7 at 12" are adequate

$As = 0.60\ in^2$

$M = Asad = 0.60 x 1.44 x 9.0 = 7.78'\text{-k}$

$0.0625y^3/6 = 7.78$

$y = 9.07'$

14'-0" Height

Depth at which No. 9 at 9" are adequate.

As = 1.33 in. 12+12x14/24 -2.5 -0.5 -0.5 = 15.5"

$M = Asad = 1.33 x 1.44 x 15.5 = 29.68\ '\text{-k}$

$0.0625y^3/6 = 29.68$

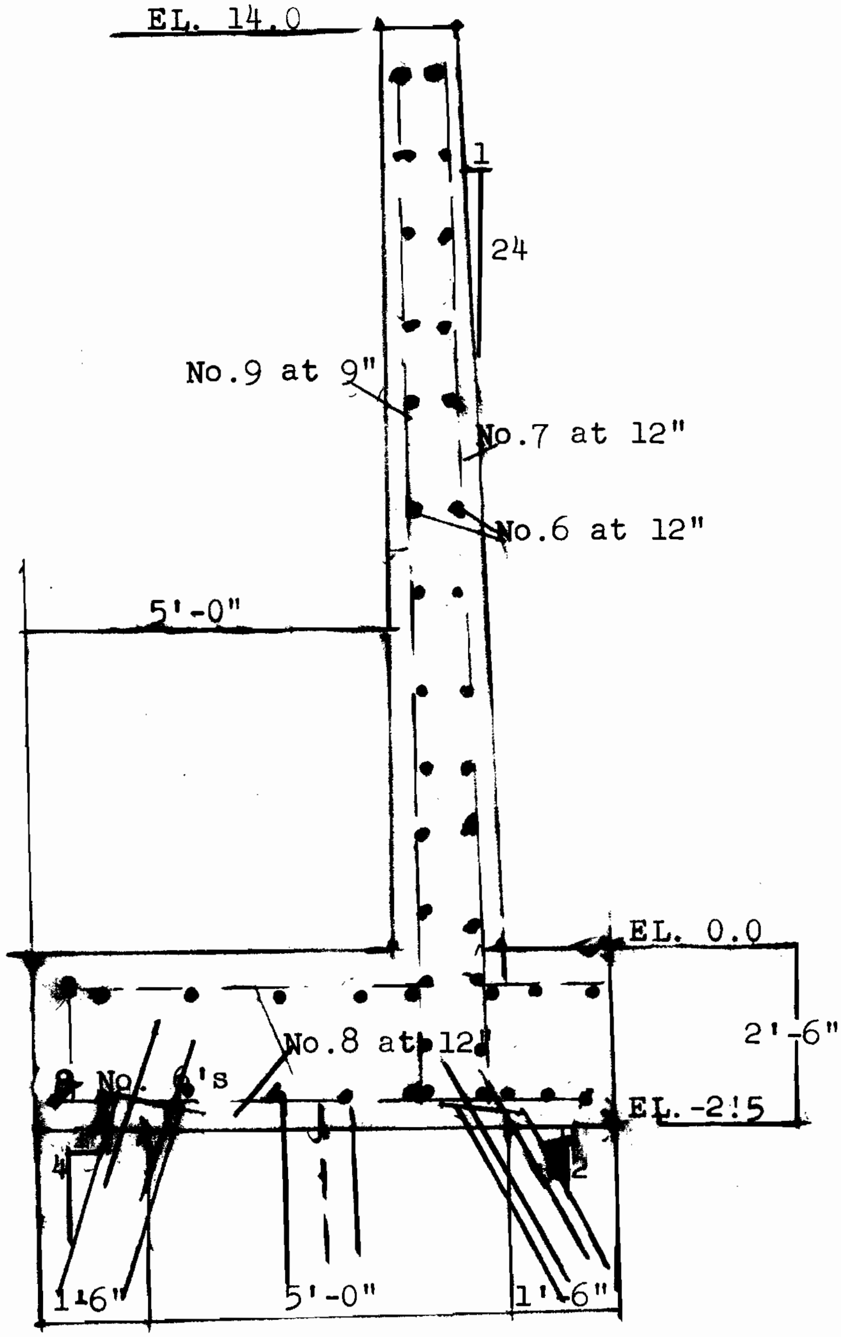
$y = 14.18'$ from top or EL. -0.18'

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 10 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RKp	DATE 7-74

T-Wall Mono 12E $\boxed{16}$

T-Wall At The Left Of The Railroad Gate Monolith

CROSS-SECTION



PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

EAST IHNC

MONOLITH 18

LMV FORM
1 AUG 68 107a

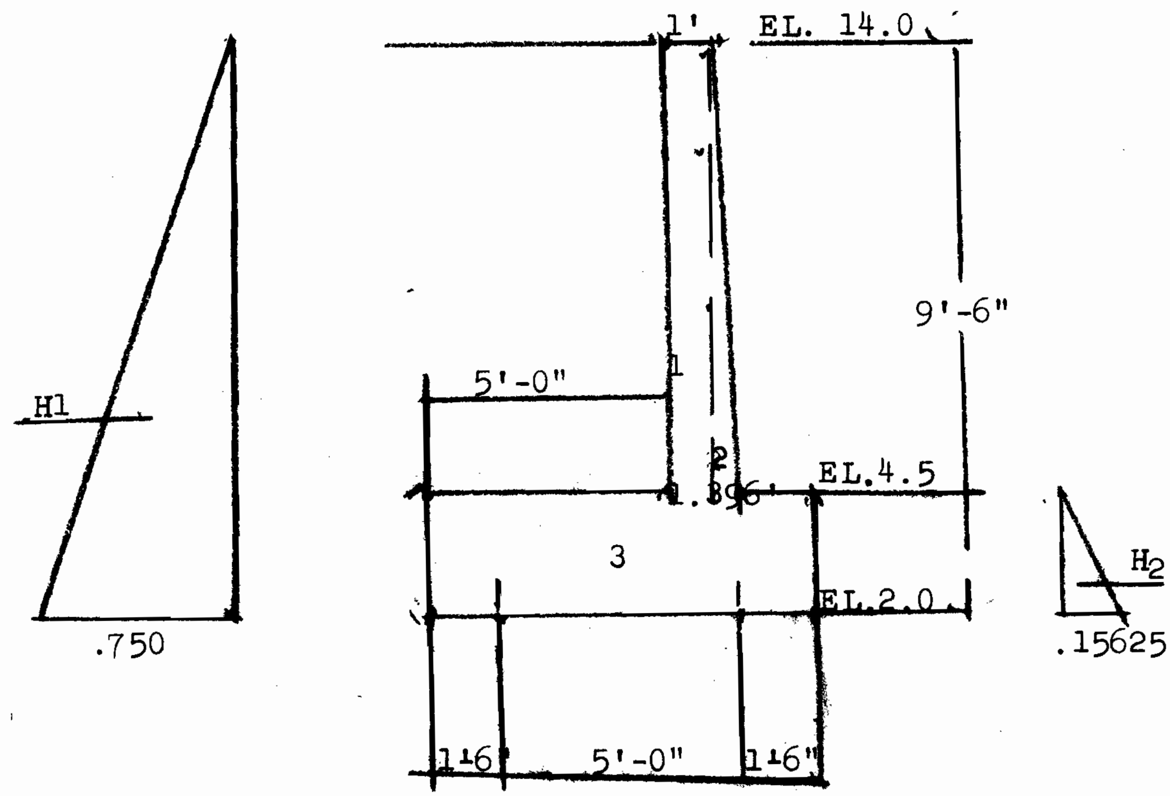
COMPUTATION SHEET

PROJECT	Page 1 of —	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN- EAST OF IHNC		RJg	7-74

T-Wall At The Right Of The Railroad Gate

T-Wall Mono 13E

18



FLA. AVE. COMPLEX IHNC EAST
T-WALL RIGHT OF RAILROAD   MONO 13E

RUN NØ. 1 - CASE 1.00

MONO $\boxed{18}$

NAN	AXX	BATTA	AN
1	1.50	-2.00	2.00

NBN	BXX	BATTB	BN
1	6.50	2.00	2.00

TØTAL NØ. ØF PILES = 4.

AREA	AI	E	AL	PC	PT
144.00	1728.00	4286826.	60.00	80.00	40.00

AK(1)
100.000

MØM.	VERT.	HØR.	CASE
401.670	47.130	43.050	10001.00

DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
0.17818E-01	-.20937E-02	0.22239E-03	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	-10.735	-.1101	0.00

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	37.056	-.0598	0.00

MØM.	VERT.	HØR.	CASE
385.960	47.130	43.050	20001.00

DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
0.11445E+00	0.76703E-01	-.14192E-02	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	-9.312	-.8217	0.00

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	35.633	-.7713	0.00

MØM.	VERT.	HØR.	CASE
261.770	57.810	0.000	30001.00

DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
-.18545E+00	-.14068E+00	0.31501E-02	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	13.412	1.3345	0.00

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	18.874	1.3962	0.00

```
K29004    15:13  WES   04/24/74

10 2 0 1
20 3 12 1
30 FLA. AVE. CØMPLEX IHNC EAST
31 T-WALL RIGHT ØF RAILRØAD
40 1
50 401.87 47.13 43.05
60 12 12 60 80 40
70 1 100
80 1 -2 1 2 0 0
90 1.5 2
100 6.5 2
120 2
130 385.96 47.13 43.05
140 261.77 57.81 0
250 0

READY
ØLD:K29004***

READY
RUN


K29004    15:14  WES   04/24/74


    PRØG. NØ. 713-F5-A2-150, MØD 7 - APR'73: FØR DESCRIPTIØN,
  LIST SØURCE FILE --- K29003***

  NØTE:  CØMP. ØF ALLØW STRESS FØR STEEL H-PILES CØRRECTED 4/15/74:
  RUNS FØR STEEL H-PILES MADE PRIØR TØ 4/15 SHØULD BE RERUN.

  SELECT INPUT METHØD:
       1 = BINARY DATA FILE CREATED BY K29002*** (713-F5-A2-110)
           PLUS KEYBØARD INPUT,
       2 = ALL DATA FRØM USER'S DATA FILE (D29004),
       3 = ALL DATA FRØM KEYBØARD INPUT,
       4 = BINARY DATA FILE CREATED BY K29002*** PLUS USER'S
           DATA FILE (D29004).
  ? 2

----------------------------------------------------------------------


   FLA. AVE. CØMPLEX IHNC EAST
   T-WALL RIGHT ØF RAILRØAD


          RUN NØ.  1  -   CASE     1.00

             NAN        AXX      BATTA       AN
              1         1.50     -2.00       2.00

             NBN        BXX      BATTB       BN
                        6.50      2.00       2.00
```

MONO 13E

MONO $\boxed{18}$

[illegible] = 4.

CRITICAL PILE LØADINGS

GRØUP A

RØW NØ.	DIST. FT.	NØ. PILES /RØW		CØMP. LØADS KIPS	ALLØW. LØADS KIPS	PERCENT LØAD	CASE NØ.	CØMP. DEFL. IN.
1	1.50	2.	P =	-10.74	40.00	26.836	10001.00	0.0498
			Q =	1.334	5.072	26.312	30001.00	0.2652

GRØUP B

RØW NØ.	DIST. FT.	NØ. PILES /RØW		CØMP. LØADS KIPS	ALLØW. LØADS KIPS	PERCENT LØAD	CASE NØ.	CØMP. DEFL. IN.
1	6.50	2.	P =	37.06	80.00	46.320	10001.00	0.0498
			Q =	1.396	4.836	28.870	30001.00	0.2652

MAX. DEFL. FØR AT REST SØIL PRESS. = 0.0780

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 2 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RSgr	DATE 7-74

T-Wall Mono 13E $\boxed{18}$

T-Wall At The Right Of The Railroad Gate Monolift

ITEM	COMPUTATION	+ V	+ H	ARM	MOMENT
1	1.0x9.5x10.0x0.150	14.25		5.50	78.38
2	0.396x9.5x10.0x0.150/2	2.82		6.13	17.29
2	8.0x2.5x10x0.150	30.00		4.00	120.00
	SUBTOTAL	47.07			215.67
Impervious Uplift	-0.15625x8.0x10.0	-12.50		4.00	-50.00
	-0.59375x4.0x10.0	-23.75		2.00	-47.50
Pervious Uplift	-0.15625x8.0x10.0	-12.50		4.00	-50.00
	-0.59375x8.0x10.0/2	-23.75		2.67	-63.41
Wt.Water	5x9.5x10.0x.0625	29.69		2.50	74.22
Earth	1.0x5.0x10.0x.0575	2.88		2.50	7.20
	1.0x1.60x10.0x.0575	0.92		7.20	6.62
H_1	0.750x12.0x10.0/2		45.00	4.00	180.00
H_2	-0.15625x2.5x10.0/2		-1.95	0.83	-1.62
	Impervious Case I	44.31	43.05		384.59
	Pervious Case II	44.31	43.05		368.68
Earth	1.0x5.0x10.0x0.120	6.00		2.50	15.00
	1.0x1.60x10.0x0.120	1.92		7.20	13.82
	Dead Loads Case III	54.99			244.49

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 3 of —	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN - EAST OF IHNC		CHECKED BY RSG	DATE 7-74

T-Wall Mono 13E 18

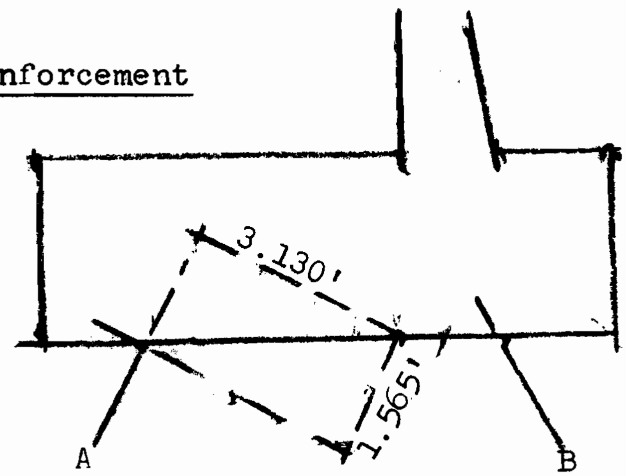
T-Wall At The Right Of The Railroad Gate Monolith

Results from Hrennikoff Pile Analysis

CASE	AXIAL - A	Q - A	AXIAL - B	Q - B
I	-10.735	-0.1101	37.056	-0.0598
II	-9.312	-0.8217	35.633	-0.7713
III	13.412	1.3345	18.874	1.3962

BASE SLAB

Transverse Reinforcement



Case I

Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile 'A' Axial	2(10.735)	21.470	3.130	67.20
	2(0.1101)	-0.220	1.565	- 0.34
Water	5x9.5x10.0x.0625	29.688	2.500	74.22
Earth	1x5x10.0x.0575	2.875	2.500	7.19
Slab	5x2.5x10.0x.150	18.750	2.500	46.88
Uplift	-0.15625x5x10.0	-7.812	2.500	-19.53
	-0.59375x4.0x10.0	-23.750	3.000	-71.25
				Σ 104.37

PROJECT	Page 4 of —	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - EAST OF IHNC		RJG	7-74

T-Wall Mono 13E $\boxed{18}$

T-Wall At The Right ~~Of~~ The Railroad Monolith

BASE SLAB

Top Reinforcement

M = 104.37'-k, M(per ft. slab)= 104.37/10 = 10.44'-k

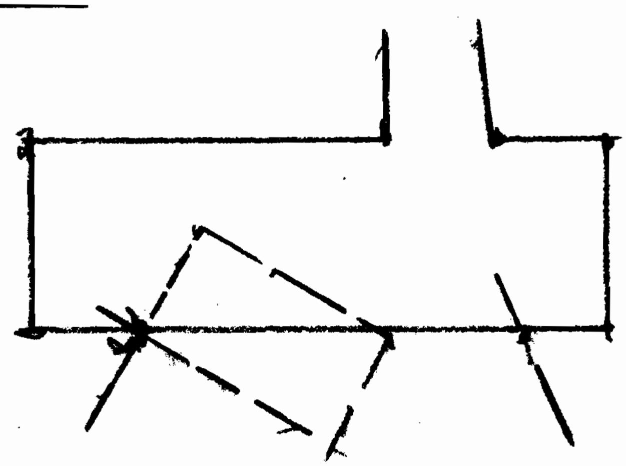
d = $\sqrt{M/kb}$ = $\sqrt{10440/152}$ = 8.3", $d_{provided}$ =27.0"

As = M/ad = 10.44/1.44x27 = 0.27 in^2.

min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2.

Use No. 8 at 12"

Case III



Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile 'A' Axial	2(13.412)	26.824	3.130	83.96
	2(1.3345)	2.669	1.565	-4.18
Earth	1x5x10.0x0.120	6.000	2.500	-15.00
Slab	2.5x5x10.0x0.150	18.750	2.500	-46.88
				Σ 17.90

T-Wall Mono 13E $\boxed{18}$

T-Wall At The Right Of The Railroad Monolift

BASE SLAB

Bottom Reinforcement

M = 17.90'-k, M(per ft. of slab)= 17.90/10.0 = 1.79'-k

$d = \sqrt{M/kb} = \sqrt{1790/152} = 3.4"$, $d_{provided} = 25.5"$

As = M/ad = 1.79/1.44x25.5 = 0.05 in.^{2}

min. As = 0.0025bd = 0.0025x12x25.5 = 0.77 in.^{2}

Use No. 8 at 12"

Longitudinal Reinforcement

min As = 0.0020bt = 0.0020x96x30 = 5.76 in.^{2}

Use 9 No. 6's top + bottom (10" spacing)

WALL STEM

The same as "T-Wall Between Harbor Road And The Railroad Gates". (See pages 9, 10)

Vertical Steel

Use No. 7 at 12" Flood Side Face

Use No. 6 at 12" Protected Side Face

Horizontal Steel

Use No. 5 at 12" on each face

CROSS-SECTION: The same as "T-Wall Between Harbor Road And The Railroad Gates" except the bottom elevation of the base slab is +2.0.

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

TWall Monolith - 18

ITEM	COMPUTATIONS	Fz	Arm y	Mx	Arm x	My
Base Slab	2.5 (10.)(8)(0.15)	30.	4.0	120.	5.0	150.
Wall	1.0 (9.5)(10)(0.15)	14.3	5.5	78.	5.0	71.3
	1/2 (0.39)(10)(0.15)(9.5)	2.8	6.46	18.1	5.0	14.0
Pedestal	2.(1.5)(1.5)(0.15)	0.7	4.25	3.0	8.83	6.2
	Concrete	48.8		219.1		241.5
Soil Subm	$\gamma_s = 120$ #/c.f.					
	1.0(6.62)(10.)(0.0575)	3.8	3.55	13.5	5.0	19.0
Soil Sat.	1.0(6.62)(10.)(0.120)	7.9	3.55	28.1	5.0	39.5
Uplift Imp.	-4(0.59375)(10.)	-23.8	2.0	-47.6	5.0	-119.
	-8(0.15625)(10.)	-12.5	4.0	-50.0	5.0	-62.5
Uplift Per	-4(0.59375)(10)	-23.8	2.67	-63.5	5.0	-119.
	-8(0.15625)(10.)	-12.5	4.0	-50.0	5.0	-62.5
Water	5.(0.0625)(10.)(9.5)	29.7	2.5	74.3	5.0	148.5
Gate	1/2 (5.7)	2.9	4.25	12.3	8.83	25.6
		Fy	Arm z	Mx	Arm x	Mz
Hor. Load	1/2(0.75)(12.)(10.)	-45.0	4.0	180	5.0	225.

LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

	Case	F_x	F_y	F_z	M_x	M_y	M_z
D.D	Case 1	0	0	29.8	-247.8	-420.5	0
W.L + IMP.	Case 2	0	-45.0	12.8	-365.6	-201.5	-225
W.L + Per	Case 3	0	-45.0	12.8	-349.7	-201.5	-225

```
02/04/76     14.82

10 FLORIDA AVENUE COMPLEX--EAST
20 RR SWING GATE STORAGE  MONOLITH
30 2 3
40 2 0 60
50 1 12 12
55 1 5
60 0 450
70 0 0 0
90 2 90 2
100 2 8
110 2*-1.5
120 2*0.0
130 2 270 2
140 2 8
150 2*-6.5
160 2*0.0
170 0 0 60 -259 -430 0
180 0 -45 46 -389 -228 -225
190 0 -45 46 -373 -228 -225

READY

*REMO CLEARFILES
*RUN A2K90/K29010,E

    PROG. NO. 713-F3-A2-210          14:50:42  02/04/76

 FLORIDA AVENUE COMPLEX--EAST
 RR SWING GATE STORAGE  MONOLITH

TOTAL NUMBER OF PILES =     4

             LOAD CONDITION  1

           LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.         0.        60.0      -259.0      -430.0        0.

            PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1      0.8     0.0      3.0
  2      0.8     0.0     27.2
  3     -0.9    -0.0      6.4
```

```
 1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


 1          0.0     -0.0     60.0    -259.0    -430.0     -0.0


           LOAD CONDITION  2

        LOADS ON PILE CAP
    X          Y          Z          MX      MY        M
    0.         -45.0      46.0     -389.0   -228.0    -225.0

         PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -0.9     0.0    -10.3
  3     0.9    -0.0     36.4
 2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


 2          0.0    -45.0     46.0    -389.0    -228.0    -225.0


           LOAD CONDITION  3

        LOADS ON PILE CAP
    X          Y          Z          MX         MY         MZ
    0.         -45.0      46.0     -373.0     -228.0     -225.0

         PILE LOADS (PILE AXIS)
 LE
 NO.      X       Y        Z
  1    -1.6     0.0     -8.9
  3     1.6    -0.0     35.0
 3      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


 3          0.0    -45.0     46.0    -373.0    -228.0    -225.0


 0   14:51: 3  02/04/76   *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11103-11106

11103     1    0.841    0.000     2.955     0.        0.        0.
11104     2    0.795    0.000    27.156     0.        0.        0.
11105     3   -0.859   -0.000     6.353     0.        0.        0.
11106     4   -0.905   -0.000    30.554     0.        0.        0.
```

```
READY

*LIST 11103-11106

11103        1   0.841   0.000     2.955     0.          0.          0.
11104        2   0.795   0.000    27.156     0.          0.          0.
11105        3  -0.859  -0.000     6.353     0.          0.          0.
11106        4  -0.905  -0.000    30.554     0.          0.          0.

READY

*LIST 12103-12106

12103        1  -0.919   0.000   -10.336     0.          0.          0.
12104        2  -0.919   0.000   -10.708     0.          0.          0.
12105        3   0.869  -0.000    36.398     0.          0.          0.
12106        4   0.870  -0.000    36.026     0.          0.          0.

READY

*LIST 13103-13106

13103        1  -1.635   0.000    -8.905     0.          0.          0.
13104        2  -1.634   0.000    -9.277     0.          0.          0.
13105        3   1.585  -0.000    34.967     0.          0.          0.
13106        4   1.586  -0.000    34.595     0.          0.          0.

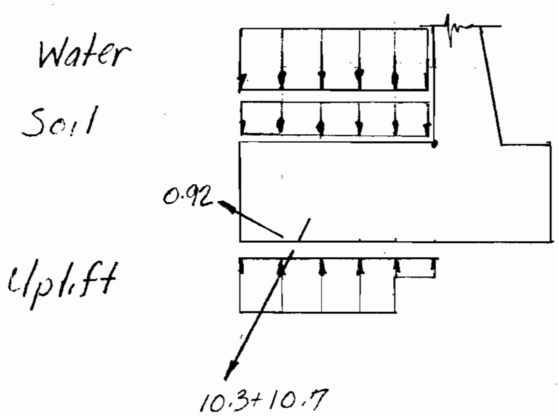
READY
```

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

East Fla. Ave. Complex - Storage Monolith

Base Slab - Top Reinforcement

Case II - Water at El. 14.0, Impervious Soil Condition



Moment about the face of the wall

		Force	Arm	Moment
Piles,	'P' (10.3+10.7)÷10	2.1	3.12	6.55
	÷Q (0.92)(2)÷10	− 0.2	1.56	− 0.31
Water	5(9.5)(0.0625)	2.97	2.5	7.43
Soil	1.(5.)(0.0575)	0.29	2.5	0.73
Slab	2.5(5.)(0.15)	1.88	2.5	4.70
Uplift	−0.15625(5.0)	− 0.78	2.5	− 1.95
	−0.59375(4.0)	− 2.38	3.0	− 7.14
				10.01 1K/1

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT	Page __ of __	COMPUTED BY	DATE
SUBJECT		CHECKED BY	DATE

Top Reinforcement - Case II

$M = 10.01^{'k}$

$d_{prov} = 27 in$

$d_{reqd} = \sqrt{\frac{M}{Kb}} = \sqrt{\frac{10{,}010}{152}} =$

$\therefore$ use min $A_s = 0.0025(12)(27) = 0.81 in^2/'$

or #8, 12"

Bottom Reinforcement:

Case 1 - Dead Load

		Force	Arm	Moment
Piles	'P' - (2.96 + 27.16) ÷ 10	3.01	3.12	9.39
	'Q' - (.84 + .80) ÷ 10	− 0.16	1.56	− 0.25
Soil	1 (5) (0.12)	− 0.6	2.5	− 1.50
Base Slab	5 (2.5) (0.15)	− 1.88	2.5	− 4.70
Gate	½ (5.7)	− 2.85	0.75	− 2.14
				0.80

$\therefore$ Use min $A_s = 0.765 in^2/'$ or #8, 12 in

Longitudinal A_s: $A_s = 0.002(96)(30) = 5.76 in^2$

or #6, 12 in

```
12/24/75     08.56


10 FLØRIDA AVENUE CØMPLEX-
20* EAST RAILRØAD SWING GATE STØRAGE MØNØLITH
30* HEIGHT-9.5', LENGTH-10.0'; 4 PILES AT 2:1 BATTER
40 3 12.0 1
50 1 3
130 2 0 2
140 1 100
150 12 60 80 40
160 1 -2
170 1.5 2
180 1 2
190 6.5 2
200 0 0
210 253 58 0
220 393 47 43
230 377 47 43
240 $$$

READY

*REMØ D29004
*RUN RK29004

        12/24/75     08.585


   PRØG. NØ. 713-F3-A2-150, MØD 9 - NØV'74; FØR DESCRIPTIØN,
 LIST SØURCE FILE --- A2B00/ADP/HRENN/K29003M


 SELECT INPUT METHØD:
   1 = ALL DATA FRØM USER'S DATA FILE (D29004);
   2 = BINARY DATA FILE FRØM K29002 PLUS USER'S DATA FILE (D29004);
   3 = BINARY DATA FILE FRØM K29002 PLUS KEYBØARD INPUT;
   4 = ALL DATA FRØM KEYBØARD INPUT.
=1
```

FLØRIDA AVENUE CØMPLEX-
EAST RAILRØAD SWING GATE STØRAGE MØNØLITH
HEIGHT-9.5', LENGTH-10.0'; 4 PILES AT 2:1 BATTER

RUN NØ. 1 - CASE 1.00

PILE ARRANGEMENT

PILE GRØUP	NØ. RØWS	CENTRØID DISTANCE	BATTER RATIØ	NUMBER PILES
A	1	1.50	-2.00	2.00
B	1	6.50	2.00	2.00

TØTAL NØ. ØF PILES = 4.

AREA	AI	E	AL	PC	PT
144.00	1728.00	4286826.	60.00	80.00	40.00

AK(1)
100.000

MØM.	VERT.	HØR.	CASE
253.000	58.000	0.	10001.00

DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
-0.12756E 00	-0.93446E-01	0.21668E-02	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	14.318	0.9082	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	18.074	0.9701	0.

FLØRIDA AVENUE CØMPLEX-
EAST RAILRØAD SWING GATE STØRAGE MØNØLITH
HEIGHT-9.5', LENGTH-10.0'; 4 PILES AT 2:1 BATTER

MØM.	VERT.	HØR.	CASE
393.000	47.000	43.000	20001.00

DELTA-X	DELTA-Y	ALPHA (INCHES AND RADIANS)
0.67011E-01	0.38023E-01	-0.61386E-03

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	-10.019	-0.4723	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	36.268	-0.4221	0.

MØM.	VERT.	HØR.	CASE
377.000	47.000	43.000	30001.00

DELTA-X	DELTA-Y	ALPHA (INCHES AND RADIANS)
0.16420E 00	0.11727E 00	-0.22648E-02

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	2.00	-8.588	-1.1879	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	2.00	34.837	-1.1377	0.

MAX. DEFL. FØR AT REST SØIL PRESS. =   0.0720

T-WALL MONOLITHS WEST IHNC

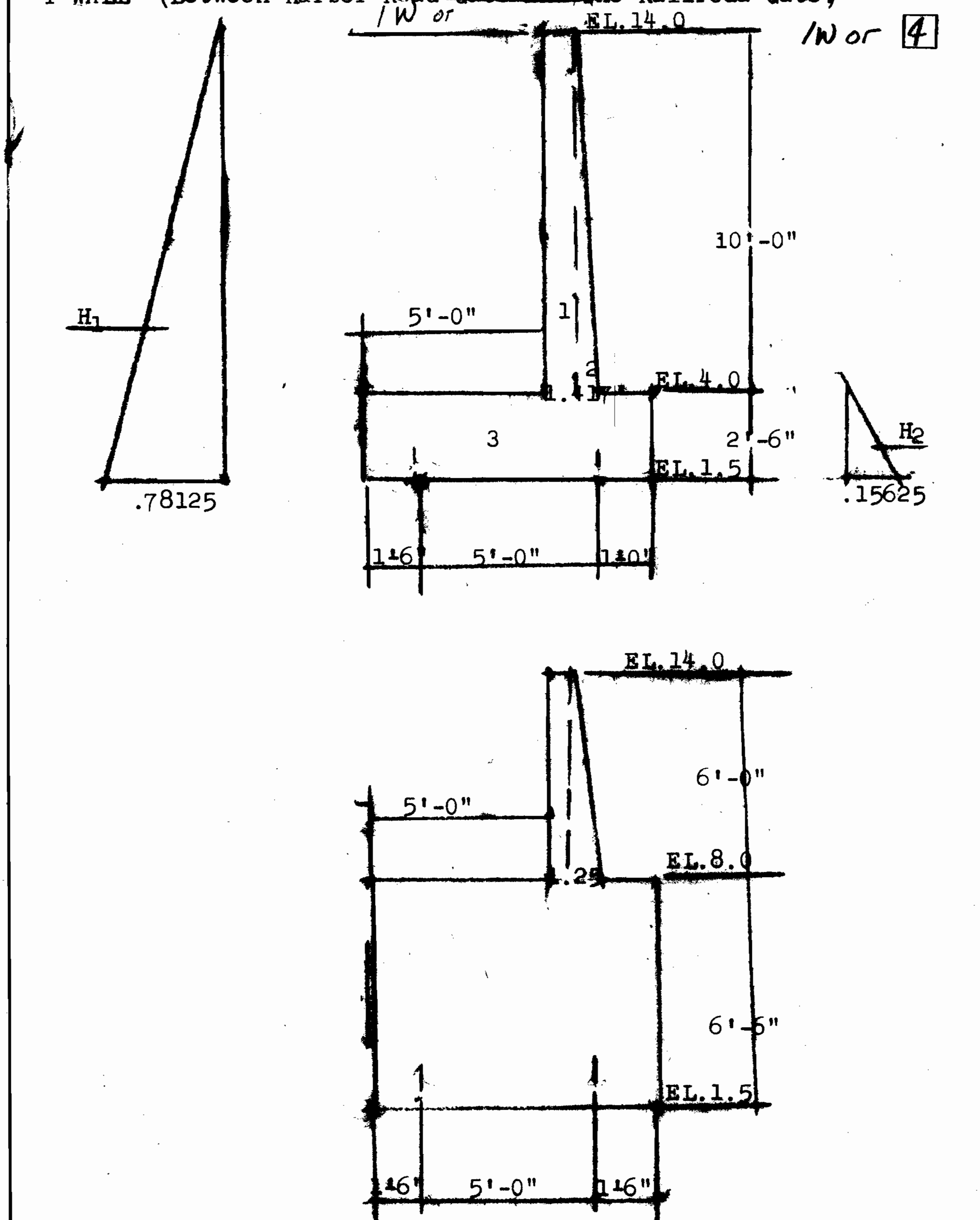
1W, 2W, 3W, 4W, 5W, 6W ← TOTAL NO. OF T-WALL MONOLITHS

$\boxed{4}$, $\boxed{6}$, $\boxed{7}$, $\boxed{9}$, $\boxed{11}$, $\boxed{12}$ ← TOTAL NO. OF MONOLITHS

VOID

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 1 of 11	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC		JGB	JUL 74

T-WALL ~~(Between Harbor Road Gate And The Railroads Gate)~~



PROJECT IHNC AND FLA. AVE. COMPLEX	Page 2 of 11	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN WEST OF IHNC		CHECKED BY JGB	DATE JUL 74

T-WALL ~~Between Harbor Road And The Railroad Gate~~ 1W or 4

Moment About X - X Axis

ITEM	COMPUTATION	+ V	+ H	Arm	Moment
1	1.0x10.0x19.13*x0.150	28.70		5.50	157.85
4	1.0x6.0x2.50*x0.150	2.25		5.50	12.38
2	0.417x10.0x19.13x0.150/2	5.98		6.14	36.53
5	0.250x6.0x2.50x0.150/2	0.28		6.08	1.70
3	8.0x2.5x19.13x0.150	57.39		4.00	229.56
6	8.0x6.5x2.50x0.150	19.50		4.00	78.00
	SUBTOTAL	114.10			516.02
Impervious Uplift	-0.15625x8.0x21.63	-27.04		4.00	-108.16
	-0.625x4.0x21.63	-54.08		2.00	-108.16
Pervious Uplift	-0.15625x8.0x21.63	-27.04		4.00	-108.16
	-0.625x8.0x21.63/2	-54.08		2.67	-144.39
Wt. Water	5.0x10.0x19.13x0.0625	59.78		2.50	149.45
	5.0x6.0x2.5x0.0625	4.69		2.50	11.72
Earth	1.0x6.58x19.13x0.0575	7.24		3.63	26.28
H_1	0.78125x12.5x21.63/2		105.62	4.17	440.44
H_2	-0.15625x2.5x21.63/2		-4.22	0.83	-3.50
	Impervious Case I	104.69	101.40		924.09
	Pervious Case II	104.69	101.40		887.86
Earth	1.0x6.58x19.13x0.120	15.11		3.63	54.85
	Dead Loads Case III	129.21			570.87

*Note: Length of monolith is actually 22.31' instead of 21.63 - Difference not considered significant to warrant revision of computations - JGB

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 3 of 11	HMB	
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BARRIER PLAN - WEST OF IHNC		JGB	JUL 74

T-WALL ~~Between Harbor Road And The Railroad Gates~~ 1N or $\boxed{4}$

Moment About Y-Y Axis

ITEM	COMPUTATION	+ V	ARM	MOMENT
1	See Page 2	28.70	9.56	274.37
4		2.25	20.38	45.86
2		5.98	9.56	57.17
5		0.28	20.38	5.71
3		57.39	9.56	548.65
6		19.50	20.38	397.41
	SUBTOTAL	114.10		1329.17
Impervious Uplift or		-27.04	10.82	-292.57
Pervious Uplift		-54.08	10.82	-585.15
Wt. Water		59.78	9.56	571.50
		4.69	20.38	95.58
Wt. Earth		7.24	9.56	69.21
	Impervious + Pervious	-9.41		-141.43
	Case I + Case II	104.69		1187.74
Wt. Earth		15.11	9.56	144.45
Dead Loads	Case III	129.21		1473.62

T-WALL ~~Between Harbor Road And The Railroad Gates~~ 1W or 4

Moment About Z-Z Axis

ITEM	COMPUTATION	H	ARM	MOMENT
Wall+Base Above EL. 4.0	$21.63 \times .0625 \times 10^2/2$	67.59	10.82	731.32
Base Below EL. 4.0	.625x2.5x21.63	33.80	10.82	365.72
	Case I + Case II	101.39		1097.04

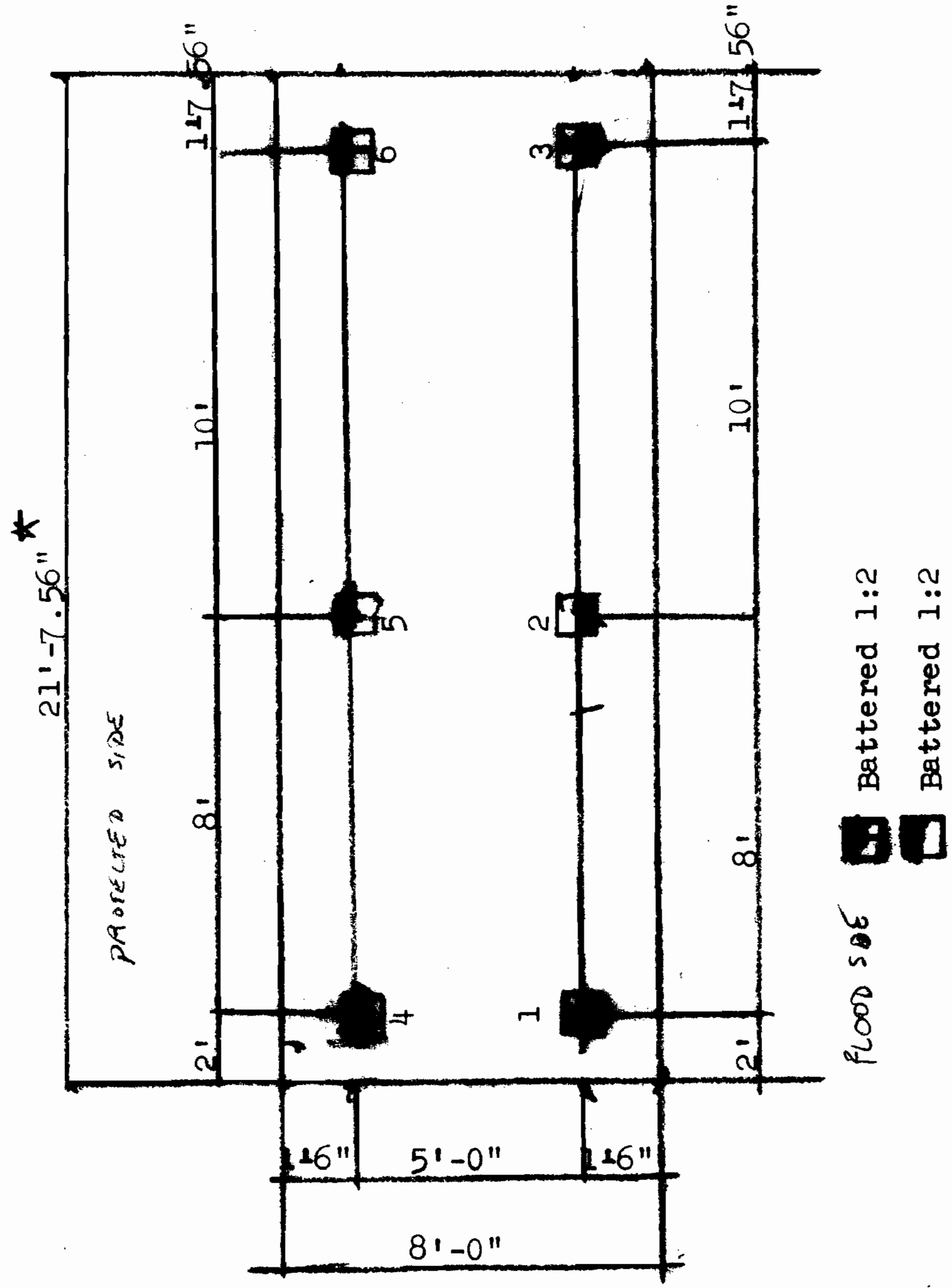
CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
1	Impervious	0	101.40	104.69	924.09	1187.74	1097.04
2	Pervious	0	101.40	104.69	887.86	1187.74	1097.04
3	Dead Loads	0	0	129.21	570.87	1473.62	0

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 5 of 11	COMPUTED BY HMB	DATE
SUBJECT BARRIER PLAN WEST OF IHNC		CHECKED BY JGB	DATE JUL 74

T-WALL ~~Between Harbor Road And The Railroad Gates~~

1W or 4

Foundation Design



LMV FORM 1 AUG 68 107a COMPUTATION SHEET

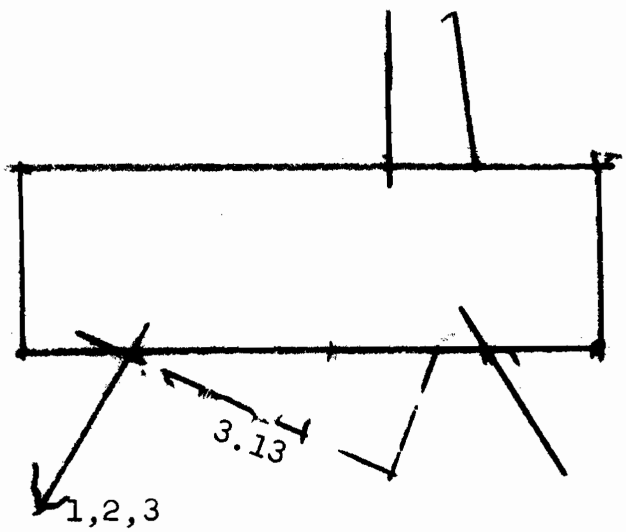
PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 6 of 11	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC		JOB	JUL 74

T-WALL ~~Between Harbor Road And The Railroad Gate~~ 1W or $\boxed{4}$

Base Slab

Transverse Reinforcement

Case I (3-D pile computer program)



Moment about face of wall		FORCE	ARM	MOMENT
Piles 1	Axial	19.2	3.13	60.10
2		18.2	"	56.97
3		17.1	"	53.52
Water	59.78+4.69	64.47	2.5	161.18
Earth	1.0x5.0x19.13x.0575	5.50	2.5	13.75
Slab	5.0x2.5x19.13x.150	35.87	2.5	89.68
	5.0x6.5x2.5x.150	12.19	2.5	30.48
Uplift	-.15625x5.0x21.63	-16.90	2.5	-42.25
	-.625x4.0x21.63	-54.08	3.0	-162.24
				261.19

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 7 of 11	HMB	
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC		JKB	JUL 74

T-WALL ~~Between Harbor Road And Railroad Gates~~ 1W or $\boxed{4}$

BASE SLAB

Top Reinforcement

M = 261.19 '-k M(per ft. slab)= 261.19/21.63= 12.08'-k

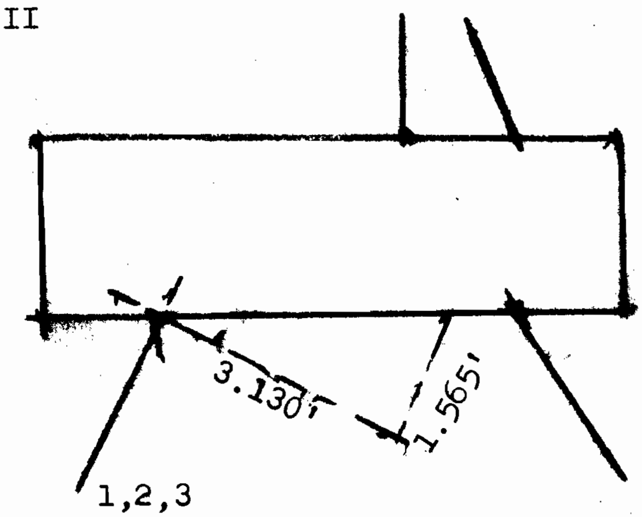
$d = \sqrt{m/kb} = \sqrt{12080/152} = 8.9$ " $d_{provided} = 27.0$"

$As = M/ad = 12.08/1.44x27 = 0.31$ in^2.

min. $As = 0.0025bd = 0.0025x12x27 = 0.81$ in^2.

Use NO. 8 at 12"

Case III



Moment about face of wall		FORCE	ARM	MOMENT
Piles 1	Axial	18.0	3.13	56.34
2		20.6	"	64.48
3		23.9	"	74.81
℄	3(1.6)	4.8	1.565	-7.51
Earth	1.0x5.0x19.13x.120	11.48	2.50	-28.70
Slab	5.0x2.5x19.13x.150	35.87	2.5	-89.68
	5.0x6.5x2.5x.150	12.19	2.5	-30.48
				39.26

```
READY
*LIST

10 FLA AVE COMPLEX
20 T-WALL MONO 1W
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 3
120 2 10 20
130 3*-1.5
140 3*0
150 2 270 3
160 2 10 20
170 3*-6.5
180 3*0
200 0 -101.04 104.69 -924.09 -1187.74 -1097.04
300 0 -101.04 104.69 -887.86 -1187.74 -1097.04
400 0       0 129.21 -570.87 -1473.62       0

READY

*REMOVE D29010
*RUNH K29010

        07/11/74    12.833

LOADER DIAGNOSTICS
<W> .FFBC  UNDEFINED


    PROG. NO. 713-F3-A2-210           12:50:53  07/11/74


 FLA AVE COMPLEX
 T-WALL MONO 1W


TOTAL NUMBER OF PILES =     6



           LOAD CONDITION  1

         LOADS ON PILE CAP
      X         Y         Z          MX        MY        MZ
      0.      -101.0     104.7     -924.1    -1187.7   -1097.0

          PILE LOADS (PILE AXIS)
PILE
 NO.       X        Y        Z
  1     -0.0     -0.0     -19.2
  2     -0.0     -0.0     -18.2
  3     -0.0     -0.0     -17.1
  4     -0.0     -0.0      53.9
  5     -0.0     -0.0      56.9
  6     -0.0     -0.0      60.6
```

MONO 4

```
   1       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1         -0.0   -101.0    104.7     -924.1    -1187.7    -1097.0


              LØAD CØNDITIØN   2

            LØADS ØN PILE CAP
        X            Y            Z            MX           MY           MZ
        0.         -101.0       104.7       -887.9     -1187.7     -1097.0

              PILE LØADS (PILE AXIS)
 PILE
  NØ.        X          Y          Z
   1      -1.1      -0.0      -17.0
   2      -1.1      -0.0      -16.1
   3      -1.1      -0.0      -15.0
   4       1.0      -0.0       51.7
   5       1.0      -0.0       54.7
   6       1.0      -0.0       58.5
   2       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2         -0.0   -101.0    104.7     -887.9    -1187.7    -1097.0


              LØAD CØNDITIØN   3

            LØADS ØN PILE CAP
        X            Y            Z            MX           MY           MZ
        0.           0.         129.2       -570.9     -1473.6          0.

              PILE LØADS (PILE AXIS)
 PILE
  NØ.        X          Y          Z
   1       1.6       0.0       18.0
   2       1.6       0.0       20.6
   3       1.6       0.0       23.9
   4      -1.7      -0.0       24.4
   5      -1.7      -0.0       27.1
   6      -1.7      -0.0       30.3
   3       SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3         -0.0      -0.0    129.2     -570.9    -1473.6       -0.0


   0    12:51:34   07/11/74    *** END ØF   RUN ***


 STØP       EØJ
```

T-WALL ~~Between Harbor Road And Railroad Gates~~ 1W or $\boxed{4}$

BASE SLAB

Bottom Reinforcement

M = 39.26 '-k   M(per ft. of slab)= 39.26/21.63 = 1.82'-k

~~d = √M/kb = √1820/152 =~~ 3.5" $d_{provided}$ = 25.5"

As = M/ad = 1.82/1.44x25.5 = .05 in.^{2}

min As = .0025bd = .0025x12x25.5 = .77 in.^{2}

Use No. 8 at 12"

Longitudinal Reinforcement

min As = .0020bt = .0020x96x30 = 5.76 in.^{2}

Use 2.88 in.^{2} for each face

Use 9- No. 6's top + Bottom (10" spacing)

PROJECT IHNC AND FLA. AVE. COMPLEX

COMPUTED BY HMB

DATE

SUBJECT BARRIER PLAN WEST OF IHNC

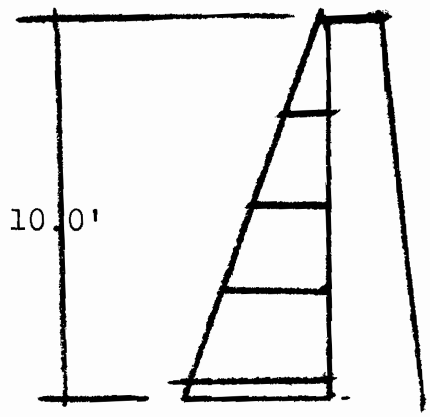
CHECKED BY JGB

DATE

T-WALL ~~Between Harbor Road Gate And The Railroad Gate~~

Wall Stem

1W or $\boxed{4}$



	FORCE	ARM	MOMENT
$0.0625 \times 10^2/2$	3.125	10/3	10.41'-k/'

$d_{req'd} = \sqrt{M/kb} = \sqrt{10410/152} = 8.3$ in.

$d_{prov'd} = 17.0 - 2.5 - 0.5 = 14.0"$

Vertical Steel

$As = M/ad = 10.41/1.44 \times 14.0 = 0.52 \text{ in}^2$

$\min As = 0.0025bd = 0.0025 \times 12 \times 14.0 = 0.42 \text{ in}^2$

Use No. 7 at 12" Flood Side Face $As = 0.60 \text{ in}^2$

Use No. 6 at 12" Protected Side Face $As = 0.44 \text{ in}^2$

$v = V/bd = 3.125/12 \times 14.0 = .019 < .060$ ksi

No shear reinf. req'd.

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 10 of 11	HMB	
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BARRIER PLAN - WEST OF IHNC		JGB	JUL 74

T-WALL ~~Between Harbor Road Gate And Railroad Gate~~

Wall Stem

1 N or $\boxed{4}$

Horizontal Steel

$As = 0.0020bt = 0.0020x12x17.0 = 0.41 \ in^2$

Use No. 5's at 12" each face

$2x0.31 = 0.61 \ in^2$

Depth at which No. 6 at 12" are adequate.

$As = 0.44 \ in^2$

$M = Asad = 0.44x1.44x9.0 = 5.70'\text{-}k$

$0.0625y^3/6 = 5.70$

$y = 8.1'$

10'-0" Height

Depth at which No.7 at 12" are adequate.

$As = 0.60 \quad 12 + 12x8/24 - 2.5 - 0.5 - 0.5 = 12.5"$

$M = Asad = 0.60x1.44x12.5 = 10.80'\text{-}k$

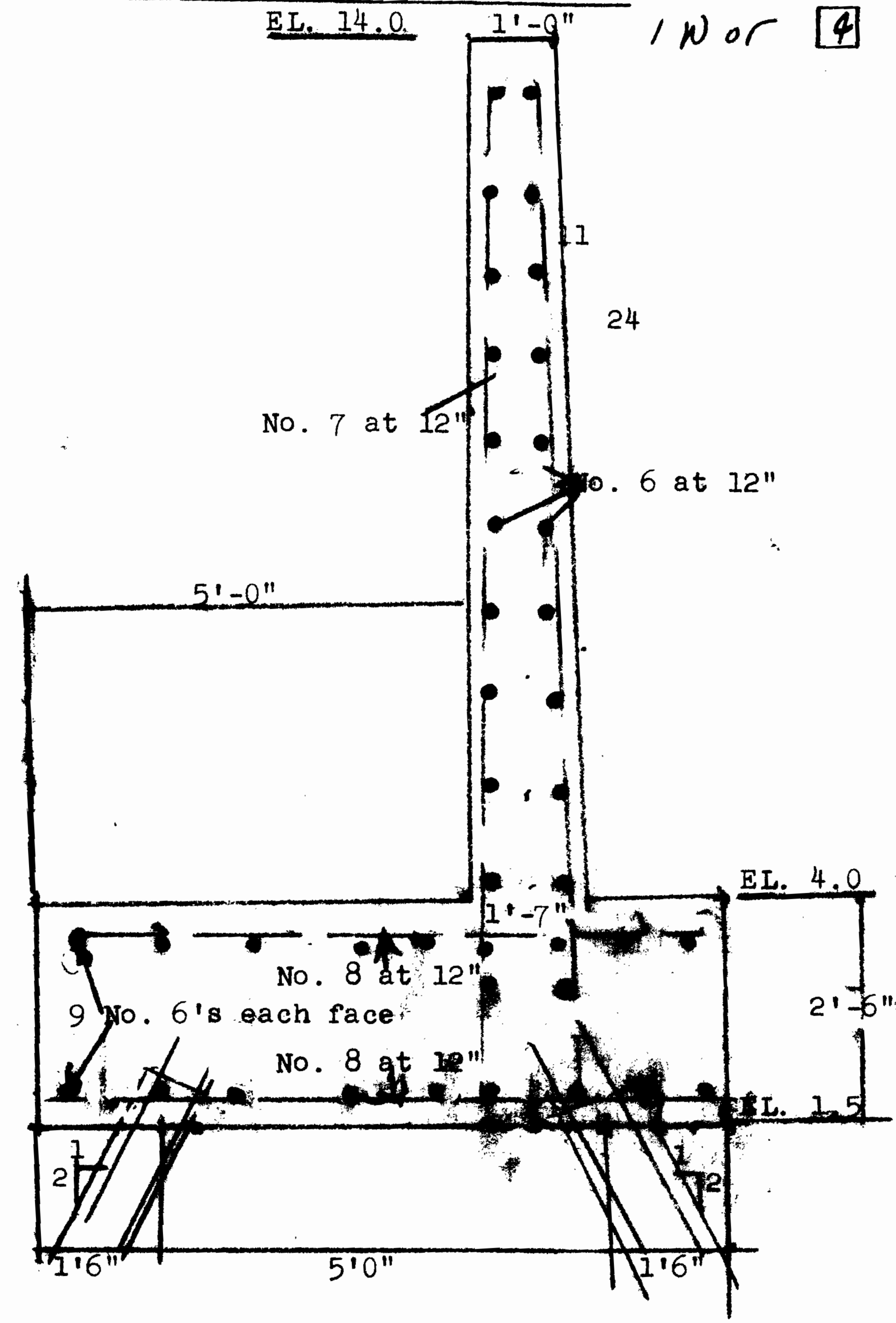
$0.0625y^3/6 = 10.80$

$y = 10.12'$ from top or EL. 3.88

PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 11 of 11	HMB	
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN - WEST OF IHNC		JGB	JUL 74

T-WALL ~~Between Harbor Road and Railroad Gates~~

1 W or $\boxed{4}$



PROJECT IHNC AND FLA. AVE. COMPLEX	Page 1 of 1	COMPUTED BY HMB	DATE June
SUBJECT BARRIER PLAN - WEST OF IHNC 155.75 TO 215.02		CHECKED BY RJG	DATE July 7[illegible]

$\boxed{6}$ $\boxed{7}$

Mono 2W & 3W

T-Wall ~~Between The Railroad And Drainage Canal Gates~~

Top of Slab EL 1.0

2+15.02 W/L End of Drainage Canal Gate Monolith

1+85.75

29.27 T-Wall Monolith next to the Drainage Canal Gate Monolith.

1+36.25 W/L Center of Railroad Gate

15.00

4.50

1+55.75 End of Railroad Gate Monolith

1+85.75

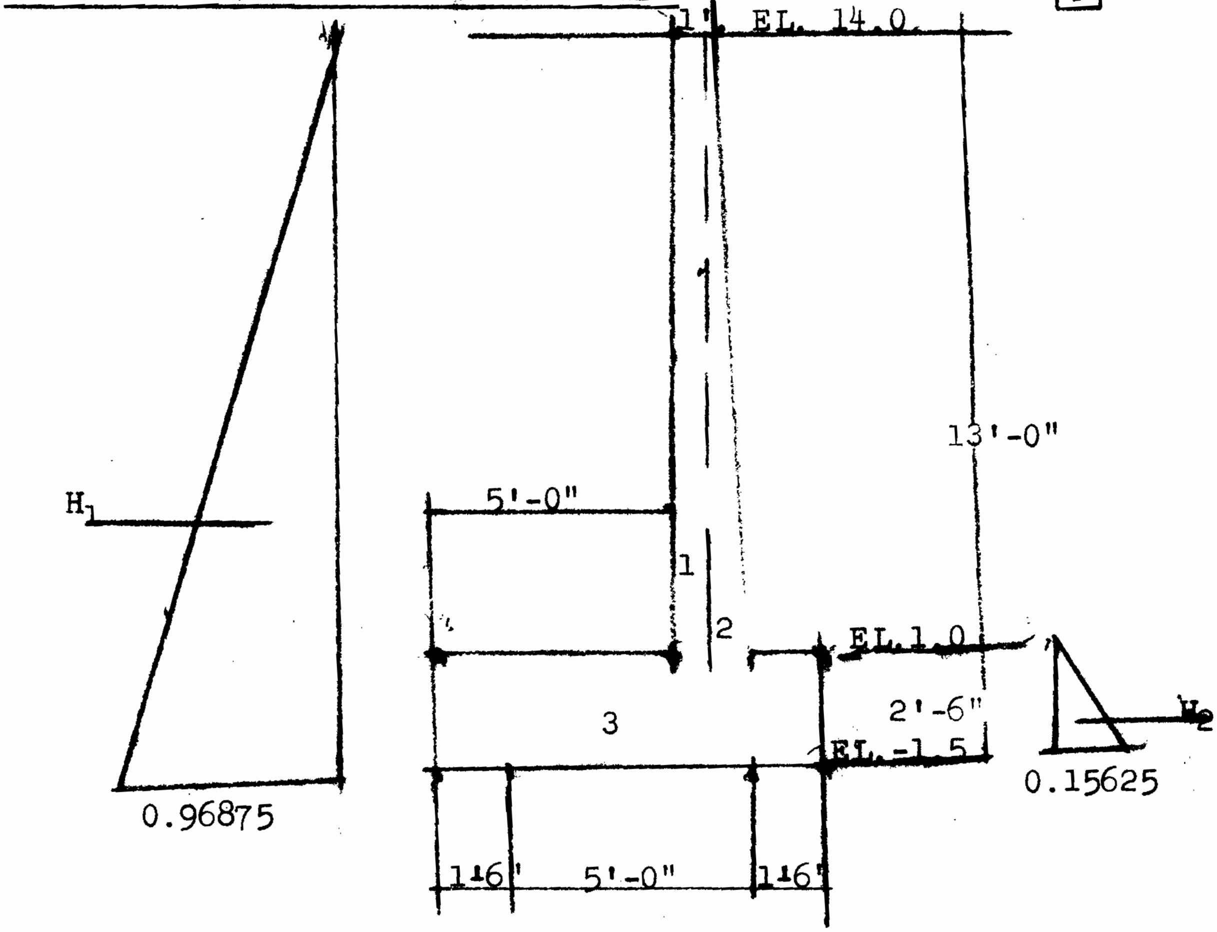
1+55.75

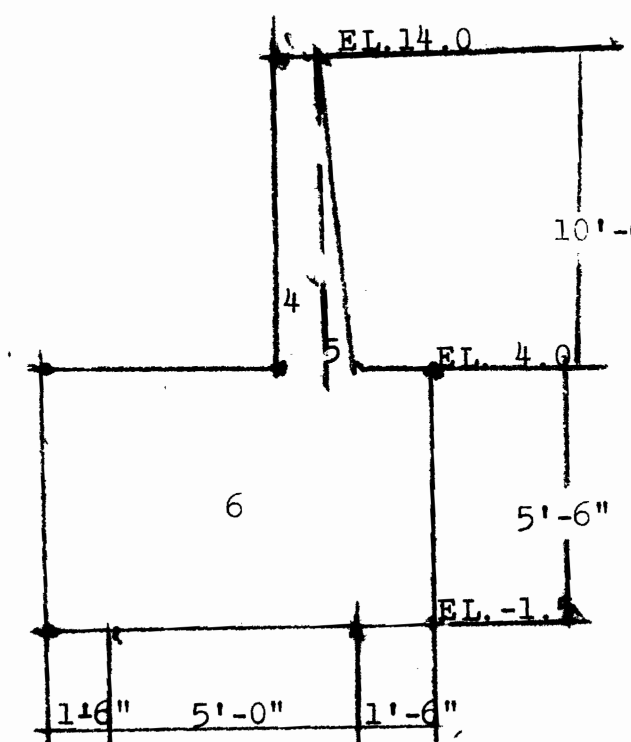
30.00 T-Wall Monolith next to the Railroad Gate monolith. (Step to El. 4.0)

PROJECT IHNC AND FLA. AVE. COMPLEX | Page 1 of 9 | COMPUTED BY HMB | DATE June '74

SUBJECT BARRIER PLAN - WEST OF IHNC 185.75 to 155.75 | CHECKED BY RJGr | DATE June 74

T-Wall ~~South Of The Railroad Gate~~ Mono 2W or $\boxed{6}$





PROJECT				
IHNC AND FLA. AVE. COMPLEX	Page 2 of 9	COMPUTED BY HMB	DATE June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		CHECKED BY R[illegible]	DATE June 74

T-Wall ~~South Of The Railroad Gate~~ Mono 2W or $\boxed{6}$

Moment About X - X Axis

ITEM	COMPUTATION	+ V	+ H	ARM	MOMENT
1	1.0x13.0x27.5x0.150	53.62		5.50	294.91
4	1.0x10.0x2.50x0.150	3.75		5.50	20.62
2	0.542x13.0x27.5x.150/2	14.53		6.18	89.80
5	0.417x10.0x2.5x.150/2	0.78		6.14	4.79
3	8.0x2.5x27.5x0.150	82.50		4.00	330.00
6	8.0x5.5x2.5x0.150	16.50		4.00	66.00
	SUBTOTAL	171.68			806.12
Impervious Uplift	-0.15625x8x30.0	-37.50		4.00	-150.00
	-0.8125x4.0x30.0	-97.50		2.00	-195.00
Pervious Uplift	-0.15625x8x30.0	-37.50		4.00	-150.00
	-0.8125x8x30.0/2	-97.50		2.67	-260.32
Wt. Water	5.0x13.0x27.5x.0625	111.72		2.50	279.30
	5.0x10.0x2.5x.0625	7.81		2.50	19.52
Earth	1.0x6.46x27.5x.0575	10.21		3.58	36.55
H_1	0.96875x15.5x30.0/2		225.23	5.17	1164.44
H_2	-0.15626x2.5x30.0/2		-5.86	0.83	-4.86
	Impervious Case I	166.42	219.37		1956.07
	Pervious Case II	166.42	219.37		1890.75
Earth	1.0x6.46x27.5x.120	21.32		3.58	76.33
	Dead Loads Case III	193.00			882.45

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT IHNC AND FLA. AVE. COMPLEX | Page 3 of 9 | COMPUTED BY HMB | DATE June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 185.75 to 155.75 | CHECKED BY RJG | DATE June 74

T-Wall ~~South Of The Railroad Gate~~ Mono 2W or $\boxed{6}$

Moment About Y - Y Axis

ITEM	COMPUTATION	+ V	ARM	MOMENT
1	See Page 2	53.62	13.75	737.28
4	" " "	3.75	28.75	107.81
2	" " "	14.53	13.75	199.79
5	" " "	0.78	28.75	22.42
3	" " "	82.50	13.75	1134.38
6	" " "	16.50	28.75	474.38
	SUBTOTAL	171.68		2676.06
Impervious Uplift or Pervious	See Page 2	-37.50	15.00	-562.50
Uplift	" " "	-97.50	15.00	-1462.50
Wt. Water	" " "	111.72	13.75	1536.15
	" " "	7.81	28.75	224.54
Earth	" " "	10.21	13.75	140.39
	Impervious Case I or Pervious Case II	166.42		2552.14
Earth	" " "	21.32	13.75	293.15
	Dead Loads Case III	193.00		2969.21

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 4 of 9	HMB	June '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		RJgr	June 74

T-Wall ~~South Of The Railroad Gate~~ Mono 7W or $\boxed{6}$

Moment About Z - Z Axis

ITEM	COMPUTATION	H(Fy)	ARM	MOMENT
Wall+Base Above EL.1.0	$30.0 \times 0.0625 \times 13^2/2$	158.44	15.0	2376.60
Base Below EL.1.0	30.0x.0625x13x2.5	60.94	15.0	914.10
Case I or Case II		219.38		3290.70

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
I	Impervious	0	219.38	166.42	1956.07	2552.14	3290.70
II	Pervious	0	219.38	166.42	1890.75	2552.14	3290.70
III	Dead Loads	0	0	193.00	882.45	2969.21	0

```
10 FLA. AVE. CØMPLEX IHNC WEST
20 T-WALL ~~SØUTH ØF RAILRØAD GATE~~ MONO EW
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 4 90 6
110 2.5 7.5 12.5 17.5 22.5 27.5
140 6*-1.5
170 6*0
200 2 270 6
210 2.5 7.5 12.5 17.5 22.5 27.5
240 6*-6.5
270 6*0
2000 0 -219 166 -1956 -2552 -3291
2010 0 -219 166 -1891 -2552 -3291
2020 0 0 193 -882 -2969 0

READY

*REMØVE D29010
*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED
```

MONO $\boxed{6}$

PRØG. NØ. 713-F3-A2-210   7:37: 4 06/12/74

FLA. AVE. CØMPLEX IHNC WEST
T-WALL SØUTH ØF RAILRØAD GATE

TOTAL NUMBER ØF PILES = 12

LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-219.0	166.0	-1956.0	-2552.0	-3291.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.4	-0.0	-31.2
7	0.3	-0.0	62.9

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	0.0	-219.0	166.0	-1956.0	-2552.0	-3291.0

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-219.0	166.0	-1891.0	-2552.0	-3291.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-1.1	-0.0	-29.2
7	1.1	-0.0	60.8

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	0.0	-219.0	166.0	-1891.0	-2552.0	-3291.0

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	193.0	-882.0	-2969.0	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	3.0	0.0	12.1
2	3.0	0.0	12.7
3	3.0	0.0	13.3
4	3.0	0.0	13.8
[illegible]	3.0	0.0	14.4
[illegible]	3.0	0.0	15.0
[illegible]	-3.3	0.0	19.6

SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

PROJECT IHNC AND FLA. AVE. COMPLEX

SUBJECT BARRIER PLAN - WEST OF IHNC 185.75 to 155.75

T-Wall ~~South of The Railroad Gate~~ Mono 2W or 6

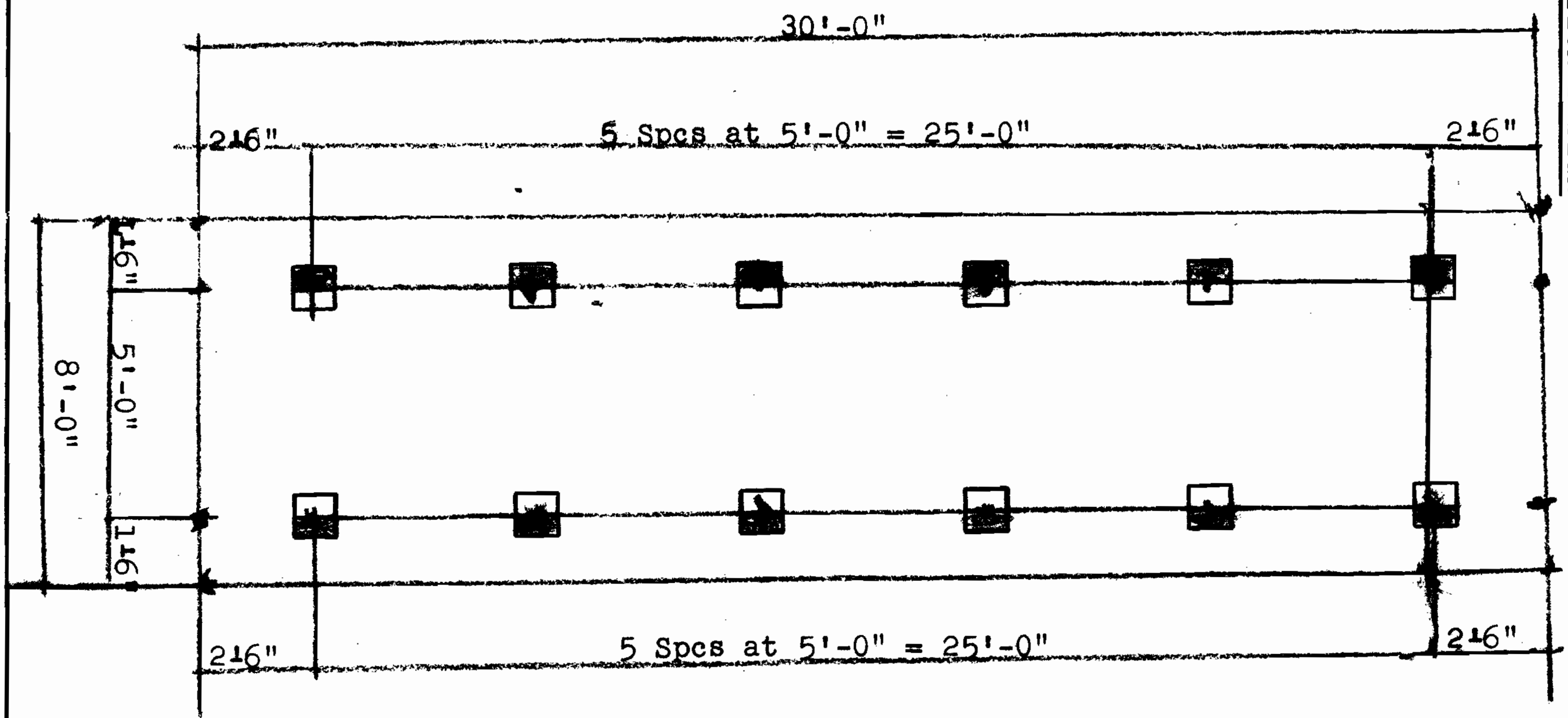
FOUNDATION DESIGN

Page 5 of 9

COMPUTED BY HNB DATE June '74

CHECKED BY [illegible] DATE June 74

Protected Side



Floodside

Battered 1:2

Battered 1:4

COMPUTATION SHEET

LMV FORM 107a
1 AUG 68

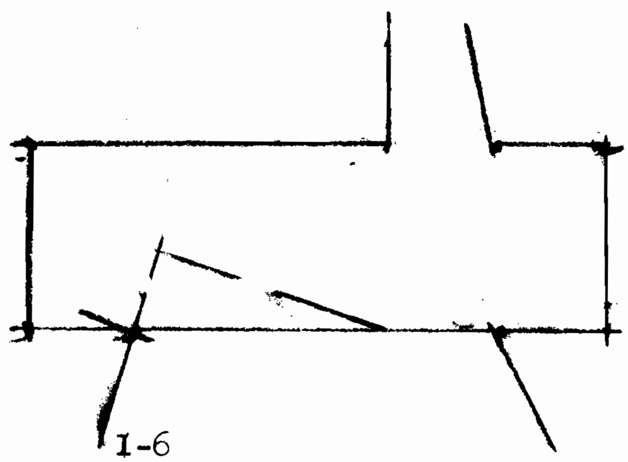
PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 6 of 1	HMB	June '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		Rdgr	June 74

T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

Results from Hrennikoff 3-D Pile Analysis

BASE SLAB

Transverse Reinforcement



Case I

Moment About Face Of Wall	FORCE	ARM	MOMENT
Piles 1-6 Axial 6(31.2)	187.2	3.395	635.54
1-6 Q 6(0.4)	-2.4	0.849	-2.04
Water 111.72+7.81	119.53	2.500	298.82
Earth 1.0x5.0x27.5x.0575	7.91	2.500	19.78
Slab 5(82.50+16.50)/8	61.88	2.500	154.70
Uplift -.15625x5.0x30.0	-23.44	2.500	-58.60
-0.8125x4.0x30.0	-97.50	3.000	-292.50

Σ 755.70'-k

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT	Page 7 of 9	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX		HMB	June '74
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		RGG	June 74

T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

Transverse Reinforcement

Top Reinforcement

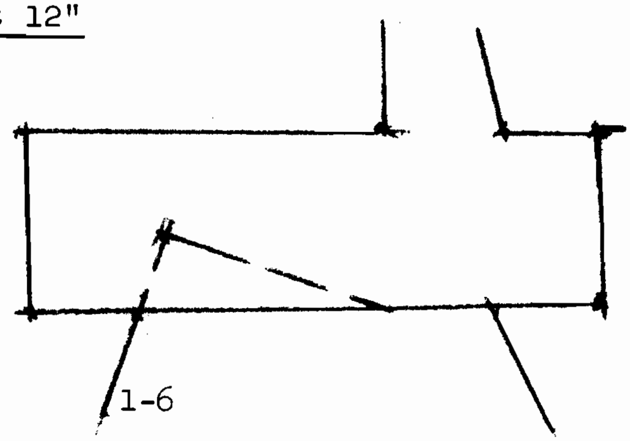
M = 755.70'-k, M(per ft. slab)= 755.70/30 = 25.19 '-k

d = $\sqrt{M/kb}$ = $\sqrt{25190/152}$ = 12.9", $d_{provided}$= 27.0"

As = M/ad = 25.19/1.44x27 = 0.65 in^2.

min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2.

Use No. 8 at 12"



Case III

Moment About Face Of Wall	FORCE	ARM	MOMENT
Pile 1-6 (12.1+12.7+13.3 +13.8+14.4+15.0)	81.3	3.395	276.01
Earth 1x5x27.5x0.120	16.50	2.500	-41.25
Slab 5(82.50+16.50)/8	61.88	2.500	-154.70
		Σ	80.06'-k

T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

Transverse Reinforcement

Bottom Reinforcement

M = 80.06'-k, M = (per ft. slab) = 80.06/30 = 2.67 '-k

d = $\sqrt{M/kb}$ = $\sqrt{2670/152}$ = 4.2", $d_{provided}$ = 25.5"

As = M/ad = 2.67/1.44x25.5 = 0.08 in^2

Min. As = 0.0025bd = 0.0025x12x25.5 = 0.77 in^2

Use No. 8 at 12"

Longitudinal Reinforcement

Due to the step in the T-Wall, there is some longitudinal moment. Therefore, .0025 is used.

Min. As = 0.0025bt = 0.0025x96x27 = 6.48 in^2

Use 6.48 in^2 for each face

Use 15 No. 6's top + bottom (16.05" spacing)

WALL STEM

The same as the "T-Wall North Of The Drainage Canal Gate".

(See pages 7, 8).

Vertical Steel

Use No. 7 at 6" Flood Sides

Use No. 7 at 12" Protected Side

Horizontal Steel

Use No. 6 at 12" each Side

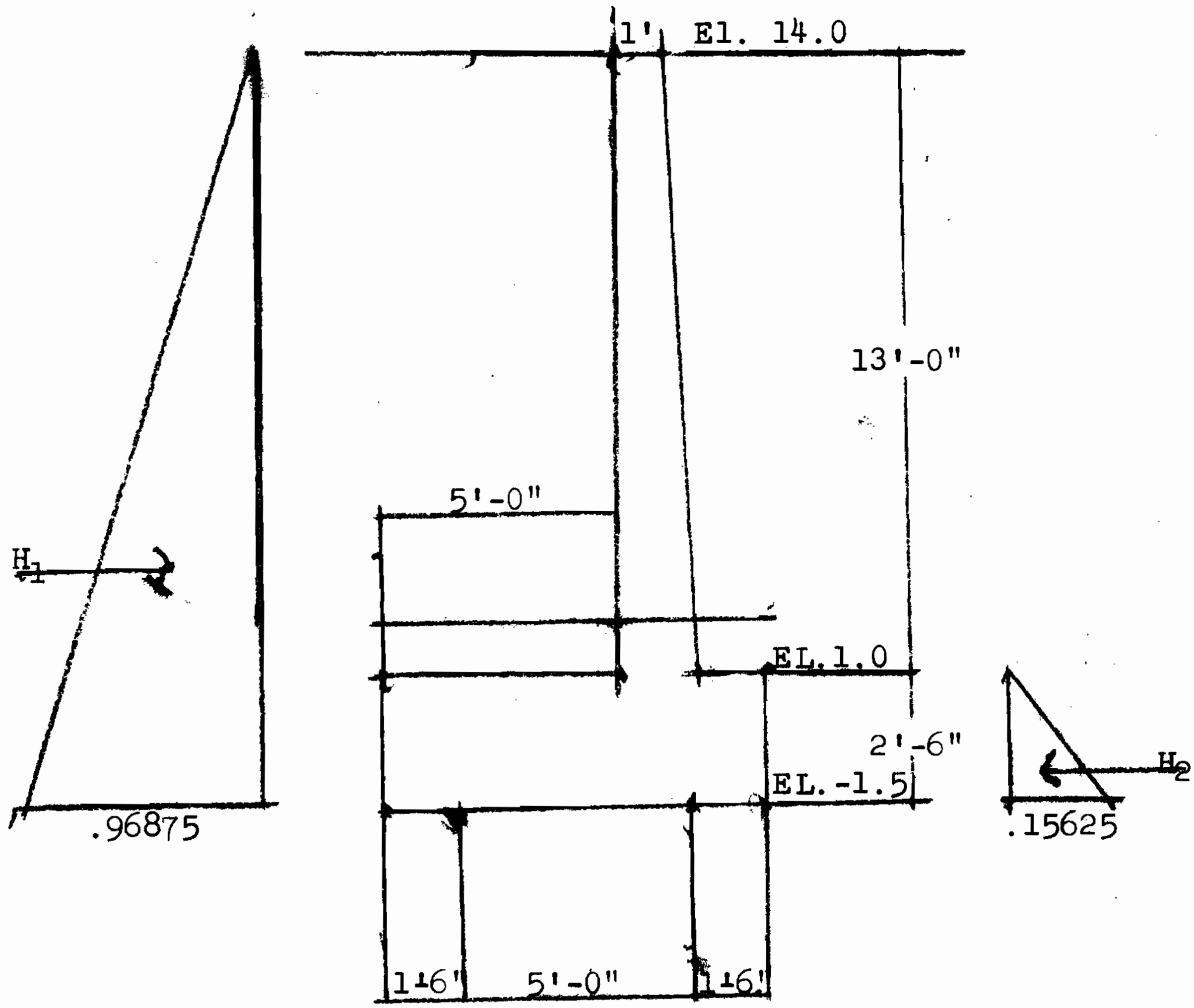
LMV FORM 1 AUG 68 107a COMPUTATION SHEET

Rev. A Aug. 76

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 1 of 9	HMB	June '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC ~~[illegible]~~ 6+69.21 to 6+97.50		Rlg	July '74

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

7



PROJECT IHNC AND FLA. AVE. COMPLEX	Page 2 of 9	COMPUTED BY HMB	DATE June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 215.02 to 185.75		CHECKED BY RJG	DATE July 74

T-Wall ~~Between The Drainage Canal And The Railroad Gates~~ Monolith 3N or $\boxed{7}$

ITEM	COMPUTATION	+ V	+H	ARM	MOMENT
1	1.0x13.0x29.27x.150	57.08		5.50	313.94
2	.542x13.0x29.27x.150/2	15.47		6.18	95.60
3	2.5x8.0x29.27x.150	87.81		4.00	351.24
	SUBTOTAL	160.36			760.78
Impervious Uplift	-0.15625x8.0x29.27	-36.59		4.00	-146.36
	-0.8125x4.0x29.27	-95.13		2.00	-190.26
Pervious Uplift	-0.15625x8.0x29.27	-36.59		4.00	-146.36
	-0.8125x8.0x29.27/2	-95.13		2.67	-254.00
Wt. Water	5x13x29.27x.0625	118.91		2.50	297.28
Earth	1.0x6.46x29.27x.0575	10.87		3.58	38.91
H_1	.96875x15.5x29.27/2		219.75	5.17	1136.11
H_2	-.15625x2.5x29.27/2		-5.72	0.83	-4.75
	Impervious Case I	158.42	214.03		1891.71
	Pervious Case II	158.42	214.03		1827.97
Earth	1.0x6.46x29.27x.120	22.69		3.58	81.23
	Dead Loads Case III	183.05			842.01

* length changed to 28.27' not significant. RJG

FLA AVE COMPLEX IHNC WEST
T-WALL ~~NORTH OF CANAL~~ MONOLITH 5W

RUN NO. 1 - CASE 1.00 MONO $\boxed{7}$

PILE ARRANGEMENT

PILE GROUP	NO. ROWS	CENTROID DISTANCE	BATTER RATIO	NUMBER PILES
A	1	1.50	-4.00	6.00
B	1	6.58	2.00	6.00

TOTAL NO. OF PILES = 12.

AREA	Ai	E	AL	PC	PT
144.00	1728.00	4286826.	60.00	80.00	40.00

AK(1)
100.000

MØM.	VERT.	HØR.	CASE
1892.000	158.000	214.000	10001.00
DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
0.68340E-01	-0.29510E-02	0.11694E-03	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	6.00	-29.829	-0.4336	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	6.00	61.870	-0.3829	0.

MØM.	VERT.	HØR.	CASE
1828.000	158.000	214.000	20001.00
DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
0.17340E 00	0.48922E-01	-0.12382E-02	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	6.00	-27.808	-1.1459	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	6.00	59.872	-1.1572	0.

MØM.	VERT.	HØR.	CASE
842.000	183.000	0.	30001.00
DELTA-X	DELTA-Y	ALPHA	(INCHES AND RADIANS)
-0.43066E 00	-0.19849E 00	0.54689E-02	

PILE LØADINGS FØR GRØUP A

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	1.50	6.00	12.665	2.9000	0.

PILE LØADINGS FØR GRØUP B

RØW	DIST	NP/RØW	AXIAL FØRCE	TRANS FØRCE	MØM.
1	6.50	6.00	19.551	3.1960	0.

MAX. DEFL. FØR AT REST SØIL PRESS. = 0.0930

LOADER DIAGNOSTICS
[illegible].FFRC UNDEFINED

PRØG. NØ. 713-F3-A2-150, MØD 8 - MAY '74; FØR DESCRIPTIØN,
LIST SØURCE FILE --- A2B00/ADP/HRENN/K29003

SELECT INPUT METHØD:
1 = BINARY DATA FILE CREATED BY K29002 (713-F3A2-110)
PLUS KEYBØARD INPUT,
2 = ALL DATA FRØM USER'S DATA FILE (D29004),
3 = ALL DATA FRØM KEYBØARD INPUT,
4 = BINARY DATA FILE CREATED BY K29002 PLUS USER'S
DATA FILE (D29004).
=2

FLA AVE CØMPLEX IHNC WEST
T-WALL ~~NORTH OF CANAL~~ MONOLITH 3W

MONO $\boxed{7}$

RUN NØ. 1 - CASE 1.00

PILE ARRANGEMENT

PILE GRØUP	NØ. RØWS	CENTRØID DISTANCE	BATTER RATIØ	NUMBER PILES
A	1	1.50	-4.00	6.00
B	1	6.50	2.00	6.00

TØTAL NØ. ØF PILES = 12.

CRITICAL PILE LØADINGS

GRØUP A

RØW NØ.	DIST. FT.	NØ. PILES /RØW		CØMP. LØADS KIPS	ALLØW. LØADS KIPS	PERCENT LØAD	CASE NØ.	CØMP. DEFL. IN.
1	1.50	6.	P =	-29.83	40.00	74.573	10001.00	0.0901
			Q =	2.900	5.104	56.819	30001.00	0.5865

GRØUP B

RØW NØ.	DIST. FT.	NØ. PILES /RØW		CØMP. LØADS KIPS	ALLØW. LØADS KIPS	PERCENT LØAD	CASE NØ.	CØMP. DEFL. IN.
1	6.50	6.	P =	61.87	80.00	77.337	10001.00	0.0901
			Q =	3.196	4.807	66.487	30001.00	0.5865

MAX. DEFL. FØR AT REST SØIL PRESS. = 0.0930

06/06/74   16.38

```
10 2 0 1
20 3 15.5 1
30 FLA AVE CØMPLEX IHNC WEST
31 T-WALL NØRTH ØF CANAL
40 1
50 1892 158 214
60 12 12 60 80 40
70 1 100
80 1 -4 1 2 0 0
90 1.5 6
100 6.5 6
120 2
130 1828 158 214
140 842 183 0
150 0 0 0
```

READY

PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 4 of 9	HMB	June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 215.02 to 185.75		CHECKED BY RJGr	DATE July 74

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

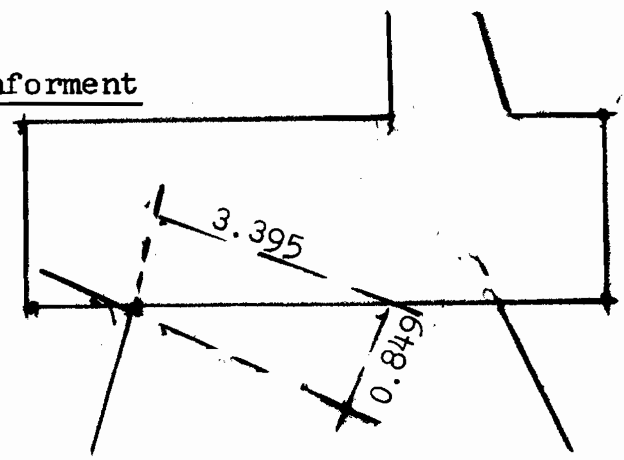
7

Results from Hrennikoff 2-D Pile Analysis

CASE	AXIAL - A	Q - A	AXIAL - B	Q - B
I	-29.829	-0.4336	61.870	-0.3829
II	-27.808	-1.1459	59.872	-1.1572
III	12.665	2.9000	19.551	3.1960

BASE SLAB

Transverse Reinforment



Case I

Moment About Face Of Wall	FORCE	ARM	MOMENT
Pile 'A' Axial 6(29.829)	178.974	3.395	607.62
'A' Q 6(0.4336)	-2.601	0.849	-2.21
Water 5x13x29.27x.0625	118.909	2.500	297.272
Earth 1x5x29.27x.0575	8.415	2.500	21.04
Slab 5x2.5x29.27x.150	54.881	2.500	137.20
Uplift -.15625x5x29.27	-22.867	2.500	-57.17
-.8125x4x29.27	-95.128	3.000	-285.38
			Σ 718.37

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

$\boxed{7}$

BASE SLAB

Top Reinforcement

M = 718.37'-k, M(per ft.slab)=718.37/29.27= 24.54'-k

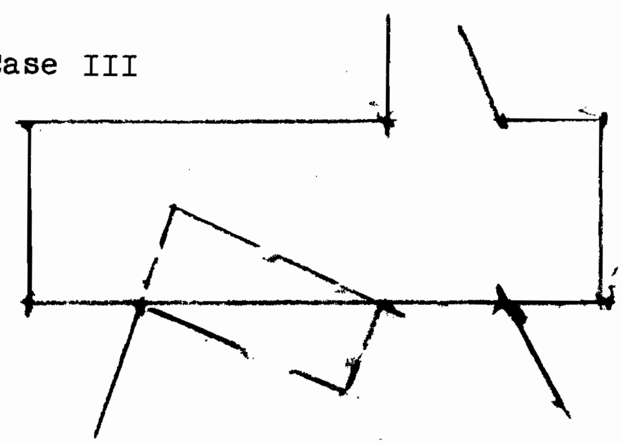
d = $\sqrt{M/kb}$ = $\sqrt{24540/152}$ = 12.7", $d_{provided}$= 27.0"

As = M/ad = 24.54/1.44x27 = 0.64 in^2

min. As = 0.0025bd = .0025x12x27 = 0.81 in^2

Use No. 8 at 12".

Case III



Moment About Face Of Wall		FORCE	ARM	MOMENT
Pile 'A' Axial	6(12.665)	75.990	3.395	257.99
" " Q	6(2.900)	-17.400	0.849	-14.77
Earth 1x5x29.27x.120		-17.562	2.500	-43.90
Slab 2.5x5x29.27x.150		-54.881	2.500	-137.20
				Σ 62.12

PROJECT IHNC AND FLA. AVE. COMPLEX	Page 6 of 9	COMPUTED BY HMB	DATE June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 215.02 to 185.75		CHECKED BY RJgr	DATE July 74

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

BASE SLAB $\boxed{7}$

Bottom Reinforcement

M = 62.12'-k, M(per ft. slab)=62.12/29.27= 2.12'-k

$d = \sqrt{M/kb} = \sqrt{2120/152} = 3.7"$, $d_{provided} = 25.5$

As = M/ad = 2.12/1.44x25.5 = .06 in^2

min. As = .0025bd = .0025x12x25.5 = .77 in^2

Use No. 8 at 12"

Longitudinal Reinforcement

min. As =.0020bt = .0020x96x30 = 5.76 in^2

Use 9 No. 6's top + bottom (10")

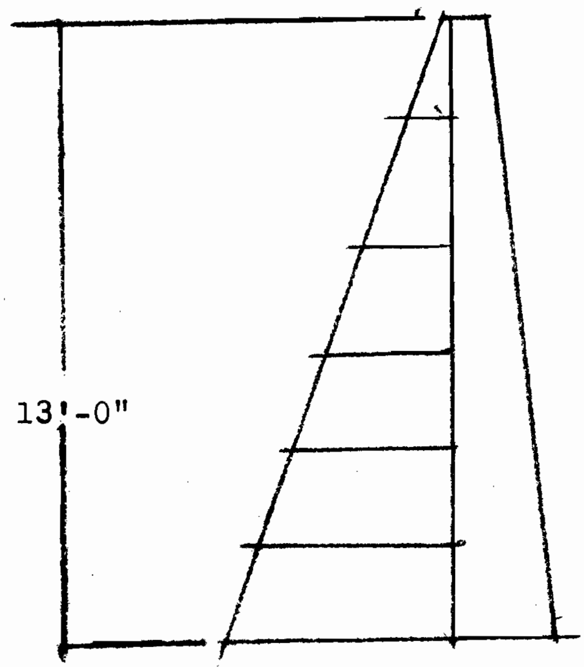
LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 7 of 9	HMB	June '74
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN - WEST OF IHNC 215.02 to 185.75		RJgu	July 74

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

7

WALL STEM



	FORCE	ARM	MOMENT
$0.0625 \times 13^2/2$	5.281	13/3	22.88 '-k/'

$d_{req'd} = \sqrt{M/kb} = \sqrt{22880/152} = 12.3"$

$d_{prov'd} = 18.5 - 2.5 - 0.5 - 0.5 = 15"$

Vertical Steel

As = M/ad = 22.88/1.44x15 = 1.06 in^2

min.As 0.0025bd = 0.0025x12x15 = 0.45 in^2

Use No. 7 at 6" Flood Sides   As = 1.20 in^2

Use No. 7 at 12" Protected Side   As = 0.60 in^2

v = V/bd = 5.281/12x15 = .030 < .060 ksi

No shear reinf. req'd.

LMV FORM 1 AUG 68 107a   COMPUTATION SHEET

~~T-Wall North Of The Drainage Canal Gate~~ Monolith 3W

$\boxed{7}$

WALL STEM

Horizontal Steel

$As = 0.0020bt = 0.0020x12x18.5 = 0.45\ in^2$

USE No. 6 at 12" each Face $2x0.44 = 0.88\ in^2$

Depth at which No. 7 at 12" are adequate

$As = 0.60\ in^2$

$M = Asad = 0.60x1.44x9.0 = 7.78'\text{-}k$

$0.0625y^3/6 = 7.78$

$y = 9.07'$

14'-0" Height

Depth at which No. 7 at 6" are adequate

$As = 1.20\ in^2$

$M = Asad = 1.20x1.44x15 = 25.92\ '\text{-}k$

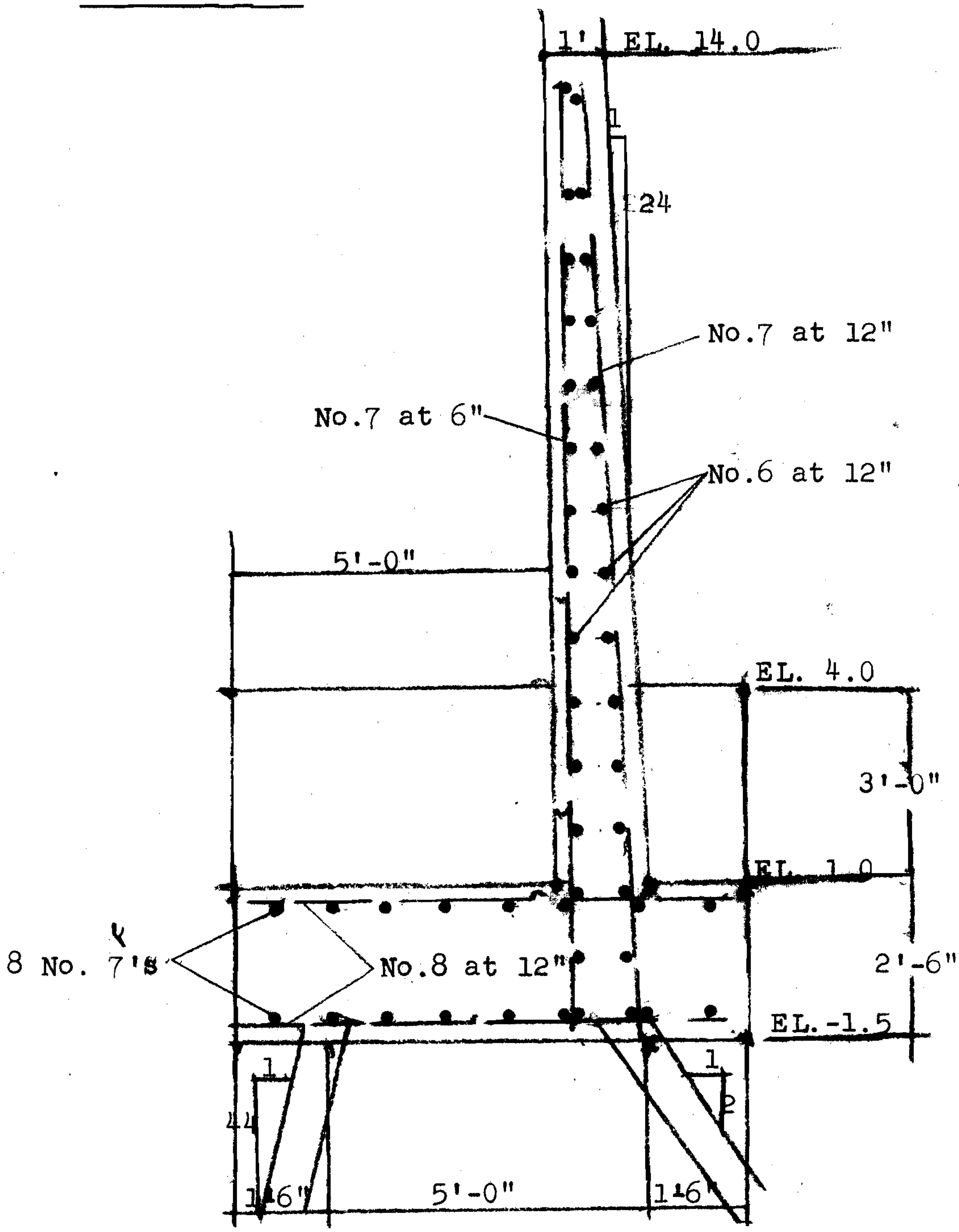
$0.0625y^3/6 = 25.92$

$y = 13.55'$ from top or EL. 0.45'

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 9 of 9	HMB	June '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		RSgr	June 74

T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

CROSS SECTION



PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 8A of 9	COMPUTED BY	DATE
SUBJECT BARRIER PLAN - WEST OF IHNC ~~215~~.02 to 187.75		CHECKED BY	DATE

Monolith 3W

$\boxed{7}$

BASE SLAB

Top Transverse Reinforcement

According to GRAPH 1 ; Min. As = 0.81 in^2.

Use No. 8 at 12".

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Min. As = 0.77 in^2.

Use No. 8 at 12".

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 ; Min As = 5.76 in^2.

As = 2.88 for top + bottom.

10 No. 5's Both Top + bottom.

WALL STEM

Flood Side Vertical Reinforcement

According to GRAPH 6 use: As = 1.20 in^2. + As = 0.60 in^2.

No. 7 at 6" bottom half + No 7 at 12" top half of Wall.

Protected Side Vertical Reinforcement

No. 5 at 12"

Both Sides Horizontal Reinforcement

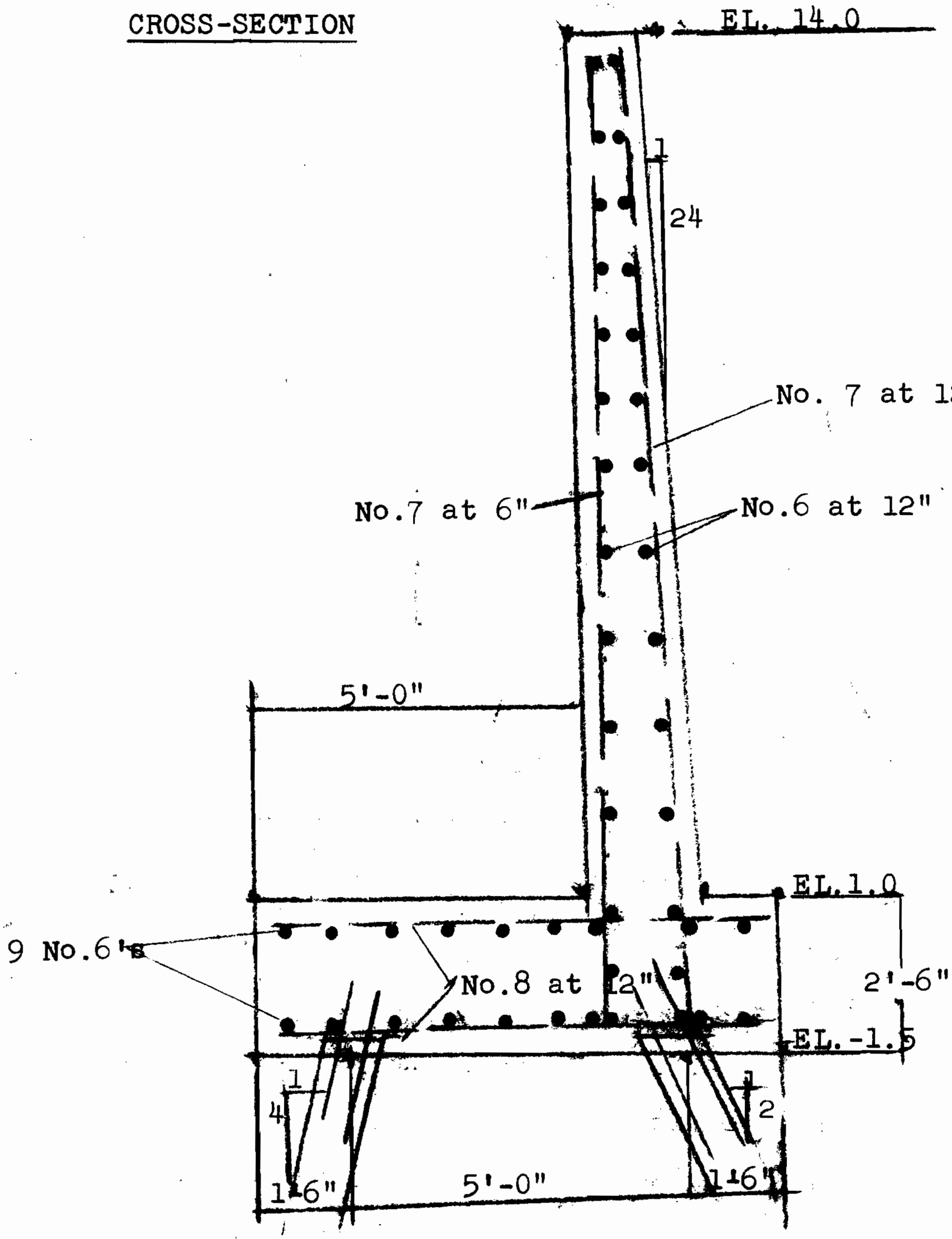
According to GRAPH 7 use: Min. As No. 5 at 12" Both Sides.

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 9 of 9	HMB	June ,74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 215.02 to 185.75		RJg	July 74

T-Wall ~~North Of The Drainage Canal Gate~~ Monolith 3W

CROSS-SECTION

7



PROJECT	Page	COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 6 of 9	HMB	June '74
SUBJECT		**CHECKED BY**	**DATE**
BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		Rsgr	June 74

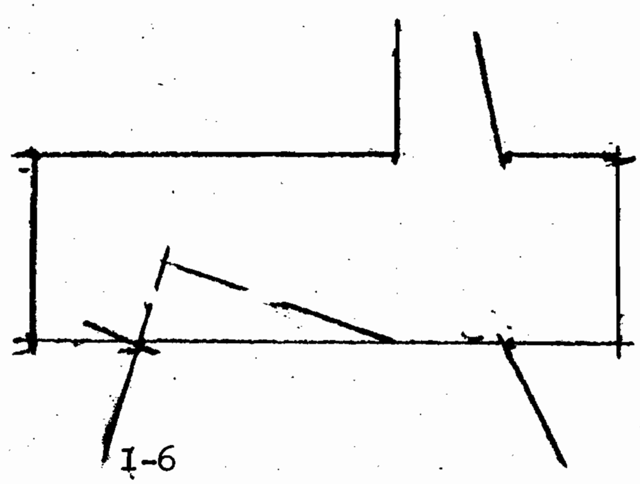
T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

Results from Hrennikoff 3-D Pile Analysis

.CASE AX

BASE SLAB

Transverse Reinforcement



Case I

1-6

Moment About Face Of Wall	FORCE	ARM	MOMENT
Piles 1-6 Axial 6(-31.2)	187.2	3.395	635.54
1-6 Q 6(0.4)	-2.4	0.849	-2.04
Water 111.72+7.81	119.53	2.500	298.82
Earth 1.0x5.0x27.5x.0575	7.91	2.500	19.78
Slab 5(82.50+16.50)/8	61.88	2.500	154.70
Uplift -.15625x5.0x30.0	-23.44	2.500	-58.60
-0.8125x4.0x30.0	-97.50	3.000	-292.50

Σ 755.70'-k

T-Wall ~~South Of The Railroad Gate~~ 2W or $\boxed{6}$

Transverse Reinforcement

Top Reinforcement

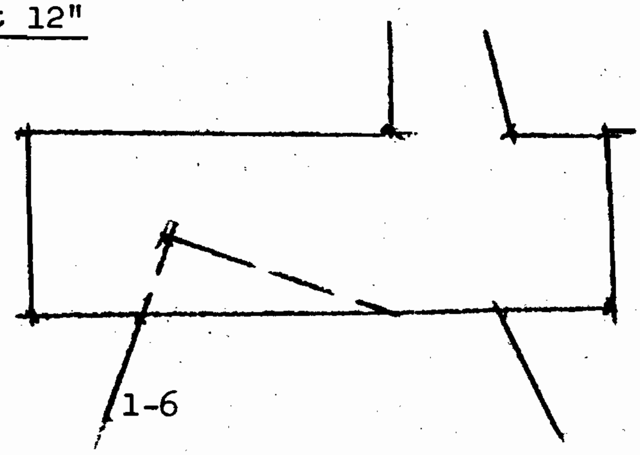
M = 755.70'-k, M(per ft. slab)= 755.70/30 = 25.19 '-k

d = $\sqrt{M/kb}$ = $\sqrt{25190/152}$ = 12.9", $d_{provided}$= 27.0"

As = M/ad = 25.19/1.44x27 = 0.65 in^2

min. As = 0.0025bd = 0.0025x12x27 = 0.81 in^2

Use No. 8 at 12"



Case III

Moment About Face Of Wall	FORCE	ARM	MOMENT
Pile 1-6 (12.1+12.7+13.3 +13.8+14.4+15.0)	81.3	3.395	276.01
Earth 1x5x27.5x0.120	16.50	2.500	-41.25
Slab 5(82.50+16.50)/8	61.88	2.500	-154.70
			Σ 80.06'-k

PROJECT		COMPUTED BY	DATE
IHNC AND FLA. AVE. COMPLEX	Page 8 of 9	HMB	June '74
SUBJECT BARRIER PLAN - WEST OF IHNC 185.75 to 155.75		CHECKED BY Rsgr	DATE June 74

T-Wall ~~South Of The Railroad~~ Gate 2W or $\boxed{6}$

Transverse Reinforcement

Bottom Reinforcement

$M = 80.06$ '-k, M=(per ft. slab)= $80.06/30 = 2.67$ '-k

$d = \sqrt{M/kb} = \sqrt{2670/152} = 4.2"$, $d_{provided} = 25.5"$

$As = M/ad = 2.67/1.44x25.5 = 0.08$ in^2

Min. $As = 0.0025bd = 0.0025x12x25.5 = 0.77$ in^2

Use No. 8 at 12"

Longitudinal Reinforcement

Due to the step in the T-Wall, there is some longitudinal moment. Therefore, .0025 is used.

Min. $As = 0.0025Bd = 0.0025x96x27 = 6.48$ in^2

Use 6.48 in^2 for each face

Use 15 No. 6's top + bottom (16.05" spacing)

WALL STEM

The same as the "T-Wall North Of The Drainage Canal Gate". (See pages 7, 8)

Vertical Steel

Use No. 7 at 6" Flood Sides

Use No. 7 at 12" Protected Side

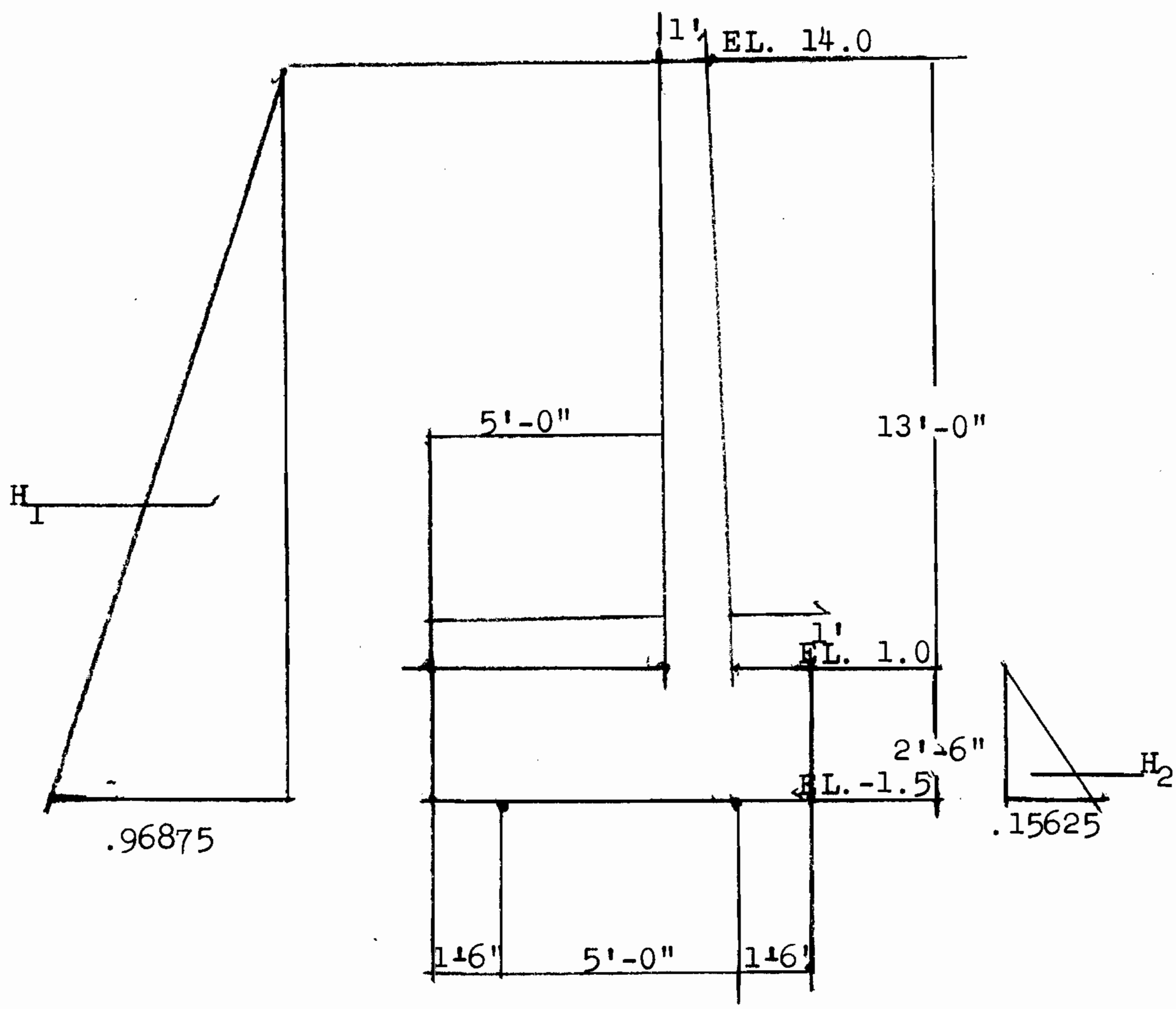
Horizontal Steel

Use No. 6 at 12" each side

PROJECT		COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page 1 of __	HMB	July '74
SUBJECT: BARRIER PLAN - WEST OF IHNC 2+81.52 to 3+09.80		CHECKED BY	DATE

T-Wall ~~South Of The Drainage Canal Gat~~e Monolith 4W

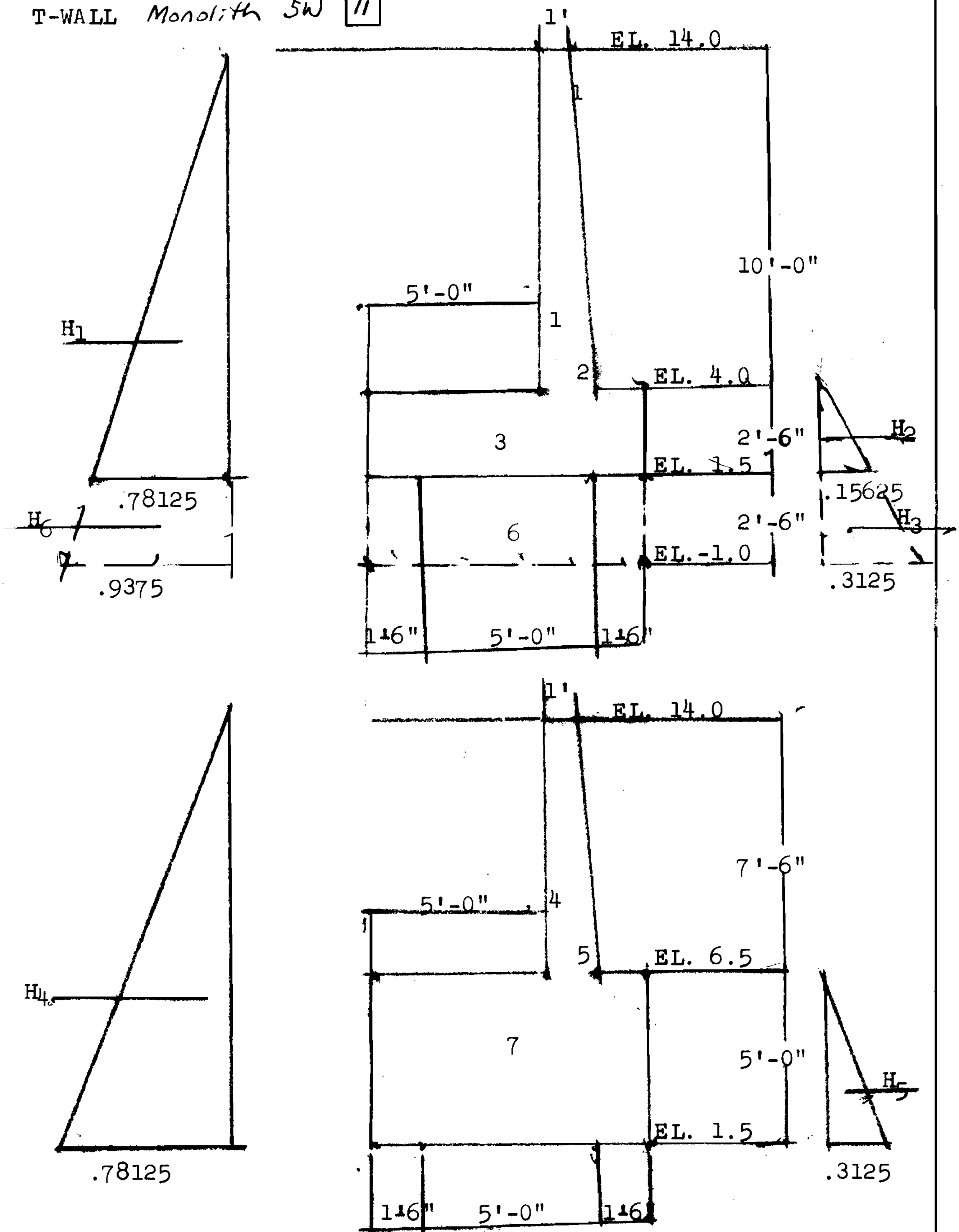
9



This T-Wall computations will be the same as the T-Wall north of the Drainage Canal Gate since it is only 1' shorted and is at the same elevation.

PROJECT		COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page 1 of 5	HMB	July '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 3+96.80 to 4+11.80		RJq	July 74

T-WALL *Monolith 5W* $\boxed{11}$



LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 2 of 5	COMPUTED BY HMB	DATE July '74
SUBJECT BARRIER PLAN - WEST OF IHNC 3+96.80 to 4+11.80		CHECKED BY [illegible]	DATE July 74

T-WALL Monolith 5W $\boxed{11}$

ITEM	COMPUTATION	Fz	ARMx	My	ARMy	Mx
1	10x1.0x12.5x.150	18.75	8.75	164.06	5.50	103.12
4	7.5x1.0x2.5x.150	2.81	1.25	3.51	5.50	15.46
2	10x.417x12.5x.150/2	3.91	8.75	34.21	6.14	24.01
5	7.5x.312x2.5x.150/2	0.44	1.25	0.55	6.10	2.68
3	2.5x8 x12.5x.150	37.50	8.75	328.12	4.00	150.00
6	2.5x8x2.5x.150	7.50	13.75	103.12	4.00	30.00
7	5x8x2.5x.150	15.00	1.25	18.75	4.00	60.00
	SUBTOTAL	85.91		652.32		385.27
Sub. Soil	3.36x6.58x15x.0575/2	9.53	5.00	47.65	3.63	34.59
Water WT.	5x10x12.5x.0625	39.06	8.75	341.78	2.50	97.65
	5x7.5x2.5x.0625	5.86	1.25	7.32	2.50	14.65
Impervious Uplift	-.15625x8x10	-12.50	7.50	-93.75	4.00	-50.00
	-.3125x8x2.5	-6.25	13.75	-85.94	4.00	-25.00
	-.625x4.0x12.5	-31.25	8.75	-273.44	2.00	-62.50
	-.3125x8x2.5	-6.25	1.25	-7.81	4.00	-25.00
	-.46875x4.0x2.5	-4.69	1.25	-5.86	2.00	-9.38
Pervious Uplift	-.15625x8x10	-12.50	7.50	-93.75	4.00	-50.00
	-.3125x8x2.5	-6.25	13.75	-85.94	4.00	-25.00
	-.625x8x12.5/2	-31.25	8.75	-273.44	2.67	-83.44
	-.3125x8x2.5	-6.25	1.25	-7.81	4.00	-25.00
	-.46875x8x2.5/2	-4.69	1.25	-5.86	2.67	-12.52
	Impervious Case I	79.42		582.27		360.28
	Pervious Case II	79.42		582.27		336.20
Saturated Soil	3.36x6.58x15x120/2	19.90	5.00	99.50	3.63	72.24
	Dead Loads Case III	105.81		751.82		457.51

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 3 of 5	COMPUTED BY HMB	DATE July '74
SUBJECT BARRIER PLAN WEST OF IHNC 3+96.80 to 4+11.80		CHECKED BY RLg	DATE July 74

T-Wall Monolith SW

11

ITEM	COMPUTATIONS HORIZONTAL FORCE	Fy	ARMz	Mx	ARMx	Mz
H_6	.9375x15x2.5/2	17.58	5.00	87.90	13.75	241.72
H_3	-.3125x5x2.5/2	-1.95	1.67	-3.26	13.75	-26.81
H_1, H_4	.78125x12.5x12.5/2	61.04	4.17	254.54	8.75	534.10
H_2	-.15625x2.5x10.0/2	-1.95	0.83	-1.62	7.50	-14.62
H_5	-.3125x5.0x2.5/2	-1.95	1.67	-3.26	1.25	-2.44
	SUBTOTAL HORZ. FORCE	72.77		334.30		731.95

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
I	Impervious	0	-72.77	79.42	-694.58	-582.27	-731.95
II	Pervious	0	-72.77	79.42	-670.50	-582.27	-731.95
III	Dead Loads	0	0	105.81	-457.51	-751.82	0

Sign is according to the right hand rule for use in the pile computer program.

PROJECT IHNC AND FLA. AVE. COMPLEX

SUBJECT BARRIER PLAN - WEST OF IHNC 6+69.21 - 6+97.50 ~~186.75 to 155.75~~

T-Wall ~~South of The Railroad Gate~~

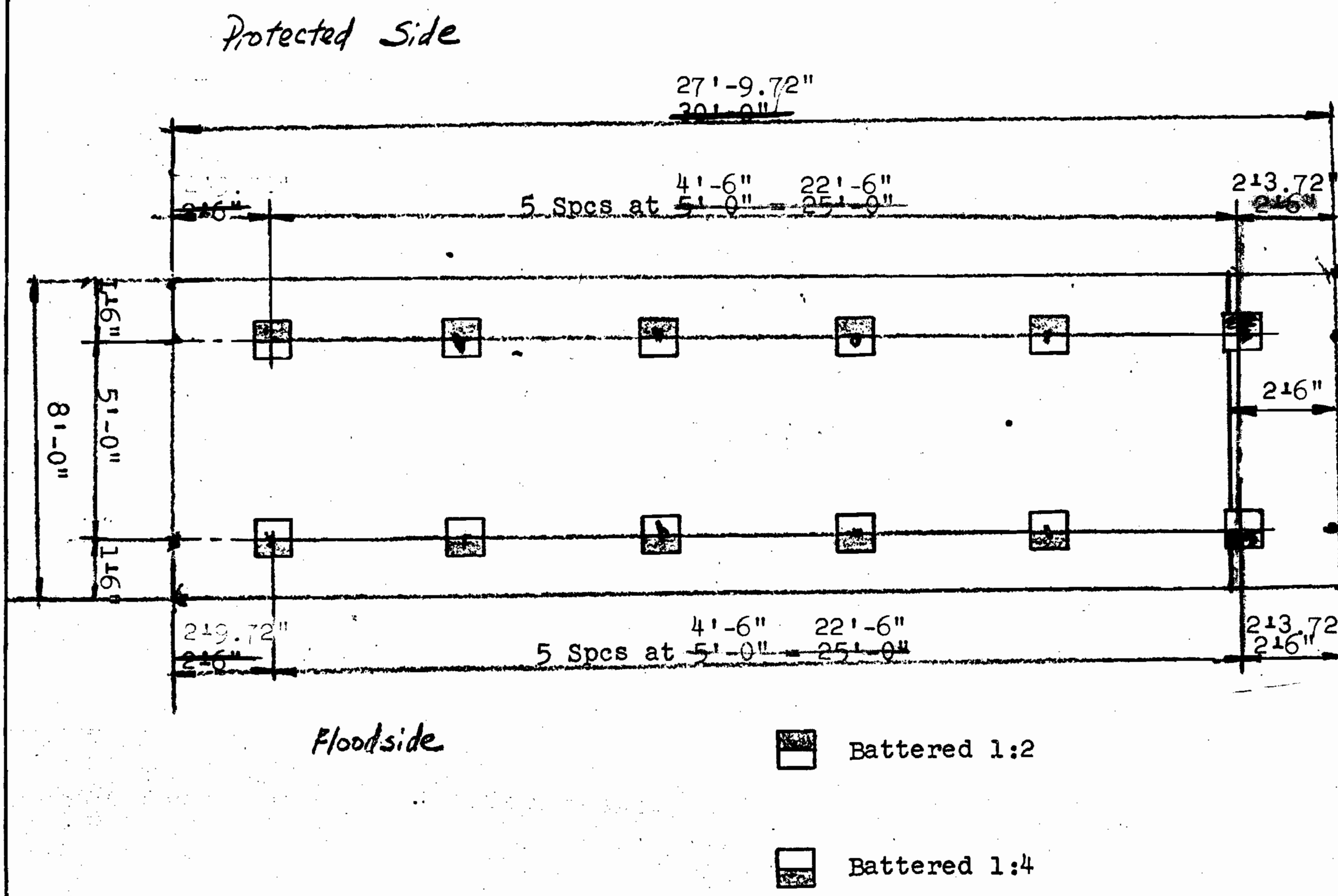
FOUNDATION DESIGN NO GOOD

Page 5 of 9

COMPUTED BY HMB DATE ~~June 1974~~

CHECKED BY [illegible] DATE June 74

REV. Aug. 76



LØAD CØNDITIØN 1

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-73.0	79.0	-695.0	-582.0	-732.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	0.6	-0.1	12.2
2	0.4	-0.1	-14.3
3	0.2	-0.1	-37.9
4	-0.6	-0.1	16.9
5	-0.4	-0.1	43.7
6	-0.3	-0.1	67.6

1 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

1	-0.0	-73.0	79.0	-695.0	-582.0	-732.0

LØAD CØNDITIØN 2

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	-73.0	79.0	-671.0	-582.0	-732.0

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	-0.1	-0.1	13.6
2	-0.3	-0.1	-12.9
3	-0.5	-0.1	-36.4
4	0.1	-0.1	15.4
5	0.3	-0.1	42.3
6	0.5	-0.1	66.2

2 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

2	-0.0	-73.0	79.0	-671.0	-582.0	-732.0

LØAD CØNDITIØN 3

LØADS ØN PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	106.0	-458.0	-752.0	0.

PILE LØADS (PILE AXIS)

PILE NØ.	X	Y	Z
1	1.0	0.0	19.4
2	1.0	0.0	17.6
3	1.0	0.0	16.1
4	-1.1	-0.0	23.5
5	-1.1	-0.0	21.7
6	-1.0	-0.0	20.1

3 SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)

3	-0.0	0.0	106.0	-458.0	-752.0	0.0

```
10 FLA. AVE. CØMPLEX IHNC WEST
20 T-WALL W/L 396.80 TO 411.80
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0
100 2 90 3
110 3 7.5 11.5
140 3*-1.5
170 3*0
200 2 270 3
210 3 7.5 11.5
240 3*-6.5
270 3*0
2000 0 -73 79 -695 -582 -732
2010 0 -73 79 -671 -582 -732
2020 0 0 106 -458 -752 0

READY

*REMØVE D29010
*RUN K29010
LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED
```

Monolith SW

MONO $\boxed{11}$

PRØG. NØ. 713-F3-A2-210   14:19:56   07/24/74

FLA. AVE. CØMPLEX IHNC WEST
T-WALL W/L 396.80 TO 411.80

TØTAL NUMBER ØF PILES =   6

PROJECT IHNC and Florida Ave. Complex

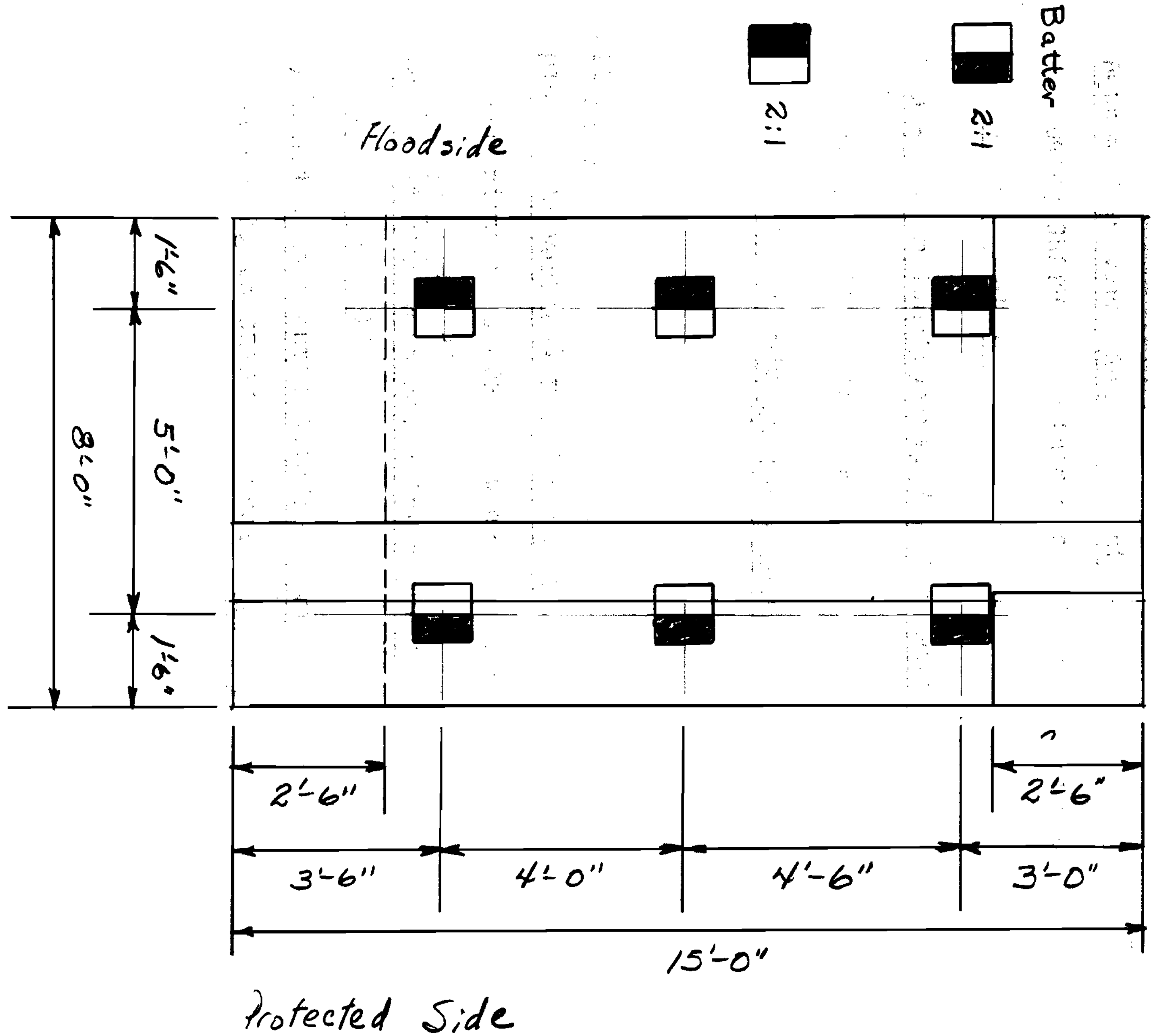
SUBJECT Barrier Plan-West of IHNC 3+96.80 to 4+11.80

Page 2 of 5

COMPUTED BY RJG DATE July '74

CHECKED BY DATE

Monolith 5W $\boxed{11}$



PROJECT		COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX	Page 5 of 5	HMB	July '74
SUBJECT: BARRIER PLAN - WEST OF IHNC 3+96.80 to 4+11.80		CHECKED BY	DATE

T-WALL Monolith 5W

BASE SLAB $\boxed{11}$

Top Transverse Reinforcement

According to GRAPH 1 Use min. As = 0.81 in.^{2}

Use No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 2: Use As = 6.48 in.^{2}

Use 15 No. 6's ON Top + Bottom

WALL STEM

Flood Side Vertical Reinforcement

According to GRAPH 6 use: As = 0.60 in.^{2}

Use No. 7 at 12"

Protected Side Vertical Reinforcement

Use No. 5 at 12"

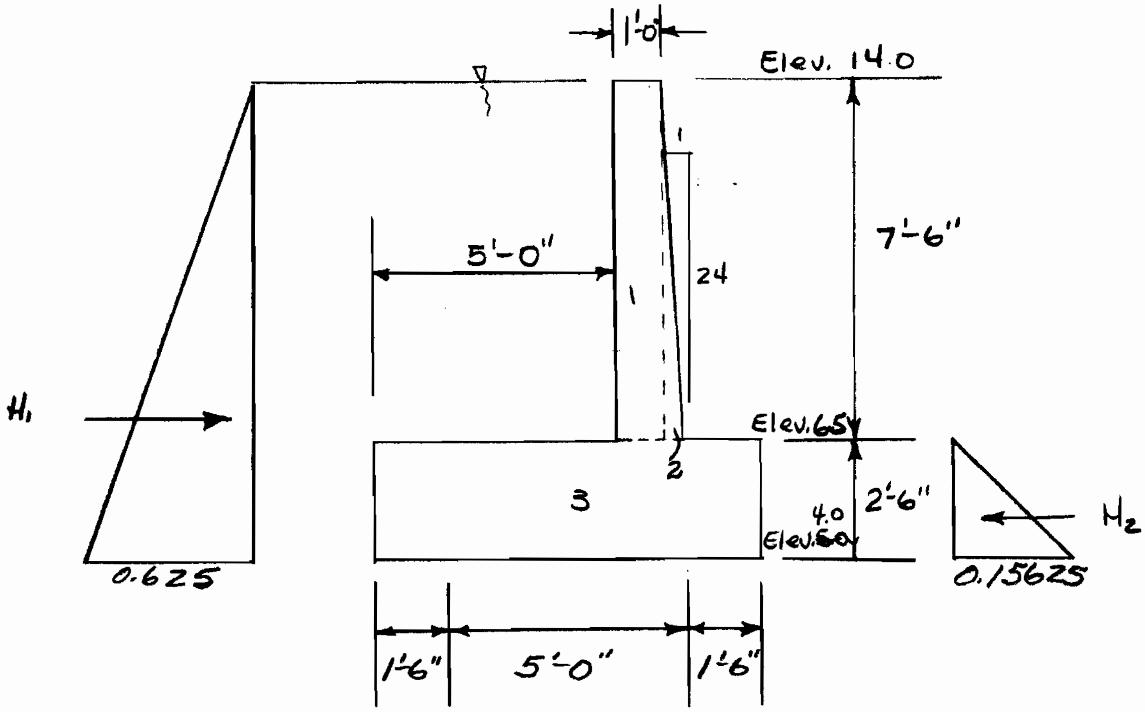
Both Sides Horizontal Reinforcement

According to GRAPH 7 use: No. 5 at 12"

PROJECT		COMPUTED BY	DATE
IHNC and Florida Ave. Complex	Page 1 of 5	RJGr	July 74
SUBJECT		CHECKED BY	DATE
Barrier Plan - West of IHNC 4+11.80 to 4+21.80			

T-Wall Monolith 6W

$\boxed{12}$



PROJECT IHNC AND FLORIDA AVE. COMPLEX	Page 2 of 5	COMPUTED BY HMB	DATE July '74
SUBJECT BARRIER PLAN - WEST OF IHNC 4+11.80 to 4+21.80		CHECKED BY Rsg	DATE July 74

T-WALL Monolith 5W [12]

ITEM	COMPUTATION	Fz	ARMx	My	ARMy	Mx
1	7.5x1.0x10x.150	11.25	5.00	56.25	5.50	61.88
2	7.5x.312x10x.150/2	1.76	5.00	8.80	6.10	10.74
3	2.5x8x10x.150	30.00	5.00	150.00	4.00	120.00
	SUBTOTAL	43.01		215.05		192.62
Submerged Soil	$\frac{(0.86+3.10)}{2}$6.69x10x.0575	7.62	4.06	30.94	3.68	28.04
Water WT.	5x7.5x10x.0625	23.44	5.00	117.20	2.50	58.60
Impervious Uplift	-.15625x8x10	-12.50	5.00	-62.50	4.00	-50.00
	-.46875x4.0x10	-18.75	5.00	-93.75	2.00	-37.50
Pervious Uplift	-.15625x8x10	-12.50	5.00	-62.50	4.00	-50.00
	-.46875x4.0x10	-18.75	5.00	-93.75	2.67	-50.06
Impervious	Case I	42.82		206.94		191.76
Pervious	Case II	42.82		206.94		179.20
Saturated Soil	$\frac{(.86+3.10)}{2}$6.69x10x.120	15.90	4.06	64.55	3.68	58.51
Dead Loads	Case III	58.91		279.60		251.13

PROJECT	Page 3 of 5	COMPUTED BY	DATE
IHNC AND FLORIDA AVE. COMPLEX		HMB	July '74
SUBJECT		CHECKED BY	DATE
BARRIER PLAN - WEST OF IHNC 4+11.80 to 4+21.80		RJG	July '74

T-WALL Monolith 6W $\boxed{12}$

ITEM	COMPUTATIONS HORIZONTAL FORCE	Fy	ARMz	Mx	ARMx	Mz
H_1	.625x10x10.0/2	31.25	3.33	104.06	5.00	156.25
H_2	-.15625x2.5x10.0/2	-1.95	0.83	-1.62	5.00	-9.75
	HOR. FORCE SUBTOTAL	29.30		102.44		146.50

CASE	NAME	Fx	Fy	Fz	Mx	My	Mz
I	Impervious	0	-29.30	42.82	-294.20	-206.94	-146.50
II	Pervious	0	-29.30	42.82	-281.64	-206.94	-146.50
III	Dead Loads	0	0	58.91	-251.13	-279.60	0

Sign is according to the right hand rule for use in the pile computer program.

```
LISTH D29010

07/25/74     14.20

10 FLA. AVE. CØMPLEX IHNC WEST
20 T-WALL W/L 411.80 TØ 421.80   Monolith 6W
30 2 3
40 2 0 60
50 1 12 12
60 1 5
70 0 450
80 0 0 0                              MONO 12
100 2.0 90 2
110 2.5 7.5
140 2*-1.5
170 2*0.0
200 2 270 2
210 2.5 7.5
240 2*-6.5
270 2*0.0
2000 0 -29 43 -294 -207 -147
2010 0 -29 43 -282 -207 -147
2020 0  0  59 -251 -280   0

READY

*RUNH D0K29010

        07/25/74     14.228

LØADER DIAGNØSTICS
<W> .FFBC  UNDEFINED


      ***  ERRØR ENCØUNTERED WHILE ATTEMPTING TØ ACCESS THE
    DATA FILE NAMED: /D29010;             ØN LØGICAL FILE DEVICE  1.
    STATUS CØDE = 403700000000; AND I = 000000000037 (ØCTAL)
    ØR     31 (DECIMAL).
DUPLICATE NAME IN AFT
    FILE DETACHED
    WILL TRY AGAIN


    PRØG. NØ. 713-F3-A2-210          14:14: 1   07/25/74

 FLA. AVE. CØMPLEX IHNC WEST
 T-WALL W/L 411.80 TØ 421.80

TØTAL NUMBER ØF PILES =    4
```

```
         LØAD CØNDITIØN  1

        LØADS ØN PILE CAP
     X            Y            Z            MX            MY            MZ
     0.         -29.0         43.0       -294.0        -207.0        -147.0

          PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1    -1.0    -0.0     -0.8
  2    -1.1    -0.0     -3.5
  3     1.0    -0.0     26.6
  4     1.0    -0.0     25.7
   1      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   1        -0.0    -29.0     43.0     -294.0     -207.0     -147.0


         LØAD CØNDITIØN  2

        LØADS ØN PILE CAP
     X            Y            Z            MX            MY            MZ
     0.         -29.0         43.0       -282.0        -207.0        -147.0

          PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1    -1.6    -0.0      0.3
  2    -1.6    -0.0     -2.4
  3     1.5    -0.0     25.5
  4     1.5    -0.0     24.6
   2      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   2        -0.0    -29.0     43.0     -282.0     -207.0     -147.0


         LØAD CØNDITIØN  3

        LØADS ØN PILE CAP
     X            Y            Z            MX            MY            MZ
     0.           0.          59.0       -251.0        -280.0          0.

          PILE LØADS (PILE AXIS)
PILE
 NØ.     X       Y        Z
  1     0.6     0.0     16.8
  2     0.6     0.0     13.5
  3    -0.7    -0.0     19.5
  4    -0.7    -0.0     16.1
   3      SUMMATIØN ØF PILE LØADS (STRUCTURE AXIS)


   3        -0.0      0.0     59.0     -251.0     -280.0        0.0


   0    14:14: 7  07/25/74    *** END ØF  RUN ***
```

PROJECT
IHNC and Florida Ave. Complex

Page 4 of 5

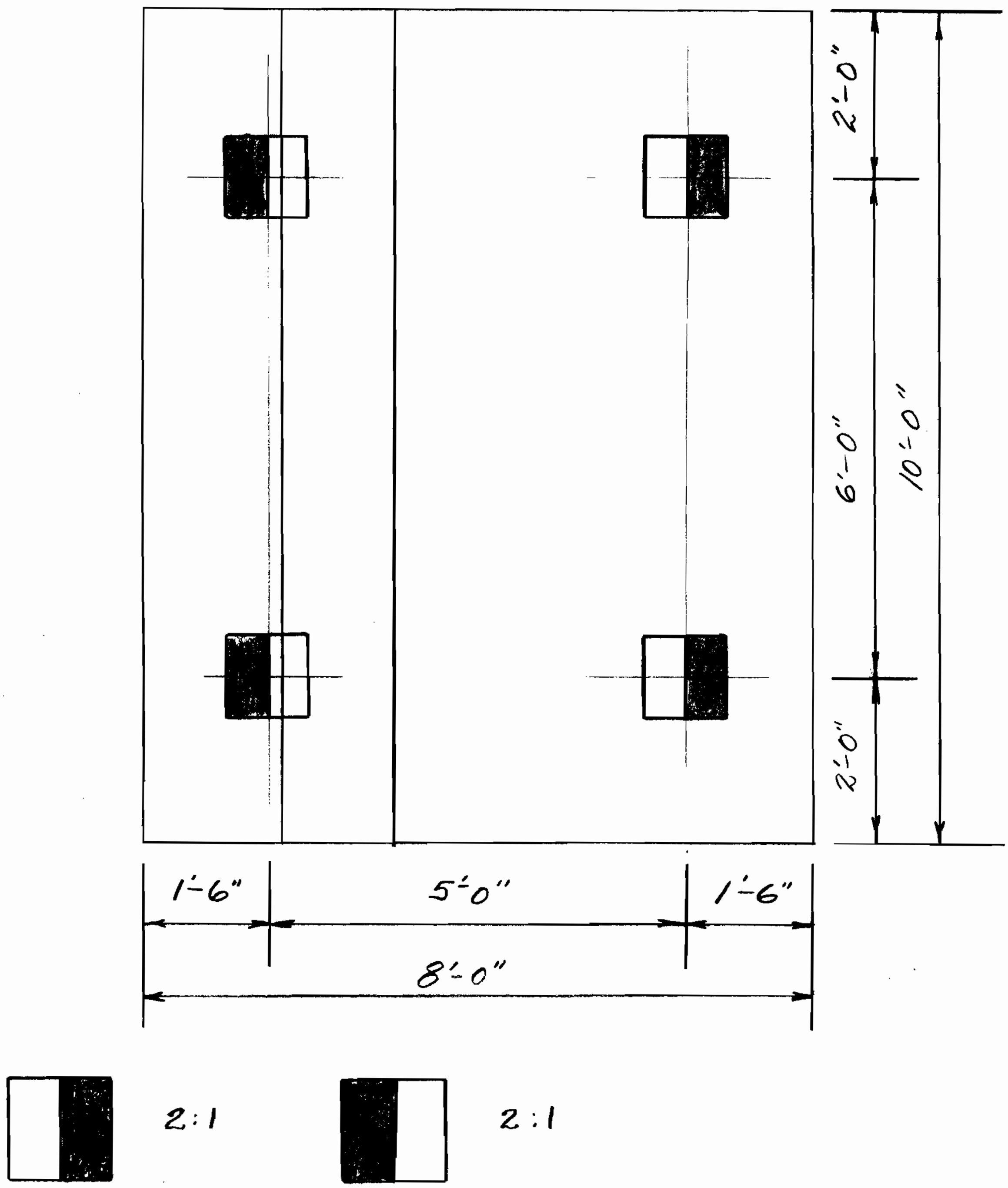
COMPUTED BY RJG. DATE July 74

SUBJECT
Barrier Plan-West of IHNC - 4+11.80 to 4+21.80

CHECKED BY DATE

T-Wall Monolith 6W

12



LMV FORM
1 AUG 68 107a COMPUTATION SHEET

T-Wall Monolith 6W

BASE SLAB $\boxed{12}$

Top Transverse Reinforcement

According to GRAPH 1 Min. As = 0.81 in^2

Use No. 8 at 12"

Bottom Transverse Reinforcement

Using GRAPH 4 minimum steel is enough.

As = 0.77 in^2 Use No. 8 at 12"

Top + Bottom Longitudinal Reinforcement

According to TABLE 1 Use As = 5.76 in^2

Use 19 No. 6's on Top + Bottom.

WALL STEM

Flood Side Vertical Reinforcement

According to GRAPH use: As = 0.39 in^2

Use No. 6 at 12".

Protected Side Vertical Reinforcement

Use No. 4 at 12"

Both Sides Horizontal Reinforcement

According to GRAPH 7 use: As = 0.44 in^2

Use No. 6 at 12" on Both Sides.

The Following Design Datas are from Modjeski & Masters Consulting Engineers Co.

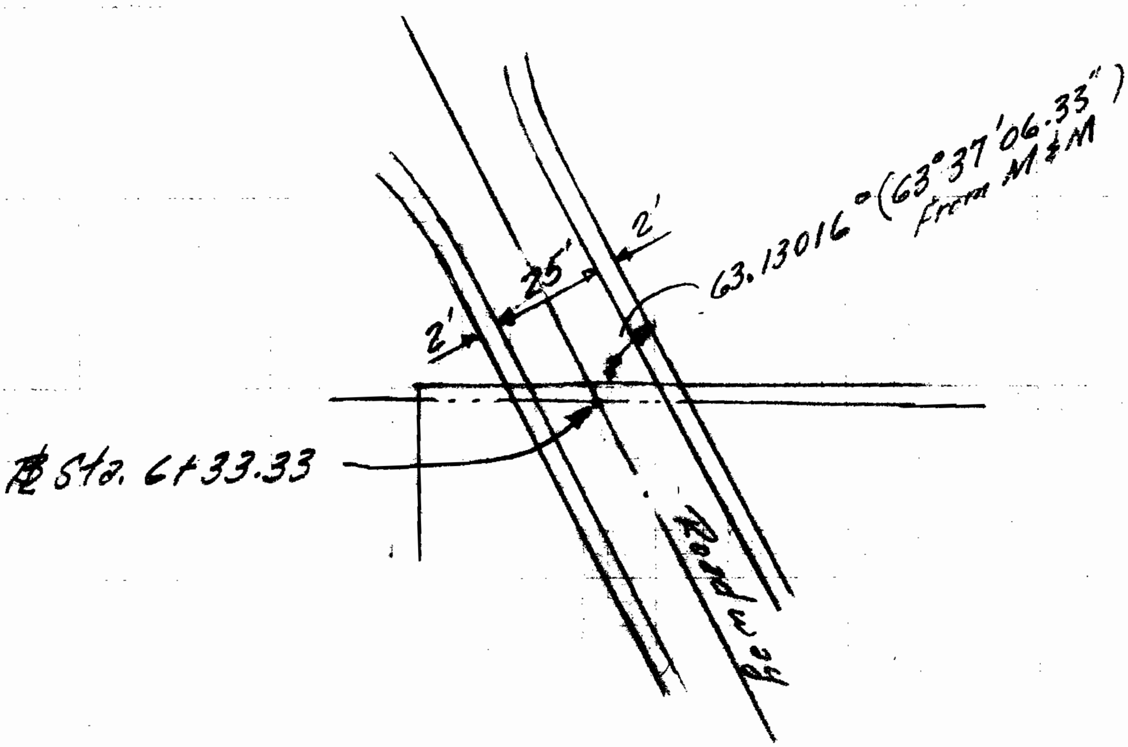
Edge To Edge of Concrete Roadway = 25'-0"

shoulder = 2'-0"

Skew Angle = 63.137016° ≅ 63°8'13" (63° 37' 06.33")

Sill Elev. = 26.80 Cairo Datum; M.S.L = 6.346 use 6.4.

Gate Height : 14 - 6.4 = 7.6'

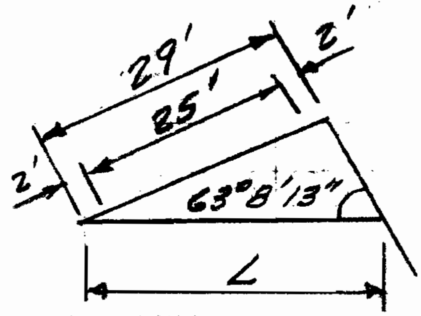


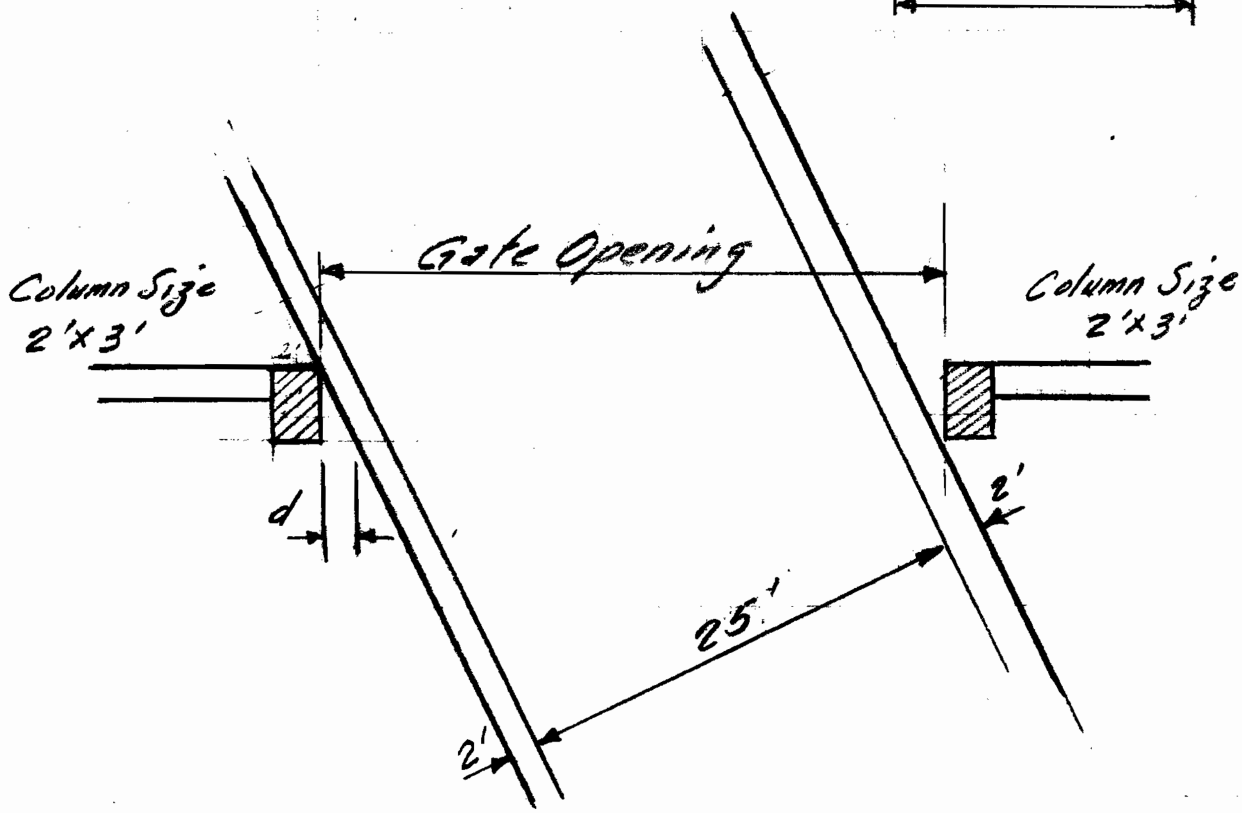
FOR REVISED PILE ANALYSIS, SEE FOLDER

PROJECT		COMPUTED BY	DATE
FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 2 of 56	TST	7 MAR. 78
SUBJECT GEOMETRY COMPUTATION		CHECKED BY HMB	DATE Mar. 78

$$L = \frac{29}{\sin 63^\circ 8' 13''} \quad \begin{matrix} \\ 0.89208907 \end{matrix}$$

$$= 32.5080'$$





$$d = \frac{3}{\tan 63^\circ 8' 13''} = 1.5196'$$

$$1.97426172$$

$$\text{Gate Opening} = L + d$$

$$= 32.5080 + 1.5196$$

$$= 34.0276' \cong 34'\text{-}0\tfrac{5}{16}''$$

<u>USE Gate Opening 36'-0"</u>

LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC

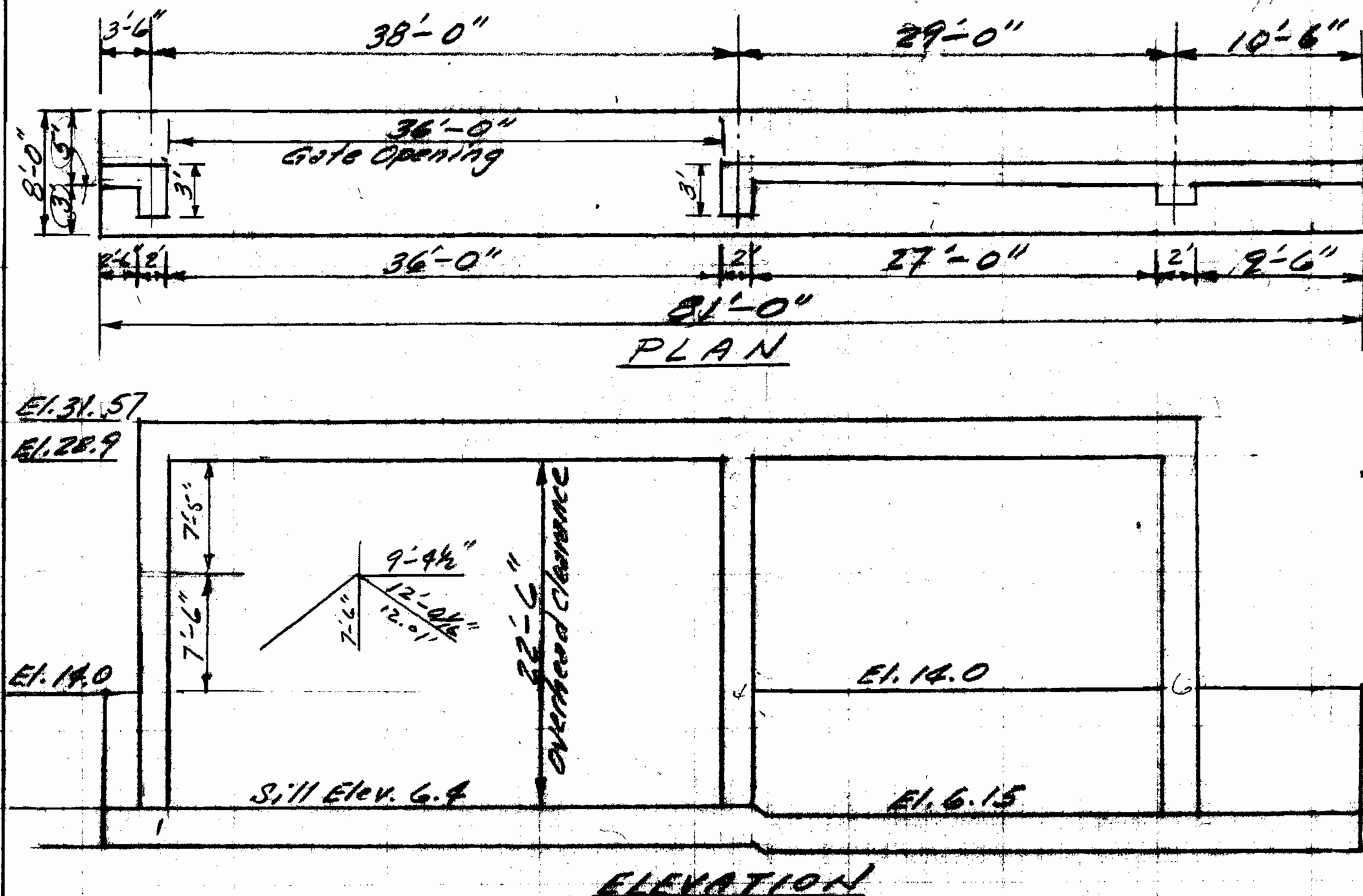
SUBJECT OVERHEAD ROLLER GATE DESIGN

Page 3 of 56

COMPUTED BY TST

CHECKED BY HMB

DATE Mar. 78



OVERHEAD GATE DESIGN (@ FLORIDA AVE.)

Water TO El. 14.0, NO WAVE FORCE, $F_b = 20{,}000$ psi

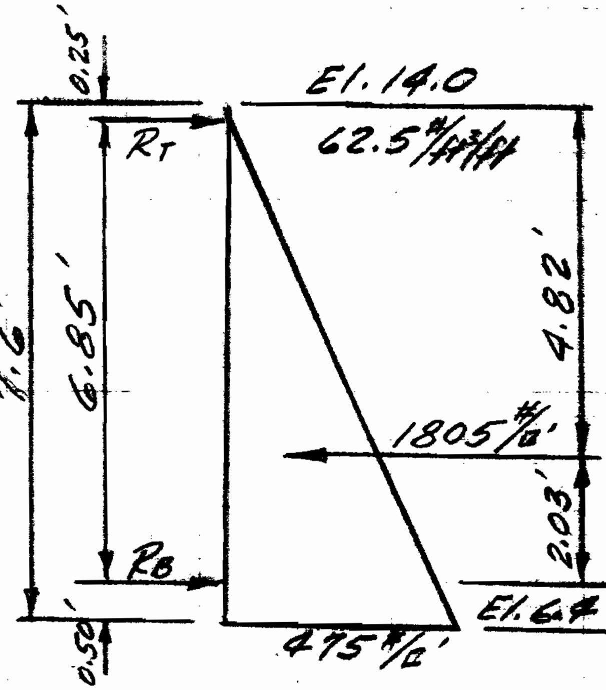
REACTIONS

$62.5 \times 7.6 = 475.0\ \#/ft^2$

$475 \times 7.6 \times 0.5 = 1805.0\ \#/ft$

$$R_T = \frac{1805 \times 2.03}{6.85} = 534.91\ \#$$

$$R_B = \frac{1805 \times 4.82}{6.85} = 1270.09\ \#$$



GIRDER DESIGN

1. TOP Girder

Span = 36.792; Load = 534.91 #

$$\text{Moment} = \frac{534.91(36.792)^2}{8} = 90{,}510.2\ \text{ft-lb} = 1{,}086{,}122.4\ \text{in-lb}$$

$$S_{req'd} = \frac{1{,}086{,}122.4}{20{,}000} = 54.31\ in^3$$

Try W21×44, $S = 81.6\ in^3$; $I = 843\ in^4$

$f_s = 13{,}310$ psi $< 20{,}000$ psi

$$\Delta = \frac{5 \times 534.91 \times 36.792(36.792 \times 12)^3}{384 \times 29 \times 10^6 \times 843}$$

$$= 0.902'' \cong \frac{29}{32}'' < 1.226''_{\text{o.k.}}$$

use W21×44

2. Bottom Girder

Span = 36.792'; Load = 1270.09#

$$\text{Moment} = \frac{1270.09(36.792)^2}{8} = 214{,}907.4 \text{ ft-lb} = 2578{,}889 \text{ in-lb}$$

$$S_{req'd} = \frac{2578889}{20{,}000} = 128.94 \text{ in}^3$$

Try W24x76; $S = 176 \text{ in}^3$; $I = 2100 \text{ in}^4$

$f_s = 14{,}653 \text{ psi} < 20{,}000 \text{ psi}$

$$\Delta = \frac{5 \times 1270.09 \times 36.792 (36.792 \times 12)^3}{384 \times 29 \times 10^6 \times 2100}$$

$$= 0.86'' \cong 7/8'' < 1.226''_{o.k}$$

Use W24x76

3. Skin Plate

Use 3/8" Skin PL

$$I = \frac{12 \times \overline{0.375}^2}{12} = 0.053 \text{ in}^4$$

$$S = \frac{2 \times 0.053}{0.375} = 0.283 \text{ in}^3$$

Load (Max.) = $62.5 \times 7.35 = 459.4$ #/ft

$M_{max.} = 0.283 \times 20{,}000 = 5660$ in-lb

(Int. Span) $M = \frac{459.4 \times L^2 \times 12}{12} = 5660$ in-lb

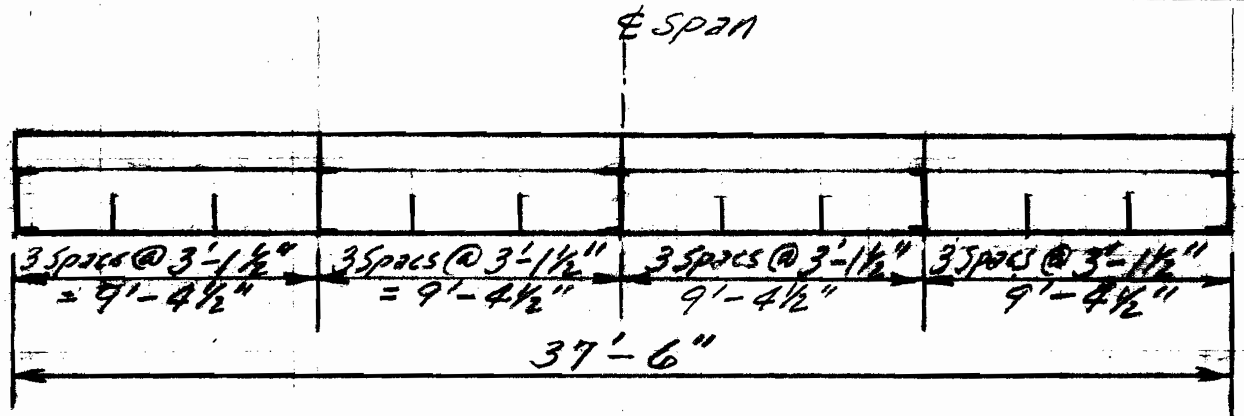
$L = 3.5100'$

(End Span) $M = \frac{459.4 \times L^2 \times 12}{10} = 5660$ in-lb

$L = 3.2042'$

PROJECT: FLORIDA AVE. COMPLEX EAST OF IHNC | Page 6 of 56 | COMPUTED BY: TST | DATE: 20 Mar. 78

SUBJECT: OVERHEAD ROLLER GATE DESIGN | CHECKED BY: HMB | DATE: Mar. 78



$$(\text{Interior})\ M = \frac{459.4 \times \overline{3.125}^2 \times 12}{12} = 4486.33 \text{ in-lb}$$

$$f_s = \frac{4486.33}{0.283} = 15{,}853 \text{ psi}$$

$$(\text{End})\ M = \frac{459.4 \times \overline{3.125}^2 \times 12}{10} = 5383.60 \text{ in-lb}$$

$$f_s = \frac{5383.60}{0.283} = 19{,}023 \text{ psi}$$

$62.5 \times 0.25 = 15.63 \text{ \#/ft}'$

$62.5 \times 7.6 = 475 \text{ \#/ft}'$

$$R_T = \frac{1805(2.03)}{6.85} = 534.91^{\#}$$

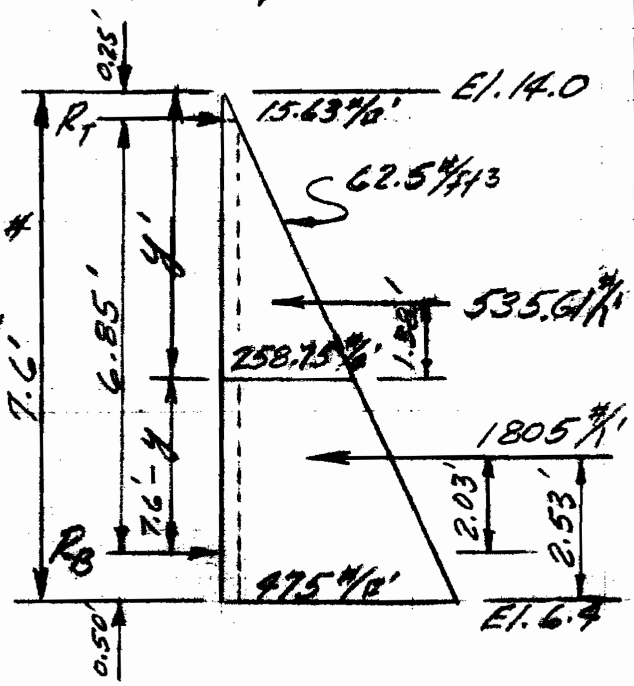
$$R_B = \frac{1805(4.82)}{6.85} = 1270.09^{\#}$$

Pt. of zero shear

$$\frac{62.5y^2}{2} = 534.91$$

$$y^2 = \frac{1169.82}{62.5} = 18.717$$

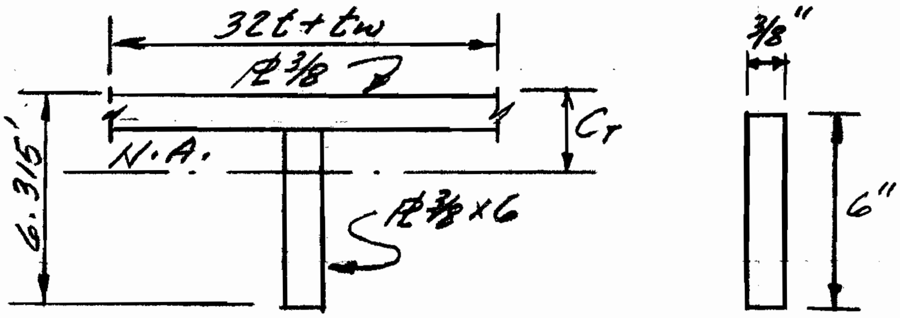
$$y = 4.14'$$



Max. Moment

$$M_{max.} = 534.91 \times 3.89 - \tfrac{1}{2} \times \overline{4.14}^2 \times 62.5 \times 1.38$$
$$= \underline{1341.65}\ ^{\prime\#}$$

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 2 of 56	COMPUTED BY TST	DATE 20 Mar. 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY HMB	DATE Mar. 78



$$I = \frac{3/8(6)^3}{12} = 6.75 \, in^4$$

Type	Area	y	Ay	Ay²	Io
PL 12.375×0.375	4.641	0.1875	0.870	0.163	—
PL 3/8×6	2.250	3.375	7.594	25.630	6.75
	6.891	3.563	8.464	25.793	6.75

$$\bar{y} = \frac{8.464}{6.891} = 1.228''$$

$$I = I_o + \Sigma A\bar{y}^2 - (\Sigma Ay \times \bar{y})$$

$$= 6.75 + 25.793 - (8.464 \times 1.228)$$

$$= 22.149 \, in^4$$

$$S_{Top} = \frac{22.149}{1.228} = 18.04 \, in^3$$

$$S_{Bott.} = \frac{22.149}{5.167} = 4.30 \, in^3$$

$$f_s = \frac{1341.63 \times 12}{18.04} = 892.44 \, psi$$

Design of Vertical Members

Spacing @ 3'-1½"

$$M = 1.342(3.125)(12) = 50.325^{\prime K}$$

$$f_s = \frac{50325}{18.04} = 2790\ psi$$

$$S_{reqd} = \frac{50325}{18000} = 2.80\ in^3$$

$$"d"_{(min)} = \frac{6.85 \times 12}{24} = 3.43\ in.$$

Check Deflection

$$\Delta = \frac{5h^4 m}{768EI}(P_1 + P_2)$$

$$= \frac{5(6.85\times12)^4 \times 3.125 \times 12}{768 \times 29\times10^6 \times 22.149}\left(\frac{\overset{459.38}{15.63 + 443.75}}{144}\right)$$

$$= 0.0554''\ o.k.$$

Check Biaxial stresses of skin plate

$$\frac{S_1^2 - S_1S_2 + S_2^2}{(F_y)^2} \leq (0.75)^2$$

$$S_1 = \frac{5.384}{0.281} = 19.16$$

$$S_2 = \frac{50.325}{18.04} = 2.79$$

$$\frac{(19.16)^2 - (19.16)(2.79) + (2.79)^2}{(36)^2} = 0.248 < 0.563\ o.k.$$

Top Girder (W21×44)

$L_u = 9'-4\frac{1}{2}'' = 112.5''$

$d/A_f = 7.05$

$I_f = \frac{bh^3}{12} = \frac{0.451(6.50)^3}{12} = 10.32\ in^4$

$A = A_f + \frac{1}{6}A_w$

$= (6.50 \times 0.451) + \frac{1}{6}[20.66 - 2(0.451)] \times 0.348$

$= 4.0775^{\square''}$

$r_y = \sqrt{\frac{I}{A}} = \sqrt{\frac{10.32}{4.0775}} = 1.591$

$\frac{L}{r_y} = \frac{112.5}{1.591} = 70.7 > 40$

use Formula (4)

Formula (4)

$C_b = 1.00\ ;\ C_c = 126.1$

$K_2 = 1 - \frac{(L/r)^2}{2C_c^2 C_b}$

$= 1 - \frac{(70.7)^2}{2(126.1)^2 1.00} = 0.843$

$F_b = 0.5 \times 0.843 \times 36000$
$= 15,174\ psi$

Formula (5)

$F_b = \frac{10,000,000}{112.5(7.05)}$

$= 12,609\ psi$ use 18,000 psi

$S = \frac{1086122.4}{18000} = 60.34\ in^3 < 81.6\ in^3$ o.k.

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FLORIDA AVE COMPLEX, EAST OF IHNC	Page 10 of 56	TST	20 Mar, 78
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Bottom Girder (W24×76)

$L_u = 9'-4\frac{1}{2}'' = 112.5''$

$d/A_f = 3.90$

$I_f = \frac{bh^3}{12} = \frac{0.682(8.985)^3}{12} = 41.22 \text{ in}^4$

$A = A_f + \frac{1}{6} A_w$
$= (8.985 \times 0.682) + \frac{1}{6}[23.91 - 2(0.682)] \times 0.440$
$= 7.781 \square''$

$r_y = \sqrt{\frac{41.22}{7.781}} = 2.302$

$\frac{L}{r_y} = \frac{112.5}{2.302} = 48.87 > 40$ use Formula 4

$K_2 = 1 - \frac{(48.87)^2}{2(126.1)^2/1.00} = 0.925$

$F_b = 0.50 \times 0.925 \times 36000$
$= 16,650 \text{ psi}$

Formula 5

$F_b = \frac{10,000,000}{112.5(3.90)}$
$= 22,792 \text{ psi}$ use 18,000 psi

$S = \frac{2578,889}{18,000} = 143.27 \text{ in}^3 < 176 \text{ in}^3$
o.k.

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MEMBER	SIZE	NO	WT/FT	LENGTH	WEIGHT (TOTAL)	ARM	MOMENT
Top Girder	W21x44	1	44	41.0	1804.0	10.71	19,320.84
Bott. Girder	W24x76	1	76	41.0	3116.0	12.34	38,451.44
Skin Plate	3/8 x 7'-3½"	1	111.6	37.5	4185.0	0.188	786.78
Vertical PL	PL 6x3/8	8	7.66	6.64	406.9	3.38	1375.32
Vertical C	C10x20	2	20	7.18	287.2	5.38	1545.14
Vertical C	C10x20	2	20	15.52	620.8	5.38	3339.90
Vertical C	C10x20	1	20	14.52	290.4	5.38	1562.35
Seal Angle	L5x5x½	1	16.2	37.5	607.5	0.93	564.98
Bars (Both sides)	1¾" x 1¾"	2	10.413	7.31	152.2	0.88	133.94
Gusset PL	PL 7¼" x 3/8"	5	9.244	0.89	41.14	14.48	595.71
Gusset PL	PL 8½" x 3/8"	5	14.19	1.16	82.30	15.88	1306.92
Horizontal L	L5x3x3/8	1	9.8	37.1	363.6	7.08	2574.29
Diagonal Cs	C10x20	2	20	12.01	480.4	5.38	2584.55
Diagonal Cs	C 6x20	2	10.5	12.01	252.2	3.38	852.44
Horizontal Cs	C 6x20	1	10.5	18.75	196.9	3.38	665.52
					12886.54	5.783	74526.96

LMV FORM 1 AUG 68 107a

COMPUTATION SHEET

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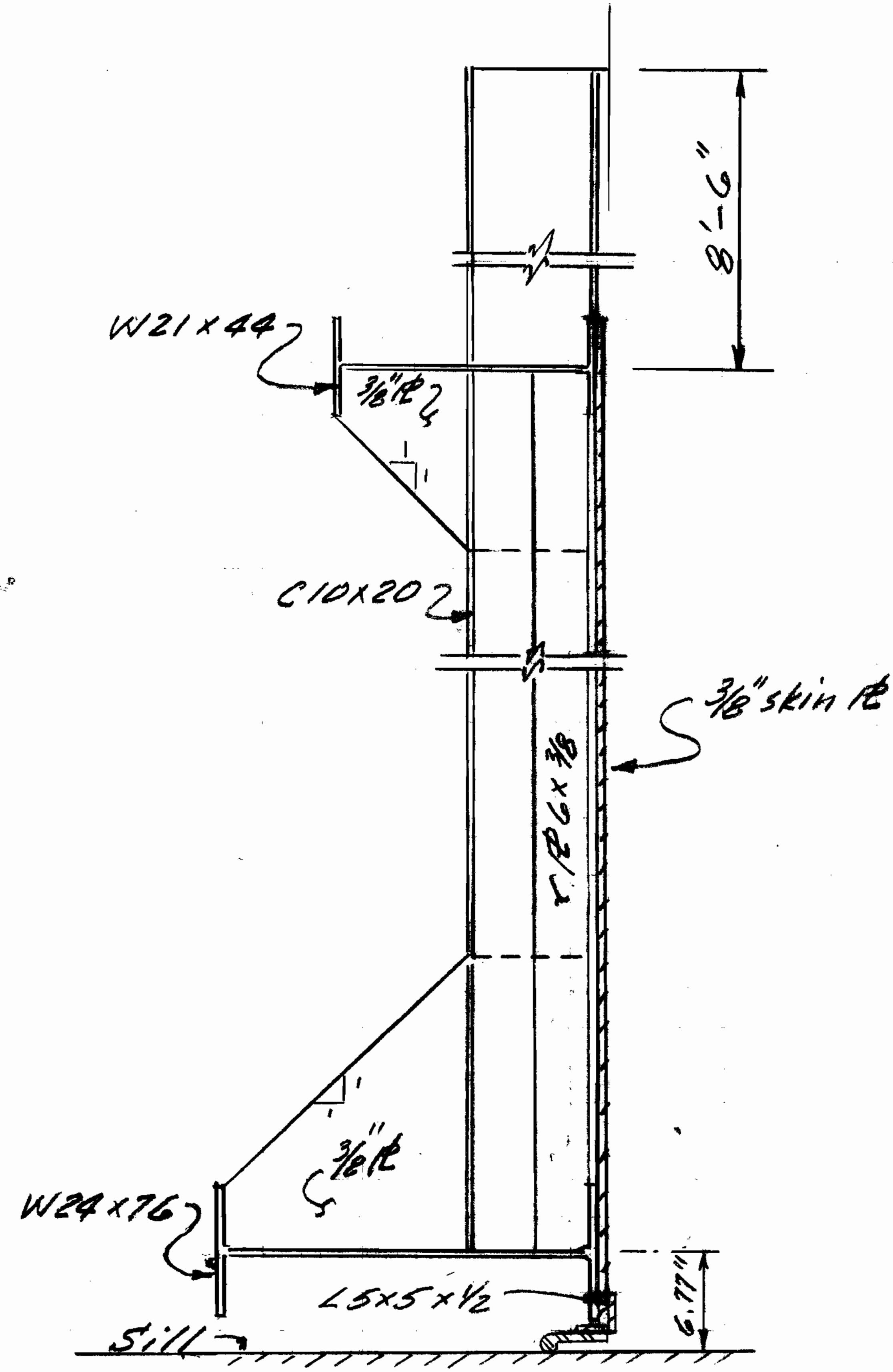

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT FLORIDA AVE COMPLEX, EAST OF IHNC

SUBJECT OVERHEAD ROLLER GATE DESIGN

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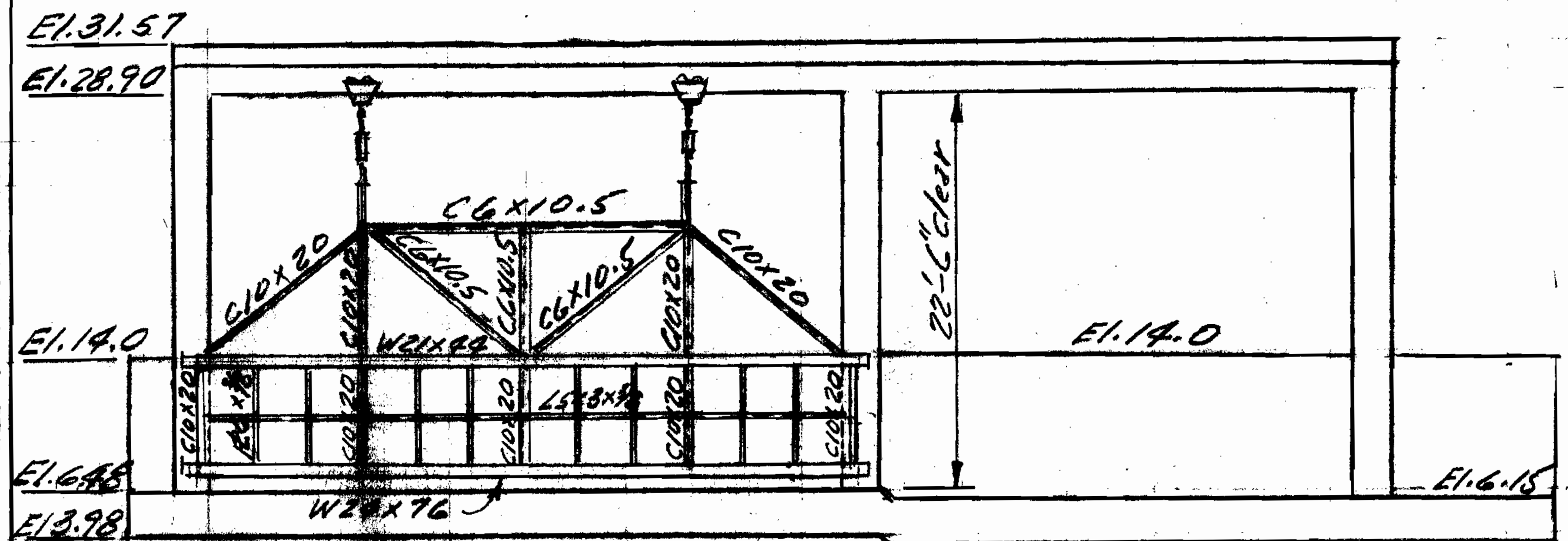
COMPUTED BY [illegible] DATE 20 Mar 78

CHECKED BY HMB DATE Apr. 78



FLOODSIDE ELEVATION

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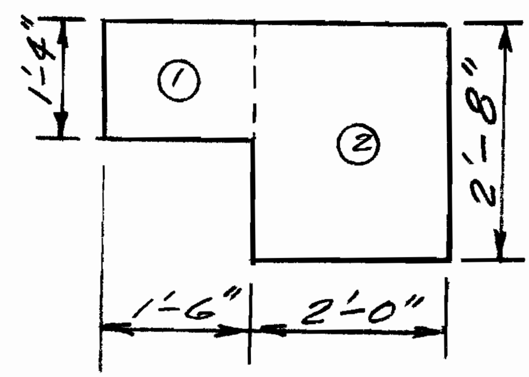
COMPUTATION SHEET

CONCRETE GATE FRAME DESIGN



Moment of Inertia – Beam

Area. (A)	Y	AY	$A\bar{Y}^2$	I_o
1 16×18 = 288	8	2304	18432	6144
2 32×24 = 768	16	12288	196608	65536
1056		14592	215040	71680

$$y = \frac{14592}{1056} = 13.818182''$$

$$I = 71680 + 215040 - (14592 \times 13.818182)$$

$$= 286720 - 201635$$

$$= 85085 \text{ in}^4$$

Loading

(a) Dead Load

Concrete : 2.67 × 2 × 0.15 = 0.80 K/'

Concrete : 1.50 × 1.33 × 0.15 = 0.30 K/'

S 12 × 31.8 = 0.03 K/'

1.13 K/'

(b) Live Load

use Two 7^{K} Load @ 18.75 ft apart

(c) Wind Load

0.050 K/□' × 2 = 0.10^{K} per ft length (Column)

Load Cases Considered (Bending about x-x Axis)

Case 1x — Gate open, no water, no wind, one hanger load placed 5.125' from end column.

Case 2x — Gate closed, no wind.

Case 3x — Gate open, no water, wind from right (75%)

Case 4x — Gate closed, wind from right (75%)

Case 5x — Gate closed wind from left (75%)

Case 6x — Gate open, no water, no wind, hanger loads placed between center column.

Case 7x — Gate open, no water, no wind, one hanger load placed 0.92 from end column.

```
LISTH JB0323

03/23/78    11.33

10 FLA AVE COMPLEX EAST IHNC -- ROAD GATE
20 7 6 7 3160
30 1 1 1 1 0.0 6.40
40 2 0 0 0 0.0 30.23
50 3 0 0 0 38.0 30.23
60 4 1 1 1 38.0 14.00
70 5 0 0 0 67.0 30.23
80 6 1 1 1 67.0 14.00
90 7 0 0 0 0.0 14.00
100 1 7 2 24 24 0
110 2 2 3 85085 0 1056
120 3 4 3 24 24 0
130 4 3 5 85085 0 1056
140 5 6 5 24 24 0
150 6 1 7 24 30 0
160 2 1.13 1.13 0 0
170 4 1.13 1.13 0 7.0 5.125 0 7.0 23.875 0 0
180 0
190 0
200 2 1.13 1.13 0 7.0 9.675 0 7.0 28.425 0 0
210 4 1.13 1.13 0 0
220 0
230 0
240 6 --0.100 --0.100 0 0
250 1 --0.100 --0.100 0 0
260 2 1.13 1.13 0 0
270 3 --0.100 --0.100 0 0
280 4 1.13 1.13 0 7.0 5.125 0 7.0 23.875 0 0
290 5 --0.100 --0.100 0 0
300 0
310 0
320 6 --0.100 --0.100 0 0
330 1 --0.100 --0.100 0 0
340 2 1.13 1.13 0 7.0 9.675 0 7.0 28.425 0 0
350 3 --0.100 --0.100 0 0
360 4 1.13 1.13 0 0
370 5 --0.100 --0.100 0 0
380 0
390 0
400 6 0.100 0.100 0 0
410 1 0.100 0.100 0 0
420 2 1.13 1.13 0 7.0 9.675 0 7.0 28.425 0 0
430 3 0.100 0.100 0 0
440 4 1.13 1.13 0 0
450 5 0.100 0.100 0 0
460 0
470 0
480 2 1.13 1.13 0 7.0 28.625 0 0
490 4 1.13 1.13 0 7.0 9.375 0 0
500 0
510 0
520 2 1.13 1.13 0 0
530 4 1.13 1.13 0 7.0 9.33 0 7.0 28.08 0 0
540 0
550 0
```

READY

```
*RUN WESLIB/GFRAME,E
      MULTIPLE LOAD CASE PLANAR RIGID FRAME ANALYSIS



ENTER DATA FILE NAME
=JB0323
ENTER A 1 TO BUILD NEW FILE OR A 2 TO EXECUTE OLD FILE
=2
DO YOU WANT INPUT CHECK --YES OR NO
=YES
```

0 FLA AVE COMPLEX EAST IHNC -- ROAD GATE

STRUCTURE INPUT DATA CHECK

7 JOINTS   6 MEMBERS   7 LOAD CASES
MODULUS OF ELASTICITY = 3160. KSI

JOINT NUMBER	Y FIXITY	X FIXITY	ROT FIXITY	X (FEET)	Y (FEET)
1	1	1	1	0.	6.40
2	0	0	0	0.	30.23
3	0	0	0	38.00	30.23
4	1	1	1	38.00	14.00
5	0	0	0	67.00	30.23
6	1	1	1	67.00	14.00
7	0	0	0	0.	14.00

MEMBER NUMBER	JOINT LEFT	JOINT RIGHT	WIDTH OR I IN OR IN^4	HEIGHT OR 0 INCHES	AREA OR 0 INCHES^2
1	7	2	24.00	24.00	0.
2	2	3	85085.00	0.	1056.00
3	4	3	24.00	24.00	0.
4	3	5	85085.00	0.	1056.00
5	6	5	24.00	24.00	0.
6	1	7	24.00	30.00	0.

0 FLA AVE COMPLEX EAST IHNC -- ROAD GATE

LOADING CASE 1 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
4	1.130	1.130	0.				
				1	7.00	5.13	0.
				2	7.00	23.88	0.

JOINT NUM	APPLIED MOMENT (FT--K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	--0.0004676	--0.0024987	--0.0027235
3	0.0000744	--0.0030120	--0.0055671
4	0.	0.	0.
5	0.0002626	--0.0033410	--0.0020507
6	0.	0.	0.
7	0.0001411	--0.0078250	--0.0007422

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT--K)	MOMENT RIGHT (FT--K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	--7.73	--53.23	--3.76	3.76	18.52	--18.52
2	2	3	38.00	53.23	--165.46	18.52	24.42	3.76	--3.76
3	4	3	16.23	2.09	7.66	0.60	--0.60	52.03	--52.03
4	3	5	29.00	157.80	--35.42	27.61	19.16	3.16	--3.16
5	6	5	16.23	15.79	35.42	3.16	--3.16	19.16	--19.16
6	1	7	7.60	--36.27	7.73	--3.76	3.76	18.52	--18.52

STRUCTURE REACTIONS

JNT NO	MOMENT (FT--K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	--36.27	18.52	3.76
4	2.09	52.03	--0.60
6	15.79	19.16	--3.16

0 FLA AVE COMPLEX EAST IHN) -- ROAD GATE

~~LOADING CASE 2 OF 7~~

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
				1	7.00	9.68	0.
				2	7.00	28.43	0.
4	1.130	1.130	0.				

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	--0.0006989	0.0005119	--0.0037069
3	0.0002718	--0.0002196	--0.0056738
4	0.	0.	0.
5	0.0001218	--0.0003890	--0.0012286
6	0.	0.	0.
7	0.0001948	--0.0108649	--0.0010102

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT--K)	MOMENT RIGHT (FT--K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	--10.03	--76.85	--5.35	5.35	25.20	--25.20
2	2	3	38.00	76.85	--200.33	25.20	31.74	5.35	--5.35
3	4	3	16.23	20.07	40.39	3.72	--3.72	53.03	--53.03
4	3	5	29.00	159.94	--17.76	21.29	11.48	1.63	--1.63
5	6	5	16.23	8.66	17.76	1.63	--1.63	11.48	--11.48
6	1	7	7.60	--50.71	10.03	--5.35	5.35	25.20	--25.20

STRUCTURE REACTIONS

JNT NO	MOMENT (FT--K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	--50.71	25.20	5.35
4	20.07	53.03	--3.72
6	8.66	11.48	--1.63

LOADING CASE 3 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT <K/FT>	DIST LD RIGHT <K/FT>	ANGLE <DEG>	PT LD NO	MAGNITUDE <K>	DIS FROM LEFT <FT>	ANGLE <DEG>
6	-0.100	-0.100	0.				
1	-0.100	-0.100	0.				
2	1.130	1.130	0.				
3	-0.100	-0.100	0.				
4	1.130	1.130	0.				
				1	7.00	5.13	0.
				2	7.00	23.88	0.
5	-0.100	-0.100	0.				

JOINT NUM	APPLIED MOMENT <FT-K>	APPLIED VERT LD <K>	APPLIED HORZ LD <K>

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION <RADIANS>	X DISPLACEMENT <INCHES>	Y DISPLACEMENT <INCHES>
1	0.	0.	0.
2	-0.0004654	-0.0116544	-0.0027372
3	0.0000841	-0.0120889	-0.0055952
4	0.	0.	0.
5	0.0002799	-0.0123936	-0.0020127
6	0.	0.	0.
7	0.0001883	-0.0105073	-0.0007460

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH <FT>	MOMENT LEFT <FT-K>	MOMENT RIGHT <FT-K>	SHEAR LEFT <K>	SHEAR RIGHT <K>	AXIAL LEFT <K>	AXIAL RIGHT <K>
1	7	2	16.23	-10.15	-54.63	-4.80	3.18	18.61	-18.61
2	2	3	38.00	54.63	-163.32	18.61	24.33	3.18	-3.18
3	4	3	16.23	-9.83	0.85	-1.36	-0.26	52.29	-52.29
4	3	5	29.00	162.47	-29.78	27.96	18.81	2.92	-2.92
5	6	5	16.23	4.46	29.78	1.30	-2.92	18.81	-18.81
6	1	7	7.60	-49.54	10.15	-5.56	4.80	18.61	-18.61

STRUCTURE REACTIONS

JNT NO	MOMENT <FT-K>	VERTICAL FORCE <K>	HORIZONTAL FORCE <K>
1	-49.54	18.61	5.56
4	-9.83	52.29	1.36
6	4.46	18.81	-1.30

LOADING CASE 4 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
6	-0.100	-0.100	0.				
1	-0.100	-0.100	0.				
2	1.130	1.130	0.				
				1	7.00	9.68	0.
				2	7.00	28.43	0.
3	-0.100	-0.100	0.				
4	1.130	1.130	0.				
5	-0.100	-0.100	0.				

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	-0.0006967	-0.0086438	-0.0037206
3	0.0002815	-0.0092965	-0.0057019
4	0.	0.	0.
5	0.0001391	-0.0094419	-0.0011906
6	0.	0.	0.
7	0.0002420	-0.0135472	-0.0010139

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT-K)	MOMENT RIGHT (FT-K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	-12.45	-78.25	-6.40	4.78	25.30	-25.30
2	2	3	38.00	78.25	-198.19	25.30	31.64	4.78	-4.78
3	4	3	16.23	8.15	33.59	1.76	-3.38	53.29	-53.29
4	3	5	29.00	164.60	-12.12	21.64	11.13	1.39	-1.39
5	6	5	16.23	-2.67	12.12	-0.23	-1.39	11.13	-11.13
6	1	7	7.60	-63.98	12.45	-7.16	6.40	25.30	-25.30

STRUCTURE REACTIONS

JNT NO	MOMENT (FT-K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	-63.98	25.30	7.16
4	8.15	53.29	-1.76
6	-2.67	11.13	0.23

LOADING CASE 5 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
6	0.100	0.100	0.				
1	0.100	0.100	0.				
2	1.130	1.130	0.				
				1	7.00	9.68	0.
				2	7.00	28.43	0.
3	0.100	0.100	0.				
4	1.130	1.130	0.				
5	0.100	0.100	0.				

JOINT NUM	APPLIED MOMENT (FT--K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	--0.0007011	0.0096676	--0.0036902
3	0.0002621	0.0088574	--0.0056450
4	0.	0.	0.
5	0.0001045	0.0086632	--0.0012667
6	0.	0.	0.
7	0.0001475	--0.0081825	--0.0010065

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT--K)	MOMENT RIGHT (FT--K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	--7.61	--75.45	--4.31	5.93	25.11	--25.11
2	2	3	38.00	75.45	--202.47	25.11	31.83	5.93	--5.93
3	4	3	16.20	31.99	47.19	5.69	--4.07	52.76	--52.76
4	3	5	29.00	155.28	--23.40	20.93	11.84	1.86	--1.86
5	6	5	16.23	19.98	23.40	3.48	--1.86	11.84	--11.84
6	1	7	7.60	--37.44	7.61	--3.55	4.31	25.11	--25.11

STRUCTURE REACTIONS

JNT NO	MOMENT (FT--K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	--37.44	25.11	3.55
4	31.99	52.76	--5.69
6	19.98	11.84	--3.48

LOADING CASE 6 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
				1	7.00	28.63	0.
4	1.130	1.130	0.				
				1	7.00	9.38	0.

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	-0.0005369	-0.0018340	-0.0029013
3	0.0001606	-0.0024146	-0.0060262
4	0.	0.	0.
5	0.0001990	-0.0026620	-0.0014623
6	0.	0.	0.
7	0.0001581	-0.0087819	-0.0007907

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT-K)	MOMENT RIGHT (FT-K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	-8.50	-60.46	-4.25	4.25	19.73	-19.73
2	2	3	38.00	60.46	-192.39	19.73	30.21	4.25	-4.25
3	4	3	16.23	9.23	21.23	1.88	-1.88	56.32	-56.32
4	3	5	29.00	171.16	-26.69	26.10	13.67	2.37	-2.37
5	6	5	16.23	11.81	26.69	2.37	-2.37	13.67	-13.67
6	1	7	7.60	-40.79	8.50	-4.25	4.25	19.73	-19.73

STRUCTURE REACTIONS

JNT NO	MOMENT (FT-K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	-40.79	19.73	4.25
4	9.23	56.32	-1.88
6	11.81	13.67	-2.37

0 FLA AVE COMPLEX EAST IHNC -- ROAD GATE

LOADING CASE 7 OF 7

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
4	1.130	1.130	0.				
				1	7.00	9.33	0.
				2	7.00	28.08	0.

JOINT NUM	APPLIED MOMENT (FT--K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	--0.0004701	--0.0014500	--0.0027225
3	0.0000770	--0.0019571	--0.0053550
4	0.	0.	0.
5	0.0002349	--0.0022621	--0.0022635
6	0.	0.	0.
7	0.0001378	--0.0076599	--0.0007419

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT--K)	MOMENT RIGHT (FT--K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	--7.39	--52.84	--3.71	3.71	18.51	--18.51
2	2	3	38.00	52.84	--165.34	18.51	24.43	3.71	--3.71
3	4	3	16.23	3.50	9.26	0.79	--0.79	50.05	--50.05
4	3	5	29.00	156.08	--32.51	25.62	21.15	2.92	--2.92
5	6	5	16.23	14.95	32.51	2.92	--2.92	21.15	--21.15
6	1	7	7.60	--35.59	7.39	--3.71	3.71	18.51	--18.51

STRUCTURE REACTIONS

JNT NO	MOMENT (FT--K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	--35.59	18.51	3.71
4	3.50	50.05	--0.79
6	14.95	21.15	--2.92

PROJECT FLORIDA AVE. COMPLEX, WEST OF IHNC
SUBJECT OVERHEAD ROLLER GATE DESIGN
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COMPUTED BY TST DATE 24 MAR 78
CHECKED BY HMB DATE Apr. 78

LOAD CASES ABOUT THE X-X AXIS

CASE	M_{1-2}	M_{2-1}	M_{2-3}	M_{3-2}	M_{3-4}	M_{4-3}	M_{3-5}	M_{5-3}	M_{5-6}	M_{6-5}	R_1	R_4	R_6	H_1	H_4	H_6
1	-36.3	-53.2	53.2	-165.5	7.6	2.1	157.8	-35.4	35.4	15.8	18.5	52.0	19.2	3.8	-0.6	-3.2
2	-50.7	-76.9	76.9	-200.3	40.4	20.0	159.9	-17.8	17.8	8.7	25.2	53.0	11.5	5.3	-3.7	-1.6
3	-49.5	-54.6	54.6	-163.3	0.8	-9.8	162.5	-29.8	29.8	4.5	18.6	52.3	18.8	5.6	1.4	-1.3
4	-64.0	-78.3	78.3	-198.2	33.6	8.2	164.6	-12.1	12.1	-2.7	25.3	53.3	11.1	7.2	-1.8	0.3
5	-37.4	-75.5	75.5	-202.5	47.2	32.0	155.3	-23.4	23.4	20.0	25.1	52.8	11.8	3.6	-5.7	-3.5
6	-40.8	-60.5	60.5	-192.4	21.2	9.2	171.2	-26.7	26.7	11.8	19.7	56.3	13.7	4.3	-1.9	-2.4
7	-35.6	-52.8	52.8	-165.3	9.3	3.5	156.1	-32.5	32.5	15.0	18.5	50.1	21.2	3.7	-0.8	-2.9

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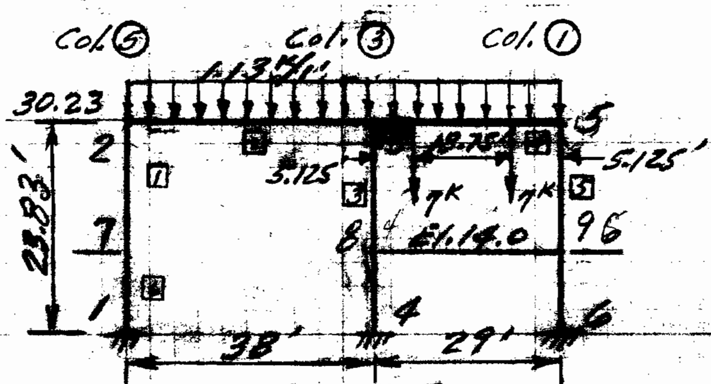
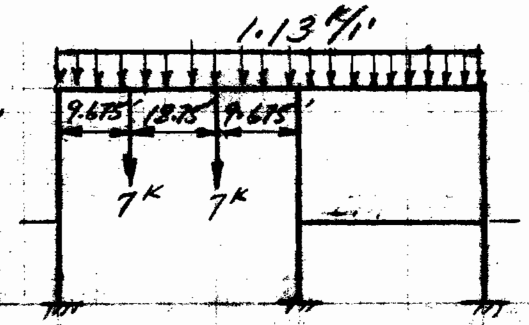
FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 17 of 56	TST	22 Mar. 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY HMB	DATE Apr. 78

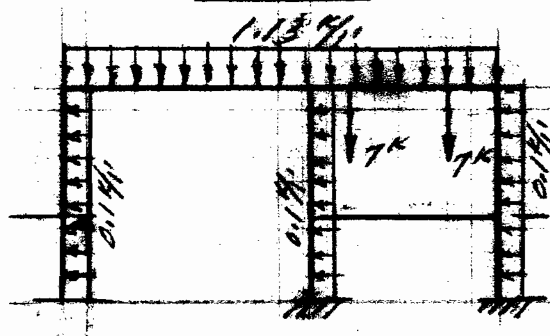
LOAD CASES



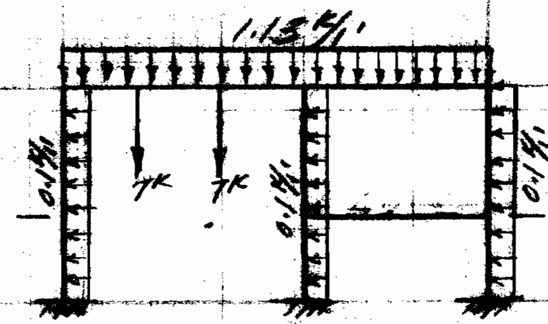
CASE I



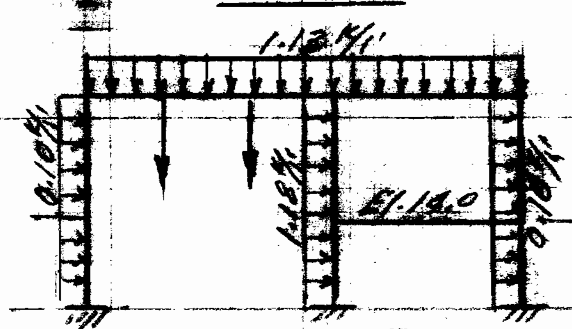
CASE II



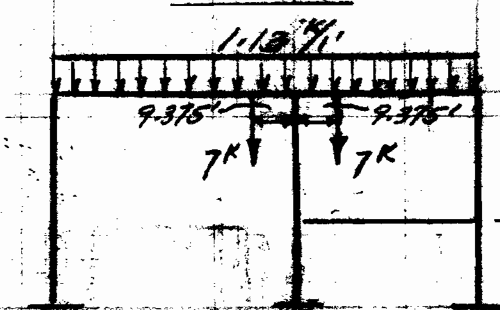
CASE III



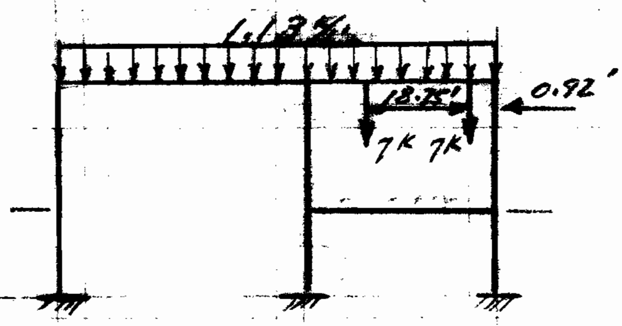
CASE IV



CASE V

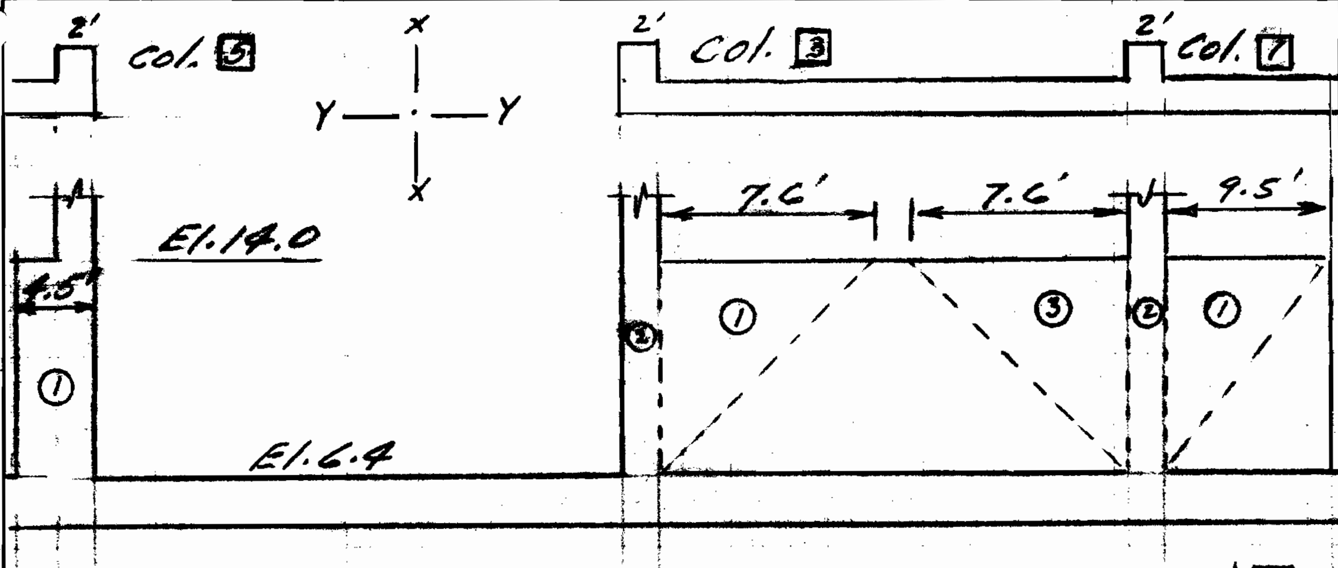


CASE VI



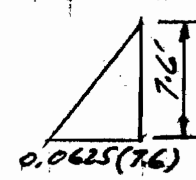
CASE VII

PROJECT	Page	COMPUTED BY	DATE
FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 18 of 56	TST	20 Mar. 78
SUBJECT		**CHECKED BY**	**DATE**
OVERHEAD ROLLER GATE DESIGN		HMB	Apr. 78



COLUMN DESIGN

Load About Y – Y Axis



Water Loads   Water to El. 14.0

Column [1]

	Force	Arm	Moment
① 1/3 (1/2)(9.5)(7.6)(0.0625)(7.6) =	5.72	3.80	21.74
② 1/2 (2.0)(7.6)(0.0625)(7.6) =	3.61	2.53	9.13
③ 1/3(1/2)(7.6)(7.6)(0.0625)(7.6) =	4.57	3.80	17.37
	$\Sigma H = 13.90^K$		$\Sigma M = 48.24^{'K}$

Column [3]

	Force	Arm	Moment
① Same as ③ Column [1]	4.57	3.80	17.37
② 1/2 (2.0)(7.6)(0.0625)(7.6) =	3.61	2.53	9.13
Gate 1/2 (0.0625)(7.6)(7.6)($\frac{36}{2}$) =	32.49	2.53	82.20
	$\Sigma H = 40.67^K$		$\Sigma M = 108.70^{'K}$

Column [5]

	Force	Arm	Moment
① 1/2 (4.5)(7.6)(0.0625)(7.6) =	8.12	2.53	20.54
Gate same as Column [3]	32.49		82.20
	$\Sigma H = 40.61^K$		$\Sigma M = 102.74^{'K}$

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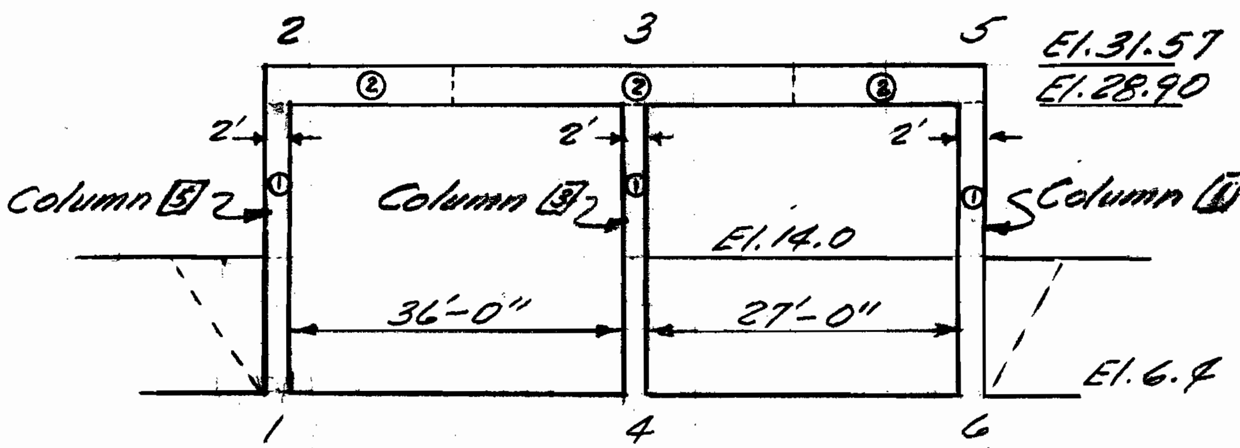
OVERHEAD ROLLER GATE DESIGN		HMB	Apr. 78

COLUMN DESIGN

Loads about Y-Y axis

Wind above El. 14.0



Column 1

	Force	Arm	Moment
① 2.0(14.90)(0.050)	1.49	15.05	22.42
② 15.5(2.67)(0.050)	2.07	23.84	49.35
	$\Sigma H = 3.56^{K}$		$\Sigma M = 71.77^{'K}$

Column 3

	Force	Arm	Moment
① 2.0(14.90)(0.050)	1.49	15.05	22.42
② 33.50(2.67)(0.050)	4.47	23.84	106.56
	$\Sigma H = 5.96^{K}$		$\Sigma M = 128.98^{'K}$

Column 5

	Force	Arm	Moment
① 2.0(14.90)(0.050)	1.49	15.05	22.42
② 20.0(2.67)(0.050)	2.67	23.84	63.65
	$\Sigma H = 4.16^{K}$		$\Sigma M = 86.07^{'K}$

COLUMN DESIGN

Loads about Y-Y axis

Wind Below El. 14.0

Column [1]	Force	Arm	Moment
① ½(9.5)(7.6)(0.050)	1.81	5.07	9.18
Gate: $(\frac{37.5}{2})(7.6)(0.050)$	7.13	3.80	27.09
	$\Sigma H = 8.94^K$		$\Sigma M = 36.27^{1K}$

Column [3]	Force	Arm	Moment
Gate: $(\frac{37.5}{2})(7.6)(0.050)$	7.13^K	3.80	27.09^{1K}

Column [5]	Force	Arm	Moment
① ½(2.50)(7.6)(0.050)	0.48	5.07	2.43
Column: 2.0(7.6)(0.05)	0.76	3.80	2.89
	$\Sigma H = 1.24^K$		$\Sigma M = 5.32^{1K}$

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COLUMN DESIGN (Bending about Y-Y axis)

Load cases considered

Case 1Y — Gate opened, no water, no wind.

Case 2Y — Gate closed, water to El. 14.0, no wind.

Case 3Y — Gate opened, no water, wind from F.S. (75%)

Case 4Y — Gate closed, water to El. 14.0, Wind from F.S. (75%)

Case 5Y — Gate opened, no water, wind from P.S. (75%)

Case 6Y — Gate closed, Water to El. 14.0, Wind from P.S. (75%)

Case 1Y No water, no wind

$M_{1Y} = 0.00$

$H_{1Y} = 0.00$

$M_{3Y} = 0.00$

$H_{3Y} = 0.00$

$M_{5Y} = 0.00$

$H_{5Y} = 0.00$

Case 2Y water, no wind

$M_{1Y} = 48.24'^{K}$

$H_{1Y} = 13.90^{K}$

$M_{3Y} = 108.70'^{K}$

$H_{3Y} = 40.67^{K}$

$M_{5Y} = 102.74'^{K}$

$H_{5Y} = 40.61^{K}$

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

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COLUMN DESIGN (Bending about Y-Y axis)

Case 3Y Gate opened, no water, wind from F.S. (75%)

$M_{1Y} = 0.75(71.77+36.27) = 0.75(108.04) = 81.03^{'K}$

$H_{1Y} = 0.75(3.56+8.94) = 0.75(12.50) = 9.38^{K}$

$M_{3Y} = 0.75(128.98+27.09) = 0.75(156.07) = 117.05^{'K}$

$H_{3Y} = 0.75(5.96+7.13) = 0.75(13.09) = 9.82^{K}$

$M_{5Y} = 0.75(86.07+5.32) = 0.75(91.39) = 68.54^{'K}$

$H_{5Y} = 0.75(4.16+1.24) = 0.75(5.40) = 4.05^{K}$

Case 4Y Gate closed water to El. 14.0, wind from F.S. (75%)

$M_{1Y} = 0.75(48.24+71.77) = 0.75(120.01) = 90.01^{'K}$

$H_{1Y} = 0.75(13.90+3.56) = 0.75(17.46) = 13.10^{K}$

$M_{3Y} = 0.75(108.70+128.98) = 0.75(237.68) = 178.26^{'K}$

$H_{3Y} = 0.75(40.67+5.96) = 0.75(46.63) = 34.97^{K}$

$M_{5Y} = 0.75(102.74+86.07) = 0.75(188.81) = 141.61^{'K}$

$H_{5Y} = 0.75(40.61+4.16) = 0.75(44.77) = 33.58^{K}$

Case 5Y Gate opened, no water, wind from P.S. (75%)

$M_{1Y} = 0.75(-71.77-36.27) = 0.75(-108.04) = -81.03^{'K}$

$H_{1Y} = 0.75(-3.56-8.94) = 0.75(-12.50) = -9.38^{K}$

$M_{3Y} = 0.75(-128.98-27.09) = 0.75(-156.07) = -117.05^{'K}$

$H_{3Y} = 0.75(-5.96-7.13) = 0.75(-13.09) = -9.82^{K}$

$M_{5Y} = 0.75(-86.07-5.32) = 0.75(-91.39) = -68.54^{'K}$

$H_{5Y} = 0.75(-4.16-1.24) = 0.75(-5.40) = -4.05^{K}$

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Case 6Y Gate closed, water to El. 14.0, wind from P.S. (75%)

$M_{1Y} = 0.75(48.24-108.04) = 0.75(-59.80) = -44.85^{'K}$

$H_{1Y} = 0.75(13.90-12.00) = 0.75(1.40) = 1.05^{K}$

$M_{3Y} = 0.75(108.70-156.07) = 0.75(-47.37) = -35.53^{'K}$

$H_{3Y} = 0.75(40.67-13.09) = 0.75(27.58) = 20.69^{K}$

$M_{5Y} = 0.75(102.74-91.39) = 0.75(11.35) = 8.51^{'K}$

$H_{5Y} = 0.75(40.61-5.40) = 0.75(35.21) = 26.41^{K}$

<u>Summary of Results</u> (Bending About Y-Y Axis)

Load case	Column No 1		Column No 3		Column No 5	
	M_{1Y} 'K	H_{1Y} K	M_{3Y} 'K	H_{3Y} K	M_{5Y} 'K	H_{5Y} K
1	0.00	0.00	0.00	0.00	0.00	0.00
2	48.24	13.90	108.70	40.67	102.74	40.61
3	81.03	9.38	117.05	9.82	68.54	4.05
4	90.01	13.10	178.26	34.97	141.61	33.58
5	-81.03	-9.38	-117.05	-9.82	-68.54	-4.05
6	-44.85	1.05	-35.53	20.69	8.51	26.41

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COLUMN DESIGN (Cont'd)

Combined Load Cases (Bending About x-x & y-y Axises)
Following cases are considered.

CASE I – Case 1X (75%) + Case 3Y (75%)

CASE II – Case 1X (75%) + Case 5Y (75%)

CASE III – Case 2X + Case 2Y

CASE IV – Case 2X (75%) + Case 4Y (75%)

CASE V – Case 2X (75%) + Case 6Y (75%)

CASE VI – Case 3X (75%) + Case 1Y (75%)

CASE VII – Case 4X (75%) + Case 2Y (75%)

CASE VIII – Case 4X (75%) + Case 6Y (75%)

CASE IX – Case 5X (75%) + Case 2Y (75%)

CASE X – Case 6X + Case 1Y

CASE XI – Case 6X (75%) + Case 3Y (75%).

CASE XII – Case 6X (75%) + Case 5Y (75%)

CASE XIII – Case 7X + Case 1Y

CASE XIV – Case 7X (75%) + Case 3Y (75%)

CASE XV – Case 7X (75%) + Case 5Y (75%)

COLUMN DESIGN (Cont'd)

Column Weight = 14.64 K

Summary of Combine Load Cases

Load case	Column No. 5					Column No. 3					Column No. 1				
	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R
I	-39.9	68.5	2.9	4.1	13.9	5.7	117.1	-0.5	9.8	39.0	36.6	81.0	-2.4	9.4	14.4
II	-39.9	-68.5	2.9	-4.1	13.9	5.7	-117.1	-0.5	-9.8	39.0	36.6	-81.0	-2.4	-9.4	14.4
III	[illegible]	102.7	5.3	40.0	25.2	40.4	108.7	-3.7	[illegible]	[illegible]	17.8	48.2	-1.6	18.9	11.5
IV	-57.7	141.8	4.0	33.6	18.9	30.3	[illegible]	-2.8	35.0	[illegible]	[illegible]	90.0	-1.2	13.1	8.6
V	-57.7	8.5	4.0	26.9	18.9	30.3	-15.2	-2.8	26.0	40.0	13.4	-44.9	-1.2	1.1	8.6
VI	-41.0	0.0	4.2	0.0	14.8	-7.4	0.0	-1.1	0.0	39.2	22.4	0.0	-1.0	0.0	14.1
VII	-38.7	77.1	5.4	30.5	19.0	25.2	81.5	-1.4	30.5	[illegible]	9.1	36.2	0.2	10.4	8.5
VIII	-38.7	8.5	5.4	26.4	19.0	25.2	-15.2	-1.4	26.0	[illegible]	9.1	[illegible]	0.2	7.9	[illegible]
IX	-36.5	77.1	2.7	30.5	18.8	35.4	81.5	-4.3	30.5	39.0	17.6	36.2	-2.6	10.9	8.9
X	[illegible]	0.0	4.3	0.0	19.7	21.2	0.0	-1.9	0.0	[illegible]	[illegible]	[illegible]	-2.4	0.0	[illegible]
XI	-45.4	68.5	3.2	4.1	14.8	15.9	117.1	-1.4	9.8	42.2	20.0	81.0	-1.8	9.4	10.3
XII	-45.4	68.5	3.2	-4.1	14.8	15.9	-117.1	-1.4	-9.8	[illegible]	20.0	81.0	-1.8	-9.4	10.3
XIII	-52.8	0.0	3.7	0.0	18.5	9.3	0.0	-0.8	0.0	50.1	32.5	0.0	-2.9	0.0	21.2
XIV	-37.6	68.5	2.8	4.1	13.9	7.0	117.1	-0.6	9.8	37.6	[illegible]	81.0	-2.2	9.4	16.9
XV	-37.6	-68.5	2.8	-4.1	13.9	7.0	-117.1	-0.6	-9.8	37.6	24.4	81.0	-2.2	-9.4	16.9

Note: [illegible] "R" in above load Table, the dead weight of columns are not included.

COLUMN DESIGN

Column #5

Loading Condition – case IV

$N = 18.9^k + \overset{\text{Col. Wt.}}{14.64^k} = 33.54^k$

$M_x = -57.7^{1k}$

$M_y = 141.6^{1k}$

$f_y = 40{,}000\,psi$

$f_c' = 3000\,psi$

$n = 9$

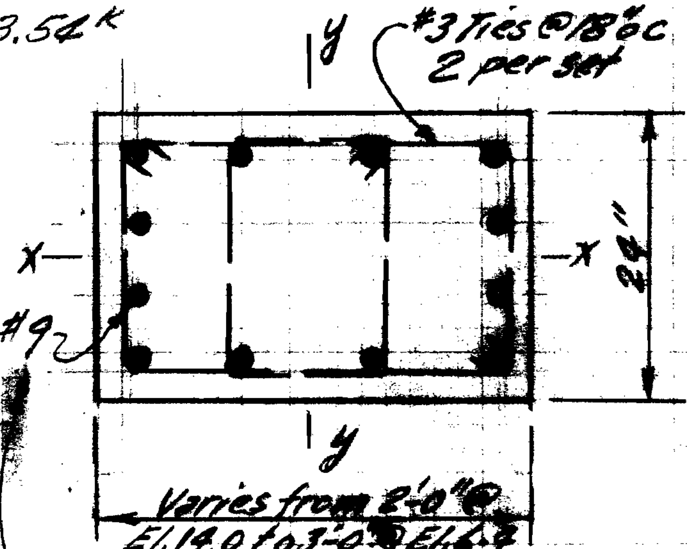
$b = 24''$

$t = 36''$

$g_x = 0.80$

$g_y = 0.86$

$A_g = 24'' \times 36'' = 864\ sq.\,in.$



Changed to #10's on final dwgs. -gsh 8 June 77

(1) Compute $\dfrac{N}{f_c' A_g} = \dfrac{39.84}{3(24 \times 36)} = 0.0154$

From Table 26

For $g_x = 0.80$

$\dfrac{P_b}{f_c' A_g} = 0.20 > 0.0129$

For $g_y = 0.86$

$\dfrac{P_b}{f_c' A_g} = 0.20 > 0.0129$

} Tension Control

(2) Assume 12 – #9 bars, as shown

$A_{st} = 12 \times 1.00 = 12.00\,\square''$

$P_g = \dfrac{12.00}{864} = 0.0139$

COLUMN DESIGN (Cont'd)

Properties of reinforcement about Y-Y Axis

$As_1 = 2 \times 4 \times 1.00 = 8.00^{\square''}; \; P_{y1} = \frac{8.00}{864} = 0.0093$

$As_2 = 2 \times 2 \times 1.00 = 4.00^{\square''}; \; P_{y2} = \frac{4.00}{864} = 0.0046$

$$P'_y = P_{y1} + 0.5 P_{y2}$$
$$= 0.0093 + 0.0023$$
$$= 0.0116$$

Properties of reinforcement about X-X Axis

$As_1 = 2 \times 4 \times 1.00 = 8.00^{\square''}; \; P_{x1} = \frac{8.00}{864} = 0.0093$

$As_2 = 2 \times 2 \times 1.00 = 4.00^{\square''}; \; P_{x2} = \frac{4.00}{864} = 0.0046$

$$P'_x = P_{x1} + 0.5 P_{x2}$$
$$= 0.0093 + 0.0023$$
$$= 0.0116$$

(3) Table 34 (ACI Reinforced Conc. Design Handbook)

$P_y = 0.0139$

For $g_y = 0.86$

$K = \frac{0.0046}{0.0093} = 0.50$

Read $D'_y = 0.155$

For $g_x = 0.80$

$K = 0.50$

Read $D'_x = 0.154$

Table 26 (ACI Reinforced Conc. Design Handbook

$f_y = 40{,}000 \text{ psi}$

$f'_c = 3000 \text{ psi}$

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COLUMN DESIGN (Cont'd)

For $g_y = 0.86$ Table 26

Read: $C'_y = 1.76$

For $g_x = 0.80$

Read $C'_x = 1.88$

$$M_{xx} = 33.5\left[\frac{0.155(24)}{12}\right] + 0.0116\left[\frac{36(24)^2}{1.88}\right]$$
$$= 138.2'^{K}$$

$$M_{yy} = 33.5\left[\frac{0.155(36)}{12}\right] + 0.0116\left[\frac{24(36)^2}{1.76}\right]$$
$$= 220.6'^{K}$$

$$\frac{M_x}{M_{xx}} + \frac{M_y}{M_{yy}} \le 1$$

$$\frac{57.7}{138.2} + \frac{141.6}{220.6} \le 1$$

$$0.418 + 0.642 \le 1$$

$$1.060 \cong 1 \quad \text{say o.k.}$$

COLUMN DESIGN (Cont'd)

Column #3 and #L

Loading Condition – Case III & IV

$N = 53.0^K + \overset{cl.wt.}{14.64^K} = 67.64^K$

$M_x = 40.4^{'K}$

$M_y = 178.3^{'K}$

$f_y = 40{,}000\ psi$

$f_c' = 3000\ psi$

$n = 9$

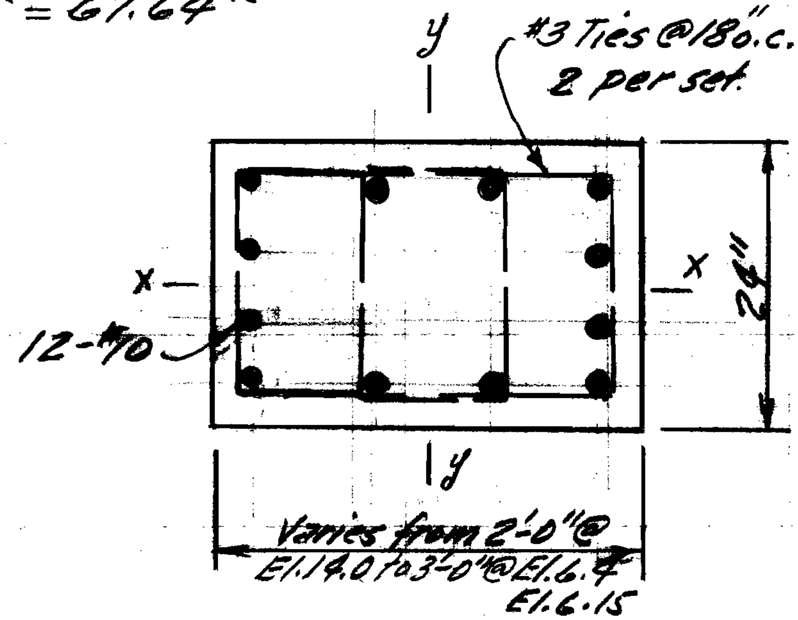
$b = 24''$

$t = 36''$

$g_x = 0.80$

$g_y = 0.86$

$A_g = 24'' \times 36'' = 864\ sq.in.$



(1) Compute $\frac{N}{f_c' A_g} = \frac{67.64}{3(24 \times 36)} = 0.0261$

From Table 26

For $g_x = 0.80$

$\frac{P_b}{f_c' A_g} = 0.20 > 0.0261$

For $g_y = 0.86$

$\frac{P_b}{f_c' A_g} = 0.20 > 0.0261$

(2) Assume 12-#10 bars as shown

$A_{st} = 12 \times 1.27 = 15.24\ \square''$

$P_g = \frac{15.24}{864} = 0.0176$

COLUMN DESIGN (Cont'd)

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2\times4\times1.27 = 10.16^{\square''}$; $P_{y1} = \frac{10.16}{864} = 0.01176$

$A_{s2} = 2\times2\times1.27 = 5.08^{\square''}$; $P_{y2} = \frac{5.08}{864} = 0.00588$

$P'_y = P_{y1} + 0.5 P_{y2}$
$= 0.01176 + 0.00294$
$= 0.0147$

Properties of reinforcement about X-X Axis

$A_{s1} = 2\times4\times1.27 = 10.16^{\square''}$ $P_{y1} = \frac{10.16}{864} = 0.01176$

$A_{s2} = 2\times2\times1.27 = 5.08^{\square''}$ $P_{y2} = \frac{10.16}{864} = 0.00588$

$P'_x = P_{y1} + 0.5 P_{y2}$
$= 0.01176 + 0.00294$
$= 0.0147$

(3) Table 34 (ACI Reinforced Conc. Design Handbook)

$P_y = 0.0176$
For $g_y = 0.86$
$K = 0.50$
Read $D'_y = 0.154$
For $g_x = 0.80$
$K = 0.50$
Read $D'_x = 0.154$

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COLUMN DESIGN (Cont'd)

Table 26 (ACI Reinforced Conc. Design Handbook)

$f_y = 40{,}000\ psi$

$f_c' = 3000\ psi$

For $g_y = 0.86$

Read $C_y' = 1.76$

For $g_x = 0.80$

Read $C_x' = 1.88$

$$M_{xx} = 67.64\left[\frac{0.154(24)}{12}\right] + 0.0147\left[\frac{36(24)^2}{1.76}\right]$$
$$= 194.0'^K$$

$$M_{yy} = 67.64\left[\frac{0.154(36)}{12}\right] + 0.0147\left[\frac{24(36)^2}{1.88}\right]$$
$$= 274.5'^K$$

$$\frac{M_x}{M_{xx}} + \frac{M_y}{M_{yy}} \leq 1$$

$$\frac{40.0}{194} + \frac{178.3}{274.5} \leq 1$$

$$0.206 + 0.650 \leq 1$$

$$0.856 \leq 1 \quad \text{o.k.}$$

COLUMN DESIGN

Column #1

Check shear

$V = 13.9^K$ (Hy, Case III)

$v = \frac{13.9}{(36)(21.5)} = 0.018\,ksi < 0.060\,ksi$

No web reinforcement required

Column #3

Check shear

$V = 40.7^K$ (Hy, Case III)

$v = \frac{40.7}{(36)(21.5)} = 0.053\,ksi < 0.060\,ksi$

No web reinforcement required

Column #5

Check shear

$V = 40.6^K$ (Hy, Case III)

$v = \frac{40.6}{(36)(21.5)} = 0.052\,ksi < 0.060\,ksi$

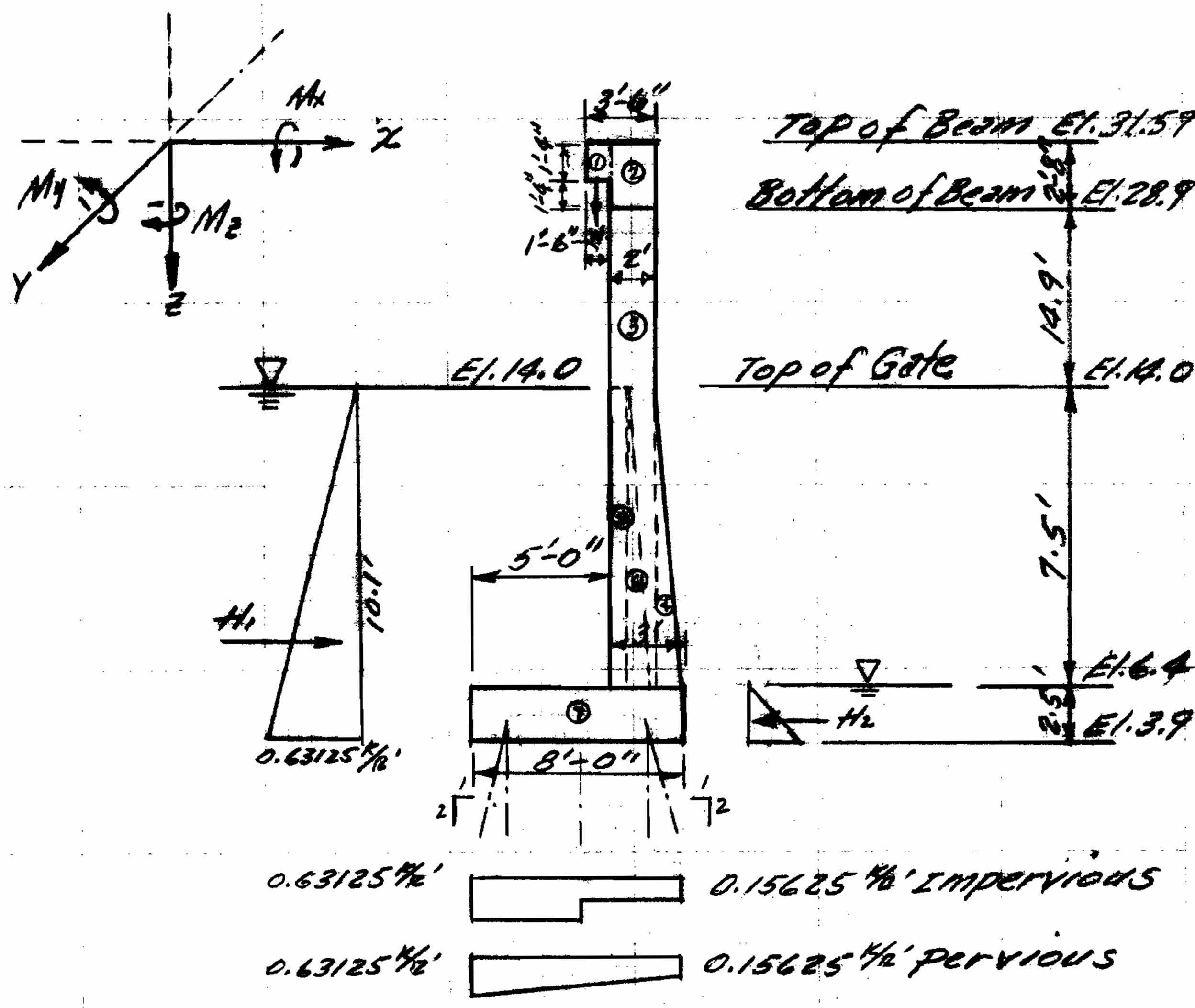
No web reinforcement required

Note: use #3 Ties @ 18" o.c. 2 per set in the entire column

Check Bond (Column #3 & #5)

$u = \frac{40.7}{(49.88)(0.875)(21.5)} = 0.045\,ksi < 0.147\,ksi$ o.K.

36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE



LOAD CASES

CASE I — Water @ El. 14.0, no wind, impervious soil

CASE II — Water @ El. 14.0, no wind, pervious soil

CASE III — No water, no wind, truck on edge slab, F.S.

CASE IV — No water, no wind, truck on edge slab, P.S.

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		HMB	Apr. 78

36'-0" OVERHEAD GATE @ FLORIDA AVE.

Moment About x-x Axis

ITEM	COMPUTATION	F_z (k)	F_y (k)	ARM (ft)	M_{xx} (ft-k)
Gate wt.	(Including Misc wt.)	14.14		-4.42	-62.50
Trolley Bm. wt.	0.0313 k/' × 69	2.16		-4.42	-9.55
Conc. Bm ①	(1.50)(1.33)(69)(0.15)	20.65		-4.42	-91.27
Conc. Bm ②	(2.67)(2)(69)(0.15)	55.27		-6.00	-331.62
Conc. Col. ③	2(2×2×22.44×0.15)	26.93		-6.00	-161.58
Conc. Col. ③	2(2)(22.75)(0.15)	13.65		-6.00	-81.90
Conc. Col. ④	2(½×2×1×7.56×0.15)	2.27		-7.33	-16.64
Conc. Col. ④	½(2)(1)(7.85)(0.15)	1.18		-7.33	-8.65
T-wall ⑤	(1)(7.85)(39)(0.15)	45.92		-5.50	-252.56
T-Wall ⑥	½(0.32)(7.85)(39)(0.15)	7.35		-6.11	-44.91
Conc. Slab ⑦	8(2.5)(81)(0.15)	243		-4.00	-972.00
sub-Total		432.52			-2033.18
Imp. uplift	-10.1(81)(4)(0.0625)	-204.53		-2.00	409.06
	-2.5(81)(4)(0.0625)	-50.62		-6.00	303.72
Water wt.	7.6(81)(5)(0.0625)	192.38		-2.50	-480.17
Water Force H_1	$\frac{1}{2}(10.1)^2(81)(0.0625)$		-258.21	3.37	-870.17
Water Force H_2	$\frac{1}{2}(2.5)^2(81)(0.0625)$		15.82	0.833	13.18
Case I Totals (100%)		369.75	-242.39		-2658.34
Perv. uplift	-0.15625(81)(8)	-101.25		-4.00	405.00
	-½(0.475×8×81)	-153.90		-2.67	410.91
Water wt.	7.6(81)(5)(0.0625)	192.38		-2.50	-480.95
Water Force H_1	$\frac{1}{2}(10.1)^2(81)(0.0625)$		-258.21	3.37	-870.17
Water Force H_2	$\frac{1}{2}(2.5)^2(81)(0.0625)$		15.82	0.833	13.18
Case II Totals (100%)		369.75	-242.39		-2555.21

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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVE.

Moment About X-X Axis (Con't)

ITEM	COMPUTATION	Fz(K)	Fy(K)	ARM(ft)	Mxx(ft-K)
Truck	(2Trucks)(H20-S16-44)	64.00		—	—
Case III Totals (100%)		496.52			-2033.18
Truck	(2Trucks)(H20-S16-44)	64.00		-8.00	-512.00
Case IV Totals (100%)		496.52			-2545.18

Moment About Y-Y Axis

ITEM	COMPUTATION	Fz(K)	Fx(K)	ARM(ft)	Myy(ft-K)
Conc. Slab ⑦	2.5(8)(81)(0.15)	243.00		-40.50	-9841.50
Conc. Col. ③	2(2)(22.5)(0.15)	13.50		-77.50	-1046.25
Conc. Col. ③	2(2)(22.58)(0.15)	13.55		-39.50	-535.23
Conc. Col. ③	2(2)(22.83)(0.15)	13.70		-10.50	-143.85
Conc. Col. ④	½(2)(1)(7.52)(0.15)	1.13		-77.50	-87.58
Conc. Col. ④	½(2)(1)(7.6)(0.15)	1.14		-39.50	-45.03
Conc. Col. ④	½(2)(1)(7.85)(0.15)	1.18		-10.50	-12.39
T-wall ⑤ ⑥	(1)(7.85)(9.5)(0.15) + ½ (0.33)(7.85)(9.5)(0.15)	13.03		-4.75	-61.89
T-wall ⑤ ⑥	(1)(7.85)(27)(0.15) + ½ (0.33)(7.85)(27)(0.15)	37.04		-25.00	-926.00
T-wall ⑤ ⑥	(1)(7.52)(2.5)(0.15) + ½ (0.33)(7.52)(2.5)(0.15)	3.29		-79.75	-262.38
Sub-total (100%)		340.56	—		-12962.10

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FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 36 of 56	TST	29 Mar. 78
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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVE.

Moment About Y-Y Axis (cont')

ITEM	COMPUTATION	Fz (K)	Fx (K)	ARM (ft)	Myy (ft-K)
Gate & Bm Wt.	See G. Frame Printout				
Reactions					
⑥	11.48 + 1.13	12.61		-10.50	-132.41
④	53.03	53.03		-39.50	-2094.69
①	25.30 + 1.13	26.33		-77.50	-2040.58
Water wt.	7.6(81)(5)(0.0625)	192.38		-40.50	-7791.39
Imp. uplift	-(10.1)(81)(4)(0.0625)	-204.53		-40.50	8283.47
	-2.5(81)(4)(0.0625)	-50.63		-40.50	2050.52
Case I Total (100%)		369.75	—		-14687.23
Gate & Bm Wt.	See G. Frame Printout				
Reactions					
⑥	11.48 + 1.13	12.61		-10.53	-132.41
④	53.03	53.03		-39.50	-2094.69
①	25.30 + 1.13	26.33		-77.50	-2040.58
Water wt.	7.6(81)(5)(0.0625)	192.38		-40.50	-7791.39
perv. uplift	-0.15625(8)(81)	-101.25		-40.50	4100.63
	-½(0.475)(8)(81)	-153.90		-40.50	6232.95
Case II Total (100%)		369.75	—		-14687.64
Gate & Bm Wt.	See G Frame Printout				
Reactions					
⑥	19.16 + 1.13	20.29		-10.53	-213.05
④	52.03	52.03		-39.50	-2055.19
①	18.52 + 1.13	19.65		-77.50	-1522.88
Truck wt.	(2 trucks)(H20-S16-44)	64.00		-66.50	-4256.00
Case III & IV Total (100%)		496.53	—		-21009.22

36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVE.

Moment About Z-Z Axis

ITEM	COMPUTATION	Fy (K)	Fx (K)	ARM (ft)	Mzz (ft-K)
	Water Force				
Water on wall Gate, Cols & slab	$\frac{1}{2}(10.1)^2(0.0625)(81)$	-258.21		40.50	-10457.51
	$-\frac{1}{2}(2.5)^2(0.0625)(81)$	15.82		40.50	640.71
Case I & II Total (100%)		-242.39			-9816.80
Case III & IV Total (100%)		0.00	—		0.00

SUMMARY OF LOADS ON GATE MONOLITH

CASE	Fx (K)	Fy (K)	Fz (K)	Mxx (ft-K)	Myy (ft-K)	Mzz (ft-K)
I	0.00	-242.39	369.75	-2658.34	-14687.23	-9816.80
II	0.00	-242.39	369.75	-2555.21	-14687.23	-9816.80
III	0.00	0.00	496.53	-2035.18	-21009.22	0.00
IV	0.00	0.00	496.53	-2545.18	-21009.22	0.00

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC
SUBJECT OVERHEAD ROLLER GATE DESIGN
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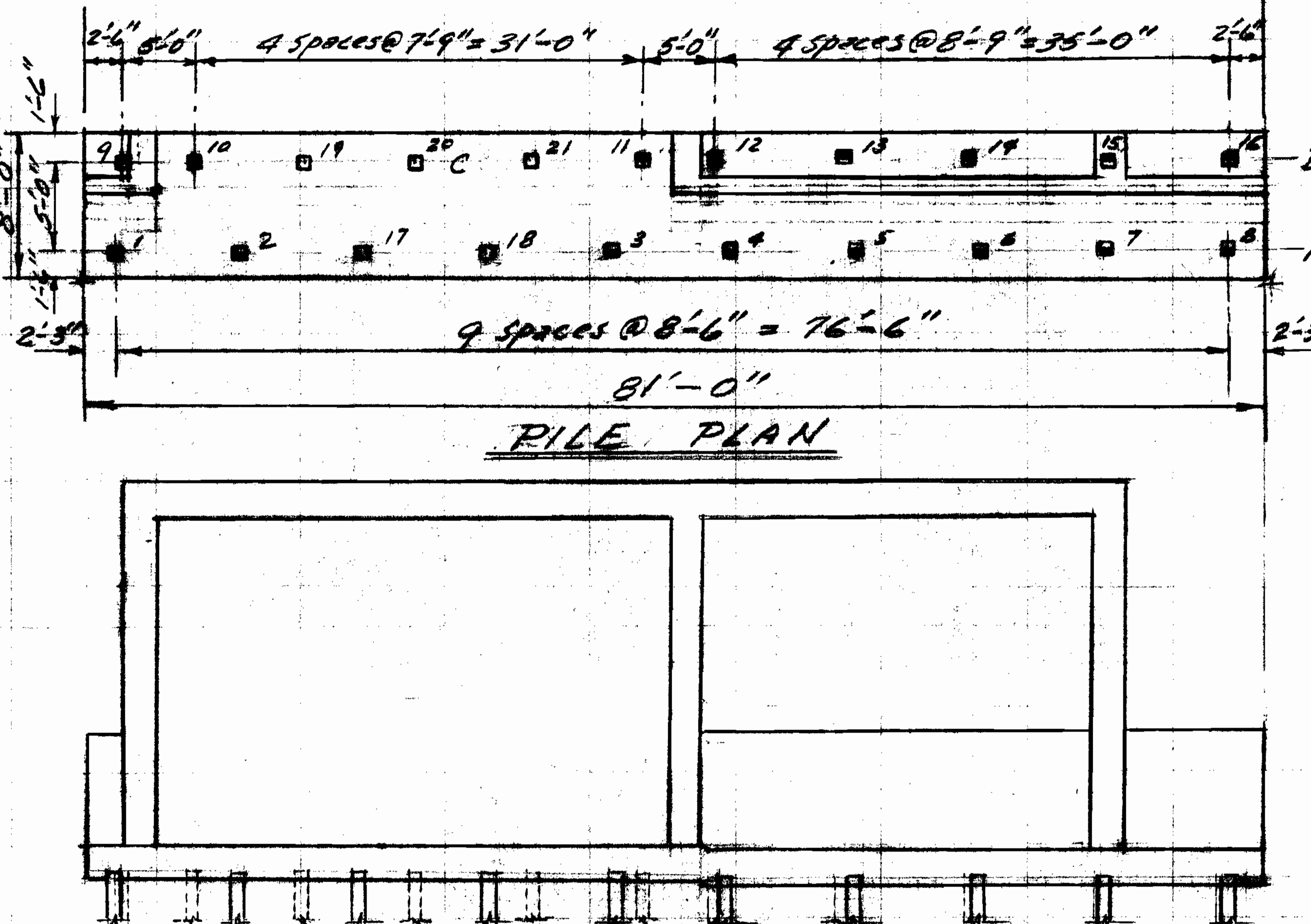

PILE PLAN

Page 1

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LISTH D29010

03/30/78     08.48


10 FLA AVE COMPLEX EAST IHNC -- ROAD GATE
20 3-D PILE ANALYSIS
30 3 4
40 2 0 65
50 1 12 12
60 1 5
70 -1 8.3333
80 0 0 0
90 2 90 8
100 2.25 10.75 36.25 44.75 53.25 61.75 70.25 78.75
110 8*-1.5
120 8*0
130 2 270 8
140 2.50 7.50 38.50 43.50 52.25 61.00 69.75 78.50
150 8*-6.5
160 8*0
170 0 90 5
180 19.25 27.75 15.25 23.00 30.75
190 2*-1.5 3*-6.5
200 5*0
210 0 -242.39 369.75 -2648.79 -14687.23 -9816.77
220 0 -242.39 369.75 -2545.66 -14687.23 -9816.77
230 0     0.0  496.53 -2023.63 -21009.22      0.0
240 0     0.0  496.53 -2535.63 -21009.22      0.0

READY

*CLEAR
AFT CLEARED

*RUN A2K90/K29010,E


    PROG. NO. 713-F3-A2-210              8:30:28   03/30/78


 FLA AVE COMPLEX EAST IHNC -- ROAD GATE
 3-D PILE ANALYSIS


TOTAL NUMBER OF PILES =    21
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Page 2

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-242.4	369.8	-2648.8	-14687.2	-9816.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	-23.7
2	-0.4	0.0	-21.8
3	-0.4	0.0	-15.9
4	-0.4	0.0	-13.9
5	-0.3	0.0	-11.9
6	-0.3	0.0	-10.0
7	-0.3	0.0	-8.0
8	-0.3	0.0	-6.0
9	0.3	0.0	57.9
10	0.3	0.0	57.2
11	0.3	0.0	52.9
12	0.3	0.0	52.2
13	0.3	0.0	50.9
14	0.2	0.0	49.7
15	0.2	0.0	48.5
16	0.2	0.0	47.3
17	-0.4	0.0	24.4
19	-0.4	-0.0	15.4

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-242.4	369.8	-2648.8	-14687.2	-9816.8

LOAD CONDITION 2

Page 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-242.4	369.8	-2545.7	-14687.2	-9816.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	0.0	-22.7
2	-0.5	0.0	-20.8
3	-0.4	0.0	-15.3
4	-0.4	0.0	-13.4
5	-0.4	0.0	-11.5
6	-0.4	0.0	-9.7
7	-0.4	0.0	-7.8
8	-0.4	0.0	-6.0
9	0.4	0.0	58.4
10	0.4	0.0	57.7
11	0.4	0.0	53.0
12	0.3	0.0	52.3
13	0.3	0.0	51.0
14	0.3	0.0	49.7
15	0.3	0.0	48.4
16	0.3	0.0	47.1
17	-0.4	0.0	32.8
19	-0.5	-0.0	8.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-242.4	369.8	-2545.7	-14687.2	-9816.8

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	496.5	-2023.6	-21009.2	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	-0.0	19.5
2	-0.1	-0.0	20.8
3	-0.1	-0.0	24.7
4	-0.1	-0.0	26.0
5	-0.1	-0.0	27.3
6	-0.1	-0.0	28.7
7	-0.1	-0.0	30.0
8	-0.1	-0.0	31.3
9	-0.0	-0.0	18.7
10	-0.0	-0.0	19.6
11	-0.0	-0.0	25.0
12	-0.0	-0.0	25.8
13	-0.0	-0.0	27.4
14	-0.0	-0.0	28.9
15	-0.0	-0.0	30.4
16	-0.0	-0.0	31.9
17	-0.0	-0.0	26.3
18	-0.0	-0.0	27.9
19	-0.0	0.0	21.9
20	-0.0	0.0	23.3
21	-0.0	0.0	24.7

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	-0.0	0.0	496.5	-2023.6	-21009.2	0.0

LOAD CONDITION 4

Page 5

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	496.5	-2535.6	-21009.2	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.3	-0.0	14.3
2	0.3	-0.0	16.1
3	0.3	-0.0	21.7
4	0.3	-0.0	23.5
5	0.3	-0.0	25.4
6	0.3	-0.0	27.2
7	0.3	-0.0	29.1
8	0.3	-0.0	30.9
9	-0.4	-0.0	16.0
10	-0.4	-0.0	17.2
11	-0.4	-0.0	24.0
12	-0.4	-0.0	25.1
13	-0.4	-0.0	27.1
14	-0.4	-0.0	29.0
15	-0.4	-0.0	30.9
16	-0.4	-0.0	32.9
17	0.3	-0.0	-15.6
18	0.3	-0.0	-13.5
19	0.3	0.0	56.8
20	0.3	0.0	58.7
21	0.3	0.0	60.6

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	-0.0	-0.0	496.5	-2535.6	-21009.2	0.0

0 8:33:35 03/30/78 *** END OF RUN ***

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```
*OLD P29010
READY
*LIST 11000-11023

0           PROG NO. 713-F3-A2-210       8:30:28   03/30/78
11000   LOAD CONDITION   1
11010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
11011           0.       -242.4      369.8    -2648.8   -14687.2    -9816.8
11012
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X           Y           Z           RX           RY           RZ
11022 -0.108E-02 -0.638E-01  0.164E-01  0.925E-04 -0.270E-05  0.218E-04
11023

READY

*LIST 12000-12023

0           PROG NO. 713-F3-A2-210       8:30:28   03/30/78
12000   LOAD CONDITION   2
12010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
12011           0.       -242.4      369.8    -2545.7   -14687.2    -9816.8
12012
12020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
12021       X           Y           Z           RX           RY           RZ
12022 -0.107E-02 -0.732E-01  0.249E-01  0.256E-03 -0.204E-05  0.216E-04
12023

READY

*LIST 13000-13023

0           PROG NO. 713-F3-A2-210       8:30:28   03/30/78
13000   LOAD CONDITION   3
13010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
13011           0.          0.       496.5    -2023.6   -21009.2          0.
13012
13020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
13021       X           Y           Z           RX           RY           RZ
13022  0.570E-04 -0.172E-02  0.151E-01  0.388E-04 -0.962E-05 -0.115E-05
13023

READY

*LIST 14000-14023

0           PROG NO. 713-F3-A2-210       8:30:28   03/30/78
14000   LOAD CONDITION   4
14010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
14011           0.          0.       496.5    -2535.6   -21009.2          0.
14012
14020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
14021       X           Y           Z           RX           RY           RZ
14022  0.102E-04  0.451E-01 -0.267E-01 -0.772E-03 -0.129E-04 -0.207E-06
14023
```

PROJECT FLORIDA AVE COMPLEX, EAST OF IHNC	Page 39 of 56	COMPUTED BY TST	DATE 30 Mar. 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY HMB	DATE Apr. 78

36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE.

Pile Reactions from Computer Printout

1. Case I (100%)

		X	Y	Z
Pile "A" Group	=	-0.4	0.0	-23.7
Pile "B" Group	=	0.3	0.0	57.9
Pile "CA" Group	=	-0.4	0.0	24.4
Pile "CB" Group	=	-0.4	-0.0	15.4

2. Case II (100%)

		X	Y	Z
Pile "A" Group	=	-0.5	0.0	-22.7
Pile "B" Group	=	0.4	0.0	58.4
Pile "CA" Group	=	-0.4	0.0	32.8
Pile "CB" Group	=	-0.5	-0.0	8.4

3. Case III (100%)

		X	Y	Z
Pile "A" Group	=	-0.1	-0.0	31.3
Pile "B" Group	=	-0.0	-0.0	31.9
Pile "CA" Group	=	-0.0	-0.0	27.9
Pile "CB" Group	=	-0.0	0.0	24.7

4. Case IV (100%)

		X	Y	Z
Pile "A" Group	=	0.3	-0.0	30.9
Pile "B" Group	=	-0.4	-0.0	32.9
Pile "CA" Group	=	0.3	-0.0	-15.6
Pile "CB" Group	=	0.3	0.0	60.6

36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

1. For Top Slab Reinforcing

Case I Loading (100%)

Pile "Av"	$= 21.2 \times 8 \div 81$	$= 2.09^K \times 3.5$	$= 7.32^{'K}$
Pile "Xav"	$= 0.18 \times 8 \div 81$	$= 0.018^K \times 3.5$	$= 0.06^{'K}$
Pile "Ca"	$= \cancel{24.9} \times 2 \div 81$	$= \cancel{0.602}^K \times 3.5$	$= 2.11^{'K}$
Ww	$= 5 \times 1 \times 7.6 \times 0.0625$	$= 2.38^K \times 2.5$	$= 5.95^{'K}$
-Ww	$= -4 \times 1 \times 10.1 \times 0.0625$	$= -2.53^K \times 3.0$	$= -7.59^{'K}$
Ws	$= 2.5 \times 1 \times 5 \times 0.15$	$= 1.88^K \times 2.5$	$= 4.70^{'K}$

$\Sigma V = 4.44^K \qquad \Sigma M = 12.55^{'K}$

$b = 12''$

$F = \frac{12.55}{152} = 0.083$

$d \cong 9''\ ;\ t = 9'' + 4'' = 13'' < 30''$ o.k.

$As = \frac{12.55}{1.44 \times 26} = 0.335^{\square''}$

$Min.\ As = 0.0025 \times 12 \times 26 = 0.78^{\square''}$

Use #8 @ 12" in Top of Slab

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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

2. For Bottom Slab Reinforcing

Case III Loading (100%)

Pile "Av"	= 28.0×8÷81	= 2.77^{K} × 3.5	= $9.70^{'K}$
Pile "XAV"	= 0.045×8÷81	= 0.004^{K} × 3.5	= $0.014^{'K}$
Pile "CA"	= 27.9×2÷81	= 0.69^{K} × 3.5	= $2.42^{'K}$
2 Truck Lds	= −64÷81	= -0.79^{K} × 5.0	= $-3.95^{'K}$
Ws	= −2.5×1×5×0.15	= -1.88^{K} × 2.5	= $-4.70^{'K}$
Ww	= 4×1×2.5×0.0625	= 0.63^{K} × 3.0	= $1.88^{'K}$

$\Sigma V = 1.424^{K}$ $\quad \Sigma M = 5.364^{'K}$

$b = 12''$

$F = \frac{5.364}{152} = 0.0353$

$d \cong 6''$, $h = 6'' + 4'' = 10'' < 30''$ o.k.

$A_s = \frac{5.364}{1.44 \times 26} = 0.143^{\square''}$

Min. $A_s = 0.0025 \times 12 \times 26 = 0.78^{\square''}$

use #8 @ 12" in Bottom of slab

36-[illegible]OVERHEAD ROLLER GATE @ FLORIDA AVENUE.

[illegible] @ Sect. "C"

Slab: 3×22.5	=	$-67.50^{k} \times 11.25$	=	-759.38^{1k}
Wall:	=	$-3.[illegible]06^{k} \times 21.25$	=	-70.25^{1k}
Pile #1	=	$17.44^{k} \times 20.25$	=	353.16^{1k}
Pile #9	=	$16.73^{k} \times 20.00$	=	334.60^{1k}
Column #1	=	$-13.90^{k} \times 19.00$	=	-264.10^{1k}
Pile #10	=	$17.53^{k} \times 15.00$	=	262.95^{1k}
Pile #2	=	$18.60^{k} \times 11.75$	=	218.55^{1k}
Pile #19	=	$21.90^{k} \times 7.25$	=	158.78^{1k}
Pile #17	=	$26.30^{k} \times 3.25$	=	85.48^{1k}

$\Sigma V = 33.794^{k}\uparrow$ $\quad \Sigma M = 319.79^{1k}$

Moment @ Sect. "D"

Slab: 3×28.5	=	$-85.50^{k} \times 14.25$	=	-1218.38^{1k}
Wall:	=	$-3.306^{k} \times 27.25$	=	-90.09^{1k}
Pile #1	=	$17.44^{k} \times 26.25$	=	457.80^{1k}
Pile #9	=	$16.73^{k} \times 26.00$	=	434.98^{1k}
Column #1	=	$-13.90^{k} \times 25.00$	=	-347.50^{1k}
Pile #10	=	$17.53^{k} \times 21.00$	=	368.13^{1k}
Pile #2	=	$[illegible].60^{k} \times 17.75$	=	330.15^{1k}
Pile #19	=	$21.90^{k} \times 13.25$	=	290.18^{1k}
Pile #17	=	$26.30^{k} \times 9.25$	=	243.28^{1k}
Pile #20	=	$23.30^{k} \times 5.50$	=	128.15^{1k}
Pile #18	=	$27.90^{k} \times 0.75$	=	20.93^{1k}
Trucks	=	$-64.00^{k} \times 6.00$	=	-384.00^{1k}

$= 2.994^{k}\uparrow$ $\quad = 233.63^{1k}$

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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

Moment @ Sect. "E"

Slab: 3×34.5	= −103.50^k × 17.25	=	−1785.38$^{'k}$
Wall:	= −3.306^k × 33.25	=	−109.92$^{'k}$
Pile #1	= 17.44^k × 32.25	=	562.44$^{'k}$
Pile #9	= 16.73^k × 32.00	=	535.36$^{'k}$
Column #1	= −13.90^k × 31.00	=	−430.90$^{'k}$
Pile #10	= 17.53^k × 27.00	=	473.31$^{'k}$
Pile #2	= 18.60^k × 23.75	=	441.75$^{'k}$
Pile #19	= 21.90^k × 19.25	=	421.58$^{'k}$
Pile #17	= 26.30^k × 15.25	=	401.08$^{'k}$
Pile #20	= 23.30^k × 11.50	=	267.95$^{'k}$
Pile #18	= 27.90^k × 6.75	=	188.33$^{'k}$
Pile #21	= 24.70^k × 3.75	=	92.63$^{'k}$
Trucks	= −64^k × 12.00	=	−768.00$^{'k}$

$\Sigma V = 9.694^k \uparrow$ $\Sigma M = 290.23^{'k}$

Moment @ Sect. "F"

Slab: 3×40.5	= −121.50^k × 20.25	=	−2460.38$^{'k}$
Wall:	= −3.306^k × 39.25	=	−129.76$^{'k}$
Pile #1	= 17.44^k × 38.25	=	667.08$^{'k}$
Pile #9	= 16.73^k × 38.00	=	635.74$^{'k}$
Column #1	= −13.90^k × 37.00	=	−514.30$^{'k}$
Pile #10	= 17.53^k × 33.00	=	578.49$^{'k}$
Pile #2	= 18.60^k × 29.75	=	553.35$^{'k}$
Pile #19	= 21.90^k × 25.25	=	552.98$^{'k}$
Pile #17	= 26.30^k × 21.25	=	558.88$^{'k}$
Pile #20	= 23.30^k × 17.50	=	407.75$^{'k}$
Pile #18	= 27.90^k × 12.75	=	355.73$^{'k}$
Pile #21	= 24.70^k × 9.75	=	240.83$^{'k}$
Pile #3	= 22.09^k × 4.25	=	93.88$^{'k}$
Pile #11	= 22.36^k × 2.00	=	44.72$^{'k}$
Trucks	= −64^k × 18.00	=	−1152.00$^{'k}$

$\Sigma V = 36.144^k \uparrow$ $\Sigma M = 432.99^{'k}$

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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

$M = 432.99^{'K}$

$b = 8 \times 12 = 96''$

$d = \sqrt{\dfrac{432.99(12)}{0.752(96)}} = 18.87''$

$t = 18.87'' + 4'' = 22.87'' < 30''$ o.k.

$As = \dfrac{432.99}{1.44(26)} = 11.56^{\square''}$

$= 7.45^{\square''}/ft.$

$As = 0.0025 \times 12 \times 26 = 0.78^{\square''}$

use : #11 bar @ 12" in bottom of slab
#8 bar @ 12" in top of slab.

Note : #11 bar @ 12" in bottom of slab required at the gate opening only

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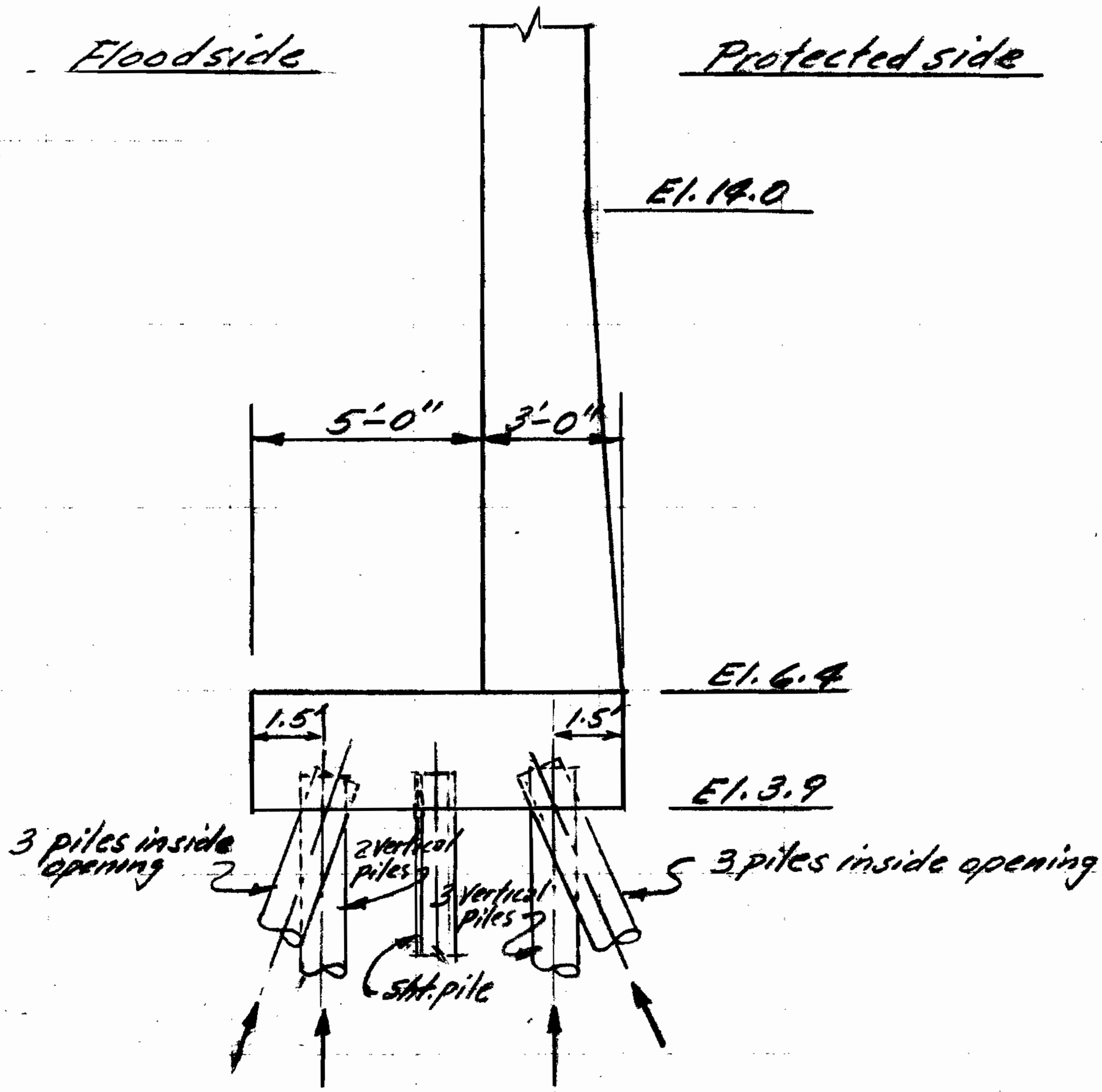
36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

Torsional Analysis



Case III Loading — No water, no wind, truck on edge slab Floodside.

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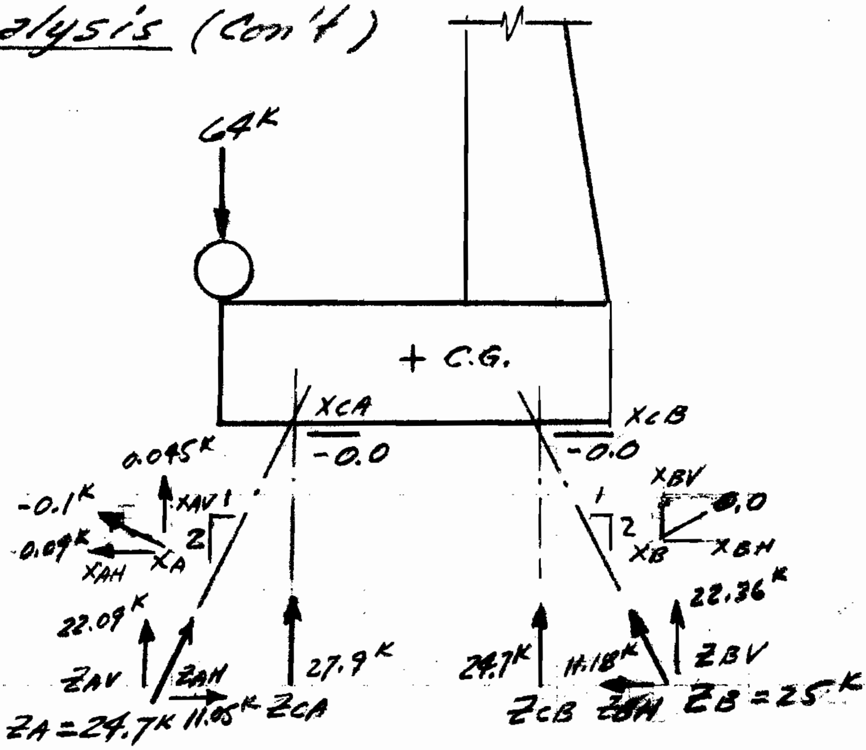
36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

Torsional Analysis (Con't)

Case III



ITEM	V(K)	H(K)	$\overline{X}$ (ft)	M (ft-K)
2 Trucks	-64.00		4.00	-256.00
Z_{AV} = 3(22.09)	66.27		2.50	165.68
Z_{AH} = 3(11.05)		33.15	-1.25	-41.44
X_{AV} = 3(0.045)	0.14		2.50	0.35
X_{AH} = 3(0.09)		-0.27	-1.25	0.34
Z_{CA} = 2(27.9)	55.80		2.50	139.50
X_{CA} = ———		———		———
Z_{CB} = 3(24.7)	74.10		-2.50	-185.25
X_{CB} = ———		———		———
Z_{BV} = 3(22.36)	67.08		-2.50	-167.70
Z_{BH} = 3(11.18)		-33.54	-1.25	41.93
X_{BV} = ———	———			———
X_{BH} = ———		———		———
			M	-302.59

36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

Torsional Analysis (con't)

Torsional moment divides equally between columns

$$M_t = \frac{302.6}{2} = 151.3^{'K}$$

$n = 5$ (Based on Australian Code)

$b = 2.5'$

$h = 8.0'$

$$v_t = \frac{n M_t}{b^2 h} = \frac{5(151300)(12)}{(30)^2(96)} = 105.1\ psi$$

Stirrups Req'd

$$\text{Min. stirrup Spacing} = \frac{27}{2} = 13.5''$$

Torsional Moment resisted by concrete

$$M_t = \frac{v_t b^2 h}{5} = \frac{(0.060 \cancel{-0.0145})(30)^2(96)}{5} = 786.24^{''K} \text{ or } 65.52^{'K}$$

Reinforcement Req'd

$$A_{st} = \frac{M_t' s}{0.8 b_c h_c f_v}$$

When M_t = excess of Torsional Moment above that taken by the concrete.

b_c = small dim. stirrup

h_c = Large dim. stirrup

$$M_t' = 151.3 - 65.52 = 85.78^{'K}$$

$$A_{st} = \frac{85780(12)(12)}{0.8(24)(90)(20{,}000)} = 0.36^{\square''}$$

USE #5 @ 12" $2(0.31) = 0.62^{\square''}$

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36'-0" OVERHEAD ROLLER GATE @ FLORIDA AVENUE

Torsional Analysis (Con't)

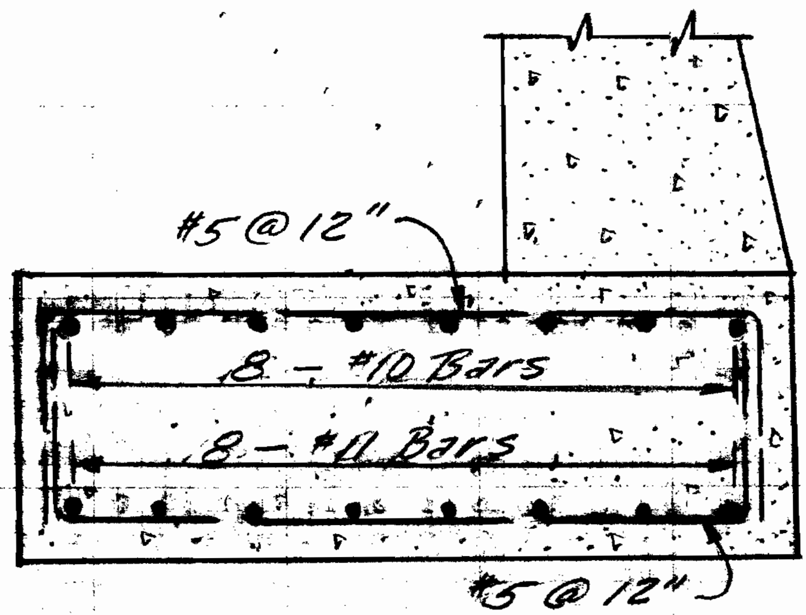
Additional Longitudinal Steel Req'd

$$A_{sl} = \frac{M_t'(b_c+h_c)}{0.8 b_c h_c f_s}$$

$$= \frac{85780(12)(24+90)}{0.8(24)(90)(20{,}000)} = 3.40''$$

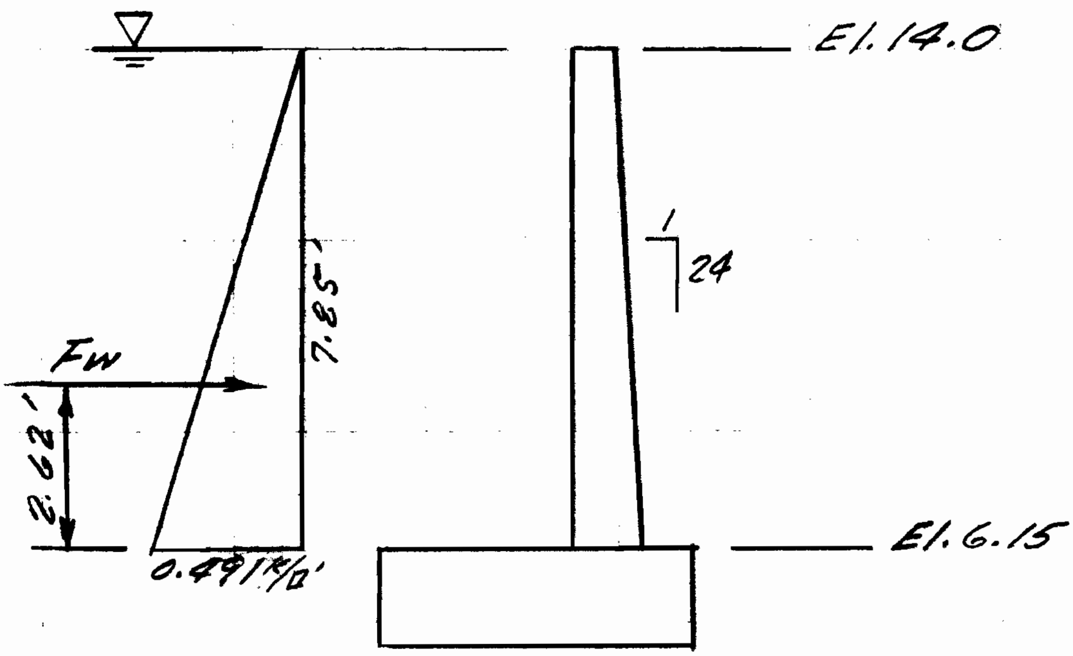
USE 12 - #9 bars @ Top slab of Gate Opening

USE 13 - #8 bars @ Bott. Slab of Gate Opening



SECTION ACROSS OPENNING

T-WALL DESIGN (@ overhead Gate Monolith)



Horizontal Force on wall

water: $F_w = \frac{1}{2}(7.85)(0.491) = 1.93^k$

Moment on wall

water: $M_w = 1.93(2.62) = 5.06'^k$

Reinforcing Required

$d = 12 + \frac{94.2}{24} - 2.5 = 13.43''$

$A_s = \frac{5.06}{(1.44)(13.43)} = 0.26^{\square''}$

Min. $A_s = (0.0025)(12)(13.43) = 0.403^{\square''}$

use #6 @ 12" Floodside; #5 @ 12" Protected side

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T-WALL DESIGN (Cont'd)

Check shear and Bond

Shear: $v = \frac{1930}{12 \times 13.43} = 11.98 \text{ psi} < 60 \text{ psi}$ o.k.

Bond: $U = \frac{1930}{(2.4)(0.875)(13.43)} = 68.43 \text{ psi} < 186 \text{ psi}$ o.k.

Temperature Steel (Horizontal)

$As = (0.0020)(12)(15.925) = 0.382^{\square''}, 0.191^{\square''}$ E.F.

$\text{Min } As = 0.0025(12)(13.42) = 0.403^{\square''}$

use #6 @ 12" Horizontally Each face

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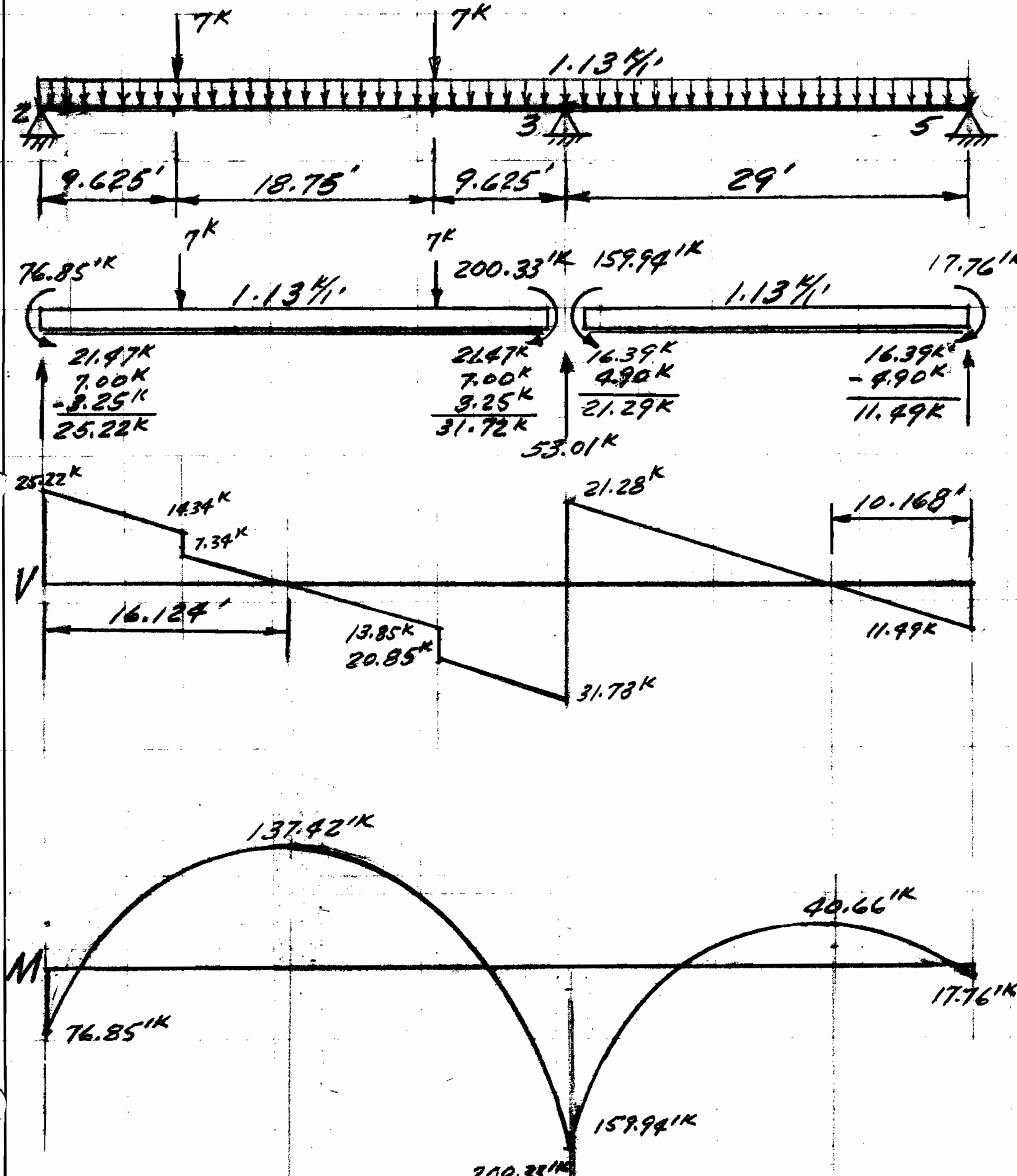
Concrete Beam Design (CASE II Loading)

Max. moment in beam ③-⑤, use same reinf. in beam ②-③



Concrete Beam Design (Cont'd)

Positive Reinforcing

$M = 137.42'^{k}$

$F = \dfrac{137.42}{152} = 0.9041$

$b = 24''$

$d = \sqrt{\dfrac{0.9041(12000)}{24}} = 21.26''$

$h = 21.26'' + 3'' = 24.26'' < 32''$ o.k.

$A_s = \dfrac{137.42}{1.44(29)} = 3.29^{\square''}$

use 4 – #9 bars, $A_s = 4.00^{\square''}$, $\Sigma_0 = 14.0''$

Negative Reinforcing

$M = 200.33'^{k}$

$F = \dfrac{200.33}{152} = 1.317961$

$d = \sqrt{\dfrac{1.317961 \times 12000}{24}} = 25.67''$

$h = 25.67'' + 3'' = 28.76'' < 32''$ o.k.

$A_s = \dfrac{200.33}{1.44(29)} = 4.80^{\square''}$

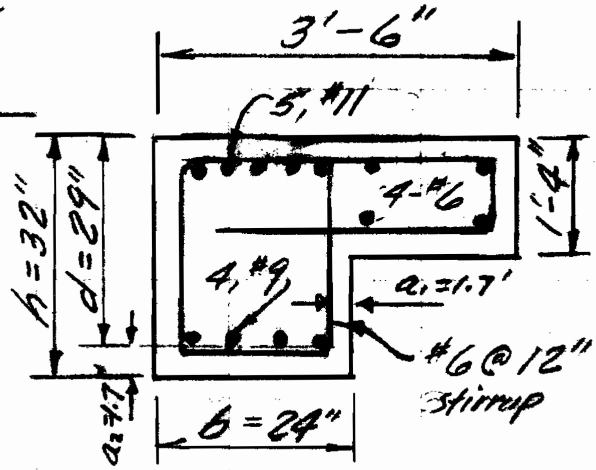
use 4 – #10 bars, $A_s = 5.08^{\square''}$, $\Sigma_0 = 16.0''$

Concrete Beam Design

$(1.33)(1.5)(0.15)21 = 6.28^{\prime\prime K}$

$0.0318 \times 21 = 0.67^{\prime\prime K}$

$6.95^{\prime\prime K}$



$6.95 \times \frac{38}{2} = 132.05^{\prime\prime K}$

$7 \times 21 = 147.00^{\prime\prime K}$

$M_t = 279.05^{\prime\prime K}$

The Bending Moment @ Face of Support

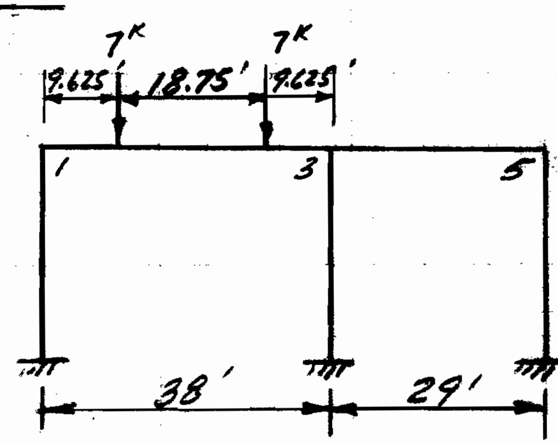
$$M_f = 200.33^{\prime K} \times 0.60 = 120.2^{\prime K}$$

$$C_1 = \frac{\left(h + \frac{b}{2}\right)}{(b-2a_1)\left(1 + \frac{d/2}{(h-2a_2)}\right)}$$

$$= \frac{\left(32 + \frac{24}{2}\right)}{(24-2\times1.7)\left(1+\frac{29/2}{32-2\times1.7}\right)}$$

$$= \frac{44}{(20.6)(1+0.507)}$$

$$= 1.42$$



$$C_2 = \frac{M_t}{M_f} = \frac{279.05}{120.2} = 2.32$$

$$1 + C_1 C_2 = 1 + (1.42)(2.32)$$

$$= 4.29$$

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Concrete Beam Design (con't)

Design Moment M = (Applied Bending Moment)$(1+C_1 C_2)$

$= 120.2\,(4.29)$

$= 515.66'^{K}$

Stirrups Req'd

$$A_{st} = \frac{515{,}660 \times 12}{0.8\,(20)(28)(20{,}000)}$$

$= 0.691\ \square''$ $\qquad \frac{0.691}{2} = 0.346\ \square''$ Each leg.

use #6 @ 12" $A_s = 0.44$"

Longitudinal Steel Req'd

$$A_{st} = \frac{515660\,(20+28)}{0.8(20)(28)(20{,}000)}$$

$= 2.76\ \square''$

Combined Flexure & Torsion

$A_s = 4.80 + 2.76 = 7.56\ \square''$

use 5 - #11, $A_s = 7.8\ \square''$

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 56 of 56	COMPUTED BY TST	DATE 3 April, 78
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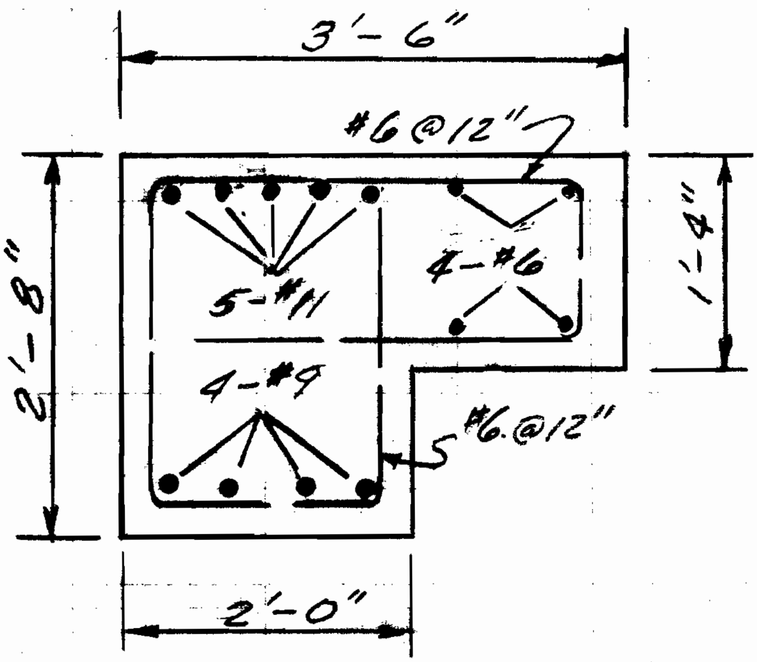
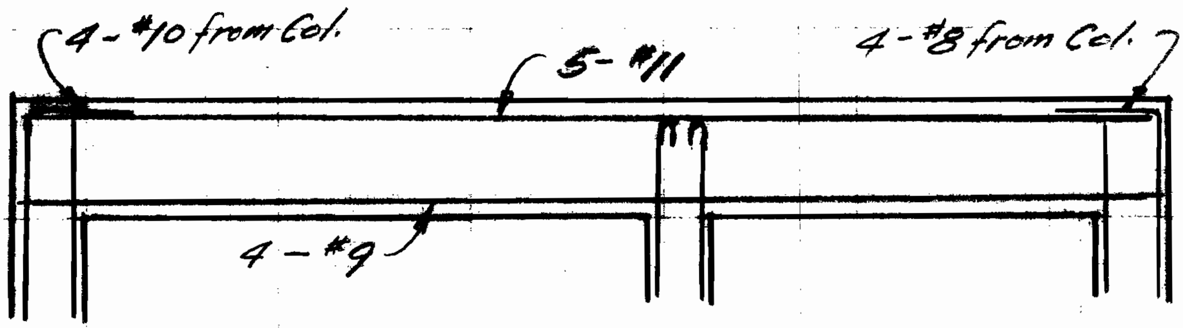
Bond

$V_{max} = 53.00^{K}$

$$u = \frac{53000}{(14.0)(0.875)(29)} = 149.2\,psi < 165\,psi \quad o.k.$$





PROJECT FLORIDA AVE. COMPLEX, EAST IHNC	Page 1 of —	COMPUTED BY TST	DATE 7 MAR 78
SUBJECT GEOMETRY COMPUTATION		CHECKED BY	DATE

The Following Design Datas are from Modeski & Masters Consulting Engineers Co.

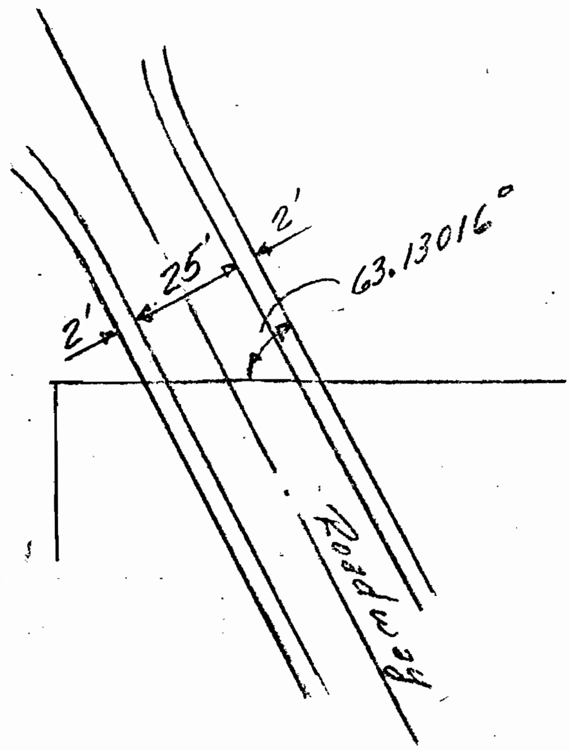
Edge To Edge of Concrete Roadway = 25'-0"

shoulder = 2'-0"

Skew Angle = 63.137016° ≅ 63°8'13"

Sill Elev. = 26.80 Cairo Datum, M.S.L. = 6.346 use 6.4

Gate Height : 14 - 6.4 = 7.6' use 8'-0"



MODJESKI & MASTERS

ENGINEERS

Harrisburg, Pa.

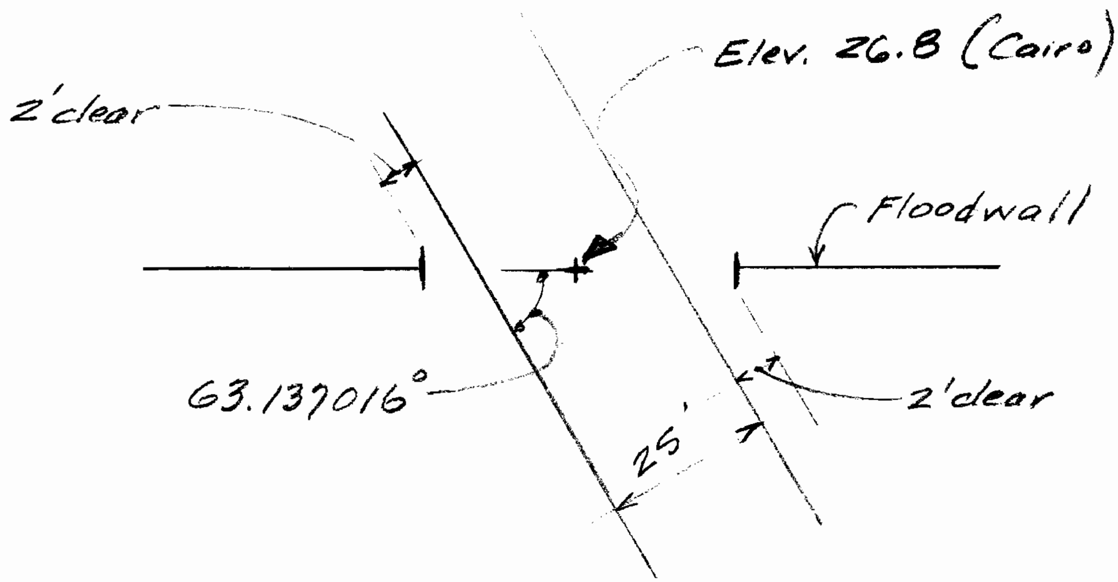
Project

Subject

Made by
Date

Checked by
Date

Sheet No. of



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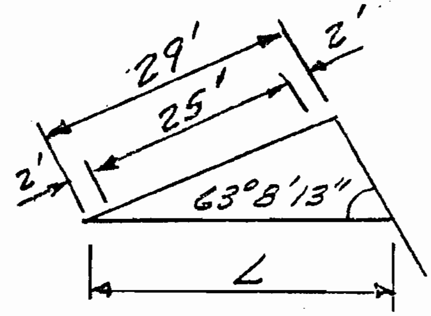
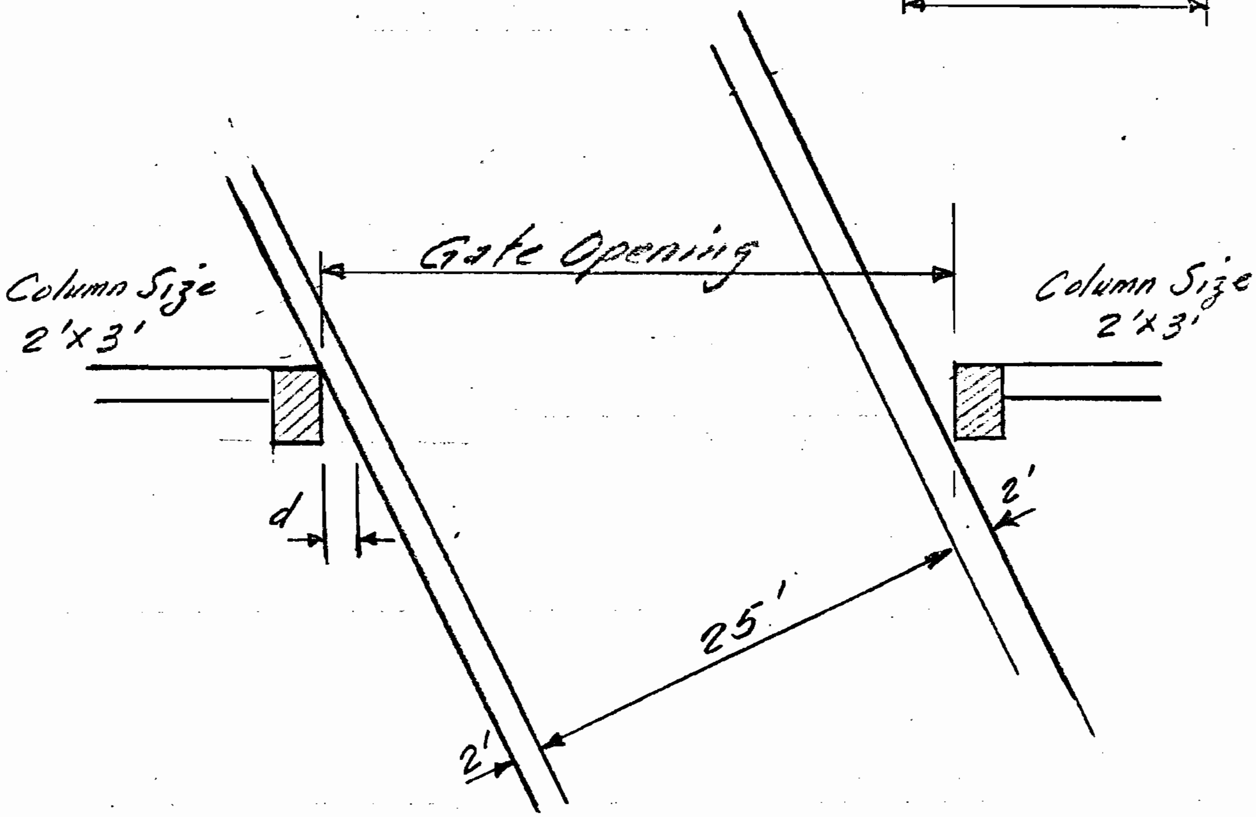
$$L = \frac{29}{\underset{0.89208907}{\sin 63°8'13''}}$$

$$= 32.5080'$$





$$d = \frac{3}{\underset{1.974426172}{\tan 63°8'13''}} = 1.5196'$$

$$\text{Gate Opening} = L + d$$

$$= 32.5080 + 1.5196$$

$$= 34.0276' \cong 34'\text{-}0\tfrac{5}{16}''$$

<u>USE Gate Opening 36'-0"</u>

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC

SUBJECT OVERHEAD ROLLER GATE DESIGN

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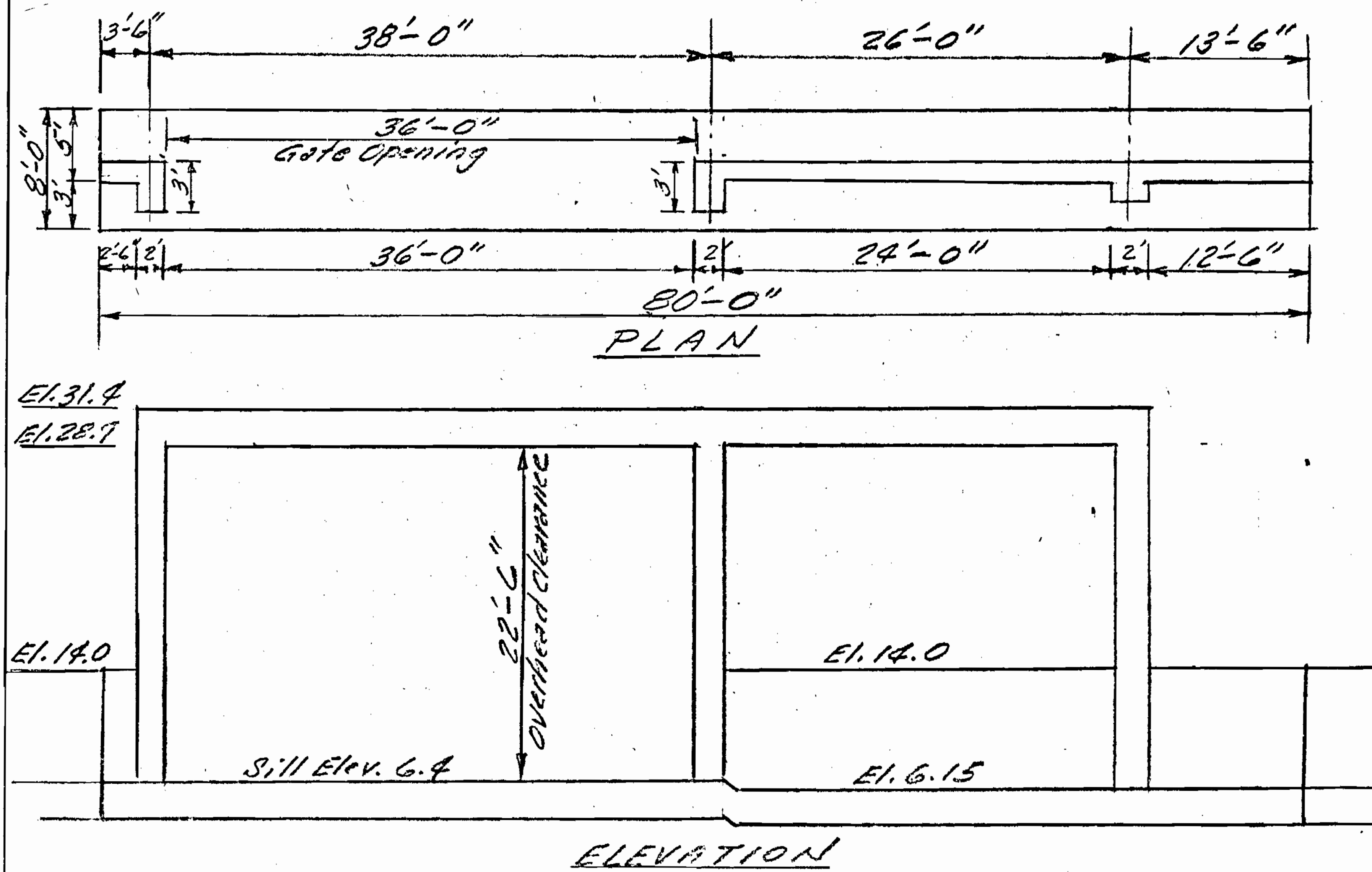

LMV FORM 107a

COMPUTATION SHEET

VOID

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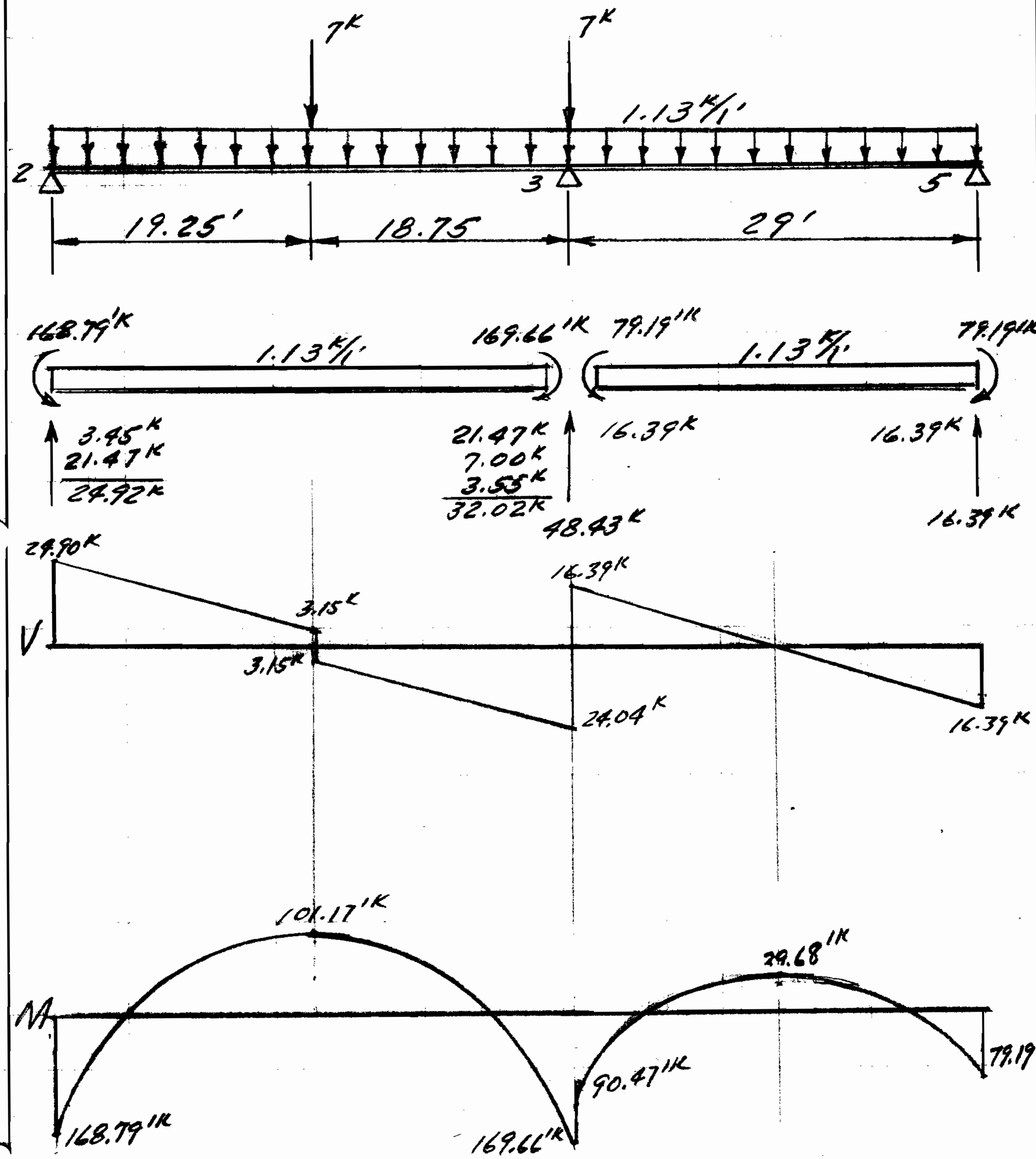
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY	DATE

Concrete Beam Design



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OVERHEAD ROLLER GATE DESIGN			

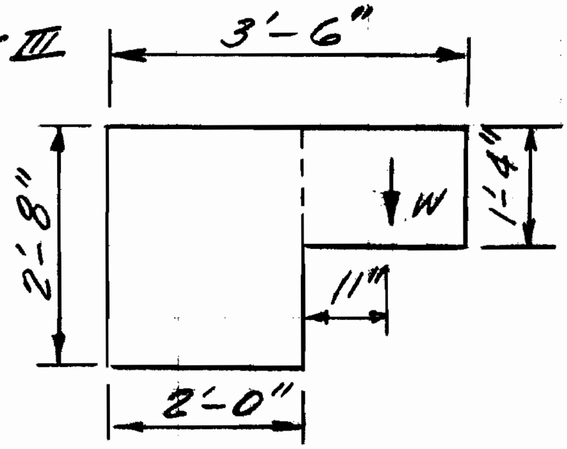
Concrete Beam Design

Shear : Vmax – Combined Load Case III

$$V = 53.00^{K}$$

$$v = \frac{53000}{\underbrace{(24)(29)+(18)(13)}_{930}}$$

$$= 57.0\ psi < 60\ psi\ \text{o.k.}$$



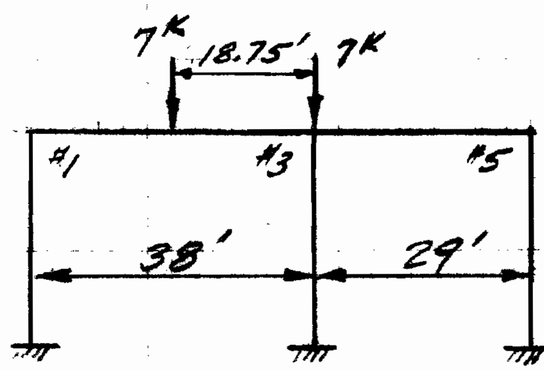
Check Torsion

$$(1.33)(1.5)(0.15)(12) = 6.28^{\prime K}$$

$$0.0318(23) = 0.73^{\prime K}$$

$$7 \times 23 = 161.00^{\prime K}$$

$$T_u = 168.01^{\prime K}$$



$$v_{tu} = 1.1\sqrt{f'_c}$$

$$= 1.1\sqrt{3000} = 60.3\ psi\ (\text{Allowable})$$

Twisting Moment resisted by the concrete only

$$M_{tc} = \frac{v_t}{3b'}\Sigma b^3 h$$

$$= \frac{0.003}{3(24)}\left[(24)^3(32)+(16)^3(18)\right] = 21.504^{\prime K}$$

$$M_t' = 168.01 - 21.50 = 146.51^{\prime K}; \quad S = 12''\ \text{spacing}$$

$$A_{st} = \frac{M_t' S}{0.8 b_c h_c f_c} = \frac{146{,}510\,(12)}{0.8(18)(26)(20000)} = 0.235^{\square''}$$

Use #5 @ 12" ($A_s = 0.31^{\square''}$)

VOID

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 54 of —	COMPUTED BY TST	DATE 15 April, 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY	DATE

Concrete Beam Design

Check Shear – Vmax, Combined Load Case III

$$V = 53.0^{k}$$

$$v = \frac{53000}{(24)(29)+(18)(13)}$$

$$= 57.0\,psi < 60\,psi \quad o.k.$$

Check Torsion

$$(1.33)(1.5)(0.15)21 = 6.28^{\prime k}$$

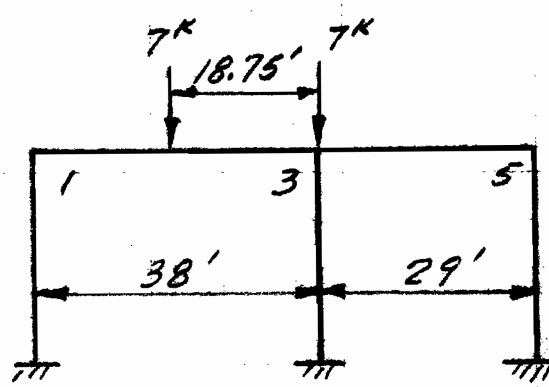
$$0.0318 \times 21 = 0.67^{\prime k}$$

$$6.95^{\prime k}$$

$$6.95 \times \frac{38}{2} = 132.05^{\prime k}$$

$$7+7\left(\frac{19.25}{38}\right)21 = 81.47^{\prime k}$$

$$M_t = 213.52^{\prime k}$$



The Bending Moment @ Face of Support

$$M_f = 169.66^{\prime k} \times 0.60 = 101.8^{\prime k}$$

$$C_1 = \frac{\left(h+\frac{b}{2}\right)}{(b-2a_1)\left(1+\frac{d/2}{h-2a_2}\right)}$$

$$= \frac{\left(32+\frac{24}{2}\right)}{(24-2\times1.7)\left(1+\frac{24/2}{3-2\times1.7}\right)}$$

$$= \frac{44}{(20.6)(1+0.507)}$$

$$= 1.42$$

$$C_2 = \frac{M_t}{M_f} = \frac{213.52}{101.8} = 2.10$$

$$1+C_1C_2 = 1+(1.42)(2.10)$$

$$= 1+2.98$$

$$= 3.98$$

V010

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SUBJECT: OVERHEAD ROLLER GATE DESIGN		CHECKED BY	DATE

Concrete Beam Design (Con't)

$$\text{Design Moment} = (\text{Applied Bending Moment})(1+C_1C_2)$$
$$= 101.8(3.98)$$
$$= 405.164^{\prime k}$$

Stirrups Req'd

$$A_{st} = \frac{405164 \times 12}{0.8(20)(28)(20{,}000)}$$
$$= 0.543^{\square''} \qquad \frac{0.543}{2} = 0.272^{\square''} \text{ Each leg}$$

$$\underline{\text{use } \#5 @ 12'' \quad A_s = 0.31^{\square''}}$$

Longitudinal Steel Req'd

$$A_{st} = \frac{405164(20+28)}{0.8(20)(28)(20{,}000)}$$
$$= 2.17^{\square''}$$

Combined Flexure & Torsion

$$A_s = 4.80 + 2.17 = 6.97^{\square''}$$

$$\underline{\text{use } 6-\#10, \; A_s = 7.62^{\square''}}$$

PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC	Page 21 of __	COMPUTED BY TST	DATE 21 Mar. 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY HMB	DATE Apr. 78

COLUMN DESIGN (Bending about Y-Y axis)

Load cases considered

Case 1Y — Gate opened, no water, no wind.

Case 2Y — Gate closed, water to El. 14.0, no wind.

Case 3Y — Gate opened, no water, wind from F.S. (75%)

Case 4Y — Gate closed, water to El. 14.0, Wind from F.S. (75%)

Case 5Y — Gate opened, no water, wind from P.S. (75%)

Case 6Y — Gate closed, Water to El. 14.0, Wind from P.S. (75%)

Case 1Y No water, no wind

$M_{1Y} = 0.00$

$H_{1Y} = 0.00$

$M_{3Y} = 0.00$

$H_{3Y} = 0.00$

$M_{5Y} = 0.00$

$H_{5Y} = 0.00$

Case 2Y water, no wind

$M_{1Y} = 48.24^{'K}$

$H_{1Y} = 13.90^{K}$

$M_{3Y} = 108.70^{'K}$

$H_{3Y} = 40.67^{K}$

$M_{5Y} = 102.74^{'K}$

$H_{5Y} = 40.61^{K}$

COLUMN DESIGN (Bending about Y-Y axis)

Case 3Y Gate opened, no water, wind from F.S. (75%)

$M_{1Y} = 0.75(71.77+36.27) = 0.75(108.04) = 81.03'^{K}$

$H_{1Y} = 0.75(3.56+8.94) = 0.75(12.50) = 9.38^{K}$

$M_{3Y} = 0.75(128.98+27.09) = 0.75(156.07) = 117.05'^{K}$

$H_{3Y} = 0.75(5.96+7.13) = 0.75(13.09) = 9.82^{K}$

$M_{5Y} = 0.75(86.07+5.32) = 0.75(91.39) = 68.54'^{K}$

$H_{5Y} = 0.75(4.16+1.24) = 0.75(5.40) = 4.05^{K}$

Case 4Y Gate closed water to El. 14.0, wind from F.S. (75%)

$M_{1Y} = 0.75(48.24+71.77) = 0.75(120.01) = 90.01'^{K}$

$H_{1Y} = 0.75(13.90+3.56) = 0.75(17.46) = 13.10^{K}$

$M_{3Y} = 0.75(108.70+128.98) = 0.75(237.68) = 178.26'^{K}$

$H_{3Y} = 0.75(40.67+5.96) = 0.75(46.63) = 34.97^{K}$

$M_{5Y} = 0.75(102.74+86.07) = 0.75(188.81) = 141.61'^{K}$

$H_{5Y} = 0.75(40.61+4.16) = 0.75(44.77) = 33.58^{K}$

Case 5Y Gate opened, no water, wind from P.S. (75%)

$M_{1Y} = 0.75(-71.77-36.27) = 0.75(-108.04) = -81.03'^{K}$

$H_{1Y} = 0.75(-3.56-8.94) = 0.75(-12.50) = -9.38^{K}$

$M_{3Y} = 0.75(-128.98-27.09) = 0.75(-156.07) = -117.05'^{K}$

$H_{3Y} = 0.75(-5.96-7.13) = 0.75(-13.09) = -9.82^{K}$

$M_{5Y} = 0.75(-86.07-5.32) = 0.75(-91.39) = -68.54'^{K}$

$H_{5Y} = 0.75(-4.16-1.24) = 0.75(-5.40) = -4.05^{K}$

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Case 6Y Gate closed, water to El. 14.0, wind from P.S. (75%)

$$M_{1Y} = 0.75(48.24 - \cancel{71.71}\ {-108.04}) = 0.75(\cancel{-23.47}\ {-59.80}) = \cancel{-17.60}\ {-44.85}^{\,1K}$$

$$H_{1Y} = 0.75(13.90 - \cancel{3.56}\ {-12.50}) = 0.75(\cancel{10.34}\ 1.40) = \cancel{7.76}\ 1.05^{\,K}$$

$$M_{3Y} = 0.75(108.70 - \cancel{128.98}\ {-156.07}) = 0.75(\cancel{-20.28}\ {-47.37}) = \cancel{-15.21}\ {-35.53}^{\,1K}$$

$$H_{3Y} = 0.75(40.67 - \cancel{5.96}\ {-13.09}) = 0.75(\cancel{34.71}\ 27.58) = \cancel{26.03}\ 20.69^{\,K}$$

$$M_{5Y} = 0.75(102.74 - \cancel{86.07}\ {-91.39}) = 0.75(\cancel{16.67}\ 11.35) = \cancel{12.50}\ 8.51^{\,1K}$$

$$H_{5Y} = 0.75(40.61 - \cancel{4.16}\ {-5.40}) = 0.75(\cancel{36.45}\ 35.21) = \cancel{27.34}\ 26.41^{\,K}$$

Summary of Results (Bending About Y-Y Axis)

Load case	Column No. 1		Column No. 3		Column No. 5	
	M_{1Y} 1K	H_{1Y} K	M_{3Y} 1K	H_{5Y} K	M_{5Y} 1K	H_{5Y} K
1	0.00	0.00	0.00	0.00	0.00	0.00
2	48.24	13.90	108.70	40.67	102.74	40.61
3	81.03	9.38	117.05	9.82	68.54	4.05
4	90.01	13.10	178.26	34.97	141.61	33.58
5	-81.03	-9.38	-117.05	-9.82	-68.54	-4.05
6	-44.85 ~~17.60~~	1.05 ~~7.76~~	-35.53 ~~-15.21~~	20.69 ~~26.03~~	8.51 ~~12.50~~	26.41 ~~27.34~~

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COLUMN DESIGN (Cont'd)

Column Weight = 14.64 K

Summary of Combine Load Cases

Load case	Column No. 1					Column No. 3					Column No. 5				
	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R
I	-39.9	81.0	2.9	9.4	13.9	5.7	117.1	-0.5	9.8	39.2	26.6	68.5	-2.4	4.1	14.4
II	-39.9	-81.0	2.9	-9.4	13.9	5.7	-117.1	-0.5	-9.8	39.0	26.6	-68.5	-2.4	-4.1	14.4
III	-76.9	48.2	5.3	13.9	25.2	40.4	108.7	-3.7	40.7	53.0	17.8	102.7	-1.6	40.6	11.5
IV	-57.7	90.0	4.0	13.1	18.9	30.3	178.3	-2.8	35.0	40.0	13.4	141.6	-1.2	33.6	8.6
V	-57.7	-44.9 ~~47.6~~	4.0	1.1 ~~7.8~~	18.9	30.3	-35.5 ~~15.2~~	-2.8	20.7 ~~26.0~~	40.0	13.4	8.5 ~~12.5~~	-1.2	26.4 ~~27.3~~	8.6
VI	-41.0	0.0	4.2	0.0	14.0	-7.4	0.0	-1.1	0.0	39.2	22.4	0.0	-1.0	0.0	14.1
VII	-58.7	36.2	5.4	10.4	19.0	25.2	81.5	-1.4	30.5	40.0	9.1	77.1	-0.2	30.5	8.3
VIII	-58.7	-44.9 ~~77.6~~	5.4	1.1 ~~7.8~~	19.0	25.2	-35.5 ~~15.2~~	-1.4	20.7 ~~26.0~~	40.0	9.1	8.5 ~~12.5~~	-0.2	26.4 ~~27.3~~	8.3
IX	-56.5	36.2	2.7	10.4	18.8	35.4	81.5	-4.3	30.5	39.6	17.6	77.1	-2.6	30.5	8.9
X	-60.5	0.0	4.3	0.0	19.7	21.2	0.0	-1.9	0.0	56.3	26.7	0.0	-2.4	0.0	13.7
XI	-45.4	81.0	3.2	9.4	14.8	15.9	117.1	-1.4	9.8	42.2	20.0	68.5	-1.8	4.1	10.3
XII	-45.4	-81.0	3.2	-9.4	14.8	15.9	-117.1	-1.4	-9.8	42.2	20.0	-68.5	-1.8	-4.1	10.3
XIII	-52.8	0.0	3.7	0.0	18.5	9.3	0.0	-0.8	0.0	50.1	32.5	0.0	-2.9	0.0	21.2
XIV	-39.6	81.0	2.3	9.4	13.9	7.0	117.1	-0.6	9.8	37.6	24.4	68.5	-2.2	4.1	15.9
XV	-39.6	-81.0	2.8	-9.4	13.9	7.0	-117.1	-0.6	-9.8	37.6	24.4	-68.5	-2.2	-4.1	15.9

NOTE: Reaction "R" in above load Table, the dead weight of columns are not included.

PROJECT	Page — of —	COMPUTED BY	DATE
FLORIDA AVE COMPLEX, EAST OF IHNC		JSR	02 JUN 78
SUBJECT OVERHEAD ROLLER GATE DESIGN		CHECKED BY	DATE

REVISED PILE DESIGN COMPUTATIONS.

NOTE: THIS REVISION WAS REQUIRED FOR THE FOLLOWING REASONS:

1) BASE SLAB LENGTH WAS INCREASED FROM 81'-0" TO 84'-6" BY AE.

2) PILE CURVES ISSUED BY F&M LIMITED THE PILE LOADINGS TO: TENSION = 30 KIPS, COMPRESSION: 44 KIPS } BATTER PILES; COMPRESSION: 65 KIPS } VERTICAL PILES

THE PILE CURVES MANDATED A CHANGE OF FROM
12"X12" X 65' PRE-STRESSED CONC PILES TO
14"X14" X 82' " " " " "
IN ORDER TO SATISFY THE LOADING RESTRICTIONS.

3) THE GATE MONOLITH CONFIGURATION WAS CHANGED TO REFLECT THE MONOLITH'S ACTUAL DIMENSIONS AND ORIENTATION.

LISTH JD0323

06/01/78   11.60

```
10 FLA AVE COMPLEX EAST IHNC -- ROAD GATE
20 7 6 2 3160
30 1 1 1 1 0.0 6.40
40 2 0 0 0 0.0 30.23
50 3 0 0 0 38.0 30.23
60 4 1 1 1 38.0 14.00
70 5 0 0 0 68.0 30.23
80 6 1 1 1 68.0 14.00
90 7 0 0 0 0.0 14.00
100 1 7 2 24 24 0
110 2 2 3 85085 0 1056
120 3 4 3 24 24 0
130 4 3 5 85085 0 1056
140 5 6 5 24 24 0
150 6 1 7 24 30 0
160 2 1.13 1.13 0 0
170 4 1.13 1.13 0 7.0 5.625 0 7.0 24.375 0 0
180 0
190 0
200 2 1.13 1.13 0 7.0 9.675 0 7.0 20.425 0 0
210 4 1.13 1.13 0 0
220 0
230 0
```

```
<RUN WESLIB/GFRAME,E
      MULTIPLE LOAD CASE PLANAR RIGID FRAME ANALYSIS


ENTER DATA FILE NAME
=JB0323
ENTER A 1 TO BUILD NEW FILE OR A 2 TO EXECUTE OLD FILE
=2
DO YOU WANT INPUT CHECK --YES OR NO
=YES


0 FLA AVE COMPLEX EAST INNC -- ROAD GATE
```

STRUCTURE INPUT DATA CHECK

7 JOINTS 6 MEMBERS 2 LOAD CASES
MODULUS OF ELASTICITY = 3160. KSI

JOINT NUMBER	Y FIXITY	X FIXITY	ROT FIXITY	X (FEET)	Y (FEET)
1	1	1	1	0.	6.40
2	0	0	0	0.	30.23
3	0	0	0	38.00	30.23
4	1	1	1	38.00	14.00
5	0	0	0	68.00	30.23
6	1	1	1	68.00	14.00
7	0	0	0	0.	14.00

MEMBER NUMBER	JOINT LEFT	JOINT RIGHT	WIDTH OR I IN OR IN^4	HEIGHT OR 0 INCHES	AREA OR 0 INCHES^2
1	7	2	24.00	24.00	0.
2	2	3	85085.00	0.	1056.00
3	4	3	24.00	24.00	0.
4	3	5	85085.00	0.	1056.00
5	6	5	24.00	24.00	0.
6	1	7	24.00	30.00	0.

0 FLA AVE COMPLEX EAST INNC -- ROAD GATE

LOADING CASE 1 OF 2

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
4	1.130	1.130	0.				
				1	7.00	5.63	0.
				2	7.00	24.38	0.

JOINT NUM	APPLIED MOMENT (FT--K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	--0.0004604	--0.0032833	--0.0027118
3	0.0000566	--0.0037956	--0.0056289
4	0.	0.	0.
5	0.0002965	--0.0041737	--0.0021184
6	0.	0.	0.
7	0.0001420	--0.0078662	--0.0007390

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT--K)	MOMENT RIGHT (FT--K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	--7.90	--52.94	--3.75	3.75	18.44	--18.44
2	2	3	30.00	52.94	--168.20	18.44	24.50	3.75	--3.75
3	4	3	16.23	--0.14	4.10	0.24	--0.24	52.61	--52.61
4	3	5	30.00	164.10	--39.53	28.10	19.80	3.50	--3.50
5	6	5	16.23	17.36	39.53	3.50	--3.50	19.80	--19.80
6	1	7	7.60	--36.39	7.90	--3.75	3.75	18.44	--18.44

STRUCTURE REACTIONS

JNT NO	MOMENT (FT--K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	--36.39	18.44	3.75
4	--0.14	52.61	--0.24
6	17.36	19.80	--3.50

9 FLA AVE COMPLEX EAST INNO - ROAD GATE

LOADING CASE 2 OF 2

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
				1	7.00	9.68	0.
				2	7.00	28.43	0.
4	1.130	1.130	0.				

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	-0.0006947	-0.0001296	-0.0037011
3	0.0002622	-0.0008620	-0.0057240
4	0.	0.	0.
5	0.0001453	-0.0010624	-0.0013035
6	0.	0.	0.
7	0.0001960	-0.0109233	-0.0010086

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT-K)	MOMENT RIGHT (FT-K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	-10.20	-76.79	-5.36	5.36	25.16	-25.16
2	2	3	38.00	76.79	-201.75	25.16	31.78	5.36	-5.36
3	4	3	16.23	18.61	38.22	3.50	-3.50	53.49	-53.49
4	3	5	30.00	163.54	-20.51	21.72	12.18	1.86	-1.86
5	6	5	16.23	9.64	20.51	1.86	-1.86	12.18	-12.18
6	1	7	7.60	-50.93	10.20	-5.36	5.36	25.16	-25.16

STRUCTURE REACTIONS

JNT NO	MOMENT (FT-K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	-50.93	25.16	5.36
4	18.61	53.49	-3.50
6	9.64	12.18	-1.86

```
DATA JE0020

06/01/78     11.60

10 FLA AVE COMPLEX EAST INHC - ROAD GATE
20 7 6 2 3160
30 1 1 1 1 0.0 6.40
40 2 0 0 0 0.0 30.20
50 3 0 0 0 30.0 30.20
60 4 1 1 1 30.0 14.00
70 5 0 0 0 60.0 30.20
80 6 1 1 1 60.0 14.00
90 7 0 0 0 0.0 14.00
100 1 7 2 24 24 0
110 2 2 3 85005 0 1056
120 3 4 3 24 24 0
130 4 3 5 85005 0 1056
140 5 6 5 24 24 0
150 6 1 7 24 30 0
160 2 1.13 1.13 0 0
170 4 1.13 1.13 0 7.0 5.625 0 7.0 24.375 0 0
180 0
190 0
200 2 1.13 1.13 0 7.0 9.675 0 7.0 28.425 0 0
210 4 1.13 1.13 0 0
220 0
230 0

*RUN NECLIB CFRAME*E
      MULTIPLE LOAD CASE PLANAR RIGID FRAME ANALYSIS


ENTER DATA FILE NAME
*JE0020
ENTER A 1 TO BUILD NEW FILE OR A 2 TO EXECUTE OLD FILE
*2
DO YOU WANT INPUT CHECK - YES OR NO
*YES


0 FLA AVE COMPLEX EAST INHC - ROAD GATE

                    STRUCTURE INPUT DATA CHECK

              7 JOINTS    6 MEMBERS    2 LOAD CASES
                MODULUS OF ELASTICITY =  3160. KSI
```

JOINT NUMBER	X FIXITY	Y FIXITY	ROT FIXITY	X (FEET)	Y (FEET)
1	1	1	1	0.	6.60
2	0	0	0	0.	30.23
3	0	0	0	38.00	30.23
4	1	1	1	38.00	14.00
5	0	0	0	68.00	30.23
6	1	1	1	68.00	14.00
7	0	0	0	0.	14.00

MEMBER NUMBER	JOINT LEFT	JOINT RIGHT	WIDTH OR I IN OR IN^4	HEIGHT OR 0 INCHES	AREA OR 0 INCHES^2
1	7	2	24.00	24.00	0.
2	2	3	85005.00	0.	1056.00
3	4	3	24.00	24.00	0.
4	3	5	85005.00	0.	1056.00
5	6	5	24.00	24.00	0.
6	1	7	24.00	30.00	0.

D FLA AVE COMPLEX EAST INMC - ROAD GATE

LOADING CASE 1 OF 2

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.130	1.130	0.				
4	1.130	1.130	0.				
				1	7.00	5.63	0.
				2	7.00	24.38	0.

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	-0.0004604	-0.0032833	-0.0027118
3	0.0000566	-0.0037956	-0.0056289
4	0.	0.	0.
5	0.0002965	-0.0041707	-0.0021184
6	0.	0.	0.
7	0.0001420	-0.0078662	-0.0007390

MEMBER END MOMENTS AND FORCES

MEM NUM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT-K)	MOMENT RIGHT (FT-K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	-7.90	-52.94	-3.75	3.75	18.44	-18.44
2	2	3	38.00	52.94	-168.20	18.44	24.50	3.75	-3.75
3	4	3	16.23	-0.14	4.10	0.24	-0.24	52.61	-52.61
4	3	5	30.00	164.10	-39.53	28.10	19.80	3.50	-3.50
5	6	5	16.23	17.36	39.53	3.50	-3.50	19.80	-19.80
6	1	7	7.60	-36.39	7.90	-3.75	3.75	18.44	-18.44

STRUCTURE REACTIONS

JNT NO	MOMENT (FT-K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	-36.39	18.44	3.75
4	-0.14	52.61	-0.24
6	17.36	19.80	-3.50

FLA AVE COMPLEX EAST INMC - ROAD GATE

LOADING CASE 2 OF 2

LOADING INPUT DATA CHECK

MEM NO	DIST LD LEFT (K/FT)	DIST LD RIGHT (K/FT)	ANGLE (DEG)	PT LD NO	MAGNITUDE (K)	DIS FROM LEFT (FT)	ANGLE (DEG)
2	1.100	1.100	0.				
				1	7.00	9.68	0.
				2	7.00	28.43	0.
4	1.100	1.100	0.				

JOINT NUM	APPLIED MOMENT (FT-K)	APPLIED VERT LD (K)	APPLIED HORZ LD (K)

JOINT DISPLACEMENTS AND ROTATIONS

JOINT NUMBER	ROTATION (RADIANS)	X DISPLACEMENT (INCHES)	Y DISPLACEMENT (INCHES)
1	0.	0.	0.
2	-0.0006947	-0.0001296	-0.0037011
3	0.0002622	-0.0008620	-0.0057240
4	0.	0.	0.
5	0.0001453	-0.0010624	-0.0013005
6	0.	0.	0.
7	[illegible]	[illegible]	[illegible]

MEMBER END MOMENTS AND FORCES

MEM	JOINT LEFT	JOINT RIGHT	LENGTH (FT)	MOMENT LEFT (FT-K)	MOMENT RIGHT (FT-K)	SHEAR LEFT (K)	SHEAR RIGHT (K)	AXIAL LEFT (K)	AXIAL RIGHT (K)
1	7	2	16.23	-10.20	-76.79	-5.36	5.36	25.16	-25.16
2	2	3	38.00	76.79	-201.75	25.10	31.78	5.36	-5.36
3	4	3	16.23	18.61	38.22	3.50	-3.50	53.49	-53.49
4	3	5	30.00	163.54	-20.51	21.72	12.18	1.86	-1.86
5	6	5	16.23	-9.64	20.51	1.86	-1.86	12.18	-12.18
6	1	7	7.60	-50.93	10.20	-5.36	5.36	25.16	-25.16

STRUCTURE REACTIONS

JNT NO	MOMENT (FT-K)	VERTICAL FORCE (K)	HORIZONTAL FORCE (K)
1	-50.93	25.16	5.36
4	18.61	53.49	-3.50
6	9.64	12.18	-1.86

PROJECT Florida Ave. Complex, East of IHNC	Page 34 of	COMPUTED BY JAR	DATE 01 Jun 78
SUBJECT Overhead Roller Gate Design		CHECKED BY	DATE

Pile Design

Moment @ X-X Axis

Item	Computation	F_z (Kips)	F_y (Kips)	Arm (Ft)	M_{x-x} (Ft-Kips)
Gate Wt	(Including Misc. Wt.)	14.14		-4.42	-62.50
Trolley Beam Wt	0.0313 k/' x 70'	2.19		-4.42	-9.68
Conc. Beam ①	(1.50)(1.33)(70)(0.15)	20.95		-4.42	-92.60
Conc. Beam ②	(2.67)(2)(70)(0.15)	56.07		-6.00	-336.42
Conc. Col. ③	2 x (2)(2)(22.5)(0.15)	27.00		-6.00	-162.00
Conc. Col. ④	2 x (½)(2)(1)(7.6)(0.15)	2.28		-7.33	-16.71
Conc. Col. ③	(2)(2)(22.75)(0.15)	13.65		-6.00	-81.90
Conc. Col. ④	(½)(2)(1)(7.85)(0.15)	1.18		-7.33	-8.65
T-Wall ⑤	(1)(7.85)(40.0)(0.15)	47.10		-5.50	-259.05
T-Wall ⑥	(½)(0.32)(7.85)(40)(0.15)	7.54		-6.11	-46.07
T-Wall ⑤	(1)(7.6)(2.5)(0.15)	2.85		-5.50	-15.68
T-Wall ⑥	(½)(0.32)(7.6)(2.5)(0.15)	0.46		-6.11	-2.81
Conc. Slab ⑦	(8)(2.5)(84.5)(0.15)	253.50		-4.00	-1014.00
Subtotal		448.91			-2108.07

PROJECT Florida Ave Complex, East of IHNC	Page 35 of __	COMPUTED BY JAR	DATE 01 Jun 78
SUBJECT Overhead Roller Gate Design		CHECKED BY	DATE

Pier Design

Moment @ X-X Axis (cont'd)

Item	Computation	F_z (kips)	F_y (kips)	Arm (ft)	M_{xx} (ft-kips)
Imp. Uplift	$-10.1(84.5)(4)(0.0625)$	-213.36		-2.00	426.72
	$-2.5(84.5)(4)(0.0625)$	-52.81		-6.00	316.84
Water Wt.	$7.4(84.5)(5)(0.0625)$	200.69		-2.50	-501.73
Water Force H_1	$\frac{1}{2}(10.1)^2(84.5)(0.0625)$		-269.37	3.37	-907.78
Water Force H_2	$\frac{1}{2}(2.5)^2(84.5)(0.0625)$		16.50	0.833	13.74
Case I	Total (100%)	383.43	-252.87		-2760.26
Perv. Uplift	$-0.15625(84.5)(8)$	-105.62		-4.00	422.48
	$-\frac{1}{2}(0.475)(8)(84.5)$	-160.55		-2.67	428.67
Water Wt.	$7.6(84.5)(5)(0.0625)$	200.69		-2.50	-501.73
Water Force H_1	$\frac{1}{2}(10.1)^2(84.5)(0.0625)$		-269.37	3.37	-907.78
Water Force H_2	$\frac{1}{2}(2.5)^2(84.5)(0.0625)$		16.50	0.833	13.74
Case II	Total (100%)	383.43	-252.87		-2452.69
Truck	2 Trucks (H20-S16-44)	64.00		—	0.0
Case III	Total (100%)	512.91			-2108.07
Truck	2 Trucks (H20-S16-44)	64.00		-8.00	-512.00
Case IV	Total (100%)	512.91			-2620.07

LMV FORM 1 AUG 68 107a COMPUTATION SHEET

PROJECT Florida Ave Complex, East of IHNC	Page 36 of __	COMPUTED BY JAR	DATE 01 Jun 78
SUBJECT Overhead Roller Gate Design		CHECKED BY	DATE

Pile Design
Moment @ Y-Y Axis

Item	Computation	F_z (Kips)	F_x (Kips)	Arm (Ft)	M_{y-y} (Ft-Kips)
Conc. Slab ⑦ &	2.5(8)(84.5)(0.15)	253.50		42.25	- 10710.38
1 Conc. Col ③ & ④		14.64		81.00	- 1185.84
4 Conc. Col ③ & ④		14.64		43.0	- 629.52
6 Conc. Col ③ & ④		14.83		13.0	- 192.79
T-Wall ⑤ & ⑥	(7.85)(28)[1 + ½(0.32)](0.15)	38.25		28.0	- 1071.00
T-Wall ⑤ & ⑥	(7.85)(12)[1 + ½(0.32)](0.15)	16.39		6.0	- 98.34
T-Wall ⑤ & ⑥	(7.6)(2.5)[1 + ½(0.32)](0.15)	3.31		83.25	- 275.56
Sub Total (100%)		355.56			-14,163.43
Gate & Bm Wt. Reactions	See GFRAME Printout				
6	12.18 + 1.13	13.31		13.00	- 173.03
4	53.49	53.49		43.00	- 2300.07
1	25.16 + 1.13	26.29		81.00	- 2129.49
Water Wt	7.6(84.5)(5)(0.0625)	200.69		42.25	-8479.15
Imp. Uplift	-10.1(84.5)(4)(0.0625)	- 213.36		42.25	9014.46
	- 2.5(84.5)(4)(0.0625)	- 52.81		42.25	2231.22
Case I Total (100%)		383.17			-15,999.49
Gate & Bm. Wt. Reactions	See GFRAME Printout				
6	12.18 + 1.13	13.31		13.00	- 173.03
4	53.49	53.49		43.00	- 2300.07
1	25.16 + 1.13	26.29		81.00	- 2129.49
Water Wt	7.6(84.5)(4)(0.0625)	200.69		42.25	-8479.15
Perv. Uplift	-0.15625(8)(84.5)	- 105.62		42.25	4462.45
	- ½(0.475)(8)(84.5)	- 160.55		42.25	6783.24
Case II Total (100%)		383.17			- 15,999.48
Gate & Bm Wt Reactions					
6	19.80 + 1.13	20.93		13.00	- 272.09
4	52.61	52.61		43.00	- 2262.23
1	18.44 + 1.13	19.57		81.00	- 1585.17
Truck Wt	(2 Trucks) (H20-S16-44)	64.00		62.00	- 3968.00
Case III & IV Total (100%)		512.67			- 22,250.92

PROJECT Florida Ave. Complex, East of IHNC	Page 37 of —	COMPUTED BY JAR	DATE 01 Jun 78
SUBJECT Overhead Roller Gate Design		CHECKED BY	DATE

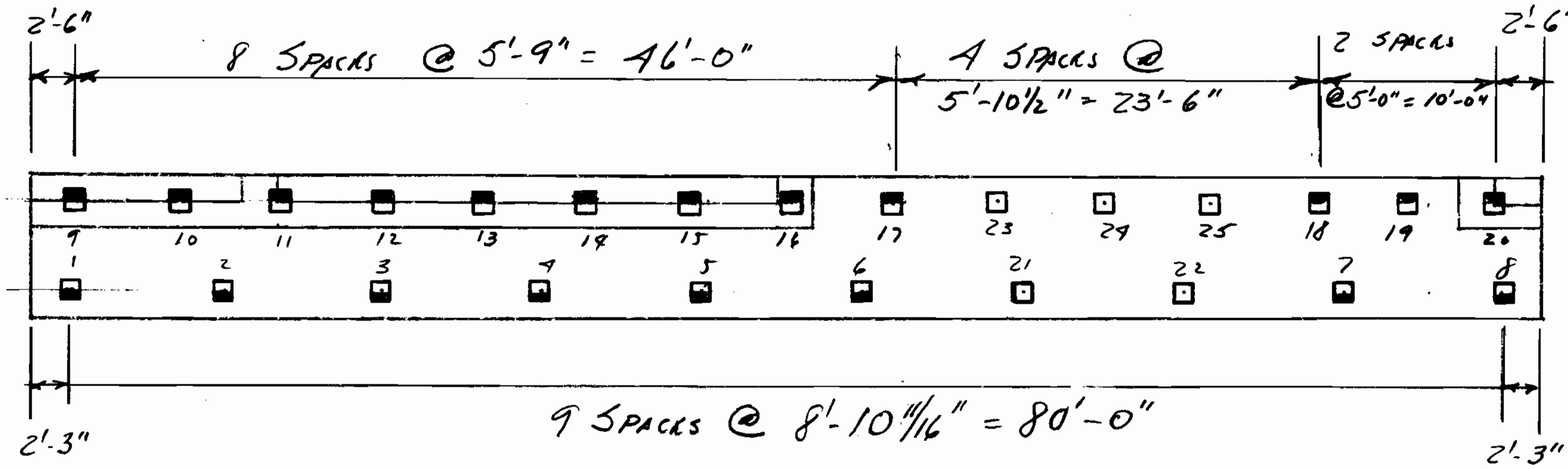
Pier Design

Moment @ Z-Z Axis

Item	Computation	F_y (Kips)	F_x (Kips)	Arm (Ft)	M_{z-z} (Ft-Kips)
Water Force H_1	$-\frac{1}{2}(10.1)^2(84.5)(0.0625)$	-269.37		42.25	-11,380.88
Water Force H_2	$\frac{1}{2}(2.5)^2(84.5)(0.0625)$	16.50		42.25	697.13
Case I & II Totals (100%)		-252.87			-10,683.75
Case III & IV Totals (100%)		0.00			0.00

Summary of Loads on Gate Monolith

Case	F_x (Kips)	F_y (Kips)	F_z (Kips)	M_{xx} (Ft-Kips)	M_{y-y} (Ft Kips)	M_{z-z} (Ft-Kips)
I	0.00	-252.87	383.43	-2760.26	-15999.49	-10683.75
II	0.00	-252.87	383.43	-2652.69	-15999.49	-10683.75
III	0.00	0.00	512.91	-2108.07	-22250.92	0.00
IV	0.00	0.00	512.91	-2620.07	-22250.92	0.00



PROJECT FLORIDA AVE. COMPLEX, EAST OF IHNC

SUBJECT OVERHEAD ROLLER GATE DESIGN

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COMPUTED BY JAR DATE 02 JUN 78

CHECKED BY DATE

RUN A2K90/K29010,E

PROG. NO. 713-F3-A2-210   13:14: 8   06/02/78

FLA AVE COMPLEX EAST INNC - ROAD GATE
3-D PILE ANALYSIS

TOTAL NUMBER OF PILES =   25

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-252.9	383.4	-2760.3	-15999.5	-10683.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.0	-5.0
2	-0.2	-0.0	-6.8
3	-0.3	-0.0	-8.6
4	-0.3	-0.0	-10.4
5	-0.3	-0.0	-12.2
6	-0.3	-0.0	-14.0
7	-0.3	-0.0	-19.4
8	-0.3	-0.0	-21.2
9	0.2	-0.0	33.5
10	0.2	-0.0	34.2
11	0.2	-0.0	34.9
12	0.2	-0.0	35.6
13	0.2	-0.0	36.3
14	0.2	-0.0	37.0
15	0.2	-0.0	37.7
16	0.2	-0.0	38.4
17	0.2	-0.0	39.2
18	0.3	-0.0	42.0
19	0.3	-0.0	42.7
20	0.3	-0.0	43.3
21	-0.3	-0.0	16.5
23	-0.3	0.0	10.7

1   SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1   0.0 -252.9 383.4 -2760.3 -15999.5 -10683.7

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-252.9	383.4	-2652.7	-15999.5	-10683.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.0	-4.9
2	-0.3	-0.0	-6.5
3	-0.3	-0.0	-8.2
4	-0.3	-0.0	-9.9
5	-0.4	-0.0	-11.6
6	-0.4	-0.0	-13.3
7	-0.4	-0.0	-18.3
8	-0.4	-0.0	-20.0
9	0.2	-0.0	33.3
10	0.3	-0.0	34.1
11	0.3	-0.0	34.8
12	0.3	-0.0	35.6
13	0.3	-0.0	36.3
14	0.3	-0.0	37.1
15	0.3	-0.0	37.8
16	0.3	-0.0	38.6
17	0.3	-0.0	39.3
18	0.3	-0.0	42.4
19	0.4	-0.0	43.0
20	0.4	-0.0	43.6
21	-0.4	-0.0	25.0
23	-0.4	0.0	3.3

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-252.9	383.4	-2652.7	-15999.5	-10683.7

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	512.9	-2108.1	-22250.9	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.0	0.0	26.8
9	-0.1	0.0	18.5
21	0.0	0.0	26.1
23	0.0	-0.0	24.2

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	-0.0	512.9	-2108.1	-22250.9	-0.0

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	512.9	-2620.1	-22250.9	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.3	-0.0	26.1
7	0.3	-0.0	22.3
9	-0.4	-0.0	19.3
18	-0.4	-0.0	16.4
21	0.4	-0.0	-14.3
23	0.4	0.0	59.4

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	0.0	-0.0	512.9	-2620.1	-22250.9	-0.0

0 13:17:42 06/02/78 *** END OF RUN ***

```
*LIST P29010

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6           LOAD CONDITION 1 OUTPUT                              11000
7                LOADS ON PILE CAP                               11010
8                DEFLECTION OF PILE CAP                          11020
9                PILE LOADS (PILE AXIS)                          11100
10               SUMMATION OF LOADS (STRUCTURE AXIS)             11900
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10100 FLA AVE COMPLEX EAST INNC - ROAD GATE
10101 3-D PILE ANALYSIS
10102
10103
10110   ELASTIC PILE CONSTANT MATRIX (C)
10111
10112    0.765E 01 0.         0.         0.         0.         0.
10113    0.         0.765E 01 0.         0.         0.         0.
10114    0.         0.         0.175E 04 0.         0.         0.
10115    0.         0.         0.         0.         0.         0.
10116    0.         0.         0.         0.         0.         0.
10117    0.         0.         0.         0.         0.         0.
10118
10119
```

```
      INPUT COORDINATES/BATTER


GROUP NO.   1
        8 PILES   ON 2.0 BATTER   AT   90.0 DEG.

       NO.    X        Y       Z
        1      2.3    -1.5     0.
        2     11.1    -1.5     0.
        3     20.0    -1.5     0.
        4     28.9    -1.5     0.
        5     37.8    -1.5     0.
        6     46.7    -1.5     0.
        7     73.4    -1.5     0.
        8     82.3    -1.5     0.

GROUP NO.   2
       12 PILES   ON 2.0 BATTER   AT  270.0 DEG.

       NO.    X        Y       Z
        9      2.5    -6.5     0.
       10      8.3    -6.5     0.
       11     14.0    -6.5     0.
       12     19.8    -6.5     0.
       13     25.5    -6.5     0.
       14     31.3    -6.5     0.
       15     37.0    -6.5     0.
       16     42.8    -6.5     0.
       17     48.5    -6.5     0.
       18     72.0    -6.5     0.
       19     77.0    -6.5     0.
       20     82.0    -6.5     0.

GROUP NO.   3
        5 PILES   ON 0.   BATTER   AT   90.0 DEG.

       NO.    X        Y       Z
       21     55.6    -1.5     0.
       22     64.5    -1.5     0.
       23     54.4    -6.5     0.
       24     60.3    -6.5     0.
       25     66.1    -6.5     0.
```

```
11000   LOAD CONDITION    1
11010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
11011          0.      -252.9      383.4    -2760.3  -15999.5  -10683.8
11012
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021      X            Y           Z           RX           RY           RZ
11022  0.934E-03 -0.274E-01  0.118E-01  0.555E-04  0.210E-05 -0.173E-04
11023
11100   PILE LOADS (PILE AXIS)
11101    NO.      X          Y           Z           MX          MY          MZ
11102
11103      1  -0.228  -0.005     -5.000      0.          0.          0.
11104      2  -0.240  -0.005     -6.795      0.          0.          0.
11105      3  -0.252  -0.005     -8.589      0.          0.          0.
11106      4  -0.263  -0.005    -10.384      0.          0.          0.
11107      5  -0.275  -0.005    -12.178      0.          0.          0.
11108      6  -0.287  -0.005    -13.972      0.          0.          0.
11109      7  -0.323  -0.005    -19.358      0.          0.          0.
11110      8  -0.335  -0.005    -21.152      0.          0.          0.
11111      9   0.166  -0.003     33.494      0.          0.          0.
11112     10   0.175  -0.003     34.201      0.          0.          0.
11113     11   0.183  -0.003     34.909      0.          0.          0.
11114     12   0.192  -0.003     35.617      0.          0.          0.
11115     13   0.201  -0.003     36.324      0.          0.          0.
11116     14   0.209  -0.003     37.032      0.          0.          0.
11117     15   0.218  -0.003     37.740      0.          0.          0.
11118     16   0.227  -0.003     38.447      0.          0.          0.
11119     17   0.235  -0.003     39.155      0.          0.          0.
11120     18   0.271  -0.003     42.047      0.          0.          0.
11121     19   0.278  -0.003     42.663      0.          0.          0.
11122     20   0.286  -0.003     43.278      0.          0.          0.
11123     21  -0.298  -0.005     16.478      0.          0.          0.
11124     22  -0.312  -0.005     16.087      0.          0.          0.
11125     23  -0.296   0.003     10.700      0.          0.          0.
11126     24  -0.306   0.003     10.441      0.          0.          0.
11127     25  -0.315   0.003     10.182      0.          0.          0.
11128
11900     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
11901        0.0  -252.9   383.4   -2760.3  -15999.5  -10683.7
11902
```

```
12000   LOAD CONDITION    2
12010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
12011          0.      -252.9     383.4    -2652.7  -15999.5  -10683.8
12012
12020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
12021      X            Y           Z           RX           RY           RZ
12022  0.917E-03 -0.363E-01  0.190E-01  0.206E-03  0.159E-05 -0.170E-04
12023
12100   PILE LOADS (PILE AXIS)
12101    NO.      X         Y          Z           MX          MY          MZ
12102
12103      1  -0.304  -0.005     -4.860        0.          0.          0.
12104      2  -0.316  -0.005     -6.543        0.          0.          0.
12105      3  -0.328  -0.005     -8.227        0.          0.          0.
12106      4  -0.339  -0.005     -9.910        0.          0.          0.
12107      5  -0.351  -0.005    -11.594        0.          0.          0.
12108      6  -0.363  -0.005    -13.277        0.          0.          0.
12109      7  -0.399  -0.005    -18.330        0.          0.          0.
12110      8  -0.410  -0.005    -20.013        0.          0.          0.
12111      9   0.242  -0.003     33.330        0.          0.          0.
12112     10   0.250  -0.003     34.076        0.          0.          0.
12113     11   0.259  -0.003     34.823        0.          0.          0.
12114     12   0.267  -0.003     35.569        0.          0.          0.
12115     13   0.276  -0.003     36.315        0.          0.          0.
12116     14   0.284  -0.003     37.062        0.          0.          0.
12117     15   0.292  -0.003     37.808        0.          0.          0.
12118     16   0.301  -0.003     38.554        0.          0.          0.
12119     17   0.309  -0.003     39.301        0.          0.          0.
12120     18   0.344  -0.003     42.351        0.          0.          0.
12121     19   0.351  -0.003     43.000        0.          0.          0.
12122     20   0.358  -0.003     43.649        0.          0.          0.
12123     21  -0.365  -0.005     24.961        0.          0.          0.
12124     22  -0.378  -0.005     24.665        0.          0.          0.
12125     23  -0.363   0.003      3.321        0.          0.          0.
12126     24  -0.372   0.003      3.125        0.          0.          0.
12127     25  -0.381   0.003      2.930        0.          0.          0.
12128
12900     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
12901        0.0  -252.9   383.4   -2652.7  -15999.5  -10683.7
12902
```

```
13000   LOAD CONDITION    3
13010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
13011          0.          0.        512.9    -2108.1   -22250.9        0.
13012
13020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
13021       X            Y            Z            RX            RY            RZ
13022 -0.442E-04   0.418E-02   0.153E-01   0.179E-04   0.118E-06   0.818E-06
13023
13100   PILE LOADS (PILE AXIS)
13101    NO.      X          Y           Z            MX          MY          MZ
13102
13103      1   -0.023    0.000      26.764       0.          0.          0.
13104      2   -0.022    0.000      26.813       0.          0.          0.
13105      3   -0.021    0.000      26.861       0.          0.          0.
13106      4   -0.021    0.000      26.910       0.          0.          0.
13107      5   -0.020    0.000      26.959       0.          0.          0.
13108      6   -0.019    0.000      27.007       0.          0.          0.
13109      7   -0.017    0.000      27.153       0.          0.          0.
13110      8   -0.017    0.000      27.202       0.          0.          0.
13111      9   -0.076    0.000      18.493       0.          0.          0.
13112     10   -0.077    0.000      18.436       0.          0.          0.
13113     11   -0.077    0.000      18.379       0.          0.          0.
13114     12   -0.078    0.000      18.322       0.          0.          0.
13115     13   -0.078    0.000      18.265       0.          0.          0.
13116     14   -0.078    0.000      18.208       0.          0.          0.
13117     15   -0.079    0.000      18.151       0.          0.          0.
13118     16   -0.079    0.000      18.094       0.          0.          0.
13119     17   -0.079    0.000      18.037       0.          0.          0.
13120     18   -0.081    0.000      17.804       0.          0.          0.
13121     19   -0.081    0.000      17.755       0.          0.          0.
13122     20   -0.081    0.000      17.705       0.          0.          0.
13123     21    0.036    0.000      26.109       0.          0.          0.
13124     22    0.037    0.000      26.087       0.          0.          0.
13125     23    0.036   -0.000      24.231       0.          0.          0.
13126     24    0.037   -0.000      24.216       0.          0.          0.
13127     25    0.037   -0.000      24.202       0.          0.          0.
13128
13900     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
13901        0.0     -0.0     512.9     -2108.1    -22250.9        -0.0
13902
```

```
14000   LOAD CONDITION    4
14010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
14011          0.         0.        512.9    -2620.1   -22250.9        0.
14012
14020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
14021      X          Y          Z          RX          RY          RZ
14022  0.346E-04  0.464E-01 -0.191E-01 -0.700E-03  0.255E-05 -0.641E-06
14023
14100   PILE LOADS (PILE AXIS)
14101    NO.      X        Y          Z          MX          MY          MZ
14102
14103     1    0.340   -0.000     26.097      0.          0.          0.
14104     2    0.340   -0.000     25.617      0.          0.          0.
14105     3    0.341   -0.000     25.138      0.          0.          0.
14106     4    0.341   -0.000     24.658      0.          0.          0.
14107     5    0.342   -0.000     24.178      0.          0.          0.
14108     6    0.342   -0.000     23.698      0.          0.          0.
14109     7    0.343   -0.000     22.259      0.          0.          0.
14110     8    0.344   -0.000     21.779      0.          0.          0.
14111     9   -0.439   -0.000     19.272      0.          0.          0.
14112    10   -0.438   -0.000     19.031      0.          0.          0.
14113    11   -0.437   -0.000     18.790      0.          0.          0.
14114    12   -0.436   -0.000     18.549      0.          0.          0.
14115    13   -0.435   -0.000     18.308      0.          0.          0.
14116    14   -0.434   -0.000     18.067      0.          0.          0.
14117    15   -0.433   -0.000     17.826      0.          0.          0.
14118    16   -0.433   -0.000     17.585      0.          0.          0.
14119    17   -0.432   -0.000     17.344      0.          0.          0.
14120    18   -0.428   -0.000     16.359      0.          0.          0.
14121    19   -0.427   -0.000     16.149      0.          0.          0.
14122    20   -0.426   -0.000     15.940      0.          0.          0.
14123    21    0.352   -0.000    -14.268      0.          0.          0.
14124    22    0.351   -0.000    -14.744      0.          0.          0.
14125    23    0.352    0.000     59.351      0.          0.          0.
14126    24    0.351    0.000     59.036      0.          0.          0.
14127    25    0.351    0.000     58.721      0.          0.          0.
14128
14900     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
14901        0.0     -0.0     512.9    -2620.1    -22250.9       -0.0
14902
14903   13:17:42  06/02/78   *** END OF FILE ***
```

LOAD CONDITION 3

LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)

0.	0.	512.9	-2108.1	-22250.9	0.

DEFLECTION OF PILE CAP (INCHES & RADIANS)

X	Y	Z	RX	RY	RZ
-0.442E-04	0.418E-02	0.153E-01	0.179E-04	0.118E-06	0.818E-06

PILE LOADS (PILE AXIS)

NO.	X	Y	Z	MX	MY	MZ
1	-0.023	0.000	26.764	0.	0.	0.
2	-0.022	0.000	26.813	0.	0.	0.
3	-0.021	0.000	26.861	0.	0.	0.
4	-0.021	0.000	26.910	0.	0.	0.
5	-0.020	0.000	26.959	0.	0.	0.
6	-0.019	0.000	27.007	0.	0.	0.
7	-0.017	0.000	27.153	0.	0.	0.
8	-0.017	0.000	27.202	0.	0.	0.
9	-0.076	0.000	18.493	0.	0.	0.
10	-0.077	0.000	18.436	0.	0.	0.
11	-0.077	0.000	18.379	0.	0.	0.
12	-0.078	0.000	18.322	0.	0.	0.
13	-0.078	0.000	18.265	0.	0.	0.
14	-0.078	0.000	18.208	0.	0.	0.
15	-0.079	0.000	18.151	0.	0.	0.
16	-0.079	0.000	18.094	0.	0.	0.
17	-0.079	0.000	18.037	0.	0.	0.
18	-0.081	0.000	17.804	0.	0.	0.
19	-0.081	0.000	17.755	0.	0.	0.
20	-0.081	0.000	17.705	0.	0.	0.
21	0.036	0.000	26.109	0.	0.	0.
22	0.037	0.000	26.087	0.	0.	0.
23	0.036	-0.000	24.231	0.	0.	0.
24	0.037	-0.000	24.216	0.	0.	0.
25	0.037	-0.000	24.202	0.	0.	0.

SUMMATION OF PILE LOADS (STRUCTURE AXIS)

0.0	-0.0	512.9	-2108.1	-22250.9	-0.0

```
LIST P29010
0          PROG NO. 713-P3-A2-210       13:14: 8   06/02/78
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5          PILE COORDINATES-BATTER                                10150
6          LOAD CONDITION 1 OUTPUT                                11000
7               LOADS ON PILE CAP                                 11010
8               DEFLECTION OF PILE CAP                            11020
9               PILE LOADS (PILE AXIS)                            11100
10              SUMMATION OF LOADS (STRUCTURE AXIS)               11900
11         LOAD CONDITION 2 OUTPUT                                12000...ETC.
12
13
14
15
10100 FLA AVE COMPLEX EAST INTC - ROAD GATE
10101 3-D PILE ANALYSIS
10102
10103
10110   ELASTIC PILE CONSTANT MATRIX (C)
10111
10112    0.765E 01 0.         0.         0.         0.         0.
10113    0.        0.765E 01  0.         0.         0.         0.
10114    0.        0.         0.175E 04  0.         0.         0.
10115    0.        0.         0.         0.         0.         0.
10116    0.        0.         0.         0.         0.         0.
10117    0.        0.         0.         0.         0.         0.
10118
10119
```

INPUT COORDINATES-BATTER

GROUP NO. 1

8 PILES ON 2.0 BATTER AT 90.0 DEG.

NO.	X	Y	Z
1	2.3	-1.5	0.
2	11.1	-1.5	0.
3	20.0	-1.5	0.
4	28.9	-1.5	0.
5	37.8	-1.5	0.
6	46.7	-1.5	0.
7	73.4	-1.5	0.
8	82.3	-1.5	0.

GROUP NO. 2

12 PILES ON 2.0 BATTER AT 270.0 DEG.

NO.	X	Y	Z
9	2.5	-6.5	0.
10	8.3	-6.5	0.
11	14.0	-6.5	0.
12	19.8	-6.5	0.
13	25.5	-6.5	0.
14	31.3	-6.5	0.
15	37.0	-6.5	0.
16	42.8	-6.5	0.
17	48.5	-6.5	0.
18	72.0	-6.5	0.
19	77.0	-6.5	0.
20	82.0	-6.5	0.

GROUP NO. 3

5 PILES ON 0. BATTER AT 90.0 DEG.

NO.	X	Y	Z
21	55.6	-1.5	0.
22	64.5	-1.5	0.
23	54.4	-6.5	0.
24	60.3	-6.5	0.
25	66.1	-6.5	0.

```
11000   LOAD CONDITION    1
11010   LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
11011           0.        -252.9       383.4    -2760.3   -15999.5   -10683.0
11012
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X            Y            Z            RX           RY           RZ
11022   0.934E-03 -0.274E-01  0.118E-01   0.555E-04   0.210E-05  -0.173E-0[illegible]
11023
11100   PILE LOADS (PILE AXIS)
11101    NO.       X          Y            Z            MX           MY           MZ
11102
11103      1   -0.228    -0.005      -5.000       0.           0.           0.
11104      2   -0.240    -0.005      -6.795       0.           0.           0.
11105      3   -0.252    -0.005      -8.589       0.           0.           0.
11106      4   -0.263    -0.005     -10.384       0.           0.           0.
11107      5   -0.275    -0.005     -12.178       0.           0.           0.
11108      6   -0.287    -0.005     -13.972       0.           0.           0.
11109      7   -0.323    -0.005     -19.358       0.           0.           0.
11110      8   -0.335    -0.005     -21.152       0.           0.           0.
11111      9    0.166    -0.003      33.494       0.           0.           0.
11112     10    0.175    -0.003      34.201       0.           0.           0.
11113     11    0.183    -0.003      34.909       0.           0.           0.
11114     12    0.192    -0.003      35.617       0.           0.           0.
11115     13    0.201    -0.003      36.324       0.           0.           0.
11116     14    0.209    -0.003      37.032       0.           0.           0.
11117     15    0.218    -0.003      37.740       0.           0.           0.
11118     16    0.227    -0.003      38.447       0.           0.           0.
11119     17    0.235    -0.003      39.155       0.           0.           0.
11120     18    0.271    -0.003      42.047       0.           0.           0.
11121     19    0.278    -0.003      42.663       0.           0.           0.
11122     20    0.286    -0.003      43.278       0.           0.           0.
11123     21   -0.298    -0.005      16.478       0.           0.           0.
11124     22   -0.312    -0.005      16.087       0.           0.           0.
11125     23   -0.296     0.003      10.700       0.           0.           0.
11126     24   -0.306     0.003      10.441       0.           0.           0.
11127     25   -0.315     0.003      10.182       0.           0.           0.
11128
11500     SUMMATION OF PILE LOADS (STRUCTURE AXIS)
11501          0.0   -252.9    383.4    -2760.3   -15999.5   -10683.7
11502
```

LOAD CONDITION 2

LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)

0.	-252.9	383.4	-2652.7	-15909.5	-10683.8

DEFLECTION OF PILE CAP (INCHES & RADIANS)

X	Y	Z	RX	RY	RZ
0.917E-03	-0.363E-01	0.198E-01	0.206E-03	0.159E-05	-0.170E-[illegible]

PILE LOADS (PILE AXIS)

NO.	X	Y	Z	MX	MY	MZ
1	-0.304	-0.005	-4.860	0.	0.	0.
2	-0.316	-0.005	-6.543	0.	0.	0.
3	-0.328	-0.005	-8.227	0.	0.	0.
4	-0.339	-0.005	-9.910	0.	0.	0.
5	-0.351	-0.005	-11.594	0.	0.	0.
6	-0.363	-0.005	-13.277	0.	0.	0.
7	-0.399	-0.005	-18.330	0.	0.	0.
8	-0.410	-0.005	-20.013	0.	0.	0.
9	0.242	-0.003	33.330	0.	0.	0.
10	0.250	-0.003	34.076	0.	0.	0.
11	0.259	-0.003	34.823	0.	0.	0.
12	0.267	-0.003	35.569	0.	0.	0.
13	0.276	-0.003	36.315	0.	0.	0.
14	0.284	-0.003	37.062	0.	0.	0.
15	0.292	-0.003	37.808	0.	0.	0.
16	0.301	-0.003	38.554	0.	0.	0.
17	0.309	-0.003	39.301	0.	0.	0.
18	0.344	-0.003	42.351	0.	0.	0.
19	0.351	-0.003	43.000	0.	0.	0.
20	0.358	-0.003	43.649	0.	0.	0.
21	-0.365	-0.005	24.961	0.	0.	0.
22	-0.378	-0.005	24.665	0.	0.	0.
23	-0.363	0.003	3.821	0.	0.	0.
24	-0.372	0.003	3.125	0.	0.	0.
25	-0.381	0.003	2.930	0.	0.	0.

SUMMATION OF PILE LOADS (STRUCTURE AXIS)

0.0	-252.9	383.4	-2652.7	-15909.5	-10683.7

14000 LOAD CONDITION 4
14010 LOADS ON PILE CAP (X,Y,Z,MX,MY,MZ)
14011 0. 0. 512.9 -2620.1 -22250.9 0.
14012
14020 DEFLECTION OF PILE CAP (INCHES & RADIANS)
14021 X Y Z RX RY RZ
14022 0.946E-04 0.464E-01 -0.191E-01 -0.700E-03 0.255E-05 -0.641E-06
14023
14100 PILE LOADS (PILE AXIS)

	NO.	X	Y	Z	MX	MY	MZ
14101	NO.	X	Y	Z	MX	MY	MZ
14102							
14103	1	0.340	-0.000	26.097	0.	0.	0.
14104	2	0.340	-0.000	25.617	0.	0.	0.
14105	3	0.341	-0.000	25.138	0.	0.	0.
14106	4	0.341	-0.000	24.658	0.	0.	0.
14107	5	0.342	-0.000	24.178	0.	0.	0.
14108	6	0.342	-0.000	23.698	0.	0.	0.
14109	7	0.343	-0.000	22.259	0.	0.	0.
14110	8	0.344	-0.000	21.779	0.	0.	0.
14111	9	-0.439	-0.000	19.272	0.	0.	0.
14112	10	-0.438	-0.000	19.031	0.	0.	0.
14113	11	-0.437	-0.000	18.790	0.	0.	0.
14114	12	-0.436	-0.000	18.549	0.	0.	0.
14115	13	-0.435	-0.000	18.308	0.	0.	0.
14116	14	-0.434	-0.000	18.067	0.	0.	0.
14117	15	-0.433	-0.000	17.826	0.	0.	0.
14118	16	-0.433	-0.000	17.585	0.	0.	0.
14119	17	-0.432	-0.000	17.344	0.	0.	0.
14120	18	-0.428	-0.000	16.359	0.	0.	0.
14121	19	-0.427	-0.000	16.149	0.	0.	0.
14122	20	-0.426	-0.000	15.940	0.	0.	0.
14123	21	0.352	-0.000	-14.268	0.	0.	0.
14124	22	0.351	-0.000	-14.744	0.	0.	0.
14125	23	0.352	0.000	59.351	0.	0.	0.
14126	24	0.351	0.000	59.036	0.	0.	0.
14127	25	0.351	0.000	58.721	0.	0.	0.

14128
14200 SUMMATION OF PILE LOADS (STRUCTURE AXIS)
14201 0.0 -0.0 512.9 -2620.1 -22250.9 -0.0
14202
14203 10:17:42 06/02/79 *** END OF FILE ***

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.0	-252.9	383.4	-2652.7	-15999.5	-10683.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.0	-4.9
2	-0.3	-0.0	-6.5
3	-0.3	-0.0	-8.2
4	-0.3	-0.0	-9.9
5	-0.4	-0.0	-11.6
6	-0.4	-0.0	-13.3
7	-0.4	-0.0	-18.3
8	-0.4	-0.0	-20.0
9	0.2	-0.0	33.3
10	0.3	-0.0	34.1
11	0.3	-0.0	34.8
12	0.3	-0.0	35.6
13	0.3	-0.0	36.3
14	0.3	-0.0	37.1
15	0.3	-0.0	37.8
16	0.3	-0.0	38.6
17	0.3	-0.0	39.3
18	0.3	-0.0	42.4
19	0.4	-0.0	43.0
20	0.4	-0.0	43.6
21	-0.4	-0.0	25.0
23	-0.4	0.0	3.3

Z SUMMATION OF PILE LOADS (STRUCTURE AXIS)

Z 0.0 -252.9 383.4 -2652.7 -15999.5 -10683.7

```
LISTA DC9010

06 02 70      13.19

10 FLA AVE COMPLEX EAST INNC - ROAD GATE
20 3-D PILE ANALYSIS
30 3 4
40 2 0.00
50 1 14 14
60 1 5
70 -1 7.1427
80 0 0 0
90 2 90 0
100 2.00 [illegible] 46.7[illegible] [illegible] 0.27
110 8*-1.5
    0 8*0.0
130 2 270 12
140 2.50 0.20 [illegible] 20.5[illegible] [illegible]
145 37.00 42.75 [illegible] 71.40 77.00 82.05
150 12*-0.5
160 12*0.0
170 0 90 5
180 55.59 64.40 54.007 60.05 [illegible].125
190 2*-1.5 3*-[illegible]
200 5*0.0
210 0.00 -252.87 380.40 -2760.26 -15999.49 -10689.75
220 0.60 -252.87 380.43 -2652.69 -15999.49 -10689.75
230 0.00      0.00 512.91 -2120.07 -22250.92      0.00
240 0.00      0.00 512.91 -2620.07 -22250.92      0.00
```

UN A2K90 K29010*E

PROG. NO. 713-F3-A2-210   13:14: 8 06/02/78

FLA-AVE COMPLEX EAST INNC -- ROAD GATE
3-D PILE ANALYSIS

TOTAL NUMBER OF PILES = 25

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-252.9	383.4	-2760.3	-15999.5	-10683.8

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.0	-5.0
2	-0.2	-0.0	-6.8
3	-0.3	-0.0	-8.6
4	-0.3	-0.0	-10.4
5	-0.3	-0.0	-12.2
6	-0.3	-0.0	-14.0
7	-0.3	-0.0	-19.4
8	-0.3	-0.0	-21.2
9	0.2	-0.0	33.5
10	0.2	-0.0	34.2
11	0.2	-0.0	34.9
12	0.2	-0.0	35.6
13	0.2	-0.0	36.3
14	0.2	-0.0	37.0
15	0.2	-0.0	37.7
16	0.2	-0.0	38.4
17	0.2	-0.0	39.2
18	0.3	-0.0	42.0
19	0.3	-0.0	42.7
20	0.3	-0.0	43.3
21	-0.3	-0.0	16.5
22	-0.3	0.0	10.7

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1 0.0 -252.9 383.4 -2760.3 -15999.5 -10683.7

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	512.9	-2108.1	-22250.9	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.0	0.0	26.8
9	-0.1	0.0	18.5
21	0.0	0.0	26.1
23	0.0	-0.0	24.2

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3 0.0 -0.0 512.9 -2108.1 -22250.9 -0.0

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	512.9	-2620.1	-22250.9	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.3	-0.0	26.1
7	0.3	-0.0	22.3
9	-0.4	-0.0	19.3
18	-0.4	-0.0	16.4
21	0.4	-0.0	-14.3
23	0.4	0.0	59.4

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4 0.0 -0.0 512.9 -2620.1 -22250.9 -0.0

0 13:17:42 06/02/78 *** END OF RUN ***

②

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

(f'c = 4000 psi fy = 60,000) design of Gate Structure & Covered Box

1. DESIGN LOAD CASES: (Per CE Memo)

West Side

Water Surface Elev. --- Ft. NGVD (MSL)

CASE	FLOODSIDE	PROTECTED SIDE
I	13.0	-8.5
II	4.0	-14.5
III	-14.0	-3.0

Case I - Design hurricane - dry inside
Case II - Mean high water outside - dry inside
Case III - Reverse head - gates closed

2. Gate Size - Two gates 12'-6" wide x 13'-0" high each.

3. Gate Type - Electrically Operated Sluice Gate

4. Seating and Unseating Heads

Assume Gate Bottom @ El. -21.34 (See 1. above)

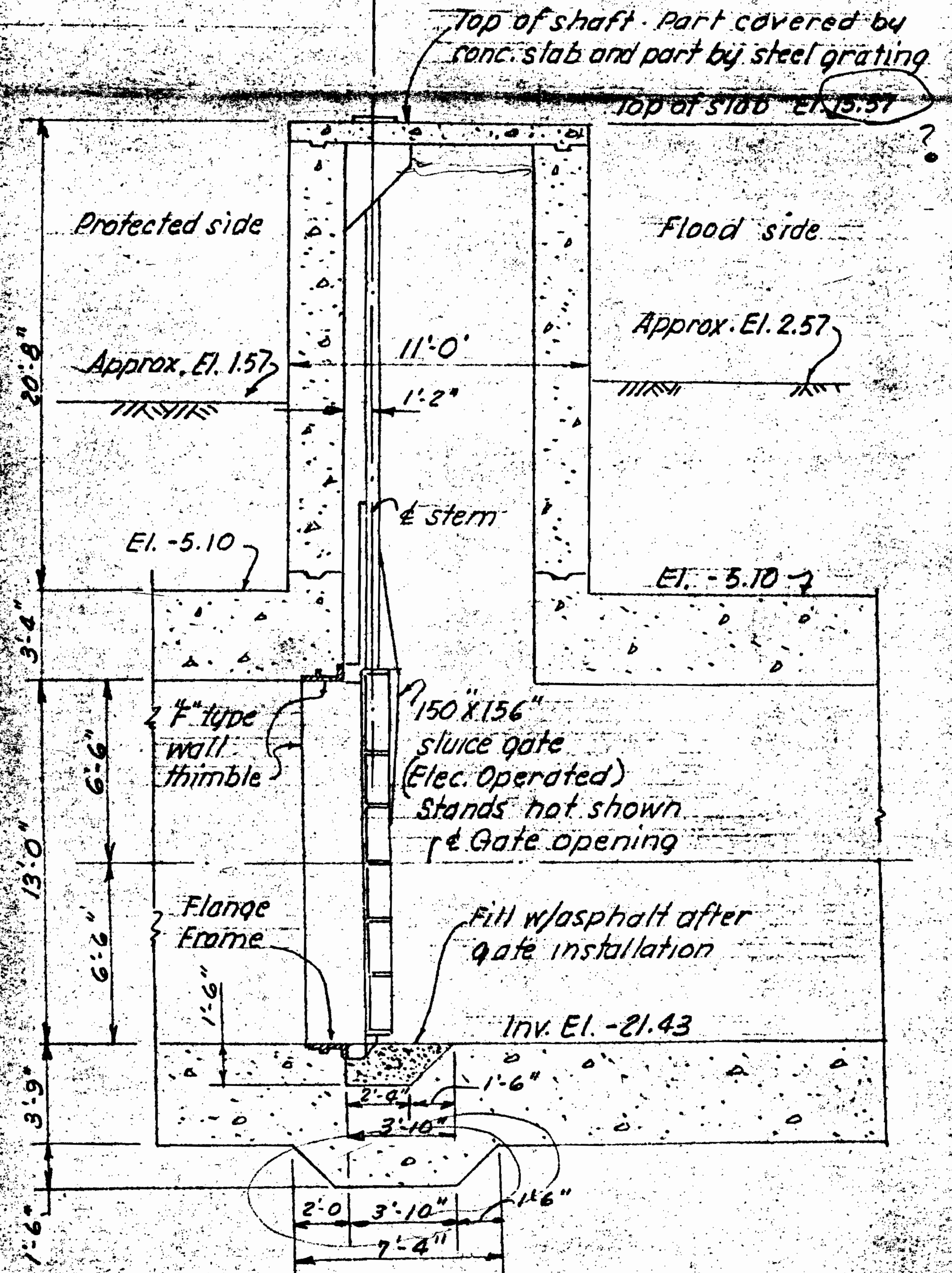
Max. seating head = 23.5 feet ±

Max. unseating head = 10.93 feet ±

5. Gate:

Medium service sluice gates with flange frame, full wedge conventional type, flush bottom closure, up to 75 ft seating and up to 35 ft. unseating heads.

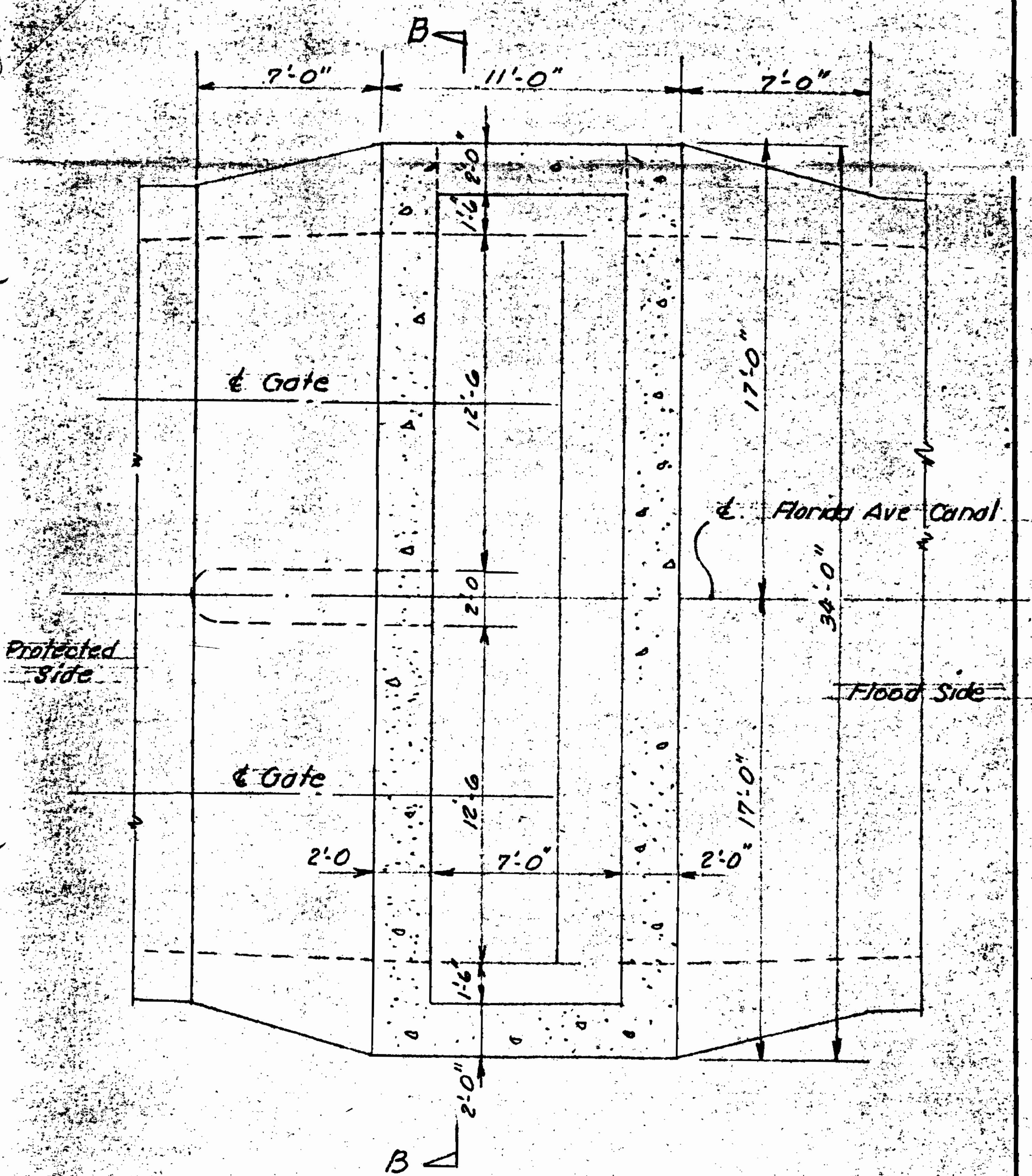
TYPICAL SECTION THRU GATE STRUCTURE



N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
METAIRIE, LOUISIANA — BILOXI, MISSISSIPPI

JOB NO.	DATE:	SHEET NO.
575-79-E	10-3-79	2 of

PLAN - GATE STRUCTURE



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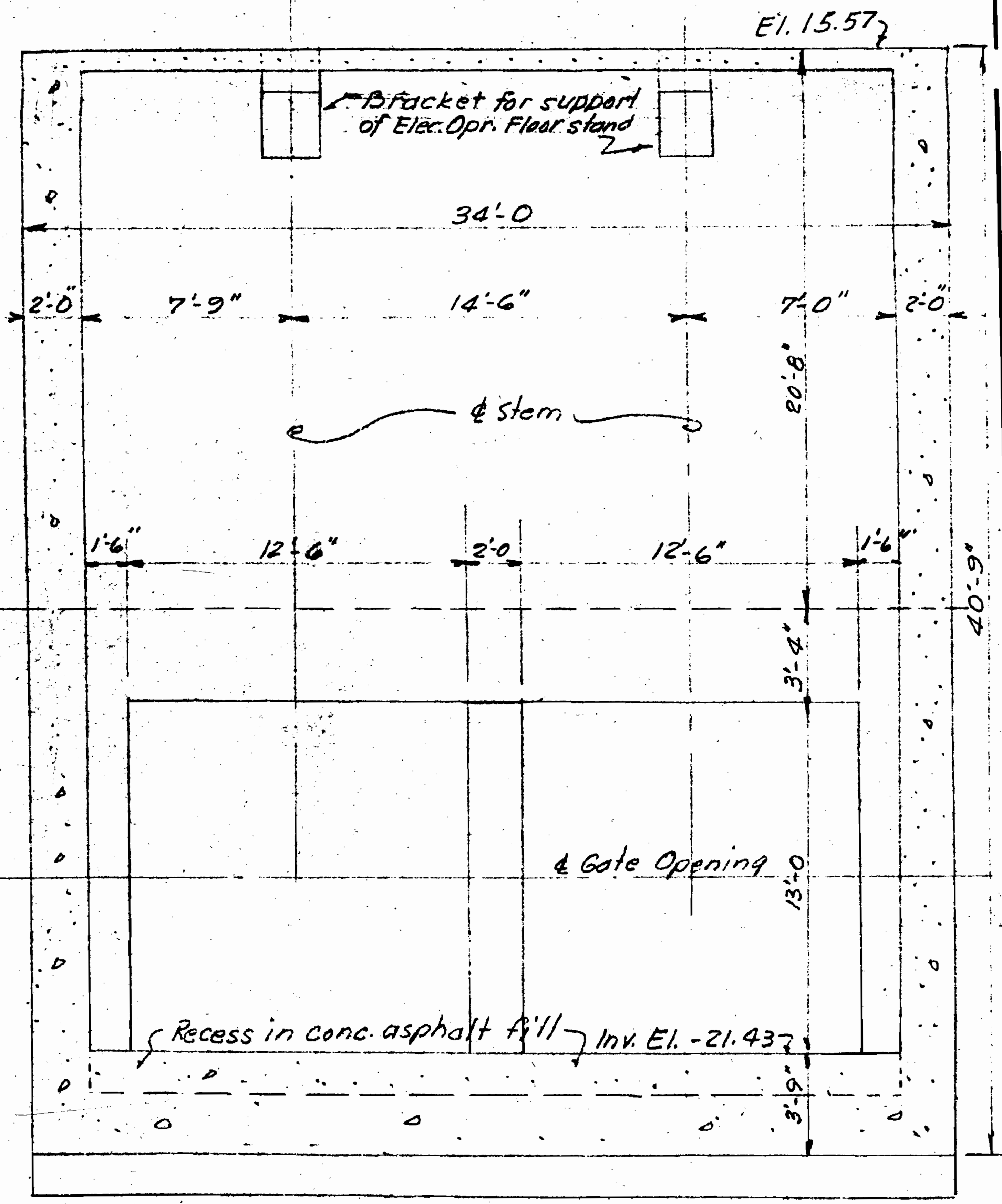
JOB NO.	DATE:	SHEET NO.
575-79-E	10-3-79	3



SECTION B-B

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
METAIRIE, LOUISIANA
BILOXI, MISSISSIPPI

JOB NO.	DATE:	SHEET NO.
575-79-E	10-3-79	4 OF

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB No 575-79-E

SHEET No 5 OF ______
BY LWC DATE 10-3-79
CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

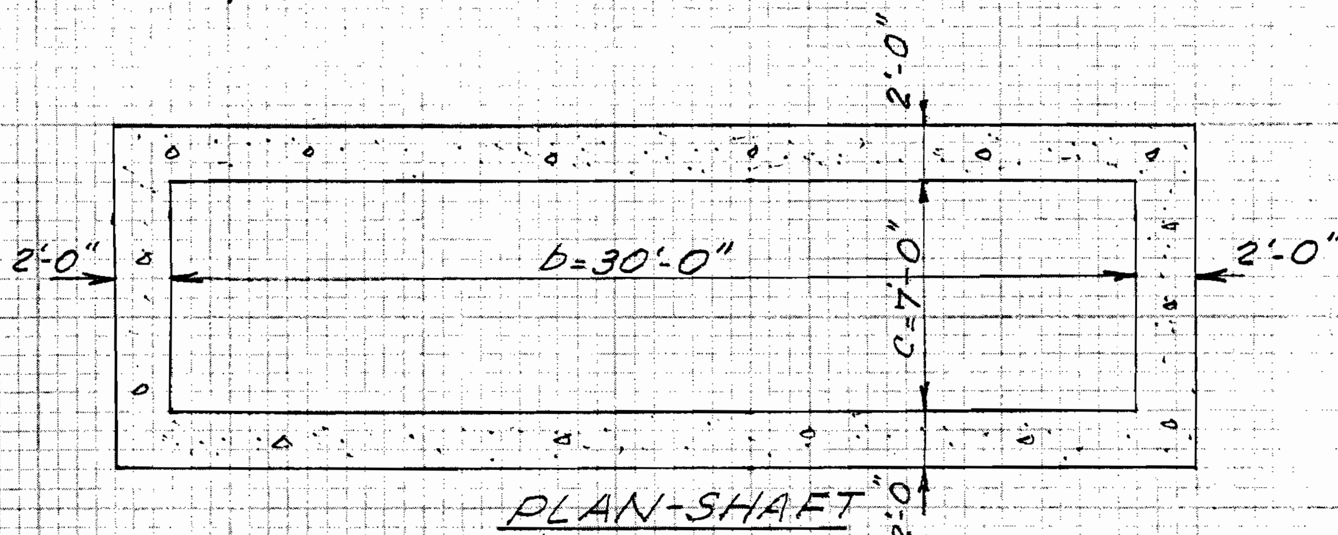
SHAFT DESIGN FOR GATE STRUCTURE : Long Walls

Use PCA Publication Titled "Rectangular Concrete Tanks".

Assume Top free, Bottom hinged, Ground El. 2.57, G.W.L @ -5.0

Note: The following 2 cases appear to be the most critical:

1. Water to El. 14.9 (Inside) No load Outside
2. Inside empty, Outside earth and water.



PLAN-SHAFT

$a = ht = 20.67'$

$b/a = \frac{30}{20.67} = 1.45$ Use $\frac{b}{a} = 1.5$

$c/a = \frac{7}{20.67} = 0.33$ Use $\frac{c}{a} = 0.5$

Moment Coefficients

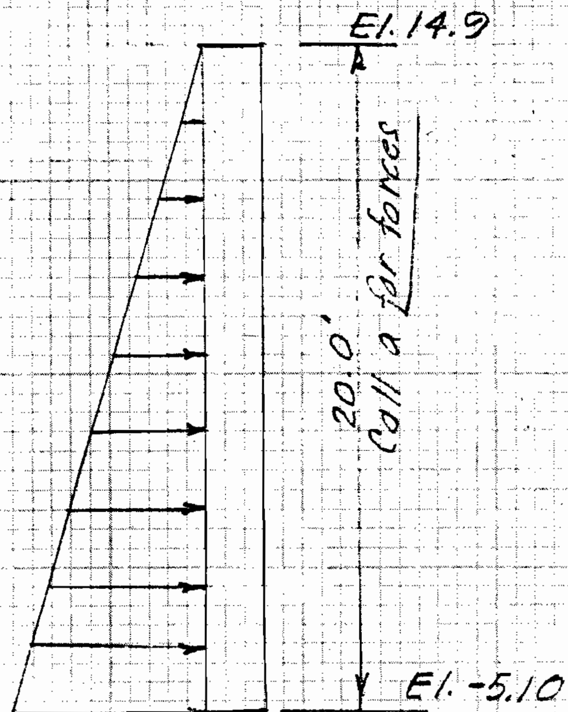
y	x/a	Mx	y	z/a	My
0	3/4	±.028	0	0	±.040
b/4	3/4	±.018	b/4	1/2	±.020
b/2	1/2	∓.009	b/2	1/2	±.044

$M = Coef. \times w a^3$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE: Long Walls

Case I - Water to El. 14.9 inside. No outside load.



Wall thickness = 24" d call 21.5"

$f'_c = 4000$ psi $f_c = 1400$ psi $f_s = 20{,}000$ psi

$a = 1.44$ $n = 8$ $K = 221$ $k = 0.359$ $j = 0.88$

Max allowable shear = $1.1\sqrt{f'_c}$ = 70 psi

70 psi × 21.5" × 12" = 18.06^K

$d_{reqd} \sqrt{\dfrac{M}{Kb}}$

Largest M = 0.044 × 500 = $22'^K$

$\sqrt{\dfrac{22000 \times 12}{221 \times 12}} = 10" < 21.5$

See table 7 PCA REC. TANKS

Max V = $0.4 \times Wa^2 = 0.4 \times 25^K = 10^K$

$10^K < 18.06^K$

$w a = 20' \times 0.0625^K = 1.25 \frac{K}{S.F}$

$w a^2 = 25^K$

$w a^3 = 500^K$

Long Wall Design

Horiz. strip (mid.depth) $M_y = 22.0'^K$ N = axial tension = 10^K

$e = \dfrac{12M}{N} + d''$ $d'' = \dfrac{21.5''}{2} - 2'' = 9.75$

$e = \dfrac{12 \times 22}{-10} + 9.75 = -16.65''$

$E = \dfrac{16.65''}{12''} = 1.39'$

$i = \dfrac{1}{1 - \frac{jd}{e}} = \dfrac{1}{-1 - \frac{0.88 \times 21.5}{-16.65}} = -0.47$

Table 4 SP-3 $k = 12$ $d = 21.5$

$F = \dfrac{0.441 + 0.484}{2} = 0.463$

NE = (-10)(-1.39) = 13.9

KF = 221 × 0.463 = 102.32

KF > NE No compressive steel reqd.

(cont on page 7)

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE : Long Wall (cont.)

Case I

Long Wall Design (Hor. strip)

$A_s = \frac{NE}{adi} = \frac{10 \times 1.39}{1.44 \times 21.5 \times 0.47} = 0.95$ Try #7@5" $A_s = 1.44^{\square''}$

$U = 246$ psi (Table 14a) $u = \frac{V}{\Sigma_o jd} = \frac{10{,}000^{\#}}{6.6 \times 0.88 \times 21.5} = 80$ psi < 246

$\Sigma_o \frac{12}{5} \times 2.749 = 6.6$

Mid point @ Mid depth

$M_y = 0.034 \times 500^{K} = 17^{'K}$ (Tension Outside)

Table II
$b/a = 1.5$
$c/a = 0.5$
$h/2$

Axial Tension $= 0.174 \times 25^{K} = 4.35^{K}$
Table 8-½

$e = \frac{12 \times 17^{'K}}{-4.35} + 9.75'' = 37.15''$

$E = \frac{37.15}{12} = 3.10$

$i = \frac{1}{-1 - \frac{jd}{e}} = \frac{1}{-1 - \frac{0.88 \times 21.5}{-37.15}} = 0.66$

$NE = (-4.35)(-3.10) = 13.49$

$KF = 102.32$

$KF > NE$ No compressive steel req'd

$A_s = \frac{NE}{adi} = \frac{3.10 \times 4.35}{1.44 \times 21.5 \times 0.66} = 0.67$ Use #7@10" = .72$^{\square''}$ Min.

Vertical strip

$M_x = 0.028 \times 500^{K} = 14^{'K}$ by observation use #7@9 = 0.80

Table V

$V = 0.4 \times 25^{K} = 10^{K}$ ∴ o/c

bond o/c by Obs.

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE (CASE I)

Short Wall Design - Horiz. Strip

@ $z = c/4$ $x = a/4$

$M_z = 0.031 \times 500^k = 15.5'^k$ (Tension Inside)

Table V

Axial Tension = end shear in long wall = 10^k

$e = \frac{12 \times 15.5'^k}{-10} + 9.75'' = 8.85''$ $E = \frac{8.85''}{12} = 0.74$ $j = 0.88$

$i = \frac{1}{-1 - \frac{jd}{e}} = \frac{1}{-1 - \frac{(0.88 \times 21.5)}{8.85}} = 0.32$

As (reqd $= \frac{10^k \times 0.74}{1.44 \times 0.32 \times 21.5} = 0.75^{\square''}$ Use #7@9

Bond and Shear O/K by obs.

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

Short Wall Design

1. Finished grade @ 2.0'
2. GWL @ -4.5 (-5.1)
3. No Water Inside

} Call Case I

1. Finished grade @ 2.0'
2. GWL @ -4.5 (-5.1)
3. Water to El. 14.9

} Call Case II

0.50 ...

100 #/cu.ft ... 112# ...

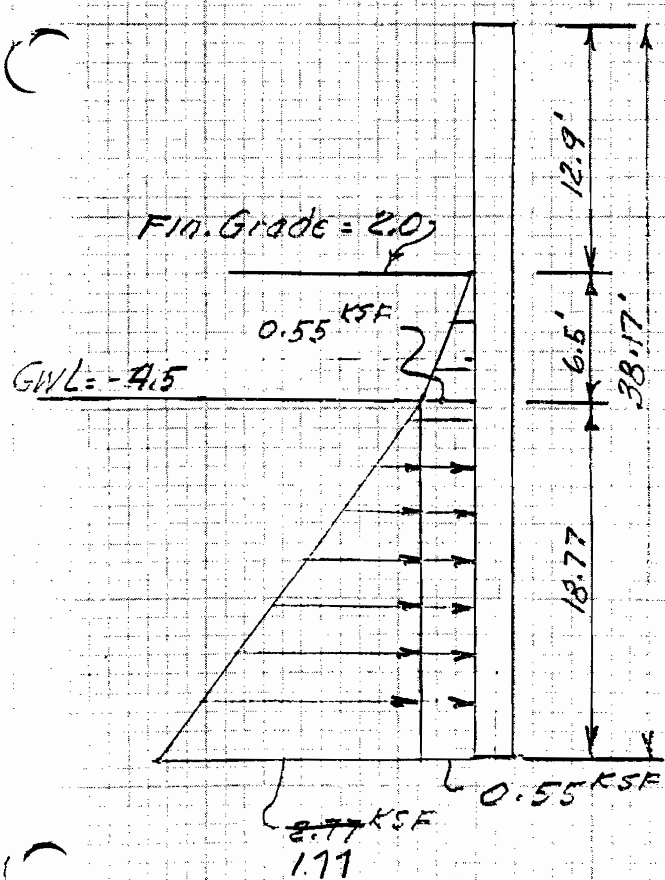
K = 0.85 ∴ Wt earth (Lateral) = 0.85 × 100# = 85#

= .085 k

Submerged wt. soil = 100 - 62.5 = 37.5#

K = 0.85 0.85(37.5) = 31.9#

= 0.032 k



$6.5' \times 0.085 = 0.55$ KSF

0.0945

$18.77\,(\overset{0.032}{\cancel{0.085}} + 0.0625) = \overset{1.77}{\cancel{2.77}}$ KSF

F.E.M.s

Unif. Load. $\frac{a}{\ell} = \frac{18.77}{38.17} = .49$

@ Top $M_{Top} = C_B w \ell^2$

$C_B = .025$

$M_{TOP} = (0.025)(0.55^{KSF})(38.17)^2$

$= 20.03'^{K}$

@ Bott $M_{BOTT} = C_A w \ell^2$

$M_{BOTT} = (0.056)(0.55^{KSF})(38.17)^2$

$= 44.87'^{K}$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

Short Wall Design (Cont.)

FEM's

$M_{TOP} = 6.16'^{K}$
$M_{BOTT} = 5.07'^{K}$ } See attached Sheet

M_{TOP} $\quad \frac{a}{L} = \frac{18.77}{38.17} = 0.49$ $\quad (0.0070)(38.17)^2(2.77) = 28.25'^{K}$

M_{BOTT} $\quad (0.0233)(38.17)^2(2.77) = 94.03'^{K}$

Σ FEM

M_{TOP}	M_{BOTT}
20.03	44.87
6.16	5.07
28.25	94.03
$54.4'^{K}$	$144.0'^{K}$

Reaction @ Top = 9.25^{K}

Reaction @ Bottom = 32.67^{K}

Base Slab:

3.75(0.150) = ; thk ht $\frac{(2)(24.0)(0.150)}{9 \text{ — width}} = 0.80$

Self weight + Walls = $0.56^{KSF} + 0.72^{KSF} = 1.28^{KSF}$

Fixed End Mom. = $(32.0')^2 (1.28^{KSF})(.0833) = 109.23'^{K}$

$R = \frac{32.0 \times 1.28}{2} = 20.48^{K}$

$\frac{I}{L} = \frac{3.75^3}{32} = 1.648$

Walls

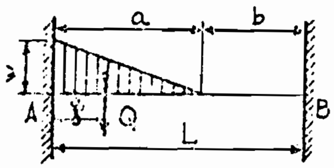
$\frac{I}{L} = \frac{2^3}{38.17} = 0.21$

DF

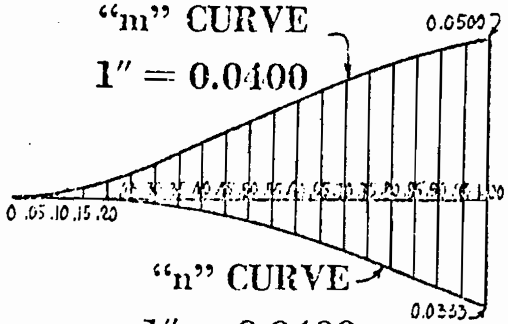
$\frac{0.21}{0.21 + 1.648} = .11$

$\frac{1.648}{0.21 + 1.648} = .89$

Fixed End Moments
for Partial Triangular Loading



"m" CURVE
1" = 0.0400



"n" CURVE
1" = 0.0400

$$Q = \frac{w \times a}{2}$$

$$M_A = \frac{wL^2}{60} \cdot \left(\frac{a}{L}\right)^2 \cdot \left(10 - 10\frac{a}{L} + 3\frac{a^2}{L^2}\right) = w \times L^2 \times \text{“m”}$$

$$M_B = \frac{wL^2}{60} \cdot \left(\frac{a}{L}\right)^3 \cdot \left(5 - 3\frac{a}{L}\right) = w \times L^2 \times \text{“n”}$$

a/L	"m"	"n"	a/L	"m"	"n"
0.01	0.0000	0.0000	0.16	0.0036	0.0003
.02	.0000	.0000	.17	.0040	.0004
.03	.0001	.0000	.18	.0045	.0005
.04	.0002	.0000	.19	.0049	.0005
.05	.0005	.0000	.20	.0054	.0006
.06	.0006	.0000	.21	.0059	.0007
.07	.0008	.0000	.22	.0064	.0008
.08	.0010	.0000	.23	.0069	.0009
.09	.0012	.0001	.24	.0075	.0010
.10	.0015	.0001	.25	.0080	.0011
.11	.0018	.0001	.26	.0086	.0012
.12	.0021	.0001	.27	.0091	.0013
.13	.0025	.0002	.28	.0097	.0015
.14	.0028	.0002	.29	.0103	.0017
.15	.0032	.0003	.30	.0109	.0019

Rogers - Formulas & Tables for F.E.M.
Case II-2 Part 1

a/L	"m"	"n"	a/L	"m"	"n"
0.31	0.0115	0.0021	0.66	0.0342	0.0145
.32	.0122	.0023	.67	.0347	.0150
.33	.0127	.0024	.68	.0354	.0156
.34	.0134	.0026	.69	.0359	.0161
.35	.0140	.0028	.70	.0365	.0166
.36	.0147	.0031	.71	.0370	.0172
.37	.0153	.0033	.72	.0376	.0177
.38	.0160	.0035	.73	.0382	.0183
.39	.0166	.0038	.74	.0388	.0187
.40	.0172	.0040	.75	.0393	.0193
.41	.0179	.0043	.76	.0398	.0198
.42	.0186	.0046	.77	.0404	.0205
.43	.0193	.0049	.78	.0409	.0211
.44	.0200	.0052	.79	.0413	.0216
.45	.0206	.0055	.80	.0418	.0222
.46	.0213	.0059	.81	.0422	.0227
.47	.0219	.0062	.82	.0428	.0234
.48	.0227	.0066	.83	.0432	.0239
.49	.0233	.0070	.84	.0437	.0245
.50	.0239	.0073	.85	.0442	.0250
.51	.0246	.0077	.86	.0446	.0255
.52	.0253	.0081	.87	.0451	.0261
.53	.0259	.0085	.88	.0455	.0268
.54	.0266	.0089	.89	.0460	.0273
.55	.0272	.0093	.90	.0464	.0278
.56	.0279	.0097	.91	.0468	.0285
.57	.0285	.0102	.92	.0472	.0290
.58	.0292	.0106	.93	.0475	.0297
.59	.0298	.0111	.94	.0479	.0302
.60	.0304	.0115	.95	.0482	.0308
.61	.0311	.0119	.96	.0485	.0314
.62	.0317	.0125	.97	.0489	.0320
.63	.0323	.0129	.98	.0494	.0324
.64	.0329	.0134	.99	.0498	.0328
.65	.0336	.0140	1.00	.0500	.0333

STRUCTURAL-RIGID FRAMES-FIXED END MOMEN

TABLE A - PARTIAL UNIFORM LOAD *

$M_A = C_A w l^2$
$M_B = C_B w l^2$

$M_A = C_A w l^2$ (for 'a' distance) — $C_A w l^2$ (for 'a′' distance)

a/l or a′/l	C_A	C_B	a/l or a′/l	C_A	C_B	a/l or a′/l	C_A	C_B	a/l or a′/l	C_A	C_B
.01	.000	.000	.26	.023	.005	.51	.059	.027	.76	.080	.063
.02	.000	.000	.27	.025	.005	.52	.060	.029	.77	.080	.064
.03	.000	.000	.28	.026	.006	.53	.061	.030	.78	.080	.066
.04	.001	.000	.29	.028	.006	.54	.062	.031	.79	.081	.067
.05	.001	.000	.30	.029	.007	.55	.063	.033	.80	.081	.068
.06	.002	.000	.31	.031	.008	.56	.064	.034	.81	.081	.070
.07	.002	.000	.32	.032	.008	.57	.065	.035	.82	.082	.071
.08	.003	.000	.33	.033	.009	.58	.066	.037	.83	.082	.072
.09	.004	.000	.34	.035	.010	.59	.067	.038	.84	.082	.073
.10	.004	.000	.35	.036	.011	.60	.068	.040	.85	.082	.074
.11	.005	.000	.36	.038	.011	.61	.069	.041	.86	.083	.075
.12	.006	.001	.37	.039	.012	.62	.070	.043	.87	.083	.076
.13	.007	.001	.38	.041	.013	.63	.071	.044	.88	.083	.077
.14	.008	.001	.39	.042	.014	.64	.072	.045	.89	.083	.078
.15	.009	.001	.40	.044	.015	.65	.073	.047	.90	.083	.079
.16	.010	.001	.41	.045	.016	.66	.074	.048	.91	.083	.080
.17	.011	.001	.42	.047	.017	.67	.074	.050	.92	.083	.080
.18	.013	.002	.43	.048	.018	.68	.075	.051	.93	.083	.081
.19	.014	.002	.44	.049	.019	.69	.076	.053	.94	.083	.082
.20	.015	.002	.45	.051	.020	.70	.076	.054	.95	.083	.082
.21	.016	.003	.46	.052	.021	.71	.077	.056	.96	.083	.083
.22	.018	.003	.47	.053	.022	.72	.078	.057	.97	.083	.083
.23	.019	.003	.48	.055	.024	.73	.078	.059	.98	.083	.083
.24	.020	.004	.49	.056	.025	.74	.079	.060	.99	.083	.083
.25	.022	.004	.50	.057	.026	.75	.079	.062	1.00	.083	.083

TABLE B CONCENTRATED LOAD

$M_C = C_C \times P \times l$

a/l	C_C	a/l	C_C	a/l	C_C
.01	.010	.26	.142	.51	.123
.02	.019	.27	.144	.52	.120
.03	.028	.28	.145	.53	.117
.04	.037	.29	.146	.54	.114
.05	.045	.30	.147	.55	.111
.06	.053	.31	.148	.56	.108
.07	.061	.32	.148	.57	.105
.08	.068	.33	.148	.58	.102
.09	.075	.34	.148	.59	.099
.10	.081	.35	.148	.60	.096
.11	.087	.36	.148	.61	.093
.12	.093	.37	.147	.62	.090
.13	.098	.38	.146	.63	.086
.14	.104	.39	.145	.64	.083
.15	.108	.40	.144	.65	.080
.16	.113	.41	.143	.66	.076
.17	.117	.42	.141	.67	.073
.18	.121	.43	.140	.68	.070
.19	.125	.44	.138	.69	.066
.20	.128	.45	.136	.70	.063
.21	.131	.46	.134	.71	.060
.22	.134	.47	.132	.72	.056
.23	.136	.48	.130	.73	.053
.24	.139	.49	.127	.74	.050
.25	.141	.50	.125	.75	.047

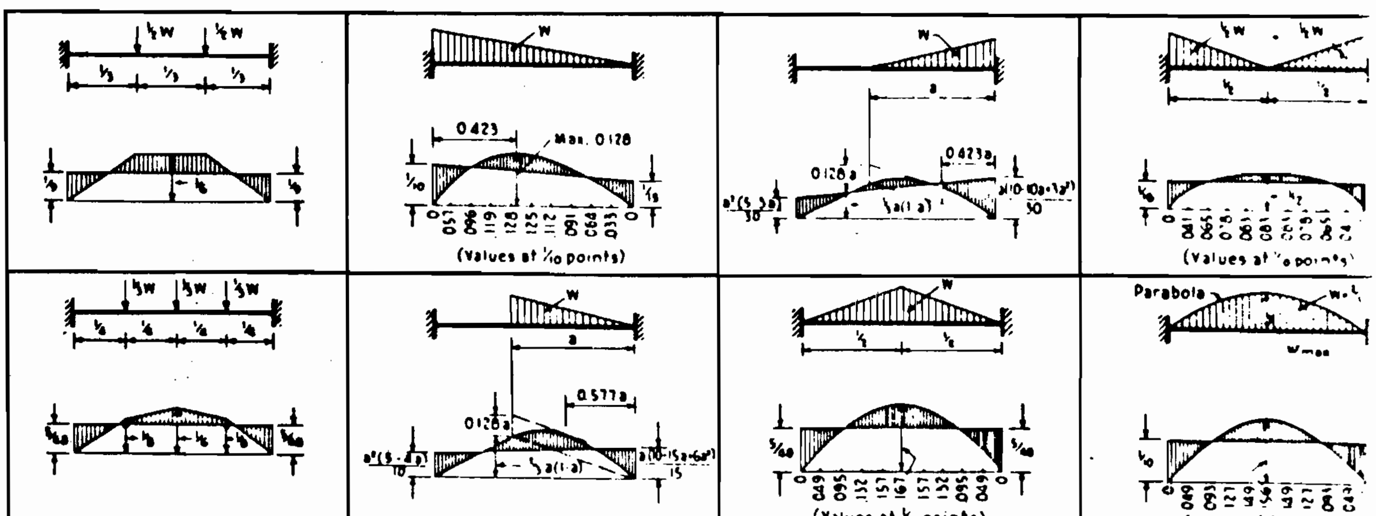
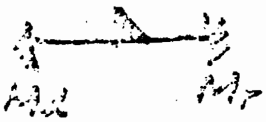


FIGURE C — COEFFICIENT FOR MOMENTS IN BEAMS OF CONSTAN SECTION AND WITH FIXED ENDS **

$M = c \cdot W \cdot L$ c - coefficient taken from diagram; L - length of beam; W - total load on beam; a - length in terms of "L"

* Data from Eng News Record, June 18, 1942, Article by M.W. Rostenstein.
** From Portland Cement Association.

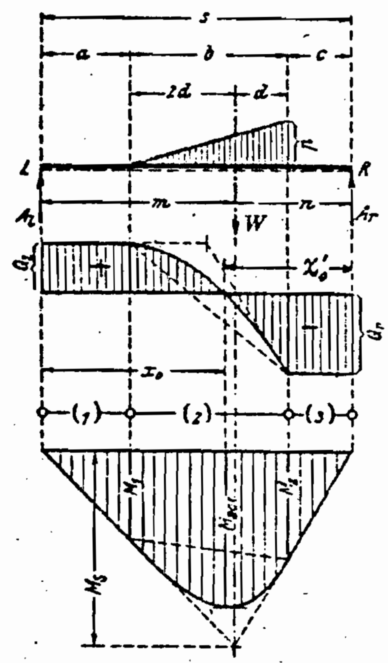
Use opposite hand.



Loading Condition 40

$$\alpha = \frac{a}{b},\quad \gamma = \frac{c}{b},\quad m = a + \frac{2b}{3},\quad n = c + \frac{b}{3},$$

$$\mu = \frac{m}{s},\quad \delta = \frac{d}{s},\quad \nu = \frac{n}{s},\quad (\mu + \nu = 1),\quad \xi_2 = \frac{x-a}{b}.$$



Forces:

$$W = \frac{pb}{2},$$

$$A_l = \frac{pb\nu}{2},\quad A_r = \frac{pb\mu}{2},$$

$$Q_l = Q_{x1} = A_l,\quad Q_r = Q_{x3} = -A_r,$$

$$Q_{x2} = \frac{pb}{6}\left(-3\alpha\nu + 3\gamma\mu + \tau_{D2}\right).$$

Moments:

$$M_1 = \frac{pba\nu}{2},\quad M_S = \frac{pbmn}{2s},\quad M_2 = \frac{pbc\mu}{2},$$

$$M_{x1} = \frac{pbn}{2}\cdot\frac{x}{s},\quad M_{x3} = \frac{pbm}{2}\cdot\frac{x'}{s},$$

$$M_{x2} = \frac{pb^2}{6}\left(3\alpha\nu\cdot\frac{x'-c}{b} + 3\gamma\mu\cdot\xi_2 + \omega_{D2}\right),$$

$$M_{max} = \frac{pb\nu}{2}\left(a + 2d\sqrt{\nu}\right).$$

$$x_0 = a + b\sqrt{\nu}.$$

$$FEM_L = -\frac{pbn}{2}\left[\mu\nu - \frac{5(3\nu-1)+2\delta}{10\nu}\,\delta^2\right],$$

$$FEM_R = -\frac{pbm}{2}\left[\mu\nu - \frac{5(3\mu-1)-2\delta}{10\mu}\,\delta^2\right].$$

Deformations:

$$\mathscr{L} = \frac{6EI}{s}\,\Theta_l = \frac{pbn}{2}\left[\mu(1+\nu) - \frac{(15\nu+2\delta)}{10\nu}\,\delta^2\right],$$

$$\mathscr{R} = \frac{6EI}{s}\,\Theta_r = \frac{pbm}{2}\left[\nu(1+\mu) - \frac{(15\mu-2\delta)}{10\mu}\,\delta^2\right].$$

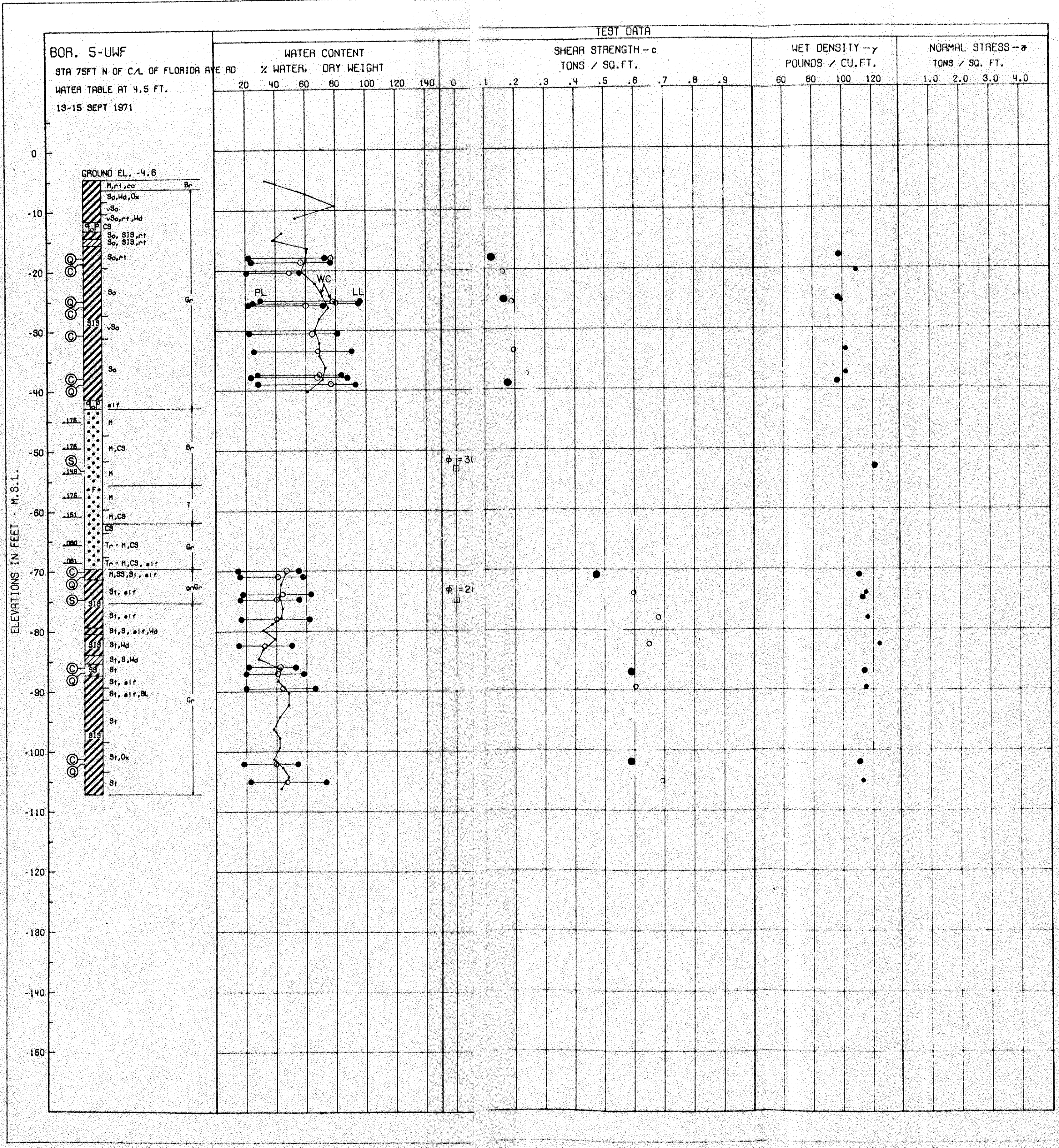
$$y_{x1} = \frac{\delta p s^4}{4EI}\left[\nu\omega_D - \left\{\nu^3 + \frac{3}{2}\delta^2\left(\nu + \frac{2}{15}\delta\right)\right\}\left(\frac{x}{s}\right)\right],$$

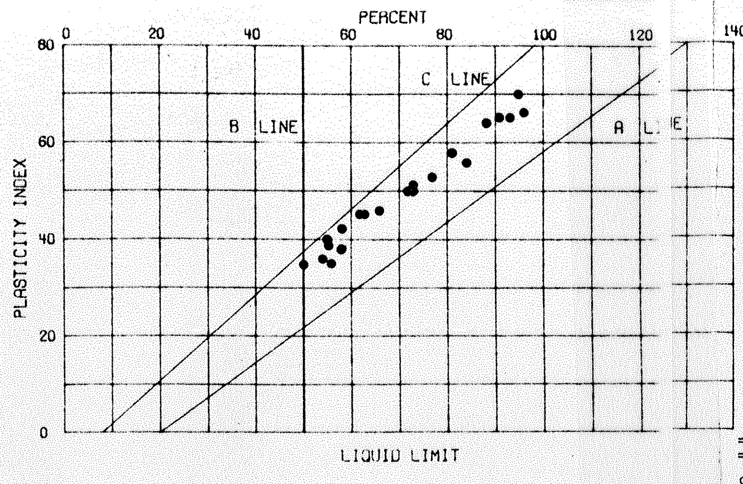
$$y_{x2} = y_{x1} + \frac{pb^4}{120EI}\,\xi_2^5,$$

$$y_{x3} = \frac{\delta p s^4}{4EI}\left[\mu\omega'_D - \left\{\mu^3 + \frac{3}{2}\delta^2\left(\mu - \frac{2}{15}\delta\right)\right\}\left(\frac{x'}{s}\right)\right].$$

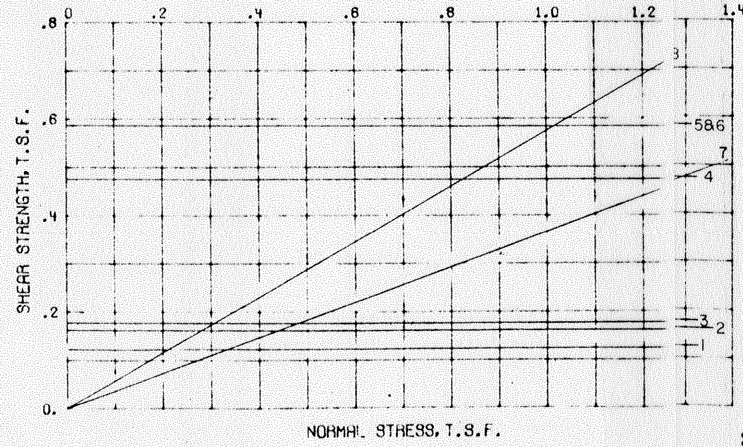
τ_{D2} and ω_{D2} are obtained from τ_D and ω_D, respectively, when ξ_2 is used as the argument. Numerical tables for ω_D and ω'_D on pp. 16, 17, for τ_D on p. 20.

Kleinlogel – Beam Formulas
Case II-2 Part 3 4



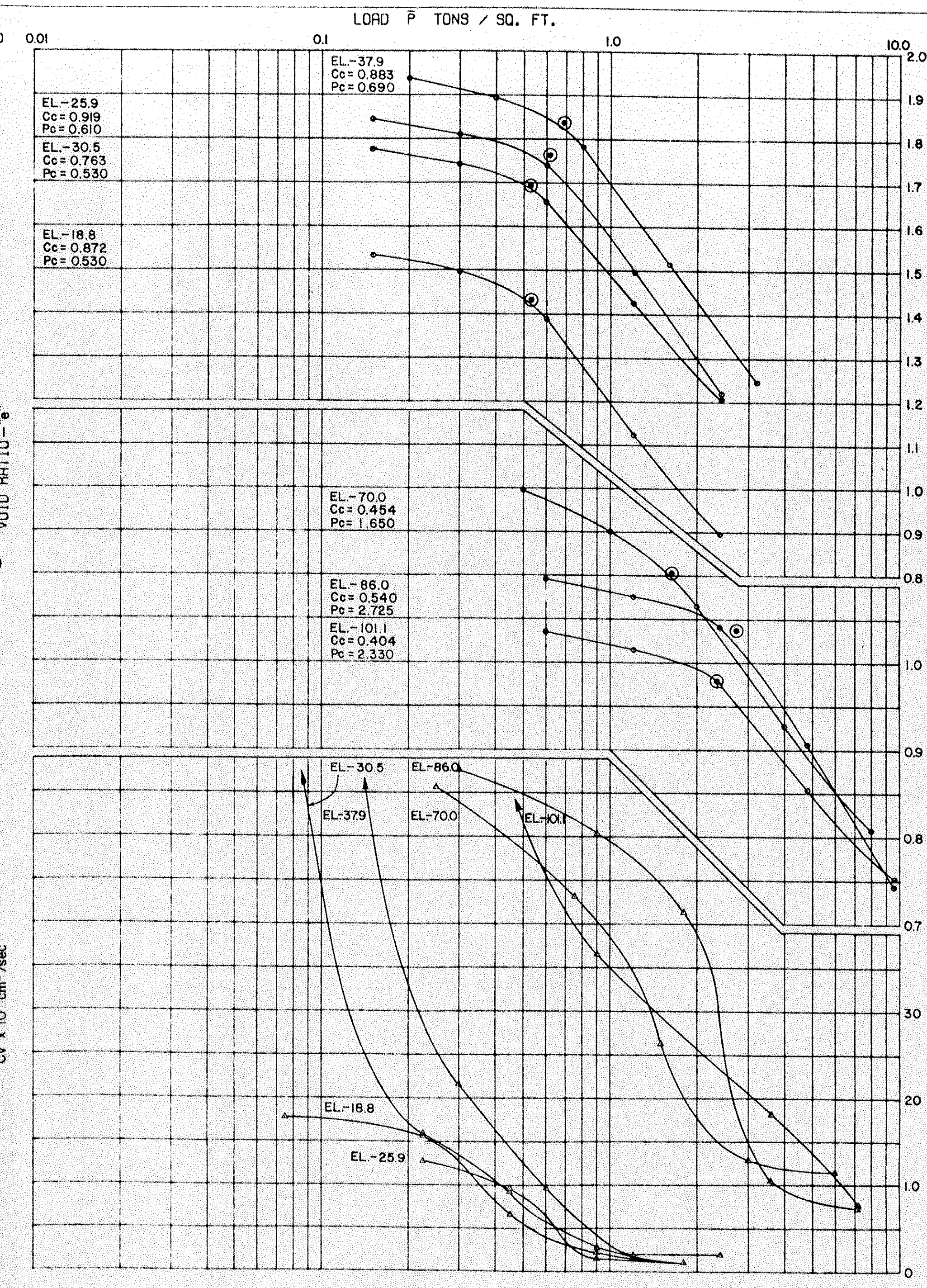


PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ°	STRENGTH c - TSF	CLASS
5-UWF	1	-17.9	Q	0	0.125	CH
	2	-25.0		0	0.163	CH
	3	-38.8		0	0.175	CH
	4	-70.9		0	0.475	CH
	5	-86.9		0	0.588	CH
	6	-102.0		0	0.588	CH
	7	-53.1	S	30	0	SP
	8	-74.8		20	0	CH



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
● - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST
BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER
FOR SOIL BORING LEGEND SEE PLATE A
FOR LOCATION OF BORINGS SEE PLATE

PLATE

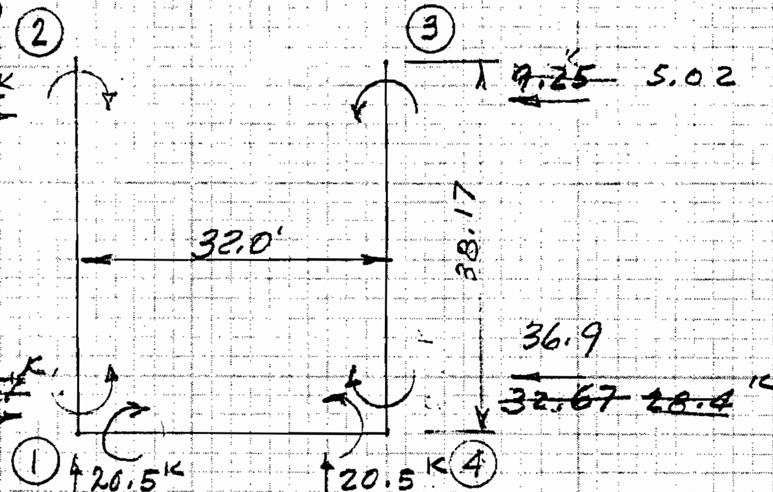
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

Short Wall Design (Cont.) Case I

Moment Distribution

$+9.25 - \frac{161.5}{38.17} = +5.02^K$



-36.9

$32.67 - 4.23 = \cancel{28.4}^K$

Joint		1		4		
Mem.		1-2	1-4	4-1	4-3	
DF	1.0	0.11	0.89	0.89	0.11	1.0
FEM	+54.4	−144.0	+109.2	−109.2	+144.0	−54.4
1st Dist	−54.4	+3.8	+31.0	−31.0	−3.8	+54.4
CO	+1.9	−27.2	−15.5	+15.5	+27.2	−1.9
2nd Dist	−1.9	+4.7	+38.0	−38.0	−4.7	+1.9
CO	+2.4	−1.0	−19.0	+19.0	+1.0	−2.4
	−2.4	+2.2	+17.8	−17.8	−2.2	+2.4
	0	−161.5 (132.1)	+161.5 (132.1)	−161.5 (131.1)	+161.5 (132.1)	0

See page 9

$\frac{2.77 + .55}{18.77 + 6.5} = 0.1313 = w$ (KSF, KS)

$+M_{,132.1}$

$192.5 - 161.5 = +31'^K$

$+M = 2.34'^K$

1-2

$$+M = \frac{(0.1313)(25.27)^2\, 8.42}{6 \times 38.17'}\left[(2 \times 12.9) + 50.54\sqrt{\frac{8.42}{38.17}}\right] - 161.5'^K = 31'^K$$

$192.5'^K$

$$R_{TOP} = \frac{(0.1313)(25.27)^2(8.42)}{2 \times 38.17'} = 9.25^K$$

$$R_{Bott} = \frac{(0.1313)(25.27)^2}{2} - 9.25 = 32.67^K$$

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ARCHITECTS & PLANNERS

JOB ______ SHEET No 12 OF ______
ITEM ______ BY LWC DATE 10-5-79
JOB No 575-79-E CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

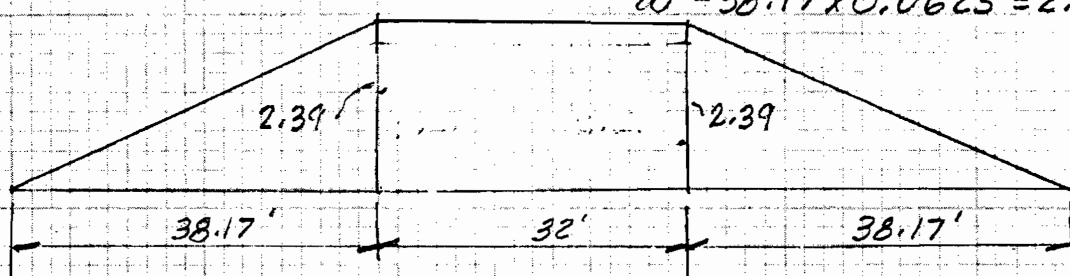
Short Wall-Case II

Water Inside to El. 14.9

$14.9' + 21.43' = 36.33'$ Water

$w = 36.33' \times 0.0625 = 2.27^{KSF}$ - inside

$w = 38.17 \times 0.0625 = 2.39^{KSF}$ - outside



$W = \frac{38.17 \times 2.39}{2} = 45.61^{K}$

FEM's

$\triangle_{TOP} = (45.61^{K})(38.17)\left(\frac{1}{15}\right) = 116^{'K}$

$\triangle_{Bott} = (45.61^{K})(38.17)\left(\frac{1}{10}\right) = 174.1^{'K}$

@ center

$\square\ 2.39^{KSF} \times 32'^{2} \times \frac{1}{12} = 203.9^{'K}$

Reactions

$\triangle_{TOP} = \frac{45.61^{K}}{3} = 15.2^{K}$

$\triangle_{BOTT} = 30.4^{K}$

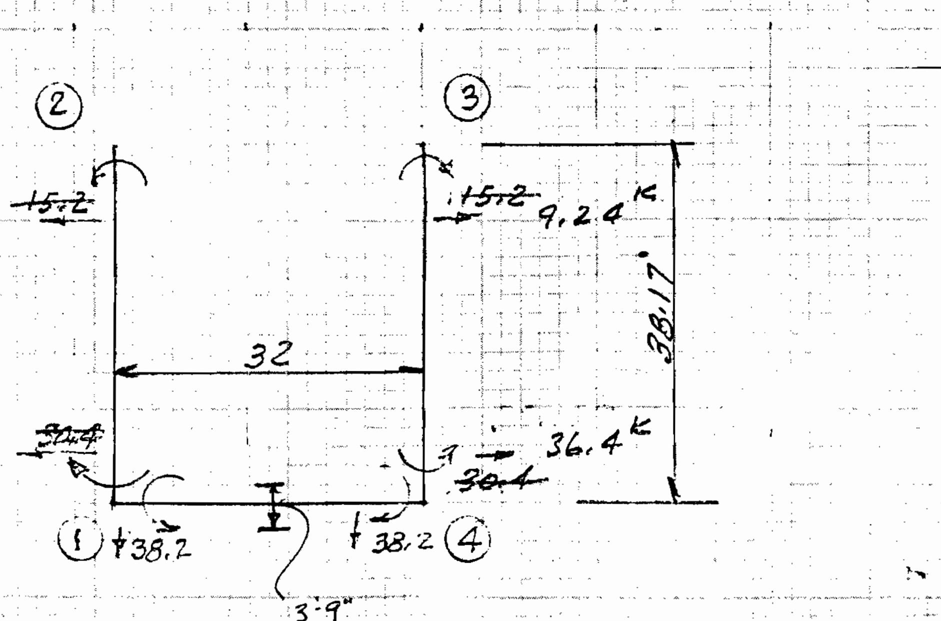
@ Center

$\square\ \frac{2.39^{KSF} \times 32}{2} = 38.2^{K}$

Adj.

$15.2 - \frac{227.5}{38.17} = 9.24^{K}$

$30.4 + \frac{227.5}{38.17} = 36.4^{K}$



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JOB
ITEM
JOB Nº 575-79E

SHEET Nº 13 OF
BY LWC DATE 10-8-79
CHKD. BY DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

Short Wall - Case II (Water inside to El.14.9)

Joint		①		④		
Mem.		1-2	1-4	4-1	4-3	
DF	1.0	0.11	0.89	0.89	0.11	1.0
F.E.M.	-116	+174.1	-203.9	+203.9	-174.1	+116
1st Dist.	+116	+3.3	+26.5	-26.5	-3.3	-116
CO	+1.7	+58.0	-13.3	+13.3	-58.0	-1.7
2nd Dist.	-1.7	-4.9	-39.8	+39.8	+4.9	+1.7
CO	-2.5	-0.9	+19.9	-19.9	+0.9	+2.5
3rd Dist.	+2.5	-2.1	-16.9	+16.9	+2.1	-2.5
	0	+227.5	-227.5	+227.5	-227.5	0

+125.2'K +78.4'K +125.2'K

Case I - Reduce Final end Moment to Face of Support (See page ⑪)

-VE Moment

$\frac{38.17-1.875'}{38.17} \times 161.5'^{K} = 153.6'^{K}$

+VE Moment $161.5' + 31'^{K} = 192.5'^{K}$

$= \frac{38.17-1.875}{38.17} \times 192.5'^{K} - 153.6'^{K} = 29.46'^{K}$

∴ Design Moment = $153.6'^{K} - 29.46'^{K} = 124.14'^{K}$

Case II Shears

9.24^{K}	36.4	38.2
-5.02	-28.4	-20.5
4.22^{K} Tension	8.0 Tension	17.7 Tension

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ITEM ____ BY LWC DATE 10-8-78
JOB Nº 575-79E CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE Short Walls

Case II - Reduce -VE Moment to face of support.

$+VE = \frac{w\,x}{3L^2}(L^2 - x^2)$

139.52

$\frac{2.39 \times 0.5 \times 38.17 \times 36.295}{3 \times 38.17^2}(38.17^2 - 36.295^2)$

$= 52.84^{'K}$

-Ve M @ Same location

$= 227.5^{'K} \times \frac{36.295}{38.17} = 216.3^{'K}$

$216.3^{'K} - 52.84^{'K} = 163.5^{'K}$

Reinforcement for Short Wall

Vertical Strip

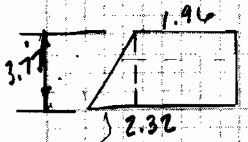
Water Inside to El. 14.9

$= 163.5^{'K}$ from above $- 124.14$ from Case I $= 30.8^{'K}$

d provided = 21.5". Max Mom allow: $= \sqrt{\frac{102,157 \times 12}{221 \times 12}} = 21.5''$

$= 102^{'K}$

∴ for Case I "d" must be increased



$124.14^{'K} = 124,140'^{\#}$ Req'd d $= \sqrt{\frac{124,140 \times 12}{221 \times 12}} = 23.7''$

-28.43 + 1.83 = -19.60

-23.27

Increase d to 23.7" + 2.5" = 26.2" say 27" Walls

-2.5

24.5

d = 26 - 4.5 - 0.9 - 0

d = 20.0"

0.0945 (3.77) = 0.36 28.4 - 8.1 = 17.8 (1.96)(3.77) + ½ (0.36)(3.77) = 7.40 + 0.68 = 8.08

Shear @ d' above base Slab $28.4^K - 4.5^K = \cancel{23.9}^K$ 17.8

20.0 16.8

$70\,psi \times 24.5'' \times 12 = 20.6^K$ not enough

23.5

11,800

$\frac{23,900}{70\,psi \times 12} = 28.5''$ = d req'd for Shear

As req'd $= \frac{124.14^{'K}}{1.44 \times 28.5} = 3.02\ in^4$

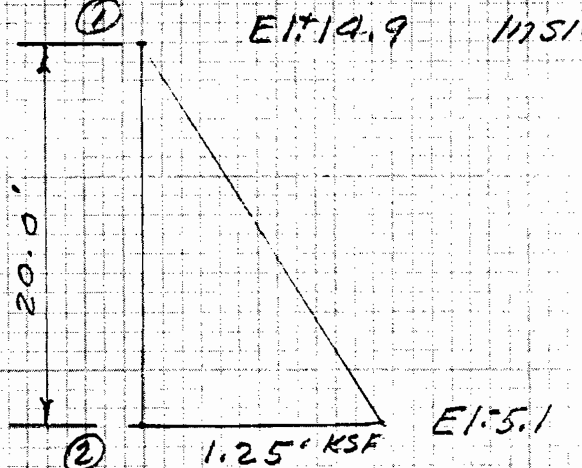
Use #9 @ 4 ea. face

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

SHAFT DESIGN FOR GATE STRUCTURE

Reinforcement for Short Wall (cont.)

Inside - Water to +14.9 Elev.



$W = \frac{1.25^{KSF} \times 20'}{2} = 12.5^K$

$R_1 = \frac{12.5^K}{3} = 4.17^K$

$R_2 = \quad = 8.33^K$

FEM @①

$(12.5^K)(20)\frac{1}{15} = 16.67^{'K}$

@ 2

$(12.5^K)(20)\frac{1}{10} = 25^K$

Simple Moment @ 11.55' from ① $= (.1283)(12.5^K)(20) = 32.07^{'K}$

Max −M = 25^K Max +M = $32.07 - 25 = 7.07^K$

∴ Walls may be decreased to 24" with "d" = 21.5

Max allow. M for 21.5 = $102^{'K}$

$V = 8.33^K < 18.06^K$

U ok by observation for 24" thick wall

U for 31" thick walls below El −5.1

Max Shear = 23.9^K (see page 14)

$\frac{23,900}{(3 \times 3.544)(0.88)(28.5)}$ = 89.63 psi less than 234 psi allowable

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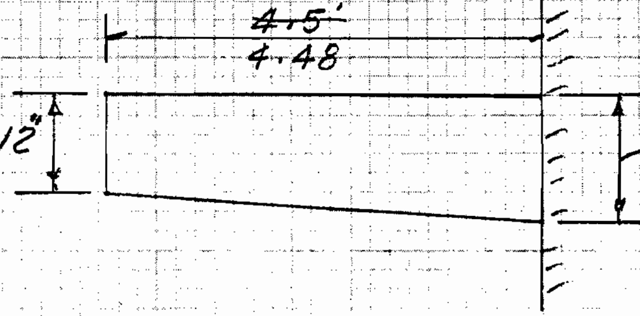
SHEET No 16 OF ___ BY LWC DATE 10-9-79 CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Stair Support @ Gate Structure (on West wall.)



$\frac{4.48 \times .333}{2} = .745 \times \frac{4.48}{3} = 1.11$

$4.48 \times 2.24 = 10.04$

$5.225 \quad \frac{10.04}{11.15}$

$\frac{11.15}{5.225} = 2.13$

Dead Load

Conc. $\frac{1+1.33}{2} \times 4.5 \times 0.15^K$
$= .79\ ^K/_F$

Steps (Steel) 11.5' long.

2 - C10 X 20 = 0.45^K
11 - C10 X 15.3# X 3.5' = 0.59^K
Conc. steps = 0.95^K
Misc (Pipe = 0.01^K

2.0^K

Live Load

Steps .83 X 3.5' X 11 X 0.15 = 4.8^K
Platforms = 3.5 X 4.5 X 0.15 = 2.36

all live loads acting at free end of cantilever!

Live Load = (4.8 + 2.4) X 1.15 = 8.28^K

$M = 8.28^K \times 4.5 = 37.26'^K$
$1.0^K \times 1.75 = 1.75^K$
$0.79^K \times 4 \times 2.25 = 7.11$
$46.12'^K$

$d = \sqrt{\frac{46,120 \times 12}{221 \times 48'' \text{wide}}} = 7.2''$ = 12" @ Free end 16" @ wall

Shear = $W = (\overset{3.16}{0.79 \times 4}) + 2.0 + 4.8 + 2.4 = 12.4^K$

$\frac{12,400}{48'' \times 70 psi} = 3.69''$

$As = $ (at fixed end) $= \frac{46.12'^K}{1.44 \times 42} = 0.76\square''$

Check Deflection

$p = \frac{as}{bd} \quad \frac{3.95}{48 \times 12} = .00686$

$pfy = 274 < 500$ Use uncracked section

$I = \frac{48 \times 14^3}{12} = 10976 \text{ in}^4$

$\frac{Pl^3}{3EI} = \frac{8280\,(54)^3}{(3)(4 \times 10^6)(10976)} = .0098$

$\frac{1000\,(21)^3}{(3)(4 \times 10^6)(10976)} = .00007$

$\frac{3160\,(27)^3}{(3)(4 \times 10^6)\,10976} = .00047$

0.0112" ok

(#3 double stirrups @ 8")

Top Use 5 #8 = $3.95\square''$

2 #7 bottom

Use same reinf and thickness. Intermediate and top landing.

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ITEM ____ BY LWC DATE 10-9-79
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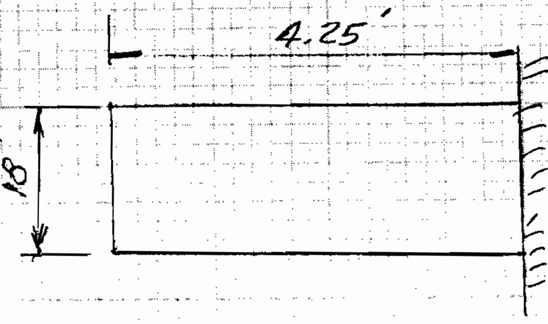
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Beam @ Bottom of stair



DL =

Conc = $1.5^2 \times 4.25' \times 0.15^K = 1.43^K$

Steps $= 1.0^K$

2.43^K

Live load

Steps 4.8^K

$M = 4.8 \times 4.25' = 20.4'^K$

$1.0 \times 1.75' = 1.75'^K$

$1.43 \times 2.13 = 3.04$

$25.19'^K$

$V = 7.23^K$ d provide $= 16"$ o/k

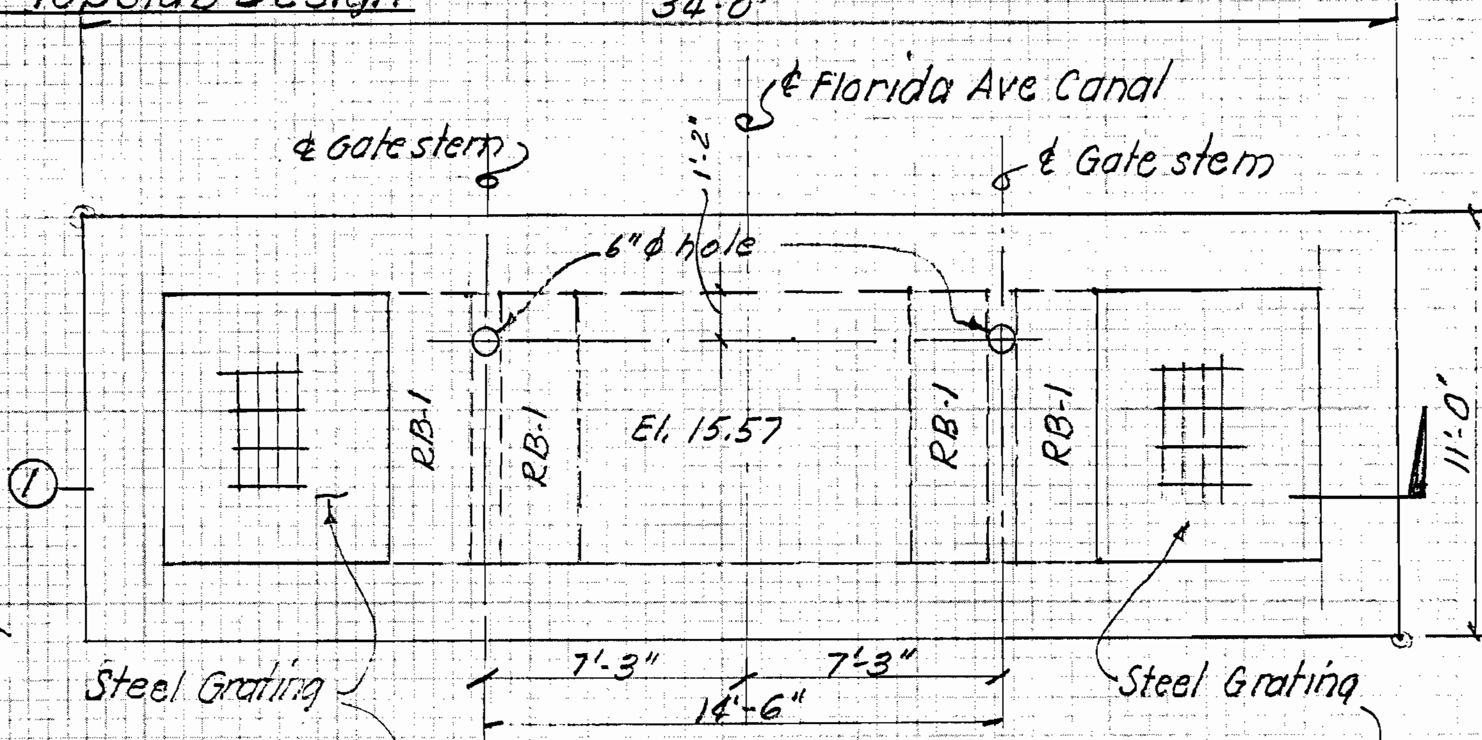
$As = \frac{25.19}{1.44 \times 16"} = 1.09^{\square"}$ $3^{\#}7$ top $= 1.2^{\square'}$ $2^{\#}6$ Bottom = Use $^{\#}3$ Stirrups @ 8"

Deflection o/k by observation

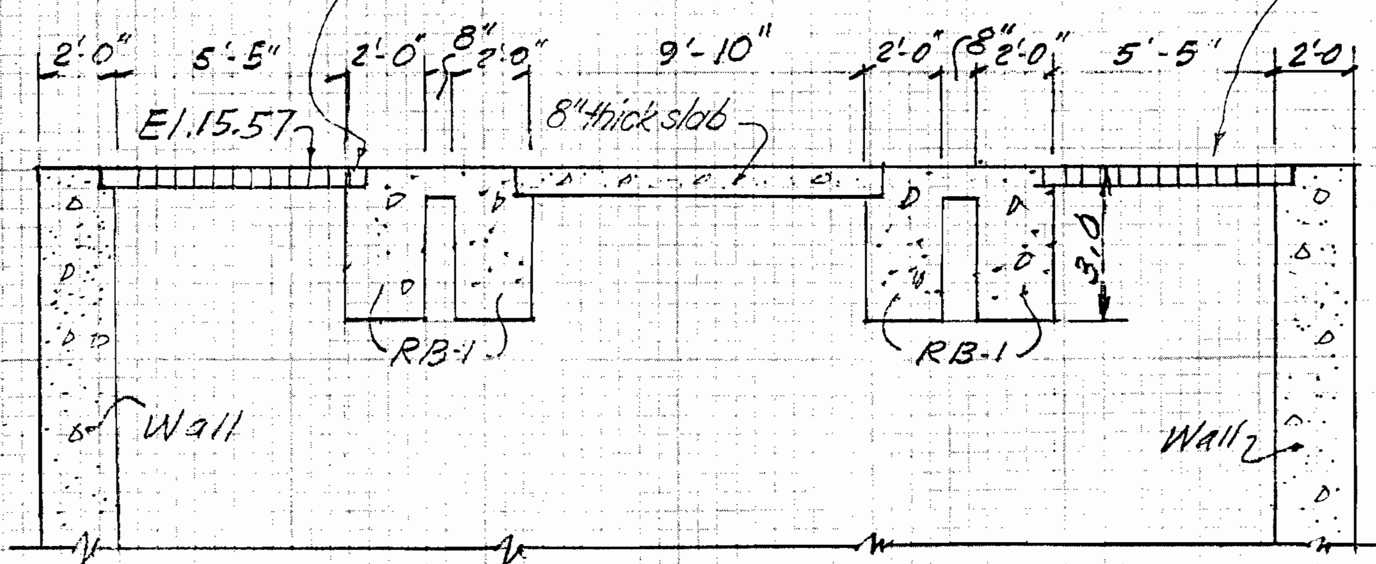
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE

Top Slab Design



PLAN - TOP SLAB



SECTION 1

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE

Top Slab Design — Two way Slab

Loads

D.L. = 8" Slab = 0.10^{KSF}
L.L. 0.15^{KSF}
0.25 KSF

Method 2 ACI-318-63 Page 318-130 Case 5

$K = 221$ $a = 1.44$ $d = 7''$ Allowable Shear = 70 psi

Min $A_s = 0.002 \times 8'' \times 12'' = 0.19^{in^2}$

$m = \frac{7}{9} = .77$ say 0.8 Short Span = 0.064 Long Span 0.050

Short Strip

$M = 0.064 \times 0.25^{KSF} \times 7.0^2 = 0.78^{'K}$

$As = \frac{0.78}{1.44 \times 7} = 0.008 < \min$

Reverse Loading = El. 14.9 − 12 = 2.9 + 21.43 = 24.33' (inv)

$24.33 \times 0.0625 = 1.52^{KSF}$ $1.52^{KSF} - 0.1$ (WT Slab) $= 1.42^{KSF}$

$M = 1.42^{KSF} \times 0.064 \times 7^2 = 4.45^{'k}$

$d\ \sqrt{\frac{4450 \times 12}{221 \times 12}} = 4.49'' < 7''$ ok

$As. = \frac{4.45}{1.44 \times 7} =$

$V = \frac{1}{2}(7 \times 1.42^k) = 4.97$

$\frac{4{,}970^{\#}}{12 \times 70 psi} = 5.91'' < 7''$ ok

Long Strip - Bottom face same as short strip = $0.44^{\square''}$

Reverse Loading (Top face)

$M = 0.050 \times 1.42^k \times 7^2 = 3.47^{'k}$

$As = \frac{3.47^{'k}}{1.44 \times 7''} = .34^{\square''}$

$V = \frac{1}{2}(9 \times 1.42) = 6.39^k$

$\frac{6390^{\#}}{12 \times 70 psi} = 7.6'' \approx 7''$ ok

Use 6@12 Top face Short direction
Use 5@12 Top face long direction
Use 4@12 ea. way bottom face

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

GATE STRUCTURE

- Gate Stem Support Beam -

Loads (8" Conc. Slab heavy Side) (uniform) Live Load + Dead Load

Beam Wt = $2' \times 3' \times .15^K = 0.9 \frac{K}{LF}$

$+ .33' \times .67' \times 0.15 = 0.03$

$\underline{1.93^{KLF}}$

0.93^{KLF}
0.26
0.30
0.39
1.88^{KLF}

WT. Conc Slab

$9.17' \times 7' = 64.2^{\square'}$ $\quad 64.2^{\square} \times .10^{KSF} = 6.42^K$

$\frac{7}{7+(2\times 9.17)} = 0.28 \quad \frac{0.28 \times 6.42^K}{7} = \underline{0.26^K LF}$

$LL = 2 \times 0.15 = 0.3^{KLF}$ on beam

From 8" Slab = $\frac{0.15^K \times 64.2 \times 0.28}{7} = 0.39^K LF$

Force Req'd to open Sluice Gate

Head = 30.0' Area of Opening = $12.5' \times 13' = 162.5^{\square'}$

f = friction coeff. = 0.35

5" dia. stem wt = $67 \frac{\#}{ft} \times 33' = 2.2^K$

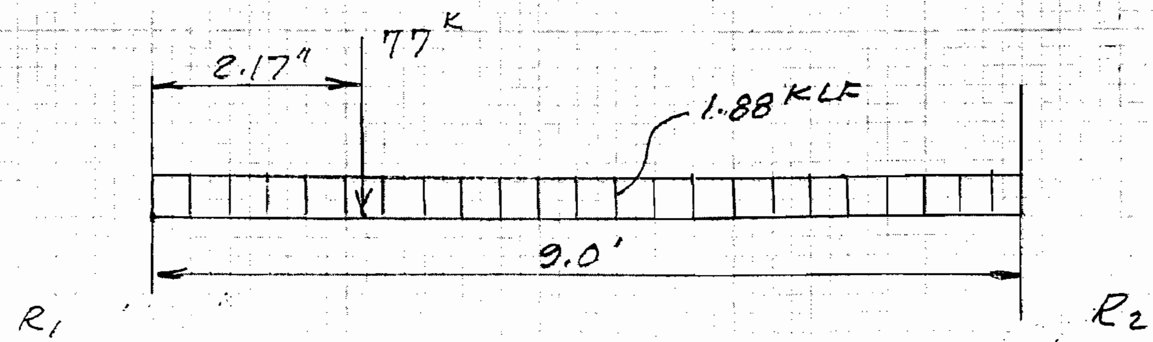
Gate @ $135^{\#}$ sq. ft $\times 162.5^{\square'} = 30.0^K$

$F = 30 \times 0.0625 \times 162.5 \times 0.35 + [1.5(30^K) + 2.2^K]$

$F = 153.8^K$ use 154^K @ ½ per beam = 77^K

Water @ El. 4 - Floodside
Head = 20.0'

$F = 20 \times 0.0625 \times 162.5 \times 0.35 + [1.5(30^K) + 2.2^K]$
$= 118.3$ use 119



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ITEM ______ BY LWC DATE 10-10-79
JOB No 575 - CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

GATE STRUCTURE

-Gate Stem Support Beam -

$R_1 = 1.88 \times \frac{9.0'}{2} = 8.46^K$

$\frac{77^K \times 6.83'}{9} = +58.43^K$

66.89^K

$R_2 = 8.46$

$\frac{77^K \times 2.17'}{9} + 18.57$

$27.03'^K$

$66.89 - (2.17 \times 1.88) = 62.81$

$8.46 - (2.17 \times 1.88$

Max Beam Moment

$\left[\frac{66.89 + 62.81}{2} \times 2.17\right] + \left[\frac{4.38 \times 2.33}{2}\right] = 145.82$

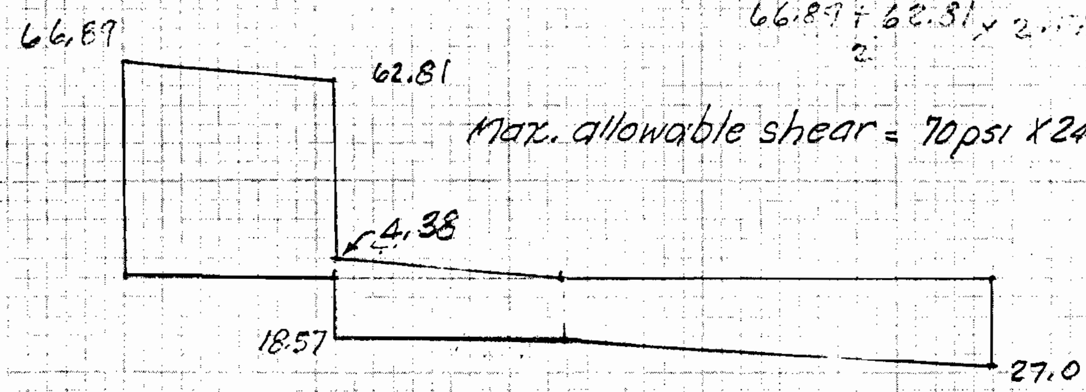
$d = \sqrt{\frac{145,820 \times 12}{221 \times 24}} = 18.16'' < 33.5$

As required:

$\frac{145.82'^K}{1.44 \times 33.5''} = 3.02^{\square''}$ use 4-#8 bott. = $3.16^{\square''}$

Use 2#8 top Cont.

$\frac{66.89 + 62.81}{2} \times 2.$ [illegible] $= 140.72'^K$



Max. allowable shear = 70psi × 24" × 33.5" = 56.28^K

SHEAR DIAGRAM

$66.89^K - 56.28 = 10.61^K$ $\frac{10.61^K}{24 \times 33.5} = .0132^K = 13.2\ psi = v_1$

#3 Stirrups

$S = \frac{2 \times .11 \times 20,000}{13.2_{psi} \times 24} = 13.88''$ Use #3 @ 10" all the way

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

LOADS: Roof slab (For 1' wide section)

El. 15.57
− 8.43
24.00 × 0.15ᴷ = 3.6 KSF

Wt. of operating floor on 12" strip of wall:

Gate (one)	= 30ᴷ
Stem (one)	= 2.2ᴷ
½ Conc. Slab	= 16.75ᴷ
½ Steel Grating	= 1.3ᴷ
Steel stairs	= 4.6ᴷ } East side only
Landings	= 6.8ᴷ }
Cracking Force (one) (154ᴷ − (30 + 1.1))	= 122.9ᴷ
	184.55ᴷ on 2 ft Wall

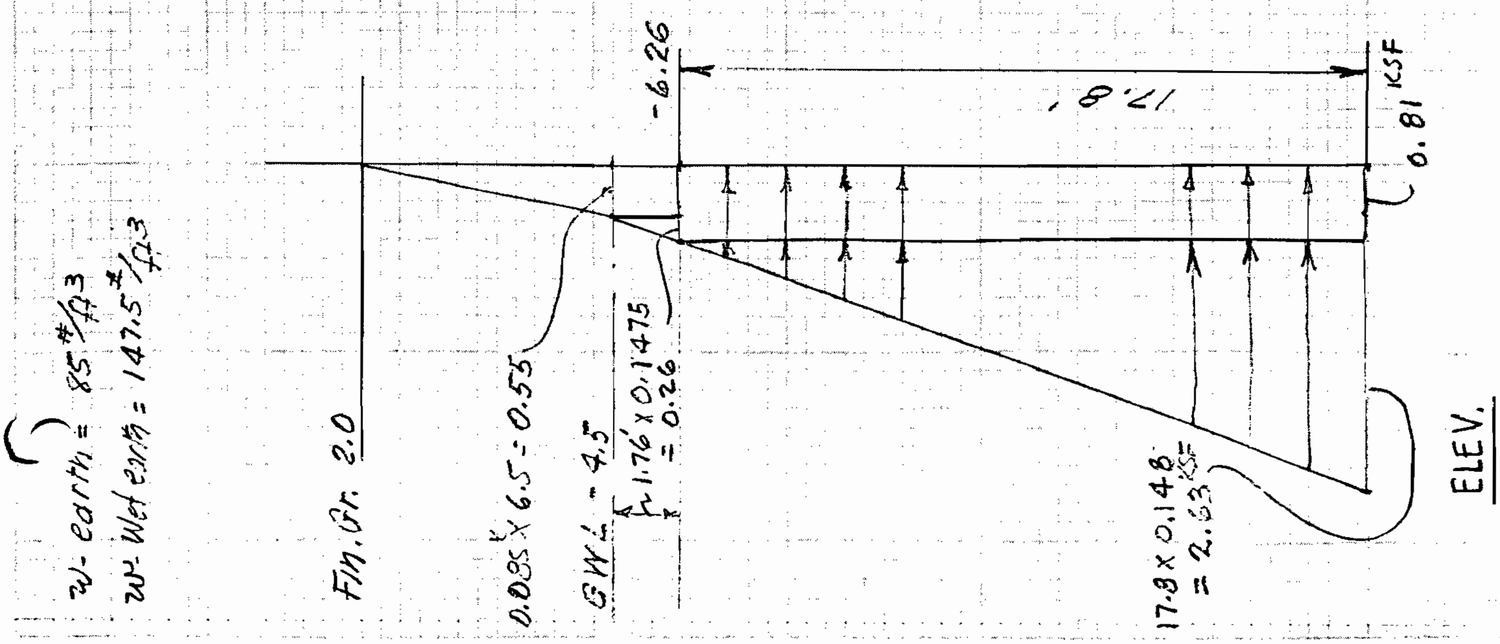
184.55 / 34 × .5 = 2.71 KSF

Load on Roof Slab = 6.31 KSF

Walls ℄ Top Slab = −6.26
℄ Bott. Slab = 24.06

Diff = 17.8'

El −24.06



GATES ACROSS FLORIDA AVE DRAINAGE CANAL

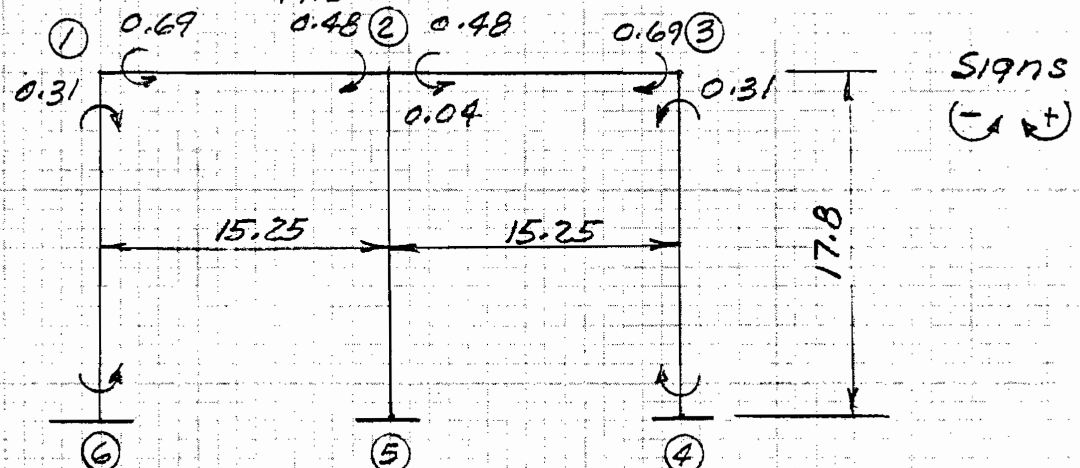
DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Distribution Factors

Roof Slab $L = 15.25'$ — Outside Wall $L = 17.8'$ — Center Wall $L = 17.8'$

$I = \frac{4.33^3}{12} = 6.76\ ft^4$ $\quad I = \frac{3.5^3}{12} = 3.57\ ft^4$ $\quad I = \frac{2.0^3}{12} = 0.6667\ ft^4$

$\frac{I}{L} = \frac{6.76\ ft^4}{15.25} = 0.4432$ $\quad \frac{I}{L} = \frac{3.57\ ft^4}{17.8} = 0.2006$ $\quad \frac{I}{L} = 0.0374$



①

$\frac{0.4432}{0.4432 + 0.2006} = 0.69$

$1 - 0.69 = 0.31$

②

$$\begin{array}{r} 0.4432 \\ 0.4432 \\ +0.0374 \\ \hline 0.9238 \end{array}$$

$\frac{0.4432}{0.9238} = 0.48$

$1.0 - (2 \times 0.48) = 0.04$

FEM's and Shears – Roof Slab

FEM $6.31^{KSF} \times 15.25^2 \times 0.0833 = 122.2'^K$

Shear $= 6.31^{KSF} \times 15.25 \times 0.5 = 48.11^K$

FEM's and Shears - Outside Walls

FEM @ ① $= 0.81^{KSF} \times 17.8^2 \times 0.0833 = 21.4'^K$

$\frac{2.63^{KSF} \times 17.8^2}{2} \times 0.0667 = 27.8'^K$

$= 49.2'^K$

Shear @ ①: $\frac{2.63 \times 17.8}{2} \times \frac{1}{3} = 7.80^K$

$0.81^{KSF} \times 17.8 \times 0.5 = 7.2$

$= 15.0^K$

FEM @ ⑥ $=$ $\quad 21.4'^K$

$\frac{2.63 \times 17.8^2}{2} \times 0.1 = +41.66$

$= 63.1'^K$

Shear @ ⑥ $\quad 7.2^K$

$\frac{2.63 \times 17.8}{2} \times \frac{2}{3} = 15.61$

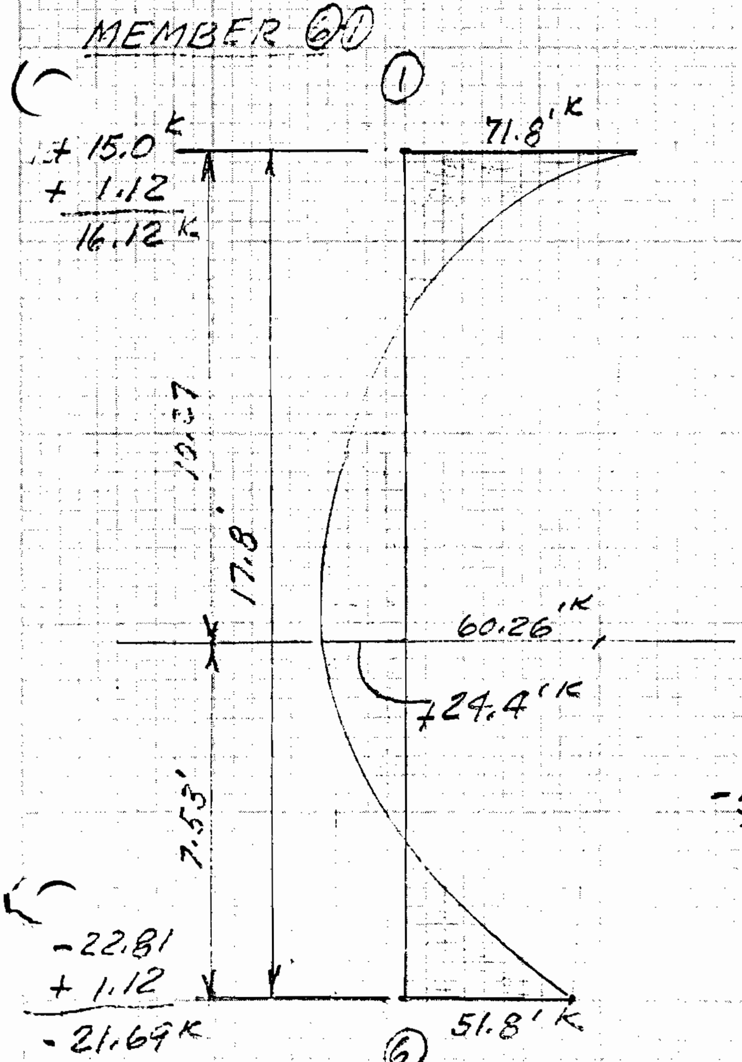
$= 22.81^K$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL
DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Moment Distribution

Jt.	6	1		2			3		4
MEM	6-1	1-6	1-2	2-1	2-5	2-3	3-2	3-4	4-3
DF		0.31	0.69	0.48	0.04	0.48	0.69	0.31	
FEM	-63.1	+49.2	-122.2	+122.2	0	-122.2	+122.2	-49.2	+63.1
1ST D.	0	+22.6	+50.4	0	0	0	-50.4	-22.6	0
C.O	+11.3	0	0	+25.2		-25.2	0	0	-11.3
2nd D	0	0	0	0	0	0	0	0	0
	-51.8	+71.8	-71.8	+147.4	0	-147.4	+71.8	-71.8	+71.8

MEMBER 6-1



W (see page 22) $= \dfrac{2.63^{KSF} \times 17.8'}{2} = 23.41^K$

Simple $^+M = (0.128)(23.41^K)(17.8') = 53.34'^K$

@ $.423 \times 17.8$ from (6) $= 7.53'$

$\dfrac{0.81 \times 7.53}{2}(17.8 - 7.53) = 31.32$

$\Sigma = 84.66'^K$

$\dfrac{71.8'^K - 51.8'^K}{17.8'} \times 7.53' + 51.8'^K = 60.26'^K$

$84.66'^K - 60.26'^K = 24.40'^K$

Shear adjustment

$\dfrac{-51.8 + 71.8'^K}{17.8'} = +1.12^K$

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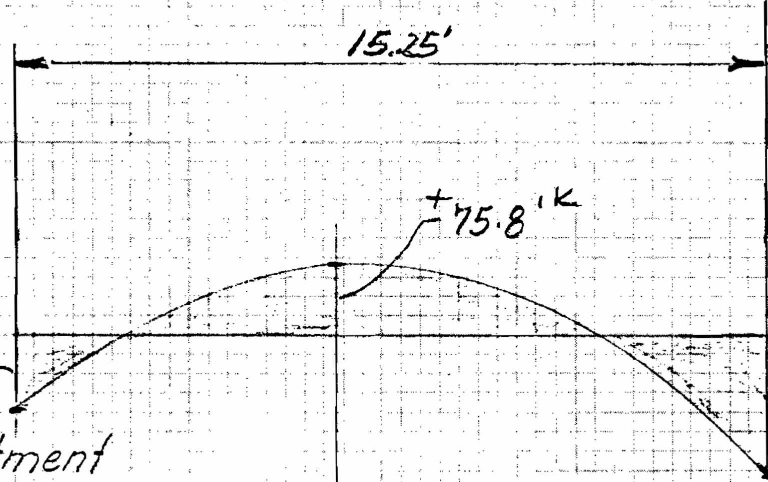
JOB No 575-79-E CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

MEMBER 1-2



-48.11
$+\ 4.96$
-43.15

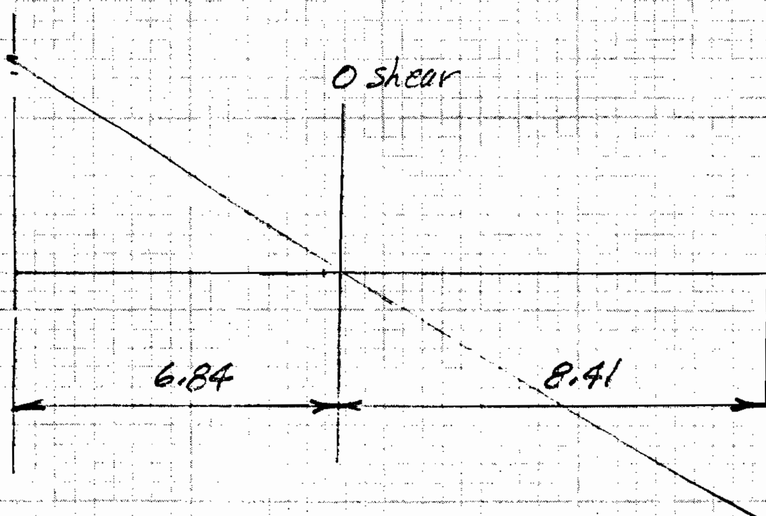
$71.8'^{k}$

$+48.11$
$+\ 4.96$
53.07^{k}

$147.4'^{k}$

Shear adjustment

$$\frac{+147.4-71.8}{15.25} = +4.96^{k}$$



43.15
$+53.07$
$\frac{96.22}{15.25} = 6.31$

$$\frac{43.15^{k}}{6.31} = 6.84'$$

$$\frac{53.07}{6.31} = 8.41'$$

$15.25'$

$$+M = \frac{43.15^{k} \times 6.84}{2} - 71.8'^{k} = 75.8'^{k} \qquad +M = \frac{53.07^{k} \times 8.41}{2} - 147.4'^{k} = 75.8'^{k}$$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL
DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Loading Bottom Slab

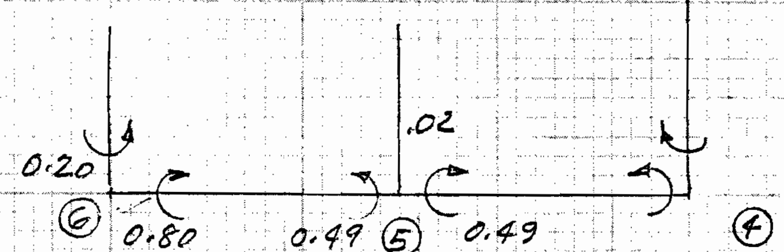
(ROOF) $6.31^{KS} + \left[\dfrac{(13' \times 3.5' \times 0.15^{K} \times 2) + (13 \times 2' \times 0.15)}{34}\right] = 6.83^{KSF}$

$FEM = 6.83^{KSF} \times 15.25^2 \times .0833 = 132.4'^{K}$

$Shear = 6.83^{KSF} \times 15.25 \times 0.5 = 52.07'^{K}$

$I \quad \dfrac{5.25^3}{12} = 12.06\ ft^4$

$\dfrac{I}{L} = \dfrac{12.06\ ft^4}{15.25} = 0.7908$



6 or 4

$\dfrac{0.7908}{0.2006 + 0.7908} = 0.80$

$= 0.20$

Moment Distribution

5

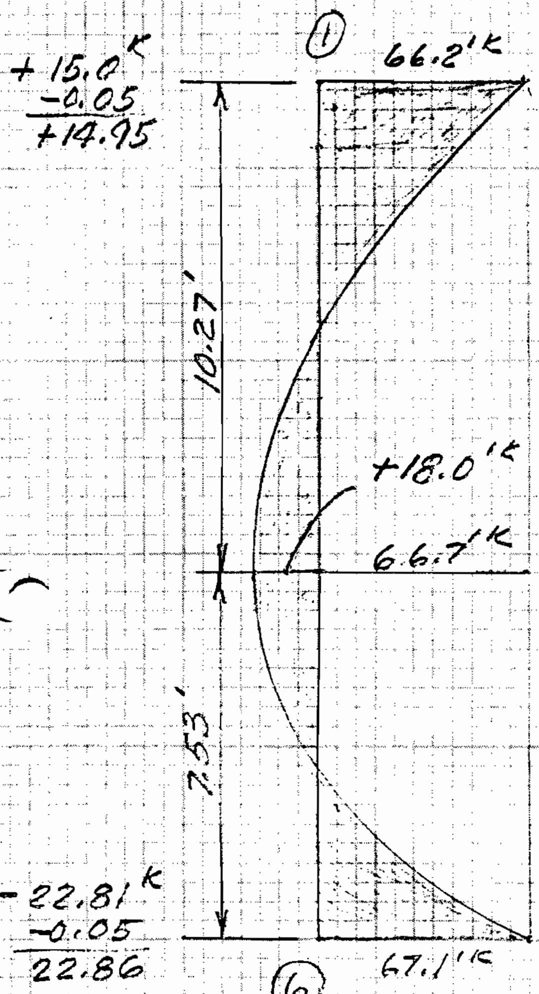
0.0374 = 0.02
0.7908 = 0.49
0.7908 = 0.49
1.6190

JT.	1		2			3		4		5			6	
DF	0.31	0.69	0.48	0.04	0.48	0.69	0.31	0.20	0.80	0.49	0.02	0.49	0.80	0.20
MEM	1-6	1-2	2-1	2-5	2-3	3-2	3-4	4-3	4-5	5-4	5-2	5-6	6-5	6-1
FEM	+49.2	-122.2	+122.2	0	-122.2	+122.2	-49.2	+63.1	-132.4	+132.4	0	-132.4	+132.4	-63.1
1st D.	+22.6	+50.4	0	0	0	-50.4	-22.6	+13.9	+55.4	0	0	0	-55.4	-13.9
CO	-7.0	0	+25.2	0	-25.2	0	+7.0	-11.3	0	+27.7	0	-27.7	0	+11.3
2nd D.	+2.2	+4.8	0	0	0	-4.8	-2.2	+2.3	+9.0	0	0	0	-9.0	-2.3
CO	-1.2	0	+2.4	0	-2.4	0	+1.2	-1.1	0	+4.5	0	-4.5	0	+1.1
3rd D	+0.4	+0.8	0	0	0	-0.8	-0.4	+0.2	+0.9	0	0	0	-0.9	-0.2
+	66.2	-66.2	+149.8	0	-149.8	+66.2	-66.2	+67.1	-67.1	+164.6	0	-164.6	+67.1	-67.1

GATES ACROSS FLORDIA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Moment Distribution : + Mom. Member ①–⑥



Simple Moment (See page 24) = ±84.66'K

See Page 24

$\frac{67.1'^K - 66.2'^K}{17.8'} \times 10.27' + 66.2'^K = 66.7'^K$

$84.66'^K - 66.7'^K = 17.96'^K$ Say $18'^K$

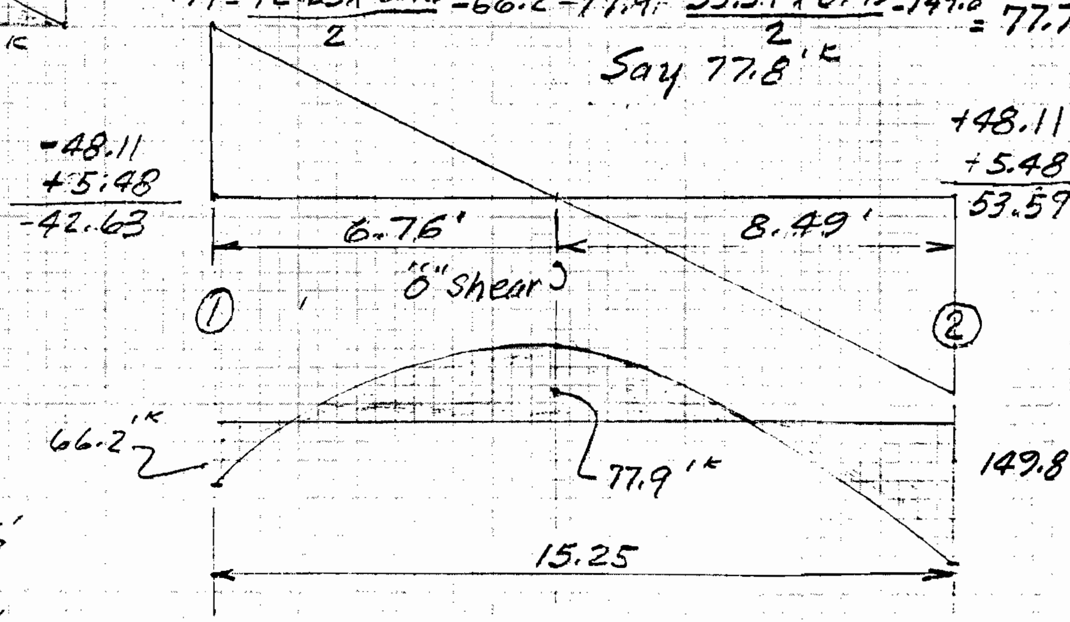
Shear Adjustment

$\frac{-67.1 + 66.2}{17.8'} = -0.05^K$

Member ① - ②

$+M = \frac{42.63^K \times 6.76'}{2} - 66.2'^K = 77.9'^K$; $\frac{53.59^K \times 8.49}{2} - 149.8 = 77.7'^K$

Say 77.8'K



Shear Adj.

$\frac{+149.8 - 66.2}{15.25} = \pm 5.48^{K}$

42.63
+53.59
$\frac{96.22}{15.25} = 6.31^K$

$\frac{42.63^K}{6.31} = 6.76'$

$\frac{53.59}{6.31} = 8.49'$

15.25

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SHEET No 28 OF ____ BY LWC DATE 10-12-79 CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Note: If one gate is opened and other close, water load will be on one side of center wall for a short time. Check and use same conditions on both Sides of Wall

Loads.

$17.8' \times 0.0625^k =$

$W = \frac{1.11 \times 17.8'}{2} = 9.88^k \qquad \frac{17.8}{3} = 5.933'$

$17.8\ R_T = 9.88^k \times 5.933'$

$R_T = 3.29^k$

$R_B = 9.88 - 3.29^k = 6.59$

FEM @ Top:

$\frac{1.11 \times 17.8^2}{2} \times 0.0667 = 11.72'^k$

FEM @ Bott.

$\frac{1.11 \times 17.8^2}{2} \times 0.1 = 17.58'^k$

② 2-1	2-5	2-3	⑤ 5-4	5-2	5-6	
0.48	0.04	0.48	0.49	0.02	0.49	
+122.2	-11.7	-122.2	+132.4	+17.6	-132.4	
	+0.5			-0.4		1ST DIST'
	-0.2			+0.3		CO
	0			0		2nd Dist
	-11.4			+17.5		

Shear Adj.

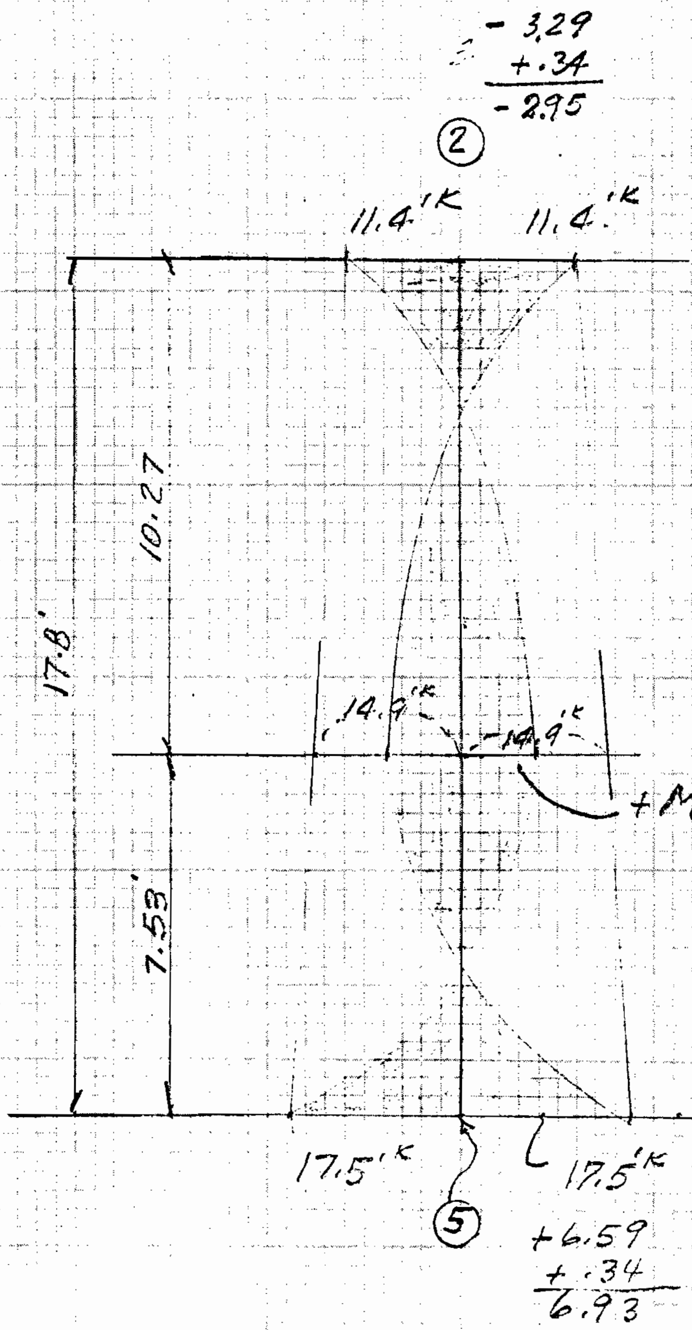
$\frac{-11.4 + 17.5}{17.8} = \pm 0.34^k$

See Sheet 29

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Center Wall Cont.



Page 28

$W = 9.88'^{K}$

Simple $^{+}M = (0.128)(9.88)(7.8) = 22.51'^{K}$

@ .423L from 5 $= 7.53'$

$\frac{17.5^{'K} - 11.4^{'K}}{17.8'}(17.8' - 7.53') + 11.4^{'K} = 14.9'^{K}$

$22.5'^{K} - 14.9'^{K} = 7.6'^{K}$

$+M = 7.6'^{K}$

Check

$\frac{10.27' \times 3.29^{K} \times 2}{3} = 22.51'^{K}$

$\frac{2.95 \times 10.27 \times 2}{3} = 20.91'^{K} - 14.9$

Actual ^{+}M

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL GATE STRUCTURE

Roof Slab See pages 25 and 27

Max Moment = -149.8'k at Center Wall, Page 27

Max Moment = -71.8'k @ Exterior Walls - Page 25

Max Moment = +77.9 Between Walls

Max Shear = 53.59k @ Center Wall ← Page 27

$d_{req'd} = \sqrt{\frac{149800 \times 12}{221 \times 12}} = 26''$ d provided = 49"

Reinforcing Steel top face adjacent to center wall

$\frac{M}{ad} = \frac{149.8'^k}{1.44 \times 49''} = 2.12\square'' = \#9@6$

However Moment may be reduced: $149.8'^k - \frac{53.5^k(2)}{6} = 132'^k$ (See page 27)

$\frac{132'^k}{1.44 \times 49} = 1.87\square'' \times 2 = 3.74\square''$ 4 #9 ok = 4□"

Check Bond - Allowable 191 psi   perimeter #9 - 2 per ft = 7.08"

$V = 53.59^k$

$\frac{53,590}{7.08 \times 0.88 \times 49} = 175 < 191$ ok

$V = 53.59^k$ Reduce to face supp. $= 53.59 - \frac{53.59^k}{8.49} \times 4.08' = 27.83^k$

$12 \times 70 \times 49'' = 41,160^\# > 27,830^\#$ ok

Near exterior Walls - Top face

- Moment = 71.8'k Reduce $71.8'^k - \frac{42.63(2)}{6} = 57.6'^k$

$\frac{M}{ad} = \frac{57.6}{1.44 \times 49} = .81\square''$ $0.81 \times 2 = 1.62\square''$ _ 4 #8 = 3.16□ ok *

Bond and V ok by observation

Attention: should be noted That laps in reinf. should be as required by ACI -

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL OF GATE STRUCTURE

Roof Slab (Cont.)

$+M = 77.9'^{K}$ See page 27

d = 49" ok by observ. U % by compar.

$\frac{77.9'^{K}}{1.44 \times 49} = 1.10^{\square''} \times 2 = 2.2^{\square''}$ 4#8 = 3.16$^{\square''}$ %K

Exterior Walls

Max. Moment @ Top = $-71.8'^{K}$ (Page 24)

Max. Moment @ Bottom = $-67.1'^{K}$ (Page 27)

Max +Moment = $24.4'^{K}$ (Page 24)

d = 39" d reqd = $\sqrt{\frac{71{,}800 \times 12}{221 \times 12}} = 18'' < 39''$

Reinf.:

$\frac{M}{ad} = \frac{71.8'^{K}}{1.44 \times 39} = 1.28^{\square''} \times 2 = 2.56^{\square''} \leq 4\#8 = 3.16^{\square''}$ %K

Max Moment Inside face = $24.4'^{K}$ (17.5'K with water inside only)

$\frac{24.4'^{K}}{1.44 \times 39} = 0.43^{\square''} > 2\#8 = 1.58^{\square''}$

Interior Wall =

Max M = 17.5'

d = 21" $\sqrt{\frac{17{,}500 \times 12}{221 \times 12}} = 8.9'' < 21''$

$\frac{17.5'^{K}}{1.44 \times 21''} = 0.58^{\square''} \times 6.5' = 3.77^{\square''} > 13 \times 0.79^{\square''} = 10.27^{\square''}$ ea. face

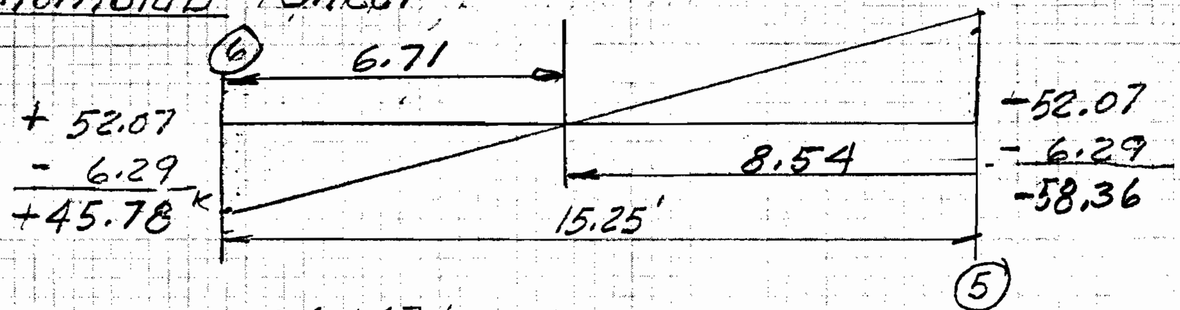
Shear = 6.93^{K}

$12 \times 70_{psi} \times 21 = 17{,}640^{\#} > 6{,}930^{\#}$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER WEST WALL OF GATE STRUCTURE

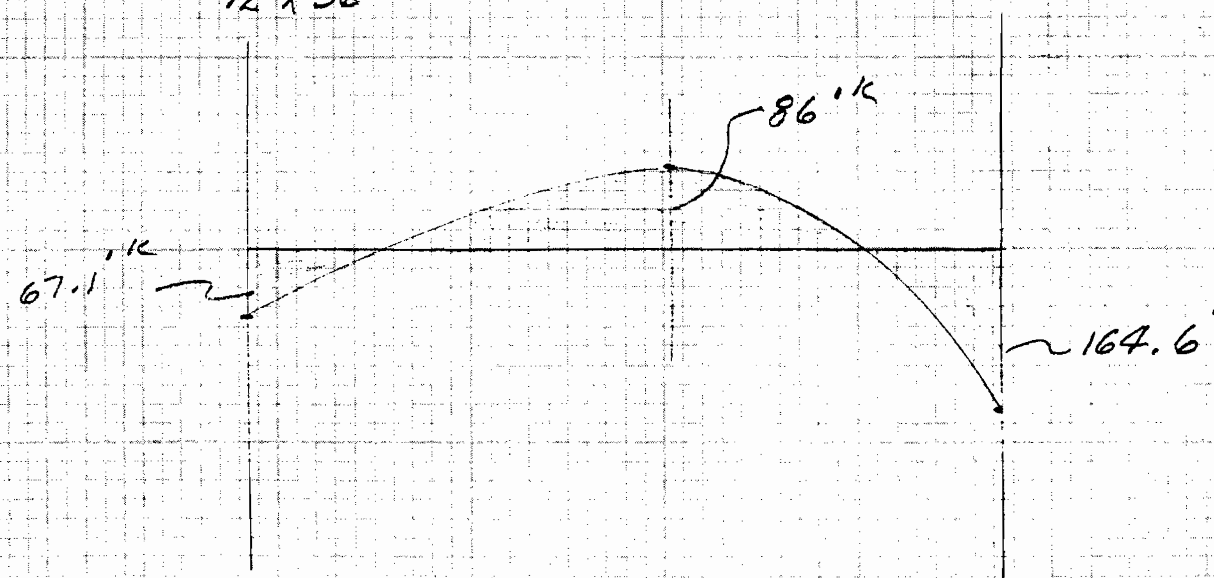
Bottom Slab - Shear :



$$\frac{-164.6+67.1}{15.25} = -6.29$$

$$\frac{58.36}{6.83} = 8.54' \qquad (8.54-1.75)(6.83) = 46.38^k = V \text{ at face Wall}$$

$$v = \frac{46{,}380^{\#}}{12 \times 56} = 69\ psi < 70\ psi\ \%_k$$



$$+M = \frac{8.54' \times 58.56^k}{2} - 164.6' = 86.k'^k$$

$$+M = \frac{6.71 \times 45.78}{2} - 67.1 = 86'^k$$

d %k by Observation

$$d = \sqrt{\frac{164{,}600 \times 12}{221 \times 12}} = 28'' < 56''$$

Reduce for A_s

$$164.6'^k - \left(\frac{58.36 \times 2}{6}\right) = 145.1'^k$$

$$\frac{145.1}{1.44 \times 56} = 1.8^{\square''} \times 2 = 3.6^{\square''}$$

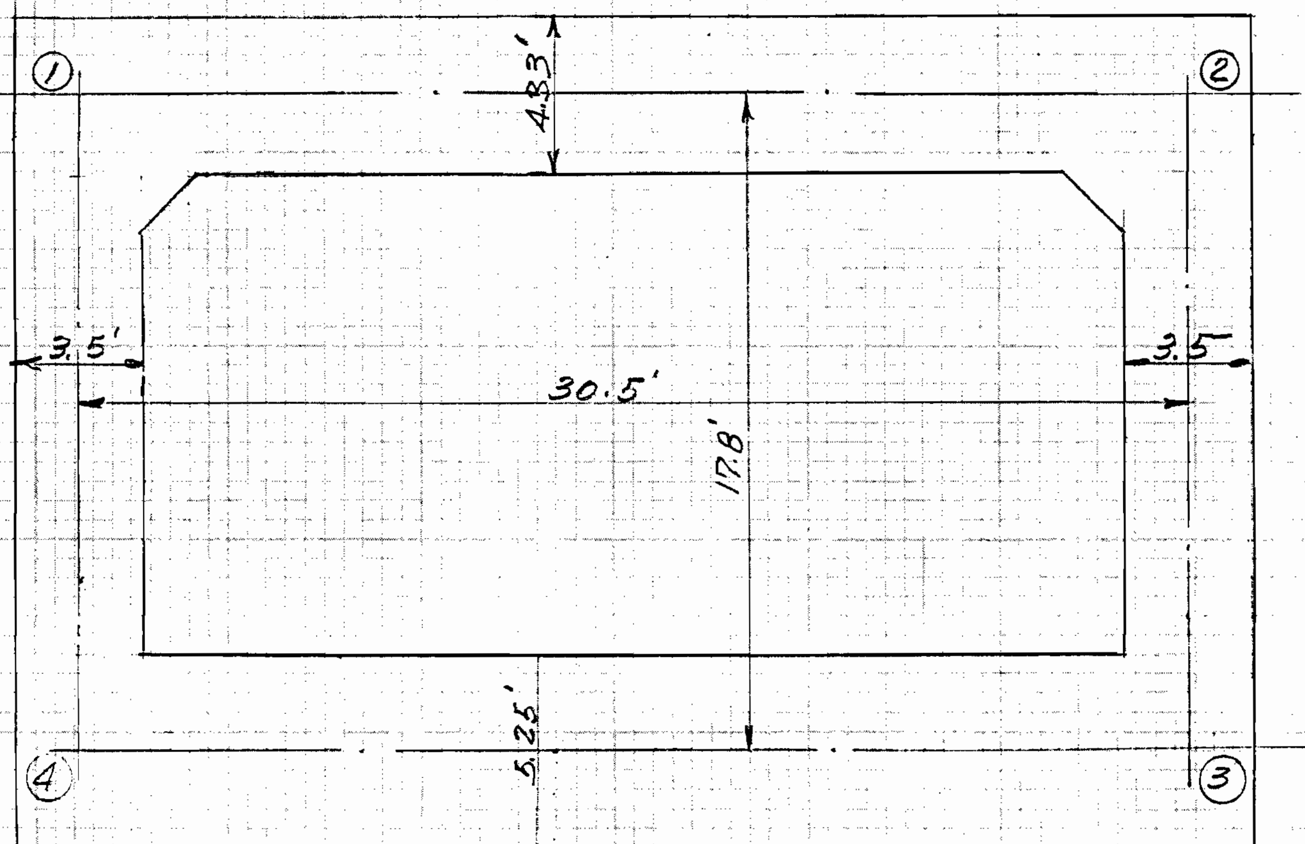
$4\#10 = 5.08^{\square''}$ on drawing

As Top face

$$\frac{86'^k}{1.44 \times 56''} = 1.06^{\square''} \times 2 = 2.12^{\square''}$$

$4\#8 = 3.16^{\square''}$ on drawing

GATES ACROSS FLORIDA AVE DRAINAGE CANAL
DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE
Moment Distribution



①-③

$I = \frac{4.33^3}{12} = 6.76\ ft^4 \quad \frac{I}{L} = 0.2216$

①-④ ②-③

$I = \frac{3.5^3}{12} = 3.57\ ft^4 \quad \frac{I}{L} = 0.2006$

④-3

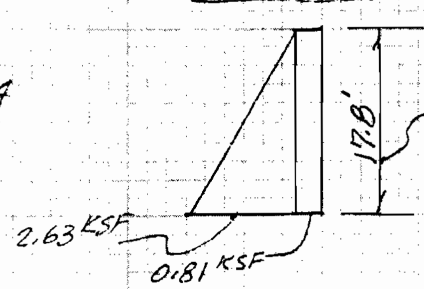
$I = \frac{5.25^3}{12} = 12.06\ ft^4 \quad \frac{I}{L} = 0.3954$

LOADING - Top Slab

$3.6^{KSF} + \frac{184.55^k - (4.6^k + 6.8^k)}{34'} \times 0.5 = 6.15^{KSF}$

See page 22

Side Wall



See Page 22

Bottom Slab

See page 26

$6.83^{KSF} - 6.31^{KSF} + 6.15 = 6.67^{KSF}$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

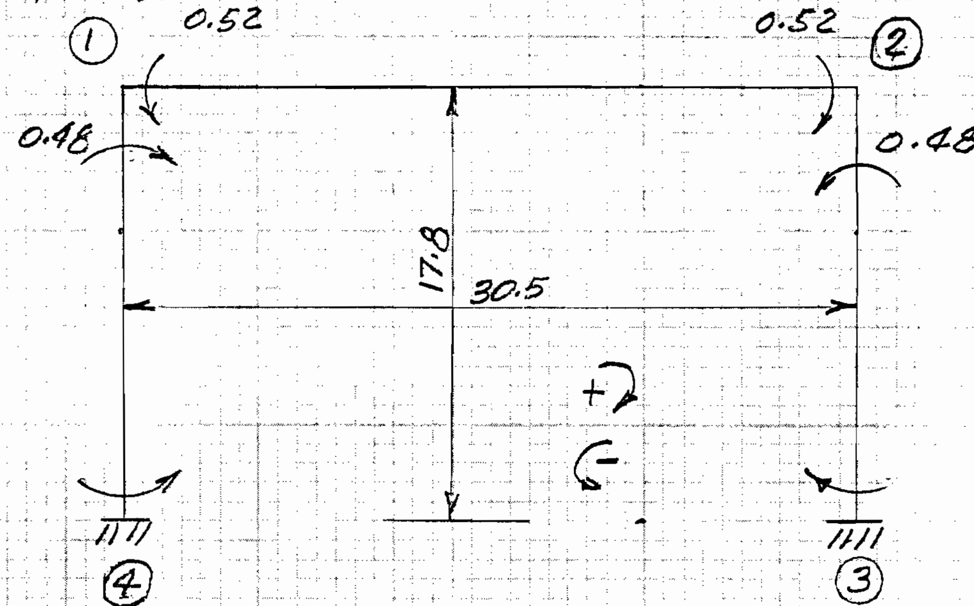
Moment Distribution (Cont.)

Distribution Factor

Joints ① or ④

$$\frac{0.2216}{0.2004+0.2216} = 0.52$$

$$\frac{0.2004}{0.2004+0.2216} = 0.48$$



FEM @ ①-② ②-①

$$FEM = \frac{6.15^{KSF} \times 30.5^2}{12} = 476.8'^{K}$$

Shear $= \frac{6.15^{KSF} \times 30.5'}{2} = 93.79^{K}$

FEM @ ①-④ ④-①
②-③ ③-②

Fem's @ ① and ②
Seepage 23 → $= 49.2'^{K}$ Shear $= 15.0^{K}$

Fem's @ ③ and 4
$= 63.1'^{K}$ Shear $= 22.81^{K}$

+M − Member 1-2 2-1

$$\frac{6.15^{K} \times 30.5^2}{8} - 321.17 = 394'^{K}$$

Jt	④	①		②		③
MEM	4-1	1-4	1-2	2-1	2-3	3-2
DF		0.48	0.52	0.52	0.48	
FEM	−63.1	+49.2	−476.8	+476.8	−49.2	+63.1
1st Dist.		+205.2	+222.4	−222.4	−205.2	
C.O.	+102.6	0	−111.2	+111.2		−102.6
2nd Dist	0	+53.4	+57.8	−57.8	−53.4	
C O	+26.7	0	−28.9	+28.9	0	−26.7
3rd Dist	0	+13.9	+15.0	−15.0	−13.9	
Final FEM →	+66.2	+321.7	−321.7	+321.7	−321.7	−66.2

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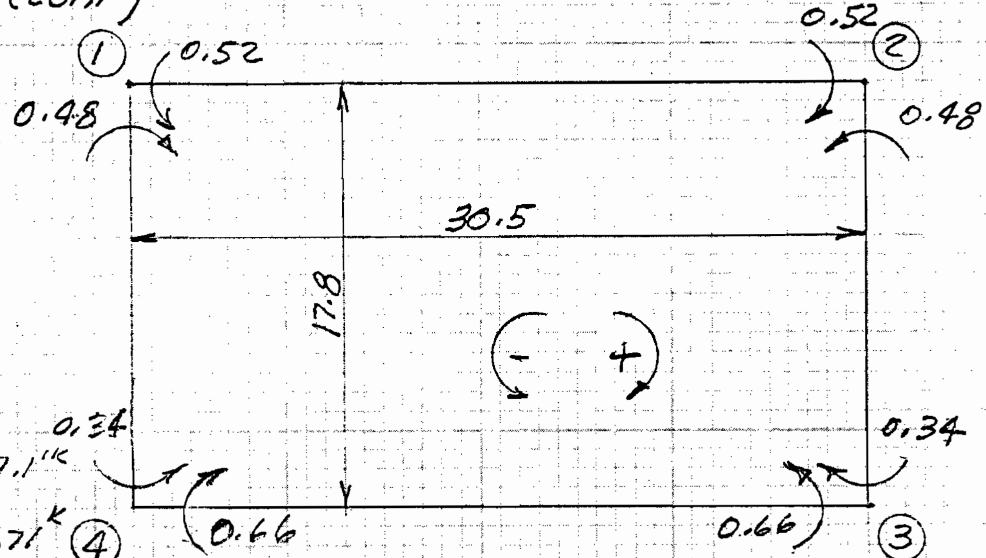
GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

Moment Distribution (cont)



Distribution Factors

Joints ③ and ④

$$\frac{0.3954}{0.2066 + 0.3954} = 0.66$$

$1.0 - 0.66 = 0.34$

FEM 4-3 3-4

$6.67^{k} \times 30.5^2 \times 0.0833 = 517.1'^{k}$

Shear

$6.67^{k} \times 30.5 \times 0.05 = 101.71^{k}$

Jt	①		②		③		④	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
D.F	0.48	0.52	0.52	0.48	0.34	0.66	0.66	0.34
FEM	+49.2	-476.8	+476.8	-49.2	+63.1	-517.1	+517.1	-63.1
1ST Dist	+205.2	+222.4	-222.4	-205.2	+154.4	+299.6	-299.6	-154.4
CO	-77.2	-111.2	+111.2	+77.2	-102.6	-149.8	+149.8	+102.6
2nd Dist	+90.4	+98.0	-98.0	-90.4	+85.8	+166.6	-166.6	-85.8
CO	-42.9	-49.0	+49.0	+42.9	-45.2	-83.3	+83.3	+45.2
3rd Dist	+44.1	+47.8	-47.8	-44.1	+43.7	+84.8	-84.8	-43.7
	+268.8	-268.8	+268.8	-268.8	+199.2	-199.2	+199.2	-199.2

Member 1-2 2-1 Shear = 93.79 ^{k}

$$+M = \frac{6.15^{KSF} \times 30.5^2}{8} - 268.8 = 446.3'^{k}$$

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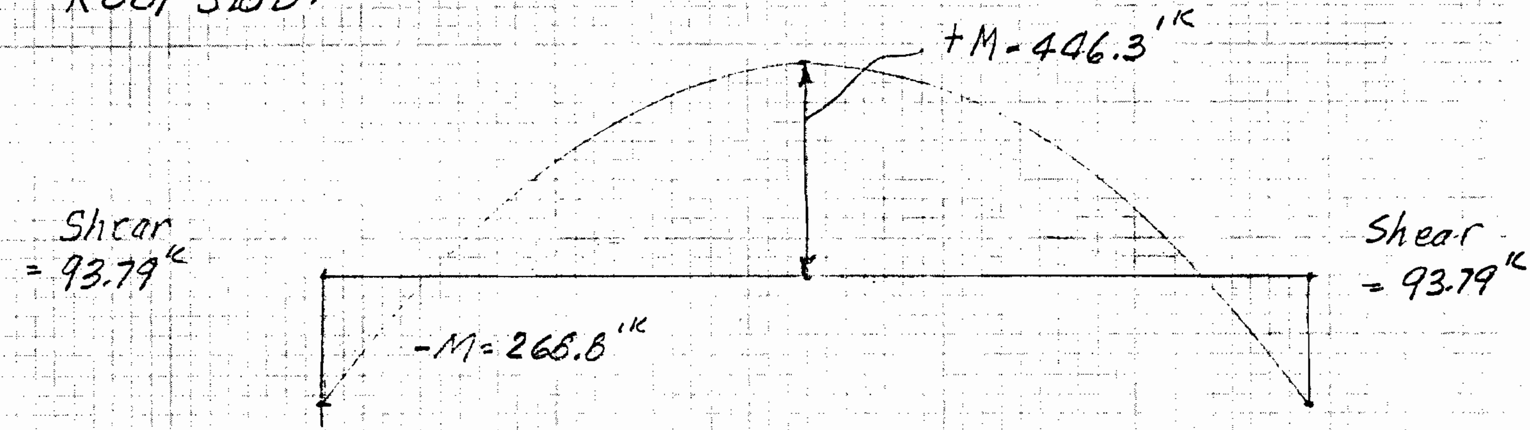
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL:
DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

Roof Slab:



Max +Moment = 446.3'k

d req'd $= \sqrt{\frac{446{,}300 \times 12}{221 \times 12}} = 44.93''$ say 45'' d prov. = 49''

Max Shear = 93.79k

Actual Shear $= 93.79 - \left(\frac{49+24}{12} \times 6.15^k\right) = 56.37^k$

$\frac{56{,}370}{12 \times 49} = 95$ psi > 70 psi

$v' = 25$ psi try #3 bars

$S = \frac{A_v f_v}{v' b} = \frac{2 \times 0.11 \times 20{,}000}{25 \times 12} = 14.66''$ #3 @ 10'' o/k

$A_s = \frac{446.3'k}{1.44 \times 49} = 6.33\,\square'' \times 2' = 12.66\,\square''$ - 8 #11 = 12.48 □''

(Note: drawings show 6 #11 bottom face)

Top face

$M = 266.8'^k$ Reduce $= 268.8 - \frac{93.79}{6}(3.5) = 214.1'^k$

d o/k by observation

$\frac{M}{a d} = \frac{214.1}{1.44 \times 49} = 3.03\,\square'' \times 2 = 6.06$ Use 6 #9 Bars

Drawing Show 4-#9 bars

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

Roof Slab (Cont)

Check Bond: Allow #11 = 153 psi

Perimeters
4 #11 per/ft = 17.72"

$U = \dfrac{56{,}370^{\#}}{17.72 \times 0.88 \times 49} = 73 < 153$ ok

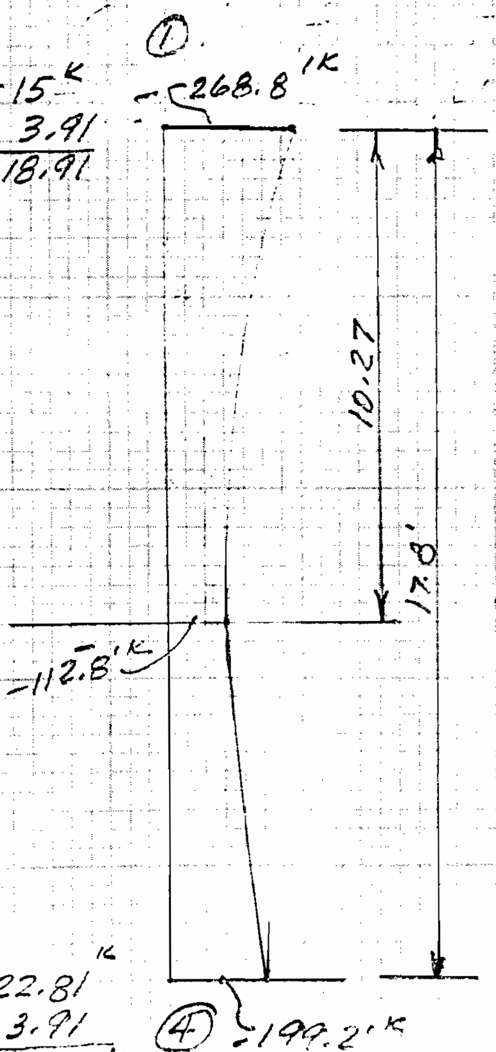
Perimeters
3 #9 per/ft = 10.63"

$\dfrac{56{,}370^{\#}}{10.63 \times 0.88 \times 49} = 122 < 191$ ok

Side Walls

Shear Correction $= \dfrac{-199.2 + 268.8}{17.8} = +3.91$

+15^k
+3.91
18.91



-22.81^k
+3.91
18.90^k

+Mom.

$\triangle = \dfrac{7.8^k}{15^k} \times 18.91^k = 9.83^k = R$

$= 9.08^k = R$

$\dfrac{9.83^k \times 10.27' \times 2}{3} = 67.3'^k$

Point of Zero Shear for uniform Load

$\dfrac{9.08' + \left(\dfrac{7.2}{22.81} \times 18.9\right)}{17.8'} = 0.845$

$\dfrac{9.08}{0.845} = 10.75'$

$M = \dfrac{10.75' \times 9.08}{2} - \left(10.75 - 10.27 \times \dfrac{9.08}{10.75} \times .5\right)$

$M = 48.6$

$\Sigma M = 48.6'^k + 67.3'^k = 115.9'^k$

$\dfrac{268.8'^k - 199.2'^k}{17.8} \times 10.27 = 40.1'$

$268.8 - 40.1 = -228.7'^k$

$-228.7'^k + 115.9 = -112.8'^k$

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GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

Side Walls (Cont.)

Outside face: "d" provided = 39"

Max Moment = 268.8

$d_{reqd} = \sqrt{\frac{268{,}800 \times 12}{221 \times 12}} = 34.87'' < 39''$

Reduce Moment

$268.8'^{K} - \frac{18.9^{K} \times 4.08}{6} = 255.9'^{K}$

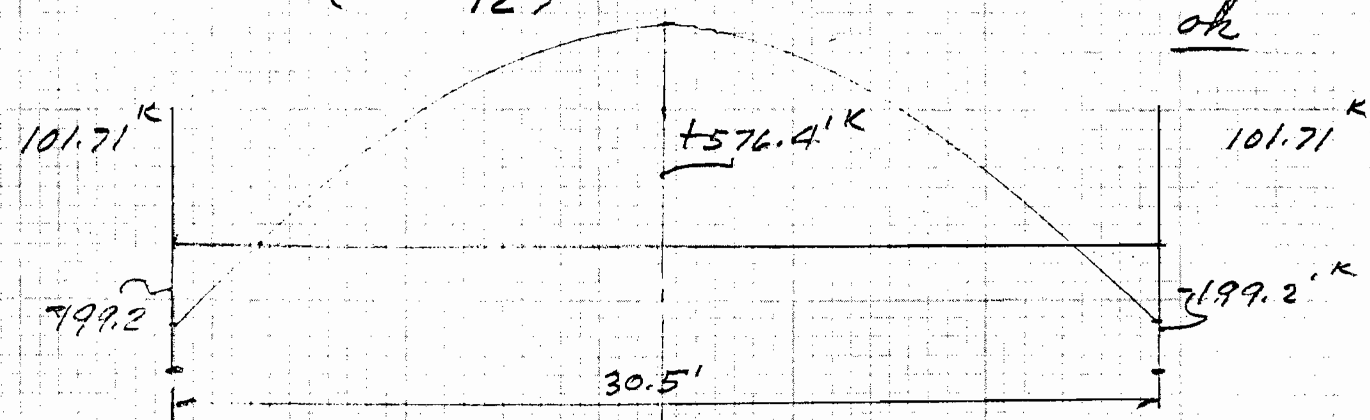
$A_s = \frac{255.9'^{K}}{1.44 \times 39} = 4.56\,\square''$ per ft for 2' = 9.12 □ or 6 #11 equally Spaced

Max Shear = 18.9^{K} Max allowable = $12'' \times 39'' \times 70^{psi} = 32.76^{K}$

Bottom Slab

+Moment $= \frac{101.71 \times 15.25}{2} - 199.2 = 576.4'^{K}$

Max Shear @ d-dist. $= 101.71^{K} - \left(6.67 \times \frac{60+21}{12}\right) = 56.69'^{K}$ $\frac{56{,}690}{12 \times 60} = 78$ psi > 70 psi but w/ longit steel ok



$d_{reqd} = \sqrt{\frac{576{,}400 \times 12}{221 \times 12}} = 51''$ 60" provided

$\frac{576.4}{1.44 \times 56} = 14.3\,\square''$

$A_s = \frac{576.4'^{K}}{1.44 \times 60} = 6.67\,\square'' \times 2 = 13.34\,\square$

{ 5 #11 top layer
5 #11 Bottom layer } = 15.6 □" however "d" is reduced to 56"

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION UNDER EAST WALL OF GATE STRUCTURE

Bottom Slab (cont.)

$-$Moment @ Support $= 199.2'^{k}$

Reduce $199.2'^{k} - \dfrac{101.71 \times 3.5}{6} = 139.9'^{k}$

$As = \dfrac{139.9}{1.44 \times 60} = 1.61^{\square''} \times 2 = 3.22^{\square''}$ #8 @ $5\frac{1}{2}''$ o.k

DESIGN OF BOX SECTION @ WEST END OF INTER. SUPPORT

Loading: Roof Slab.

Back fill $= 6.5 @ 100^{\#} = .65$

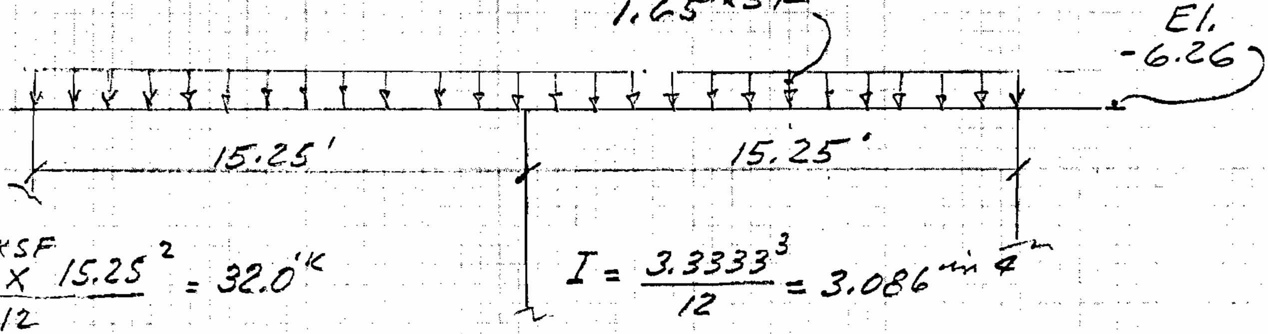
$2.0 @ 162.5 = \underline{.325}$

$.975$ Call 1.0^{KSF}

Conc. $3.33 \times .15^{k} = 0.5^{KSF}$

L.L. $= \underline{.15}^{KSF}$

1.65^{KSF}



$FEM = \dfrac{1.65^{KSF} \times 15.25^2}{12} = 32.0'^{k}$

$I = \dfrac{3.3333^3}{12} = 3.086^{in^4}$

$V = \dfrac{1.65^{KSF} \times 15.25}{2} = 12.58'^{k}$

$\dfrac{I}{L} = 0.2023$

Loading: Outside Wall (see Sheet 22)

FEM @ top $= 49.2'^{k}$

Sheer @ top $= 15.0^{k}$

FEM @ Bott. $= 63.1^{k}$

Shear @ Bott. $= 22.81^{k}$

Sheet 23

$\dfrac{I}{L} = 0.2006$

Loading: Base Slab

Walls @ 2.0' Wide

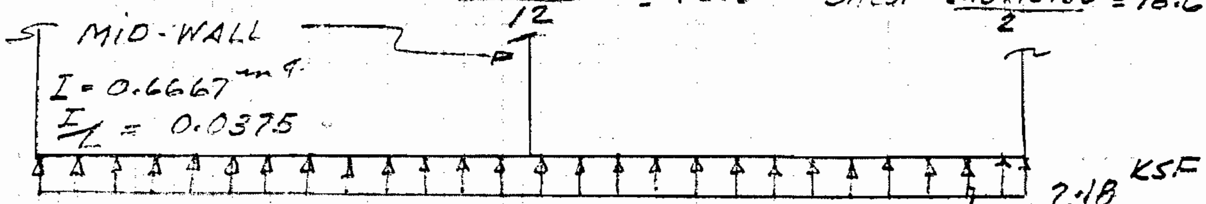
$\dfrac{2' \times 17.8 \times 0.15 \times 3}{30.5} = 0.53^{KSF}$

Roof $\underline{1.65}$

2.18^{KSF}

$FEM = \dfrac{2.18^{KSF} \times 15.25^2}{12} = 42.3'^{k}$

$Shear = \dfrac{2.18^{KSF} \times 15.25}{2} = 16.62$



$I = \dfrac{3.25^3}{12} = 2.86^{in^4}$ $\dfrac{I}{L} = 0.1876$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION @ WEST END OF INTER. SUPPORT WALL

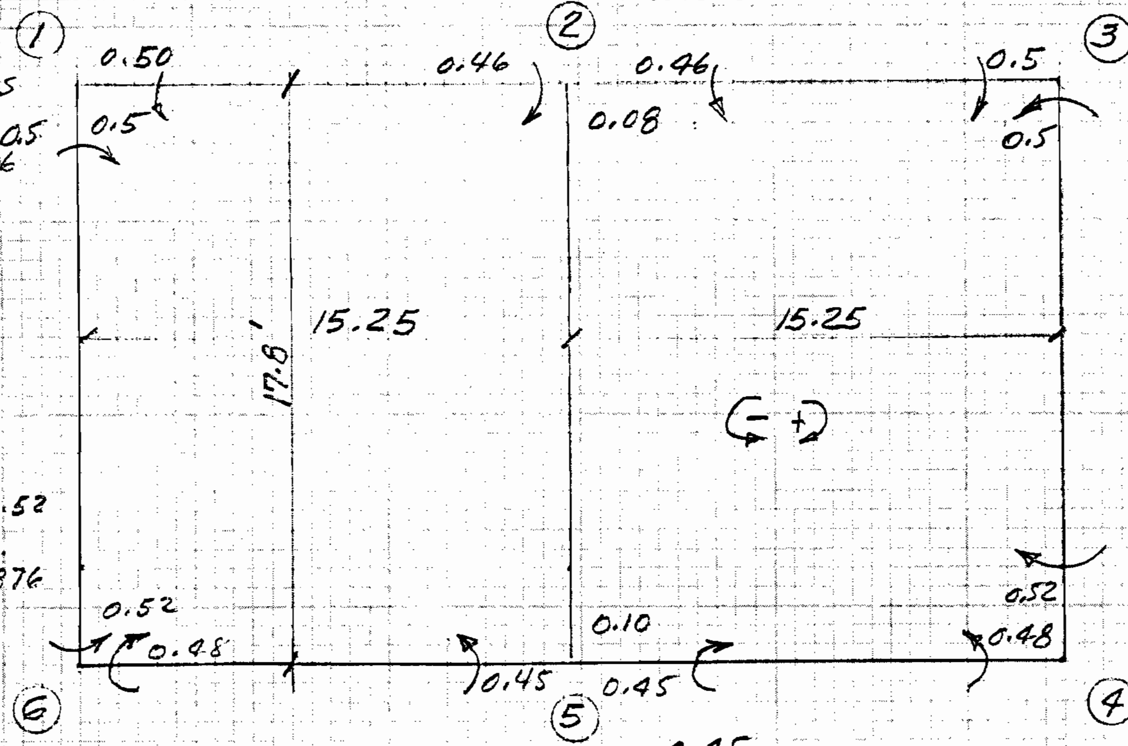
Moment Distribution

$\frac{0.2023}{0.2023+0.2023+0.0375} = 0.46$

Dist. Factors

$\frac{0.2023}{0.2023+0.2006} = 0.5$

$\frac{0.2006}{0.2006+0.1876} = 0.52$



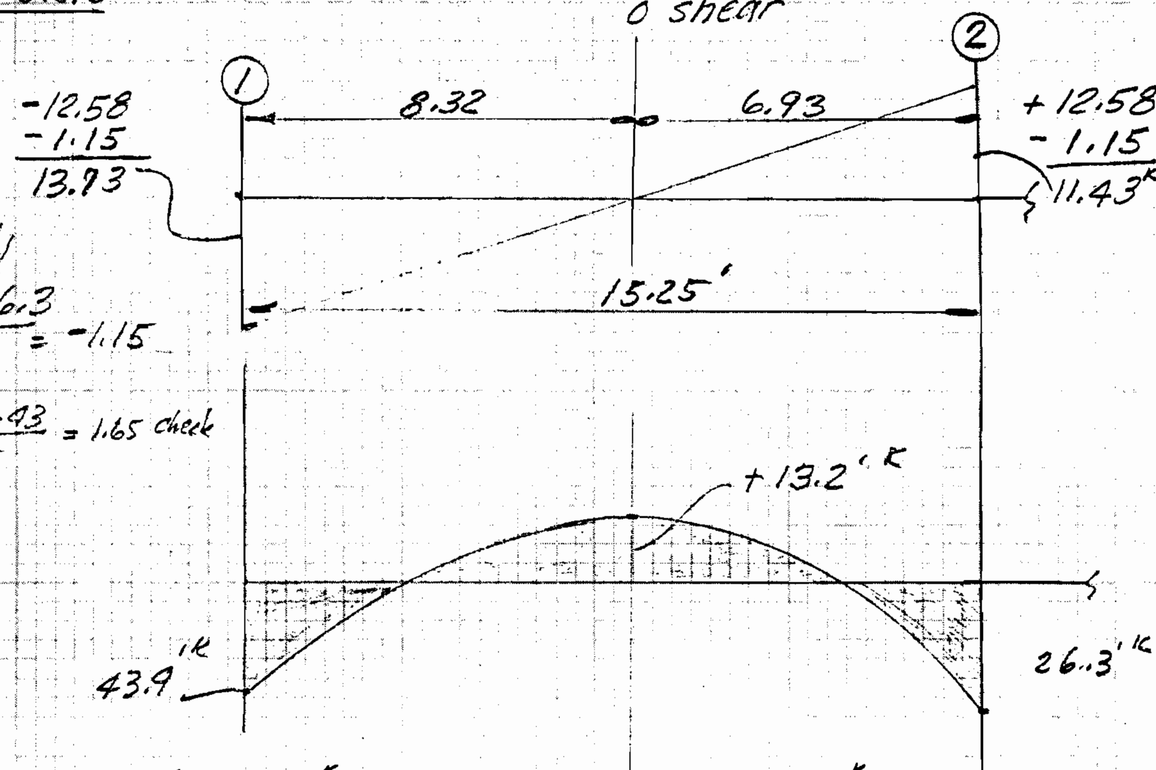
$\frac{0.1876}{0.1876+0.1876+0.0375} = 0.45$

Jt.	1		2			3		4		5			6	
MEM	1-6	1-2	2-1	2-5	2-3	3-2	3-4	4-3	4-5	5-4	5-2	5-6	6-5	6-1
DF	0.5	0.5	0.46	0.08	0.46	0.5	0.5	0.52	0.48	0.45	0.10	0.45	0.48	0.52
FEM	+49.2	-32.0	+32.0	0	-32.0	+32.0	-49.2	+63.1	-42.3	+42.3	0	-42.3	+42.3	-63.1
1st D	-8.6	-8.6	0	0	0	+8.6	+8.6	-10.8	-10.0	0	0	0	+10.0	+10.8
CO	+5.4	0	-4.3	0	+4.3	0	-5.4	+4.3	0	-5.0	0	+5.0	0	-4.3
2nd D.	-2.7	-2.7	0	0	0	+2.7	+2.7	-2.2	-2.1	0	0	0	+2.1	+2.2
CO	+1.1	0	-1.4	0	+1.4	0	-1.1	+1.4	0	-1.1	0	+1.1	0	-1.4
3rd D	-0.6	-0.6	0	0	0	+0.6	+0.6	-0.7	-0.7	0	0	0	+0.7	+0.7
Final	+43.9	-43.9	+26.3	0	-26.3	+43.9	-43.9	+55.1	-55.1	+36.2	0	-36.2	+55.1	-55.1

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION @ WEST END OF INTERM. SUPPORT WALL

Top Slab



Shear Adj

$$\frac{-43.9+26.3}{15.25} = -1.15$$

$$\frac{13.73+11.43}{15.25} = 1.65 \text{ check}$$

$$+M = \frac{8.32' \times 13.73^K}{2} - 43.9'^K = 13.2'^K \qquad \frac{11.43^K \times 6.93'}{2} - 26.3'^K = 13.3'$$

Max Moment = $43.9'^K$ $d = 37''$ available

$$d \text{ req'd} = \sqrt{\frac{43,900 \times 12}{221 \times 12}} = 14'' < 37$$

$$v = \frac{13,730^{\#}}{12 \times 37} = 31 psi < 70 psi$$

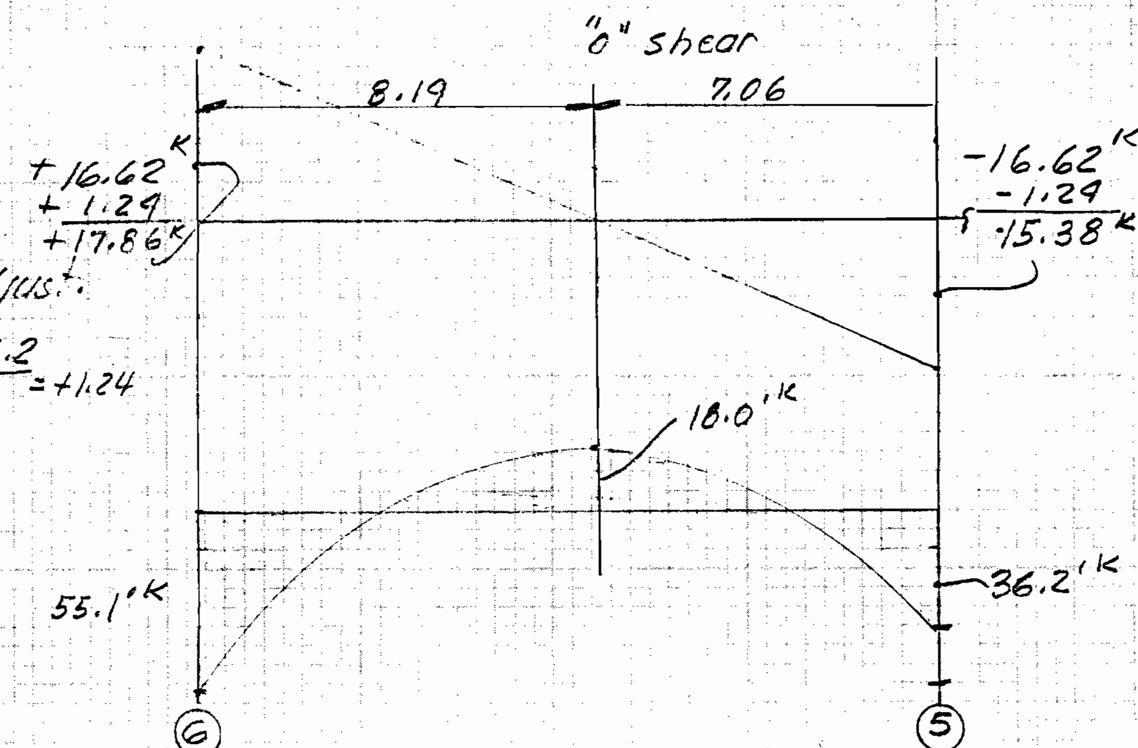
$$As = \frac{13.2'^K}{1.44 \times 37} = 0.26^{\square''} \times 7 = 1.82^{\square} < 15 \#7 \text{ bars} = 9^{\square''}$$

$$As = \frac{43.9'^K}{1.44 \times 37} = 0.82^{\square''} \times 7 = 5.74^{\square''} < 8\text{-}\#8 \text{ bars} = 6.32^{\square''}$$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION @ WEST END OF INTERM. SUPPORT WALL

Bottom Slab



Shear Adjust.

$$\frac{+55.1-36.2}{15.25} = +1.24$$

$$+M = \frac{17.86^K \times 8.19'}{2} - 55.1 = 18.0'^K \qquad \frac{15.38^K \times 7.06'}{2} - 36.2'^K = 18.0'^K$$

Max Mom = $55.1'^K$ $d = 36''$

$$d\ reqd = \sqrt{\frac{55{,}100 \times 12}{221 \times 12}} = 16'' < 36''$$

$$v = \frac{17{,}860}{12 \times 36} = 41_{psi} < 70\ psi$$

$$As = \frac{18'^K}{1.44 \times 36} = 0.35\ \square'' \times 7 = 2.45\ \square'' < 15\text{-}\#7\ bar = 9\ \square''$$ ok

Reduce $55.1'^K$; $55.1 - \frac{17.86^K \times 5'}{6} = 40.21'^K$

$$As = \frac{40.21'^K}{1.44 \times 36''} = .78\ \square'' \times 7 = 5.46\ \square'' < 8\ \#8\ bars = 6.32\ \square''$$ ok

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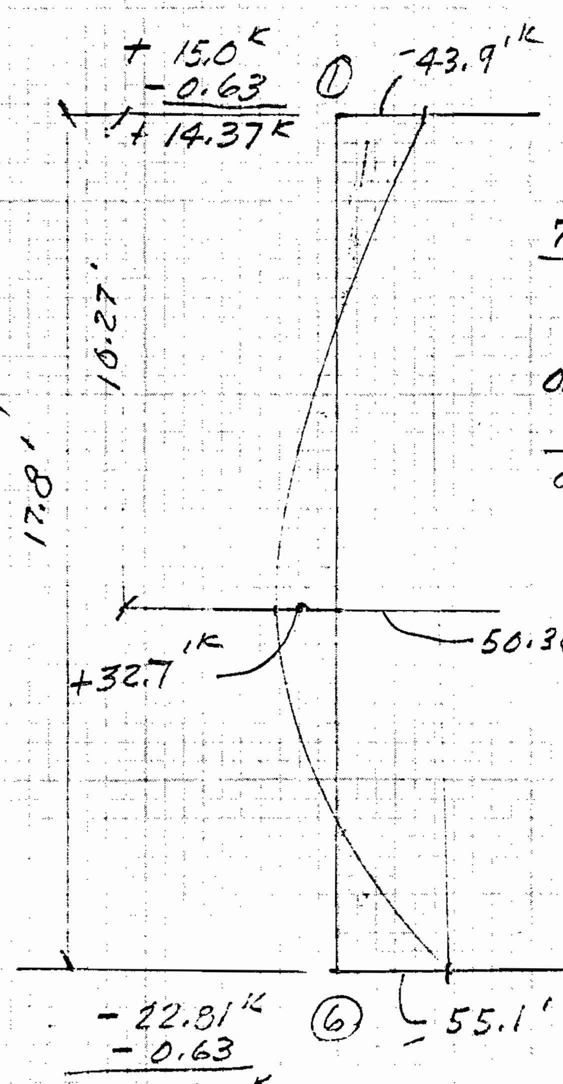
ITEM ______ BY LWC DATE 10-17-79
JOB No 575-79-E CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL
DESIGN OF BOX SECTION @ WEST END OF INTERM. SUPPORT WALL
Side Walls

Shear adj.

$$\frac{+43.9-55.1}{17.8} = -0.63$$



Δ $\frac{7.8}{15} \times 14.37^K = 7.47^K$

$\square$ $= 6.9^K$

$+14.37$

$\frac{7.47^K \times 10.27' \times 2}{3} = 51.1'^K$

$\frac{7.2^K}{22.81^K} \times 23.44^K = 7.4^K$

$\frac{7.4^K + 6.9}{17.8} = 0.8033^{KF}$

$\frac{7.4^K}{0.8033} \times 6.9 \times .5 = 32'^K$ $\Sigma M = 51.1'^K + 32'^K = 83.1'^K$

$\frac{6.9}{0.8033} \times 7.4 \times .5 = 32'^K$

$\frac{55.1'^K - 43.9'^K}{17.8} \times 10.27' + 43.9 = \begin{array}{r} 83.10'^K \\ -50.36 \\ \hline 32.74'^K \end{array}$

Max Moment = $55.1'^K$

min "d" = 22"

$d = \sqrt{\frac{55{,}100 \times 12}{221 \times 12}} = 15.78 < 22"$

$d + \frac{1}{2}d = 33" = 2.75'$

Actual Max Shear = $23.44 - \left(\frac{23.44}{17.8'} \times 2.75'\right)$
$= 19.81^K$

$v = \frac{19{,}810}{12 \times 22} = 75$ psi   Close enough thinest part of wall

Reduce Moment

$-55.1'^K - \frac{23.44 \times 3.25}{6} = 42.4'^K$ As +M o/k by observation

$A_s = \frac{42.4'^K}{1.44 \times 22} = 1.34^{\square"} \times 7' = 9.36^{\square"} < 14\#8 = 11.06$

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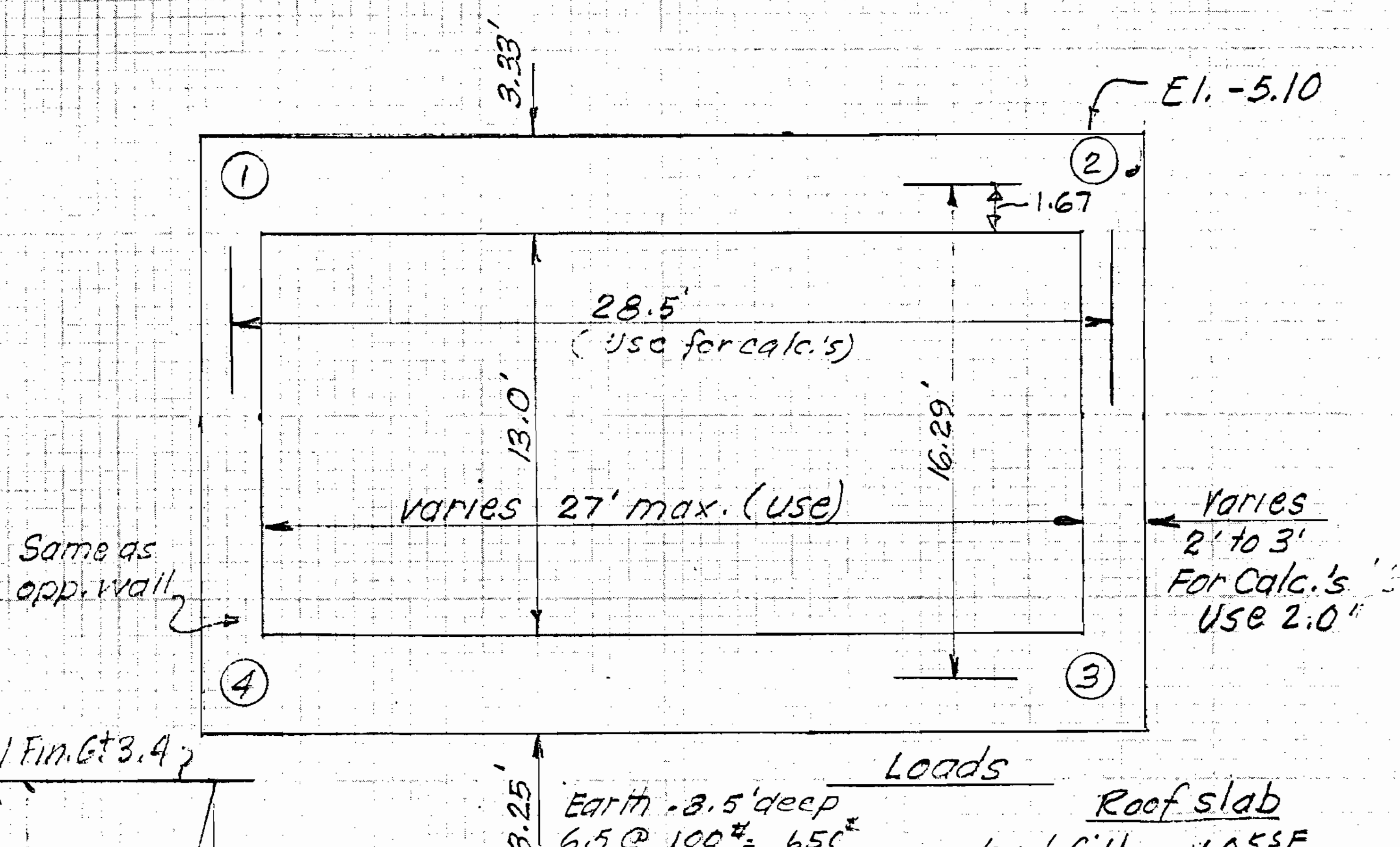
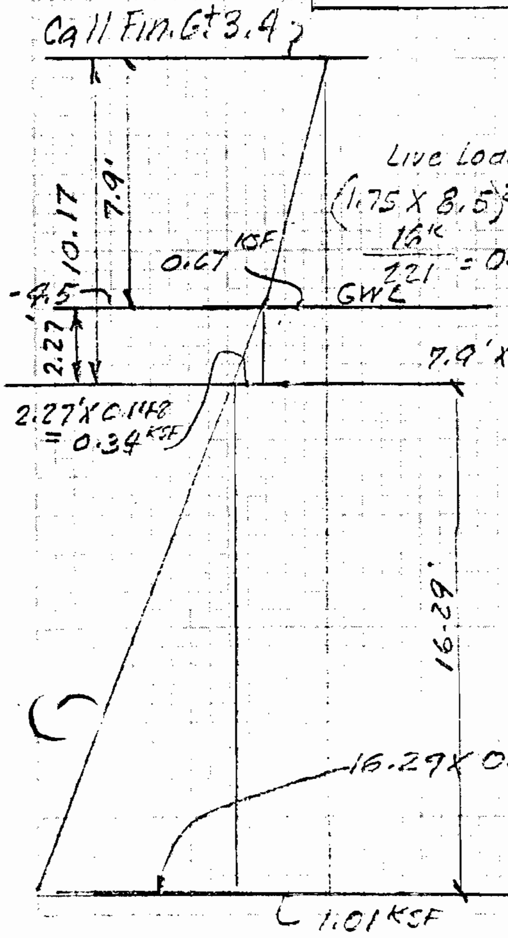
JOB	SHEET Nº 44 OF	
ITEM	BY LWC	DATE 10-17-79
JOB Nº 575-79 E	CHKD. BY	DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX SECTION @ 7' EAST OF EAST WALL-GATE STRUCT.





Live Load

$(1.75 \times 8.5)^2 = 221$

$\frac{16^k}{221} = 0.072 \times 2$ wheels $= 0.14$

Say 0.15 KSF

Loads

Earth - 8.5' deep

6.5 @ 100# = 650#

2.0 @ 162.5 = 325#

975

Say 1.0 KSF

Roof slab

backfill	1.0 KSF
Conc.	0.5 KSF
LL	0.15
	1.65 KSF

Walls - uniform 1.01 KSF

Triang. 2.41 KSF @ Fl. Slab

Base Slab

Roof	1.65
Walls - 2.5' x 16.29'	.28 KSF
	1.93 KSF

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION @ 7' EAST OF EAST WALL - GATE STRUCTURE

Fixed End Moments and Shears

Member 1-2 2-1

$FEM = 1.65^{KSF} \times 28.5^2 \times 0.0833 = 111.7'^K$

$V = 1.65^{KSF} \times 28.5 \times 0.5 = 23.51^K$

Member 1-4 4-1 and 2-3 3-2

@ 1 or 2

Uniform Load

$FEM = 1.01^{KSF} \times 16.29^2 \times 0.0833 = 22.33'^K$

Triang. Load

$\frac{2.41^{KSF}}{2} \times 16.29^2 \times 0.0667 = 21.33'^K$

$\Sigma\ 43.7'^K$

Shear

$= 1.01^{KSF} \times 16.29' \times 0.5 = 8.23'^K$

$= \frac{2.41^{KSF}}{2} \times 16.29' \times \frac{1}{3} = 6.54$

$\Sigma\ 14.77$

@ 3 or 4

FEM

$= 22.33'^K$

$= \frac{2.41^{KSF}}{2} \times 16.29^2 \times 0.1 = 31.97'^K$

$53.4'^K$

Shear

$= 8.23^K$

$= \frac{2.41^{KSF}}{2} \times 16.29' \times \frac{2}{3} = 13.08$

$\Sigma\ 21.31^K$

Member 4-3 3-4

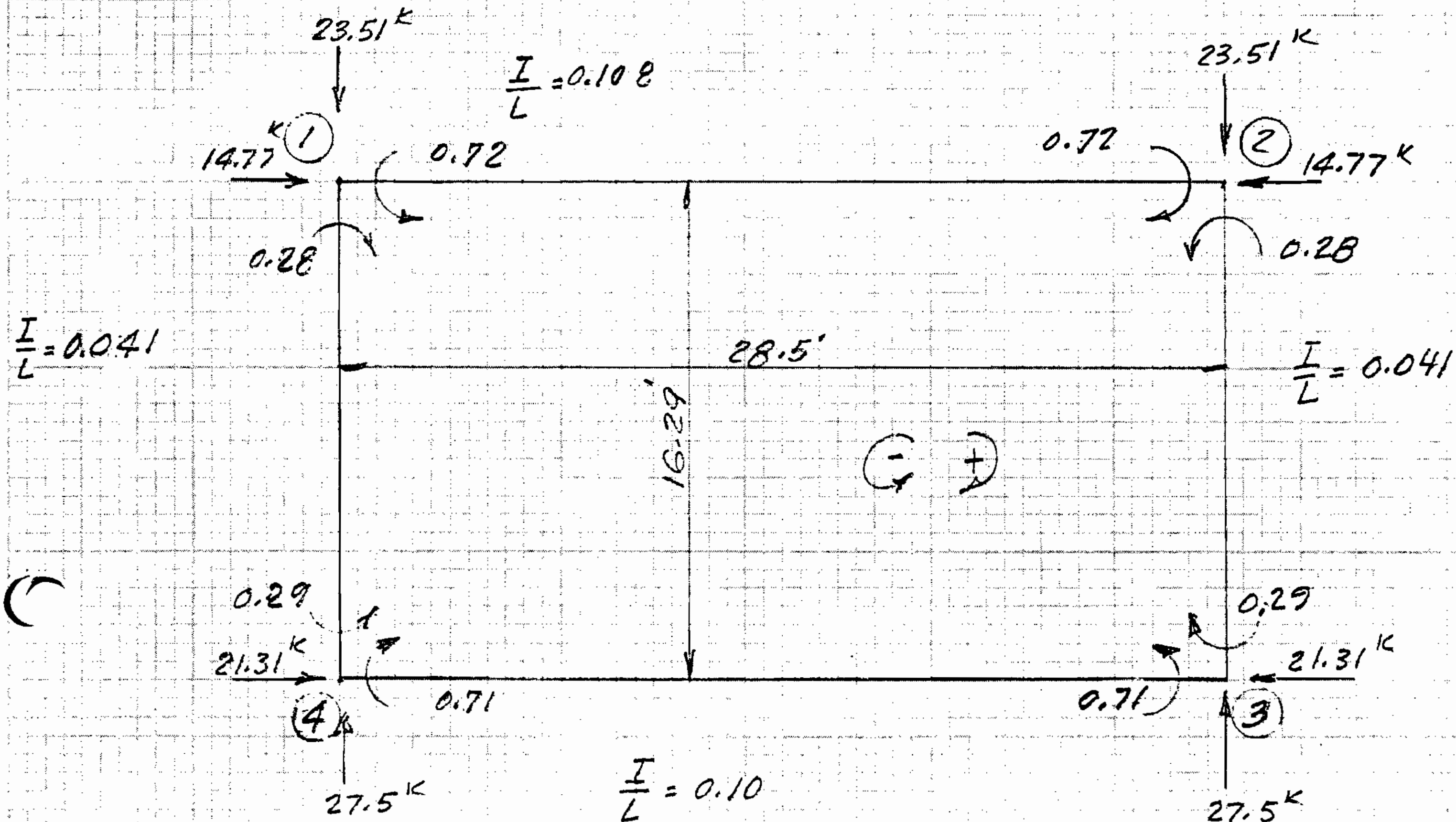
$FEM = 1.93^{KSF} \times 28.5^2 \times 0.0833 = 130.5'^K$

$Shear = 1.93^{KSF} \times 28.5 \times 0.5 = 27.5^K$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX SECTION @ 7' EAST OF EAST WALL - GATE STRUCT.

Moment Distribution



Jt.	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
DF	0.28	0.72	0.72	0.28	0.29	0.71	0.71	0.29
FEM	+43.7	-111.7	+111.7	-43.7	+53.4	-130.5	+130.5	-53.4
1st Dist.	+19.0	+49.0	-49.0	-19.0	+22.4	+54.7	-54.7	-22.4
CO	-11.2	-24.5	+24.5	+11.2	-9.5	-27.4	+27.4	+9.5
2nd Dist	+10.0	+25.7	-25.7	-10.0	+10.7	+26.2	-26.2	-10.7
CO	-5.4	-12.9	+12.9	+5.4	-5.0	-13.1	+13.1	+5.0
3rd Dist	+5.1	+13.2	-13.2	-5.1	+5.2	+12.9	-12.9	-5.2
CO	-2.6	-6.6	+6.6	+2.6	-2.6	-6.5	+6.5	+2.6
4th Dist	+2.6	+6.6	-6.6	-2.6	+2.6	+6.5	-6.5	-2.6
	+61.2	-61.2	+61.2	-61.2	+77.1	-77.1	+77.1	-77.1

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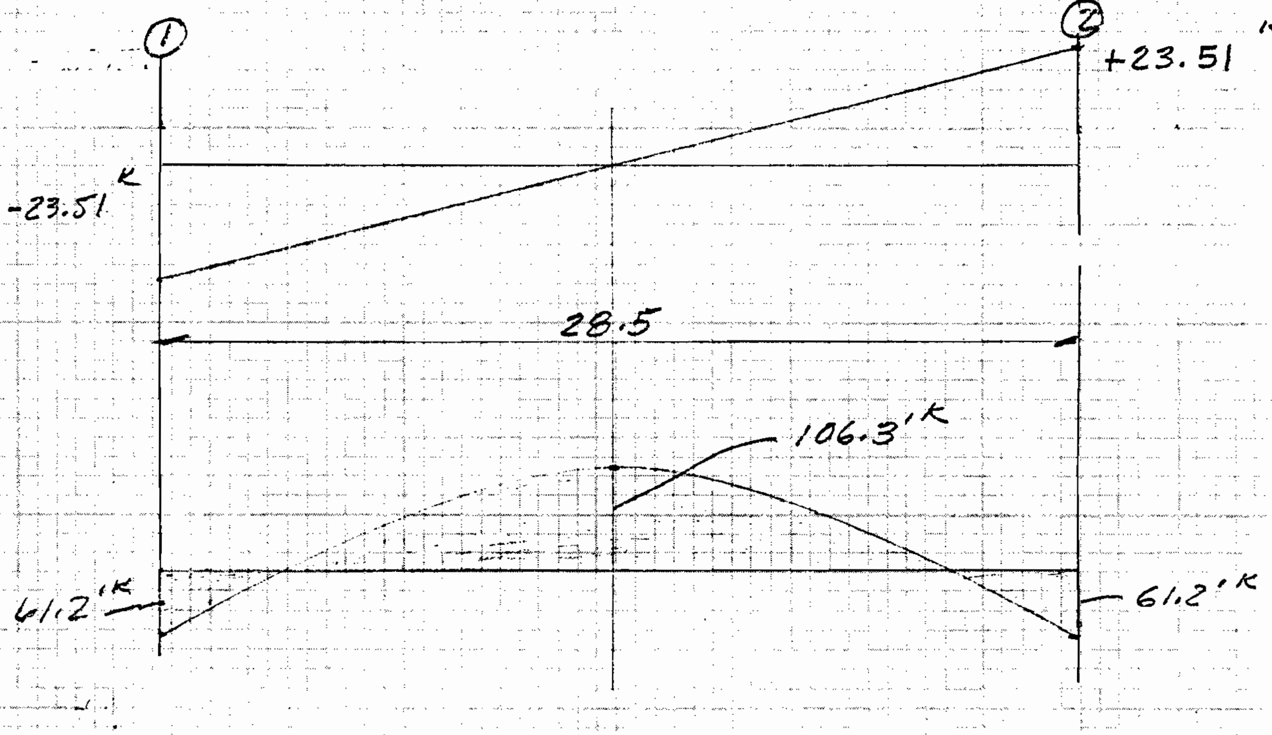
JOB
ITEM
JOB No 575-79-E

SHEET No 46 OF
BY LWC DATE 10-18-79
CHKD. BY DATE

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX SECTION @ 7' EAST OF EAST WALL-GATE STRUCTURE

Roof Slab



$+M = 23.51 \times \frac{28.5}{2} \times 0.5 - 61.2'^{K} = 106.3'^{K}$

Max Mom. = 106.3 'K "d" provided = 37"

$"d" \text{ req'd} = \sqrt{\frac{106,300 \times 12}{221 \times 12}} = 15" < 37"$

V provided = $70^{psi} \times 12" \times 37" = 31.08^{K} > 23.51^{K}$

Reinforcement

1. @ Support (Top face)

$\frac{61.2'^{K}}{1.44 \times 37"} = 1.15^{\square'} <$ #8@6 provided = $1.58^{\square"}$ U o/k

2. @ Midspan (Bottom face)

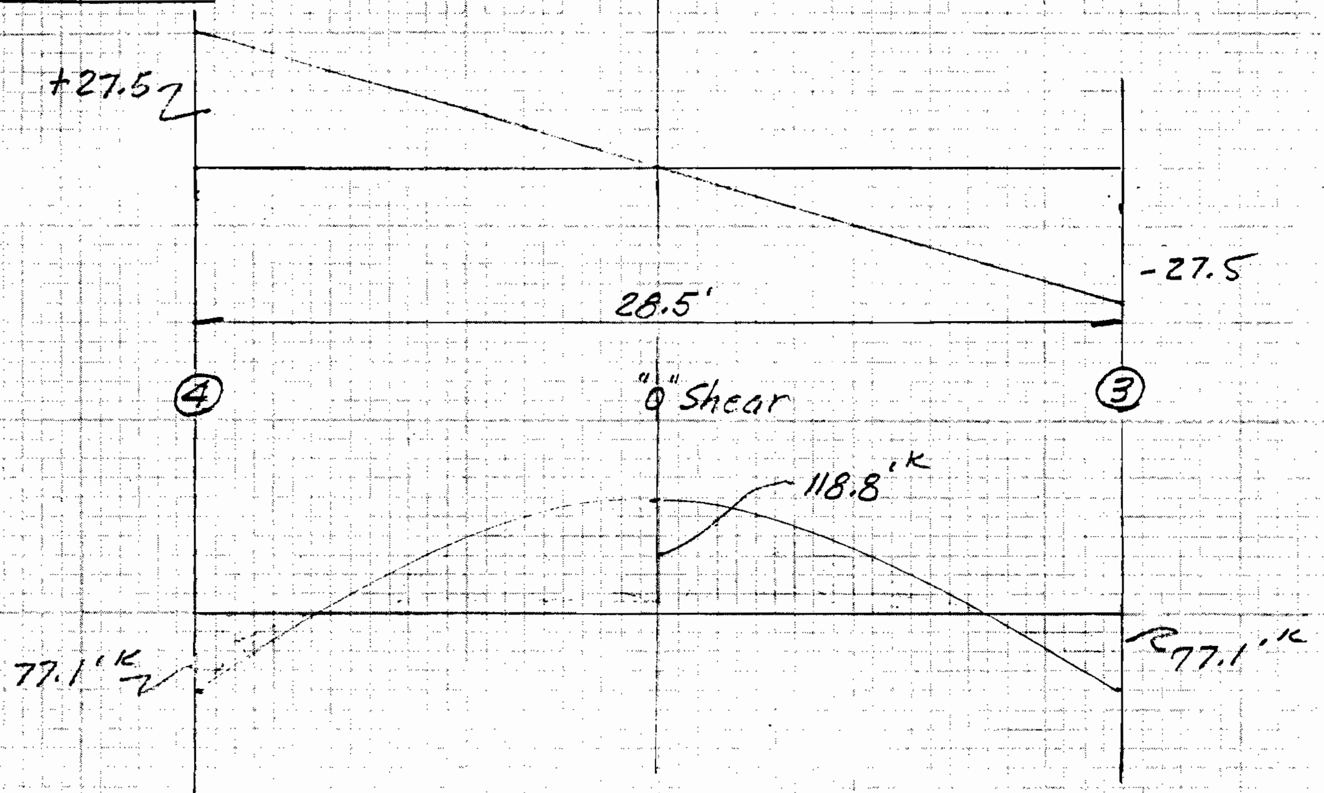
$\frac{106.3'^{K}}{1.44 \times 37} = 2.0^{\square"} <$ #11@6 = $3.12^{\square"}$

$U = \frac{23,510^{\#}}{2 \times 4.43 \times 0.88 \times 37"} = 81.49 psi < 215 psi$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

DESIGN OF BOX STRUCTURE @ 7' EAST OF EAST WALL OF GATE STR'T.

Bottom Slab



$+\text{Moment} = 27.5^{k} \times \frac{28.5}{2} \times 0.5 - 77.1'^{k} = 118.8'^{k}$

Max Moment = $118.8'^{k}$ "d" provided = 36"

"d" req'd = $\sqrt{\frac{118{,}800 \times 12}{221 \times 12}} = 23" < 36"$

V provided = $70\,psi \times 12 \times 36 = 30.24^{k} > 27.5^{k}$

Reinforcement

@ Outside Wall (Bottom face)

$77.1'^{k} - \frac{VaL}{6} = 77.1 - \frac{27.5(2)}{6} = 67.9'^{k}$

$\frac{67.9'^{k}}{1.44 \times 36} = 1.3^{\square"} < \#8 @ 6 = 1.58^{\square'}$ Bond ok

@ Midspan (Top face)

$\frac{118.8'^{k}}{1.44 \times 36} = 2.29'^{k} < \#11 @ 6 = 3.12^{\square'}$

$U = \frac{27{,}500^{\#}}{2 \times 4.43 \times 0.88 \times 37} = 95\,psi < 215\,psi$

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BY LWC DATE 10-18-79
CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

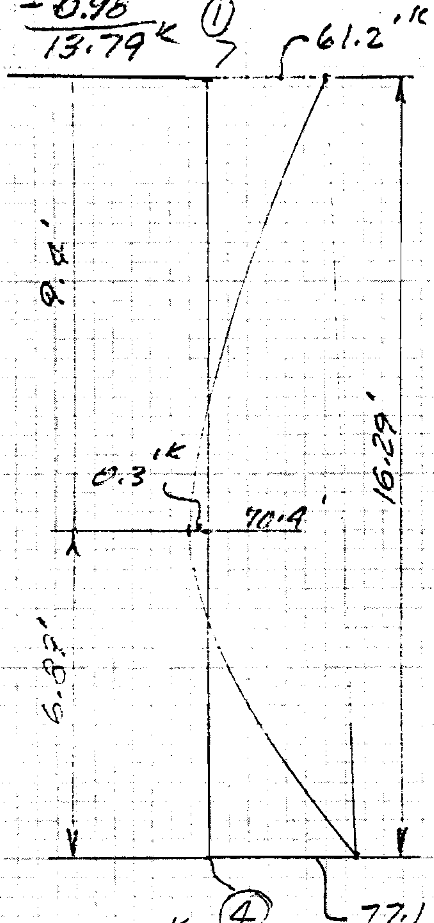
DESIGN OF BOX SECTION @ 7' EAST OF EAST WALL - GATE STRUCTURE

Side Walls:

$\frac{6.59}{14.77} \times 13.79 = 6.11^k \triangle$

7.68 ▯

$+ 14.77^k$
$- 0.98$
13.79^k ①



-21.31^k
$-\ .98$
22.29^k

$\frac{13.08}{21.31} \times 22.29 = 13.68^k$

$\triangle = 13.68^k$

▯ $= 8.61^k$

Shear adjustment $= \frac{+61.2 - 77.1}{16.29} = -0.98^k$

Simple Moment $= \frac{(6.11^k)(.577 \times 16.29)(2)}{3}$ 9.4' $= 38.28$

$\frac{8.61^k + 7.68}{16.29} \times 6.89 \times 0.5 \times 9.4$ $= 32.38$

$\Sigma = 70.66$ a 9.4 from ①

$61.2'^k + [9.4 \times 0.98] = 70.4'^k$

$+M = 70.7'^k - 70.4'^k = 0.3'^k$

Max $M = 77.1'^k$ $d = 22''$ (Smallest) Varies

$d = \sqrt{\frac{77{,}100 \times 12}{221 \times 12}} = 18.67'' < 22''$

$\frac{\overset{d}{36''} + \overset{\frac{1}{2}d}{12''}}{12} = 4.0'$

$\frac{22.29^k + 13.79^k}{16.29} \times 4.0' = 8.86^k$

$V = 22.29^k - 8.86^k = 13.43^k$

$\frac{13{,}430\#}{12 \times 22} = 51 \text{ psi} < 70 \text{ psi}$

$77.1'^k - \frac{Va}{6} = 77.1 - \frac{22.29^k \times 3}{6} = 66.0'^k$

$A_s = \frac{66.0}{1.44 \times 22} = 2.08 \square'$ 24" Wall

$34 = 1.34$ 36" Wall

15 #8 bars shown on Sec. 5 (Pepper dwg)

FLORIDA AVENUE DRAINAGE CANAL

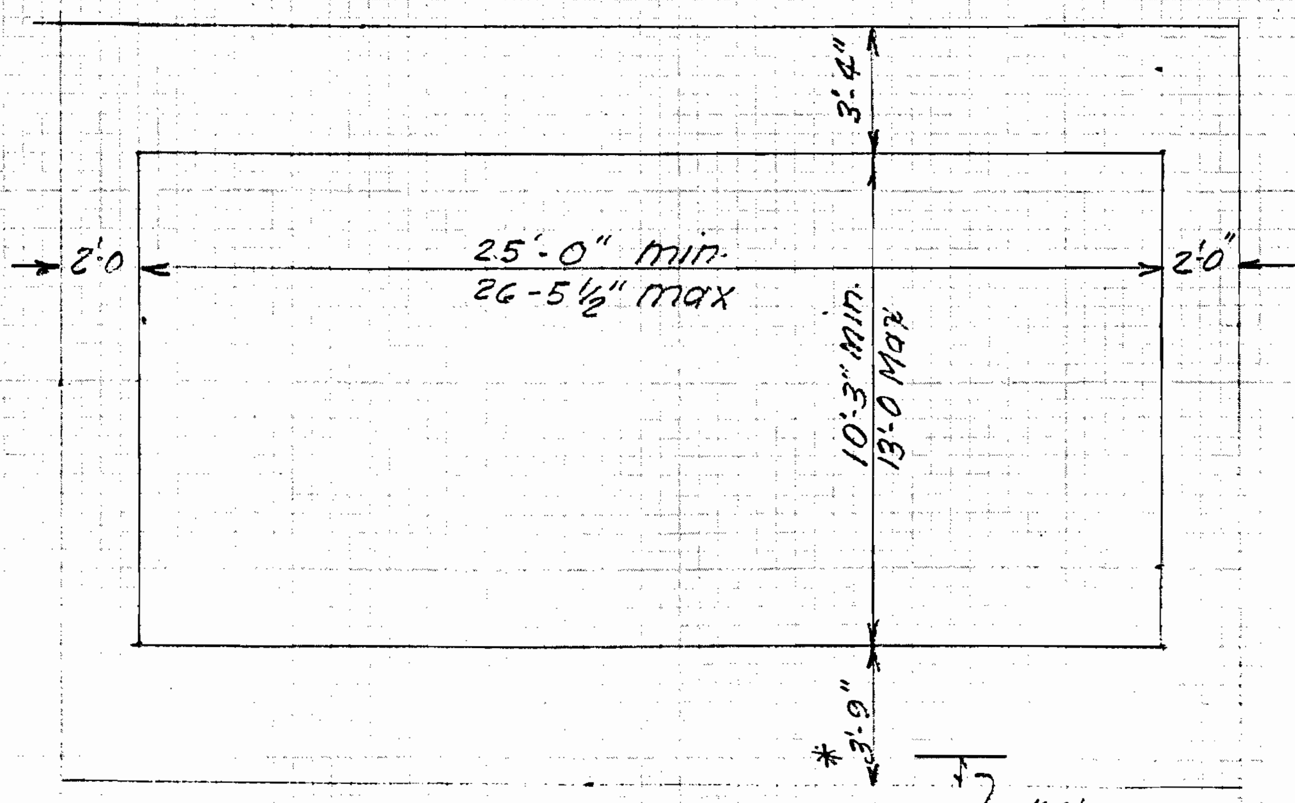
DESIGN OF BOX CULVERT

Notes: Size of culvert varies from 10'-3" to 13'-0 inside height and from 25'-0" to 26'-5½" in width. The walls have been presented as 2 feet thick with "d" = 21". The top slab is shown 3'-4" thick, "d" = 37". The bottom slab is 3'-9" with 7" clr. @ bottom and 2" clr. @ top. d = 36".

Use a consistent cover of 10' (with GWL @ 7.9' below surface. Wt of earth @ 100#/cu. ft., for lateral pressures K = 0.85 (COE).

Culvert empty, backfill in place, is critical by inspection. This will be known as Case I. Case II will be with backfill in place and conduit filled with water.

The culvert will be examined and calculations will be made for smallest and largest size.



* Use 3'-2" for distribution because of 7" clr.

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FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (min size) Loading

1. Roof slab. - Earth $= 100^{\#}/\text{cu. ft} \times 10 =$ 1.0^{KSF}

Live Load (A.A.SH.O.) L.L. $= 0.15^{KSF}$

$a = 1.75\ h = 17.5'$ $A = \frac{a}{2} + 3 = 11.75$

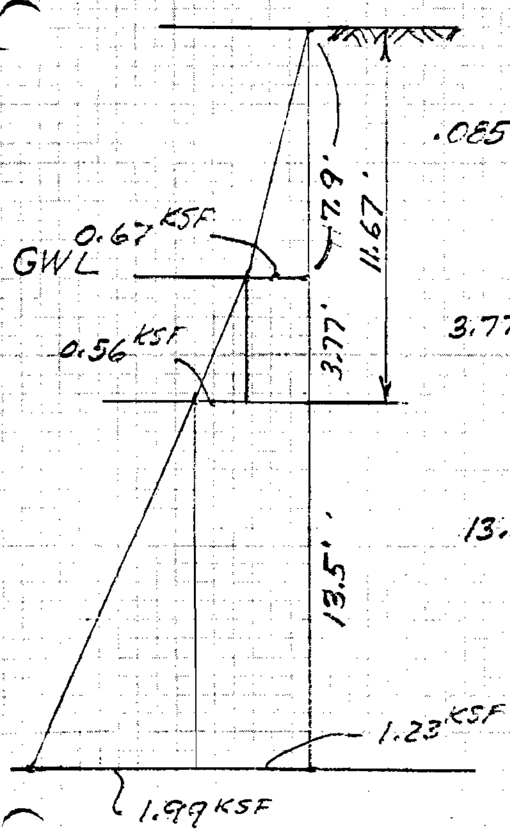
$b = 1.75\ h = 17.5$ $B = \frac{b}{2} + 7 = 15.75$

$\frac{16^{K}}{11.75 \times 15.75} = 87^{\#}/\text{sq ft}$ Use $150^{\#}$

Conc $= 3.33 \times 0.15 =$ 0.50

$\Sigma = 1.65^{KSF}$

2. Side Walls =



$.085^{K} \times 7.9' = 0.67^{KSF}$

$3.77\,(0.085 + 0.0625) = 0.56^{KSF}$

$13.5 \times (0.085 + 0.0625) = 1.99^{KSF}$

3. Floor slab

wt Top slab $= 1.65$

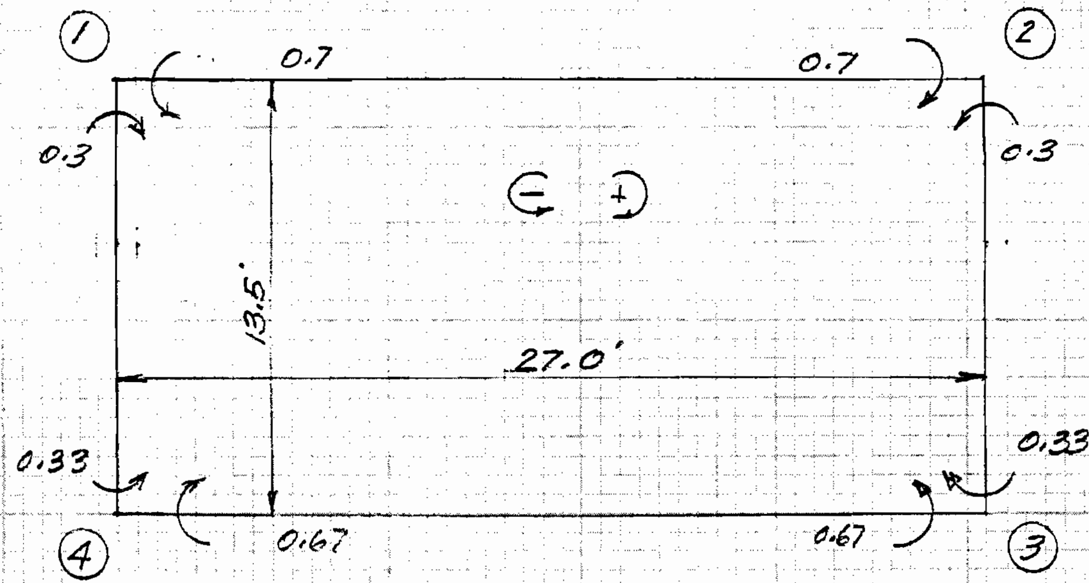
Side W. $= \frac{11.84 \times 2 \times 0.15^{K} \times 2}{27}$ $= 0.26$

1.91^{KSF}

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (min. size)



Jt. 1 and 2

$\frac{0.114}{0.114+0.049} = 0.70$

$= 0.30$

Dist. Factors

Top Slab 1-2 - 2-1

$I = \frac{3.33^3}{12} = 3.077\ ft.^4$

$\frac{I}{L} = .114$

Jt. 3 and 4

$\frac{0.098}{0.098+0.049} = 0.67$

0.33

Side Walls 1-4 4-1
2-3 3-2

$I = \frac{2.0^3}{12} = 0.667\ ft^4$

$\frac{I}{L} = 0.049$

Fixed End Moments- Simple Shears

Member 1-2 2-1 (Top Slab)

$\frac{1.65^{ksf} \times 27^2}{12} = 100.24^{fk} = FEM$

$\frac{1.65^{ksf} \times 27'}{2} = 22.28^{k} = V$

Bott. Slab 4-3 3-4

$I = \frac{3.17^3}{12} = 2.654\ ft^4$

$\frac{I}{L} = 0.098$

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

CASE I (min. size)

Fixed End Moments · Simple Shears

Member ①-④ ④-① ②-③ ③-② (sides)

Top

$$\frac{1.23^{KSF} \times 13.5^2}{12} = 18.68'^K$$

$$\frac{1.99 \times 13.5^2}{2} \times \frac{1}{15} = \underline{12.08}$$

$$30.76'^K = FEM$$

$$\frac{1.23^{KSF} \times 13.5}{2} = 8.3^K$$

$$\frac{1.99 \times 13.5}{2} \times \frac{1}{3} = \underline{4.47^K}$$

$$12.77^K = V$$

Bottom

$$18.68'^K$$

$$\frac{1.99 \times 13.5^2}{2} \times \frac{1}{10} = \underline{18.13'^K}$$

$$36.81^K = FEM$$

$$8.3^K$$

$$\underline{8.94}$$

$$17.24^K = V$$

Mem. ③-④ ④-③ (Bottom Slab)

$$\frac{1.91^{KSF} \times 27^2}{12} = 116.03 = FEM$$

$$\frac{1.91^{KSF} \times 27}{2} = 25.79^K = V$$

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JOB ____ SHEET No 52 OF ____
ITEM ____ BY LWC DATE 10-23-27
JOB No 575-79-E CHKD. BY ____ DATE ____

FLORIDA AVENUE DRAINAGE CANAL

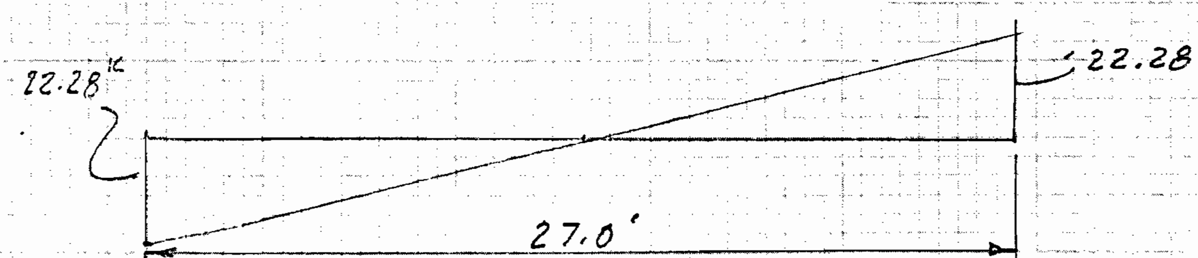
DESIGN OF BOX CULVERT

Case I (Min. Size)

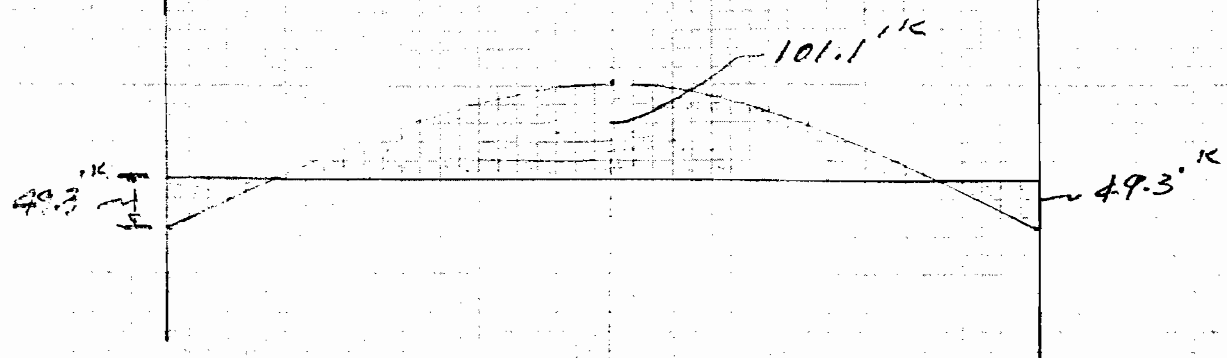
Moment Distribution.

Jt.	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
DF	0.3	0.7	0.7	0.3	0.33	0.67	0.67	0.33
FEM	+30.8	-100.2	+100.2	-30.8	+36.8	-116.0	+116.0	-36.8
1st Dist	+20.8	+48.6	-48.6	-20.8	+26.1	+53.1	-53.1	-26.1
CO	-13.1	-24.3	+24.3	+13.1	-10.4	-26.6	+26.6	+10.4
2nd Dist.	+11.2	+26.2	-26.2	-11.2	+12.2	+24.8	-24.8	-12.2
CO	-6.1	-13.1	+13.1	+6.1	-5.6	-12.4	+12.4	+5.6
3rd Dist	+5.8	+13.4	-13.4	-5.8	+5.9	+12.1	-12.1	-5.9
CO	-3.0	-6.7	+6.7	+3.0	-2.9	-6.1	+6.1	+2.9
4th Dist	+2.9	+6.8	-6.8	-2.9	+3.0	+6.0	-6.0	-3.0
	+49.3	-49.3	+49.3	-49.3	+65.1	-65.1	+65.1	-65.1

Roof Slab



$$+M = \left(22.28^{k} \times \frac{27.0}{2} \times 0.5\right) - 49.3'^{k} = 101.1'^{k}$$



FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I-(min. size)

Roof Slab (cont.)

Max Mom = $+101.1'^{k}$ "d" provided $37''$ $K = 221$ $a = 1.44$

$$d_{req'd} = \sqrt{\frac{101{,}100'^{\#} \times 12}{221 \times 12}} = 21.39'' < 37''$$

$$V_{allow} = 70^{psi} \times 37'' \times 12'' = 31.08^{k} > 22.28^{k}$$

Reinforcement

1. Bott. face - midspan

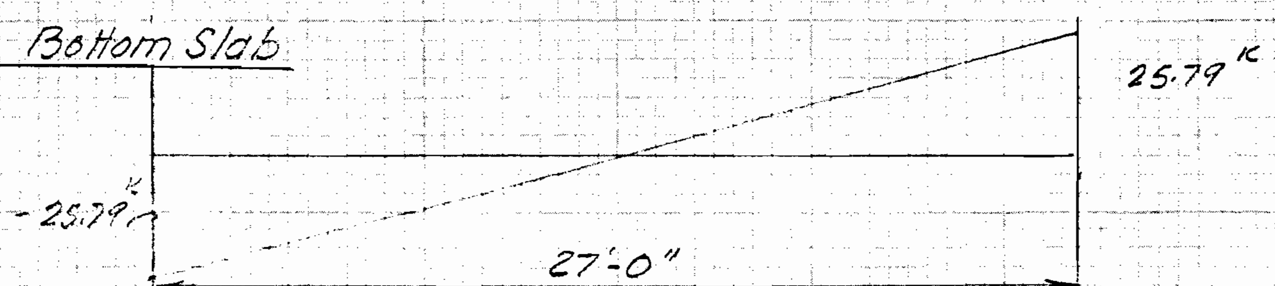
$$\frac{101.1'^{k}}{1.44 \times 37''} = 1.9^{\square''} \text{req'd} < \#11@6 \text{ provided} = 3.12^{\square''}$$

2. Top face @ support

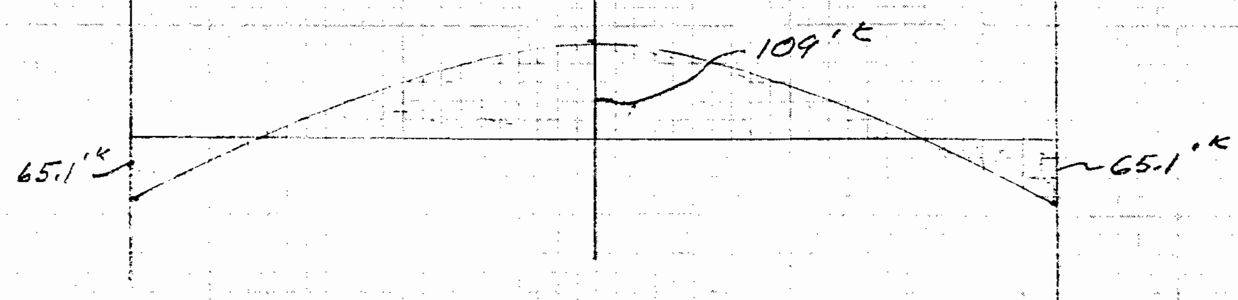
$$\frac{47.9'^{k}}{1.44 \times 37''} = 0.9^{\square''} \text{req'd} < \#8@6 \text{ provided} = 1.58^{\square''}$$

$$U = \frac{22{,}280^{\#}}{2 \times 4.43'' \times 0.88 \times 37''} = 77.23 \text{ psi} < 215 \text{ psi allowed}$$

Bottom Slab



$$+M = \left(25.79^{k} \times \frac{27.0'}{2} \times 0.5\right) - 65.1'^{k} = 109'^{k}$$



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JOB ____ SHEET No 54 OF ____
ITEM ____ BY LWC DATE 10-24-79
JOB No 575-79-E CHKD. BY ____ DATE ____

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (min size)

Bottom Slab (cont)

Max Mom. = +109'k d provided = 36" (See note page 48) K = 221, J = 0.88

$d\ reqd = \sqrt{\frac{109{,}000 \times 12}{221 \times 12}} = 22.2" < 36"$

$V_{allow} = 70^{psi} \times 36" \times 12" = 30.24^k > 25.79^k$

Reinforcement

1. Top face @ midspan

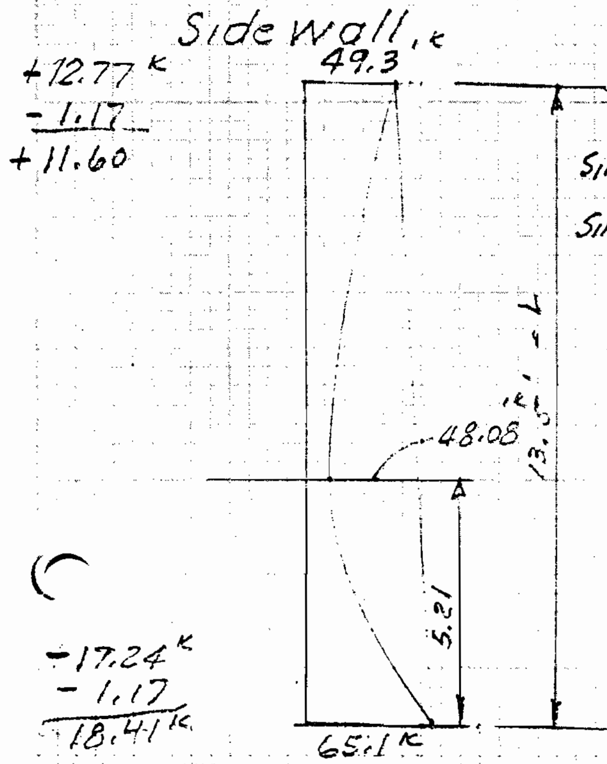
$\frac{109'^k}{1.44 \times 36"} = 2.1^{\square"}$ reqd < 11 @ 6 provided = $3.12^{\square"}$

2. Bottom face @ Wall

$\frac{65.1'^k}{1.44 \times 36"} = 1.26^{\square"}$ < #8 @ 6 provided = $1.58^{\square"}$

$U = \frac{25{,}790}{2 \times 4.43 \times 0.88 \times 36} = 91.88_{psi}$ < 215 psi allow

Side wall



Shear Adjust = $\frac{-65.1 + 49.3}{13.5} = -1.17$

W = 1.99 × 13.5 × 0.5 = 13.43

Simp. M = .1283 W L = 23.25'k

Simp. M = $\frac{1.23 \times 13.5^2}{8}$ = 28.02

51.27'k

.5774 × 13.5 = 7.79

$\frac{11.6^k + 18.41^k}{13.5} = 2.22^k$

13.5
-8.29
5.21

48.08

$(18.41^k \times 5.21 \times 0.5) - (11.6 \times 8.29 \times 0.5) \approx 0$

49.95   48.08

48.08'k ≈ 51.27'k

Use 51.27'k No +M this Case

*

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (Min. size)

Side Walls (Cont.)

Max Mom. = 65.1'K   d provided = 22"   K = 221   j = 0.88

$d\ required = \sqrt{\frac{65,100 \times 12}{221 \times 12}} = 17.15" < 22"$

$V\ allow = 70\ psi \times 22" \times 12" = 18.48^K > 18.4^K$

could be reduced o/k

Reinforcement.

outside face $\frac{65.1'^K}{1.44 \times 22} = 2.05\ \square"$ Reduce Mom by $\frac{Va}{6}$ per code

$65.1'^K - \frac{18.41^K \times 3}{6} = 55.9'^K$ $U = \frac{18,400^\#}{2 \times 3.142 \times 0.88 \times 22} = 151\ psi$ ok

$\frac{55.9'^K}{1.44 \times 22} = 1.76\ \square" > 2\ \#8 = 1.58\ \square"$ Allw. 304 psi

Max. allowable Moment for #8@6 $= \frac{x}{1.44 \times 22} = 1.58\ \square"$

$x = 50.05'^K$

$jd = 0.88 \times 22 = 19.36$ $kd = 0.359 \times 22 = 7.9$

As = 1.58

$55,900'^\# \times 12 = T \times 19.36$

$T = 34,648^\# = C$

$34,648^\# = 1.58 \times f_s$

* $f_s = 21,929 > 20,000$

$34,648 = \frac{1}{2} f_c \times 12 \times 7.9$

$f_c = 731 < 1400\ psi$ allowable

*This is close enough For Case I, however check Case II

Inside face ; #8@12 o/k by inspection

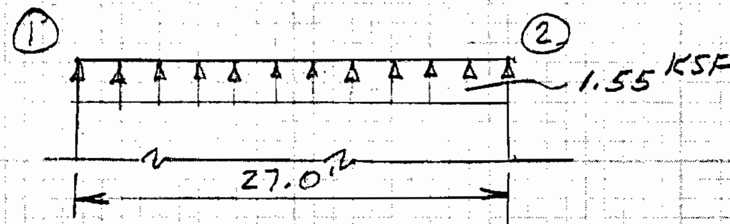
FLORIDA AVENUE DRAINAGE CANAL
DESIGN OF BOX CULVERT

Case II (Min. Size)

The only difference from Case I will be 35' of head (2.19 KSF) on Floor slab, Uplift on roof slab 24.75' of head (1.55 KSF) and pressure on sides @ ℄ = 29.87' of head (1.87 KSF)

Fixed End Moments and shears.

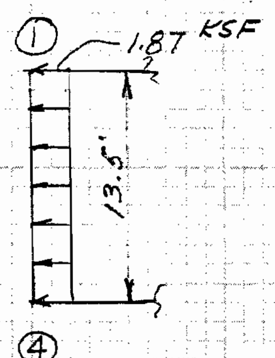
Top Slab



$$FEM = \frac{1.55^{KSF} \times 27^2}{12} = 94.2'^{K}$$

$$V = \frac{1.55^{KSF} \times 27'}{2} = 20.93^{K}$$

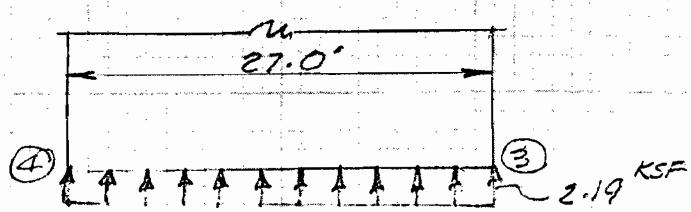
Sidewalls



$$FEM = \frac{1.87^{KSF} \times 13.5^2}{12} = 28.4'^{K}$$

$$V = \frac{1.87 \times 13.5}{12} = 12.62^{K}$$

Bottom Slab



$$FEM = \frac{2.19^{KSF} \times 27^2}{12} = 133'^{K}$$

$$V = \frac{2.19 \times 27}{2} = 29.57^{K}$$

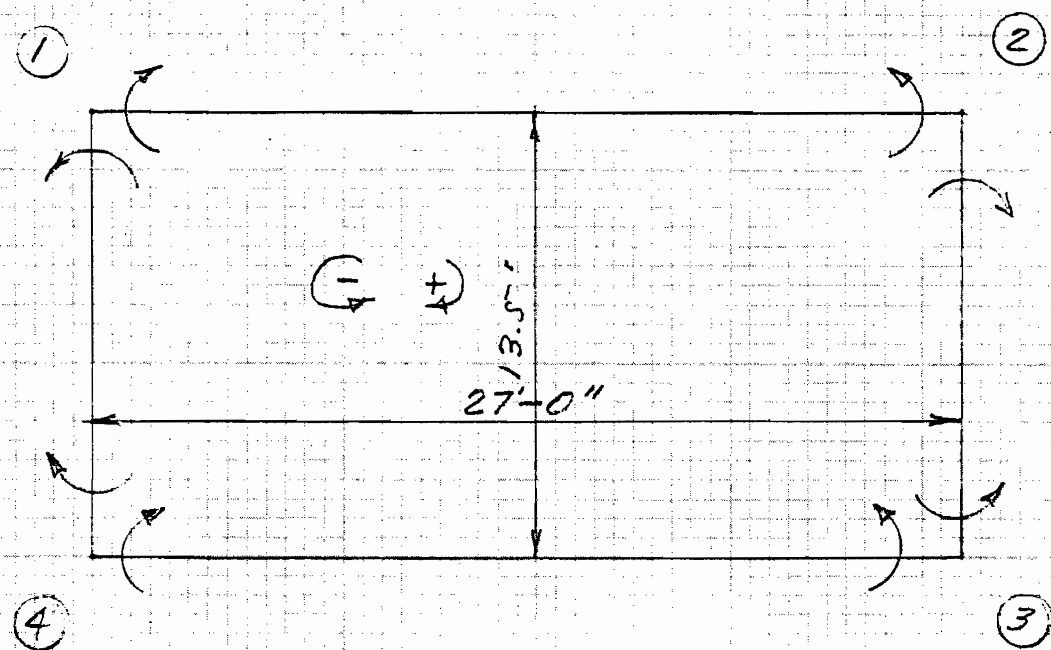
N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET № 57	OF
	ITEM	BY LWC	DATE 10-24-79
	JOB № 575-79-E	CHKD. BY	DATE

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

CASE II (Min. size)

Moment Distribution



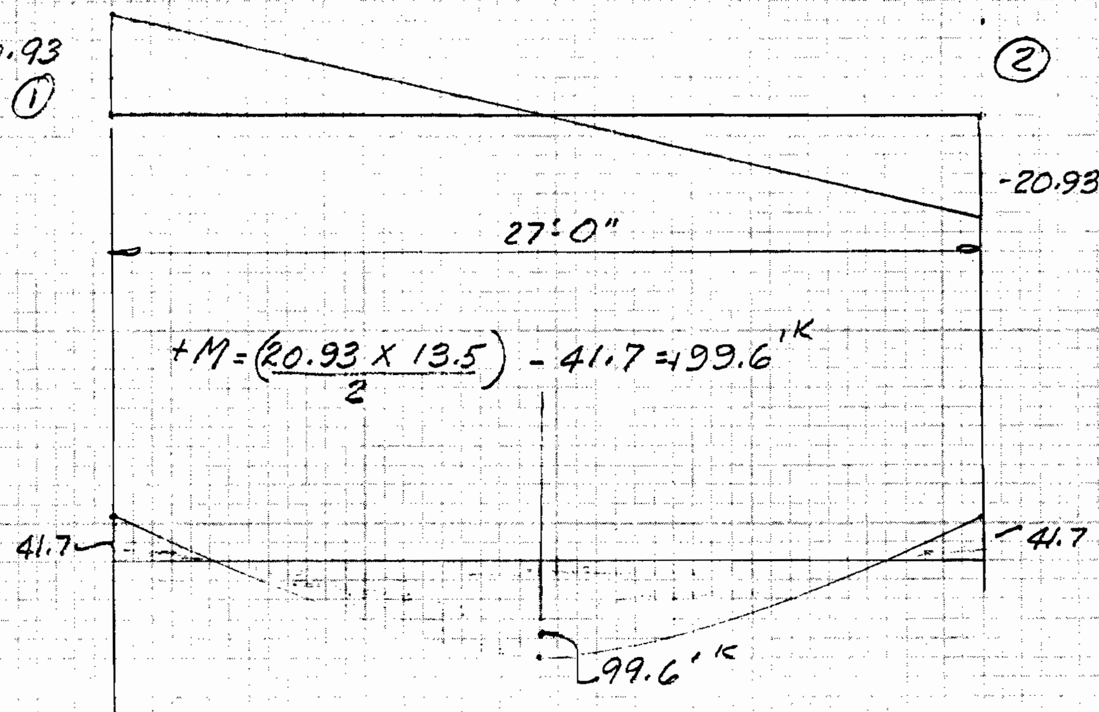
Jt.	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
D.F.	0.3	0.7	0.7	0.3	0.33	0.67	0.67	0.33
FEM	-28.4	+94.2	-94.2	+28.4	-28.2	+133	-133	+28.2
1 Dist.	-19.7	-46.1	+46.1	+19.7	-34.6	-70.2	+70.2	+34.6
C.O.	+17.3	+23.1	-23.1	-17.3	+9.9	+35.1	-35.1	-9.9
2nd Dist.	-12.1	-28.3	+28.3	+12.1	-14.9	-30.1	+30.1	+14.9
CO	+7.5	+14.2	-14.2	-7.5	+6.1	+15.1	-15.1	-6.1
3rd Dist.	-6.5	-15.2	+15.2	+6.5	-7.0	-14.2	+14.2	+7.0
CO	+3.5	+7.6	-7.6	-3.5	+3.3	+7.1	-7.1	-3.3
4th Dist.	-3.3	-7.8	+7.8	+3.3	-3.4	-7.0	+7.0	+3.4
	-41.7	+41.7	-41.7	+41.7	-68.8	+68.8	-68.8	+68.8

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Min size)

Roof Slab



Max. Moment = 99.6'K d provided = 37" K = 221 a = 1.44

"d" and "V" o.k by inspection see Case I page 53

"U" o.k. by inspection page 53

Reinforcement

Top face - Mid. Span $99.6'^{K} - \frac{20.93 \times 2}{6} = 92.6'^{K}$ (Vol.) $jd = 0.88 \times 37'' = 32.56''$

$kd = 0.359 \times 37 = 13.283$

$\frac{92.6'^{K}}{1.44 \times 37} = 1.74^{\square''} > \#8 @ 12 = 0.79^{\square''}$

$92{,}600'^{\#} \times 12 = T \times 32.56$

$T = 34{,}128^{\#} = C$

$34{,}128 = 0.79 \times f_s$

* $f_s = 43{,}200$ psi

End Moments ok by inspection see pg 53 #11@6 provided

Note: Top face reinforcement is overstressed unless earth cover is provided before testing.

$34{,}128^{\#} = \frac{1}{2} f_c \times 12 \times 13.283$

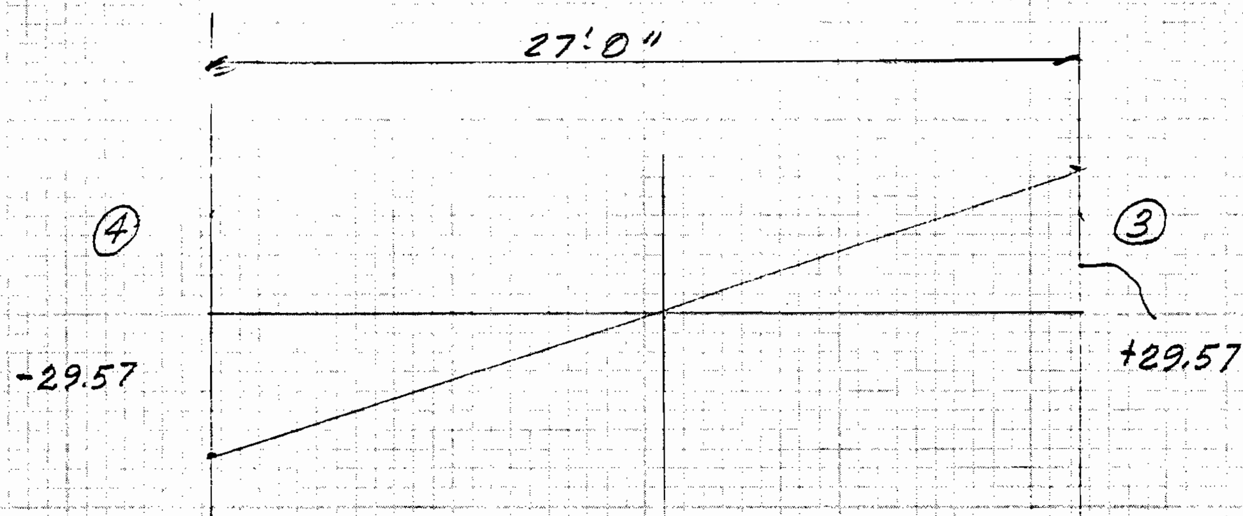
$f_c = 428_{psi} < 1400\,psi$

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Min. Size)

Bottom Slab

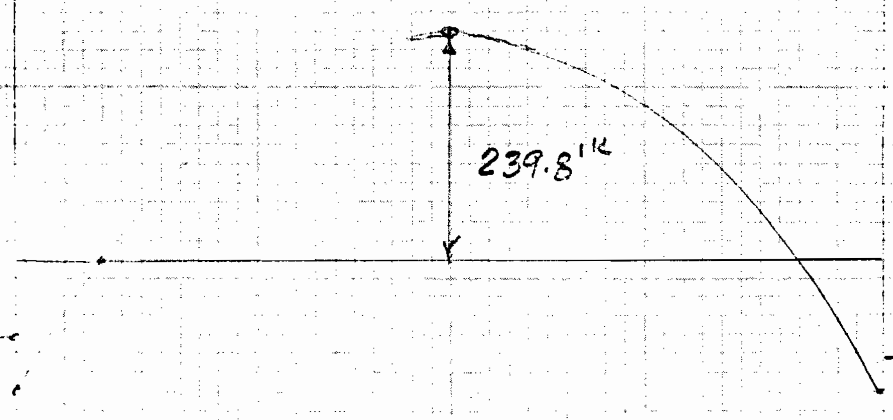


$+M = \left(\frac{29.57 \times 13.5}{2}\right) - 68.8'^{K} = 130.79'^{K}$

Note: Resultant Moments and Shears are equal to Case I + Case II

-29.57 Case II
-25.79 Case I
Σ 55.36ᴷ

+29.57 Case II
+25.79 Case I
Σ +55.36



End Moments
Case II : 68.8'K
Case I = +65.1
133.9'K

Mid-span
130.8'K Case II
109.0 Case I
239.8'K

$239.8'^{K} - \frac{Va\,L}{6} = 239.8'^{K} - \left(\frac{55.36 \times 2}{6}\right) = 221.4'^{K}$ Modified Mom.

$133.9'^{K} - \frac{Va\,L}{6} = 133.9 - \left(\frac{55.36 \times 2}{6}\right) = 115.5'^{K}$

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FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II Min. Size

Bottom Slab-(Cont.)

Max Moment = 221.4'K d provided = 36" K=221 j=0.88

$d\ req'd = \sqrt{\frac{221,400 \times 12}{221 \times 12}} = 31.65'' < 36''$

$V = 55.36^K \quad V \div \frac{L}{2} = 4.1^K$

$55.36^K - 4.1\left(\frac{36+12}{12}\right) = \underline{38.96^K}$

$\frac{38,960^{\#}}{12'' \times 36''} = \underline{90\ psi > 70\ psi} = \frac{38,960^{\#}}{12'' \times 46.39''}$

$\therefore$ d must be increased to $\underline{47''}$

Reinforcement

Top face Midspan

$A_s\ \frac{221.4'^K}{1.44 \times 36''} = \underline{4.27^{\square''} > \#11 @ 6 = 3.12^{\square''}}$

$jd = 0.88 \times 36 = 31.68$

$kd = 0.359 \times 36 = 12.92$

$221,400'^{\#} \times 12 = T \times 31.68$

$T = 83,864^{\#} = C$

$83,864^{\#} = 3.12 \times f_s$

$\underline{f_s = 26,880\ psi}$

$83,864^{\#} = \frac{1}{2} f_c \times 12 \times 12.92$

$f_c = 1082\ psi$ O/K

End Moments-Bottom face @ Supports

$A_s\ \frac{115.5'^K}{1.44 \times 36''} = \underline{2.23^{\square''} > \#8 @ 6 = 1.58^{\square''}}$

$115,500 \times 12 = T \times 31.68$

$T = 43,750^{\#} = C$

$43,750^{\#} = 1.58 \times f_s$

$\underline{f_s = 27,687\ psi}$

$43,750 = \frac{1}{2} f_c (12 \times 12.92)$

$f_c = 564\ psi$

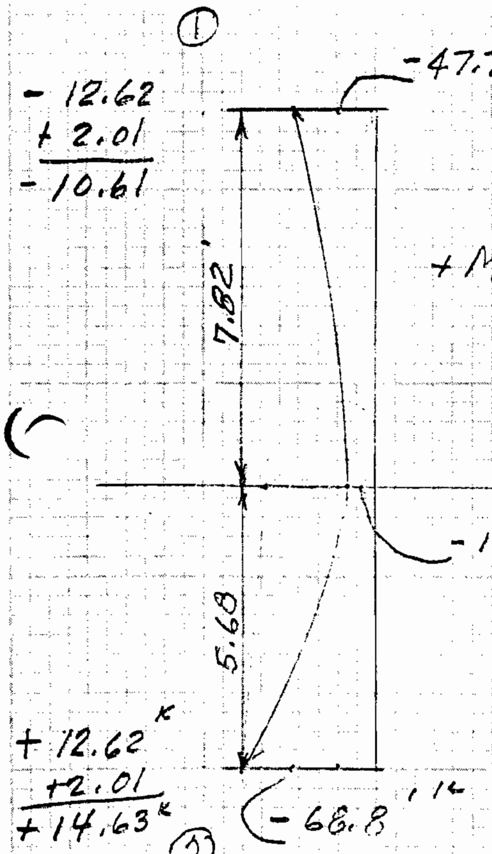
FLORIDA AVE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Min. Size)

Sidewalls

$$\text{Shear adj.} = \frac{-41.7^{'K} + 68.8^{'K}}{13.5} = +2.01^{K}$$



$$\text{pt Zero Shear} = \frac{13.5}{2} + \left(\frac{68.8-41.7}{1.87 \times 13.5}\right) = 7.82'$$

$$+M = \frac{1.87^{K} \times 13.5^2}{8} - \left[\frac{41.7+68.8}{2} + \frac{\overbrace{(68.8-41.7)^2}^{734.41}}{\underbrace{(2)(1.67)(13.5)^2}_{608.72}}\right]$$

$$+M = 42.60 - 56.45 = -13.85^{'K}$$

"d" and "V" o.k. by inspection See page 55

Reinforcement $d = 22''$ $K = 221$ $k = 0.359$ $j = 0.88$

@ Midspan o/k by inspection $jd = 19.36''$ $kd = 7.90''$

Inside face @ Top

$$-47.7^{'K} - \frac{10.61^{K} \times 3.33'}{6} = 41.8^{'K}$$

$$\frac{41.8^{'K}}{1.44 \times 22} = 1.32^{\square''} > \#8 @ 12 \quad 0.79^{\square'}$$

$$41{,}800^{'\#} \times 12 = T \times 19.36$$

$$T = 25{,}909^{\#} = C$$

$$25{,}909^{\#} = 0.79 \times f_s$$

$$f_s = 32{,}796 \text{ psi}$$

$$25{,}909^{\#} = \tfrac{1}{2} f_c \times 12 \times 7.9$$

$$f_c = 546 \text{ psi o.k.}$$

Inside face @ Bottom

$$-68.8 - \left(\frac{14.63 \times 3.0}{6}\right) = 61.49^{'K}$$

$$\frac{61.49}{1.44 \times 22} = 1.94^{\square''} > 8 @ 12 = 0.79^{'K}$$

$$61{,}490 \times 12 = T \times 19.36$$

$$T = 38{,}114^{\#} = C$$

$$38{,}114 = 0.79 \times f_s$$

$$f_s = 48{,}245$$

$$38{,}114 = \tfrac{1}{2} f_c \times 12 \times 7.9$$

$$f_c = 804 \text{ o/k}$$

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FLORIDA AVENUE DRAINAGE CANAL

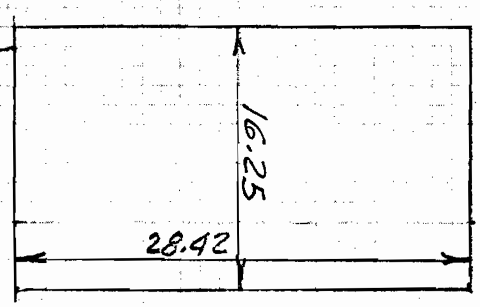
DESIGN OF BOX CULVERT

Case I (max size)

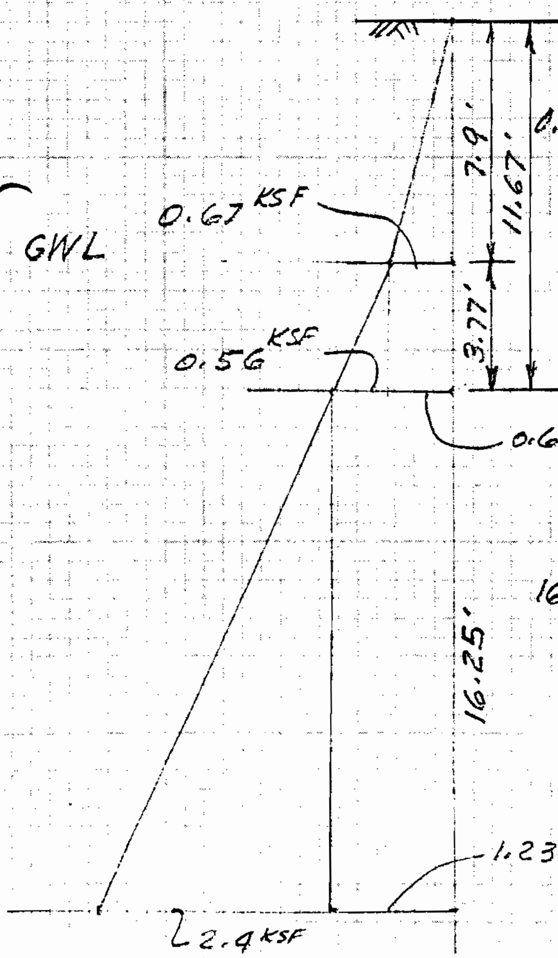
Loading - Roof slab

See page 49

Uniform Load @ 1.65 KSF



Side Walls



$0.085^{K} \times 7.9 = 0.67^{KSF}$

$3.77' \times (0.085 + 0.0625) = 0.56^{KSF}$

$16.25' \times (0.085 + 0.0625) = 2.4^{KSF}$

Floor Slab

Wt. - Top Slab $= 1.65$

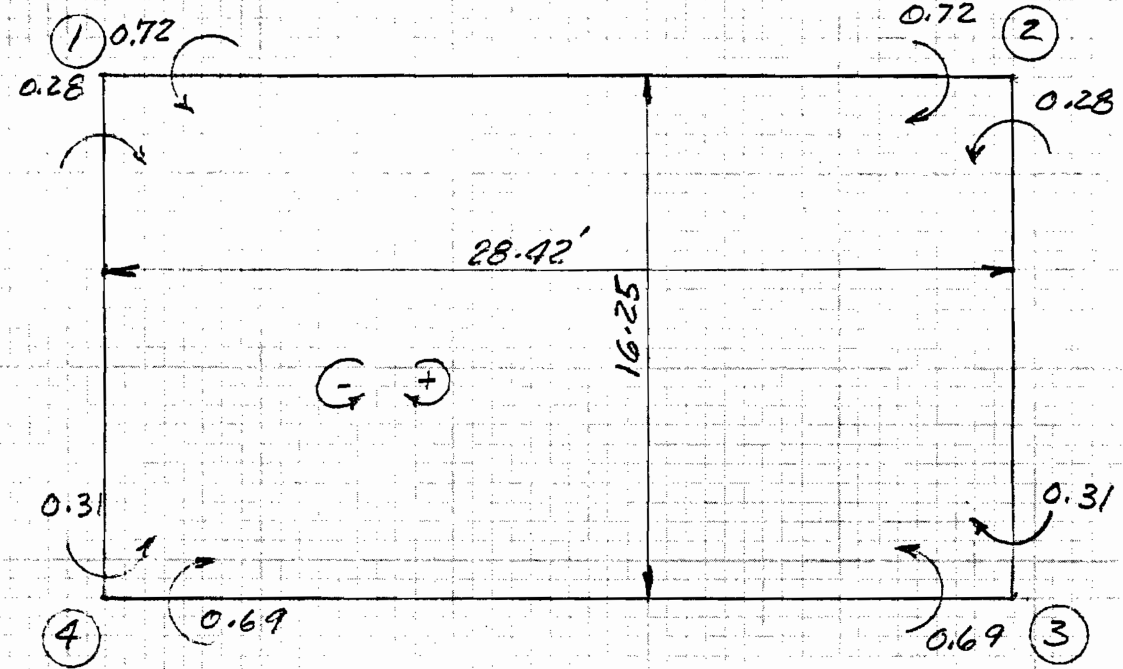
Wt. Sidewalls $= \dfrac{14.59 \times 2 \times 0.15^{K} \times 2}{28.42} = 0.31$

1.96^{KSF}

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (Max Size)



See Page 50

Dist Factors

Top slab ①-② ②-①

$\frac{I}{L} = 0.108$

Sidewalls ①-④ ②-③

④-① ③-②

I 0.041

Bottom Slab ④-③ ③-④

$\frac{I}{L} = 0.093$

Jt ① and ②

$\frac{0.108}{0.108 + 0.041} = .72$

.28

Jt. ③ and ④

$\frac{0.093}{0.093 + 0.041} = 0.69$

0.31

Fixed End Moments - Shears

Mem. ①-② (Top slab)

$\frac{1.65^{KSF} \times 28.42^2}{12} = 111.1'^{K} = FEM$

$\frac{1.65^{KSF} \times 28.42'}{2} = 23.45^{K} = V$

Mem. ①-④ ②-③ (Sidewalls)

Top

$\frac{1.23^{KSF} \times 16.25^2}{12} = 27.1'^{K}$

$\frac{2.4^{KSF} \times 16.25^2}{2} \times \frac{1}{15} = 21.1'^{K}$

$48.2'^{K} = FEM$

$\frac{1.23^{KSF} \times 16.25}{2} = 9.9^{K}$

$\frac{2.4^{KSF} \times 16.25}{2} \times \frac{1}{3} = 6.5$

$16.4^{K} = V$

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (Max Size)

Fixed End Moments (cont)

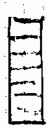
Side Walls

Bottom

$\doteq 27.1'^{k}$

$\dfrac{2.4 \times 16.25^2}{2} \times \dfrac{1}{10} = 31.7'^{k}$

$58.8'^{k} = FEM$



9.9^{k}

$\dfrac{2.4 \times 16.25}{2} \times \dfrac{2}{3} = 13.0^{k}$

$22.9^{k} = V$

Member 4-3 3-4

$\dfrac{1.96^{KSF} \times 28.42^2}{12} = 131.9'^{k}$

$\dfrac{1.96^{KSF} \times 28.42'}{2} = 27.85'^{k}$

Jt.	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
DF	0.28	0.72	0.72	0.28	0.31	0.69	0.69	0.31
FEM	+48.2	-111.1	+111.1	-48.2	+58.8	-131.9	+131.9	-58.8
1st DIST.	+17.6	+45.3	-45.3	-17.6	+22.7	+50.4	-50.4	-22.7
CO	-11.4	-22.7	+22.7	+11.4	-8.8	-25.2	+25.2	+8.8
2nd Dist	+9.5	+24.6	-24.6	-9.5	+10.5	+23.5	-23.5	-10.5
CO	-5.3	-12.3	+12.3	+5.3	-4.8	-11.8	+11.8	+4.8
3rd Dist	+4.9	+12.7	-12.7	-4.9	+5.1	+11.5	-11.5	-5.1
Co	-2.6	-6.4	+6.4	+2.6	-2.5	-5.8	+5.8	+2.5
4th Dist	+2.5	+6.5	-6.5	-2.5	+2.6	+5.7	-5.7	-2.6
	+63.5	-63.5	+63.5	-63.5	+83.6	-83.6	+83.6	-83.6

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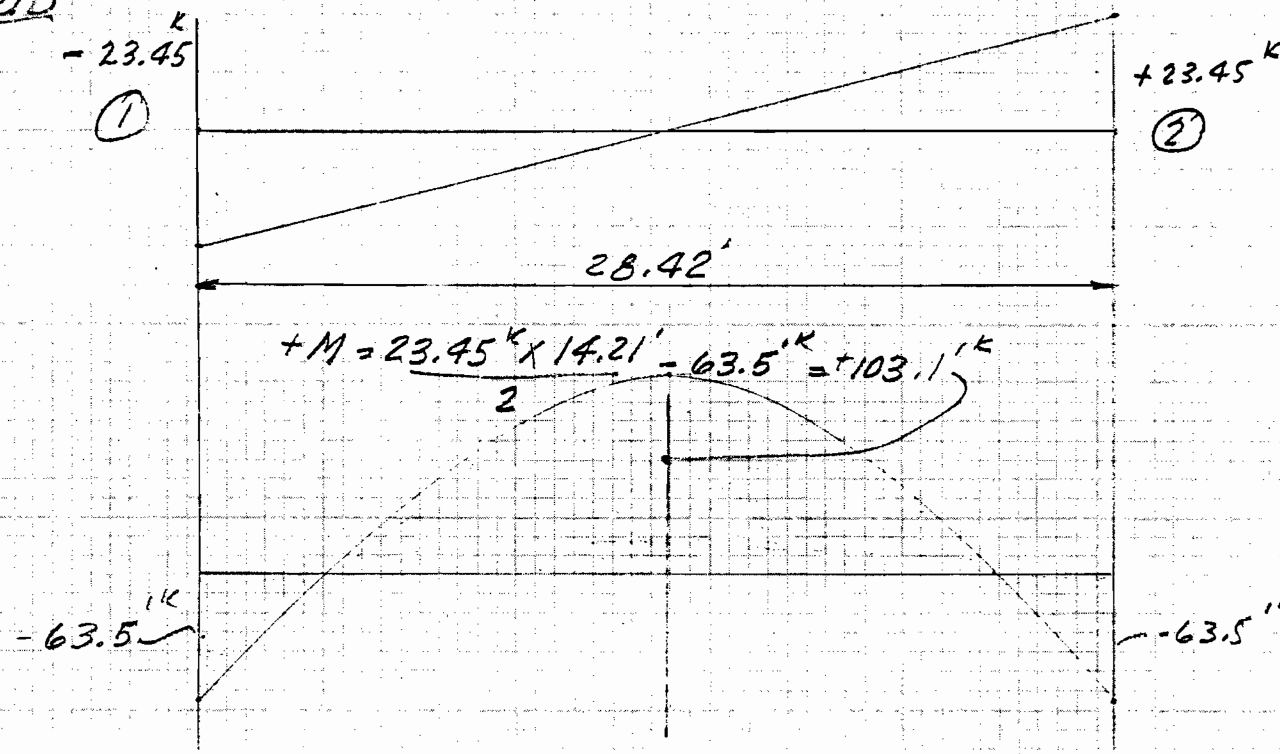
FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (Max size)

Top Slab



Max Moment $= 103.1'^{k}$ d provided $= 37''$ $j = 0.88$ $k = 0.359$

Reduce $103.1'^{k} - \frac{23.45 \times 2}{6} = 95.3'^{k}$

d req'd $= \sqrt{\frac{95{,}300 \times 12}{221 \times 12}} = 20.75'' < 37''$ ok

$12'' \times 70^{psi} \times 37'' = 31.08^{k} > 23.45^{k}$ ok

$U = \frac{23450^{\#}}{2 \times 4.43 \times 0.88 \times 37} = 81$ psi < 215 psi allow

Reinforcement

@ Midspan - Bottom face

$A_s = \frac{95.3'^{k}}{1.44 \times 37''} = 1.79^{\square''} < \#11@6 = 3.12^{\square''}$

@ Support (Top face)

$A_s = \frac{63.5'^{k}}{1.44 \times 37} = 1.19^{\square''} < \#8@6 = 1.58^{\square''}$

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FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

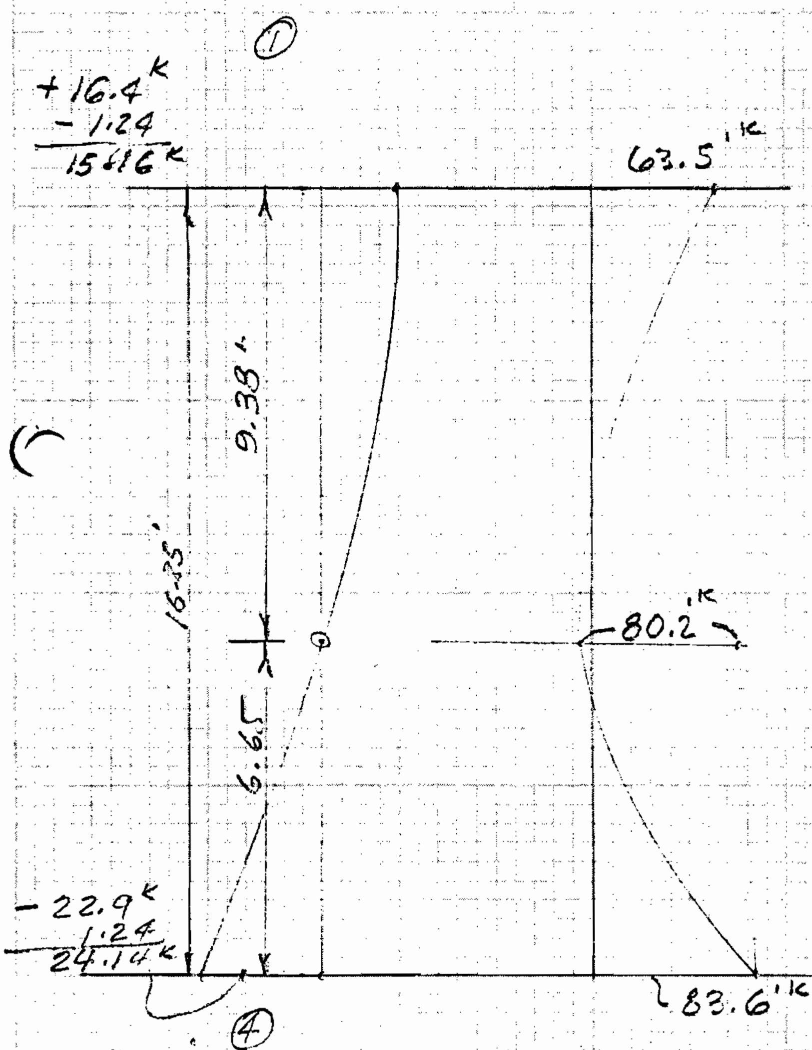
Case I (Max size)

Side Wall

$d = 22''$ $K = 221$ $j = 0.88$ $k = 0.359$

Shear adjustment

$\frac{-83.6 + 63.5}{16.25} = -1.24$



$0.128 \times \frac{16.25 \times 2.4^k}{2} \times 16.25' = 40.56$

$\frac{1.23 \times 9.38'}{2}(16.25 - 9.38) = 39.63$

$80.19'^k$

$+M \approx 0$

$6.65' \times 24.14^k \times .5 = 80.26'^k$

Reduce $83.6'^k$

$83.6 - \left(\frac{24.14 \times 3.0}{6}\right) = 71.53'^k$

"d" req'd $= \sqrt{\frac{71,530 \times 12}{221 \times 12}} = 18'' < 22$

$70 psi \times 12 \times 22 = 18,480^\# > 15.36^k$

Reduce $V = 24.14 - \left(\frac{24.14}{6.65} \times 1.5 + .92\right)$

$V_1 = 15.36^k$

Reinforcement. (Outside face) @ Support

@ Bot. $\frac{71.53}{1.44 \times 22} = 2.25^{\square''} >$ #8 @ 6'' $= 1.58^{\square''}$

$0.88 \times 22 = 19.36''$

$0.359 \times 22 = 7.9$

$71,530'^\# \times 12 = 19.36 \times T$

$T = 44,336^\# = C$

$44,336^\# = \frac{1}{2} f_c (12)(7.9)$

$f_c = 935 psi$ o/k

$f_s \times 1.58^{\square''} = 44,336^\#$

$f_s = 28,061 psi$

@ Top $63.5'^k - \frac{15.16^k \times 3.1'}{6} = 55.66'^k$

See page 67

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FLORIDA AVENUE DRAINAGE CANAL
DESIGN OF BOX CULVERT

Case I (Max size)

Sidewall (cont.) @ Top

See page 66

$\frac{55.66'^{K}}{1.44 \times 22} = 1.76^{\square''} > \#8 @ 6 = 1.58^{\square''}$

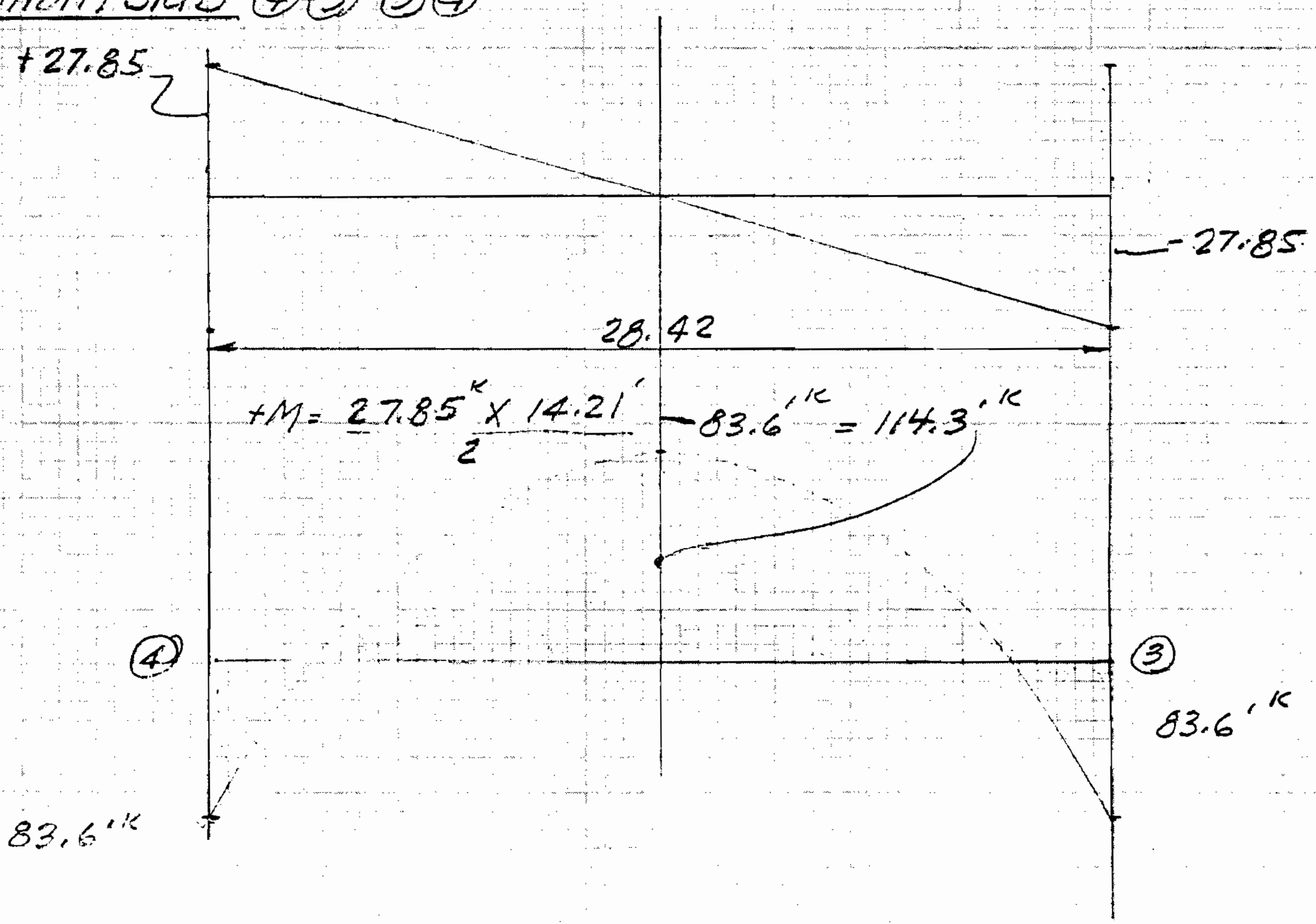
$55,660 \times 12 = T \times 19.36''$

$T = 34,500^{\#}$

$34,500^{\#} = 1.58 \times f_s$ — f_c O/K by inspection

$f_s = 21,835$ psi

Bottom Slab ④-③ ③-④



$+M = \frac{27.85^{K} \times 14.21'}{2} - 83.6'^{K} = 114.3'^{K}$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 68 OF
BY LWC DATE 10-26-79
CHKD. BY DATE

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case I (Max Size)

Bottom Slab ④③ ③④ (Cont.)

Max Moment – $111.4'^{K}$ $d=36''$ $K=221$ $j=0.88$ $k=0.359$

$d\ req'd = \sqrt{\dfrac{111,400 \times 12}{221 \times 12}} = 22.45 < 36$

$V = 27.85^{K} < 12 \times 70 \times 36 = 30.24^{K}$ o/k

Reinforcement (Top face)

@ Midspan – Reduce M $= 111.4 - \left(\dfrac{2 \times 27.85^{K}}{6}\right) = 102.1^{K}$

$A_s = \dfrac{102.1'^{K}}{1.44 \times 36} = 1.97^{\square''} < \#11 @ 6 = 3.12^{\square''}$

@ Support (bottom face) Reduce $M = 83.6'^{K} - \left(\dfrac{2 \times 27.85}{6}\right) = 74.3'^{K}$

$A_s = \dfrac{74.3'^{K}}{1.44 \times 36} = 1.43^{\square''} < \#8 @ 6 = 1.58^{\square''}$

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JOB ______ SHEET Nº 69 OF ______
ITEM ______ BY LWC DATE 10-26-79
JOB Nº 575-79E CHKD. BY ______ DATE ______

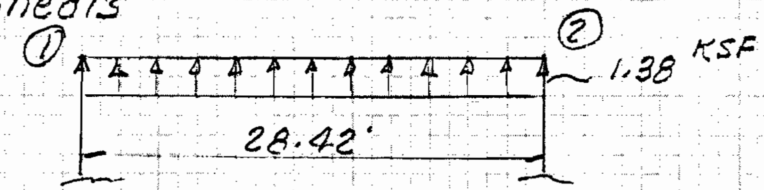
FLORIDA AVENUE DRAINAGE CANAL
DESIGN OF BOX CULVERT

Case II (Max Size) (see page 56 for explanation)

Floor Slab - 35' of head = 2.19 KSF
Side Wall - 28.5' of head = 1.78 KSF
Top Slab - 22' of head = 1.38 KSF

Fixed End Moments and Shears

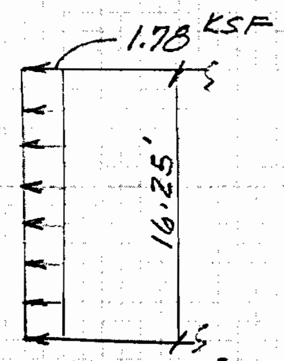
Top Slab



$$FEM = \frac{1.38^{KSF} \times 28.42^2}{12} = 92.9^{'K}$$

$$V = \frac{1.38^{KSF} \times 28.42}{2} = 19.6^{K}$$

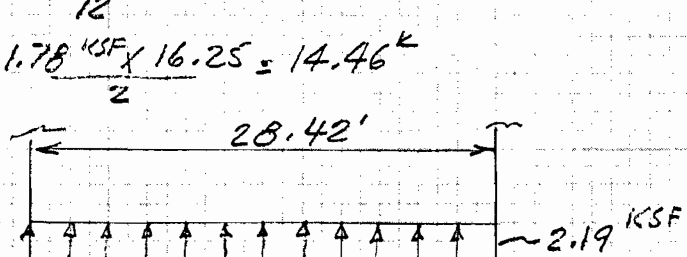
Side walls



$$FEM = \frac{1.78^{KSF} \times 16.25^2}{12} = 39.3^{'K}$$

$$V = \frac{1.78^{KSF} \times 16.25}{2} = 14.46^{K}$$

Bottom Slab



$$FEM = \frac{2.19^{KSF} \times 28.42^2}{12} = 147.4^{'K}$$

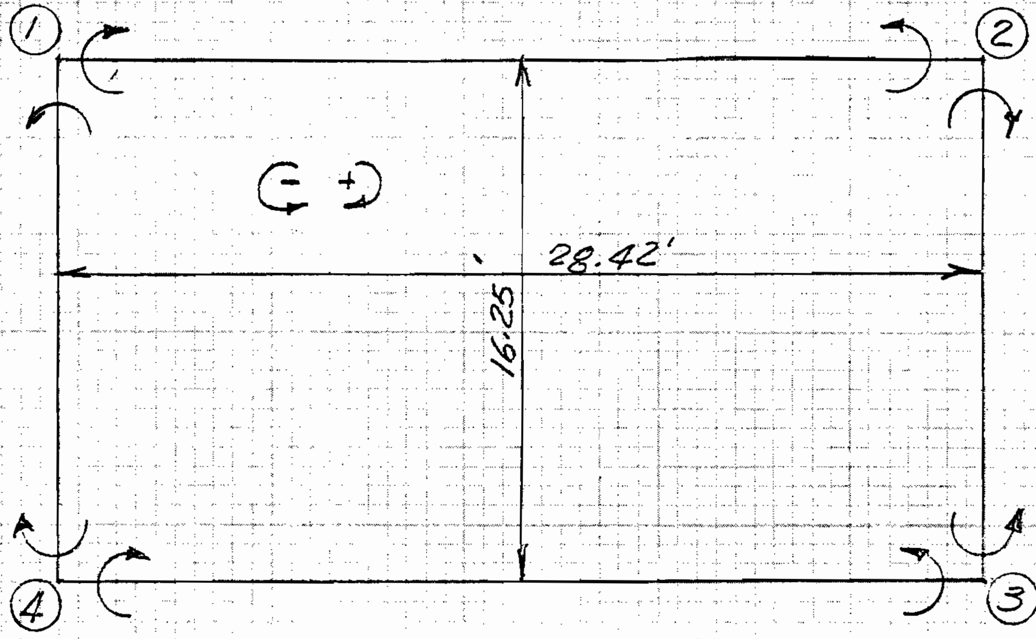
$$V = \frac{2.19 \times 28.42}{12} = 31.11^{'K}$$

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Max size)

Moment Distribution



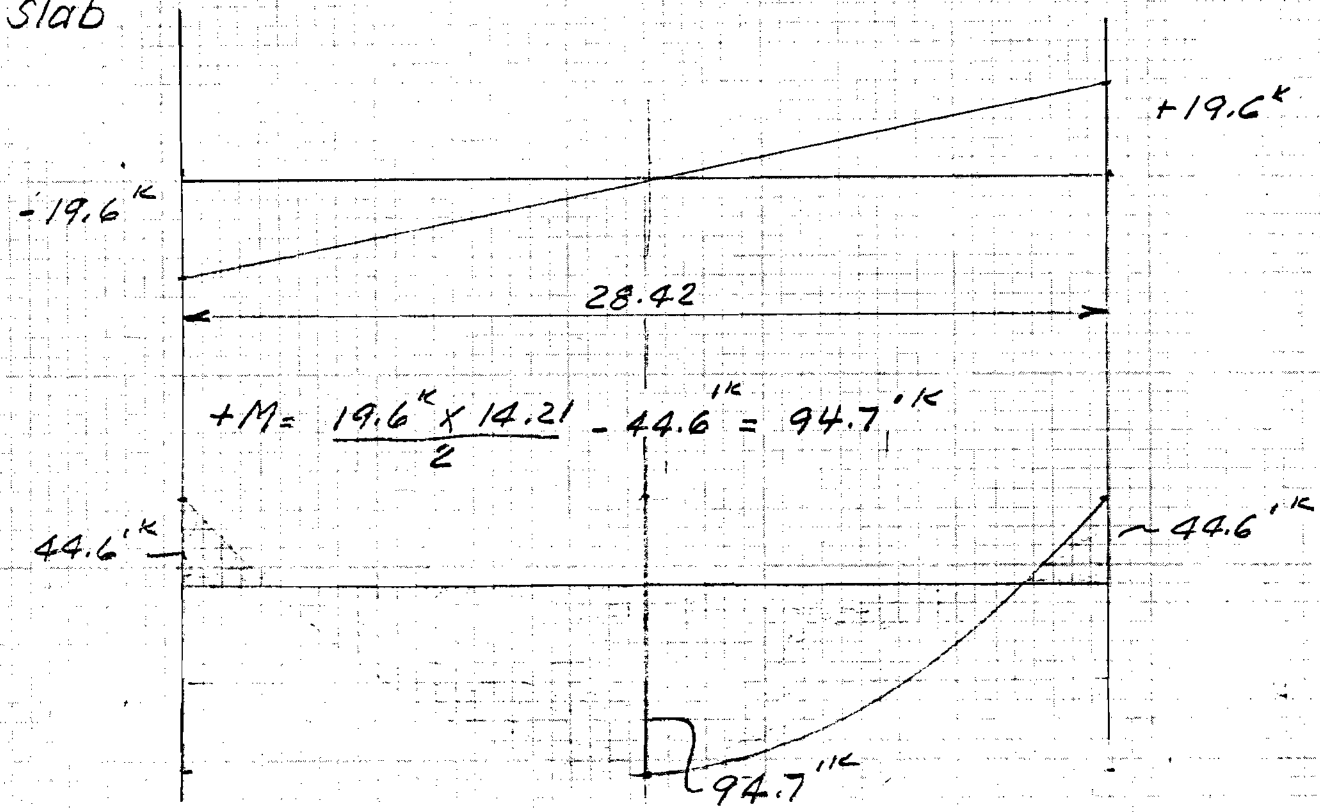
Jt	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
DF	0.28	0.72	0.72	0.28	0.31	0.69	0.69	0.31
FEM	+39.3	-92.9	+92.9	-39.3	+39.3	-147.4	+147.4	-39.3
1st Dist.	+15.0	+38.6	-38.6	-15.0	+33.5	+74.6	-74.6	-33.5
CO	-16.8	-19.3	+19.3	+16.8	-7.5	-47.3	+47.3	+7.5
2nd Dist	+10.1	+26.0	-26.0	-10.1	+17.0	+37.8	-37.8	-17.0
Co	-8.5	-13.0	+13.0	+8.5	-5.1	-18.9	+18.9	+5.1
3rd Dist.	+6.0	+15.5	-15.5	-6.0	+7.4	+16.6	-16.6	-7.4
CO	-3.7	-7.8	+7.8	+3.7	-3.0	-8.3	+8.3	+3.0
4th Dist.	+3.2	+8.3	-8.3	-3.2	+3.5	+7.8	-7.8	-3.5
	+44.6	-44.6	+44.6	-44.6	+85.1	-85.1	+85.1	-85.1

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Max. size)

Roof Slab



Max Moment = $94.7'^k$ $d = 37''$ $K = 221$ $j = 0.88$ $k = 0.359$

$d' reqd = \sqrt{\frac{94{,}700 \times 12}{221 \times 12}} = 20.70 < 37$

Shear $12'' \times 70^{psi} \times 37 = 31.08^k > 19.16^k$ ok

Reinforcement

Mid Span – Top face

$jd = 32.56$

$kd = 13.283$

Reduce Mom $94.7'^k - \left(\frac{19.6^k \times 2}{6}\right) = 88.2'^k$ ($\frac{V a}{6}$ 7)

$88{,}200'^k \times 12 = T \times 32.56$

$T = 32{,}506^{\#} = C$

* $As = \frac{88.2'^k}{1.44 \times 37} = 1.66^{\square} > \#8 @ 12 = 0.79^{\square''}$

$32{,}506 = 0.79 \times fs$

* $fs = 41{,}147$ psi

$32{,}506^{\#} = \frac{1}{2} fc (12 \times 13.283)$

$fc = 408$ psi

End Moments ok by inspection - See page 53

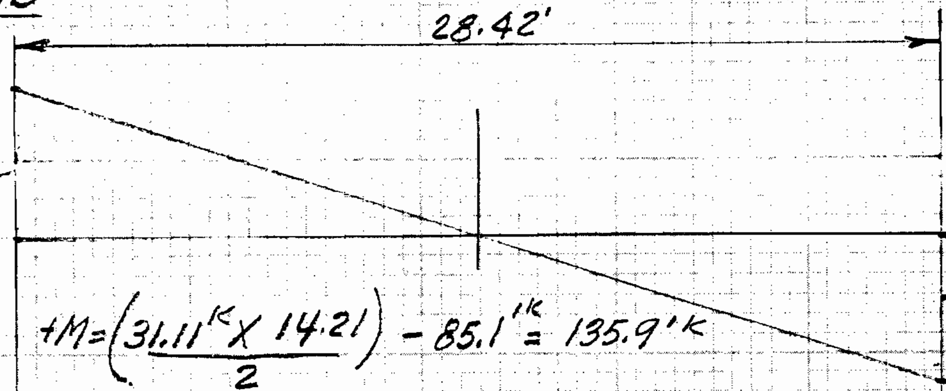
Note: Top face reinforcement is overstressed unless earth cover is provided before testing.

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II (Max size)

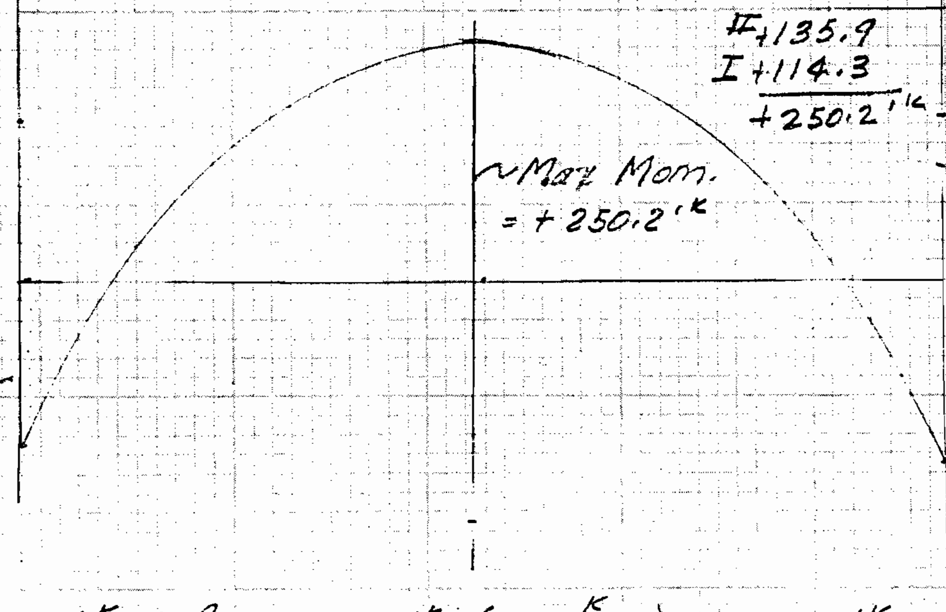
Bottom Slab



$+M = \left(\frac{31.11^{k} \times 14.21}{2}\right) - 85.1'^{k} = 135.9'^{k}$

Note: Resultant Moments and Shears are equal to Case I + Case II

Shear
31.11 II
+27.85 I
58.96 k



Shear
-31.11 II
-27.85 I
58.96

End Moments
85.1'k II
83.6 I
168.7'k

+ Moments
135.9'k II
114.3 I
250.2'k
168.7'k

$250.2'^{k} - \frac{Va\ell}{6} = 250.2'^{k} - \left(\frac{58.96^{k} \times 2}{6}\right) = 230.5'^{k}$

$168.7'^{k} - \frac{Va\ell}{6} = 168.7'^{k} - \left(\frac{58.96 \times 2}{6}\right) = 149.0'^{k}$

$V = 58.96^{k} - \left[\frac{58.96}{0.5 \times 28.42} \times \frac{36+12}{12}\right] = 42.36^{k}$

FLORIDA AVENUE DRAINAGE CANAL

DESIGN OF BOX CULVERT

Case II + Case I (Max size)
(Floor Slab only)

Max Moment = 230.5'k d = 36" K = 221 j = 0.88 k = 0.359

$d\ req'd = \sqrt{\frac{230{,}500 \times 12}{221 \times 12}} \neq 32.3'' < 36$

$V = 42.36^k \qquad \frac{42{,}360^{\#}}{12 \times 36} = \underline{98\ psi} > 70\ psi = \frac{42{,}360}{12 \times 50.4''}$

∴ d must be increased to 51"

Reinforcement

Top face - Mid-span

$As = \frac{230.5'^k}{1.44 \times 36} = 4.45\square'' > \#11@6 = 3.12$

jd = 31.68

kd = 12.92

$230{,}500'^{\#} \times 12 = T \times 31.68$

$T = 87{,}310^{\#} = C$

$87{,}310 = 3.12 \times f_s$

$f_s = 27{,}983$

$87{,}310 = \frac{1}{2} f_c\ (12 \times 12.92)$

$f_c = 1126\ psi$

Bottom face at Side Walls

$As = \frac{149'^k}{1.44 \times 36} = 2.87\square'' > 8@6 = 1.58\square''$

$149{,}000'^{\#} \times 12 = T \times 31.68$

$T = 56{,}439^{\#} = C$

$56{,}439 = 1.58 \times f_s$

$f_s = \underline{35{,}721\ psi}$

$56{,}439 = \frac{1}{2} f_c\ (12 \times 12.92)$

$f_c = 728\ psi$

FLORIDA AVENUE DRAINAGE CANAL

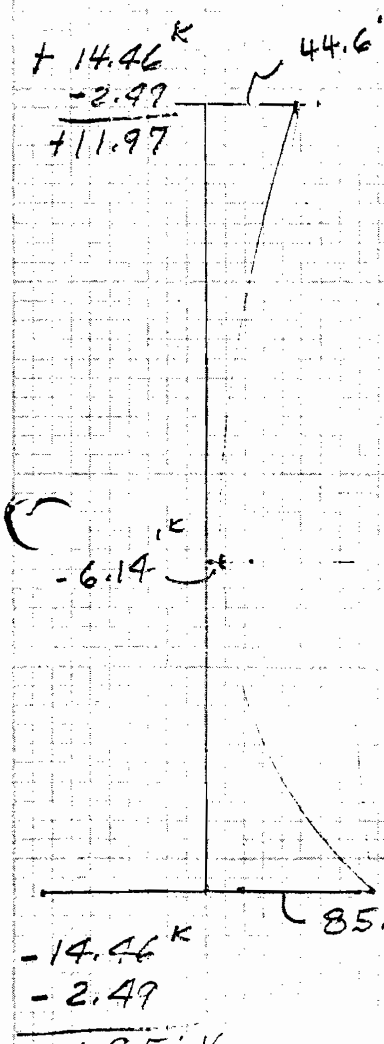
DESIGN OF BOX CULVERT

Case II (Max Size)

Sidewalls

Shear adjustment

$$\frac{-85.1'^k + 44.6'^k}{16.25'} = -.2.49$$



$w = 1.78$

$$V_1 = \frac{wl}{2} + \frac{M_1 - M_2}{l} = \frac{1.78^{ksf}(16.25)}{2} + \frac{85.1 - 44.6}{16.25}$$ (14.46)

$= 16.95^k$ Check

$$\text{"0" Shear} = \frac{l}{2} + \frac{M_1 - M_2}{wl} = \frac{16.25}{2} + \frac{85.1 - 44.6}{1.78 \times 16.25} = 9.52$$ (8.125) (28.925)

$$9.53 \times 11.97 = 114'^k = (16.25 - 9.53)16.95$$

$$+M = \frac{wl^2}{8} - \frac{M_1 + M_2}{2} + \left(\frac{M_1 - M_2}{2wl^2}\right)^2$$

$$= \frac{1.78 \times 16.25^2}{8} - \frac{85.1 + 44.6}{2} + \frac{(85.1 - 44.6)^2}{(2)(1.78)(16.25)^2}$$

$$= 58.75 - 64.85 + 0.4 = -6.14'^k$$

Max Moment = 85.1 d = 22" K = 221 k = 0.359 j = 0.88

$$d = \sqrt{\frac{85{,}100 \times 12}{221 \times 12}} = 19.62'' < 22'' \text{ o/k}$$

$12 \times 70 \times 22 = 18.48^k > 16.95$ V o/k

Reinforcement @ top - Outside face $0.88 \times 22 = 19.36$

$M = 44.6'^k$ Reduce $= 44.6'^k - \dfrac{11.97^k \times 3.25}{6} = 38.1'^k$

$As \; \dfrac{38.1'^k}{1.44 \times 22} = 1.20\square'' < \#8 @ 6 = 1.58\square''$ o/k

$M = 85.1'^k$ Reduce $= 85.1'^k - \dfrac{16.95^k \times 3.25}{6} = 75.9'^k$

$As = \dfrac{75.9'^k}{1.44 \times 22} = 2.4\square'' > \#8@6 = 1.58$

f_c o/k by inspection

$75{,}900'^k \times 2 = T \times 19.36$ $47{,}045^{\#} = 1.58 \times f_s$

$T = 47{,}045^{\#}$ $f_s = 29{,}775$

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Motors required to Lift Gates (2)

Force = 153,800#

$$\text{Torsion} = \frac{f_s J}{C} \qquad D = 5''$$

Torsion
$$385,100 = \frac{15,693 \times 61.35}{2.5}$$
Close enough

$$J = \frac{\pi D^4}{32} = \text{polar moment of inertia} = 61.35^4$$

$$C = \frac{D}{2}$$

$$\therefore T = \frac{f_s \times \frac{3.1416 \times D^4}{32 \cdot 16}}{\frac{D}{2}} = T = 0.196\, f_s D^3 = 384,500$$

(with D^3 written above D^4)

$$f_s = \frac{T}{0.196 \times D^3} \qquad T = 2.5 \times 153,800^{\#} = 384,500''\#$$

$$f_s = \frac{2.5 \times 153,800}{0.196 \times 5^3} = \underline{15,693}\ \text{psi o/k}$$

$F_y = 68,000$ psi

$$\frac{F_y}{4} \times .9 = 15,300$$

N = 870 rpm

$$HP = \frac{2\pi TN}{33,000 \text{ per ft}} = \frac{TN}{5240} \quad \text{but } T \text{ is inch lbs}$$

$$\therefore \frac{(2.5'' \times 153,800^{\#})(870\text{ rpm})}{5240 \times 12} = 5319\ HP$$ Can be reduced with leverage

Gear Reduction	HP req'd		
10:1	531	90 = 59	
20:1	265	100 = 53	
30:1	177		
40:1	132		
50:1	106		
60:1	88		
70:1	76		
80:1	66		

N-Y ASSOCIATES, INC.
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JOB ____ SHEET No 76 OF ____
ITEM ____ BY LWC DATE 10-30-79
JOB No 575-79-E CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

SLUICE GATE

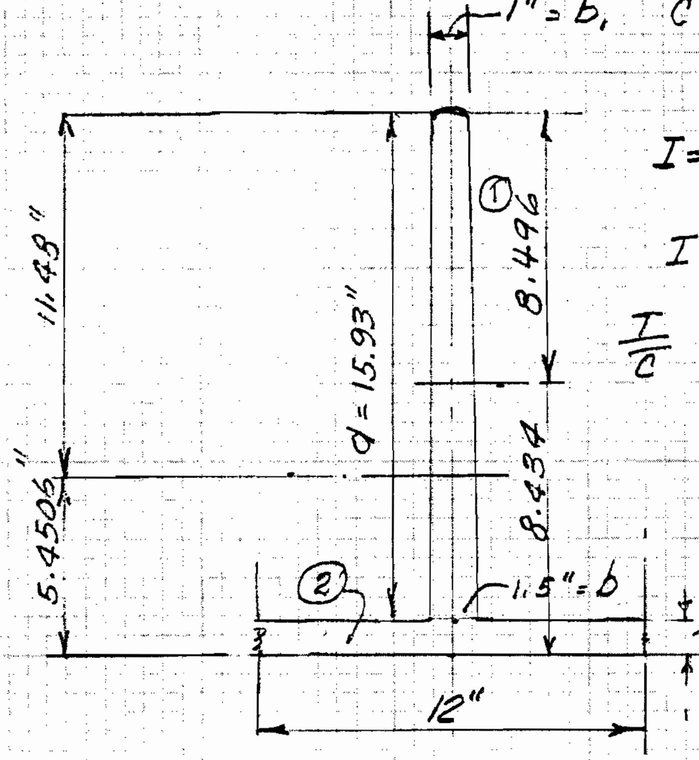
① $A = d\left(\frac{b+b_1}{2}\right) = 19.9125^{\square'}$

$C = \frac{d(2b+b_1)}{3(b+b_1)} = 8.496''$

$I = \frac{d^3(1.5^2 + 6 + 1)}{36(2.5)}$ 90

$I = 415.477 \ in^4$

$\frac{I}{C} = 48.90 \ in^3$



21.43
− 4.5
16.93"

	Area	Y	AY	AY^2	I_o
①	19.9125	8.434	167.942	1416.423	415.477 in⁴
②	12.0	0.5	6.0	3.0	
	31.9125	8.934	173.942	1419.423	415.477

$\bar{y} = \frac{173.942}{31.9125} = 5.4506''$

$I = I_o + \Sigma AY^2 - (\Sigma Ay \times \bar{y})$

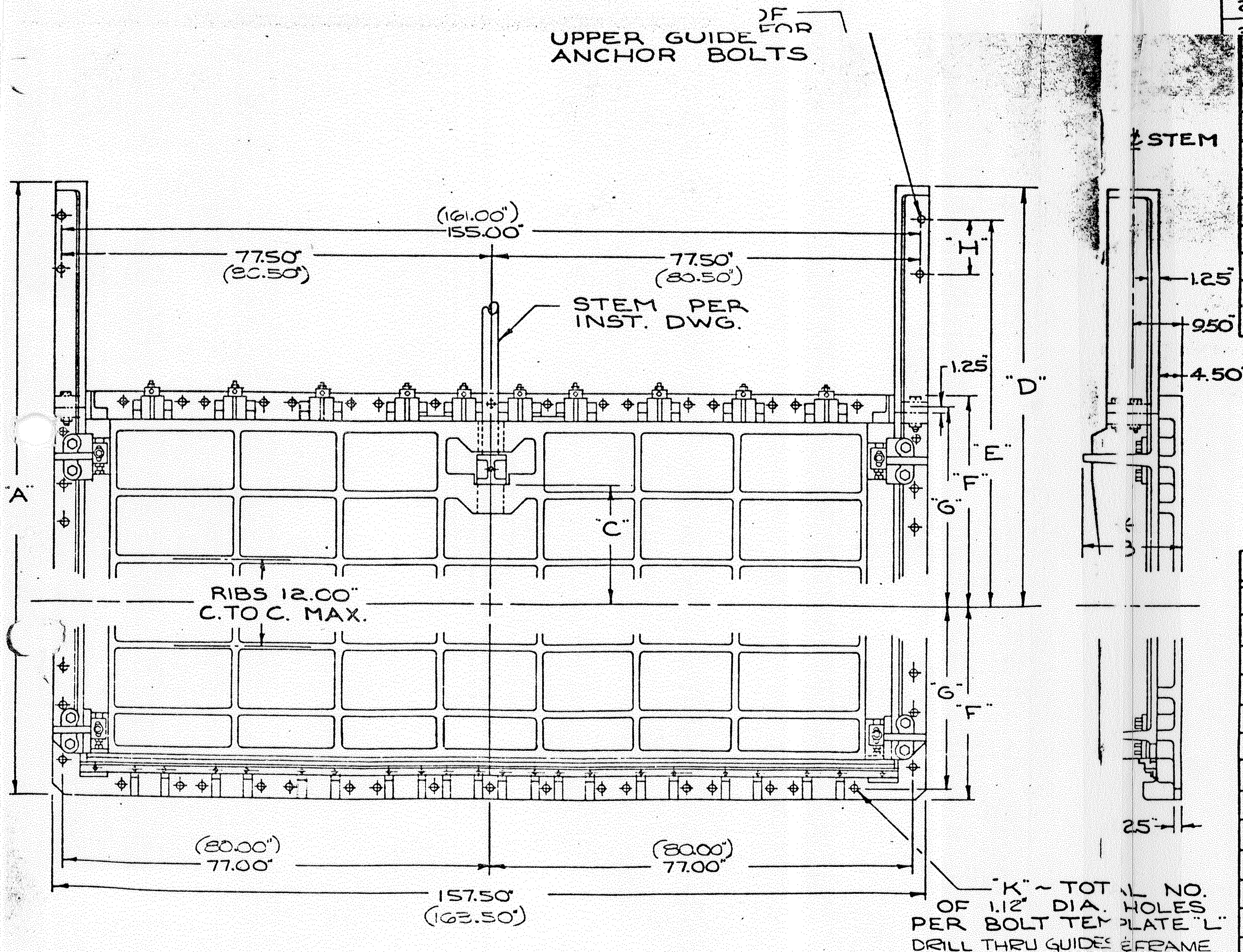
$= 415.477 + 1419.423 - (173.942 \times 5.4506)$

$= 886.8117 \ in.^4$

16.93
− 5.45
11.48

$S = \frac{886.8117}{5.4506} = 162.7 \ in^3$

$\frac{886.8117}{11.48} = 77.24 \ in^3$

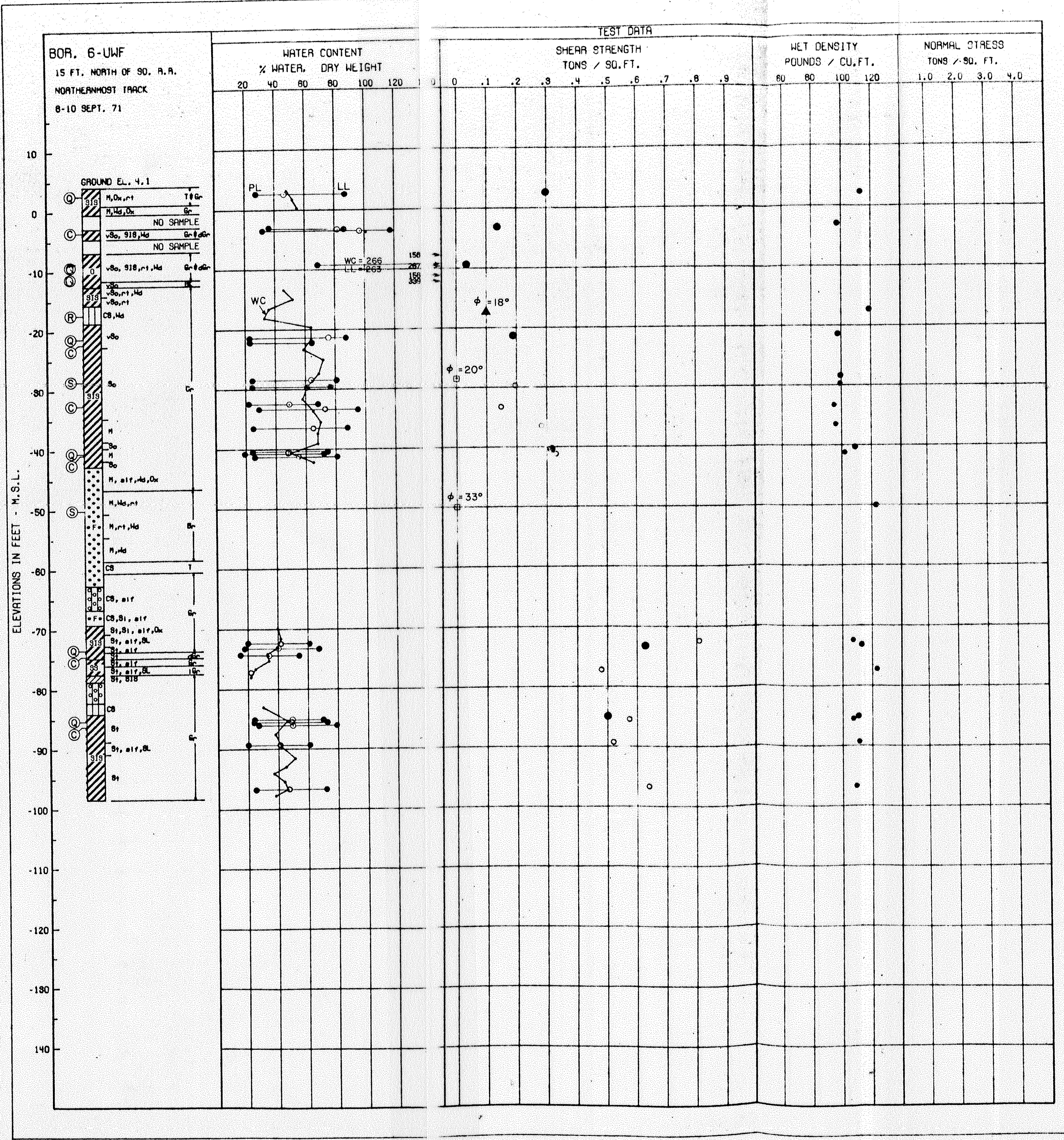


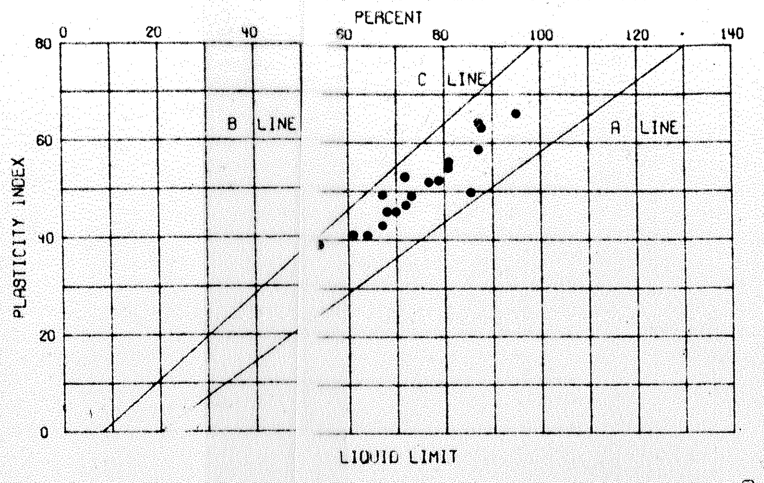
ITEM	HEIGHT	FRAME	DISC	GUIDE	GUIDE EXTEN.	AGP	CK'D.
1	48.00"						
2	60.00"						
3	72.00"	C-15120-1	C-15116-1	C-12615-43	E-22220-11	✓	DRL
4	84.00"						
5	96.00"						
6	54.00"						
7	66.00"						
8	78.00"						
9	90.00"						
10	102.00"	C-14[illegible]9-1	C-14810-1	C-13632-45	E-22223-10	✓	
11	108.00"						
12	120.00"						
13	144.00"						

THRUST NUT
E-16021
SIDE WEDGE
E-3813A
TOP WEDGE
E-18193
BOT. WEDGE
~
SEAL
F-4199K
STOP BAR
E-21873

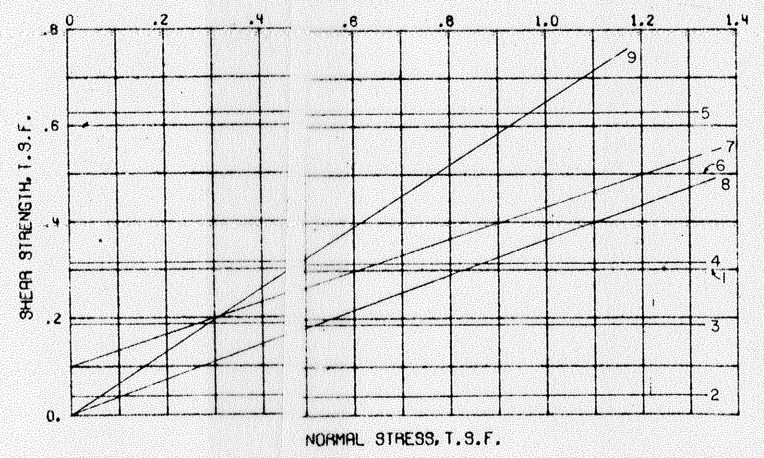
ITEM	HEIGHT	NO. OF SIDE WEDGES	"A"	"B"*	"C"	"D"	"E"	"F"	"G"	"H"	"J"	"K"	"L" BOLT TEMP.
1	48.00"	3	82.25"	17.43"	14.00"	51.50"	46.25"	30.75"	29.00"	—	2	46	
2	60.00"	4	100.25"	17.43"	20.00"	63.50"	58.25"	36.75"	35.00"	—	2	50	
3	72.00"	4	118.25"	17.43"	26.00"	75.50"	70.25"	42.75"	41.00"	—	2	50	B-144020
4	84.00"	5	136.25"	17.68"	32.00"	87.50"	82.25"	48.75"	47.00"	24.00"	4	54	
5	96.00"	5	154.25"	17.68"	38.00"	99.50"	94.25"	54.75"	53.00"	24.00"	4	56	
6	54.00"	3	91.25"	17.43"	17.00"	57.50"	52.25"	33.75"	32.00"	—	2	46	
7	66.00"	4	109.25"	17.43"	23.00"	69.50"	64.25"	39.75"	38.00"	—	2	50	
8	78.00"	4	127.25"	17.43"	29.00"	81.50"	76.25"	45.75"	44.00"	—	2	50	
9	90.00"	5	145.25"	17.68"	35.00"	93.50"	88.25"	51.75"	50.00"	24.00"	4	54	
10	102.00"	5	163.25"	17.68"	41.00"	105.50"	100.25"	57.75"	56.00"	24.00"	4	56	B-144019
11	108.00"	6	174.50"	18.93"	44.00"	114.00"	106.25"	60.75"	59.00"	24.00"	4	60	
12	120.00"	6	192.50"	18.93"	50.00"	126.00"	118.25"	66.75"	65.00"	24.00"	4	62	
13	144.00"	7	228.50"	20.18"	62.00"	150.00"	142.25"	78.75"	77.00"	24.00"	4	68	
14	152.00"	7 or 8	246.50"	21.43"	68.00"	162.00"	154.25"	84.75"	83.00"	24.00"	4	70	

* MAXIMUM OVERALL
OF ASSEMBLY





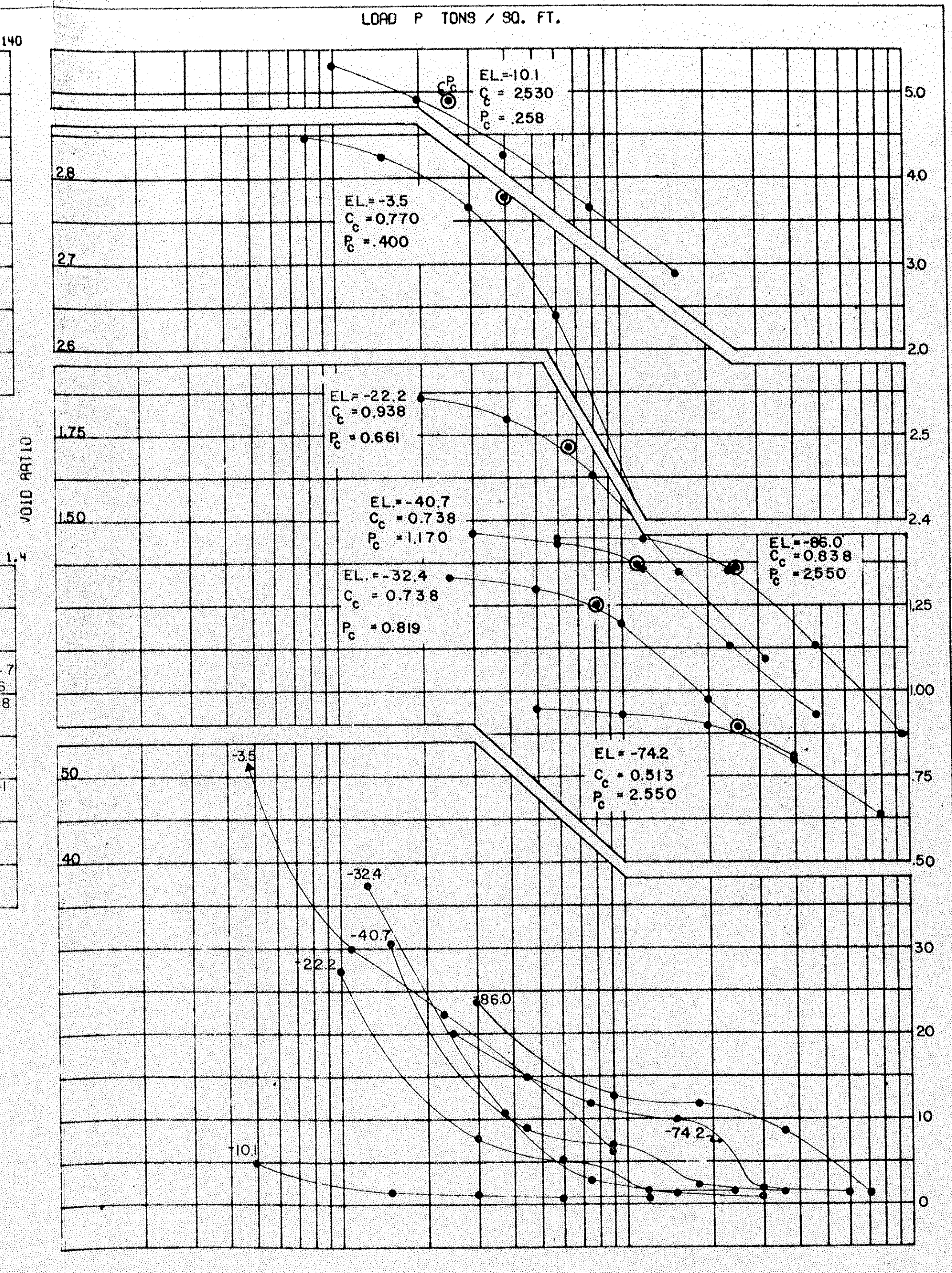
PLASTICITY CHART



SHEAR STRENGTH DATA

BORING NO.	ENVELOPE NO.		TYPE	STRENGTH $\Phi°$	STRENGTH C - TSF	CLASS
6 - UWF	1	[illegible]	Q	0	0.300	CH
	2	-[illegible]	Q	0	0.038	CH
	3	-2[illegible]	Q	0	0.188	CH
	4	-4[illegible]	Q	0	0.313	CH
	5	-7[illegible]	Q	0	0.625	CH
	6	-8[illegible]	Q	0	0.500	CH
	7	-1[illegible]	R*	18	0.100	ML
	8	-2[illegible]4	S	20	0	CH
	9	-5[illegible]	S	33	0	SM

*BASED ON ([illegible] σ_3) AT MAXIMUM PORE PRESSURE



CONSOLIDATION DATA

○ - (UC) UNCONFINED COMPRESSION TEST
● - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
▲ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
⊡ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

FOR LOCATION OF BORINGS SEE PLATE

PLATE

GATES ACROSS FLORIDA AVE DRAINAGE CANAL
SLUICE GATE

$w = 35'$ of head

$\frac{62.5^{\#/ft^3}}{144^{cu.in}} \times 35' = 15.19$ psi

$\frac{(12 \times 15.19) \times 150^{2''}}{8} = 512{,}663$ "lbs per 12" width

$S_x = \frac{512{,}663''^{\#}}{7000\,psi} = 73.23\ in^3 < 162.7\ in^3$

$77.24\ in^3$

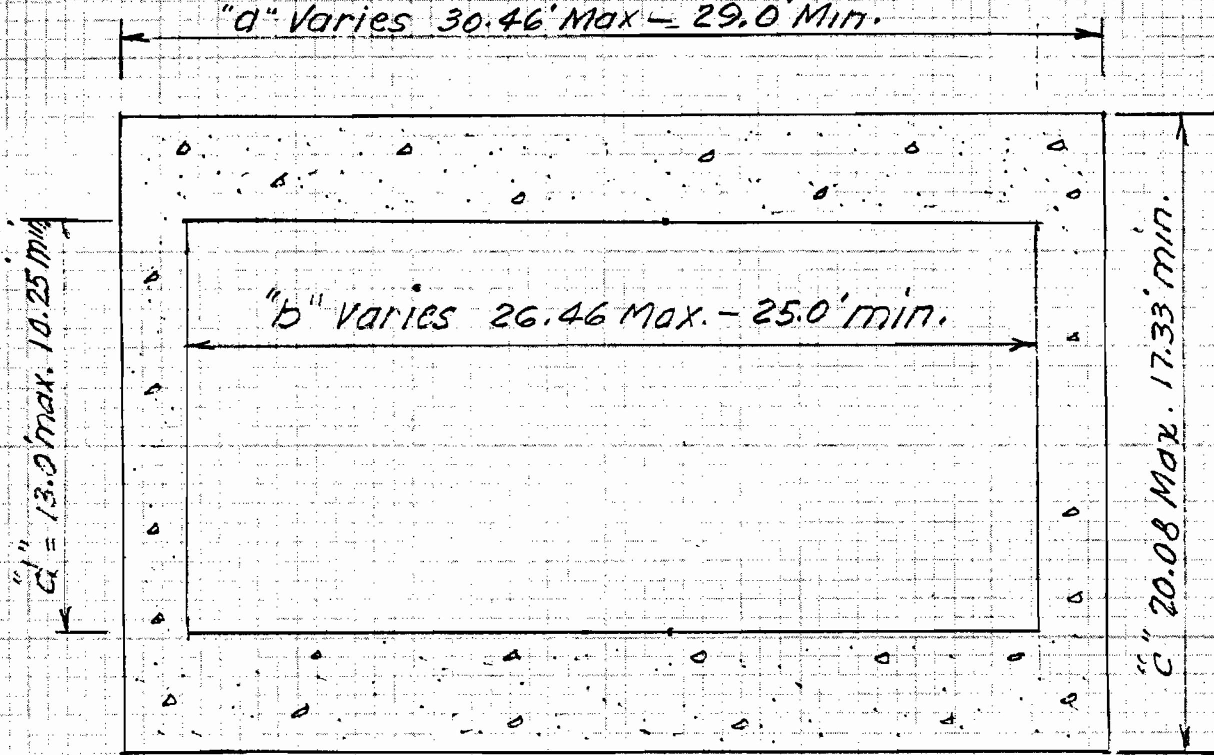
Note:

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ____ OF ____
ITEM ______ BY LWC DATE 11-14-79
JOB No 575-79-E CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL

BOX CONDUIT FOUNDATION LOADS



$(19.28 \times 29) - (12.19 \times 25)\,(0.15^{k}) = 38.16$

$(20.08' \times 30.46') - (13.0' \times 26.46)\,(0.15^{k}) = 40.14^{k}$ per ft of Box Culvert

Wt Conc. Min

$(17.33' \times 29.0') - (10.25' \times 25.0')(0.15^{k}) = 36.95^{k}$ per ft of Box Culvert

Back fill - Say Average 9' Cover = El. top of Fill approx. 3.0
Ground Water level – 4.5
7.5'

7.5' @ $100^{\#}/ft^3$ = 0.75^{k}
1.5' @ $143^{\#}/ft^3$ = 0.21^{k}
$0.96^{k}/\square'$

Live Load (A.A.S.H.O)
h = 9'
a = 1.75h = 15.75' $A = \frac{a}{2} + 3 = 10.88$
b = 1.75h = 15.75' $B = \frac{b}{2} + 7 = 14.88$

$\frac{16^{k}}{10.88 \times 14.88} = .098^{KSF}$ Say 0.1^{KSF}

0.1 + 0.96 = 1.06 KSF @ Top Box Conduit
L.L. + D.L. Earth on Box Culvert

Max. = $30.46 \times 1.06^{KSF} = 32.29^{k}$/Per ft. Culvert
Min. = $29 \times 1.06^{KSF} = 30.74^{k}$/Per ft. Culvert

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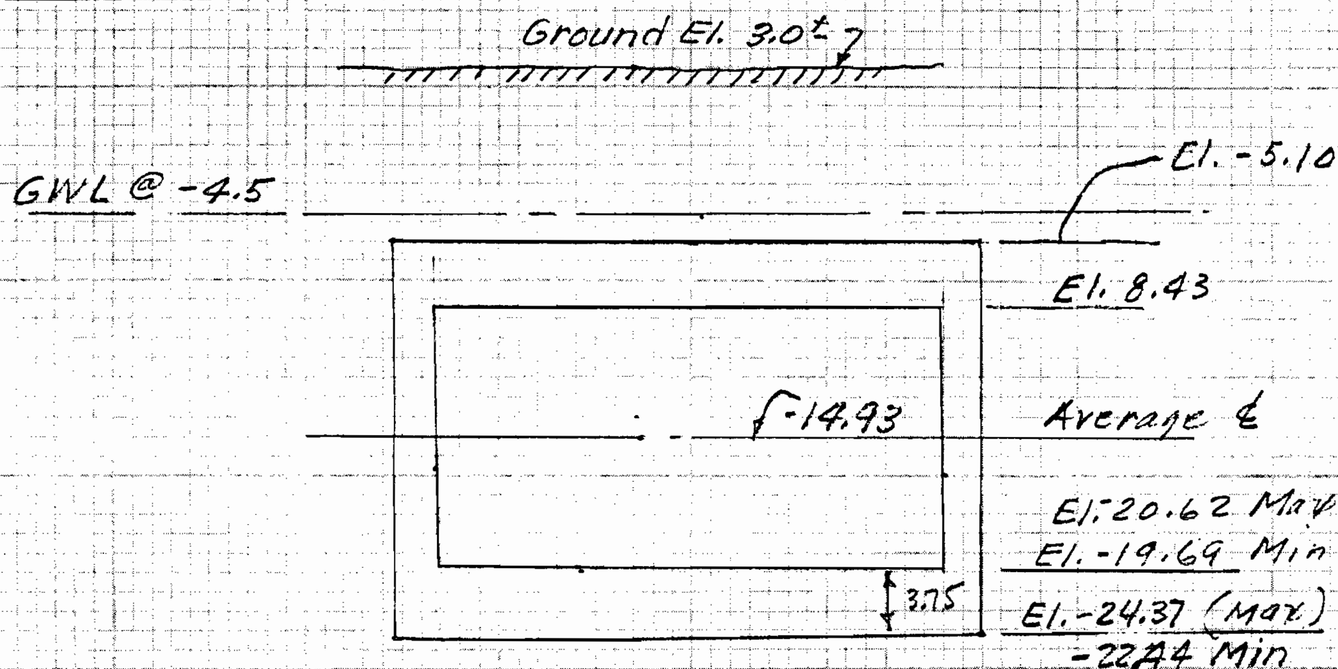
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

BOX CULVERT FOUNDATION LOADS



Max high Water @ El. 14.0

20.62' + 14 = 34.62 ft of head

34.62 x 0.0625^{k} = 2.16^{KSF}

Max H2O = 2.16^{KSF} X 26.46' = 57.15^{k} }
Min. H2O = 2.16^{KSF} X 25' = 54.0^{k} } Water @ El. 14.0

20.62 + 4 = 24.62

24.62 x 0.0625 = 1.54^{KSF}

Max H2O = 1.54 X 26.46 = 40.75^{k} }
Min. H2O = 1.54 X 25 = 38.5^{k} } Water @ El. 4.0

20.62 - 3 = 17.62'

17.62 X .0625 = 1.10^{KSF}

Max H2O = 1.10^{KSF} X 26.46 = 29.1^{k} }
Min H2O = 1.10^{KSF} X 25 = 27.5^{k} } Water @ El. -3

20.62 - 14 = 6.62   6.62 X 0.0625 = 0.41^{KSF}

Max. H2O = 0.41^{KSF} X 26.46 = 10.8^{k} }
Min H2O = 0.41^{KSF} X 25.0 = 10.3^{k} } Water @ El. -14

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

BOX CULVERT FOUNDATION LOADS

Water Wts (Cont

$20.62 - 14.5 = 6.12 \quad 6.12' \times 0.0625 = 0.38^{KSF}$

Max H_2O = $0.38 \times 26.46 = 10.05^K$ } Water @ El. -14.5
Min. H_2O = $0.38 \times 25 = 9.5^K$

$20.62 - 8.5 = 12.12' \quad 12.12 \times 0.0625 = 0.76^{KSF}$

Max H_2O = $0.76^{KSF} \times 26.46 = 20.1^K$ } Water @ El. -8.5
Min. H_2O = $0.76^{KSF} \times 25 = 19.0^K$

- Uplift -

Min. Size

$22.44 - 4.5 = 17.94' \quad 17.94 \times 0.625 = 1.12^{KSF}$

Uplift = $29 \times 1.12^{KSF} = 32.5^K$
Uplift = $30.46 \times 1.12 = 34.1^K$

Max. Size

$24.37 - 4.5 = 19.87 \quad 19.87 \times .0625 = 1.24^{KSF}$

Uplift = $29 \times 1.24^{KSF} = 36^K$
Uplift = $30.46 \times 1.24 = 37.8^K$

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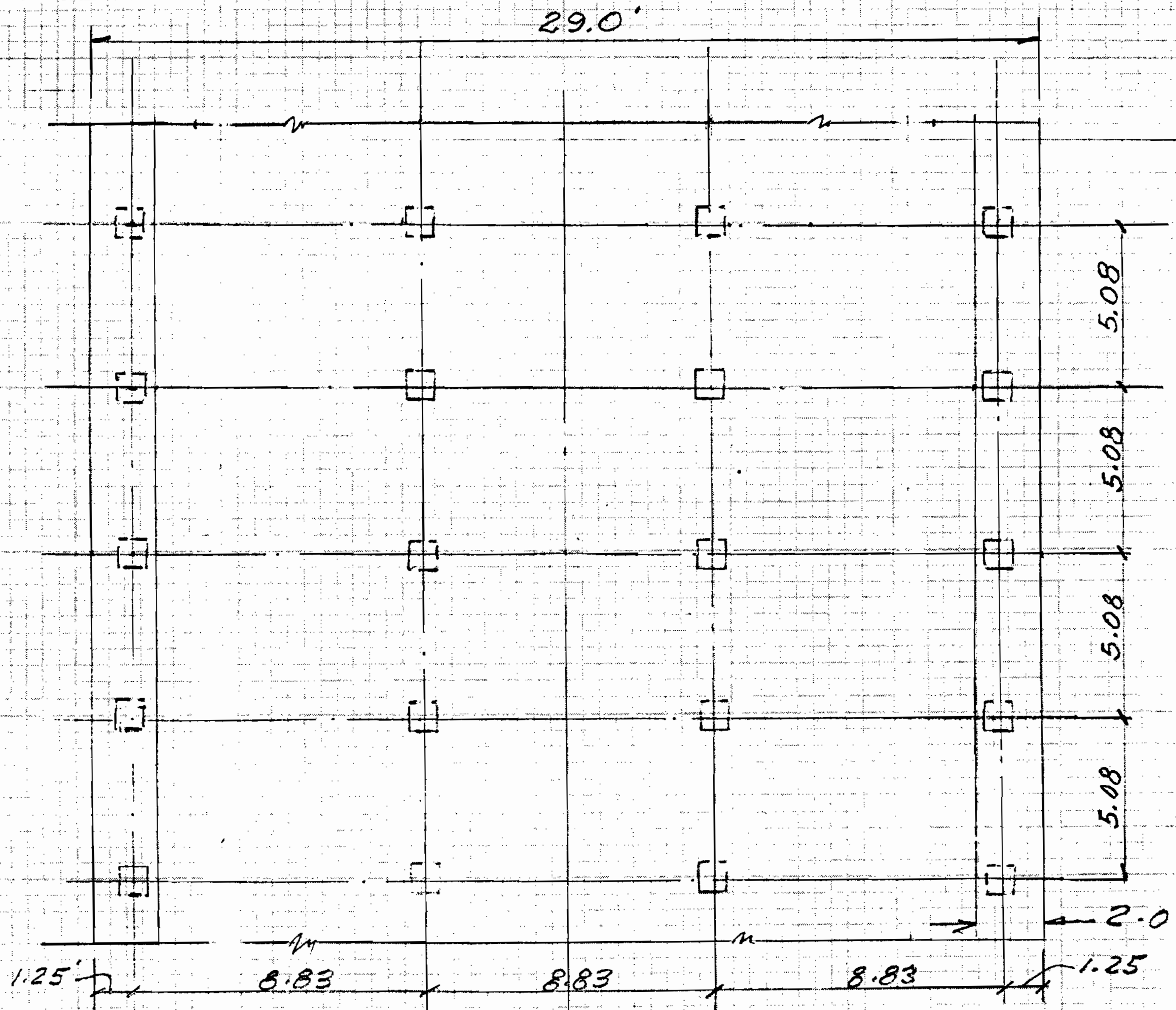
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

BOX CULVERT FOUNDATION LOADS



Backfill Concrete Water uplift

$\Sigma\ F_z = (30.74^k + 38.16^k + 54^k) - 36^k = 57.4^k \quad 57.4 \times 5.08' = 291.6^k$

$d = 45 - 7 - 3 = 35''$

$\dfrac{291.6^k}{4} = 72.9^k < 40\,T$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

BOX CULVERT FOUNDATION LOADS

Top Face Reinf.

Uplift (H_2O) = 1.24^{KSF}

$M = 1.24^{K} \times 5.08' \times 8.08' \times 8.08' \times 0.5 = 206'^{K}$

Pile

$M = 72.9^{K} \times 8.08 = 589$

$\Sigma M = 795'^{K}$

*Note
Reinf may be reduced by 15%

$d = \sqrt{\dfrac{795{,}000 \times 12}{221 \times 61}} = 27'' < 35''$

$A_s = \dfrac{795}{1.44 \times 35} = {}^{*}15.77^{\square''} < \#11@6 = 3.12^{\square''}/Ft$

$3.12 \times 5.08 = 15.84^{\square''}$

$\therefore$ #11@6 o/c Top face

$V = 72.9^{K} + 1.24^{K} \times 8.08' \times 5.08' = 124^{K}$

$v = \dfrac{124{,}000}{35 \times 61} = 58psi < 60\ psi$ (allowable)

Bottom face Reinf

$W = \dfrac{\text{Conc} + \text{backfill} + H_2O}{29'} = \dfrac{30.74 + 38.16 + 54^{K}}{29} = 4.24^{KSF}$

$M = \dfrac{4.24^{KSF} \times 8.83^2}{10} = 33'^{K}$ $d = \sqrt{\dfrac{33{,}000 \times 12}{221 \times 12}} = 12'' < 35''$

$V = \dfrac{4.24 \times 8.83}{2} = 18.72^{K}$ Shear ok by inspection

$A_s = \dfrac{33'^{K}}{1.44 \times 35} = 0.65^{\square'} < \#8@12 = 0.79$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL - APRROACH STRUCTURE

Pile Design:

Soil allowable for ~~12"x 12"~~ 14" x 14" precast prestressed piles

Compression = 80^k

Tension = 40^k

P = Axial pile load

Q = Transverse pile load

Maximum bending moment = 0.5 RQ

R = Effective length

$$R = \sqrt[4]{\frac{EI}{K}}$$

E = modulus of elasticity of pile = 4.29×10^6

I = moment of inertia of pile = $\frac{bh^3}{12} = \frac{12^4}{12} = 1728\ in^4$

K = modulus of subgrade reaction = 100 psi

$$R = \sqrt[4]{\frac{(4.29 \times 10^6)(1728)}{100}} = 92.8\ in.$$

$M = 0.5\,RQ = 0.5\,(92.8)\,Q = 46.4\,Q$

f_b = actual bending stress

$$f_b = \frac{M}{S}$$

where S = Section modulus of pile = $\frac{bh^2}{6} = \frac{12^3}{6} = 288\ in^3$

$$f_b = \frac{46.4\,Q}{288} = 0.1611\,Q$$

f_a = actual axis stress

$$f_a = \frac{P}{A}$$

Where A = area of pile = $144\ in^2$

$$f_a = \frac{P}{144} = .006944\,P$$

F_b = Allowable bending stress

F_b = Allowable axial stress

GATES ACROSS FLORIDA AVE DRAINAGE CANAL - APPROACH STRUCTURE

PILE DESIGN:

COMPRESSION PILES

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \le 1.0$$

$F_a = F_b = 750$ psi

(0.35f'c - max. prestress 0.2f'c
= 1750 - 1000 = 750)

$$\frac{0.006944P}{750} + \frac{0.1611Q}{750} = 1$$

$$0.006944(80000) + 0.1611Q = 750$$

$$= 555.52 + 0.1611Q = 750$$

$$\frac{750 - 555.52}{0.1611} = Q = 1207^{\#}$$

$$Q_{ALLOW.} = 1207^{\#} = \underline{1.207^{K}}$$

Tension Piles

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \le 1.0$$

$F_a = F_b = 771$ psi

(min. effective prestress after losses)

$$\frac{0.006944P}{\cancel{771}\ 850} + \frac{0.1611Q}{\cancel{771}\ 850} = 1$$

$$= 0.006944(40{,}000) + 0.1611Q = 771$$

$$= \frac{\cancel{771}\ 850 - 277.76}{0.1611} = Q = \cancel{3062}\ 3552$$

$$Q_{allowable} = \cancel{3062}\ 3552\ lb = \cancel{3.062}\ 3.552^{K}$$

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

LOAD CASES

Case I: Construction Case, No backfill, Gates raised, No Water

Case II: Water level El. 14.0 Flood side, El -8.5 Protected side, impervious cutoff.

Case III: Water level El. 14.0 Flood side, El. -8.5 Protected side pervious cutoff.

Case IV: Water Level El. 4.0 Flood side, El. -14.5 Protected side impervious cutoff

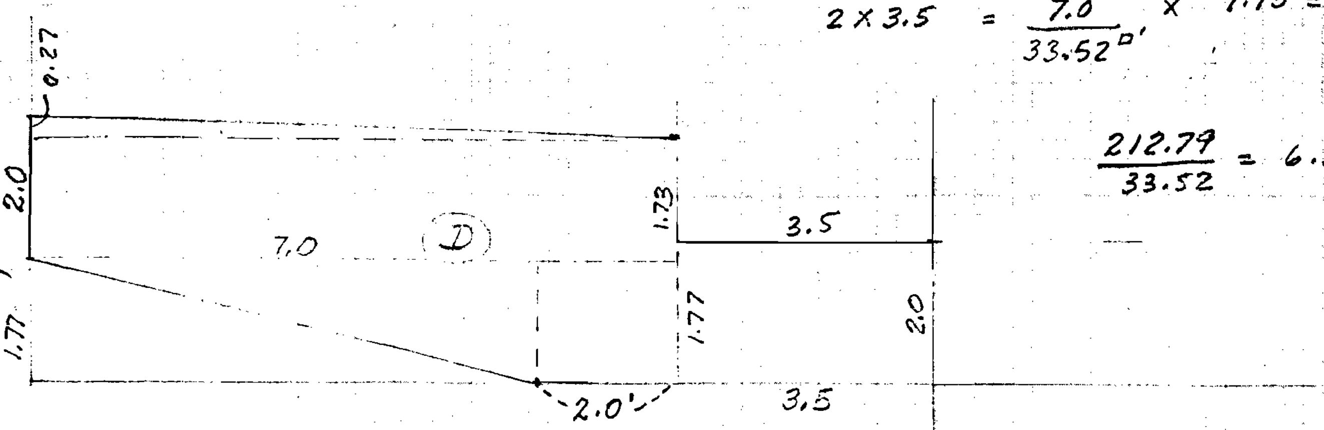
Case V: Water Level El. 4.0 Flood side, El. -14.5 Protected side pervious cutoff.

Case VI: Water Level El. -14.0 Flood side, El. -3.0 Protected side impervious cutoff.

Case VII: Water Level El. -14.0 Flood side, El. -3.0 Protected side pervious cutoff.

$$\frac{0.27 \times 9}{2} = 1.215 \times 9.5 = 11.543$$
$$9 \times 1.73 = 15.57 \times 8 = 124.56$$
$$\frac{1.77 \times 7}{2} = 6.195 \times 7.83 = 48.507$$
$$2 \times 1.77 = 3.54 \times 4.5 = 15.93$$
$$2 \times 3.5 = 7.0 \times 1.75 = 12.25$$

Totals: $33.52^{\square'}$ and 212.79



$$\frac{212.79}{33.52} = 6.35'$$

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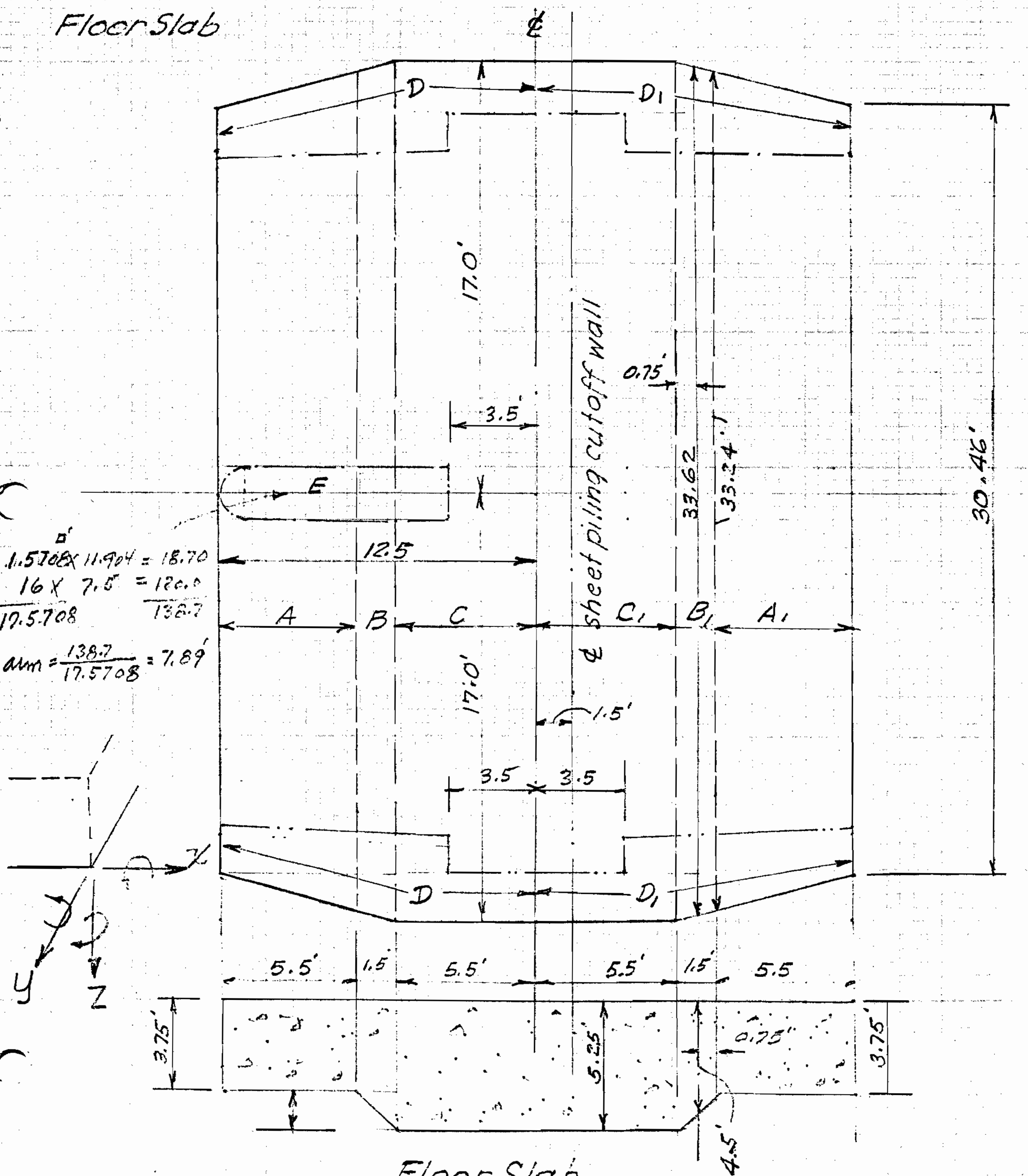
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

Floor Slab



Floor Slab

$1.5708 \times 11.904 = 18.70$

$16 \times 7.5 = 120.0$

Arm 17.5708 $\quad 138.7$

$\text{arm} = \frac{138.7}{17.5708} = 7.89'$

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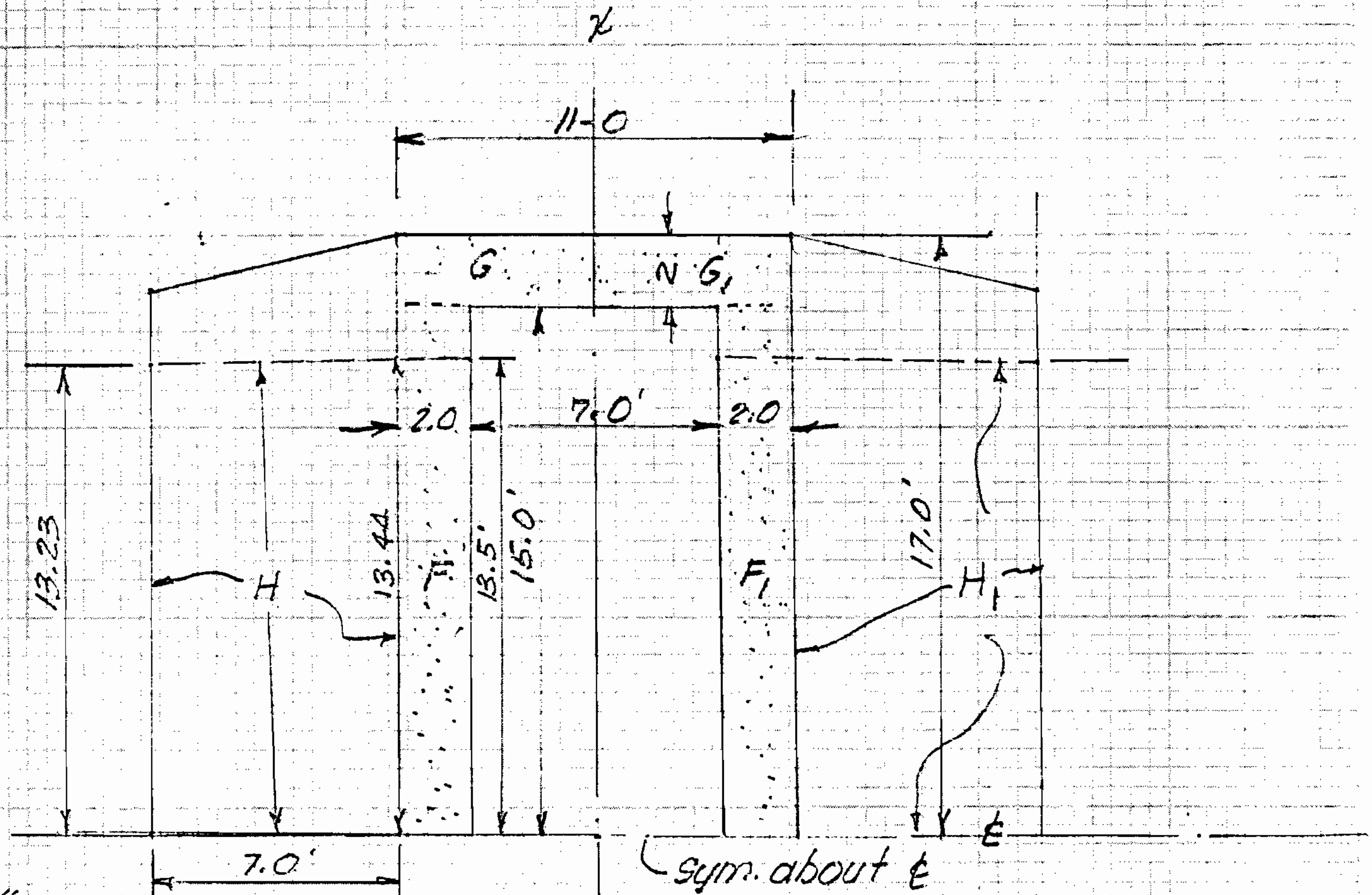
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL
GATE STRUCTURE FOUNDATION



PLAN OF WALLS
El. -5.1 to El. 15.57

$$\begin{array}{r} 13.44 \\ 13.23 \\ \hline 0.21 \end{array}$$

H

$\frac{0.21 \times 7}{2} = 0.735 \times \left(\frac{7}{3} + 5.5\right) = 5.758$

$= 20.67'$

$7 \times 13.23 = 92.61 \times (3.5 + 5.5) = 833.49$

$93.345 \square'$ $\quad$ 839.248

$\frac{839.248}{93.345 \square'} = 8.99'$

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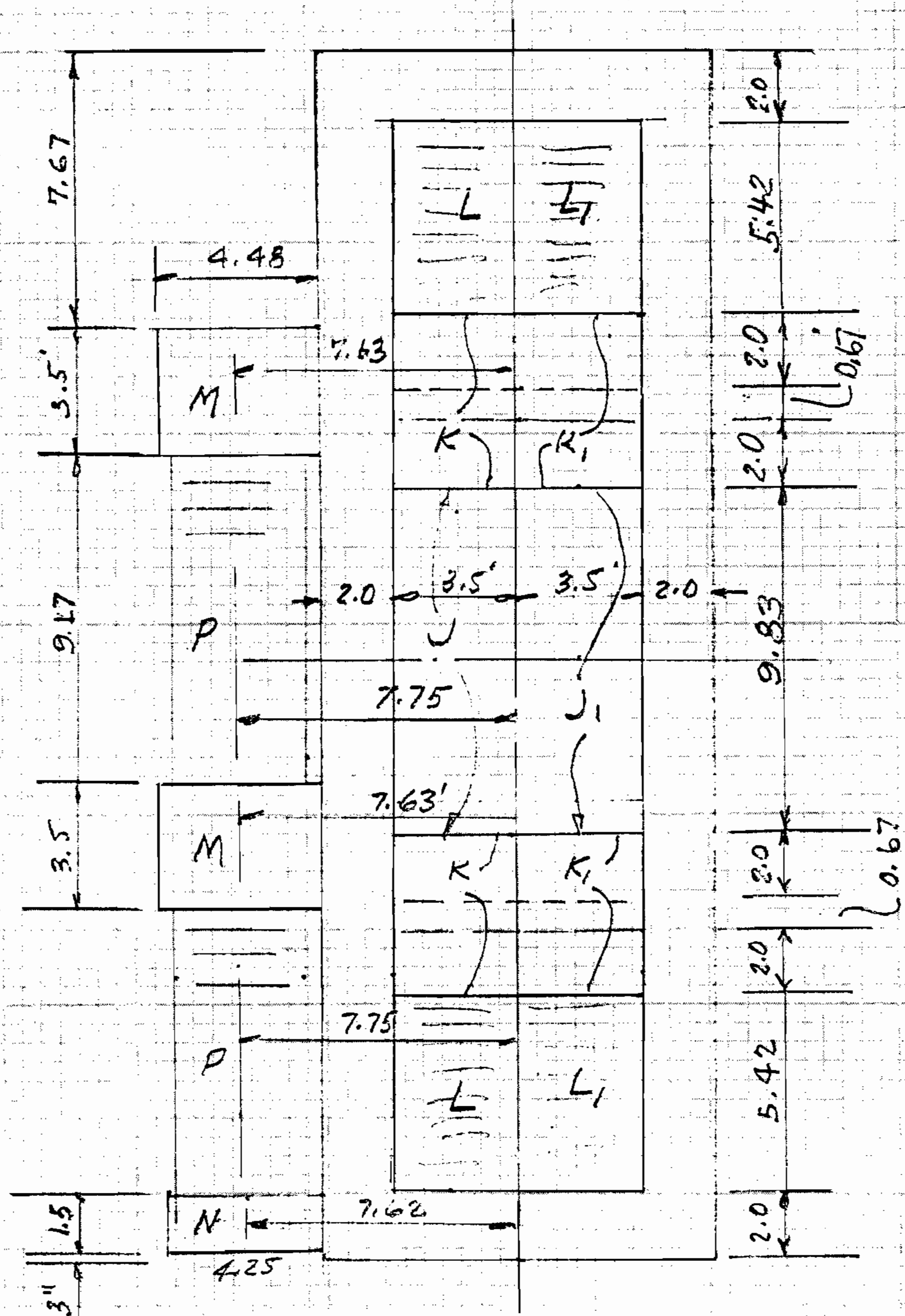
GATES ACROSS FLORIDA AVE DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS



Top Plan

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL
GATE STRUCTURE FOUNDATION LOADS

MOMENTS ABOUT X-X AXIS

ITEM.	COMPUTATION	F_z K	F_y K	ARM Ft	$M_{x\text{-}x}$ FT. K
Floor Slab					
A	$\left(\frac{33.24+34}{2}\right)(5.5)(3.75)(0.15)$	104.0		-9.75	-1014
A_1	$\left(\frac{33.24+34}{2}\right)(5.5)(3.75)(0.15)$	104.0		9.75	1014
B	(1.5)(4.5)(33.62)(0.15)	34.0		-6.25	-213
B_1	(1.5)(4.5)(33.62)(0.15)	34.0		6.25	213
C	(5.5)(34)(5.25)(0.15)	147.3		-2.75	-405
C_1	(5.5)(34)(5.25)(0.15)	147.3		2.75	405
Walls	Page 1 Sect			Page 1	
D	(33.52)(14.33)(0.15)	72.1		-6.43	-464
D	(33.52)(14.33)(0.15)	72.1		-6.43	-464
D_1	(33.52)(14.33)(0.15)	72.1		6.43	464
D_1	(33.52)(14.33)(0.15)	72.1		6.43	464
E	(17.57)(13)(0.15)	34.3		-7.89	-271
F	(30)(2)(20.67)(0.15)	186.0		-4.5	-837
F_1	(30)(2)(20.67)(0.15)	186.0		4.5	+837
G	(5.5)(2)(20.67)(0.15) 2	68.2		-2.75	-188
G_1	(5.5)(2)(20.67)(0.15) 2	68.2		2.75	188
Cond. Top Slab H	Page 3 (93.35)(3.33)(0.15) 2	93.3		-8.99	-839
H_1	(93.35)(3.33)(0.15) 2	93.3		8.99	839
Oper Floor J	(3.5)(9.83)(0.67)(0.15)	3.5		-1.75	-6
J_1	(3.5)(9.83)(0.67)(0.15)	3.5		1.75	6
K	2[(7.0×2×3 + 7.0×0.67×1)(0.15)]	22		-1.75	-39
K_1	2[(7×2×3 + 7×0.67×1)(0.15)]	22		1.75	39

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GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL
GATE STRUCTURE FOUNDATION LOADS
MOMENTS ABOUT X-X AXIS

ITEM	COMPUTATION	F_Z K	F_Y K	ARM Ft	M_{X-X} FT K
Open Fl. Grating (L)	5.42'X7X0.035 K	1.3		-1.75	-2
L1	5.42X7X0.035 K	1.3		1.75	2
Live Load @ 100 #/sq ft	5.5X34X0.1	18.7		-2.75	-51
	5.5 X 34X 0.1	18.7		2.75	51
* Gate + Stem + Cracking force	= 154 K X2	308 K		-2.33	-718
Stair Land. (M)	$\left[\frac{(0.33 \times 4.48)}{2} + (1.0 \times 4.48)\right](3.5)(2)(0.15)$	5.5		-7.63	-42
(N)	(4.25)(1.5)(1.5)(0.15)	1.4		-7.62	-11
Steel Stairs	(see page 22)	4.6		-7.75	-36
Live Load @ 100 lbs/sq ft	9.17X3.5X2X0.1	6.4		-7.75	-50
	4.48X3.5X2X0.1	3.1		-7.63	-24
	1.5X4.25X0.1	0.6		-7.62	-5
	SUB-TOTAL CASES II, III, IV, V, VI, VII	2008.9			-1157
		-308			+718
* Wt. 2 gates + stems	SUB-TOTAL	1700.9			
		+64.4		-2.33	-150
	CASE I	1765.1			-589
Backfill Assume 0.85 K/ft³ + H_2O = 0.143	8.67X7X32.23X0.143	279.7		-8.94	-1976
	8.67X7X32.23X0.143	279.7		8.94	+1976
	Case II III IV, V, VI VII	2450.9			-1157

* See Page 20. Gate Structure Calcs for Wt 2 gates + stems @ 20' head (El. 4 Water Surface Flood side)

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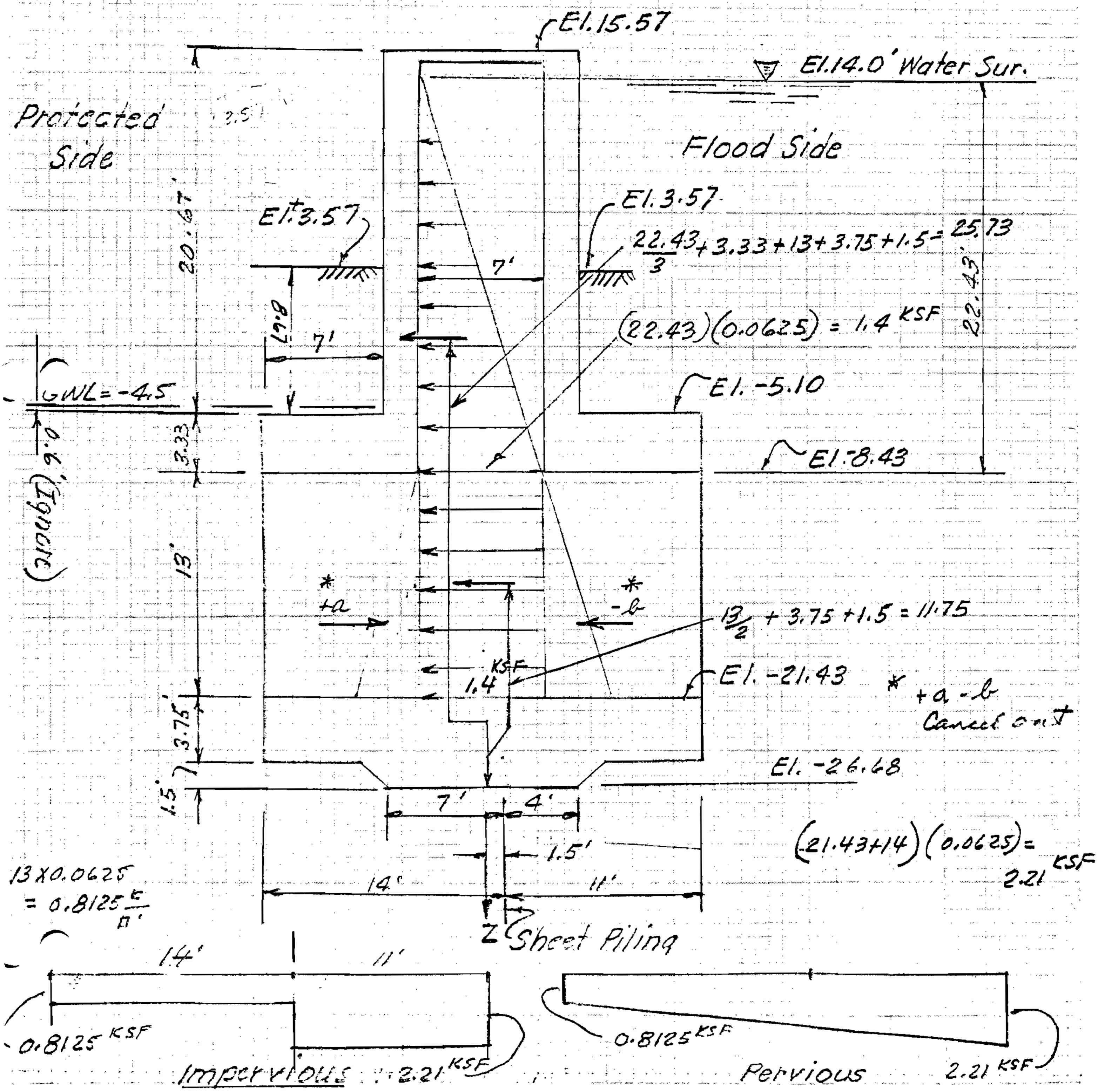
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

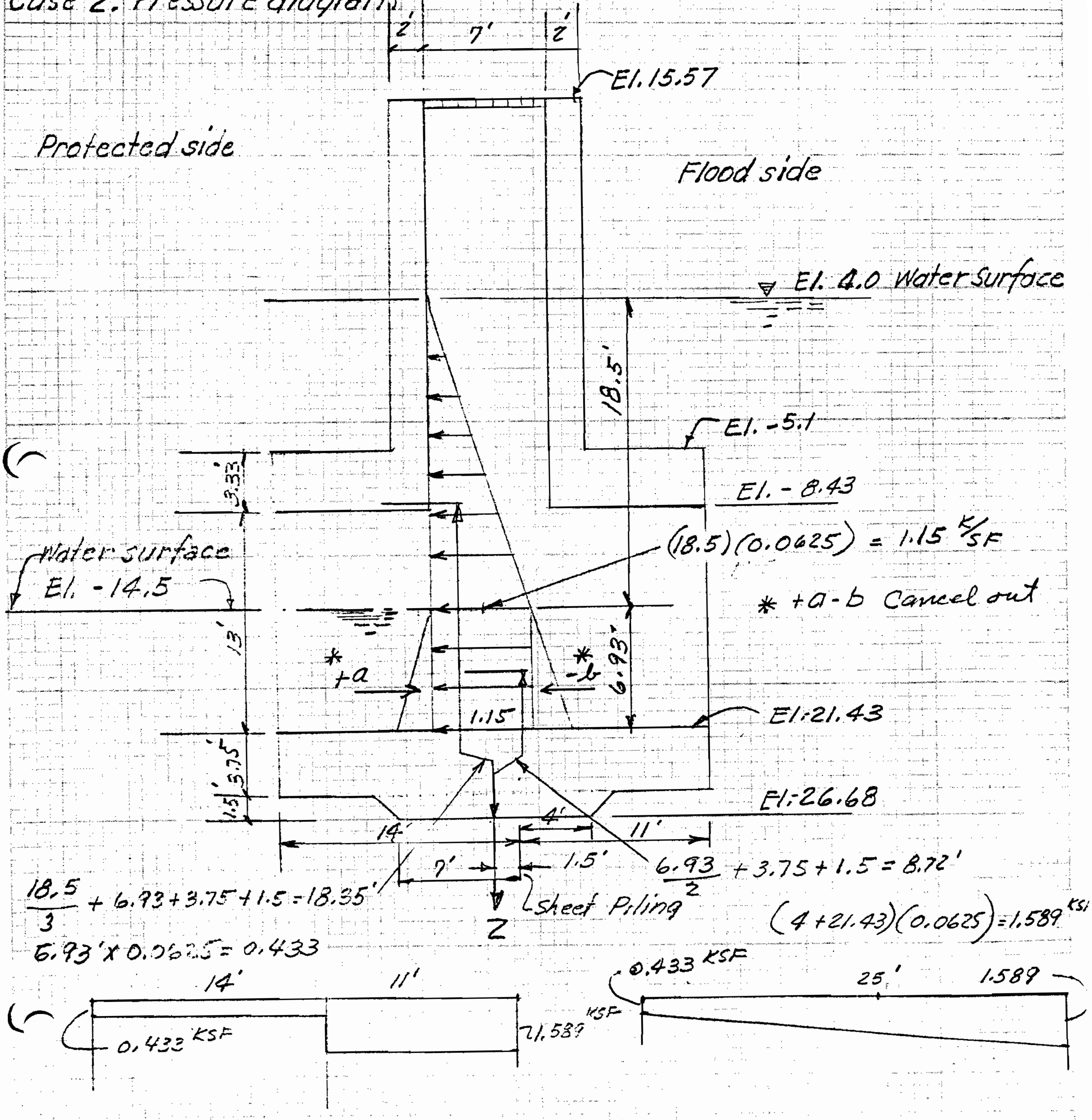
Case. I Pressure Diagram



GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION

Case 2. Pressure diagram



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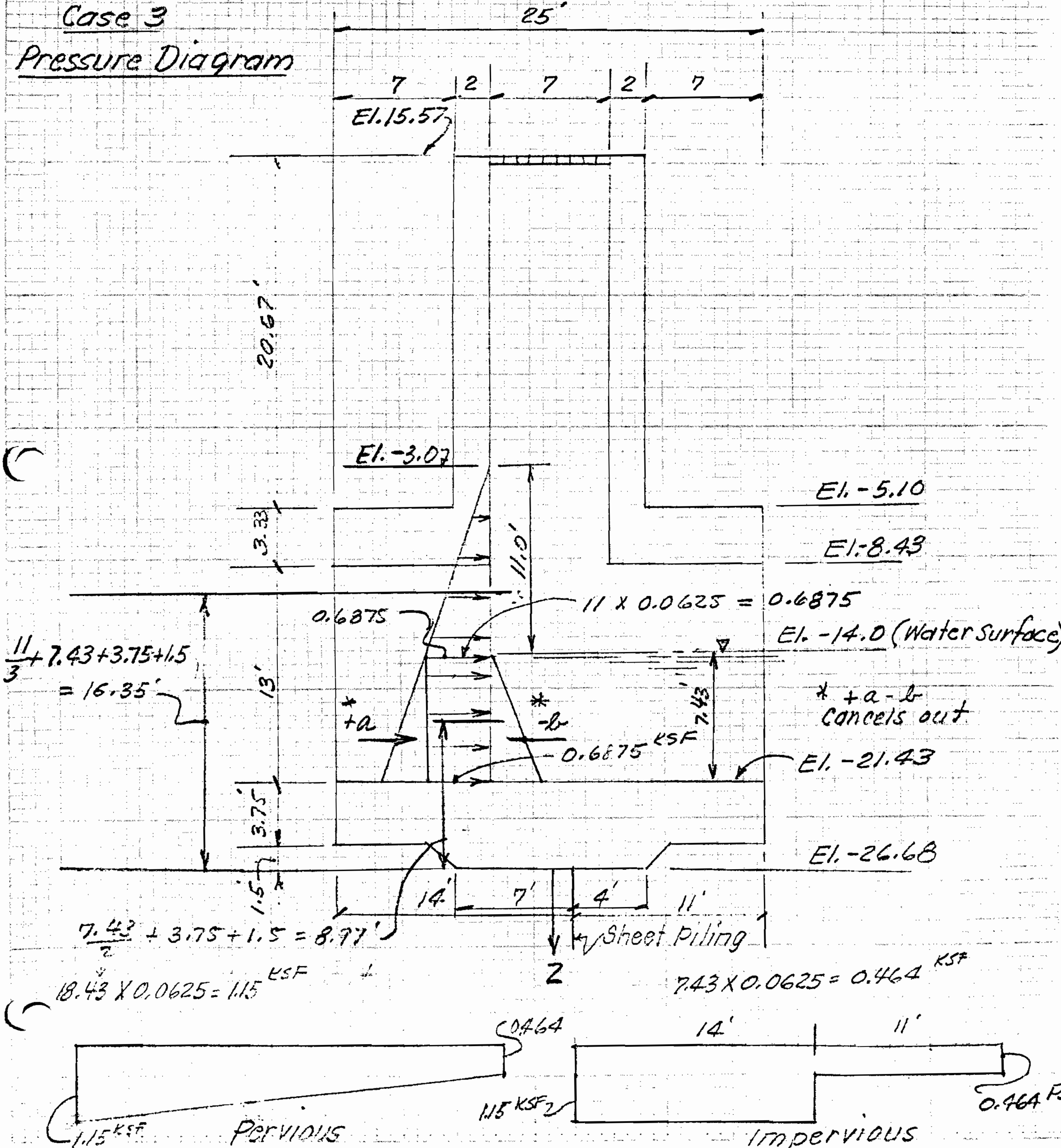
GATE STRUCTURE FOUNDATION

Case 3

Pressure Diagram



GATES ACROSS FLORIDA AVE. DRAINAGE CANAL - GATE STRUCT.

IHNC Flood Side	Florida Ave Canal Protected Side
Case 1. El. 14.0	El. -8.5
Case 2. El. 4.0	El. -14.5
Case 3. El. -14.0	El. -3.0

ITEM	COMPUTATION	Fz K	Fy K	ARM FT.	Mxx FT-K.
Case 1. (See pressure diagram) Page-7					
Horiz.	(1.4)(13)(30)		-546	11.75	-6416
Horiz.	$\left(\frac{1.4 \times 22.43}{2}\right)(30)$		-471	25.73	-12,119
Case 2. (See pressure diagram) Page 8					
Horiz.	(1.19)(6.93)(30)		-247.4	8.72	-2157
Horiz	$\left(\frac{1.19 \times 18.5}{2}\right)(30)$		-330.2	18.35	-6059
Case 3 (See pressure Diagram) Page 9					
Horiz.	(0.6875)(7.43)(30)		+153.2	8.97	+1374
Horiz.	$\left(\frac{0.6875 \times 11}{2}\right)(30)$		+113.4	16.35	+1854

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

MOMENTS ABOUT X-X AXIS (Case 1. Water Load)

ITEM	COMPUTATION	Fz K	Fy K	Arm	Mx-x FT K.
Vert H_2O Case 1.	35.43 X 30 X 7 X 0.0625	465.0			
"	13 X 27 X 2 X 0.0625	43.9		4.5	198.
"	19.1 X 7 X $\frac{30.48+34}{2}$ X 0.0625	269.4		8.94	2408
"	13 X 7 X $\frac{30.48+34}{2}$ X 0.0625	183.4		8.94	1640
"	13 X 25 X 2 X 0.0625	40.6		-4.5	-183
"	13 X 7 X $\frac{30.48+34}{2}$ X 0.0625	183.4	1185.7	-8.94	-1640
					+2423
Case 1 Uplift-Imp.	2.21 KSF X 4 X 34	-300.6		3.5	-1052
"	2.21 X 7 X $\frac{30.48+34}{2}$	-498.8		8.94	-4468
"	0.8125 X 7 X 34	-193.4		-2	387
"	0.8125 X 7 X $\frac{30.48+34}{2}$	-183.4	-1176.2	-8.94	1640
					-3493
Uplift Per.	0.8125 (7 X 34 + 2 X 7 X $\frac{30.48+34}{2}$)	-560.1			
"	$\frac{2.21-0.8125}{2}$ (7 X 34 + 2 X 7 X $\frac{30.48+34}{2}$)	-481.7	-1041.8	4.17	-2009

(Case 2 Water Load)

ITEM	COMPUTATION	Fz K	Fy K	Arm	Mx-x FT K.
Vert H_2O Case 2	25.43 X 30 X 7 X 0.0625	333.8			
"	13 X 27 X 2 X 0.0625	43.9		4.5	198
"	9.1 X 7 X $\frac{30.48+34}{2}$ X 0.0625	128.4		8.94	1148
"	13 X 7 X $\frac{30.48+34}{2}$ X 0.0625	183.4		8.94	1640
"	6.93 X 2 X 25 X 0.0625	21.7		-4.5	-98
"	6.93 X 7 X $\frac{30.48+34}{2}$ X 0.0625	97.7		-8.94	-873
		808.9			+2015

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

MOMENTS ABOUT X-X AXIS (Case 2. Water Loads) Cont.

ITEM	COMPUTATION	F_z K	F_y K	ARM FT	M_{x-x} FT K
Case 2 Uplift. Imper.	$1.589 \times 4 \times 34$	-216.1		3.5	-756
"	$1.589 \times 7 \times \frac{30.48+34}{2}$	-358.6		8.94	-3206
"	$0.433 \times 7 \times 34$	-103.1		-2	206
"	$0.433 \times 7 \times \frac{30.48+34}{2}$	-97.7	-775.5	-8.94	873
Uplift-Perv.	$0.433(7 \times 34 + 2 \times 7 \times \frac{30.48+34}{2})$	-298.5			-2883
"	$\frac{1.589-0.433}{2}(7 \times 34 + 2 \times 7 \times \frac{30.48+34}{2})$	-398.5	-697	4.17	-1662
					(Case 3 - Water Load)
Vert. H_2O Case 3	$7.43 \times 30 \times 7 \times 0.0625$	97.5			
"	$7.43 \times 30 \times 2 \times 0.0625$	27.9		4.5	126
"	$2.1 \times 7 \times \frac{30.48+34}{2} \times 0.0625$	-29.6		8.94	-265
"	$13 \times 7 \times \frac{30.48+34}{2} \times 0.0625$	-183.4		8.94	-1640
"	$13 \times 2 \times 2.5 \times 0.0625$	-40.6		4.5	-183 -1962
Uplift. Imp	$7 \times 34 \times 1.15$	-273.7	-128.2	-2	547
"	$7 \times \frac{30.48+34}{2} \times 1.15$	-259.5		-8.94	2320
"	$4 \times 0.464 \times \frac{30.48+34}{2}$	-59.8		3.5	-209
"	$7 \times 0.464 \times \frac{30.48+34}{2}$	-104.7		8.94	-936
Uplift Perv.	$0.464(7 \times 34 + 2 \times 7 \times \frac{30.48+34}{2})$	-319.9	-697.7		1722
"	$\frac{1.15-0.464}{2}(7 \times 34 + 2 \times 7 \times \frac{30.48+34}{2})$	-236.5	-556.4	-4.17	986
Average Backfill @ El 3.57 Case 1 & 2	K = 0.85 $\gamma = 100\,\#/ft^3$ Saturated = $0.143\,K/ft^3$				
Floodside	$(0.5)\, 8.67^2 \times 0.143 \times 0.5$		2.7	24.47	66
Protected	$(0.5)\, 8.67^2 \times 0.085 \times 0.5$		-1.6	24.47	-39

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL
GATE STRUCTURE FOUNDATION LOADS

LOAD TABULATION

Load Nº	ITEM	F_x K	F_y K	F_z K	M_x 1-K	M_y 1-K	M_z 1-K
1	Concrete, Misc.	0	0	1700.9	-589	0	0
2a	Gates, Water @ El. 14.0, FS	0	0	308.0	-718	0	0
2b	Gates, Water @ El. 4.0, FS	0	0	238.0	-555	0	0
2c	Gates, Open (Normal)	0	0	64.4	-150	0	0
3a	Earth (Vert.)	0	0	559.4	0	0	0
3b	Earth (Horiz.)	0	1.1	0	27	0	0
4a	Water (Horiz) El. 14.0 FS, El. -8.5 PS	0	-1017.0	0	-18,535	0	0
4b	Water (Horiz.) El. 4.0 FS, El. -14.5 PS	0	-577.6	0	-8216	0	0
4c	Water (Horiz.) El. -14.0 FS, El. -3.0 PS	0	-266.6	0	3228	0	0
5a	Water (Vert.) El. 14.0 FS, El. -8.5 PS	0	0	1185.7	2423	0	0
5b	Water (Vert) El. 4.0 PS El -14.5 PS	0	0	808.9	2015	0	0
5c	Water (vert) El. -14.0 FS El. -3.0 PS	0	0	-128.2	-1962	0	0
6a	Uplift - Impervious Water El. 14.0 FS, El. -8.5 PS	0	0	-1176.2	-3493	0	0
6b	Uplift - Impervious Water - El. 4.0 FS, El -14.5 PS	0	0	-775.5	-2883	0	0
6c	Uplift - Impervious Water EL. -14.0 FS, El. -3.0 PS	0	0	-697.7	1722	0	0
7a	Uplift - Pervious Water El. 14.0 FS, El. -8.5 PS	0	0	-1041.8	-2009	0	0
7b	Uplift - Pervious Water El. 4.0 FS, El. -14.5 PS	0	0	-697.0	-1662	0	0
7c	Uplift - Pervious Water El. -14.0 FS, El. -3.0 PS	0	0	-556.4	986	0	0

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

GATE STRUCTURE FOUNDATION LOADS

LOAD SUMMATION							
CASE	ITEM	F_x K	F_y K	F_z K	M_x 1-K	M_y 1-K	M_z 1-K
I	1+2c	0	-120.1	1765.4	-739	0	0
II	1+2a+3a+3b+4a+5a+6a	0	-1015.9	2578.0	-20,885	0	0
III	1+2a+3a+3b+4a+5a+7a	0	-1015.9	2711.2	-19,990	0	0
IV	1+2b+3a+3b+4b+5b+6b	0	-576.5	2531.7	-10,201	0	0
V	1+2b+3a+3b+4b+5b+7b	0	-576.5	2610.2	-8980	0	0
VI	1+2c+3a+3b+4c+5c+6c	0	-265.5	1498.8	-2276	0	0
VII	1+2c+3a+3b+4c+5c+7c	0	-265.5	1640.1	1540	0	0

11/28/79   16.21

(99)

```
10 FLORIDA AVE WEST 575-79
20 CANAL GATE
 0 5,7
  2,0.0,64
   1,14,14
60 1,5
70 -1,7.14
80 0,0,0
100 4,90,6
110 3*-12.5,3*12.5
140 10.75,7.25,3.75,10.75,7.25,3.75
170 6*0.0
200 2,90,23
210 -9.5,-6.5,-3.5,0,3.5,6.5,9.5,-9.5,-6.5,-3.5,0,3.5,6.5,9.5,-15.5,-9.5,
220 -6.5,-3.5,0,3.5,6.5,9.5,15.5
240 7*10.75,7*7.25,9*3.75
270 23*0.0
300 0,90,11
310 -15.5,-12.5,-9.5,-6.5,-3.5,0,3.5,6.5,9.5,12.5,15.5
340 11*0.0
370 11*0.0
400 2,270,23
410 -15.5,-9.5,-6.5,-3.5,0,3.5,6.5,9.5,15.5,-9.5,-6.5,-3,5,0,3.5,6.5,9.5,
420 -9.5,-6.5,-3.5,0,3.5,6.5,9.5
440 9*-5.25,7*-8.25,7*-11.25
470 23*0.0
500 4,270,6
510 3*-12.5,3*12.5
540 -5.25,-8.25,-11.25,-5.25,-8.25,-11.25
570 6*0.0
000 0,0,1765.4,-739,0,0
2010 0,-1015.9,2578,-20885,0,0
2020 0,-1015.9,2711.2,-19990,0,0
2030 0,-576.5,2531.7,-10201,0,0
2040 0,-576.5,2610.2,-8980,0,0
2050 0,-265.5,1498.8,2276,0,0
2060 0,-265.5,1640.1,1540,0,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A
```

11/28/79   16.234

PROG. NO. 713-F3-A2-210   16:14:47 11/28/79   MOD 6A, JUN 78   100

FLORIDA AVE WEST 575-79
CANAL GATE

TOTAL NUMBER OF PILES =   69

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	1765.4	-739.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.0	0.0	29.0
7	-0.0	0.0	26.7
30	-0.0	0.0	29.9
41	-0.0	-0.0	26.7
64	-0.0	-0.0	29.0

1   SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	0.0	1765.4	-739.0	-0.0	-0.0

LOAD CONDITION 2

101

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-1015.9	2578.0	-20885.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	0.0	-27.8
2	0.0	0.0	-5.7
3	-0.0	0.0	16.4
4	0.0	0.0	-27.8
5	0.0	0.0	-5.7
6	-0.0	0.0	16.4
7	0.1	0.0	-25.3
14	0.0	0.0	-4.9
21	-0.0	0.0	15.5
30	0.0	0.0	40.9
41	-0.1	-0.0	66.4
50	-0.2	-0.0	83.8
57	-0.2	-0.0	101.3
64	-0.1	-0.0	72.4
65	-0.1	-0.0	91.3
66	-0.1	-0.0	110.2
67	-0.1	-0.0	72.4
68	-0.1	-0.0	91.3
69	-0.1	-0.0	110.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-1015.9	2578.0	-20885.0	0.0	0.0

3-6-83 8/

447

LOAD CONDITION 3

(4)

(102)

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-1015.9	2711.2	-19990.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	0.0	-14.3
2	-0.1	0.0	2.3
3	-0.1	0.0	18.9
4	-0.1	0.0	-14.3
5	-0.1	0.0	2.3
6	-0.1	0.0	18.9
7	-0.1	0.0	-18.5
14	-0.1	0.0	-3.1
21	-0.1	0.0	12.2
30	-0.1	0.0	43.8
41	-0.0	-0.0	72.7
50	-0.1	-0.0	85.9
57	-0.1	-0.0	99.0
64	0.0	-0.0	73.2
65	0.0	-0.0	87.4
66	-0.0	-0.0	101.7
67	0.0	-0.0	73.2
68	0.0	-0.0	87.4
69	-0.0	-0.0	101.7

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	-0.0	-1015.9	2711.2	-19990.0	0.0	-0.0

(5)

103

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-576.5	2531.7	-10201.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	26.7
2	-0.2	0.0	27.2
3	-0.2	0.0	27.7
4	-0.2	0.0	26.7
5	-0.2	0.0	27.2
6	-0.2	0.0	27.7
7	-0.2	0.0	12.4
30	-0.2	0.0	42.8
41	0.1	-0.0	63.4
64	0.1	-0.0	55.5
67	0.1	-0.0	55.5

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	-0.0	-576.5	2531.7	-10201.0	-0.0	-0.0

(7)

104

LOAD CONDITION 6

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-265.5	1498.8	2276.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	0.0	102.1
2	-0.8	0.0	61.6
3	-0.8	0.0	21.1
4	-0.9	0.0	102.1
5	-0.8	0.0	61.6
6	-0.8	0.0	21.1
7	-0.9	0.0	46.4
14	-0.9	0.0	9.0
21	-0.8	0.0	-28.3
30	-0.7	0.0	30.4
41	0.7	-0.0	66.6
50	0.8	-0.0	34.6
57	0.8	-0.0	2.6
64	0.8	-0.0	20.5
65	0.8	-0.0	-14.3
66	0.8	-0.0	-49.0
67	0.8	-0.0	20.5
68	0.8	-0.0	-14.3
69	0.8	-0.0	-49.0

6 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

6	-0.0	-265.5	1498.8	2276.0	-0.0	-0.0

LOAD CONDITION 7

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-265.5	1640.1	1540.0	0.	0.

(105)

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.8	0.0	96.4
2	-0.8	0.0	59.8
3	-0.7	0.0	23.1
4	-0.8	0.0	96.4
5	-0.8	0.0	59.8
6	-0.7	0.0	23.1
7	-0.8	0.0	45.1
14	-0.8	0.0	11.4
21	-0.7	0.0	-22.4
30	-0.7	0.0	32.3
41	0.7	-0.0	65.7
50	0.7	-0.0	36.7
57	0.8	-0.0	7.8
64	0.7	-0.0	23.8
65	0.7	-0.0	-7.6
66	0.7	-0.0	-39.0
67	0.7	-0.0	23.8
68	0.7	-0.0	-7.6
69	0.7	-0.0	-39.0

7 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

7 -0.0 -265.5 1640.1 1540.0 -0.0 -0.0

0 16:21:28 11/28/79 *** END OF RUN ***

LOAD CONDITION 5

(6)

(106)

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-576.5	2610.2	-8980.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	42.8
2	-0.3	0.0	36.2
3	-0.3	0.0	29.5
4	-0.4	0.0	42.8
5	-0.3	0.0	36.2
6	-0.3	0.0	29.5
7	-0.4	0.0	19.8
14	-0.4	0.0	13.7
21	-0.4	0.0	7.5
30	-0.3	0.0	45.0
41	0.2	-0.0	70.3
50	0.2	-0.0	65.0
57	0.2	-0.0	59.7
64	0.3	-0.0	54.9
65	0.3	-0.0	49.2
66	0.3	-0.0	43.5
67	0.3	-0.0	54.9
68	0.3	-0.0	49.2
69	0.3	-0.0	43.5

5 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

5	-0.0	-576.5	2610.2	-8980.0	-0.0	-0.0

STOP EOJ

107

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022,15022,16022,17022

```
0          PROG NO. 713-F3-A2-210      16:14:47  11/28/79          MOD 6A, JUN 78
 020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y          Z          RX          RY          RZ
11022 -0.771E-08 -0.411E-04  0.136E-01  0.218E-06 -0.338E-12 -0.239E-11
12022 -0.219E-07  0.751E-03  0.187E-01 -0.248E-03 -0.754E-13 -0.568E-11
13022 -0.224E-07 -0.108E-01  0.200E-01 -0.187E-03 -0.120E-12 -0.586E-11
14022 -0.169E-07 -0.250E-01  0.195E-01 -0.563E-05 -0.289E-12 -0.465E-11
15022 -0.171E-07 -0.402E-01  0.206E-01  0.749E-04 -0.329E-12 -0.475E-11
16022 -0.845E-08 -0.976E-01  0.139E-01  0.455E-03 -0.339E-12 -0.254E-11
17022 -0.915E-08 -0.894E-01  0.148E-01  0.411E-03 -0.352E-12 -0.274E-11
```

READY

*

(A)

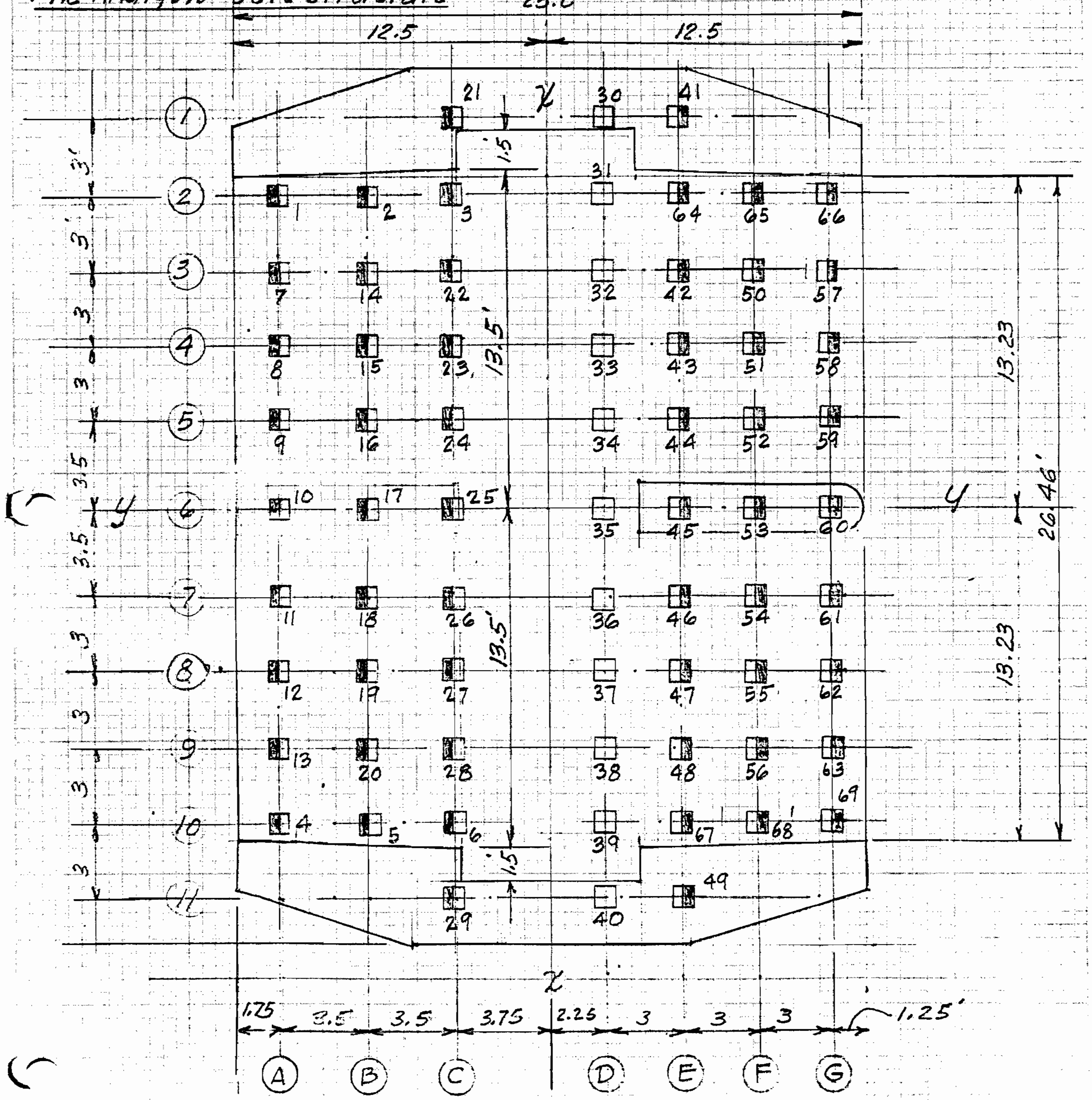
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 108 OF
BY LWC DATE 12-18-79
CHKD. BY DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Pile Analysis - Gate Structure



Pile Layout

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Pile Analysis · Gate Structure - Pile Reactions from Computer Printout

Case I - Construction Case, no backfill, Gates raised, no water (100%)

		X^K	Y^K	Z^K
Pile Group "2" A B C E F G	=	0	0	29 *
Pile Group "2" D	=	0	0	29.9 **
Pile Group "3" A B C E F G	=	0	0	26.7 ***
Pile Group "3" D	=	0	0	29.9 **
Pile Group "4" A B C E F G	=	0	0	26.7 ***
Pile Group "4" D	=	0	0	29.9 **
Pile Group "5" A B C E F G	=	0	0	26.7 ***
Pile Group "5" D	=	0	0	29.9 **
Pile Group "6" A B C E F G	=	0	0	26.7 ***
Pile Group "6" D	=	0	0	29.9 **
Pile Group "7" A B C E F G	=	0	0	26.7 ***
Pile Group "7" D	=	0	0	29.9 **

Note: * = 4:1 Batter
** = Vertical
*** = 2:1 Batter

(C)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB NO 575-79-E

SHEET NO 110 OF
BY LWC DATE 12-18 79
CHKD. BY DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL
Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out

Case 1 - (Cont)

		x^k	y^k	z^k
Pile Group "8" A B C E F G	=	0	0	26.7***
Pile Group "8" D	=	0	0	29.9**
Pile Group "9" A B C E F G	=	0	0	26.7***
Pile Group "9" D	=	0	0	29.9**
Pile Group "10" A B C E F G	=	0	0	29.0*
Pile Group "10" D	=	0	0	29.9**

Case II Water Level 14.0 Flood side, El. -8.5 Protected side, Impervious cutoff (100%)

Pile Group "2"			
A	0	0	-27.8*
B	0	0	-5.7*
C	0	0	16.4*
E	-0.1	0	72.4*
F	-0.1	0	91.3*
G	-0.1	0	110.2*
D	0	0	40.9**
Pile Group "3"			
A	0.1	0	-25.3***
B	0	0	-4.9***
C	0	0	15.5***
D	0	0	40.9**

Note: * = 4:1 Batter *** = 2:1 Batter
** = Vertical

Ⓓ

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 111 OF ______
ITEM ______ BY LWC DATE 12·18·79
JOB Nº 575·79-E CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out.

Case II (Cont.)

Note: ** = Vertical; *** = 2:1 batter

Pile Group "3" cont.	x^k	y^k	z^k
D	0	0	40.9 **
E	-0.1	0	66.4 ***
F	-0.2	0	83.8 ***
G	-0.2	0	101.3 ***
Pile Group "4"			
A	0.1	0	-25.3 ***
B	0	0	-4.9 ***
C	0	0	15.5 ***
D	0	0	40.9 **
E	-0.1	0	66.4 ***
F	-0.2	0	83.8 ***
G	-0.2	0	101.3 ***
Pile Group "5"			
A	0	0	-25.3 ***
B	0	0	-4.9 ***
C	-0.1	0	15.5 ***
D	0	0	40.9 **
E	-0.1	0	66.4 ***
F	-0.2	0	83.8 ***
G	-0.2	0	101.3 ***
Pile Group "6"			
A	0.1	0	-25.3 ***
B	0	0	-4.9 ***
C	0	0	15.5 ***
D	0	0	40.9 **
E	-0.1	0	66.4 ***
F	-0.2	0	83.8 ***
G	-0.2	0	101.3 ***

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB Nº 575-79-E

SHEET Nº 112 OF
BY LWC DATE 12-18-79
CHKD. BY DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out

Case II (Cont.)

	X^K	Y^K	Z^K
Pile Group "7"			
(A)	0.1	0	-25.3 ***
(B)	0	0	-4.9 ***
(C)	0	0	15.5 ***
(D)	0	0	40.9 **
(E)	-0.1	0	66.4 ***
(F)	-0.2	0	83.8 ***
(G)	-0.2	0	101.3 ***
Pile Group "8"			
(A)	0.1	0	-25.3 ***
(B)	0	0	-4.9 ***
(C)	0	0	15.5 ***
(D)	0	0	40.9 **
(E)	-0.1	0	66.4 ***
(F)	-0.2	0	83.8 ***
(G)	-0.2	0	101.3 ***
Pile Group "9"			
(A)	0.1	0	-25.3 ***
(B)	0	0	-4.9 ***
(C)	0	0	15.5 ***
(D)	0	0	40.9 **
(E)	-0.1	0	66.4 ***
(F)	-0.2	0	83.8 ***
(G)	-0.2	0	101.3 ***

Note:

** = Vertical

*** = 2:1 Batter

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out

Case II (cont)

* = 4:1 batter
** = Vertical
*** = 2:1 Batter

Pile Group "10"

	X^k	Y^k	Z^k
A	0	0	-27.8 *
B	0	0	-5.7 *
C	0	0	16.4 *
D	0	0	40.9 **
E	-0.1	0	72.4 *
F	-0.1	0	91.3 *
G	-0.1	0	110.2 *

Case III Water level El. 14.0 Floodside, El. -8.5 Protected side, pervious cut-off

Pile Group "2" and "10"

	X^k	Y^k	Z^k
A	-0.1	0	-14.3 *
B	-0.1	0	2.3 *
C	-0.1	0	18.9 *
D	-0.1	0	43.8 **
E	0	0	73.2 *
F	0	0	87.4 *
G	0	0	101.7 *

Pile Group "3" and "4" and "5" and "6" and "7" and "8" and "9"

	X^k	Y^k	Z^k
A	-0.1	0	-18.5 ***
B	-0.1	0	-3.1 ***
C	-0.1	0	12.2 ***
D	-0.1	0	43.8 **
E	0	0	72.7 ***
F	-0.1	0	85.9 ***
G	-0.1	0	99.0 ***

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GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from computer Print-out

Case IV - Water level El. 4.0 Flood side, El. 14.5 Protected side, Impervious cutoff.

Note
* = 4:1 batter
** = Vertical
*** = 2:1 batter

Pile Group "2" and "10"	X^K	Y^K	Z^K
A	-0.2		26.7 *
B	-0.2		27.2 *
C	-0.2		27.7 *
D	-0.2		42.8 **
E	-0.1		55.5 *
F	-0.1		55.5 *
G	-0.1		55.5 *

Pile Group "3" and "4" and "5" and "6" and "7" and "8" and "9"

	X^K	Y^K	Z^K
A	-0.2		12.4 ***
B	-0.2		12.4 ***
C	-0.2		12.4 ***
D	-0.2		42.8 **
E	0.1		63.4 ***
F	0.1		63.4 ***
G	0.1		63.4 ***

(H)

N-Y ASSOCIATES, INC.
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GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out.

Case V El. 4.0 Flood side, El. -14.5 Protected side, pervious Cut-off.

Pile Group "2" and "10"	X^K	Y^K	Z^K
A	-0.4	0	42.9*
B	-0.3	0	36.2*
C	-0.3	0	29.5*
D	-0.3	0	45.0**
E	0.3	0	54.9*
F	0.3	0	49.2*
G	0.3	0	43.5*

Pile Group "3" and "4" and "5" and "6" and "7" and "8" and "9"

A	-0.4	0	19.8***
B	-0.4	0	13.7***
C	-0.4	0	7.5***
D	-0.3	0	45.0**
E	0.2	0	70.3***
F	0.2	0	65.0***
G	0.2	0	59.7***

(I)

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GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions from Computer Print-out

Case VI Water Level El. -14.0 Flood side, El. -3.0 Protected side, Impervious Cutoff

Pile Group "2" and "10"

	X^K	Y^K	Z^K
A	-0.9	0	102.1 *
B	-0.8	0	61.6 *
C	-0.8	0	21.1 *
D	-0.7	0	30.4 **
E	0.8	0	20.5 ***
F	0.8	0	-14.3 ***
G	0.8	0	-49.0 ***

Pile Group "3" and "4" and "5" and "6" and "7" and "8" and "9"

	X^K	Y^K	Z^K
A	-0.9	0	46.4 ***
B	-0.8	0	9.0 ***
C	-0.8	0	-28.3 ***
D	-0.7	0	30.4 **
E	0.7	0	66.6 ***
F	0.8	0	34.6 ***
G	0.8	0	2.6 ***

* = 4:1 batter
** = Vertical
*** = 2:1 batter

Ⓙ

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Pile Reactions From Computer Print-out

Case VII Water level El. -14.0 Flood side, El. -3.0 Protected side, pervious cutoff.

Pile Group "2" and "10"

	X^k	Y^k	Z^k
A	-0.8	0	96.4 *
B	-0.8	0	59.8 *
C	-0.7	0	23.1 *
D	-0.7	0	32.3 **
E	0.7	0	23.8 *
F	0.7	0	-7.6 *
G	0.7	0	-39.0 *

Pile Group "3" and "4" and "5" and "6" and "7" and "8" and "9"

A	-0.8		45.1 ***
B	-0.8		11.4 ***
C	-0.7		-22.4 ***
D	-0.7		32.3 **
E	0.7		65.7 ***
F	0.7		36.7 ***
G	0.8		7.8 ***

ASSOCIATES, INC.
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JOB ______ SHEET Nº 118 OF ______
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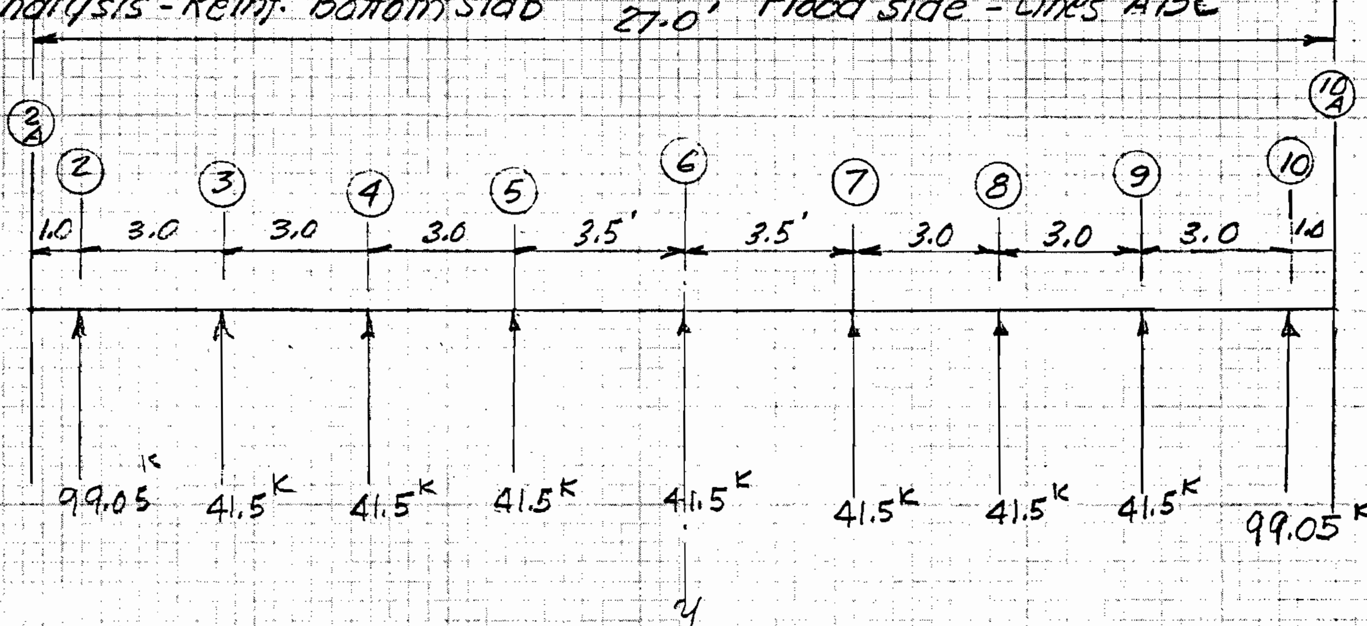
(K)

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Reinf. Bottom Slab Flood side - Lines ABC



Moments @ Piles

(2), (10): $\dfrac{(2)(99.05)(1)^2(26)^2}{(27)^3} = 6.8'^{K}$

(3), (9): $(2)\dfrac{(41.5)(4)^2(23)^2}{(27)^3} = 35.69'^{K}$

(4), (8): $\dfrac{(2)(41.5)(7)^2(20)^2}{(27)^3} = 82.65'^{K}$

(5), (7): $\dfrac{(2)(41.5)(10)^2(17)^2}{(27)^3} = 121.9'^{K}$

(6): $\dfrac{(2)(41.5)(13.5)^2(13.5)^2}{(27)^3} = 140.06'^{K}$

FEM's @ (2A) (10A)

$\dfrac{(99.05)(1)(26)^2}{(27)^2} + \dfrac{(99.05)(1)^2(26)}{(27)^2} = 95.38$

$\dfrac{(41.5)(4)(23)^2}{(27)^2} + \dfrac{(41.5)(4)^2(23)}{(27)^2} = 141.41$

$\dfrac{(41.5)(7)(20)^2}{(27)^2} + (41.5)(7)^2(20) = 215.35$

$\dfrac{(41.5)(10)(17)^2}{(27)^2} + (41.5)(10)^2(17) = 261.29$

$\dfrac{(41.5)(13.5)(13.5)^2}{27}$ $140.06'^{K}$

$= \Sigma\ FEM\ 853.49$

CASE 6

Water on Flood-side $= -21.43 - 14.0 = 6.43' \times 0.0625 = 0.40^{KSF}$

Concrete $= 3.75' \times 0.15 = 0.56$

-0.96^{KSF}

$-\dfrac{(0.96^{K})(3.5)(27)^2}{12} = -204.12'^{K}$

$\dfrac{(0.96)(3.5)(27)^2}{24} = -102.06'^{K}$

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis : Reinf. Bottom Slab. · Lines (A)(B)(C)

Shear: (2) (10) $\frac{(99.05)(26)^2}{(27)^3}(3+26) = 98.65$ $\quad 98.65 + \frac{99.05(1)^2}{(27)^3}\left(1+(3\times26)\right) = 99.05$

(3) (9) $\frac{(41.5)(23)^2}{(27)^3}(12+23) = 39.04$ $\quad 39.04 + \frac{41.5(4)^2}{(27)^3}\left[4+(3\times23)\right] = 41.5$

(4) (8) $\frac{(41.5)(20)^2}{(27)^3}(21+20) = 34.58$ $\quad 34.58 + \frac{41.5(7)^2}{(27)^3}\left(7+(3\times20)\right] = 41.5$

(5) (7) $\frac{(41.5)(17)^2}{(27)^3}(30+17) = 28.63$ $\quad 28.63 + \frac{41.5(10)^2}{(27)^3}\left[10+(3\times17)\right] = 41.5$

(6) $\frac{(41.5)(13.5)^2}{(27)^3}(40.5+13.5) = 20.75$ $\quad 20.75$

244.3^k
-45.36
$\Sigma V \quad 198.94$

$\frac{-0.96\times3.5\times27}{2} = -45.36^k$

$f'_c = 4000$ psi $f_s = 20{,}000$ $K = 221$ $A = 1.44$ $d = 3.75' = 45''$ $45 - 3'' = 42''$

$\frac{853.49'^k - 204.12'^k}{3.5'} = 185.53'^k$

d' reqd. $= \sqrt{\frac{185.53\times12000}{221\times42}} = 15.48'' < 42''$

$V = \frac{198.94^k}{3.5} = 56.84^k/12''$ wide strip

$v = \frac{56.84\times1000}{12\times42} = 112$ psi $< 2\sqrt{4000} = 126$ psi

Top Face

$A_s = \frac{185.53}{1.44\times42} = 3.06\,\square''/ft$ $\quad$ 2 #11 provided = 3.12

Bottom face

$\frac{140.06'^k}{3.5}\times\frac{1}{1.44\times42} = 0.66\,\square''$ $\quad$ 1 #8 provided O/K

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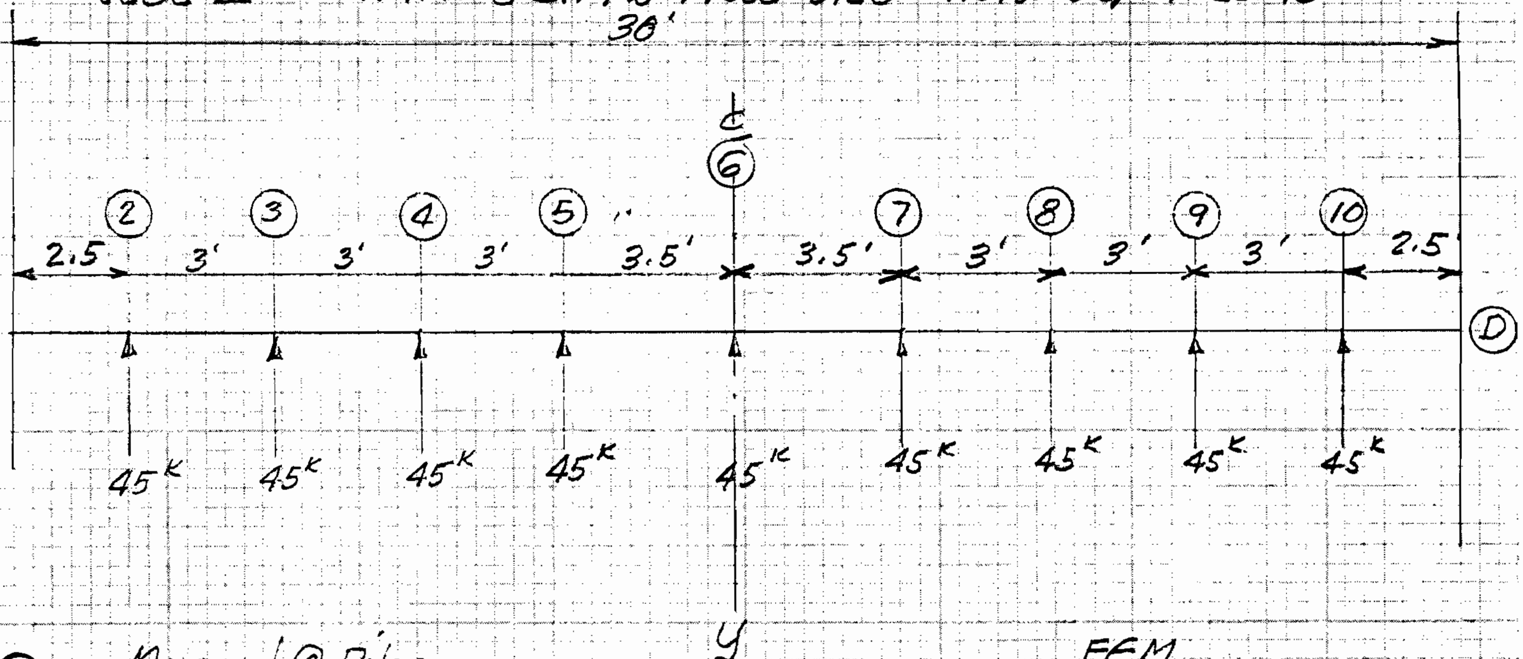
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Reinf. Bottom Slab Flood Side - Line (D) (Vert piles)

Case V Water @ El. 4.0 Flood Side - Water Depth 25.43'



Moment @ Piles

(2), (10): $\frac{(2)(45)(2.5)^2(27.5)^2}{(30)^3} = 15.76'^K$

(3), (9): $\frac{(2)(45)(5.5)^2(24.5)^2}{(30)^3} = 60.53'^K$

(4), (8): $\frac{(2)(45)(8.5)^2(21.5)^2}{(30)^3} = 111.32'^K$

(5), (7): $\frac{(2)(45)(11.5)^2(18.5^2)}{(30)^3} = 150.87'^K$

(6): $\frac{(2)(45)(15)^2(15)^2}{(30)^3} = 168.75'^K$

FEM

$\frac{(45)(2.5)(27.5)^2}{(30)^2} + \frac{(45)(2.5)^2(27.5)}{(30)^2} = 103.13'^K$

$\frac{(45)(5.5)(24.5)^2}{(30)^2} + \frac{(45)(5.5)^2(24.5)}{(30)^2} = 202.13'^K$

$\frac{(45)(8.5)(21.5)^2}{(30)^2} + \frac{(45)(8.5)^2(21.5)}{(30)^2} = 274.13'^K$

$\frac{(45)(11.5)(18.5)^2}{(30)^2} + \frac{(45)(11.5)^2 18.5}{(30)^2} = 319.13'^K$

$168.75'^K$

Σ FEM $1067.24'^K$

-647.06

$+420.18'^K$

Water = $25.43' \times 0.0625 = 1.59^{KSF}$

Conc = $5.25' \times 0.15 = 0.79^{KSF}$

2.38^{KSF}

$-\frac{2.38^{KSF} \times 3.625' \times (30)^2}{12} = -647.06'^K =$ FEM

$-\frac{2.38 \times 3.625 \times (30)^2}{24} = -323.53'^K$ @ (6)

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Reinf. Bottom Slab   Floodside Line (D) Vertical Piles

Shear:

$$\left.\begin{matrix}2\\10\end{matrix}\right\} \frac{(45)(27.5)^2}{(30)^3}(7.5+27.5) + \frac{45(2.5)^2}{(30)^3}(2.5+82.5) = 45.0$$

$$\left.\begin{matrix}3\\9\end{matrix}\right\} = 45.0$$

$$\left.\begin{matrix}4\\8\end{matrix}\right\} = 45.0$$

$$\left.\begin{matrix}5\\9\end{matrix}\right\} = 45.0$$

$$6 = 22.5$$

$$202.5^K$$
$$-129.41$$
$$93.09^K$$

Width of pile Area

$$\frac{2.0+2.25}{2} + \frac{3}{2} = 3.625'$$

$$V = -\frac{2.38 \times 3.625 \times 30}{2} = -129.41^K$$

$f'c = 4000$ psi $f_s = 20{,}000$ psi $K = 221$ $A = 1.44$ $d = (5.25' \times 12) - 4'' = 59''$

$$\frac{420.18'^K}{3.625} = 115.91'^K \text{ for } 12'' \text{ strip}$$

$$d' reqd = \sqrt{\frac{115.91 \times 12000}{221 \times 59}} = 10.32'' < 59 \quad ok$$

$$V = \frac{93.09}{3.625} = 25.68^K \qquad v = \frac{25.68 \times 1000}{12 \times 59} = 36.27 \text{ psi} < 2\sqrt{4000}$$

As top face

$$As \; \frac{115.91}{1.44 \times 59} = 1.36^{\square''} < \#9 @ 8'' = 1.50^{\square''}$$

As bottom face

$$\frac{-323.53 + 168.75'^K}{3.625} = 42.69'^K \text{ for } 12'' \text{ strip}$$

$$As = \frac{42.69}{1.44 \times 59} = 0.502^{\square''} < \#9 @ 12 = 1.0^{\square''}$$

"0"

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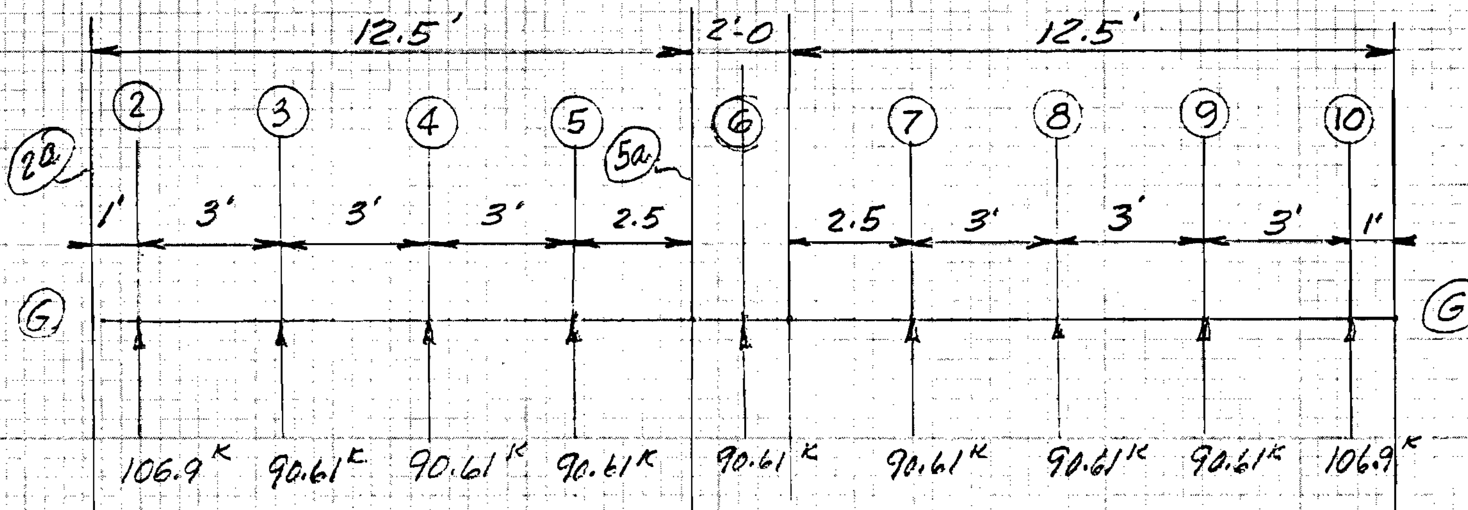
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL

Pile Analysis - Gate Structure Protected side Lines EFG · Line "G" "Dominant"



Case II - Water Level -8.5 Protected side 13' Water

Moments @ Piles

(2) $\frac{(2)(106.9)(1)^2(11.5)^2}{(12.5)^3} = 14.47'^K$

(3) $\frac{(2)(90.61)(4)^2(8.5)^2}{(12.5)^3} = 107.26'^K$

(4) $\frac{(2)(90.61)(7)^2(5.5)^2}{(12.5)^3} = 137.53'^K$

(5) $\frac{(2)(90.61)(10)^2(2.5)^2}{(12.5)^3} = 57.99'^K$

FEM @ (2a)

$\frac{(106.9)(1)(11.5)^2}{(12.5)^2} = 90.48'^K$

$\frac{(90.61)(4)(8.5)^2}{(12.5)^2} = 167.59'^K$

$\frac{(90.61)(7)(5.5)^2}{(12.5)^2} = 122.79'^K$

$\frac{(90.61)(10)(2.5)^2}{(12.5)^2} = 36.24'^K$

$\Sigma\ 417.1'^K$

FEM @ (5a)

$\frac{(106.9)(1)^2(11.5)}{(12.5)^2} = 7.86'^K$

$\frac{(90.61)(4)^2(8.5)}{(12.5)^2} = 78.87'^K$

$\frac{(90.61)(7)^2(5.5)}{12.5} = 156.28'^K$

$\frac{(90.61)(10)^2(2.5)}{12.5} = 144.98$

$\Sigma\ 387.99''$

Shear @ (2a)

(2) $\frac{(106.9)(11.5)^2}{(12.5)^3}(3+11.5) = 104.96^K$

(3) $\frac{(90.61)(8.5)^2}{(12.5)^3}(12+8.5) = 68.71^K$

(4) $\frac{(90.61)(5.5)^2}{(12.5)^3}(21+5.5) = 37.19^K$

(5) $\frac{(90.61)(2.5)^2}{(12.5)^3}(30+2.5) = 9.42^K$

$\Sigma = 220.28^K$

Shear @ (5a)

$\frac{(106.91)(1)^2}{(12.5)^3}(1+34.5) = 1.94^K$

$\frac{(90.61)(4)^2}{(12.5)^3}(4+25.5) = 21.90^K$

$\frac{(90.61)(7)^2}{(12.5)^3}(7+16.5) = 53.42^K$

$\frac{(90.61)(10)^2}{(12.5)^3}(10+7.5) = 81.19$

$\Sigma = 158.45^K$

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL

Pile Analysis - Gate Structure - Protected side - Lines EFG — Line "G" dominant

Width of Pile Area = $1.25 + \frac{3}{2} = 2.75'$

Wt. Water = $13 \times 0.0625 = 0.8125$

Wt. Conc = $3.75 \times 0.15 = 0.5625$

$1.375^{K}/\square'$

$1.375^{K} \times 2.75 = 3.78\ ^{K}/_{Lin}$ ft.

FEM = $-\frac{3.78 \times 12.5^2}{12} = -49.22'^{K}$

Shear = $\frac{3.78 \times 12.5}{2} = -23.63^{K}$

$f'c = 4000$ psi $fs = 20{,}000$ $K = 221$ $A = 1.44$ $d = (3.75 \times 12) - 4 = 41''$

$\frac{417.1'^{K} - 49.22'^{K}}{2.75'} = 133.77'^{K}$ for 12" strip

$d'reqd = \sqrt{\frac{133.77 \times 12000}{221 \times 12}} = 24.6'' < 41''$

$V = \frac{220.28^{K} - 23.63}{2.75'} = 71.50^{K}\ V$ for 12" strip

$71.5^{K} - \frac{104.96}{2.75} = 33.33^{K}$ "d" distance from Wall

$v = \frac{33.33^{K} \times 1000}{12 \times 41} = 67.74$ psi $< 2\sqrt{4000}$

Top Reinforcement

$As = \frac{133.77}{1.44 \times 41} = 2.27\ \square'' >$ #7@6 = 1.20 $\square$

Bottom Reinforcement

$\frac{137.53'^{K} - 0.5(49.22)}{2.75'} = 41.06'^{K}$

$As = \frac{41.06}{1.44 \times 41} = 0.70\ \square'' <$ #8@12 0.79 $\square''$

Longit. Steel

$As = 0.0025 \times 12 \times 41 = 1.23\ \square''$ Use #10@12 or equal Top and Bott. End units

$As = 0.0025 \times 12 \times 59 = 1.77\ \square''$ Use #10@8½ or equal " Mid-Section

③

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

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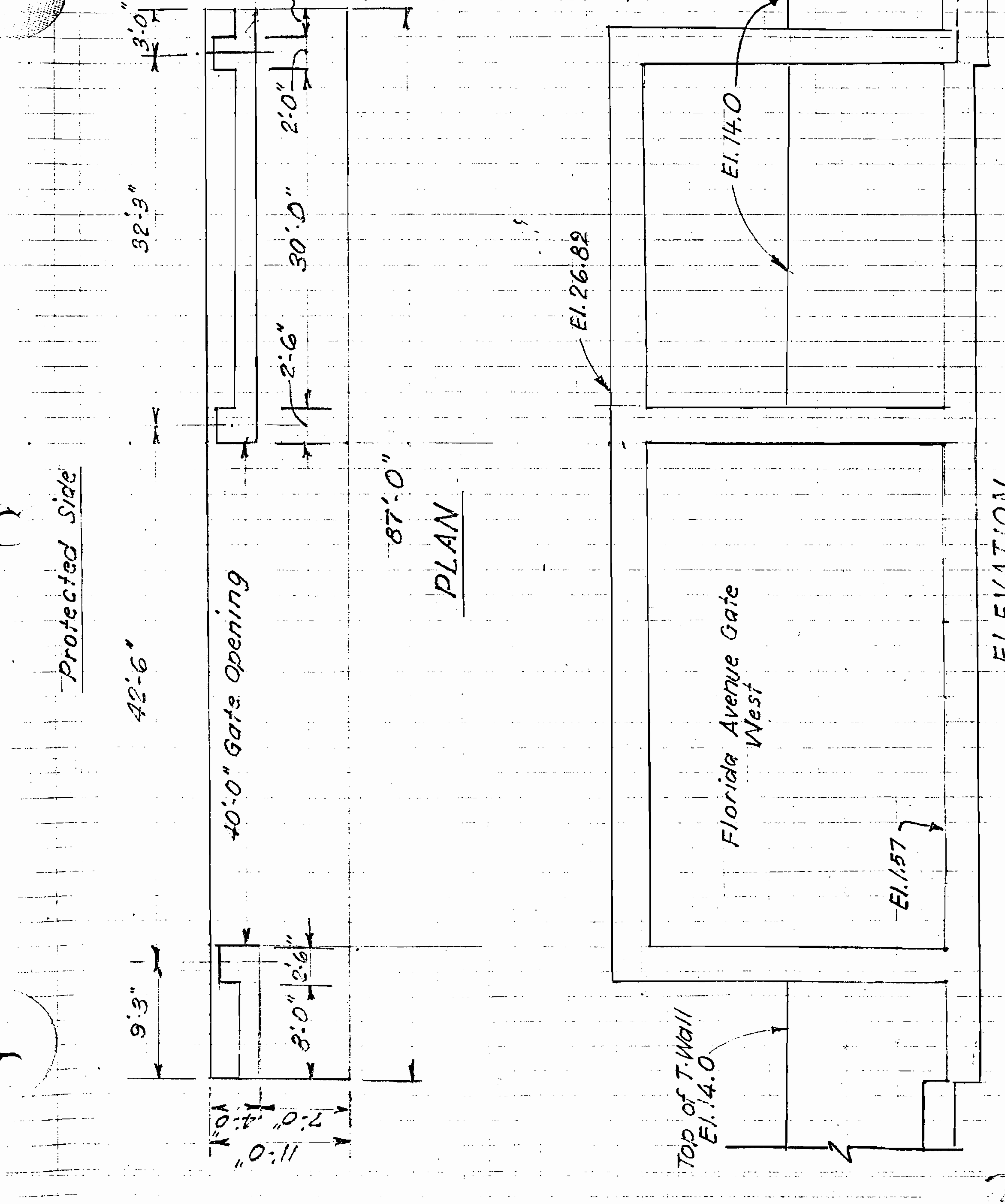
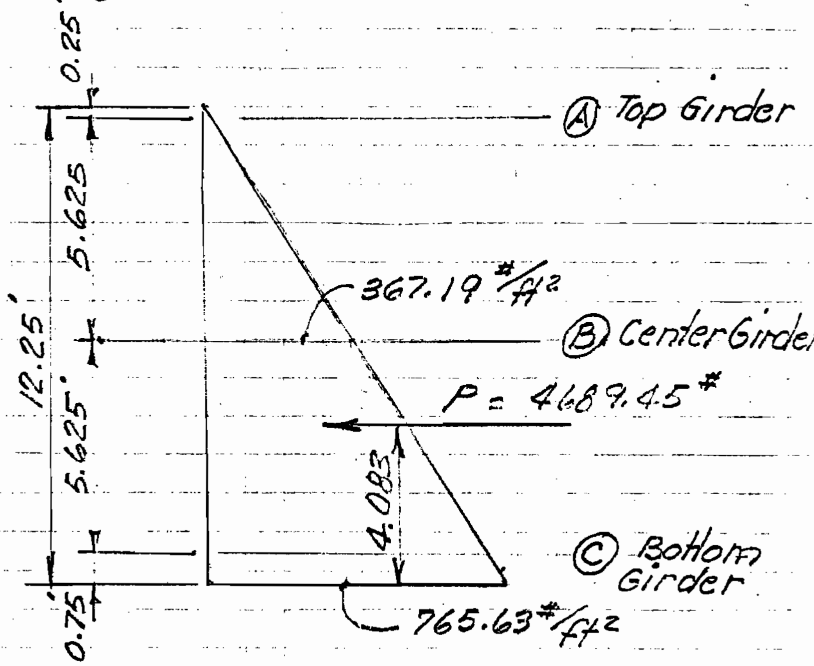
OVERHEAD GATE DESIGN
At Florida Ave. West of IHNC



OVERHEAD GATE DESIGN (AT FLORIDA AVE WEST OF IHNC)

Water to Elev. 14.0, No wave force, $F_b = 20,000$ psi

REACTIONS



$P @ \frac{12.25'}{3} = 4.083'$

$P = \frac{wh^2}{2} = \frac{(62.5^{\#})(12.25)^2}{2} = 4689.45^{\#}$

Pressure @ (B) $= (62.5^{\#})(5.625' + .25') = 367.19 \,^{\#}/ft^2$

Pressure @ Bottom $= (12.25')(62.5^{\#}) = 765.63 \,^{\#}/ft^2$

$R_B = 367.19 \,^{\#}/ft^2 \,(5.625' + .75')(.5) = 1170.42^{\#}$

$\frac{(765.63^{\#} - 367.19^{\#})(5.625 + .75)(.5)}{3} = 423.34^{\#}$

$\frac{(367.19^{\#})(5.625' + .25')(.5)(2)}{3} = 719.08^{\#}$

Σ @ (B) $\quad 2312.84^{\#}$

$R_A = \frac{719.08^{\#}}{2} = 359.54^{\#}$ @ (A) $\quad 359.54^{\#}$

$R_C = 1170.42^{\#} + [423.34^{\#} \times 2]$ @ (C) $= 2017.1^{\#}$

$\underset{R_C}{2017.1^{\#}} + \underset{R_A}{359.54} + \underset{R_B}{2312.84^{\#}} = 4689.48^{\#} \approx P$

GIRDER DESIGN - OVERHEAD GATE - (Florida Ave - West of IHNC)

Top Girder Span = 42.5' Load = 359.54 #/ft (See R_A page 2)

Moment = $(359.54 \frac{\#}{ft})(42.5')^2(.125) = 81,177.4'^{\#}$

$S_{req'd} = \dfrac{81,177.4'^{\#} \times 12}{20,000\ psi} = 48.71\ in^3$

Try W18 × ~~35~~ 45 $S = \cancel{57.9}\ 79.0\ in^3$ $I = \cancel{513}\ 706\ in^4$ Not allow see below bottom page

$\Delta = \dfrac{(5)(359.54 \times 42.5)(42.5 \times 12)^3}{(384)(29 \times 10^6)(513)} = \cancel{1.77}'' = 1:\cancel{288}$ ok

Use W18 × ~~35~~ 45 (see below) $f_s = \dfrac{81,177.4 \times 12}{\cancel{57.9 in^3}\ 79\ in^3} = \cancel{16,824}\ 12,330$ psi

2. Center Girder Span = 42.5' Load = 2312.84 #/ft (See R_B page 2)

Moment = $(2312.84 \frac{\#}{ft})(42.5')^2(.125) = 522,195.9'^{\#}$

$S_{req'd} = \dfrac{522,195.9 \times 12}{20,000\ psi} = 313.32\ in^3$

Try W30 × 124 $S = 355\ in^3$ $I = 5630\ in^4$

$f_s = \dfrac{522,195.9 \times 12}{355} = 17,651$ psi

$\Delta = \dfrac{(5)(2312.84^{\#} \times 42.5')(42.5 \times 12)^3}{(384)(29 \times 10^6)(5630)} = 1.04'' = 1:490$ ok

Use W30 × 124

1. Top Girder - Try W18 × 45 $I = 706\ in^4$ $S = 79.0\ in^3$

$\dfrac{81,177.4 \times 12}{79} = 12,330$ psi

$\Delta = \dfrac{(5)(359.54 \times 42.5)(42.5 \times 12)^3}{384(29 \times 10^6)(706)\ in^4} = 1.29 < \dfrac{42.5 \times 12}{360}\ (1.42)$

3. Bottom Girder Span = 42.5' Load = 2017.1 #/ft (See R_C page 2)

$$Moment = (2017.1\ \#/ft)(42.5')^2(.125) = 455,423.4\ '\#$$

$$S_{req'd} = \frac{455,423.4\ '\# \times 12}{20,000\ psi} = 273.25\ in^4$$

Try W30 X 108 $S = 299.2\ in^3$ $I = 4470\ in^4$

$$f_s = \frac{455,423.4 \times 12}{299.2\ in^3} = 18,266\ psi$$

$$\Delta = \frac{(5)(2017.1\ \# \times 42.5')(42.5 \times 12)^3}{(384)(29 \times 10^6)(4470)} = 1.14'' \quad 1:447\ ok$$

Use W30 X 108

SKIN PLATE

Use 3/8" skin plate

$$I = \frac{12 \times 0.375^3}{12} = .053\ in^4$$

$$S = \frac{.053 \times 2}{.375} = 0.283\ in^3$$

$$Load\ (Max) = 62.5\ \#/ft^2 \times 11.25' = 703.13\ \#/ft$$

$$M_{Max} = 0.283\ in^3 \times 20,000\ psi = 5660\ ''\#$$

(Interior span) $M = \frac{703.13 \times L^2 \times 12}{12} = 5660\ ''\#$

$L = 2.837 = 2'-10''$

(End Span $M = \frac{703.13 \times L^2 \times 12}{10} = 5660\ ''\#$

$L = 2.59' = 2'7''$

Cont. on Page 5

OVERHEAD GATE DESIGN · (At Florida Ave. West of IHNC)

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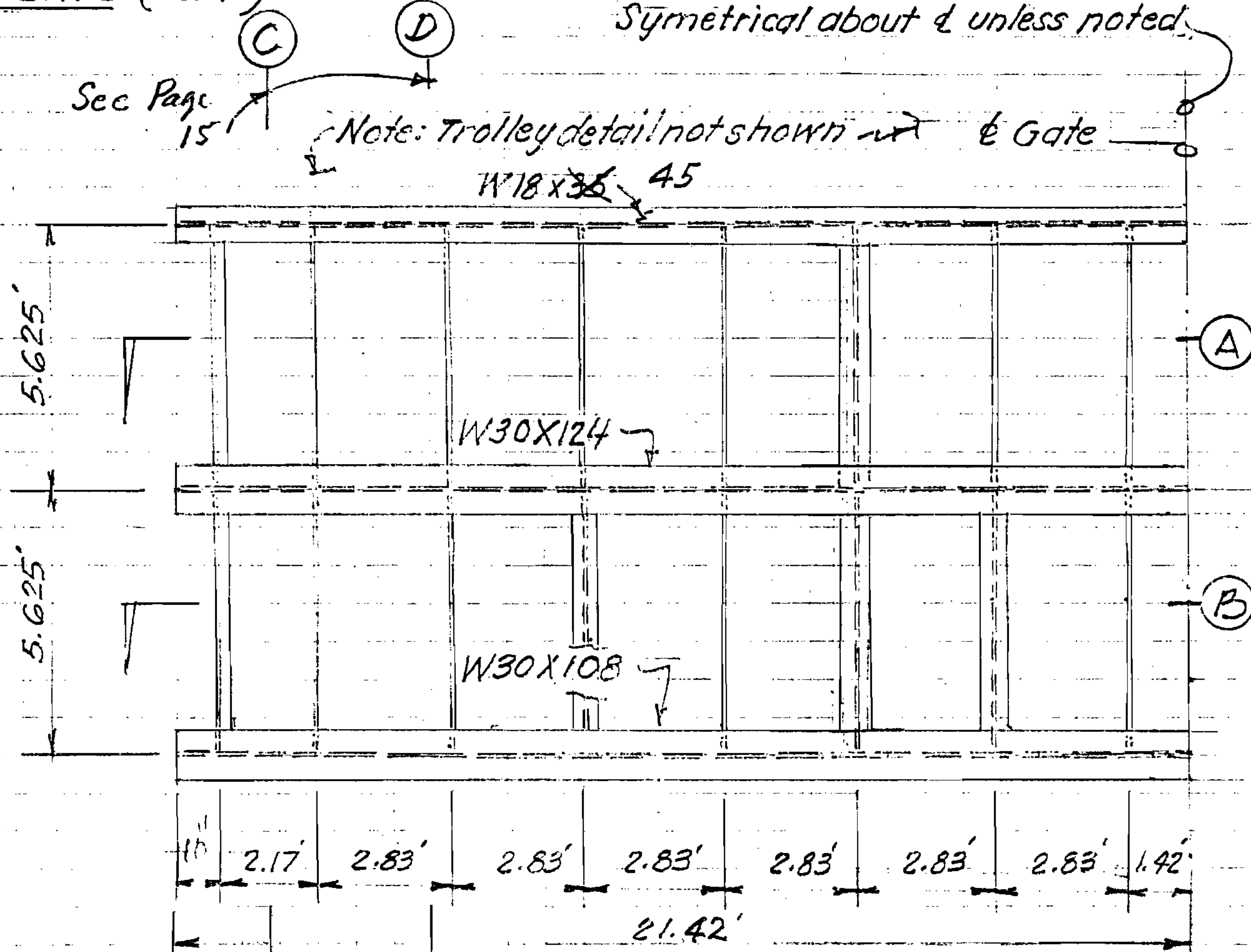
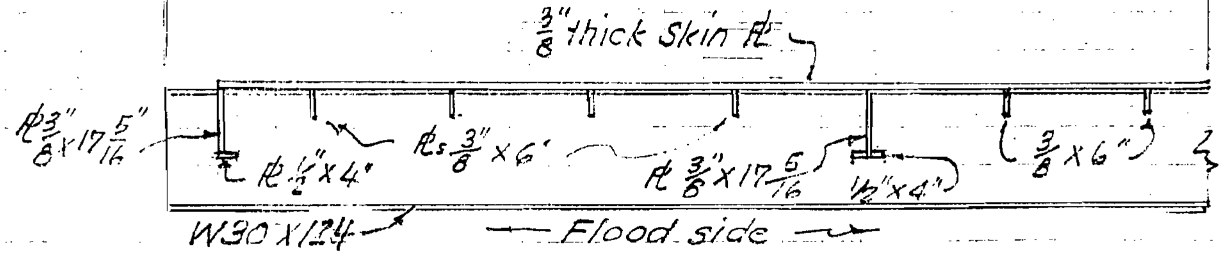
JOB		SHEET Nº 5	OF
ITEM		BY LWC	DATE 8-8-79
JOB Nº	575·79·E	CHKD. BY	DATE

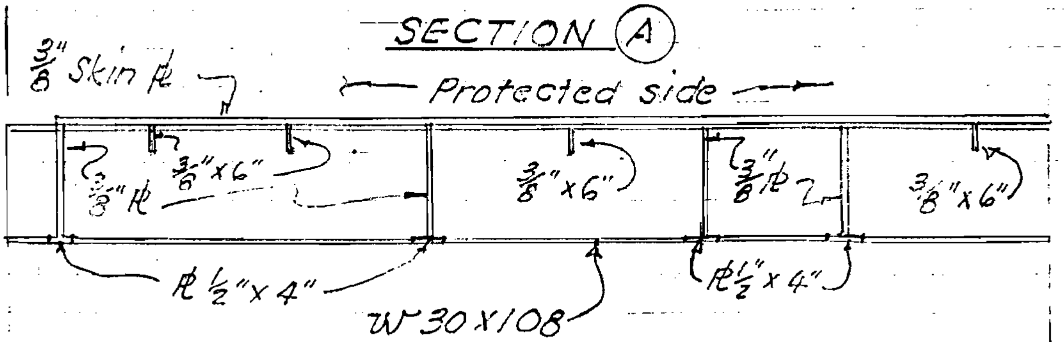
SKIN PLATE (Cont.)



GATE FRAMING
FLOOD SIDE ELEVATION



SECTION (A)



SECTION (B)

Cont. on Page 6

N-Y ASSOCIATES, INC.
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JOB ______ SHEET No 6 OF ____
ITEM ______ BY LWC DATE 8-8-79
JOB No 575-79-E CHKD. BY ____ DATE ____

SKIN PLATE (Cont) OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Interior Moment = $\frac{703.13 \text{ \#/ft} \times 2.83^2 \times 12}{12}$ = 5631.3 in lbs

$f_s = \frac{5631.3 \text{ in lb}}{0.283} = 19,898$ psi

End Moment = $\frac{703.13 \text{ \#/ft} \times 2.59^2 \times 12}{10}$ = 5660 in lbs

$f_s = \frac{5660 \text{ in lbs}}{0.283} = 20,000$ psi

~~Max Moment~~ VOID See page 6a

$62.5 \frac{\#}{ft^3} \times 0.25' = 15.63' \frac{\#}{ft^2}$ (A)

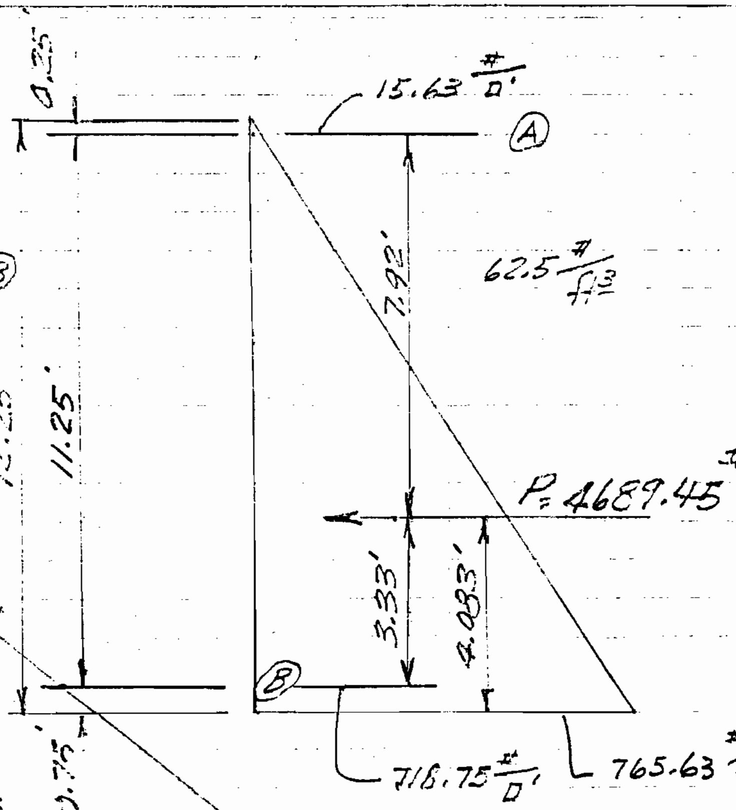
$62.5 \frac{\#}{ft^3} (11.25' + .25') = 718.75 \frac{\#}{ft^2}$ (B)

Max Moment @ (.577)(11.25') = 6.49' from (A) AISC

$M = \frac{(15.63 \frac{\#}{ft} \times 11.25)(6.49)(11.25 - 6.49)}{2 \times 11.25} = 241.4'\#$

$\left(\frac{718.75 \times 11.25^2}{2}\right) .128$ AISC $= 5821.9'\#$

$\Sigma = 6063.3'\#$



USED Method Use

$62.5 \times 0.25' = 15.63 \frac{\#}{ft}$

$62.5 \times 12.25' = 765.63 \frac{\#}{ft}$

$R_T = \frac{4689.45^\# (3.33)}{11.25'} = 1388.08^\#$

$R_B = \frac{4689.45^\# (7.92)}{11.25} = 3301.67^\#$

$\frac{62.5 y^2}{2} = 1388.08^\#$

$y^2 = \frac{2776.18}{62.5}$

$y = 6.66$

$y - .25 = 6.41'$

$\frac{y}{3} = 2.22$

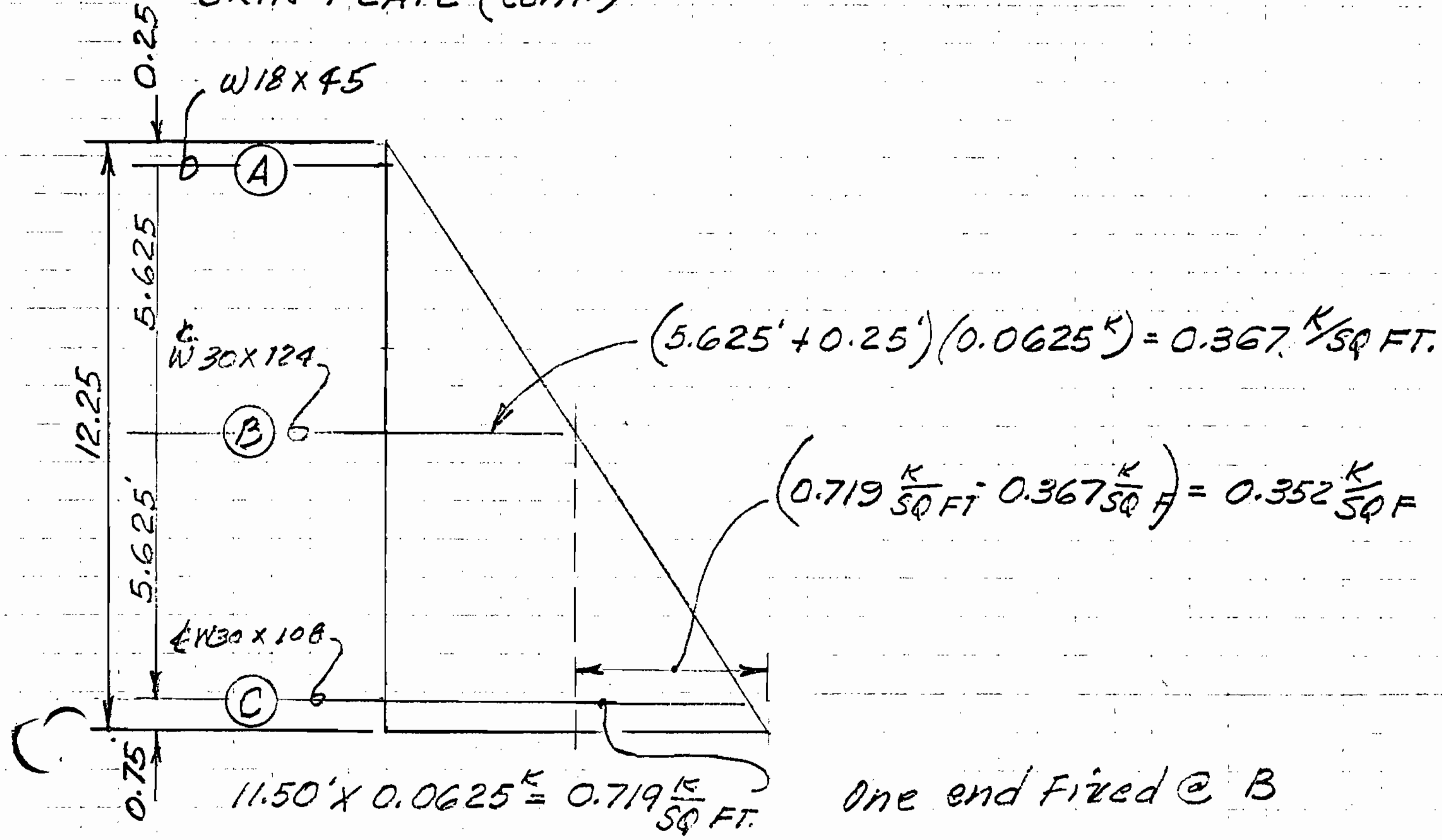
Max Mom = $(1388.08^\# \times 6.41) - (.5 \times 6.66^2 \times 62.5^\# \times 2.22)$

$= 8897.59 - 3077.17$

$= {}^*5820.42'\#$ * same

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

SKIN PLATE (Cont.)



One end Fixed @ B

Simple Max Mom. between B and C @ $\frac{5.625}{\sqrt{3}} = 3.25'$ from B

$$= \left(\frac{2}{9\sqrt{3}}\right)\left(0.\frac{352^K \times 5.625'}{2}\right)(5.625) = 0.71'^K$$

$$= \frac{0.367 \times 3.25}{2}(5.625 - 3.25') \qquad = 1.42'^K$$

$$\Sigma = 2.13'^K$$

If end fixed @ B

Max Neg Moment $= \frac{wl^2}{8} = 0.367^K \times 5.625^2 \times 0.125 = 1.45'^K$

Max Pos Moment $= \frac{9}{128} \times 0.367^K \times 5.625^2 \qquad = .81'^K$

M Max Neg @ 3.77 from $B = \frac{7wl^3}{120} = \frac{(7)(0.0625)5.625^3}{120} = .56'^K$

M Max Pos @ 3.66 from $B = 0.04229(0.0625)\ 5.625^3 = 0.47'^K$

Neg $1.45'^K + .56'^K = 2.01'^K$ Use $2.13'^K$

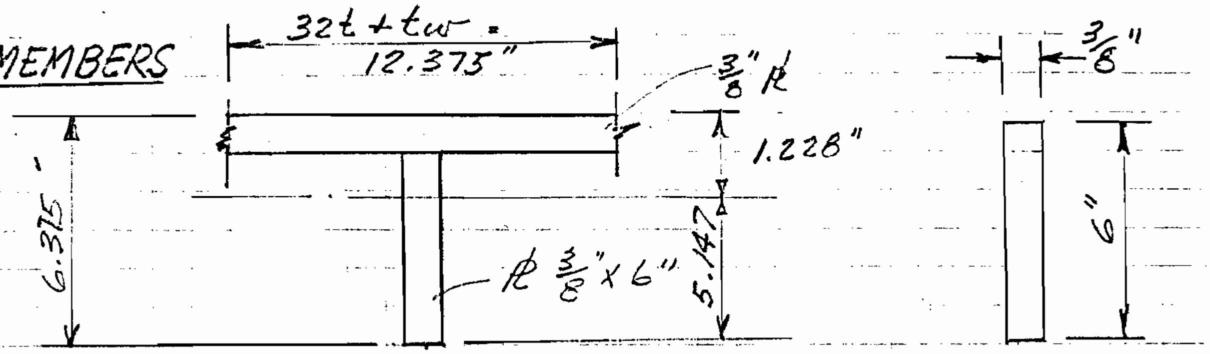
Pos $.81'^K + .47'^K = \frac{1.28'^K}{3.29} \times 0.666 = 2.19 \approx 2.13$

OVERHEAD GATE DESIGN - (At Florida Ave West of IHNC)

DESIGN OF VERT. MEMBERS

AISC

$$\frac{6000t}{\sqrt{33,000}} = 12.375''$$



$$I = \frac{.375(6)^3}{12} = 6.75 \text{ in}^4$$

Type	Area	Y	AY	$A\bar{Y}^2$	I_o
PL 12.375" x .375"	4.641	0.1875	0.870	0.163	
PL 6 x .375	2.250	3.375	7.594	25.630	6.75
	6.891	3.563	8.464	25.793	6.75

$$y = \frac{8.464}{6.891} = 1.228$$

$$I = I_o + \Sigma A\bar{y}^2 - (\Sigma A y \times \bar{y})$$

$$= 6.75 + 25.793 - (8.464 \times 1.228)$$

$$= 22.147 \text{ in}^4$$

$$S_{top} = \frac{22.149}{1.228} = 18.04 \text{ in}^3$$

$$S_{bottom} = \frac{22.149}{5.147} = 4.30 \text{ in}^3$$

- Page 6a

$$f_s = \frac{2.13^{k}(12)(2.83)}{4.30 \text{ in}^3} = 16.82 \text{ ksi} < 18,000 \text{ psi allowable}$$

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

Spacing @ 2.83' DESIGN OF VERTICAL MEMBERS (Cont.)

Moment = 2,130 '# x 2.83' = 5,027 '#

$f_s = \frac{5,027 \times 12}{16.04} = 14,028$ psi

$S_{required} = \frac{5,027 \times 12}{18,000} = 3.35 \text{ in}^3 < 4.30 \text{ in}^3$

"d"(min.) $= \frac{5.625 \times 12}{24} = 2.81$" ok

Check Deflection

$$\Delta = \frac{5 h^4 m}{768 EI} \left(P_1 + P_2\right)$$

$$= \frac{(5)(5.625 \times 12)^4 (2.83 \times 12)}{768 (29 \times 10^6)(22.149)} \left(\frac{15.63 + 718.75}{144}\right) = .036" \text{ ok}$$

Check Biaxial Stresses of skin plate

$$\frac{S_1^2 - S_1 S_2 + S_2^2}{(F_y)^2} \pm (.75)^2$$

$S_{pl} = \frac{12 (0.375)^2}{6} = 0.281 \text{ in}^3$

Max. allowable Mom. = $S F_b$

$F_b = 24 \times \frac{5}{6} = 20$ ksi
(1110-1-2101)

$$\frac{(20)^2 - [(20)(11.4)] + (11.4)^2}{36^2} = 0.233 < .562$$

ok

1296

Mom. = $20^k \times 0.281 = 5.62$ "k

Max M. = 462.33 '#

$S_1 = 20^k$ ok

$S_2 = \frac{17.159 \times 12}{16.04} = \frac{205.81 \text{ "k}}{16.04}$
$= 11.40$

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JOB ____ SHEET No 9 OF ____
ITEM ____ BY LWC DATE 8-10-79
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

TOP GIRDER (W18X45) $S = 79 \text{ in}^3$

$L_u = 5 \times 2.8333' \times 12 = 170''$

$\frac{d}{A_f} = \frac{17.86}{7.477 \times .499} = 4.786$

$I_f = \frac{bh^3}{12} = \frac{.499 \times (7.477)^3}{12} = 17.38 \text{ in}^4$

$b = t_f$
$h = b_f$

$A = A_f + \frac{1}{6} A_w$

$(7.477 \times .499) + \frac{1}{6} \left[17.86 - 2(0.499) \right] \times 0.335$

3.73

$= 4.67 \square''$

$r_y = \sqrt{\frac{I}{A}} = \sqrt{\frac{17.38 \text{ in}^4}{4.67}} = 3.72''$

$\frac{L}{r_y} = \frac{170''}{3.72} = 45.69 > 40$ Use Formula (4)

Formula (4) AISC 1970 (1.5-6a)

$C_b = 1.0 \quad C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = 126.1$

$k_2 = 1 - \frac{\left(\frac{L}{r_y}\right)^2}{2 C_c^2 C_b}$

$= 1 - \frac{(45.69)^2}{2(126.1)^2 \times 1} = 0.93$

$F_b = 0.5 \times 0.93 \times 36{,}000 = 16{,}740 \text{ psi}$

Cont. on page 10

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET No 10 OF
	ITEM	BY LWC DATE 8-10
	JOB No 575-79-E	CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Formula (5) Top Girder (cont)

$$F_b = \frac{10,000,000}{170\ (4.786)} = 12,290\ psi$$

Page 3?

$$S = \frac{M}{F_p} = \frac{81.177^{1K} \times 12}{18^K psi} = 54.118\ in^3 < \cancel{57.9}\ 79\ in^3$$

See USED Calcs page 9 and 10

Middle Girder (W30 X 124) $S = 355\ in^3$ $M = 522.195^{1K}$

Lu on top side $= 5 \times 2.8333 \times 12 = 170''$

$$d/A_F = \frac{30.16}{(10.521)(0.93)} = 3.08$$

$b = t_f$
$h = b_f$

$$I_f = \frac{bh^3}{12} = \frac{0.93\ (10.521)^3}{12} = 90.25\ in^4$$

$$A = A_f + \frac{1}{6} A_W$$

$$= (10.521 \times 0.93) + \frac{1}{6}\left[30.16 - 2(0.93)\right] \times 0.585$$

$$= 12.54\ \square''$$

$$r_y = \sqrt{\frac{I}{A}} = \sqrt{\frac{90.25}{12.54}} = 2.68$$

$$\frac{L}{r_y} = \frac{170}{2.68} = 63.43 > 40$$ use Formula (4)

$$K_2 = 1 - \frac{63.43^2}{2(126.1)^2 \times 1} = 0.87$$

$$F_b = 0.50 \times 0.87 \times 36000$$

$$= 15,660\ psi$$

Cont. on page (11)

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 11 OF ______
ITEM ______ BY LWC DATE 8-10-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Formula (5) Lu on top = 170" Middle Girder (cont)

$F_b = \dfrac{10,000,000}{170\ (3.08)} = 19,098$ psi use 18,000 psi

$S = \dfrac{522.195^{'K} \times 12}{18^{K}psi} = 348.13^{in^3} < 355^{in^3}$

Lu on Bottom = $3 \times 2.8333' \times 12 = 102"$

$d/A_F = 3.08$

$I_f = 87.71$

$A = 12.54 \square"$

$r_y = 2.64$

$\dfrac{L}{r_y} = \dfrac{102}{2.64} = 38.64 < 40$

Formula (5)

$F_b = \dfrac{10,000,000}{(102")(3.08)} = 31,830$ psi

Use 18000 psi

$S = \dfrac{522.195^{'K} \times 12}{18\ psi} = 348.13^{in^3} < 355^{in^3}$

Bottom Girder

Note: Same properties as Middle Girder with less moment and max spacing of bracing at 102."

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JOB ____ SHEET Nº 12 OF ____
ITEM ____ BY LWG DATE 8-13
JOB Nº 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

GATE WTS.

MEMBER	SIZE	Nº	W/Ft LBS.	LENGTH FT	WT (TOT.) lbs	ARM INCHES	MOMENT IN. LBS
TOP GIRDER	W18 x ~~35~~ 45	1	~~35~~ 45	42.5	~~1487.5~~ 1912.5	9.06	~~13,477~~ 17,327
MID. GIRDER	W30 X 124	1	124	42.5	5270.0	15.25	80,368
BOTT. GIRDER	W30 X 108	1	108	42.5	4590.0	15.125	69,424
BARS	3/8" X 6"	12	7.65	5.589	513.1	3.188	1,636
BARS	3/8" x 6"	8	7.65	5.579	341.4	3.186	1,088
BARS	3/8" X 17 5/16"	4	22.07	5.589	493.4	8.844	4,364
BARS	3/8" X 29 3/16"	8	37.21	5.579	1660.8	14.875	24,704
PLATES	1/2" X 4"	4	6.8	5.589	152.0	17.75	2,698
PLATES	1/2 X 4"	8	6.8	4.75	258.4	29.625	7,655
SKIN PLATE	3/8" X 12.25	1	187.43	40.83	7652.8	.1875	1,435
BARS	1 1/2 X 1 1/2"	2	7.65	12.25	197.4	- .75	- 148
SEAL ANGLE	L5X5X1/2	1	16.2	65.33	1025.9	+.743	+762
					~~23,643~~ # 24,068		~~207,467~~ "# 211,317

5.3#/ft'

$$\frac{207{,}467''\#}{23{,}643\#} = 8.775''$$

TRUSS

MEMBER	SIZE	Nº	W/Ft LBS.	LENGTH FT	WT (TOT.) lbs	ARM INCHES	MOMENT IN. LBS
CHANNEL	C15 X 33.9	2	33.9	14.0	949.2	7.688	7,297
CHANNEL	C15 X 33.9	2	33.9	4.75	322.0	7.688	2,476
CHANNEL	C15 X 33.9	1	33.9	14.17	480.4	7.688	3,693
					1752 "		13,466 "#

$$\frac{207{,}467 + 13{,}466}{23{,}643 + 1752} = 8.699''$$

~~25,395~~ #
25,820 #

Cont. on p. 13

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JOB ______ SHEET Nº 13 OF ______
ITEM ______ BY LWC DATE 8-13-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Trolley WT. = 1752#

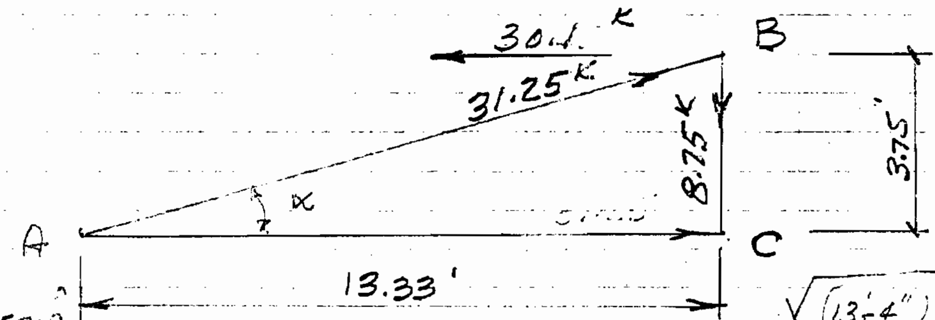
Total WT = 1752# + 24,068# = 25,820#

+25% Impact = 1.25 X 25,820 = 32,275#

Frame Design

Gate Wt = 24,068#

w/ Impact = 1.25 x 24,068 = 30,085#



$\alpha = 15.709°$

$\frac{3.75}{13.34} = .28125 = \text{Tan } 15.709°$

$\sqrt{(13'\text{-}4'')^2 + (3'\text{-}9'')^2} = 13.85$

$\frac{13.85}{13.3333} \times 30.1 = 31.27$

$\Sigma F_x = 0$

$= -30.1 + F_{AB} \cos \alpha = 0$

$F_{AB} = 31.25^k$

$\Sigma F_y = 0$

$= -F_{BC} + F_{AC} \sin \alpha = 8.47^k$

$P = 31.27$

$L = \frac{13.33}{\cos \alpha} = 13.85$

$K = 1.0$

Try C15 x 33.9 r = .904 A = 9.96

page 3-7 AISC - 1970

$\frac{Kl}{r} = \frac{K(13.85 \times 12)}{.904} = 183.8$ $F_a = 4.41$

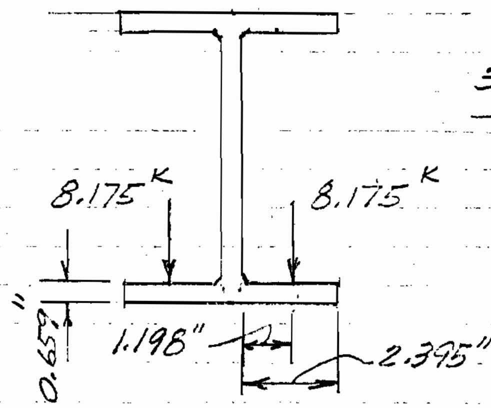
$f_a = \frac{P}{A} = \frac{31.25}{9.96} = 3.14 < 4.41$ ok

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº 14 OF
	ITEM	BY LWC DATE 8-14-79
	JOB Nº 575-79-E	CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Trolley Beam

Try S12 x 50



$$\frac{32{,}700\ \text{lbs}}{4} = 8.175^{\#}$$

Moment @ web edge:

$$M = 1.198'' \times 8.175^{k} = 9.794''^{K}$$

$$S_{reqd} = \frac{M}{F_b} = \frac{9.793''^{K}}{20^{ksi}} = 0.49\ \text{in}^3$$

$$\text{Furn. } S = \frac{bh^2}{6} = \frac{12'' \times 0.659^2}{6} = 0.869''^3 > 0.49\ \text{in}^3$$

Check Δ $\frac{Pb^3}{3EI}$ $P = 8175^{\#}$ $I = \frac{12 \times 0.659^3}{12} = 0.28619\ \text{in}^4$

$b = 1.198''$

$$\frac{8175^{\#}(1.198)^3}{3\,(29 \times 10^6)(0.28619)} = .000564 < \frac{2.395''}{360} = .00655$$

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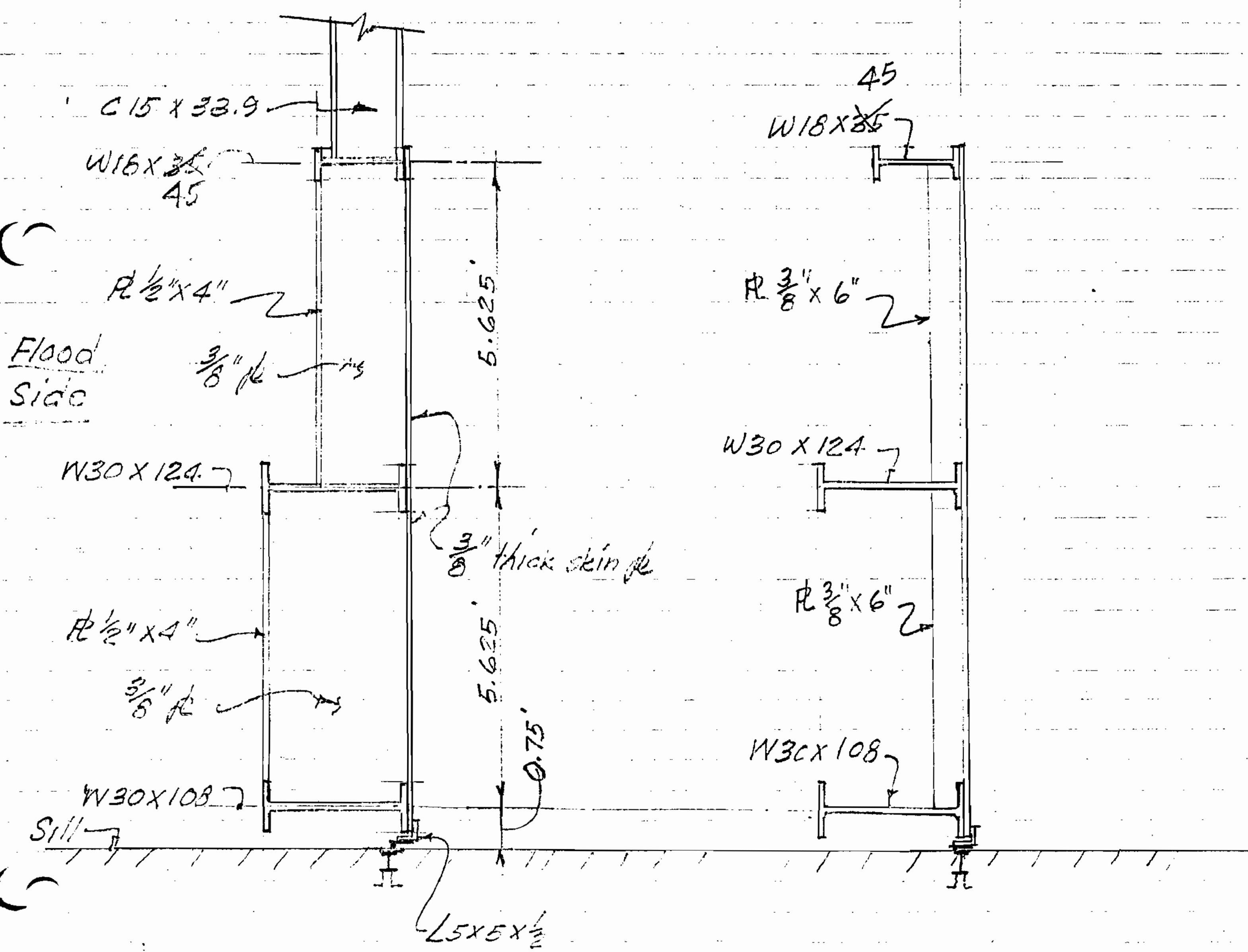
JOB ______ SHEET No 15 OF ______
ITEM ______ BY LWC DATE 8-14
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

STEEL GATE DETAILS



SECTION C
See Page 5

SECTION D
See Page 5

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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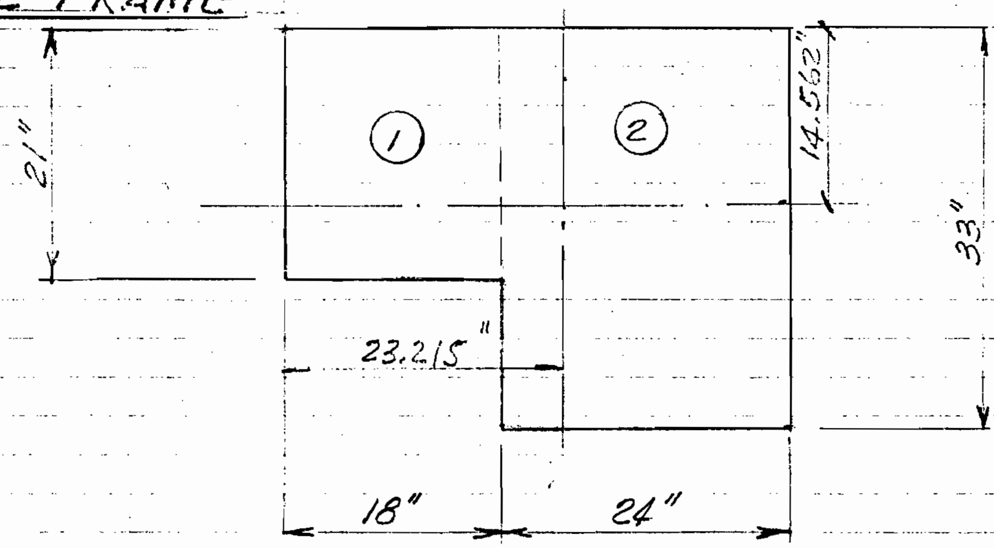
JOB ______ SHEET No 16 OF ____
ITEM ______ BY LWC DATE 8-14-79
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

CONCRETE FRAME



Moment of Inertia - (Beam B-C, C-D)

X-X

	Area (A)	Y	AY	$A\bar{Y}^2$	I_o
1	21 X 18 = 378	10.5"	3969	41674.5	13891.5
2	24 X 33 = 792	16.5"	13068	215622.0	71874.0
	1170		17037	257296.5	85765.5

$$Y = \frac{17037}{1170} = 14.562$$

$$I = 85765.5 + 257296.5 - (17037 \times 14.562)$$

$$= 94,969.2 \text{ in}^4$$

Y-Y

1	378	9"	3,402	30,618	10,206
2	792	30"	23,760	712,800	38,016
	1170		27,162	743,418	48,222

$$Y = \frac{27,162}{1170} = 23.215'$$

$$I = 48,222 + 743,418 - (27,162 \times 23.215)$$

$$= 161,069 \text{ in}^4$$

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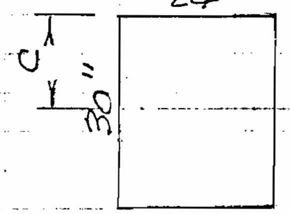
JOB ______ SHEET No 17 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB No 575-79-C CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

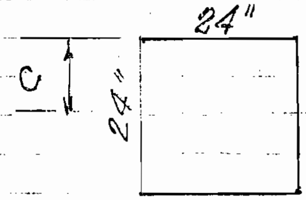
CONCRETE FRAME

Moment of Inertia (Cols A-B, E-C)



$$I = \frac{(24)(30)^3}{12} = 54000 \text{ in}^4$$

(Col. F-D)



$$I = \frac{(24)^4}{12} = 27648 \text{ in}^4$$

Distribution Factors

Cols. A-B, E-C

E = 1 $\qquad \frac{EI}{L} = \frac{1\,(54000)}{11.45 \times 12} = 393.01$

Col. F-D $\qquad \frac{EI}{L} = \frac{1\,(27648)}{11.45 \times 12} = 201.22$

Beam B-C $\qquad \frac{EI}{L} = \frac{1\,(94,969.2)}{42.5 \times 12} = 186.21$

Beam C-D $\qquad \frac{EI}{L} = \frac{1\,(94,969.2)}{32.5 \times 12} = 243.51$

Distribution

Jt. BA-BC $\qquad$ Col. BA $= \frac{393.01}{393.01 + 186.21} = .679$ BA

Beam BC $= \frac{186.21}{393.01 + 186.21} = .321$ BC

Jt CB-CE-CD $\qquad$ Beam CB $= \frac{186.21}{186.21 + 393.01 + 243.51} = .226$ CB

Col. CE $= \frac{393.01}{822.73} = .478$ CE

Beam CD $= \frac{243.51}{822.73} = .296$ CD

1.0

Jt. DC-DF $\qquad$ Beam DC $= \frac{243.51}{243.51 + 201.22} = .547$ DC

Col. DF $= \frac{201.22}{243.51 + 201.22} = .453$ DF

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

CONCRETE FRAME (Loading)

(a) Dead Load

Concrete: $2.75' \times 2.0' \times 0.15^k = 0.825^k$

Concrete: $1.75' \times 1.5' \times 0.15^k = 0.394$

Steel S12 X50 $= 0.05$

$1.27\ ^k/_{\text{lin ft}}$

(b) Live Load

Use two 16.5^k loads 14.17' apart

(c) Wind Load

$0.05\ ^k/_{\square'}$

$0.05 \times 2 = 0.10\ ^k/_{ft}$ length of column

Load Cases considered (Bending about x-x Axis)

Case 1x - Gate open, no water, no wind, one hanger load placed 19.17' from end Column.

Case 2x - Gate closed, no wind.

Case 3x - Gate open, wind from right (75%)

Case 4x - Gate closed, wind from right (75%)

Case 5x - Gate closed, wind from left (75%)

Case 6x - Gate open, no water, no wind, hanger load placed between center column.

Case 7x - Gate open, no water, no wind, one hanger load placed 0.92' from end column.

ASSOCIATES, INC.
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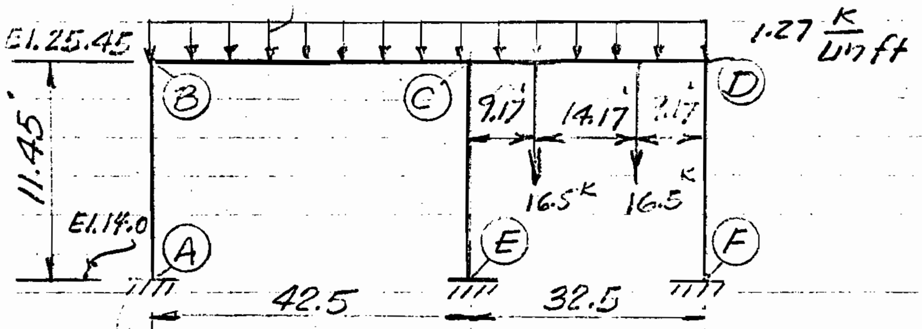
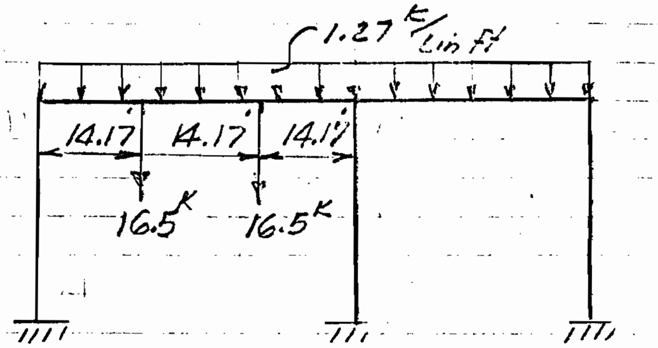
JOB ______ SHEET Nº 19 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

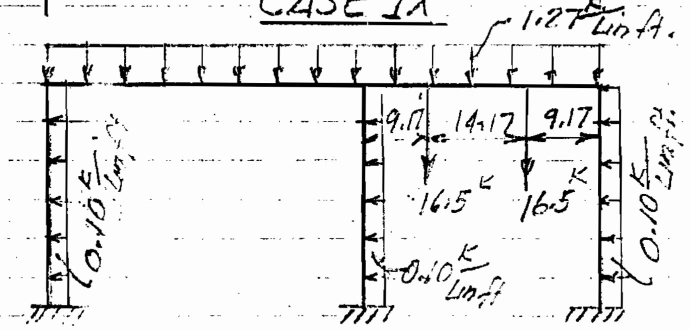
CONCRETE FRAME - (Load Cases)



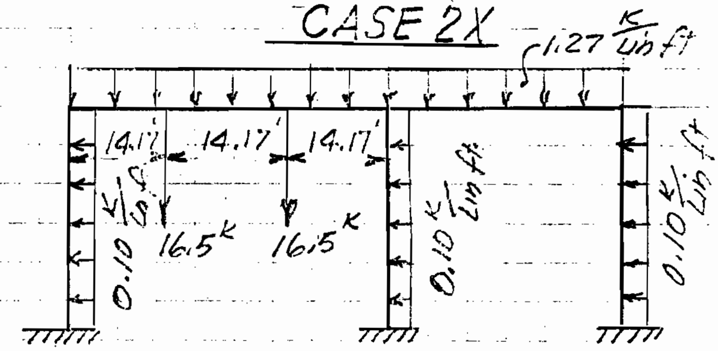
CASE 1X



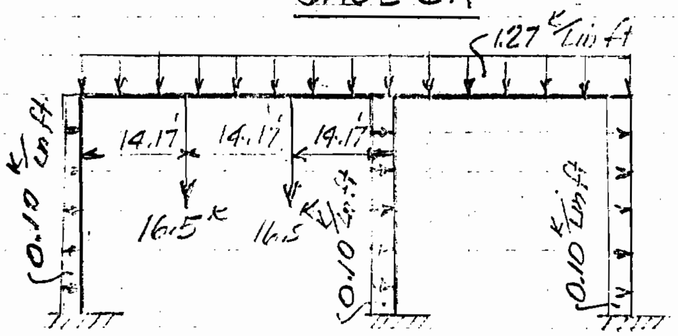
CASE 2X



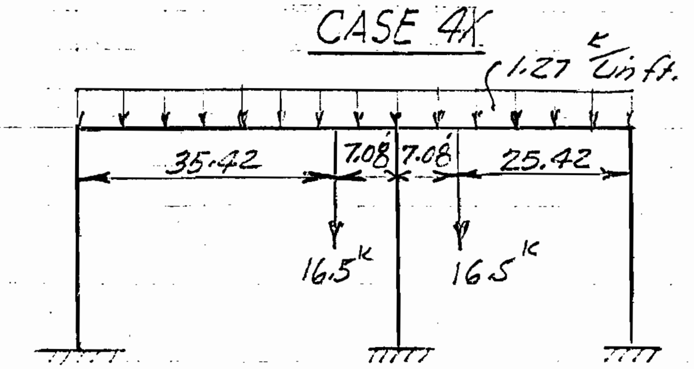
CASE 3X



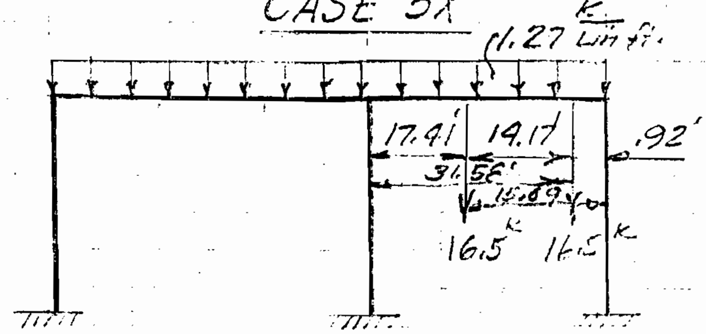
CASE 4X



CASE 5X



CASE 6X



CASE 7X

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JOB ______ SHEET Nº 20 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

CONCRETE FRAME (Fixed End Moments)

Case 1x (MEM BC-CB)

$1.27^k (42.5')^2 (\frac{1}{12}) = \underline{191.16}'^k$ → FEM @ B = FEM @ C

$V_B = (1.27^k)(42.5')(.5) = 26.98^k$

$V_B = V_C$

(MEM CD-DC)

$1.27^k (32.5')^2 .0833 = 111.79'^k$

$\frac{16.5^k \times 9.17^2 \times 23.34}{32.5^2} = 30.66'^k$ FEM @ C = FEM @ D

$\frac{16.5^k \times 9.17 \times 23.34^2}{32.5^2} = \underline{78.03}'^k$

$\Sigma FEM = 220.48'^k$

$V_C = (1.27^k)(32.5')(.5) = 20.64^k$

$V_D = V_C$

$\frac{16.5^k \times 23.34^2}{(32.5)^3} [(3 \times 9.17) + 23.34] = 13.31$

$\frac{16.5^k \times 9.17^2}{(32.5)^3} [9.17 + (3 \times 23.34)] = \underline{3.19}$

$\Sigma V = 37.14^k$

Case 2x (Mem BC-CB)

$= 191.16'^k$

$\frac{16.5^k \times 14.17^2 \times 28.34'}{42.5^2} = 51.98'^k$

$\frac{16.5^k \times 14.17' \times 28.34^2}{42.5^2} = \underline{103.96}'^k$

$\Sigma FEM = 347.10'^k$ → FEM @ B = Fem @ C

$V_B = 26.98^k$

$V_B = V_C$

$\frac{16.5^k \times 28.34^2}{(42.5)^3} [(3 \times 14.17) + 28.34] = 12.23^k$

$\frac{16.5^k \times 14.17^2}{(42.5)^3} [14.17 + (3 \times 28.34)] = \underline{4.28}^k$

$\Sigma V = 43.49^k$

(MEM CD DC)

$= 111.74'^k$ FEM @ C = FEM @ D

$V_C = V_D$

$V_C = 20.64^k$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 21 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

CONCRETE FRAME (Fixed End Moments)

Case 3x (Mem BC-CB)

= 191.16'k — FEM@B = FEM@C

$V_B = V_C$ V_B = 26.95 k

(Mem CD-DC)

= 111.74'k

= 30.66'k
= 78.03'k
ΣFEM = 220.43'k — FEM@C = FEM@D

V_C
= 20.64 k
= 13.31 k
= 3.19 k

$V_C = V_D$

$\Sigma V_C = 37.14$ k

(Mem AB-BA)

wind $0.1^k \times 11.45^2 \times .0633$ = 1.09'k — FEM@A = FEM@B

$V_A = V_B$ $V_A = 0.1^k \times 11.45' \times .5$ = 0.573 k

(MEM FC-CF)

= 1.09'k — FEM@F = FEM@C

$V_E = V_C$ V_E = 0.573 k

(MEM ED-DE)

= 1.09'k FEM@E = FEM@D

$V_E = V_D$ V_E = 0.573 k

Case 4x (Mem BC-CD)

= 191.16'k

= 51.98'k
= 103.96'k
ΣFEM = 347.10'k — FEM@B = FEM@C

(Cont on Page 22)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 22 OF
BY LWC DATE 8-15-79
CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
CONCRETE FRAME (Fixed End Moments)

Case 4x (Mem BC-CB cont.)

V_B $= 26.98^k$
$V_B = V_C$ $= 12.23^k$
$= 4.28^k$
$\Sigma V_B = 43.49^k$

(Mem CD-DC)

$= 111.79'^k$ → FEM@C = FEM@D

$V_C = V_D$ V_C $= 20.64^k$

(Mem. AB-BA)

$= 1.09'^k$ → FEM@A = FEM@B

$V_A = V_B$ V_A $= 0.573^k$

(Mem EC-CE)

$= 1.09'^k$ → FEM@E = FEM@C

$V_E = V_C$ V_E $= 0.573^k$

(Mem FD-DF)

$= 1.09'^k$ → FEM@F = FEM@D

$V_F = V_D$ V_F $= 0.573^k$

Case 5x (Mem BC-CB)

$= 191.16'^k$

$= 51.98'^k$
$= 103.96'^k$
Σ FEM $= 347.10'^k$ → FEM@B = FEM@C

V_B' $= 26.98^k$
$V_B = V_C$ $= 12.23^k$
$= 4.23^k$
$\Sigma V_B = 43.49^k$

(MEM CD-DC)

$= 111.79'^k$ → FEM@C = FEM@D

V_C $= 20.64^k$
$V_C = V_D$

Cont. on Page 23

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET № 23 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB № 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)
CONCRETE FRAME (Fixed End Moments)

Case 5x (cont - MEM AB-BA)

$= 1.09'^{k}$ FEM@A = FEM@B

$V_A = V_B$ V_A $= 0.573^{k}$

(MEM EC-CE)

$= 1.09'^{k}$ FEM@E = FEM@C

$V_E = V_C$ V_E $= 0.573^{k}$

(MEM FD-DF)

$= 1.09'^{k}$ FEM@F = FEM@D

$V_F = V_D$ V_F $= 0.573^{k}$

Case 6x (MEM BC-CB)

$= 191.16'^{k}$

7.08'

$\frac{16.5^{k}(35.42)^2 7.08}{(42.5)^2} = 81.14'^{k}$

$272.30'^{k}$ FEM@C

$= 191.16'^{k}$

$\frac{(16.5)^{k}(35.42)(7.08)^2}{(42.5)^2} = 16.22'^{k}$

$207.38'^{k}$ FEM@B

$V_C = \frac{(16.5)^{k}(35.42)^2}{(42.5)^3}\left[35.42 + (3 \times 7.08)\right] = 15.28$

.26966

$1.27^{k} \times 42.5' \times .5 = 26.99$

$V_C = 42.27^{k}$

$V_B = \frac{(16.5)^{k}(7.08)^2}{(42.5)^3}\left[(3 \times 35.42) + 7.08\right] = 1.22^{k}$

.0107717

$= 26.99$

$V_B = 28.21^{k}$

Cont on Page 24

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
CONCRETE FRAME (Fixed End Moments)

Case 6X (MEM CD-DC)

$= 111.79'^k$

C — D $\frac{16.5^k (25.42)^2\, 7.08}{32.5^2} = +71.46'^k$ → FEM @ C

$\Sigma\ 183.25'^k$

$= 111.79'^k$

C — D $\frac{16.5^k (25.42)(7.08)^2}{32.5^2} = +19.90$ → FEM @ D

$\Sigma\ 131.69'^k$

V_C $1.27^k \times 32.5' \times .5 = 20.64^k$

$.3105^{3/2}\ \frac{(16.5^k)(25.42)^2}{32.5^3}\left[25.42 + (3 \times 7.08)\right] = +14.49^k$

$35.13^k = V_C$

V_D $\frac{(16.5)(7.08)^2}{32.5^3}\left[(3 \times 25.42) + 7.08\right] = 20.64^k$

$= +2.01^k$

$22.65^k = V_D$

Case 7X (MEM BC-CB)

$= 191.16'^k$ FEM @ B = FEM @ C

$V_B = 26.99^k$

$V_B = V_C$

(MEM CD-DC)

$= 111.79'^k$

$\frac{16.5^k (31.58)^2 (0.92)}{32.5^2} = 14.33'^k$

$\frac{16.5^k (17.41)^2 (15.09)}{32.5^2} = 71.45'^k$

$\Sigma\ 197.57'^k$ FEM @ D

$= 111.79'^k$

$\frac{16.5^k (31.58)(0.92)^2}{32.5^2} = 0.42'^k$

$\frac{16.5^k (17.41)(15.09)^2}{32.5^2} = 61.93'^k$

$\Sigma\ 174.14'^k$ FEM @ C

Cont. on pg 25

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

CONCRETE FRAME (Fixed End Moments)

Case 7X (MEM CD-DC)

V_D $\quad 1.27^k \times 32.5' \times .5 = 20.64^k$

.4794 $\quad \dfrac{16.5^k (31.58)^2}{32.5^3}\left[31.58 + (3 \times 0.92)\right] = 16.46^k$

.1457 $\quad \dfrac{16.5^k (17.41)^2}{32.5^3}\left[17.41 + (3 \times 15.09)\right] = 9.13^k$

$46.23^k = V_D$

V_C $\quad = 20.64^k$

.00041 $\quad \dfrac{16.5^k (0.92)^2}{32.5^3}\left[(3 \times 31.58) + 0.92\right] = 0.04^k$

.10445 $\quad \dfrac{16.5^k (15.09)^2}{32.5^3}\left[(3 \times 17.41) + 15.09\right] = 7.37^k$

$28.05^k \; V_C$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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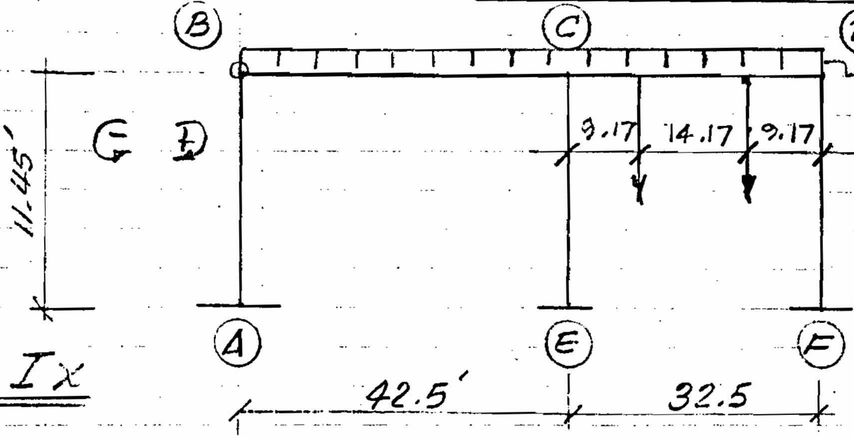
JOB
ITEM
JOB NO 575-79-E

SHEET NO 26 OF
BY DATE 8-16-79
CHKD. BY DATE



CASE IX

OVERHEAD GATE DESIGN
(At Florida Ave. West of IHNC)
CONCRETE FRAME
(Moment Distribution)

	JOINT	A	B		C			D		F	E
	MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 17	D.F.	1	0.679	0.321	0.226	0.478	0.296	0.547	0.453	1	1
Pg. 20	FEM			-191.16	+191.16		-220.48	+220.48			
	BAL		+129.79	+61.36	+6.63	+14.01	+8.68	-120.60	-99.88		
	C.O	+64.90		+3.32	+30.68		-60.30	+4.34		-49.94	+7.01
	BAL		-2.25	-1.07	+6.69	+14.16	+8.77	-2.37	-1.97		
	CO	-1.13		+3.35	-0.54		-1.19	+4.36		-0.99	+7.07
	BAL		-2.27	-1.07	+0.39	+0.83	+.51	-2.38	-1.97		
	CO	-1.14		+0.20	-0.54		-1.19	+0.26		-0.99	+0.42
	BAL		-0.14	-0.06	+0.39	+0.83	+0.51	-0.14	-0.12		
	CO	-0.67		+0.20	-0.03		-0.07	+0.26		-0.06	+0.42
	BAL		-0.14	-0.06	+0.07	+0.05	+0.03	-0.14	-0.12		
Dist. Moments	Total	+62.56	+125.0	-125.0	+234.85	+29.88	-264.73	+104.06	-104.06	-51.98	+14.92
	Shear	16.38k			6.67k (sidesway)					13.62k	3.91

$$\frac{+62.56'^k + 125.0'^k}{11.45'} = +16.38^k \qquad \frac{-51.98'^k - 104.06}{11.45'} = -13.62^k \qquad \frac{+14.92'^k + 29.88'^k}{11.45} = +3.91^k$$

$$+16.39^k + 3.91^k - 13.62^k = 6.67^k$$

		AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 27	Correction Moments	-63.96	-37.77	+37.77	+31.47	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
	Factor x Corr. Mom.	-16.03	-8.78	+8.78	+7.32	-14.98	+7.66	+7.66	-7.66	-9.78	-19.13
	Final Moments	+46.53	+116.22	-116.22	+242.17	+14.90	-257.07	+111.72	-111.72	-61.76	-4.21
	Final Shear	14.21								15.15	0.93
	Final Vert. Reac.	24.04								32.66	71.52

Final Shear @AB $= \frac{+46.53+116.22}{11.45} = 14.21^k$

@FD $= \frac{-61.76-111.72}{11.45} = 15.15$

@EC $= \frac{-4.21+14.9}{11.45} = 0.93$

+14.21
+0.93
-15.15
-0.01

Sidesway Correction Factor $= \frac{6.67^k}{28.69^k} = 0.2325$
See page 27

Note:
Sidesway Correction = Factor x Correction moment. Apply correction to distributed Moments for Final Moments

OVERHEAD GATE DESIGN
(At Florida Ave West of IHNC)
CONCRETE FRAME
Moment Distribution

Sidesway Adjustment:

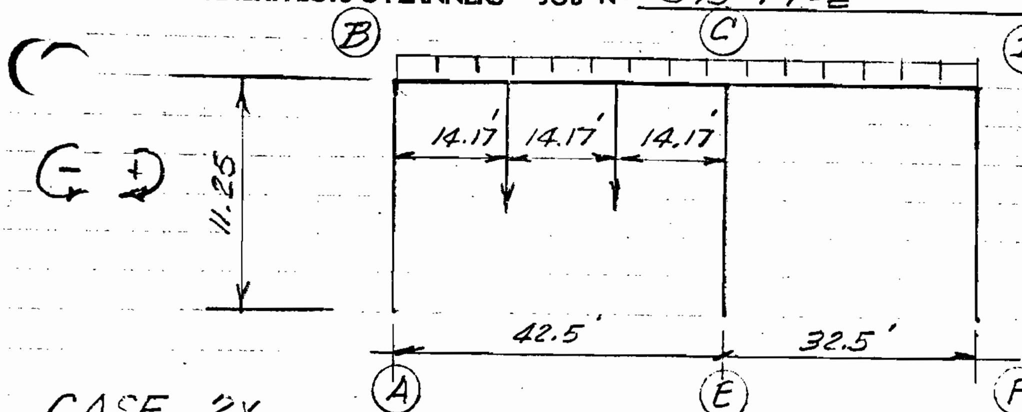
$$M_{FD} = M_{DF} = \frac{I_{FD}\ L_{FD}^2}{I_{AB}\ L_{AB}^2}\ M_{AB} =$$

$$\frac{27648\ in^4}{54000\ in^4} = .512\ M_{AB}$$

JOINT	A	B		C			D		F	E
MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
DF		0.679	0.321	0.226	0.476	0.296	0.547	0.453		
assumed FEM	-100	-100			-100			-51.2	-51.2	-100
BAL		+67.9	+32.1	+22.6	+47.8	+29.6	+28.01	+23.19		
CO	+33.95		+11.30	+16.05		+14.0	+14.8		+11.60	+23.9
BAL		-7.67	-3.63	-6.79	-14.36	-8.89	-8.10	-6.70		
CO	-3.87		-3.40	-1.82		-4.05	-4.45		-3.35	-7.18
BAL		+2.31	+1.09	+1.33	+2.81	+1.74	+2.43	+2.02		
CO	+1.15		+0.67	+0.55		+1.22	+0.87		+1.01	+1.42
BAL		-0.45	-0.22	-0.40	-0.85	-0.52	-0.48	-0.39		
CO	-0.22		-0.20	-0.11		-0.24	-0.26		-0.20	-0.42
BAL		+0.14	+0.06	+0.08	+0.17	+0.10	+0.14	+0.12		
Total	-68.96	-37.77	+37.77	+31.49	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
Shear	← 9.32 k				Sidesway ← 28.69 k				← 6.36 k	← 12.81 k

$$\frac{-68.96^{'k} - 37.77^{'k}}{11.45'} = -9.32^k \qquad \frac{-42.14 - 32.96^{'k}}{11.45'} = -6.56^k \qquad \frac{-82.3 - 64.33^{'k}}{11.45'} = 12.81^k$$

$$-9.32^k - 6.56^k - 12.81^k = -28.69^k$$



OVERHEAD GATE DESIGN

(At Florida Ave West of IHNC)

CONCRETE FRAME

(Moment Distribution)

CASE 2X

	JOINT	A	B		C			D		F	E
	MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 17	D.F.		0.679	0.321	0.226	0.478	0.296	0.547	0.453		
Page 20	FEM			-347.10	+347.10		-111.74	+111.74			
	Bal.		+235.68	+111.42	-53.19	-112.50	-69.67	-61.12	-50.62		
	CO	+117.84		-26.60	+55.71		-30.58	-34.84		-25.31	-56.25
	Bal.		+18.06	+8.54	-5.68	-12.01	-7.43	+19.06	+15.76		
	CO	+9.03		-2.84	+4.27		+9.53	-3.72		+7.89	-6.01
	Bal.		+1.93	+0.91	-3.12	-6.60	-4.08	+2.03	+1.69		
	CO	+0.97		-1.56	+0.46		+1.02	-2.04		+0.85	-3.30
	Bal		+1.06	+0.50	-0.33	-0.71	-0.44	+1.12	+0.92		
	CO	+0.53		-0.17	+0.25		+0.56	-0.22		+0.46	-0.36
	Bal		+0.12	+0.05	-0.15	-0.39	-0.24	+0.12	+0.10		
	Total	+128.37	+256.85	-256.85	+345.29	-132.21	-213.07	+32.13	-32.13	-16.11	-65.92
	Shear	33.64k								4.21	17.27
	Sidesway				Sidesway = 12.16k						

$$\frac{128.37^k + 256.85^k}{11.45'} = 33.64^k \quad \frac{-16.11^k - 32.13}{11.45'} = 4.21^k \quad \frac{-65.92 - 132.29}{11.45} = 17.31^k$$

$$+33.64^k - 4.21^k - 17.27^k = -12.16^k$$

		AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 27	Correction Moments	-68.67	-37.77	-37.77	+31.49	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
Factor	x Corr. Mom.	-29.11	-16.01	-16.01	+13.35	-27.31	+13.97	+13.97	-13.97	-17.85	-34.88
	Final Moments	+99.26	+240.84	-240.84	+358.64	-159.52	-199.10	+46.10	-46.10	-33.96	-100.80
	Final Shear	29.70								6.99	22.73
	Vert. Reaction	40.70 ↑								↑ 15.92	↑ 71.55

Sidesway Correction Factor $= \frac{12.16^k}{28.69^k} = 0.42384$

See page 27

Final Shear @ FD

$$\frac{-33.96 - 46.10}{11.45} = 6.99^k$$

See Note bottom page 26

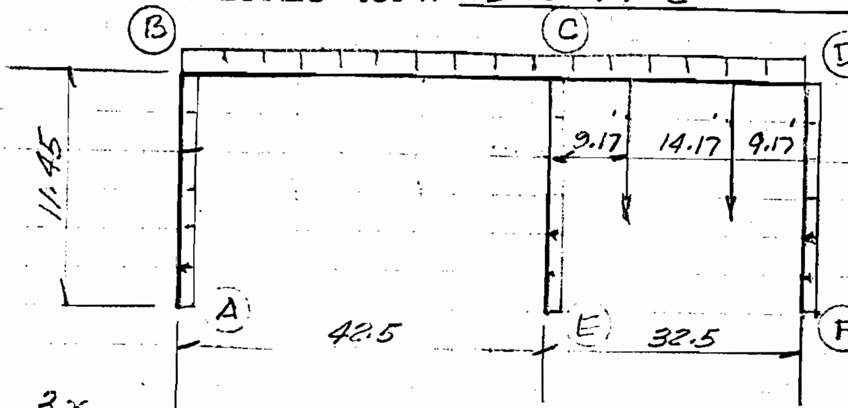
Final Shear @ EC

$$\frac{-100.80 - 159.52}{11.45} = 22.73^k$$

Final Shear @ AB

$$\frac{+99.26 + 240.84}{11.45} = 29.70^k$$

$$+29.70 - 6.99^k - 22.73^k = -.02 \approx 0$$



OVERHEAD GATE DESIGN
(At Florida Ave West of IHNC)
CONCRETE FRAME
(Moment Distribution)

CASE 3x

See 17
Page 21

JOINT	A	B		C			D		F	E
MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
D.F.	1	0.677	0.321	0.226	0.478	0.296	0.547	0.453	1	1
FEM	+1.09	-1.09	-191.16	+191.16	-1.09	-220.48	+220.48	-1.09	+1.09	+1.09
BAL		+130.53	+61.71	+6.87	+14.54	+9.00	-120.01	-99.38		
CO	+65.27		+3.44	+30.86		-60.01	+4.40		-49.69	+7.27
BAL		-2.32	-1.10	+6.59	+13.93	+8.63	-2.41	-1.99		
CO	-1.17		+3.30	-0.55		-1.21	+4.32		-1.00	+6.97
BAL		-2.24	-1.06	+0.40	+0.84	+0.52	-2.36	-1.97		
CO	-1.12		+0.20	-0.53		-1.18	+0.26		-0.99	+0.42
BAL		-0.14	-0.06	+0.39	+0.82	+0.51	-0.14	-0.12		
CO	-0.07		+0.20	-0.03		-0.07	+0.26		-0.06	+0.41
BAL		-0.14	-0.06	+0.02	+0.05	+0.03	-0.14	0.12		
CO	-0.07		+0.02	-.03		-0.07	+0.02		-0.06	+0.03
BAL		-0.01	-0.01	+0.02	+0.05	+0.03	-0.01	-0.01		
Final	+63.93	+124.57	-124.57	+235.17	+29.14	-264.30	+104.67	-104.67	-50.79	+16.19
Shear	16.46								13.58	3.96
				6.84^k = Sidesway						

$$\frac{+63.93'^k + 124.57'^k}{11.45'} = +16.46^k \qquad \frac{+29.14'^k + 16.19'^k}{11.45'} = +3.96^k \qquad \frac{-104.67'^k - 50.79'^k}{11.45'} = -13.58^k$$

$16.46^k + 3.96^k - 13.58^k = 6.84^k$ = Sidesway

Page 21

	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Correction Moments	-68.7?	-37.77	+37.77	+31.49	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
Factor x Corr Mom.	-16.44	-9.00	+9.00	+7.51	-15.36	+7.88	+7.88	-7.88	-10.04	-19.62
Final Moments	+47.49	+115.57	-115.57	+242.68	+13.78	-256.42	+112.55	-112.55	-60.83	-3.43
Final Shear	14.24								15.14	0.90
Vert Reaction	24.07								32.59	71.59

Sidesway Correction Factor

$$= \frac{6.84^k}{28.69^k} = .2384$$

See Page 27

See Note bottom of page 26

Final Shear @ AB

$$\frac{+47.49'^k + 115.57'^k}{11.45'} = +14.24^k$$

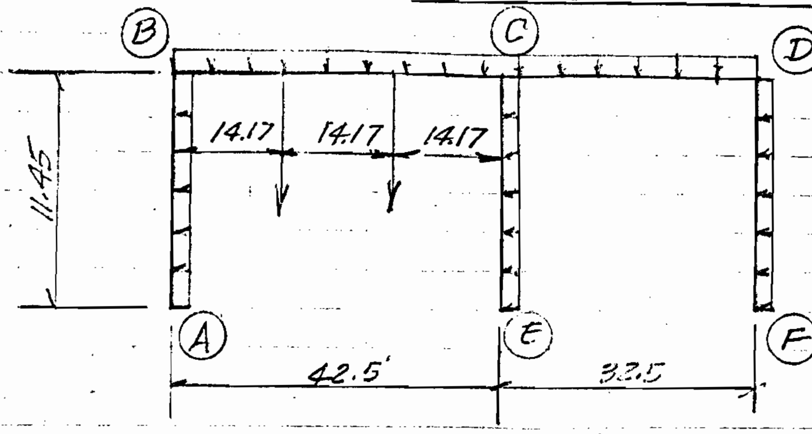
Final Shear @ FD

$$\frac{-112.55'^k - 60.83'^k}{11.45} = -15.14^k$$

Final Shear @ EC

$13.78'^k - 3.43'^k = +0.90^k$

$+14.24 + 0.90 - 15.14 = 0$



OVERHEAD GATE DESIGN

(At Florida Ave. West of IHNC)

CONCRETE FRAME

(Moment Distribution)

CASE 4X

JOINT	A	B		C			D		F	E
MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 17 DF	1	0.679	0.321	0.226	0.478	0.296	0.547	0.453		
Page 21, 22 FEM	+1.09	-1.09	-347.10	+347.10	-1.09	-111.79	+111.79	-1.09	+1.09	+1.09
BAL		+236.42	+111.77	-52.93	-111.96	-69.33	-60.55	-50.15		
CO	+118.71		-26.47	+55.89		-30.28	-34.67		-25.08	-55.98
BAL		+17.97	+8.50	-5.79	-12.24	-7.58	+18.96	+15.71		
CO	+8.99		-2.90	+4.25		+9.48	-3.79		+7.86	-6.12
BAL		+1.97	+0.93	-3.16	-6.56	-4.06	+1.72	+2.07		
CO	+0.99		-1.55	+0.47		+0.86	-2.03		+1.04	-3.28
BAL		+1.05	+.50	-0.30	-0.64	-0.39	+1.11	+0.92		
CO	+0.53		-0.15	+0.25		+0.56	-0.20		+0.46	-0.32
BAL		+0.10	+0.05	-0.16	-0.39	-0.24	+0.11	+0.09		
CO	+0.05		-0.09	+0.03		+0.06	-0.12		+0.05	-0.20
BAL		+0.06	+0.03	-0.02	-0.04	-0.03	+0.07	0.05		
Total	+130.37	+256.48	-256.48	+345.67	-132.92	-212.75	+32.40	-32.40	-14.58	-64.81
Shear	33.79			Sidesway = 12.43k					4.10	17.26

$$\frac{+130.37^k + 256.48^k}{11.45'} = 33.79^k \qquad \frac{-132.92 - 64.81}{11.45} = 17.26^k \qquad \frac{-32.40 - 14.58}{11.45} = 4.10^k$$

$$+33.79^k - 17.26^k - 4.10^k = 12.43^k$$

Page 27 Correction Moments	-68.92	-37.77	+37.77	+31.49	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
Factor × Corr. Moments	-29.86	-16.36	+16.36	+13.64	-27.91	+14.28	+14.28	-14.28	-18.26	-35.66
Final Moments	+100.51	+240.12	-240.12	+359.31	-160.83	-198.47	+46.68	-46.68	-32.84	-100.47
Final Shear	29.75								6.94	22.82
Vert Reaction	40.77								15.85	71.55

Sidesway correction Factor

$$= \frac{12.43}{28.69} = .43325$$

See page 27

See Note bottom page 26

Final Shear @ AB

$$\frac{+100.51^k + 240.12^k}{11.45'} = +29.75^k$$

$$+29.75^k - 6.94^k - 22.82^k = -0.01 \approx 0$$

Final Shear @ FD

$$\frac{-46.68^k - 32.84^k}{11.45'} = 6.94^k$$

Final Shear @ EC

$$\frac{-160.83^k - 100.47^k}{11.45} = 22.82^k$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

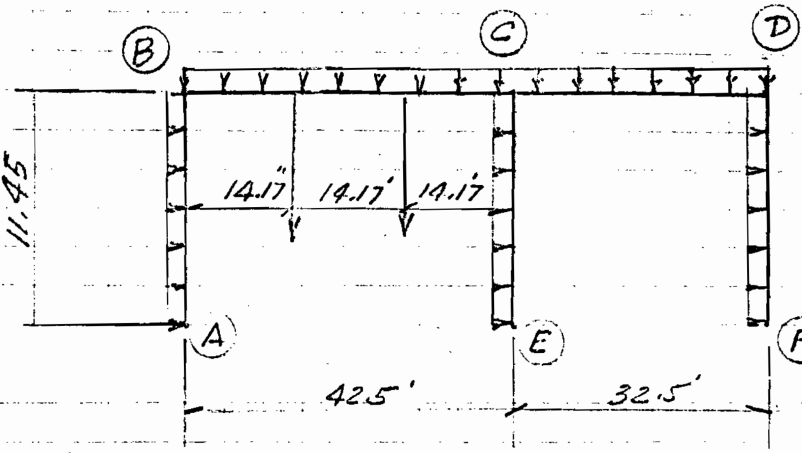
JOB ______ SHEET No 31 OF ______
ITEM ______ BY LWC DATE 8-20-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN

(At Florida Ave West of IHNC)

CONCRETE FRAME

(Moment Distribution)



CASE 5X

Page 17

JOINT	A	B		C			D		F	E
MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
DF		[illegible]	0.321	0.226	0.475	0.296	0.547	0.453		
FEM	-1.09	+1.09	-347.10	+347.10	+1.09	-111.79	+111.79	+1.09	-1.09	-1.09
BAL		+234.94	+111.06	-53.48	-113.00	-69.97	-61.75	-51.13		
CO	+117.47		-26.72	+55.53		-30.88	-34.99		-25.57	-56.50
BAL		+18.14	+8.58	-5.57	-11.78	-7.30	+19.14	+15.85		
CO	+9.07		-2.79	+4.29		+9.57	-3.65		+7.93	-5.89
BAL		+1.89	+0.90	-3.13	-6.63	-4.10	+2.00	+1.65		
CO	+0.95		-1.57	+0.45		+1.00	-2.05		+0.83	-3.32
BAL		+1.07	+0.50	-0.33	-0.69	+0.43	+1.12	+0.93		
CO	+0.54		-0.17	+0.25		+0.56	-0.22		+0.47	-0.35
BAL		+0.12	+0.05	-0.18	-0.39	-0.24	+0.12	+0.10		
CO	+0.06		-0.07	+0.03		+0.06	-0.12		+0.05	-0.20
BAL		+0.06	+0.03	-0.02	-0.04	-0.03	+0.07	+0.05		
Total	+127.0	+257.31	-257.31	+344.99	-131.44	-213.58	+31.46	-31.46	-17.38	-67.35
Shear	33.56			Sidesway = 11.93					4.27	17.36

$$\frac{+127.0'^k + 257.31'^k}{11.45'} = 33.56^k \qquad \frac{-131.44'^k - 67.35'^k}{11.45'} = 17.36^k \qquad \frac{-31.46'^k - 17.38'^k}{11.45'} = 4.27^k$$

$$+33.56^k - 17.36^k - 4.27^k = 11.93^k$$

Page 47

Correction Moments	-68.96	-37.77	+37.77	+31.47	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
Factor x Corr. Mom	-28.66	-15.71	+15.71	+13.09	-26.79	+13.71	+13.71	-13.71	-17.52	-34.22
Final Moments	+98.32	+241.60	-241.60	+35[illegible]	-158.23	-199.87	+45.17	-45.17	-34.90	-161.57
Final Shear	29.69								6.99	22.69
Vert Reaction	40.63								15.66	71.55

Sidesway Correction Factor

$$= \frac{11.93^k}{28.67^k} = .415524$$

page 27

See Note bottom page 26

Final Shear @ AB

$$\frac{+98.32'^k + 241.60'^k}{11.45'} = 29.69^k$$

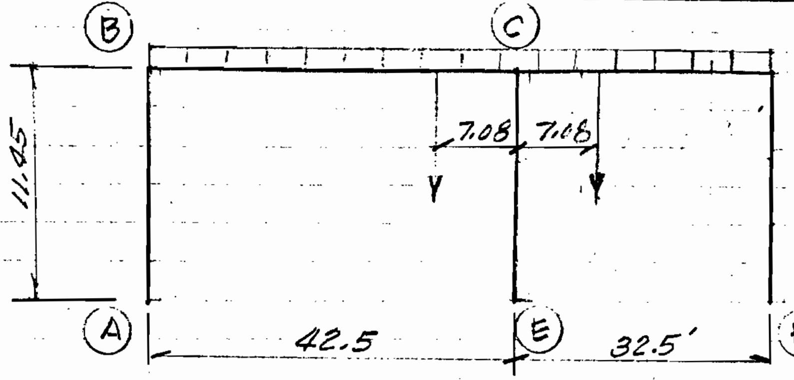
Final Shear @ EC

$$\frac{-158.23'^k - 101.57'^k}{11.45} = -22.69^k$$

Final Shear @ FD

$$\frac{-45.17'^k - 34.90'^k}{11.45'} = -6.99^k$$

$$+29.69^k - 22.69^k - 6.99^k = .01 \approx 0$$



(−) (+)

OVERHEAD GATE DESIGN

(At Florida Ave. West of IHNC)

CONCRETE FRAME

(Moment Distribution)

CASE 6X

	JOINT	A	B		C			D		F	E
	MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 17	D.F		0.679	0.321	0.226	0.478	0.296	0.547	0.453		
Page 23,24	FEM			-207.38	+272.30		-183.25	+131.69			
	Bal.		+140.81	+66.57	-20.13	-42.57	-26.36	-72.03	-59.66		
	CO	+70.41		-10.07	+33.29		-36.02	-13.18		-29.83	-21.29
	Bal.		+6.84	+3.23	+0.63	+1.30	+0.81	+7.20	+5.97		
	CO	+3.42		+0.32	+1.62		+3.60	+0.41		+2.99	+0.65
	Bal.		-0.22	-0.10	-1.18	-2.50	-1.55	-0.22	-0.19		
	CO	-0.11		-0.59	-0.05		-0.11	-0.78		-0.10	-1.25
	Bal		+0.40	+0.19	+0.04	+0.03	+0.04	+0.42	+0.35		
	Total	+73.72	+147.83	-147.83	+286.52	-43.69	-242.84	+53.52	-53.52	-26.94	-21.89
	Shear	19.34				6.60 k Sidesway				7.02	5.72

$$\frac{+73.72'^{k} + 147.83'^{k}}{11.45'} = 19.34^{k} \qquad \frac{-43.69'^{k} - 21.89'^{k}}{11.45'} = -5.72^{k} \qquad \frac{-53.52'^{k} - 26.94'^{k}}{11.45'} = 7.02'$$

$$+19.34^{k} - 5.72^{k} - 7.02^{k} = 6.60'^{k}$$

		AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
Page 27	Correction Moments	-68.94	-37.77	+37.77	+31.49	-64.31	+32.96	+32.96	-32.96	-42.14	-82.30
	Factor X Corr. Mom.	-15.86	-8.69	+8.69	+7.24	-14.79	+7.58	+7.58	-7.58	-9.69	-18.93
	Final Moments	+57.85	+139.14	-139.14	+293.76	-58.48	-235.26	+61.10	-61.10	-36.63	-40.82
	Final Shear	17.20								8.54	8.67
	Vert React.	26.03								18.86	83.23

Sidesway Correction Factor $= \frac{6.60^{k}}{28.69^{k}} = 0.23005$

See page 27

Final Shear @ FD

$$\frac{-61.10'^{k} - 36.63'^{k}}{11.45'} = -8.54'^{k}$$

See Note bottom of page 26

Final Shear @ EC

$$\frac{-58.48'^{k} - 40.82'^{k}}{11.45} = -8.67^{k}$$

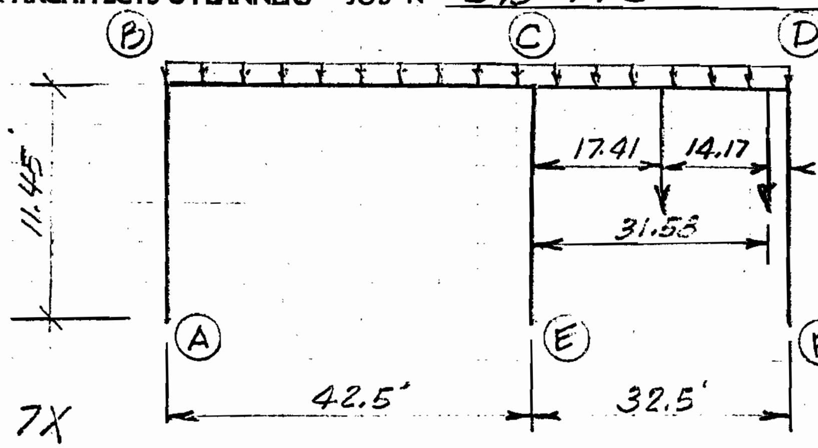
Final Shear @ AB

$$\frac{57.85'^{k} + 139.14'^{k}}{11.45'} = +17.20^{k}$$

$$+17.20^{k} - 8.54^{k} - 8.67^{k} = -.01 \approx 0$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 33 OF ______
ITEM ______ BY LWC DATE 8-21-77
JOB No 575-79C CHKD. BY ______ DATE ______



OVERHEAD GATE DESIGN

(At Florida Ave. West of IHNC)

CONCRETE FRAME

(Moment Distribution)

CASE 7X

See Page 17 (DF) — Pages 24 & 25 (FEM)

JOINT	A	B	B	C	C	C	D	D	F	E
MEMBER	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
DF		0.677	0.321	0.226	0.478	0.296	0.547	0.453		
FEM			-191.16	+191.16		-174.14	+197.57			
BAL		+129.79	+61.36	-3.85	-8.14	-5.04	-108.07	-89.50		
CO	+64.90		-1.93	+30.68		-54.04	-2.52		-44.75	-4.07
BAL		+1.31	+0.62	+5.28	+11.17	+6.91	+1.38	+1.14		
CO	+0.66		+2.64	+0.31		+0.69	+5.59		+0.57	+5.59
BAL		-1.79	-0.85	-0.22	-0.48	-0.30	-3.06	-2.53		
CO	-0.90		-0.11	-0.43		-1.53	-0.15		-1.27	-0.24
BAL		+0.07	+0.04	+0.44	+0.94	+0.58	+0.08	+0.07		
CO	+0.04		+0.22	+0.02		+0.04	+0.27		+0.04	+0.47
BAL		-0.15	-0.07	-0.01	-0.03	-0.02	-0.15	-0.12		
TOTAL	+64.70	+129.23	-129.23	+223.38	+3.46	-226.85	+91.94	-90.94	-45.41	+1.75
Shear	16.94			SIDESWAY =		5.49^k			11.91	0.46

$$\frac{+64.70^{'k}+129.23^{'k}}{11.45'} = +16.94^k \qquad \frac{+3.46^{'k}+1.75^{'k}}{11.45} = +.46^k \qquad \frac{-90.94^{'k}-45.41^{'k}}{11.45'} = -11.91^k$$

$$+16.94^k + .46^k - 11.91^k = +5.49^k$$

Page 27 — Factor

	AB	BA	BC	CB	CE	CD	DC	DF	FD	EC
correction Moments	-68.96	-37.77	+37.77	+31.49	-64.43	+32.96	+32.96	-32.96	-42.14	-82.3
x Corr. Mom.	-13.20	-7.23	+7.23	+6.03	-12.33	+6.31	+6.31	-6.31	-8.06	-15.75
Final Mom's	+51.50	+122.0	-122.0	+229.41	-8.87	-220.54	+97.25	-97.25	-53.47	-14.00
Final Shear	15.15								13.16	2.0
Reaction	24.41								41.61	62.21

Sidesway Correction Factor

$$\frac{5.49^k}{28.69^k} = .19136$$

See Page

See note bottom Page 26

Final Shear @ AB

$$\frac{+51.5^{'k}+122.0^{'k}}{11.45'} = +15.15^k$$

Final Shear @ EC

$$\frac{-14.0^{'k}-8.87^{'k}}{11.45'} = 2.0^k$$

Final Shear @ FD

$$\frac{-97.25^{'k}-53.47^{'k}}{11.45'} = 13.16^k$$

$$+15.15^k - 13.16^k - 2.0^k = -0.01 \approx 0$$

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 34 OF
BY LNC DATE 8-21-77
CHKD. BY DATE

OVERHEAD GATE DESIGN

(At Florida Ave. West of IHNC)

CONCRETE FRAME

(Summary Sheet)

(Moment Distribution)

Load Cases about X-X Axis

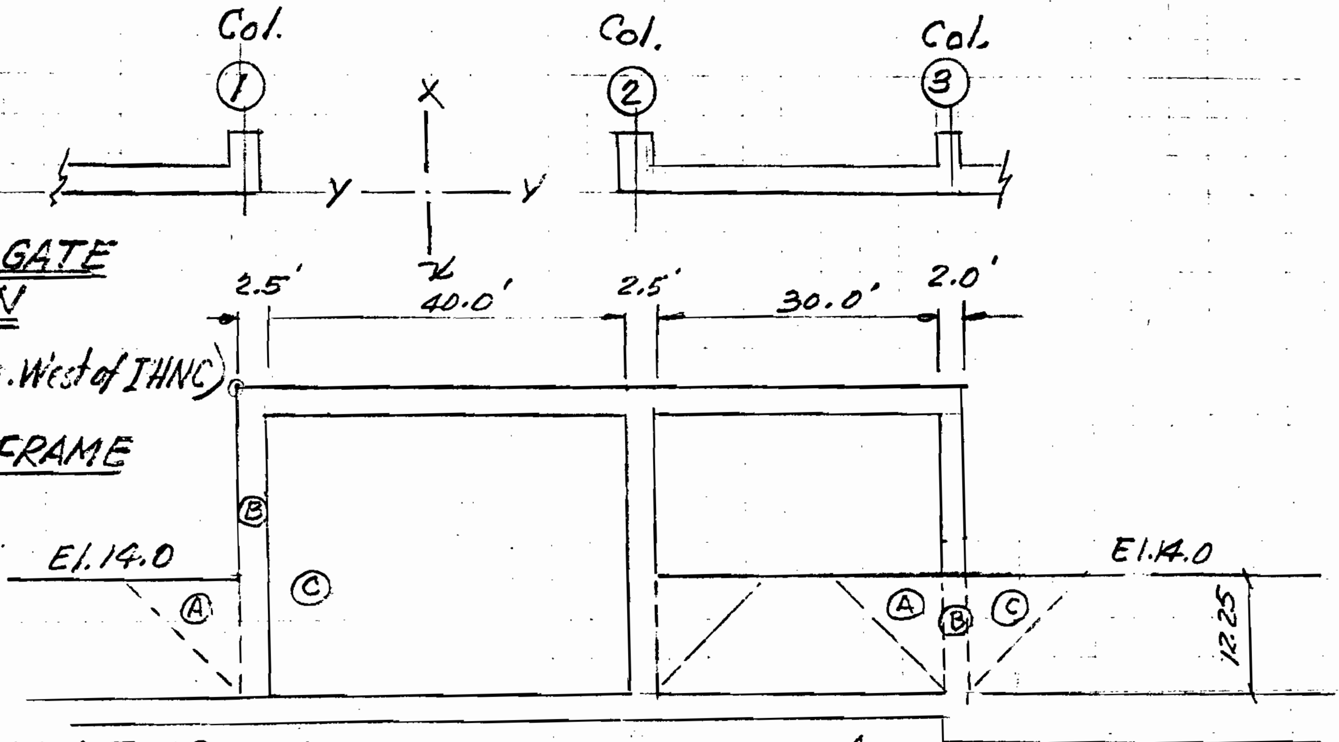
#1 #2 #3 #2 (-) (+)

CASE	M_{AB}	M_{BA}	M_{BC}	M_{CB}	M_{CE}	M_{CD}	M_{DC}	M_{DF}	M_{FD}	M_{EC}	R_A	R_E	R_F	H_A	H_E	H_F
1	46.55	116.22	-116.22	242.17	14.90	-257.07	111.72	-111.72	-61.76	-4.21	24.0	71.52	32.66	14.21	0.93	-15.15
2	99.26	240.84	-240.84	358.64	-159.52	-199.10	46.10	-46.10	-33.96	-100.80	40.70	71.55	15.92	29.70	-22.73	-6.99
3	47.49	115.57	-115.57	242.68	13.78	-256.42	112.55	-112.55	-60.83	-3.43	24.07	71.59	32.59	14.24	0.90	-15.14
4	100.51	240.12	-240.12	359.31	-160.83	-198.47	46.68	-46.68	-32.84	-100.47	40.77	71.55	15.85	29.75	-22.82	-6.94
5	98.32	241.60	-241.60	358.08	-158.23	-199.87	45.17	-45.17	-34.9	-101.57	40.63	71.5	15.66	29.69	-22.69	-6.99
6	57.85	139.14	-139.14	293.76	-58.48	-235.26	61.10	-61.10	-36.63	-40.82	26.09	83.23	18.86	17.20	-8.67	-8.54
7	51.50	122.0	-122.0	229.41	-8.87	-220.54	97.25	-97.25	-53.47	-14.0	24.91	62.21	41.61	15.15	-2.0	-13.16

OVERHEAD GATE DESIGN

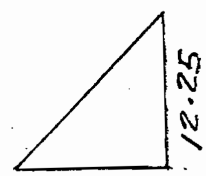
(At Florida Ave. West of IHNC)

CONCRETE FRAME



COLUMN DESIGN

Load about Y-Y Axis



Water loads - Water to Elev. 14.0   0.0625(12.25)

Column 1		Force	Arm	Moment
A = $\frac{1}{3}\left(\frac{1}{2}\times 12.25' \times 0.0625^k\right)(12.25')^2$	=	19.15^k	6.125'	$117.29'^k$
B = $\frac{1}{2}\left(2.5' \times 12.25' \times 0.0625^k\right)(12.25')$	=	11.72^k	4.083'	$47.86'^k$
(Galc) C = $\frac{1}{2}\left(0.0625^k \times 12.25'^2\right)\left(\frac{40}{2}\right)$	=	93.79^k	4.083'	$382.98'^k$
		$\Sigma H_y = 124.66^k$		$\Sigma M_y = 548.13'^k$

Column 2

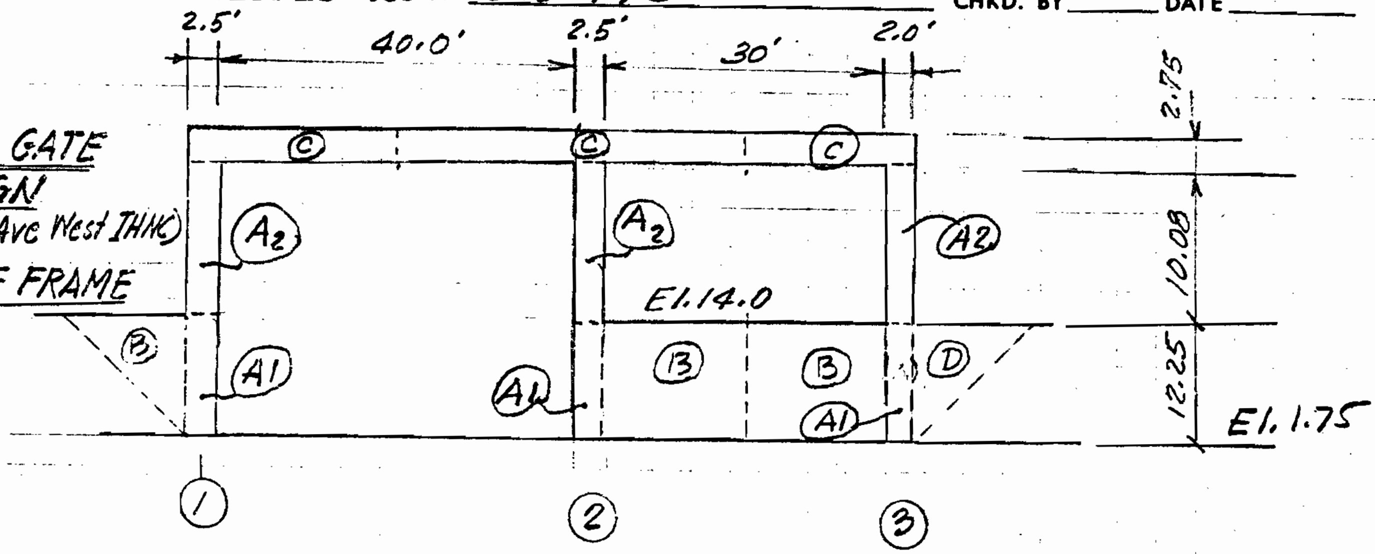
Same as Column 1 $\Sigma H_y = 124.66^k$ $\Sigma M_y = 548.13'^k$

Column 3				
A = $\frac{1}{3}\left(\frac{1}{2}\times 12.25' \times 0.0625^k\right)(12.25)^2$	=	19.15^k	6.125'	$117.29'^k$
B = $\frac{1}{2}\,(2.0')(12.25' \times 0.0625^k)(12.25')$	=	9.38^k	4.083'	$38.30'^k$
C = $\frac{1}{3}\left(\frac{1}{2}\times 12.25' \times 0.0625^k\right)(12.25)^2$	=	19.15^k	6.125	$117.29'^k$
		$\Sigma H_y = 47.68^k$		$\Sigma M_y = 272.88'$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 36 OF ______
ITEM ______ BY LWC DATE 8-22-79
JOB No 575-79E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN
(At Florida Ave West THHC)
CONCRETE FRAME



COLUMN DESIGN

Loads about Y-Y Axis

Wind above Elev. 14.0

Col (2) about El. 14

$1.25^k \times [17.29' - 12.25'] = 6.3'^k$

$5.16^k \times [23.71' - 12.25') = 59.13'^k$

$65.43'^k$

See page 45

	Force	Arm	Moment
Column (1)			
(A2) $(2.5' \times 0.05^k)(10.08) =$	1.25^k	17.29'	$21.61'^k$
(C) $(2.75' \times 0.05^k)(20' + 2.5') =$	3.09^k	23.71'	$73.25'^k$
	$\Sigma H_y = 4.34^k$		$\Sigma M_y = 94.86'^k$
Column (2)			
(A2) $(2.5' \times 0.05^k)(10.08) =$	1.25^k	17.29'	$21.61'^k$
(C) $(2.75' \times 0.05^k)(20' + 2.5 + 15') =$	5.16^k	23.71'	$122.34'^k$
	$\Sigma H_y = 6.41'^k$		$\Sigma M_y: 143.95'^k$
Column (3)			
(A2) $(2.0' \times .05^k)(10.08) =$	1.01^k	17.29'	$17.46'^k$
(C) $(2.75' \times .05)(15' + 2.0') =$	2.34^k	23.71	$55.48'^k$
	$\Sigma H_y = 3.35^k$		$\Sigma M_y = 72.94'^k$

About El. 14.0

$1.01^k \times \overset{5.04}{(17.29' - 12.25')} = 5.09'^k$

$2.34'^k \times \overset{11.46}{(23.71' - 12.25)} = 26.82'^k$

ΣM_y $31.91'^k$

about El. 14.0

COLUMN DESIGN

OVERHEAD GATE DESIGN
(At Florida Ave West of IHNC)
CONCRETE FRAME

Loads about Y-Y Axis

Wind below Elev. 14.0

Column ①	Force	Arm	Moment
(A1) $(2.5 \times .05)(12.25) =$	1.53^k	$6.13'$	$9.38'^k$
(B) $\frac{1}{2}(12.25')^2 \times 0.05^k =$	3.75^k	$8.17'$	$30.64'^k$
	$\Sigma H_y = 5.28^k$		$\Sigma M_y = 40.02'^k$

Column ②	Force	Arm	Moment
(A1) $(2.5 \times .05)(12.25) =$	1.53^k	$6.13'$	$9.38'^k$
Gate (B) $\left(\frac{40.83'}{2} \times 12.25\right)(0.05) =$	12.50^k	$6.13'$	$76.65'^k$
	$\Sigma H_y = 14.03^k$		$\Sigma M_y = 86.03'^k$

Column ③	Force	Arm	Moment
(A1) $(2.0 \times .05)(12.25) =$	1.23^k	$6.13'$	$7.54'^k$
Gate (B) $\left(\frac{40.83'}{2} \times 12.25\right)(0.05) =$	12.50^k	$6.13'$	$76.65'^k$
(D) $\frac{1}{2}(12.25')^2 \times 0.05 =$	3.75^k	$8.17'$	$30.64'^k$
	$\Sigma H_y = 17.48^k$		$\Sigma M_y = 114.83'^k$

OVERHEAD GATE DESIGN
(At Florida Ave. West of IHNC)
CONCRETE FRAME

COLUMN DESIGN
(Bending about Y-Y Axis

Load Cases considered

Case 1Y - Gate opened, no water, no wind.

Case 2Y - Gate closed, water to Elev. 14.0, no wind.

Case 3Y - Gate opened, no water, wind from F.S. (75%)

Case 4Y - Gate closed, water to Elev. 14.0, wind from F.S. (75%)

Case 5Y - Gate opened, no water, wind from P.S. (75%)

Case 6Y - Gate closed, water to Elev. 14.0, wind from P.S. (75%)

Case 1Y No water, no wind

$M_{1Y} = 0.00$

$H_{1Y} = 0.00$

$M_{2Y} = 0.00$

$H_{2Y} = 0.00$

$M_{3Y} = 0.00$

$H_{3Y} = 0.00$

Case 2Y Water, no wind

$M_{1Y} = 548.13'^{k}$

$H_{1Y} = 124.66^{k}$

$M_{2Y} = 548.13'^{k}$

$H_{2Y} = 124.66^{k}$

$M_{3Y} = 272.88'^{k}$

$H_{3Y} = 47.68^{k}$

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

CONCRETE FRAME

COLUMN DESIGN
(Bending about Y-Y Axis)

Case 3Y Gate opened, no water, wind from F.S. (75%)

$M_{1Y} = 0.75\,(94.86'^{k} + 40.02'^{k}) = 0.75\,(134.88'^{k}) = 101.16'^{k}$

$H_{1Y} = 0.75\,(4.34^{k} + 5.28^{k}) = 0.75\,(9.62^{k}) = 7.22^{k}$

$M_{2Y} = 0.75\,(143.95'^{k} + 86.03'^{k}) = 0.75\,(229.98'^{k}) = 172.49'^{k}$

$H_{2Y} = 0.75\,(6.41^{k} + 14.03^{k}) = 0.75\,(20.44^{k}) = 15.33^{k}$

$M_{3Y} = 0.75\,(114.83'^{k} + 72.94'^{k}) = 0.75\,(187.77'^{k}) = 140.83'^{k}$

$H_{3Y} = 0.75\,(3.35^{k} + 17.48^{k}) = 0.75\,(20.83^{k}) = 15.62^{k}$

Case 4Y Gate closed, water to Elev. 14.0, wind from F.S. (75%)

$M_{1Y} = 0.75\,(548.13'^{k} + 94.86'^{k}) = .75\,(642.99'^{k}) = 482.24'^{k}$

$H_{1Y} = 0.75\,(124.66^{k} + 4.34^{k}) = .75\,(129.0^{k}) = 96.75^{k}$

$M_{2Y} = 0.75\,(548.13'^{k} + 143.95'^{k}) = .75\,(692.08'^{k}) = 519.06'^{k}$

$H_{2Y} = 0.75\,(124.66^{k} + 6.41^{k}) = .75\,(131.07^{k}) = 98.30^{k}$

$M_{3Y} = 0.75\,(272.88'^{k} + 72.94'^{k}) = .75\,(345.82'^{k}) = 259.37'^{k}$

$H_{3Y} = 0.75\,(47.68'^{k} + 3.35^{k}) = .75\,(51.03^{k}) = 38.27^{k}$

Case 5Y Gate opened, no water, wind from P.S. (75%)

$M_{1Y} = 0.75\,(-94.86'^{k} - 40.02'^{k}) = .75\,(-134.88'^{k}) = -101.16'^{k}$

$H_{1Y} = 0.75\,(-4.34'^{k} - 5.28^{k}) = .75\,(-9.62^{k}) = -7.21^{k}$

$M_{2Y} = 0.75\,(-143.95'^{k} - 86.03'^{k}) = .75\,(-229.98'^{k}) = -172.49'^{k}$

$H_{2Y} = 0.75\,(-6.41^{k} - 14.03^{k}) = .75\,(-20.44^{k}) = -15.33^{k}$

$M_{3Y} = 0.75\,(-72.94'^{k} - 114.83'^{k}) = .75\,(-187.77) = -140.83'^{k}$

$H_{3Y} = 0.75\,(-3.35'^{k} - 17.48^{k}) = .75\,(-20.83) = -15.62^{k}$

ASSOCIATES, INC.
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JOB ______ SHEET No 40 OF ______
ITEM ______ BY LWC DATE 8-22-78
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

COLUMN DESIGN
Bending about Y-Y Axis

CONCRETE FRAME

Case 6Y Gate closed, water to Elev. 14.0, wind from P.S. (75%)
see Case 3 ~~For page 38~~ 39

$M_{1Y} = 0.75(548.13'^k - 134.88'^k) = 0.75(413.25'^k) = 309.94'^k$

$H_{1Y} = 0.75(124.66^k - 9.62^k) = 0.75(115.04^k) = 86.28^k$

$M_{2Y} = 0.75(548.13'^k - 229.98'^k) = 0.75(318.15'^k) = 238.61'^k$

$H_{2Y} = 0.75(124.66^k - 20.44^k) = 0.75(104.22^k) = 78.17^k$

$M_{3Y} = 0.75(272.88'^k - 187.77'^k) = 0.75(85.11'^k) = 63.83'^k$

$H_{3Y} = 0.75(47.68^k - 20.83^k) = 0.75(26.85) = 20.13^k$

Summary of Resultants (Bending about Y-Y axis

	Load Case	Column No.1		Column No.2		Column No.3	
		M_{1Y}	H_{1Y}	M_{2Y}	H_{2Y}	M_{3Y}	H_{3Y}
	1	0.00	0.00	0.00	0.00	0.00	0.00
100%	2	548.13'k	124.66k	548.13'k	124.66k	272.88'k	47.68k
75%	3	101.16'k	7.22k	172.49'k	15.33k	140.83'k	15.62k
75%	4	482.24'k	96.75k	517.06'k	98.30k	259.37'k	38.27k
75%	5	-101.16'k	-7.21k	-172.49	-15.33k	-140.83'k	-15.62k
75%	6	309.94'k	86.28k	238.61'k	78.17k	63.83'k	20.13k

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC.)
CONCRETE FRAME

COLUMN DESIGN (Cont)

Combined Load Cases (Bending about x-x & y-y axes)

Following Cases are considered:

CASE I - Case 1X (75%) + Case 3Y (75%)

CASE II - Case 1X (75%) + Case 5Y (75%)

100% CASE III - Case 2X + Case 2Y

CASE IV - Case 2X (75%) + Case 4Y (75%)

CASE V - Case 2X (75%) + Case 6Y (75%)

CASE VI - Case 3X (75%) + Case 1Y (75%)

CASE VII - Case 4X (75%) + Case 2Y (75%)

CASE VIII - Case 4X (75%) + Case 6Y (75%)

CASE IX - Case 5X (75%) + Case 2Y (75%)

100% CASE X - Case 6X + Case 1Y

CASE XI - Case 6X (75%) + Case 3Y (75%)

CASE XII - Case 6X (75% + Case 5Y (75%)

100% CASE XIII - Case 7X + Case 1Y

CASE XIV - Case 7X (75%) + Case 3Y (75%)

CASE XV - Case 7X (75% + Case 5Y (75%)

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº 42	OF
	ITEM	BY LWC	DATE 8-22-79
	JOB Nº 575-79-E	CHKD. BY	DATE

COLUMN DESIGN (Cont'd)

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
CONCRETE FRAME

Column Weights

Column #1 & 2 : 20.19 K

Column #3 = 16.15 K

Summary of combine load Cases

	Load Case	Column Nº 1					Column Nº 2					Column Nº 3				
		M_x	M_y	H_x	H_y	R	M_x	M_y	H_x	H_y	R	M_x	M_y	H_x	H_y	R
	I	87.2	101.2	10.6	7.2	18.0	11.2	172.5	0.7	15.3	53.6	-83.8	140.8	-11.4	15.6	-25.5
	II	87.2	101.2	10.6	7.2	18.0	11.2	172.5	0.7	15.3	53.6	-83.8	140.8	-11.4	15.6	-25.5
100%	III	240.8	548.1	29.7	124.7	40.7	-159.5	548.1	-22.7	124.7	71.6	-46.1	272.9	-7.0	47.7	15.9
	IV	180.6	482.2	22.3	96.8	30.5	-119.6	519.1	-17.1	98.3	53.7	-34.6	259.4	-5.2	38.3	11.9
	V	180.6	309.9	22.3	86.3	30.5	-119.6	238.6	-17.1	78.2	53.7	-34.6	63.8	-5.2	20.1	11.9
	VI	86.7	0.0	10.7	0.0	18.1	10.3	0.0	0.70	0.0	53.7	84.2	0.0	11.4	0.0	24.4
	VII	180.1	548.1	22.3	124.7	30.6	-120.6	-548.1	-17.1	124.6	53.7	-35.0	272.9	-5.2	47.7	11.9
	VIII	180.1	309.9	22.3	86.3	30.6	-120.6	238.6	-17.1	78.2	53.7	-35.0	63.8	-5.2	20.1	11.9
	IX	181.2	548.1	22.3	124.7	30.5	-118.2	548.1	-17.0	124.7	18.0	-33.9	272.9	-5.2	47.7	6.0
105%	X	139.1	0.0	17.2	0.0	26.08	58.48	0.0	-8.67	0.0	83.23	-61.1	0.0	-8.54	0.0	18.86
	XI	104.3	101.2	12.9	7.2	18.3	43.9	172.5	-6.5	15.3	62.4	-45.8	140.8	-6.4	15.6	14.1
	XII	104.3	-101.2	12.9	-7.2	18.3	43.9	-172.5	-6.5	-15.3	62.4	-45.8	-140.8	-6.4	-15.6	14.1
150%	XIII	122.0	0.0	15.5	0.0	24.4	-8.9	0.0	-2.0	0.0	41.6	-97.3	0.0	-13.2	0.0	62.2
	XIV	91.5	101.2	11.6	7.2	18.3	-6.7	172.5	-1.5	15.3	31.2	-73.0	140.8	-9.9	15.6	46.7
	XV	91.5	-101.2	11.6	-7.2	18.3	-6.7	-172.5	-1.5	-15.3	31.2	-73.0	-140.8	-9.9	-15.6	46.7

OVERHEAD GATE DESIGN (AT Florida Ave. West of IHNC)
CONCRETE FRAME

COLUMN DESIGN (Cont.)

Columns Nº 1 and Nº 2

(See ACI-SP-3)

Loading - Case VII and IX, Reaction @ Case X (Col 2) Page 42

$N = 83.23^k + 20.19^k = 103.42^k$

$My = 548.1'^k$

$Mx = 181.2'^k$

Page 42 Case 5, M&M EC page 34

$fy = 40{,}000$ psi

$fc' = 3{,}000$ psi

$n = 9$

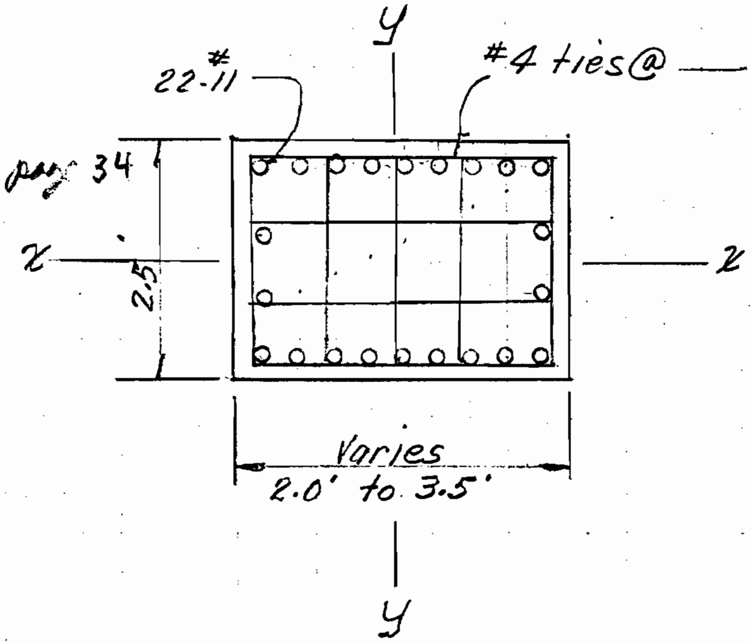
$b = 30"$

$t = 24"$ to $42"$

$gx = .80$

$gy = .86$

$Ag = 30" \times 42" = 1260$ sq. inches



1. Compute $\dfrac{N}{fc'\,Ag} = \dfrac{103.42^k}{3(1260\,\square")} = .0274$

from table 26 (SP-3)

For $gx = 0.80$

$\dfrac{Pb}{fc'\,Ag} = 0.20 > .0274$

For $gx = 0.86$

$\dfrac{Pb}{fc'\,Ag} = 0.20 > .0274$

— Tension Controls

② Try 22 #11 bars

$A_{st} = 22 \times 1.56\square" = 34.22\ in.^2$

$Pg = \dfrac{34.32\ in^2}{1260\ in^2} = .0272$

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)
CONCRETE FRAME

COLUMN DESIGN (Cont)

Properties of reinforcement about Y-Y Axis

$A_{s_1} = 2 \times 9 \times 1.56^{\square''} = 28.08^{\square''}$ $\quad P_{y_1} = \frac{28.08}{1260} = 0.02228$

$A_{s_2} = 2 \times 2 \times 1.56^{\square''} = 6.24^{\square''}$ $\quad P_{y_2} = \frac{6.24}{1260} = 0.00495$

$$P'_y = P_{y_1} + \frac{P_{y_2}}{2} = 0.02228 + 0.002476 = 0.02476$$

Properties of reinforcement about X-X Axis

$P_{y_1} = P_{x_1}$
$P_{y_2} = P_{x_2}$ $\quad \therefore \quad P'_y = P'_x = 0.02476$

(3) Table 34 (ACI-SP3)

$P_g = 0.0272$

$K = \frac{0.00495}{0.0228} = 0.215$

$D'_y = 0.142$

Table 26 (ACI-SP3)

$f_y = 40{,}000$ psi

$f'_c = 3000$ psi

For $g_y = 0.86$

Read $= C'_y = 1.76$

For $g_x = 0.80$, $C'_x = 1.88$

Table (34)
for $g_y = 0.80$

$K = 0.215$

$D'_x = 0.141$

$$M_{x-x} = 103.42^K \left[\frac{0.141\,(30)}{12} \right] + 0.02476 \left[\frac{42\,(30)^2}{1.88} \right]$$

36.45   .3525   497.83 C'_x

$= 534.28^{'K}$

$$M_{y-y} = 103.42^K \left[\frac{0.142\,(42)}{12} \right] + 0.02476 \left[\frac{30\,(42)^2}{1.76} \right]$$

51.40   .497 C_y

$= 795.89^{'K}$

N-Y ASSOCIATES, INC.
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JOB ______ SHEET NO 45 OF ______
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OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)
CONCRETE FRAME

COLUMN DESIGN (Cont.)

$$\frac{M_x}{M_{xx}} + \frac{M_y}{M_{yy}} \leqq 1$$

$$\frac{181.2'^k}{534.28'^k} + \frac{548.1'^k}{795.89'^k} = 1.027 \quad o/k$$

(.3391) (.6887)

Column #1 and 2 @ Elev. 14.0

Col. Wt = 2' x 2.5' x 0.15 x 10.08 = 7.54^k

Loading - Col. 2 M_y (see page 36) - M_x - Case 5a (page 34) Reaction page 34 (MEM: E-C)

R_E Case 6

$N = 83.23^k + 7.56 = 90.76^k$

$M_y = 65.43'^k$ (page 36)

$M_x = 101.57'^k$ (Case 5, MEM.EC, Page 34)

$f_y = 40{,}000$ psi

$f'_c = 3{,}000$ psi

$n = 9$

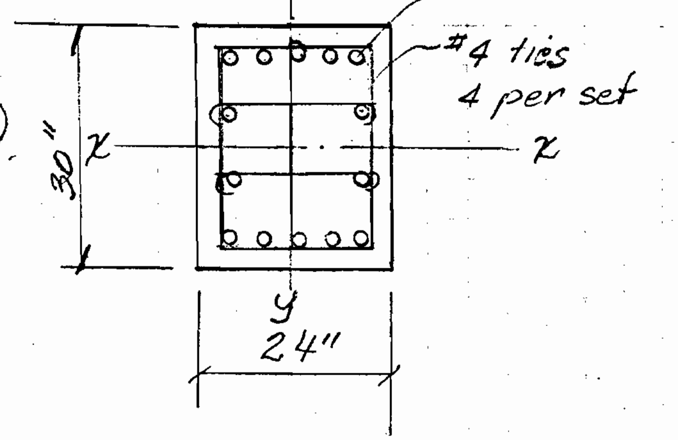
$b = 30''$

$t = 24''$

$g_x = .80$

$g_y = .75$

$A_g = 30'' \times 24'' = 720$ sq. in.



(2) Assume 14-#11 bars

$A_{st.} = 14 \times 1.56^{\square''} = 21.84^{\square''}$

$P_g = \frac{21.84^{\square''}}{720^{\square''}} = 0.03033$

(1) Compute $\frac{N}{f'_c A_g} = \frac{90.76}{3(720)} = .042$

From table 26

For $g_x = 0.80$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.042$

For $g_y = 0.75$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.042$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB
ITEM
JOB No 575-79-E
SHEET No 46 OF
BY LWC DATE 9-27-79
CHKD. BY DATE

COLUMN DESIGN (Cont.) — OVERHEAD GATE DESIGN CONCRETE FRAME (At Florida Ave West of IHNC)

Col.'s #1 and #2 at Elev. 14.0 (Cont)

Properties of Reinforcement about Y-Y Axis

$A_{s1} = 2 \times 5 \times 1.56^{\square''} = 11.56^{\square''}$ $\quad P_{y1} = \frac{11.56 \text{ in}^2}{720 \text{ in}^2} = 0.0161$

$A_{s2} = 2 \times 2 \times 1.56^{\square''} = 6.24^{\square''}$ $\quad P_{y2} = \frac{6.24 \text{ in}^2}{720 \text{ in}^2} = 0.0087$

$$P'_y = P_{y1} + \frac{P_{y2}}{2} = 0.0161 + \frac{0.0087}{2} = 0.02045$$

Properties of reinforcement about x-x Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\quad \therefore P'_y = P'_x = 0.02045$

ⓢ Table 34 (SP-3)

$P_g = 0.03033$

For $g_y = 0.75$

$K = \frac{0.0087}{0.0161} = 0.50$

Read $D'_y = 0.152$

For $g_x = 0.80$ $K = .5$

$D_x = 0.152$

Table 26 (SP-3)

$f_y = 40{,}000$ psi
$f'_c = 3000$ psi

For $g_y = 0.86$

Read $C'_y = 2.0$

$g_x = 0.80$

Read $C'_x = 1.88$

$$M_{x-x} = 90.76^{k}\left[\frac{\overset{D'_x}{0.152}(30)}{12}\right] + 0.02045\left[\frac{24(30)^2}{\underset{C'_x}{1.88}}\right] \quad (34.49)$$

$= 269.45'^{k}$

$$M_{y-y} = 90.76^{k}\left[\frac{0.152(24)}{12}\right] + 0.02045\left[\frac{30(24)^2}{2.00}\right] \quad (27.59)$$

$= 204.28'^{k}$

$$\frac{M_x}{M_{x-x}} + \frac{M_y}{M_{y-y}} \leq 1$$

$$\frac{101.57'^{k}}{269.45'^{k}} + \frac{165.43'^{k}}{204.28'^{k}} = .6972 < 1$$

ok

COLUMN DESIGN (Cont)

OVERHEAD GATE DESIGN
CONCRETE FRAME
(At Florida Ave West of IHNC)

Column 3

Page 34

Load Condition. Case II and Case VII, R@ Case I or III 32.6^k

$N = 32.6^k + 16.15^k = 48.75^k$

$M_x = -83.8'^k$

$M_y = 272.9'^k$

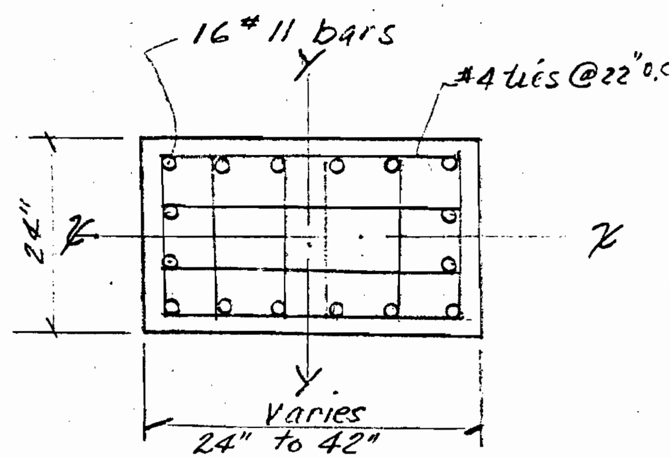
$f_y = 40{,}000$ psi

$f_c' = 3{,}000$ psi

$n = 9$

$b = 24''$

$t = 42''$



$g_x = 0.75$

$g_y = 0.86$

$A_g = 24'' \times 42'' = 1008\ \square''$

① Compute $\dfrac{N}{f_c' A_g} = \dfrac{48.75^k}{3(24 \times 42)} = 0.016$

From table 26 (SP-3)
for $g_x = 0.75$

$\dfrac{P_b}{f_c' A_g} = 0.20 > 0.016$

for $g_y = 0.86$

$\dfrac{P_b}{f_c' A_g} = 0.20 > 0.016$

② Assume 16-#11 bars as shown

$A_{st} = 16 \times 1.56 = 24.96$

$P_g = \dfrac{24.96}{1008} = 0.02476$

COLUMN DESIGN (Cont.) — OVERHEAD GATE DESIGN CONCRETE FRAME (AT Florida Ave West of IHNC)

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 6 \times 1.56\,\square'' = 18.72\,\square''$; $P_{y1} = \dfrac{18.72\,\square''}{1008\,\square''} = 0.01857$

$A_{s2} = 2 \times 2 \times 1.56\,\square'' = 6.24\,\square''$; $P_{y2} = \dfrac{6.24\,\square''}{1008\,\square''} = 0.00619$

$P'_y = P_{y1} + 0.5\,P_{y2}$

$= 0.01857 + 0.003095 = 0.02167$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore P'_y = P'_x = 0.02167$

(3) Table 34 (SP-3)

$P_g = 0.02476$

For $g_y = 0.86$ $\quad K = \dfrac{0.00619}{0.01857} = .3333$

Read $D'_y = 0.149$

For $g_x = 0.75$

Read $D'_x = 0.151$

Table 26 (SP-3)

$f_y = 40{,}000$ psi
$f'_c = 3{,}000$ psi
For $g_y = 0.86$

Read $C'_y = 1.76$

For $g_x = 0.75$

Read $C'_x = 2.00$

$M_{xx} = 48.75^k \left[\dfrac{0.151(24)}{12}\right] + 0.02167 \left[\dfrac{42(24)^2}{2.0}\right]$

$= 276.8'^k$

$M_{yy} = 48.75^k \left[\dfrac{0.149(42)}{12}\right] + 0.02167 \left[\dfrac{24(42)^2}{1.76}\right]$

$= 546.7'^k$

$\dfrac{M_x}{M_{xx}} + \dfrac{M_y}{M_{yy}} \leq 1$

$\dfrac{83.8'^k}{276.8} + \dfrac{272.9'^k}{546.7'^k} =$

$0.3027 + 0.4992 = .8019 < 1$

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC) CONCRETE FRAME

COLUMN DESIGN (Cont)

col wt: $2' \times 2' \times .15^k \times 10.08' = 6.048^k$

Column Design @ El. 14.0 - Column 3

Loading - Col. 3 My (Page 36) Mem FD, Case 1, (Page 34) Reaction Case 1 & 3, Page 3

$N = 32.6 + 6.048 = 38.65^k$

$My = 31.91'^k$ —— (Bott. page 36)

$Mx = 61.76'^k$ —— (MEM FD, Case 1, page 34)

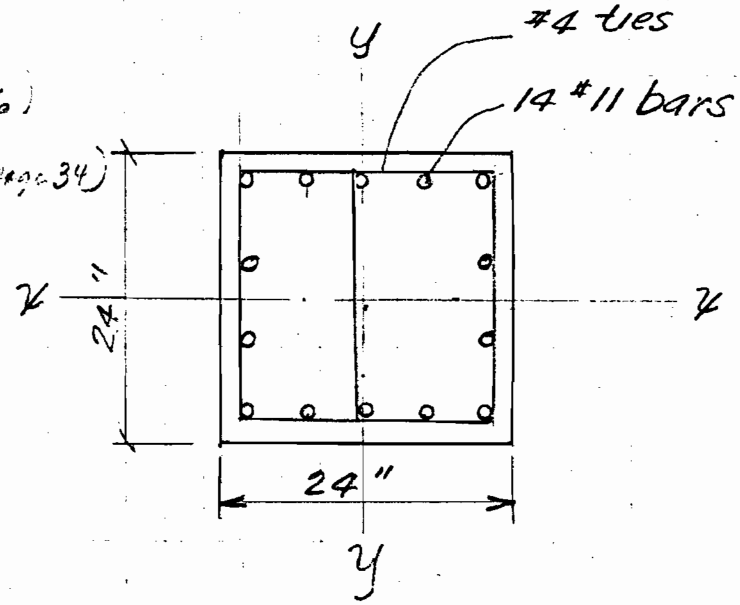
$f_y = 40{,}000$ psi

$f_c' = 3000$ psi

$n = 9$

$b = 24''$

$t = 24''$



$g_x = 0.75$
$g_y = 0.75$ } $\frac{18}{24}$

$A_g = (24'')^2 = 576 \square''$

① Compute $\frac{N}{f_c' A_g} = \frac{38.65^k}{3(576\square'')} = 0.0224$

From table 26 (SP-3)

for $g_x = 0.75$

$\frac{P_b}{f_c' A_g} = 0.20 > .0224$

for $g_y = 0.75$

$\frac{P_b}{f_c' A_g} = 0.20 > .0224$

② Assume 14 #11 bars as shown

$A_s = 14 \times 1.56 = 21.84$

$P_g = \frac{21.84\square''}{576\square''} = .0379$

N-Y ASSOCIATES, INC.
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ARCHITECTS & PLANNERS

JOB ______ SHEET No 50 OF ______
ITEM ______ BY LWC DATE 8-28-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave
CONCRETE FRAME West of IHNC)

COLUMN DESIGN

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 5 \times 1.56 = 15.60^{\square''}$; $P_{y1} = \dfrac{15.60^{\square''}}{576^{\square''}} = 0.0271$

$A_{s2} = 2 \times 2 \times 1.56 = 6.24^{\square''}$; $P_{y2} = \dfrac{6.24}{576^{\square''}} = 0.0108$

$$P'y = Py_1 + 0.5 Py_2$$

$$= 0.0271 + 0.0054 = 0.0325$$

Properties of reinforcement about X-X Axis

$Py_1 = Px_1$
$Py_2 = Px_2$ $\therefore P'y = P'x = 0.0106$

(3) Table 34 (SP-3)

$Pg = .0379$

For $gy = 0.75$
Read $D'y = 0.161$

For $gx = 0.75$
Read $D,x = 0.161$

Table 26 (SP-3)

For $gy = 0.75$
Read $C'y = 2.0$

For $gx = 0.75$
Read $C'x = 2.0$

$K = \dfrac{0.0108}{0.0271} = .40$

$$Mx\text{-}x = 38.65\left[\frac{0.161(24)}{12}\right] + 0.0325\left[\frac{24(24)^2}{2.0}\right]$$

$$= 237.08^{'K}$$

$$My\text{-}y = 38.65\left[\frac{0.161(24)}{12}\right] + 0.0325\left[\frac{24(24)^2}{2.0}\right]$$

$$= 237.08^{'K}$$

$$\frac{31.91}{237.08} + \frac{61.76^{'K}}{237.08} = 0.394 < 1$$

COLUMN DESIGN (Cont.) OVERHEAD GATE DESIGN (At Florida Ave West of IHNC) CONCRETE FRAME

Column #1 and #2

Check shear

$V = 124.7^k$ (Hy Case III)

$v = \dfrac{124.7^k}{27.5'' \times 42''} = 0.107$ KSI

allowable $v = 1.1\sqrt{f'_c} = 1.1\sqrt{3000}^k = 0.060^{KSI}$

$v' = 0.107^{KSI} - 0.060 = 47$ psi

$L = 10.08' + 12.25' = 22.33'$

$a = \dfrac{L}{2}\left(\dfrac{v'}{v}\right)$ $a = \dfrac{22.33'}{2}\left(\dfrac{47}{107}\right) = 4.9'$ from supports

$s = \dfrac{A_v f_v}{v' b} = \dfrac{5 \times .20^{\#''} \times 16^k}{47^{PSI} \times 30} = 11.34''$

use stirrups #4 @ 11" o.c.

Column #3

Check Shear

$V = 47.7^k$ (Hy Case III VII)

$v = \dfrac{47.7^k}{21.5 \times 42} = 0.052^{KSI} < 0.060\ v_a$

COLUMN DESIGN

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)
CONCRETE FRAME

Col. 1 and 2

#11 - Perimeter = 4.43"
j = .875
d = 21.5

$$U = \frac{V}{\Sigma_0 j d} = \frac{124.7^k}{(22 \times 4.43'')(.875)(21.5)}$$

$$= 0.068 < 0.132$$

allowable bond stresses

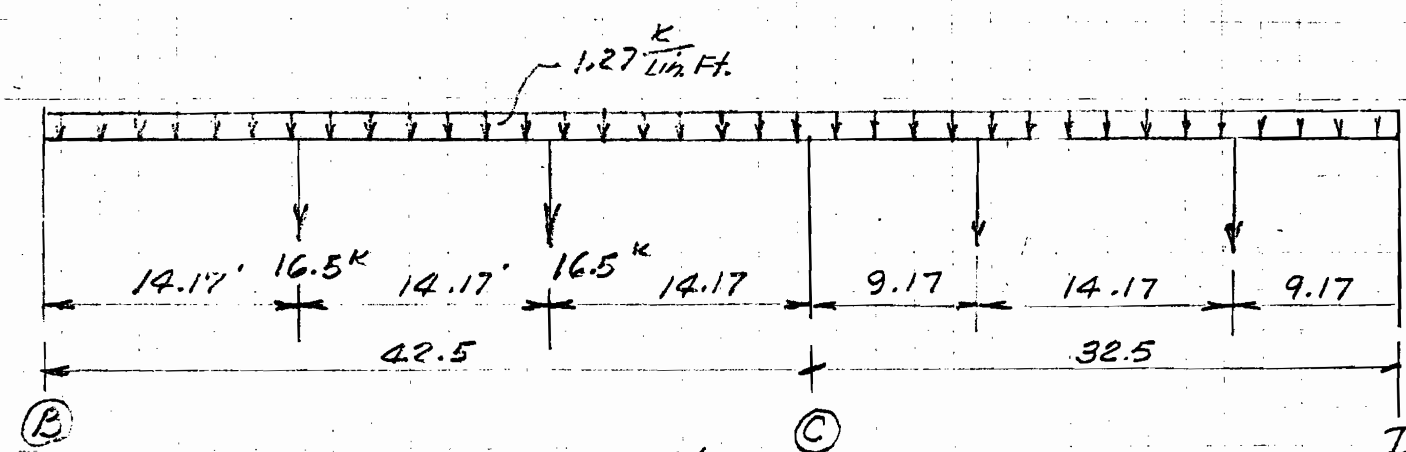
#11 = 132 psi
Table 14a (SP-3)

Col. 3

$$U = \frac{47.7^k}{(22 \times 4.43'')(.875)(21.5)} = .042 < 0.132$$

CONCRETE BEAM DESIGN

OVERHEAD GATE DESIGN
(At Florida Ave. West of IHNC)
CONCRETE FRAME



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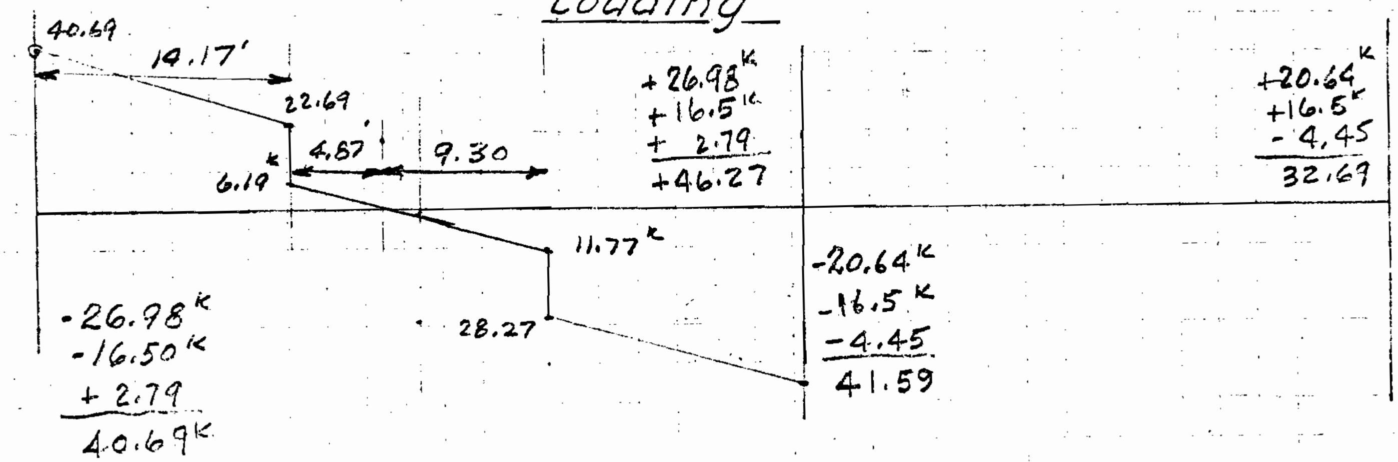


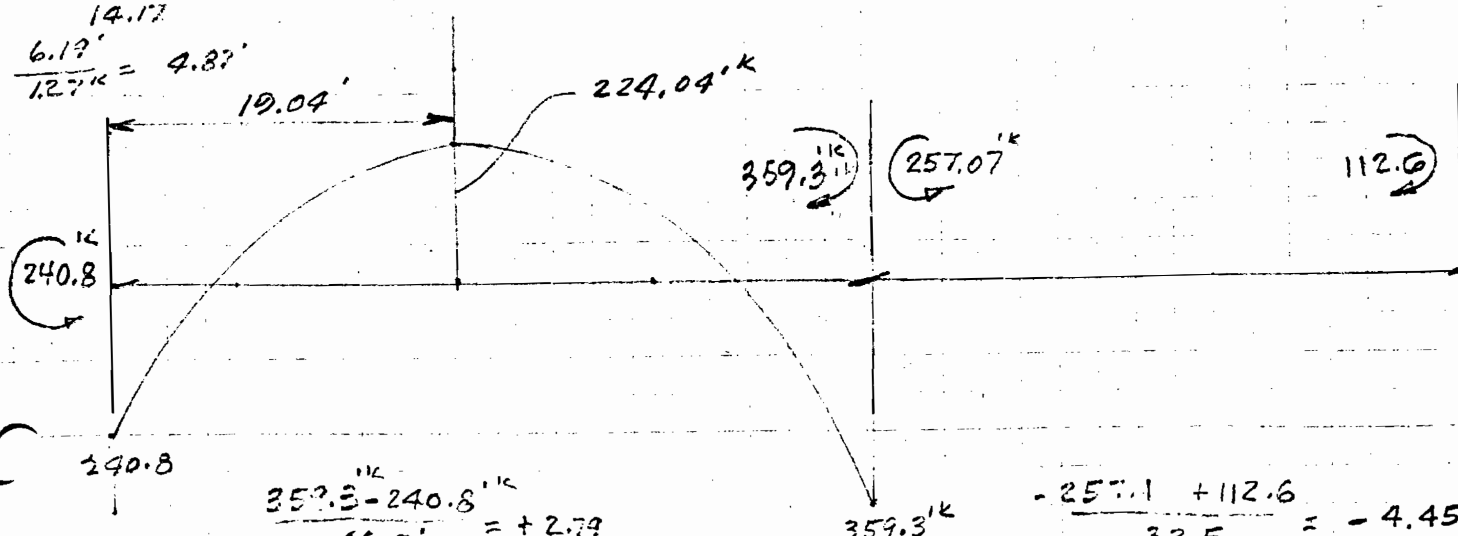
$40.69 - (14.17 \times 1.27) = 22.69^k - 16.5^k = 6.19^k$

$46.27 - (14.17 \times 1.27) = 28.27^k - 16.5^k = 11.77^k$

$\frac{6.19 + 11.77}{14.17} = 1.27$

14.17' + 4.87' = 19.04' from B = point zero shear

$\frac{6.19'}{1.27^k} = 4.87'$



$\frac{359.3'^k - 240.8'^k}{42.5'} = +2.79$

$\frac{-257.1 + 112.6}{32.5} = -4.45$

$M^+ = \left[(14.17')(22.69^k)\right] + \left[\frac{(40.69^k - 22.69^k)\,14.17}{2}\right] + \left[\frac{(6.19^k \times 4.87)}{2}\right] - 240.8'^k = 224.04'^k$

CONCRETE BEAM (Cont.) OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)
CONCRETE FRAME

$M = 224.04'^k$

Postive Reinforcement

$F = \frac{224.04'^k}{152} = 1.47$

Table 1

$d = \sqrt{\frac{1.47 \times 12000}{24}} = 27.11 < 30''$ ok

Reduce to face Col.

$224.04'^k - \frac{46.27(2.5')}{6} = 204.8'^k$

$d = 30''$

$A_s = \frac{M}{ad} = \frac{204.8}{(1.44)(29.5)} = 4.67^{\square''}$ Use 6 #9 bar = 6 □"

Negative Reinforcement

$M = 359.3'^k$

Moment @ Face Column (C)

$M = 359.3 - (46.27^k \times 1.25)$

$M = 301.5'^k$

$F = \frac{301.5}{152} = 1.98$

$d = \sqrt{\frac{1.98 \times 12000}{24}} = 31.5 > 30''$ ok with compression steel

$A_s = \frac{301.5'^k}{1.44 \times 30} = 6.98^{\square''}$ Add to torsional reinforcement

Stirrups

Shear @ "d" from support $V = 46.27 - \left[\left(1.27 \times 2.5'\right) + \left(\frac{16.5}{14.17} \times 2.5\right)\right]$

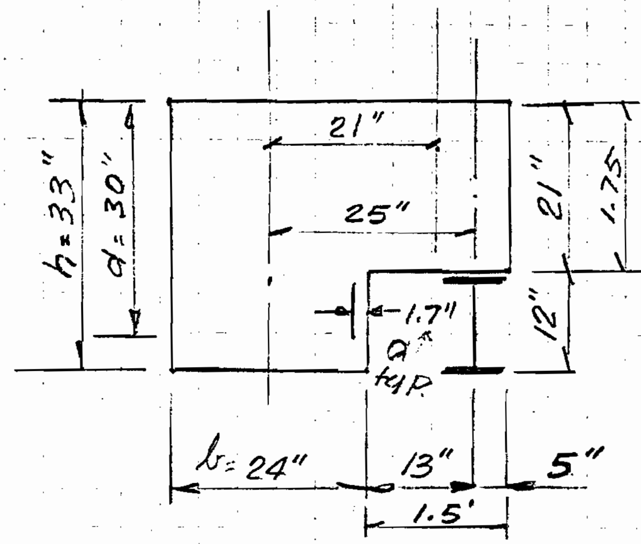
$V = 40.2'^k$

$v = \frac{40.2^k \times 1000}{24 \times 30} = 55.83$ psi No stirrup required but required for torsion.

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
CONCRETE FRAME

CONCRETE BEAM (Cont)

Torison



	Force	Arm	Moment
(Conc.)	$1.75' \times 1.5' \times 0.15^k$	21"	$8.27\ ^{"k}/_{Ft}$
(Steel)	0.05^k	25"	$1.25\ ^{"k}/_{Ft}$
			$9.52\ ^{"k}/_{Ft}$

$$\left(9.52\,^{"k}/_{Ft} \times \frac{42.5}{2}\right) + \left(\underset{412.5}{16.5^k \times 25"}\right) = 614.8"^k = M_t$$

The bending moment @ Face of Support

$$M_f = 359.3'^k - 57.84'^k = 301.5'^k$$

$$C_1 = \frac{\left(h + \frac{b}{2}\right)}{(b - 2a_1)\left(1 + \frac{\frac{d}{2}}{h - 2a_2}\right)}$$

$$C_2 = \frac{M_t}{M_f} = \frac{614.8"^k}{302.5'^k \times 12} = 0.1694$$

$$= \frac{\left(33 + \frac{24}{2}\right)}{(24 - 2\times1.7)\left(1 + \frac{15}{33 - 2\times1.7}\right)}$$

$$1 + C_1C_2 = 1 + (1.45 \times 0.1694)$$
$$= 1.246$$

$$= \frac{45}{(20.6)(1.507)}$$

$$= 1.45$$

CONCRETE BEAM (Cont.)

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
CONCRETE FRAME

Torison

Design Moment $M = (\text{Applied bending Mom.})(1+C_1C_2)$

$= 301.5'^k \times 1.246$

$= 375.67'^k$

Stirrups Req'd

$X_1 = 24'' - (2 \times 1.7'') = 20.6''$

$Y_1 = 33 - (2 \times 1.7'') = 29.6$

$$S = \frac{1.6 f_s a_s X_1 Y_1}{M}$$

$$S = \frac{1.6(20^k)(20.6)(29.6) A_s}{376.92'^k \times 12}$$

$= 4.31 A_s$

Use #4@6 up to 3' from end

Longit Reinforcing.

$$A_t = \frac{(2) A_s (X_1 + Y_1)}{S}$$

$$= \frac{(2 \times 0.2^{\square''})(20.6'' + 29.6'')}{5}$$

$= 4.02^{\square''}$ $7\#7 = 4.2^{\square''}$

Total Negative Reinforcing

$4.02^{\square''} + 6.98^{\square''} = 11^{\square''}$

Use 8 #11 bars $= 12.48^{\square''}$

CONCRETE BEAM (Cont.)

OVERHEAD GATE DESIGN (At Florida Ave
CONCRETE FRAME (West of IHNC)

Postive Reinforcement

Check Bond 6 #11 bars V = 46.27 (page 53)

$$U = \frac{V}{\Sigma_o jd} = \frac{46.27^k}{(6 \times 4.43)(0.875)(31)} = 0.064 \text{ ksi}$$

Allow U = $0.187^{ksi} > 0.064$

Negitive Reinforcement

Check Bond

8 #11 Bars

$$\frac{46.27^k}{(8 \times 4.43)(0.875)(30)} = 0.049$$

Allowable U = $0.356 > 0.049$

N-Y ASSOCIATES, INC.
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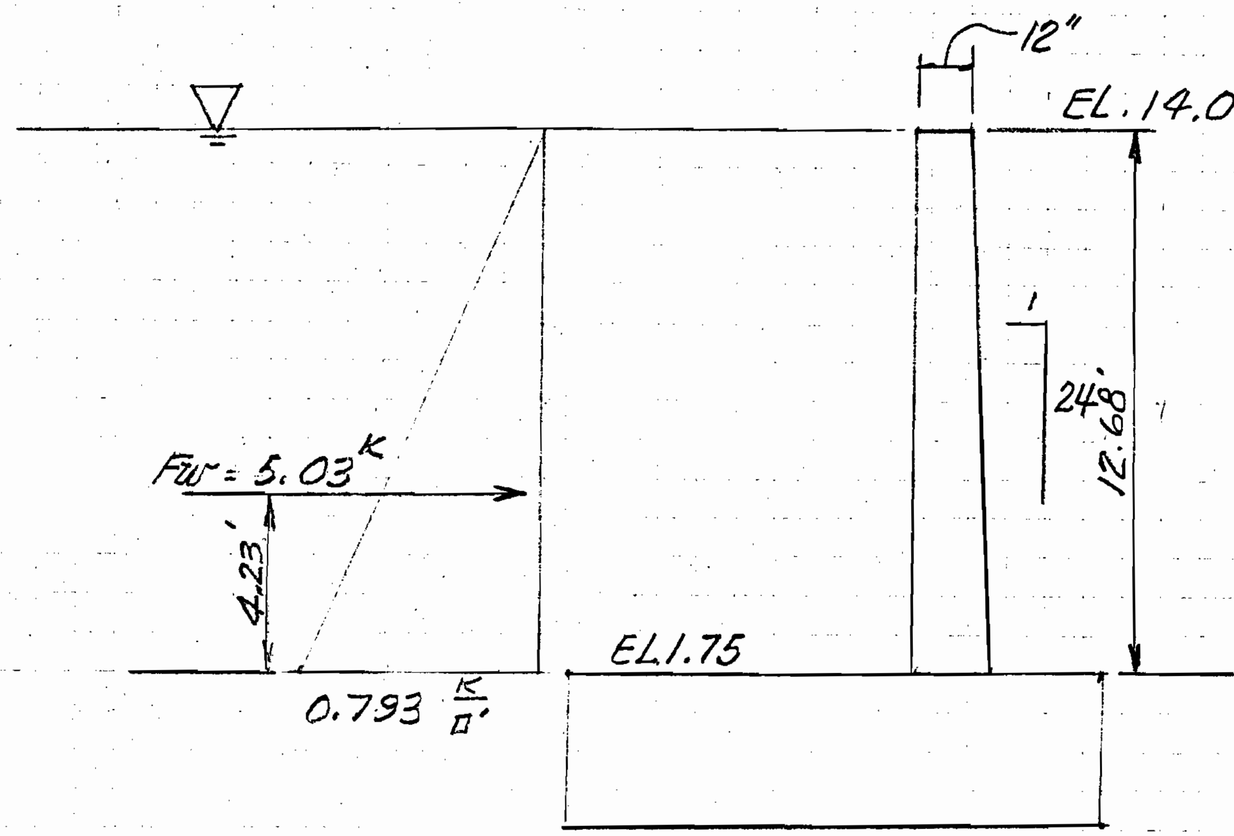
JOB ______ SHEET No 58 OF ____
ITEM ______ BY LWC DATE 9-25-79
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE (At Florida Ave West of IHNC)

T-Wall design @ Gate Monolith



Horizontal Force on wall

Water: $F_w = (0.5)(12.68')(0.793^{k/\square'}) = 5.03^k$

Moment on Wall

Water: $M_w = (5.03^k)(4.23') = 21.28'^k$

Reinforcement required

$d = 12" + \frac{12.68 \times 12}{24} - 2.5 = 15.84"$

$A_s = \frac{M}{ad} = \frac{21.28'^k}{1.44 \times 15.84"} = 0.93 \square"$

Use #9@12 Floodside : #5@12 protected side

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET № 59 OF
	ITEM	BY LWC DATE 9-25-79
	JOB № 575-79-E	CHKD. BY DATE

OVERHEAD GATE (At Florida Ave West of IHNC)

(T-Wall Design @ Gate Monolith)

Shear = F_{iv} = 5.03^k

$$\frac{5030^{\#}}{15.84'' \times 12''} = 26.5 \text{ psi} < 60 \text{ psi allowed}$$

Bond: $U = \dfrac{5030}{(3.544)(0.875)(15.84)}$ Perimeter #9 = 3.544"

= 102.4 psi < 165 allowable

Temperature Steel (Horizontal)

$A_s = (0.0020)(12'')(18.34) = 0.44 \;\square''$; $0.218 \;\square''$ E.F

Min. A_s = 0.0025 (12)(15.84) = 0.475

Use #6@12 e.f. Horizontal

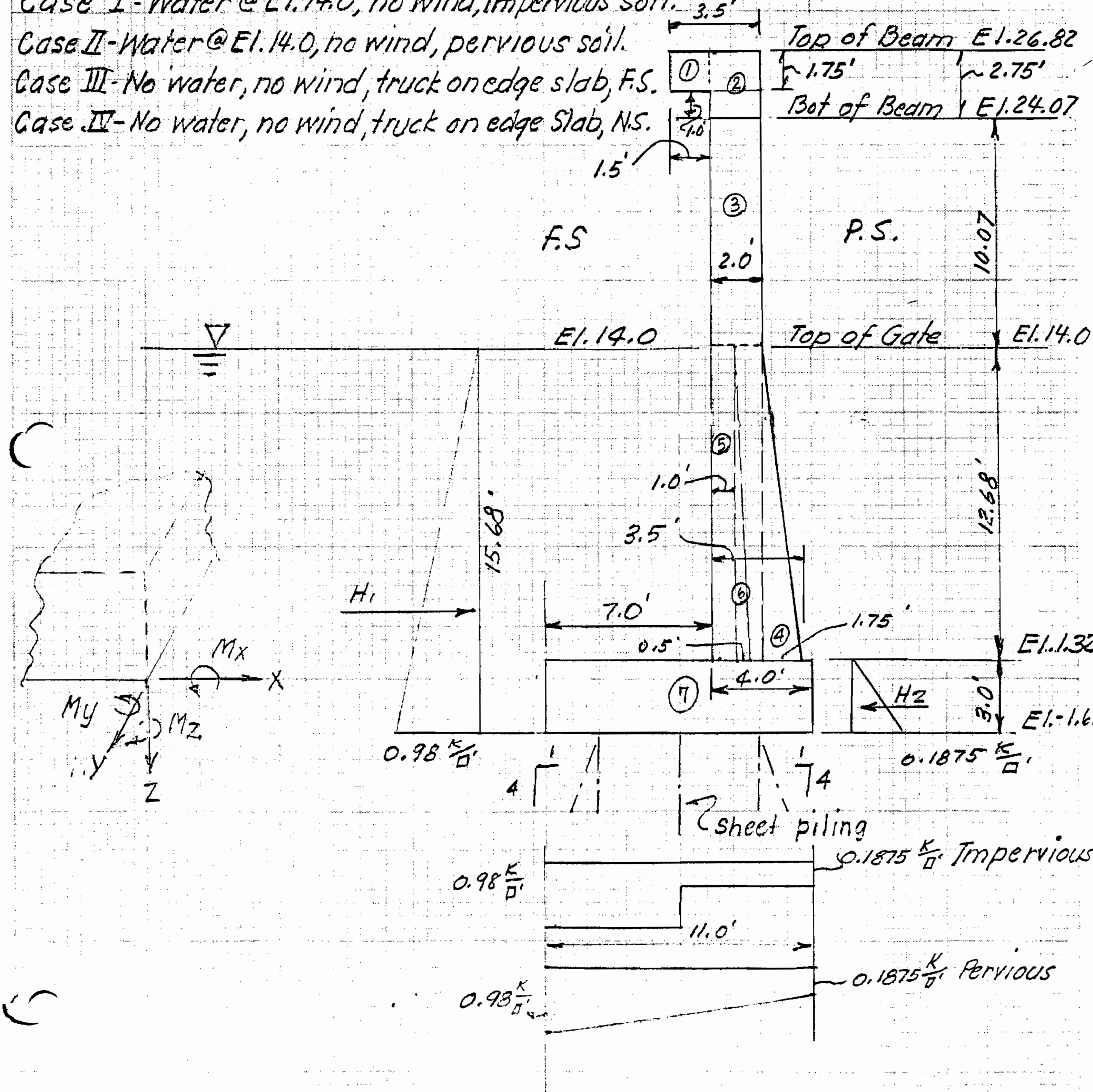
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 60 OF ______
ITEM ______ BY LWC DATE Nov. 1-1979
JOB Nº 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

Pile Loads

Case I - Water @ El. 14.0, no wind, impervious soil.
Case II - Water @ El. 14.0, no wind, pervious soil.
Case III - No water, no wind, truck on edge slab, F.S.
Case IV - No water, no wind, truck on edge slab, N.S.



OVERHEAD GATE DESIGN (At Florida Ave - West of IHNC)

Pile Loads

MOMENTS ABOUT X-X AXIS

ITEM	COMPUTATION	F_Z K	F_y K	ARM Ft	M_{X-X} ft.K
Gate Wt	(Including Misc.)	32.0		-5.92	-189
Conc. Bm. ①	(1.75')(1.5')(77.0')(0.15)	30.3		-6.25	-189
Conc. Bm ②	(2.75')(2.0')(77.0)(0.15)	63.5		-8.0	-508
Conc. Col. ③	(2)(2.5)(22.75)(0.15)(2)	34.1		-8.0	-273
Conc. Col ③	(2)(2)(22.75)(0.15)(1)	13.7		-8.0	-110
T-Wall ⑤	(1)(12.68)(30)(0.15)	57.1		-7.5	-428
T-Wall ⑥	(0.5)(0.5)(12.68)(30)(0.15)	14.3		-8.17	-117
Conc Col ④	(½)(1.75)(2.5)(12.68)(0.15)(2)	8.4		-9.58	-80
Conc. Col. ④	(½)(1.75)(2.0)(12.68)(0.15)	3.3		-9.58	-32
T-wall ⑤	(1)(12.68)(10)(0.15)	19.0		-7.5	-143
T-Wall ⑥	(0.5)(0.5)(12.68)(10)(0.15)	4.6		-8.17	-39
Conc. Slab ⑦	(11)(87)(3)(0.15)	430.7		-5.5	-2369
	SUB-TOTAL	711.2			-4477
Imp. Uplift	$-(15.68)(87)(5.5)(0.0625)$	-468.9		-2.75	1289
" "	$-(3.0)(87)(5.5)(0.0625)$	-89.7		-8.25	740
Water Wt	(12.68)(87)(7)(0.0625)	482.6		-3.5	-1689
H_2O Force $\overrightarrow{H_1}$	$-\frac{1}{2}(15.68)^2(87)(0.0625)$		-668.4	5.23	-3496
H_2O Force $\overleftarrow{H_2}$	$\frac{1}{2}(3)^2(87)(0.0625)$		24.5	1.0	25
CASE I TOTALS (100%)		635.2	-643.9		-7608
Perv. Uplift	$-(0.1875)(87)(11)$	-179.4		-5.5	987
	$-\frac{1}{2}(0.7925)(11)(87)$	-379.2		-3.67	1392
Water Wt.	(12.68)(87)(7)(0.0625)	482.6		-3.5	-1689
H_2O Force $\overrightarrow{H_1}$	$-\frac{1}{2}(15.68)^2(87)(0.0625)$		-668.4	5.23	-3496
H_2O Force H_2	$\frac{1}{2}(3)^2(87)(0.0625)$		24.5	1.0	25
CASE II TOTALS (100%)		635.2	-643.9		-7258

OVERHEAD GATE DESIGN (At Florida Ave - West of IHNC)

Pile Loads

MOMENTS ABOUT X-X AXIS (Cont.)

ITEM	COMPUTATION	F_z K	F_y K	Arm ft	$M_{x\text{-}x}$ ft.K
Truck	(2 Trucks) H-20-S16-44	64.0		–	–
Uplift	-0.1875 (11)(87)	-179.4		-5.5	986.7
CASE III TOTALS		595.8	—		-3490
Truck	(2 Trucks) H-20-S16-44	64.0		-11.0	-704
Uplift	-0.1875 (11)(87)	-179.4		-5.5	986.7
CASE IV TOTALS		595.8			-4194

MOMENTS ABOUT Y-Y AXIS

ITEM	COMPUTATION	F_z K	F_x K	Arm ft	$M_{y\text{-}y}$ ft.K
Conc. Slab ⑦	(11)(87)(3)(0.15)	430.7		-43.5	-18,735
Conc. Col. ③	(2)(2.5)(22.75)(0.15)	17.1		-9.25	-158
Conc. Col. ③	(2)(2.5)(22.75)(0.15)	17.1		-51.75	-885
Conc. Col. ③	(2)(2)(22.75)(0.15)	13.7		-84.0	-1151
Conc. Col. ④	½ (1.75)(2.5)(12.68)(0.15)	4.1		-9.25	-38
Conc. Col. ④	½ (1.75)(2.5)(12.68)(0.15)	4.1		-51.75	-212
Conc. Col. ④	½ (1.75)(2.0)(12.68)(0.15)	3.3		-84.0	-277
T-wall ⑤	(1)(12.68)(2)(0.15)	3.8		-86.0	-327
T-wall ⑥	(0.5)(0.5)(12.68)(2)(0.15)	1.0		-86.0	-86
T-wall ⑤	(1)(12.68)(30)(0.15)	57.1		-68.0	-3883
T-wall ⑥	(0.5)(0.5)(12.68)(30)(0.15)	14.3		-68.0	-972
T-wall ⑤	(1)(12.68)(8)(0.15)	15.2		-4.0	-61
T-wall ⑥	(0.5)(0.5)(12.68)(8)(0.15)	3.8		-4.0	-15
SUBTOTAL (100%)		585.3			-26,800

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB ______ SHEET No 63 OF ______
ITEM ______ BY LWC DATE 11-2-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave - West of IHNC)

Pile loads

MOMENTS ABOUT Y-Y AXIS (Cont.)

Case 2K page 28

ITEM	COMPUTATION	F_z K	F_x K	Arm ft	My-y ft.K
Gate-Bm Wt. Reactions	See Moment Dist Case 2K				
(A)	40.7 + 4.1	44.8		-9.25	-414
(E)	71.55	71.55		-51.75	-3703
(F)	15.92 + 3.3	19.22		-84	-1615
Water Wt	(12.68)(7)(87)(0.0625)	482.1		-43.5	-20,971
Impervious Uplift	-(15.68)(87)(5.5)(0.0625)	-468.9		-43.5	-20,397
	-(3.0)(87)(5.5)(0.0625)	-89.7		-43.5	3,902
CASE I TOTAL (100%)		644.57			-29,204
Gate-Bm. Wt. Reaction	See Moment Dist Case 2K				
(A)	40.7 + 4.1	44.8		-9.25	-414
(E)	71.55	71.55		-51.75	-3703
(F)	15.92 + 3.3	19.22		-84	-1615
Water Wt	(12.68)(7)(87)(0.0625)	482.1		-43.5	-20,971
Pervious Uplift	-0.1875 (11)(87)	-179.4		-43.5	7804
	-0.7925 (11)(87)(0.5)	-379.2		-43.5	16495
CASE II TOTAL (100%)		644.4			-29,204
Gate-Bm. Wt. Reaction	See Moment Dist Case 1K	585.3			
(A)	24.0 + 4.1	28.1		-9.25	-260
(E)	71.52	71.52		-51.75	-3701
(F)	32.66 + 3.3	36.0		-84	-3024
Truck Wt	2 trucks H20-516-44	64.0		-30.5	-1952
CASES III & IV TOTAL (100%)		784.72			35,737

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 64 OF
BY LWC DATE 11-2-79
CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

Pile Loads

MOMENTS ABOUT Z-Z AXIS

ITEM	COMPUTATION	F_Y K	F_X K	ARM Ft	$M_{Z\text{-}Z}$ FT K
Water on Wall, Gate	$\frac{1}{2}(15.68)^2(0.0625)(87)$	-668.4		43.5	-29075
Cols & Slab	$\frac{1}{2}(3)^2(0.0625)(87)$	24.5		43.5	1066
CASES I & II TOTAL (100%)		-643.9			-28,009
CASES III & IV TOTAL (100%)		0.0			0.0

OVERHEAD GATE DESIGN (AT Florida Ave. West of IHNC)

LOAD TABULATION

Load No	ITEM	Fx K	Fy K	Fz K	Mx 1-K	My 1K	Mz 1K
1	Concrete plus Gate	0	0	711.2	-4,477	-32,532	0
2	Water Vert.	0	0	482.6	-1,689	-20,971	0
3	Water Horiz.	0	-643.9	0	-3,367	0	-28,010
4	Uplift-Imperv.	0	0	-558.6	2,029	24,299	0
5	Uplift-Perv.	0	0	-558.6	2,379	24,299	0
6	Truck - Case III	0	0	64	0	-1952	0
7	Truck - Case IV	0	0	64	-704	-1952	0

LOAD SUMMATION

CASE	ITEM	Fx K	Fy K	Fz K	Mx 1-K	My 1-K	Mz 1-K
I	1+2+3+4	0	-643.9	635.2	-7,504	-29,204	-28,010
II	1+2+3+5	0	-643.9	635.2	-7,504	-29,204	-28,010
III	1+6	0	0	775.2	-4,477	-34,484	0
IV	1+7	0	0	775.2	-5,185	-34,484	0

11/28/79 15.10

0 FLORIDA AVE WEST 575-79
J FLA AVE GATE
30 2,4
4? ?,0.0,64
?,12,12
60 1,5
70 -1,8.33
30 0,0,0
100 2,90,10
110 1.5,10.5,19.5,28.5,37.5,46.5,55.5,65.67,76.67,85.5
140 10*-1.5
170 10*0.0
200 2,270,24
210 1.5,7.5,12.5,21.0,30.0,39.0,48.0,51.75,55.5,65.67,76.67,85.5,1.5,7.5,
220 12.5,21.0,30.0,39.0,48.0,51.75,55.5,65.67,76.67,85.5
240 12*-6.5,12*-9.5
270 24*0.0
000 0,-643.9,635.2,-7504,-29204,-28010
020 0,-643.9,635.2,-7154,-29204,-28010
030 0,0,775.2,-4477,-34484,0
040 0,0,775.2,-5185,-34484,0

EADY

CLEAR
FT CLEARED

JN RK29010A

11/28/79 15.127

PROG. NO. 713-F3-A2-210 15:09:29 11/28/79 MOD 6A, JUN 78

FLORIDA AVE WEST 575-79
FLA AVE GATE

JTAL NUMBER OF PILES = 34

2 67

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-643.9	635.2	-7504.0	-29204.0	-28010.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z	
1	-0.1	-0.0	-39.6	
2	-0.1	-0.0	-38.8	
3	-0.1	-0.0	-38.1	
4	-0.1	-0.0	-37.3	A
5	-0.1	-0.0	-36.5	
6	-0.1	-0.0	-35.8	
7	-0.1	-0.0	-35.0	
8	-0.1	-0.0	-34.2	
9	-0.1	-0.0	-33.3	
10	-0.1	-0.0	-32.5	
11	0.1	-0.0	26.5	
12	0.1	-0.0	27.7	
13	0.1	-0.0	28.7	
14	0.1	-0.0	30.4	
15	0.1	-0.0	32.3	
16	0.1	-0.0	34.1	B
17	0.1	-0.0	35.9	
18	0.1	-0.0	36.6	
19	0.1	-0.0	37.4	
20	0.1	-0.0	39.4	
21	0.1	-0.0	41.7	
22	0.1	-0.0	43.4	
23	0.1	-0.0	46.8	
24	0.1	-0.0	48.0	
25	0.1	-0.0	49.0	
26	0.1	-0.0	50.7	
27	0.1	-0.0	52.5	
28	0.1	-0.0	54.4	C
29	0.1	-0.0	56.2	
30	0.1	-0.0	56.9	
31	0.1	-0.0	57.7	
32	0.1	-0.0	59.7	
33	0.1	-0.0	61.9	
34	0.1	-0.0	63.7	

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-643.9	635.2	-7504.0	-29204.0	-28010.0

(3) 68

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-643.9	635.2	-7154.0	-29204.0	-28010.0

PILE LOADS (PILE AXIS)

[illegible]E NO.	X	Y	Z	
1	-0.3	-0.0	-38.8	
2	-0.3	-0.0	-38.0	
3	-0.3	-0.0	-37.3	
4	-0.3	-0.0	-36.5	A
5	-0.3	-0.0	-35.8	
6	-0.3	-0.0	-35.0	
7	-0.3	-0.0	-34.3	
8	-0.3	-0.0	-33.5	
9	-0.3	-0.0	-32.5	
10	-0.4	-0.0	-31.8	
11	0.3	-0.0	35.6	
12	0.3	-0.0	36.8	
13	0.3	-0.0	37.8	
14	0.3	-0.0	39.5	
15	0.3	-0.0	41.3	
16	0.3	-0.0	43.1	
17	0.3	-0.0	44.9	B
18	0.3	-0.0	45.7	
19	0.3	-0.0	46.4	
20	0.3	-0.0	48.5	
21	0.3	-0.0	50.7	
22	0.3	-0.0	52.5	
23	0.3	-0.0	37.2	
24	0.3	-0.0	38.4	
25	0.3	-0.0	39.5	
26	0.3	-0.0	41.2	
27	0.3	-0.0	43.0	
28	0.3	-0.0	44.8	C
29	0.3	-0.0	46.6	
30	0.3	-0.0	47.3	
31	0.3	-0.0	48.1	
32	0.3	-0.0	50.1	
33	0.3	-0.0	52.4	
34	0.3	-0.0	54.1	

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-643.9	635.2	-7154.0	-29204.0	-28010.0

[redacted] (4)
69

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	775.2	-4477.0	-34484.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.5	0.0	36.7
2	0.5	0.0	37.7
3	0.5	0.0	38.[illegible]
4	0.5	0.0	39.6
5	0.5	0.0	40.6 A
6	0.5	0.0	41.6
7	0.5	0.0	42.6
8	0.5	0.0	43.7
9	0.5	0.0	44.9
10	0.5	0.0	45.8
11	-0.5	0.0	-5.0
12	-0.5	0.0	-4.5
14	-0.6	0.0	-3.3
15	-0.6	0.0	-2.5
16	-0.6	0.0	-1.8 B
17	-0.6	0.0	-1.0
20	-0.6	0.0	0.5
21	-0.6	0.0	1.5
22	-0.6	0.0	2.3
23	-0.6	0.0	35.6
24	-0.6	0.0	36.2
26	-0.6	0.0	37.3
27	-0.6	0.0	38.1
[illegible]3	-0.6	0.0	38.9 C
29	-0.6	0.0	39.7
32	-0.6	0.0	41.2
33	-0.7	0.0	42.2
34	-0.7	0.0	42.9

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	0.0	775.2	-4477.0	-34484.0	0.0

LOAD CONDITION 4

5

70

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	775.2	-5185.0	-34484.0	0.

PILE LOADS (PILE AXIS)

.LE NO.	X	Y	Z
1	0.9	0.0	35.1
2	0.9	0.0	36.1
3	0.9	0.0	37.1
4	0.9	0.0	38.1
5	0.9	0.0	39.1
6	0.9	0.0	40.1
7	0.9	0.0	41.1
8	0.9	0.0	42.2
9	0.9	0.0	43.4
10	0.9	0.0	44.4
11	-0.9	0.0	-23.3
12	-0.9	0.0	-22.8
14	-0.9	0.0	-21.7
15	-0.9	0.0	-20.9
16	-0.9	0.0	-20.1
17	-0.9	0.0	-19.3
20	-0.9	0.0	-17.8
21	-0.9	0.0	-16.8
22	-0.9	0.0	-16.0
23	-1.1	0.0	55.0
24	-1.1	0.0	55.5
26	-1.1	0.0	56.7
27	-1.1	0.0	57.5
'8	-1.1	0.0	58.3
29	-1.1	0.0	59.0
32	-1.1	0.0	60.6
33	-1.1	0.0	61.5
34	-1.1	0.0	62.3

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	0.0	-0.0	775.2	-5185.0	-34484.0	0.0

0 15:14:38 11/28/79 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022

0 PROG NO. 713-F3-A2-210 15:09:29 11/28/79 MOD 6A, JUN 7:

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

11021	X	Y	Z	RX	RY	RZ
11022	0.497E-03	-0.223E-01	-0.235E-01	-0.392E-03	-0.826E-05	-0.681E-05
12022	0.502E-03	-0.497E-01	-0.278E-02	-0.319E-04	-0.822E-05	-0.686E-05
13022	-0.932E-04	0.761E-01	-0.268E-01	-0.785E-03	-0.565E-05	0.127E-05
14022	-0.102E-03	0.131E 00	-0.687E-01	-0.151E-02	-0.574E-05	0.139E-05

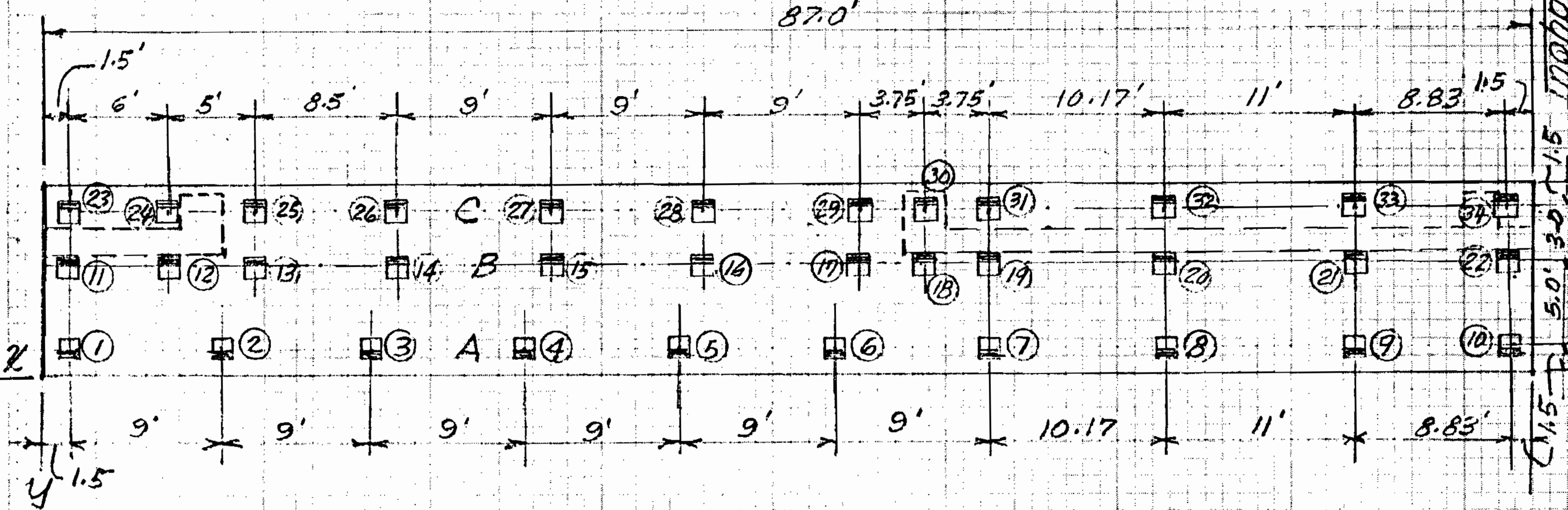
N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79E

SHEET No 71 OF
BY LWC DATE 12-10-79
CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave. West of IHNC)

Pile Layout



Pile Layout

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 72 OF ______
ITEM ______ BY LWC DATE 12-10-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (AT Florida Avenue West of IHNC)

Pile Reactions from Computer Printout

Case I: Water @ El. 14.0, no wind, impervious soil. (100%)

		X^k	Y^k	Z^k
Pile Group "A"	=	-0.1	0	-39.6
Pile Group "B"	=	0.1	0	43.4
Pile Group "C"	=	0.1	0	63.7

Case II: Water @ El. 14.0, no wind, pervious soil. (100%)

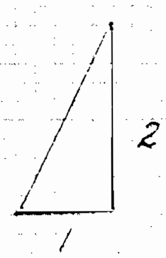
		X^k	Y^k	Z^k
Pile Group "A"	=	-0.3	0	38.8
Pile Group "B"	=	0.3	0	52.5
Pile Group "C"	=	0.3	0	54.1

Case III: No water, no wind, truck on edge slab, flood side (100%)

		X^k	Y^k	Z^k
Pile Group "A"	=	0.5	0	45.8
Pile Group "B"	=	-0.5	0	-5.0
Pile Group "C"	=	-0.7	0	42.9

Case IV: No water, no wind, truck on edge slab, protected side (100%)

		X^k	Y^k	Z^k
Pile Group "A"	=	0.9	0	44.4
Pile Group "B"	=	-0.9	0	-23.3
Pile Group "C"	=	-1.1	0	-62.3



$$\frac{2}{\sqrt{5}} = 0.8944$$

$$\frac{1}{\sqrt{5}} = 0.4472$$

OVERHEAD GATE DESIGN (At Florida Avenue West of IHNC)
Monolith - Top face reinforcement (transverse)

Case II Loading

			Arm	
Pile A_V	$= \frac{(38.8)(0.8944)(11)}{87}$	$= 4.39 \times$	$5.5'$	$= 24.13'^K$
Pile χ_{AV}	$= -\frac{(0.3)(0.4472)(11)}{87}$	$= -0.017 \times$	$5.5'$	$= -0.09'^K$
Pile B_V	$= \frac{(52.5)(0.8944)(11)}{87}$	$= 5.94 \times$	0.5	$= 2.97'^K$
Pile χ_{BV}	$= \frac{(0.3)(0.4472)(11)}{87}$	$= 0.017 \times$	0.5	$= 0.01'^K$
+ Wt. Water	$= (7.0)(12.68)(0.0625)$	$= 5.55 \times$	3.5	$= 19.42'^K$
- Wt. water	$= -(4.0)(15.68)(0.0625)$	$= -3.92 \times$	5.0	$= -19.60'^K$
Wt. Slab	$= (3)(7)(0.15)$	$= 3.15 \times$	3.5	$= 11.03'$
		15.11^K		$37.87'^K$

$b = 12''$ $f'c : 3000$ psi $f_c = 1050$ $K = 152$ $a = 1.44$ $j = 0.891$

$$d_{reqd} = \sqrt{\frac{37.87 \times 12000}{(152)(12)}} = 15.78''$$

$15.78'' + 4'' = 19.78'' < 36$ O/K.

$$A_s = \frac{M}{a\,d} = \frac{37.87}{(1.44)(32)} = 0.82^{\square''}$$

Min $A_s = (0.0025)(12)(32) = 0.96^{\square''}$ Use #9 @ 12 = $1.0^{\square''}$
Top face - Transverse

Max shear = 15.11^K

$$v = \frac{15{,}110^{\#}}{12 \times 32} = 39.35 \text{ psi} < 60 \text{ psi allowable}$$

$$\text{Bond: } \frac{15.11^K}{3.544 \times 0.891 \times 32} = 0.149^{KSI} < 0.165^{KSI} \text{ Top bar O/K}$$

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Monolith - Bottom face reinforcement (transverse)

Case III Loading

			Arm	
Pile Av = $\frac{(45.8)(0.8944)(11)}{87}$	= 5.17	X	5.5 =	$28.45'^{K}$
Pile ½Av = $\frac{(0.5)(0.4472)(11)}{87}$	= 0.03	X	5.5 =	$0.17'^{K}$
Pile Bv = $\frac{(-5.0)(0.8944)(11)}{87}$	= −0.57	X	0.5 =	$-0.29'^{K}$
Pile ½Bv = $\frac{(-0.5)(0.4472)(11)}{87}$	= −0.03	X	0.5 =	$-0.02'^{K}$
Two truck Load = $\frac{64}{87}$	= −0.74	X	7.0 =	$-5.18'^{K}$
Wt Water = (3)(4)(0.0625)	= −0.75	X	5.0 =	$3.75'^{K}$
Wt slab = (3)(7)(0.15)	= −3.15	X	3.5 =	$-11.03'^{K}$
	1.46^{K}			$M = 15.85'^{K}$

b = 12" f'c = 3000 fc = 1050 K = 152 a = 1.44 j = 0.891

$$d \text{ reqd} = \sqrt{\frac{15.85 \times 12000}{(152)(12)}} = 10.21''$$

10.21" + 4 = 14.21" < 36" ok

$$As = \frac{M}{ad} = \frac{15.85}{(1.44)(32)} = 0.34 \square''$$

Min. As = (0.0025)(12)(32) = 0.96 □" Use #9@12 = 1.0 □"

Bottom face - Transverse

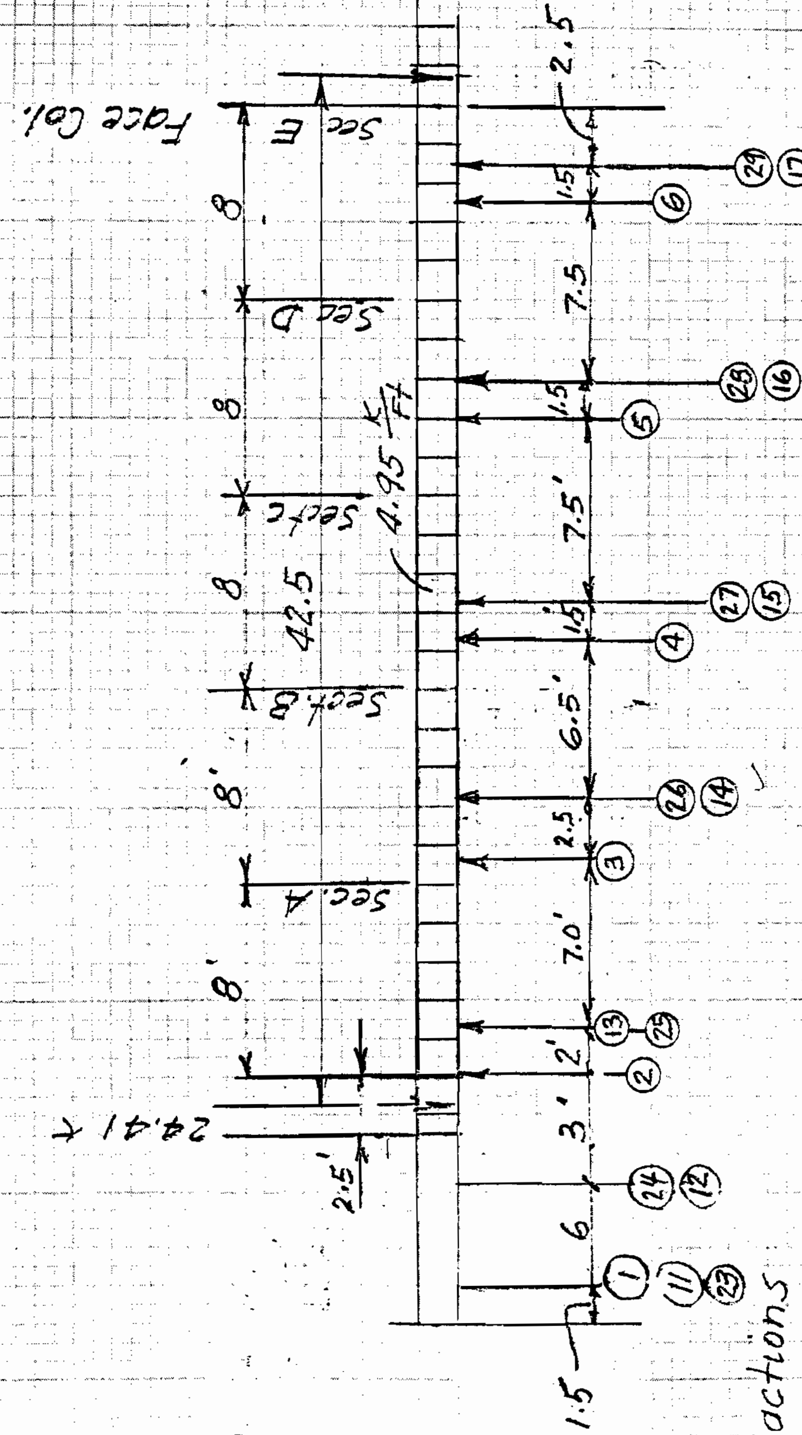
Shear and bond ok by inspection

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No 75 OF ____
ITEM ____ BY LWC DATE 12-11-79
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Avenue West of IHNC)

Monolith - Longitudinal Reinforcement · Top and bottom faces



Pile Reactions

① 32.8k
⑪ 4.47
㉓ 31.84
㉔ 32.38
⑫ 4.02
② 33.72k
⑬ 33.80k
㉕ 35.3k
③ 34.6
㉖ 33.36
⑭ -29.5k
④ 35.4k
㉗ 34.07k
⑮ -2.24k
⑤ 36.31k
㉘ 34.79k
⑯ -1.61k
⑥ 37.2k
㉙ 35.51k
⑰ -0.89k

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB No 575-79-E

SHEET No 76 OF ____ BY LWC DATE 12-11-79 CHKD. BY ______ DATE ______

Not Used

OVERHEAD GATE DESIGN (Florida Ave. West of IHNC)

Monolith - Longitudinal Reinforcement (Cont.)

Not used

Moment @ Section A

Item	Reaction k	Arm ft	Moment 'k
Pile #1	-32.8	17.0	-557.6
Pile #11	4.47	17.0	76.0
Pile #23	-31.84	17.0	-541.3
Pile #12	4.02	11.0	44.2
Pile #24	-32.38	11.0	-355.1
Pile #2	-33.72	8.0	-269.8
Pile #13	33.80	6.0	202.8
Pile #25	-35.3	6.0	-211.8
Conc. Slab	4.95k x 18.5' = 91.57k	9.25	847.0c
T-Wall	2.38k x 8 = 19.04k	14.5	276.1
Column	24.41	9.25	225.8
	Σ 11.27k		Σ - 263.7'k

Moment @ Section B

Item	Reaction	Arm	Moment
Pile #1	-32.8	25.0	-820.0
#11	4.47	25.0	111.8
#23	-31.84	25.0	-796.0
#12	4.02	19.0	76.4
#24	-32.38	19.0	-615.2
#2	-33.72	16.0	-539.5
#13	33.80	14.0	473.2
#25	-35.3	14.0	-494.2
#3	-34.6	7.0	-242.2
#26	-33.36	4.5	-150.1
#14	2.95	4.5	13.3

cont.

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 77 OF
BY LWC DATE 12-11-79
CHKD. BY DATE

OVERHEAD GATE DESIGN (Florida Ave. West of IHNC)
Monolith - Longit. Reinf. (Cont)
Moment at Section B (cont.)

Not used

Item	Reaction K	Arm Ft.	Moment 'K
Conc. Slab	4.95K x 26.5' = 131.2K	13.25	1738.4
T-wall	19.04	22.5	428.4
Column	24.41	17.25	421.1
Σ	-14.11K		Σ -394.6'K

Moment @ Section C

Item	Reaction	Arm	Moment
Pile #1	-32.8	33.0	-1082.4
#11	4.47	33.0	147.5
#23	-31.84	33.0	-1050.7
#12	4.02	27.0	108.5
#24	-32.38	27.0	-874.3
#2	-33.72	24.0	-809.3
#13	33.80	22.0	743.6
#25	-35.3	22.0	-776.6
#3	-34.6	15.0	-519.0
#26	-33.36	12.5	-417.0
#14	2.95	12.5	36.9
#4	-35.4	6.0	-212.4
#27	-34.07	4.5	-153.3
#15	2.24	4.5	10.1
Conc. Slab	4.95K x 34.5 = 170.76	17.25	2945.6
T-Wall	19.04	30.5	580.7
Col.	24.41	25.25	616.4
Trucks	64	4	256.0
	Σ +22.22K		Σ -449.7'K

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No 78 OF ____
ITEM ____ BY LWC DATE 12-13-79
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (Florida Ave. West of IHNC)
Monolith - Longit. Reinf. (Cont)
Moment @ Section "D"

Not used

Item	Reaction K	Arm Ft	Moment 'K
Pile #1	-32.8	41.0	-1344.8
#11	4.47	41.0	183.7
#23	-31.84	41.0	-1305.4
#12	4.02	35.0	140.7
#24	-32.38	35.0	-1129.8
#2	-33.72	32.0	-1079.0
#13	33.8	30.0	1115.4
#25	-35.3	30.0	-1059.0
#3	-34.6	23.0	-795.8
#26	-33.36	20.5	-683.9
#14	2.95	20.5	60.5
#4	-35.4	14.0	-495.6
#27	-34.07	12.5	-425.8
#15	2.24	12.5	28.0
#5	-36.31	5.0	-181.6
#16	1.61	3.5	5.6
#28	-34.79	3.5	-121.8
Conc. Slab	49.5 x 4.25 = 210.38	21.25	4470.6
T-Wall	19.04	38.5	733.0
Col.	24.41	33.25	811.6
Trucks	64.0	12	768.0
	Σ - 7.65		Σ -305.4 'K

OVERHEAD GATE DESIGN (Florida Ave. West of IHNC)

Monolith - Longit. Reinf. (cont.)

Moment at Section E   Case III

Item	Reaction k	Arm Ft	Moment 'k
Pile #2	33.72	40.0	1348.8
#13	33.8	38.0	1284.4
#25	35.3	38.0	1341.4
#3	34.6	31.0	1072.6
#26	33.36	28.5	950.8
#14	−2.95	28.5	−84.1
#4	35.4	22.0	778.8
#27	34.07	20.5	698.4
#15	−2.24	20.5	−45.9
#5	36.31	13.0	472.0
#16	−1.61	11.5	−18.5
#28	34.79	11.5	400.1
#6	37.2	4.0	148.8
#17	−0.89	2.5	−2.2
#29	35.51	2.5	88.8
	376.37		8434.2

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 79d OF ____
ITEM ______ BY LWC DATE 1-18-80
JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (Florida Ave West of IHNC)
Monolith - Longit. Reinf. (External Forces - Case III)
Monolith @ Sec. E (Face of Middle Column)

Item	Force K	Arm Ft	Moment 'K
Col. Reaction	24.41	41.25	-1006.9
Col. Weight	21.22	41.25	-875.3
Conc. Slab	204.2	20.63	-4212.6
Truck	32.0	26.0	-832.0
Truck	32.0	14.0	-448.0
	313.83 K		-7374.8

Final Moment

$+8434.2 - 7374.8 = 1059.4'^{K}$

Final Shear @ 38.25 from "A" or Sec. E

$= 125.6'^{K}$

Check on + Mom. (See page 79d)

33.72 X 2 = 68
102.82 X 7 = 720
137.42 X 2.5 = 340
167.8 X 6.5 = 1091
203.23 X 1.5 = 305
235.64 X 7.5 = 1767
271.37 X 1.5 = 407
304.43 X 7.5 = 2283
342.13 X 1.5 = 513
376.75 X 2.5 = 942
$\Sigma = 8436'^{K} \approx 8434'^{K}$

Check on - Mom. (See page 79d)

	Shear	
15.25 X	45.63	= 696
5.37 X	77.63	= 417
6.63 X	281.83	= 1869
14.0 X	313.83	= 4394

Σ -7376'K
$\approx$
-7374.8'K

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB
ITEM
JOB No 575-79-E

SHEET No 79b OF
BY LWC DATE 1-18-80
CHKD. BY DATE

OVERHEAD GATE DESIGN (Florida Ave. West of IHNC)
Monolith Longit. Reinf (Cont)
Moment @ Section E Case I

ITEM	Reaction K	Arm Ft	Moment 'K
#2	-34.7	40.0	-1388.0
#13	25.7	38.0	976.6
#25	43.8	38.0	1664.4
#3	-34.1	31.0	-1057.1
#26	45.3	28.5	1291.1
#14	27.2	28.5	775.2
#4	-33.4	22.0	-734.8
#27	46.9	20.5	961.5
#15	28.9	20.5	592.5
#5	-32.6	13.0	-423.8
#16	30.5	11.5	350.8
#28	48.6	11.5	558.9
#6	-32.0	4.0	-128.0
#17	32.1	2.5	80.3
#29	50.3	2.5	125.8
	+ 212.5		3645.4 'K

N-Y ASSOCIATES, INC.
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JOB
ITEM
JOB Nº 575-79-E

SHEET Nº 79C OF
BY LWC DATE 1-18-80
CHKD. BY DATE

OVERHEAD GATE DESIGN (Florida Ave West of IHNC)
Monolith - Longit. Reinf. (External Forces - Case I)
Monolith @ Sec. E (Face of Mid. Column)

ITEM	FORCE ^{k}	ARM ^{Ft}	Moment $^{'k}$
Col. Reaction	-40.7	41.25	-1078.9
Col. Wt.	-21.22	41.25	-875.3
Conc. Slab	-204.2	20.63	-4212.6
Water Wt.	-228.9	20.63	-4722.2
Uplift - Impervious	+264.8	20.63	+5462.8
	-230.2		-5426.2

Final Moment Case I

$-5426.2 + 3645.4 = 1780.8'^k$

Final Shear = -147.22^k @ 29.25

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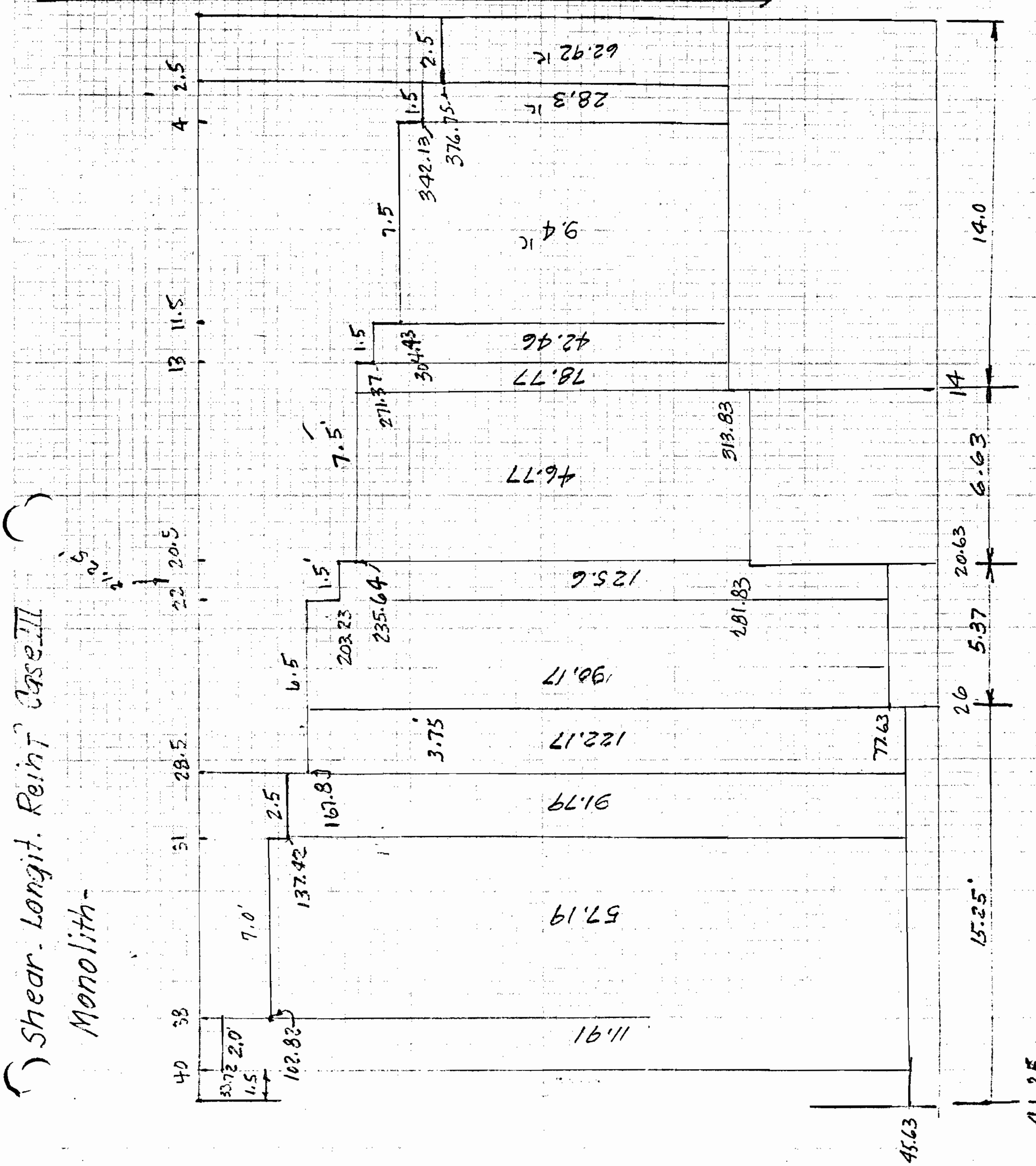
JOB ______ SHEET No 79d OF ____
ITEM ______ BY LWC DATE 1-18-80
JOB No 575-79E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (Fla. Ave West of IHNC)



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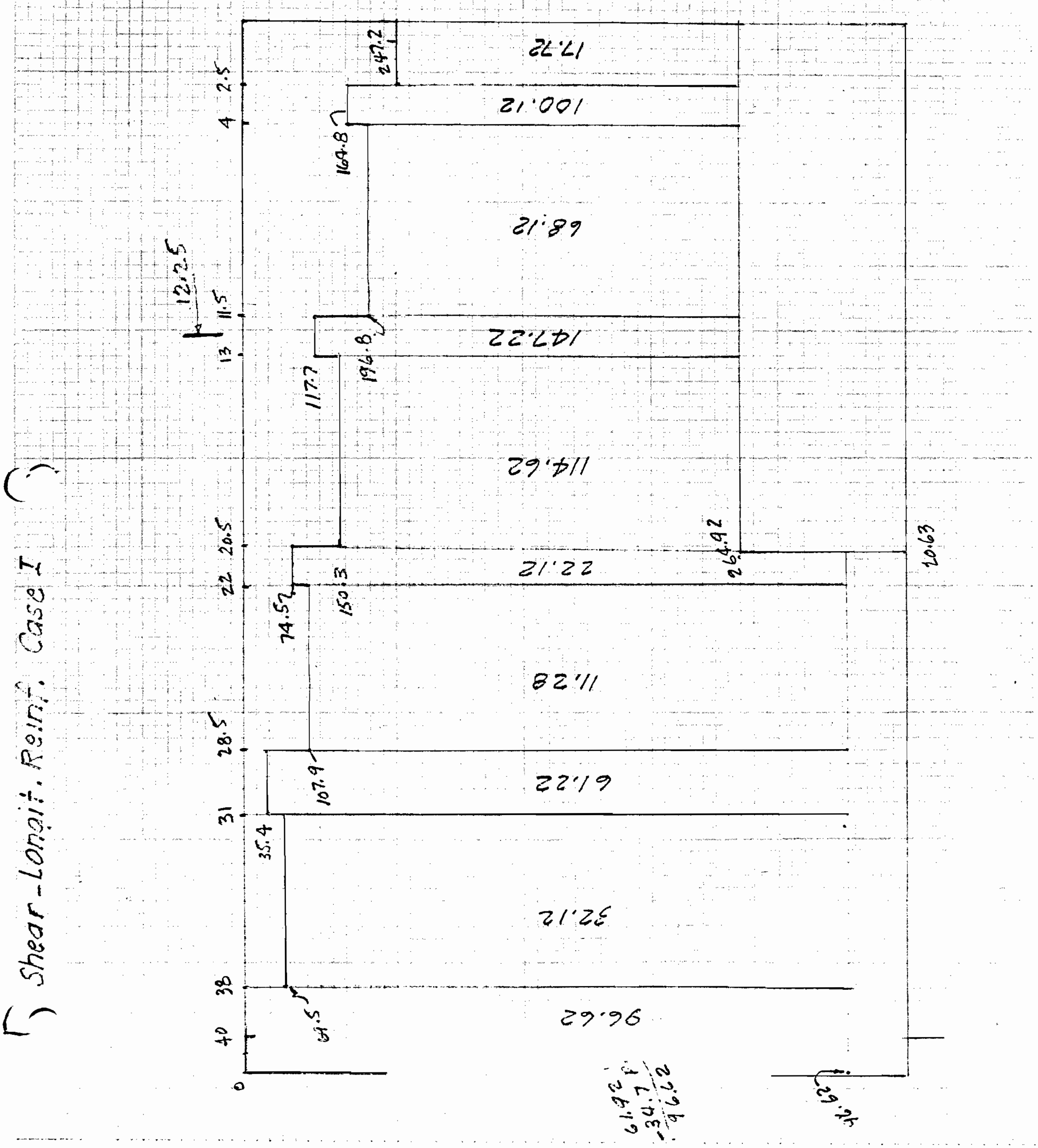
OVERHEAD GATE DESIGN (Florida Ave West of IHNC)



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JOB ____ SHEET No 80 OF ____
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JOB No 575-79-E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC) Case III
Monolith - Longit. Reinforcement (Cont.) Bottom face Reinf

Max Moment = $-1121.9\ ^{'K}$ $f'c = 3000$ psi $f_s = 20{,}000$ psi $f_c = 1050$ $a = 1.44$
$d = 32"$ $b = 12 \times 11 = 132"$ $K = 152$

$$d\ \text{req'd} = \sqrt{\frac{-1121.9 \times 12000}{152 \times 132}} = 25.9" < 32"$$

$$\frac{1121.9}{11}^{'K} = 102^{'K} = \text{Moment for 1' wide Strip.}$$

$$As = \frac{102^{'K}}{(1.44)(32)} = 2.21\ \square"$$

#10@6 bottom face

Pepper's Calc.'s show Moment = $\frac{1010.7}{11}^{'K}$

$$= \frac{91.88'}{1.44 \times 32} = 1.99\ \square"$$ Call #10@6 in bottom face

Pepper's dwg's shown #10@6 top face and #9@12 bott. face

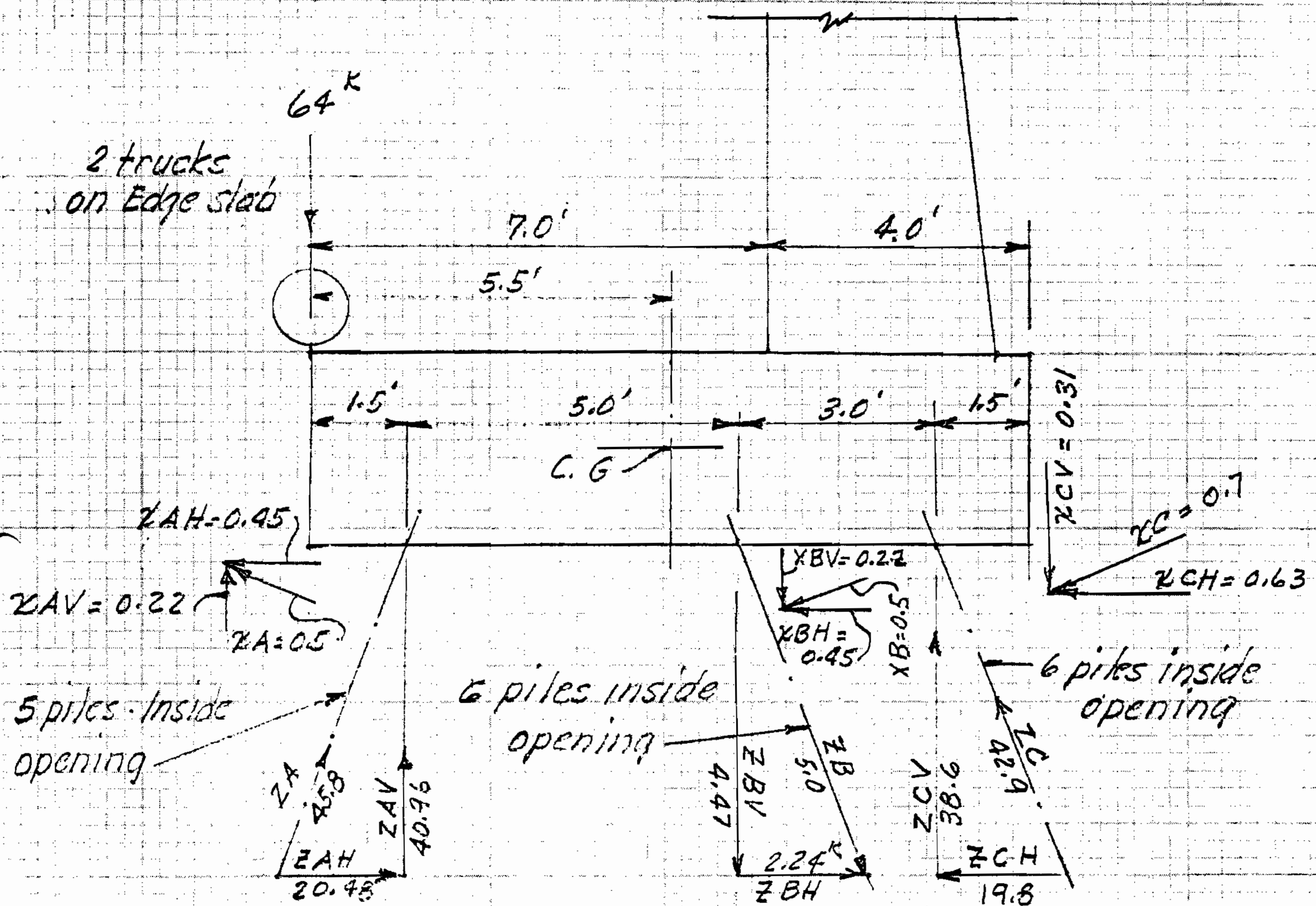
Top face longit steel Min As $= 0.0025 \times 12" \times 32" = 0.96\ \square"$

#9@12 top face

OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)

Torsional Analysis - Monolith

Case III Loading



OVERHEAD GATE DESIGN (At Florida Ave West of IHNC)
Torsional Analysis - Monolith (Cont.)

Item	V^k	H^k	$\bar{x}^{ft}$	Moments $^{'k}$
2 trucks	64		5.5	352.0
Z_{AV} = 5 (40.96)	- 204.80		4.0	-819.2
Z_{AH} = 5 (20.48)		- 102.40	-1.5	153.6
X_{AV} = 5 (0.22)	- 1.1		4.0	- 4.4
- X_{AH} = 5 (0.45)		2.25	-1.5	- 3.4
Z_{BV} = 6 (4.47)	26.82		-1.0	- 26.8
Z_{BH} = 6 (2.24)		- 13.44	-1.5	20.2
X_{BV} = 6 (0.22)	-1.32		-1.0	-1.3
X_{BH} = 6 (0.45)		2.7	-1.5	-4.1
Z_{CV} = 6 (38.6)	- 231.6		- 4.0	926.4
Z_{CH} = 6 (19.8)		118.8	-1.5	-178.2
X_{CV} = 6 (0.31)	1.86		-4.0	- 7.4
X_{CH} = 6 (0.63)		3.78	-1.5	- 5.7
				M = 401.7

Torsional Moment divides equally between Columns.

$$M_t = \frac{401.7}{2} = 200.9^{'k}$$

$b = 3.0'$ $h = 11.0'$ $\qquad \frac{h}{b} = \underline{3.66}$

$K_1 = 3.62$

$$v_t = \frac{K_1 M_t}{b^2 h} = \frac{3.62(200900)(12)}{(36)^2(132)} = 51.0\ psi < 1.1\sqrt{3000} = 60.25$$

No stirrups required.

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

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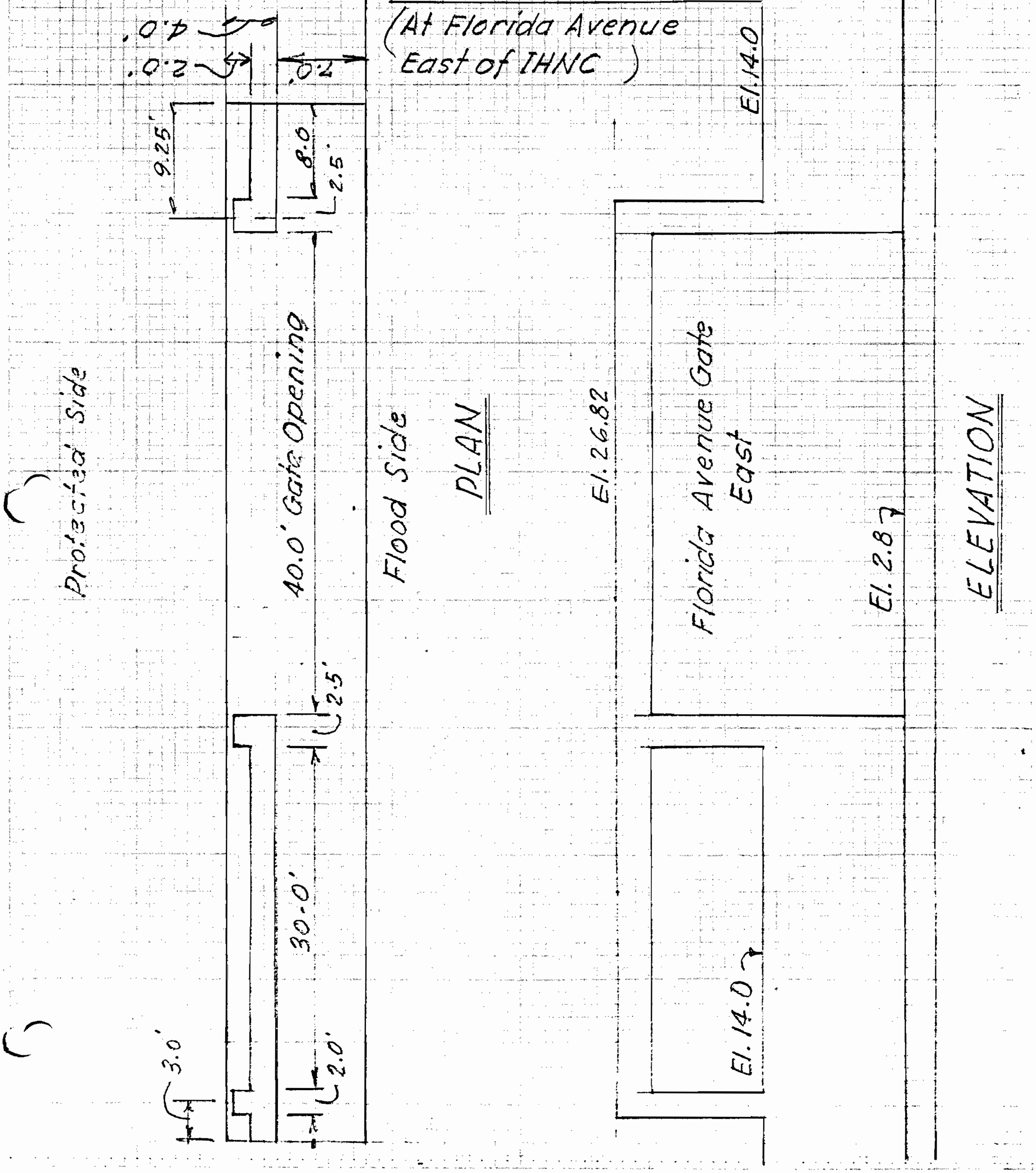
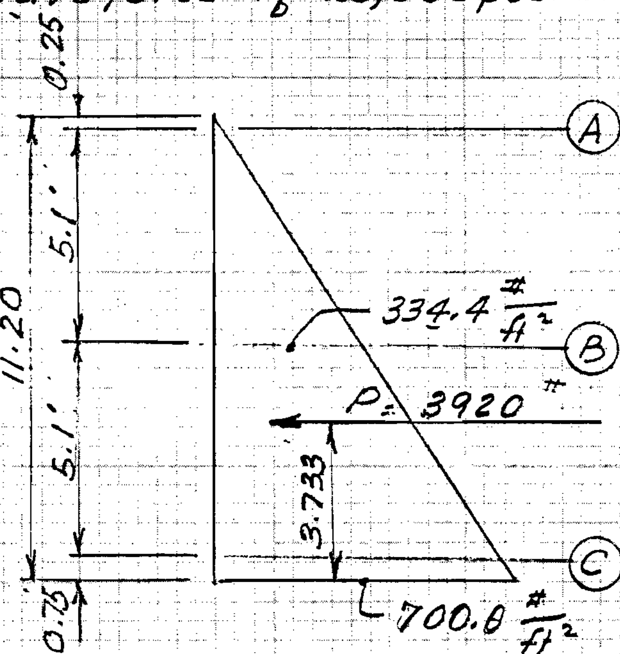
OVERHEAD GATE DESIGN
(At Florida Avenue East of IHNC)



OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

Water to Elev. 14.0 - No wave force - $F_b = 20{,}000$ psi

REACTIONS



$P @ \frac{11.2'}{3} = 3.733'$

$P = \frac{wh^2}{2} = \frac{(62.5^{\#})(11.2)^2}{2}$

$= 3920^{\#}$

Pressure @ B

$62.5^{\#}(5.10' + 0.25') = 334.4^{\#}$

Pressure @ Bottom

$62.5^{\#}(11.20') = 700^{\#}$

$R_B = 334.4^{\#}(5.10' + 0.75')(0.5) = 978.1^{\#}$

$(700.0^{\#} - 334.4^{\#})(5.10' + 0.75')(0.5)(0.333) = 374.3^{\#}$

$(334.4^{\#})(5.10 + 0.25)(0.5)(2)(0.333) = 595.8^{\#}$

$\Sigma R@B = 1948.2^{\#}$

$R_A = (0.5)(595.8^{\#}) = 297.9^{\#}$

$R_C = 978.1^{\#} + (374.^{\#} \times 2) = 1726.1^{\#}$

$R_A + R_B + R_C = 1948.2^{\#} + 297.2^{\#} + 1726.1 = 3971 \approx 3920$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

GIRDER DESIGN

1. Top Girder Span = 42.5' Load = 0.298 $^k/_{ft}$ – See R_A - page 2

$$\text{Moment (max.)} = (42.5)^2 (0.298^k)(0.125) = 67.2\ ^{'k}$$

$$S_{req'd} = \frac{67.28^{'k}(12)}{20\,ksi} = 40.37\ in^3$$

Try W18x35 $S = 57.9\ in^3$ $I = 513\ in^4$

$$\Delta = \frac{(5)(298^{\#} \times 42.5')(42.5' \times 12)^3}{(384)(29 \times 10^6)(513)} = 1.47'' \approx \frac{42.5' \times 12}{360} = 1.42''$$

Use W18x35 $f_s = \dfrac{65.03^{'k} \times 12000}{57.9\ in^3} = 13{,}478\ psi < 20{,}000\ psi$

2. Center Girder Span 42.5' Load = 1.948 $^k/_{ft}$ · See R_B - page 2

$$\text{Moment (max.)} = (42.5')^2 (1.948^k)(0.125) = 439.82\ ^{'k}$$

$$S_{req'd} = \frac{439.82^{'k}(12)}{20\,ksi} = 263.89\ in^3$$

Try W30x108 $S = 300\ in^3$ $I = 4470\ in^4$

$$\Delta = \frac{(5)(1948^{\#} \times 42.5')(42.5' \times 12)^3}{(384)(29 \times 10^6)(4470)} = 1.10 < \frac{42.5' \times 12}{360}$$

Use W30x108

$$f_s = \frac{421.99^{'k} \times 12{,}000}{300} = 16888\ psi$$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº 4 OF
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OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

GIRDER DESIGN (cont)

3. Bottom Girder   Span = 42.5' Load = $1.728\ ^{k}/_{ft}$ See R_C page 2

$$\text{Moment (max)} = (42.5)^2 (1.726^k)(0.125) = 389.70'^k$$

$$S\,req'd = \frac{389.70'^k (12)}{20^k} = 234.82\ in^3$$

Try W30x106 $S = 300\ in^3$ $I = 4470\ in^4$

$$\Delta = \frac{(5)(1728^{\#} \times 42.5')(42.5' \times 12)}{(384)(29 \times 10^6)(4470)} = 0.97'' < \frac{42.5' \times 12}{360}$$

SKIN PLATE DESIGN

Use $\frac{3}{8}''$ thick skin plate

$$I = \frac{12\,(0.375)^3}{12} = 0.053\ in^4$$

$$S = \frac{0.053\ in^4}{(0.5)(0.375)} = 0.283\ in^3$$

$$\text{Load (Max.)} = 62.5\ ^{\#}/_{ft} \times 10.02' = 626.25\ ^{\#}/_{ft}$$

$$\text{Moment (Max)} = 0.283\ in^3 \times 20{,}000\ psi = 5660''^{\#}$$

(Interior Span) $M = \frac{626.25^{\#} \times L^2 \times 12}{12} = 5660^{\#}$

$L = 3.0'$ Use 2'-10"

(End Span)

$$M = \frac{626.25 \times L^2 \times 12}{10} = 5{,}660$$

$L = 2.74'$ Use 2'-7"

Cont. on Page 5

N-Y ASSOCIATES, INC.
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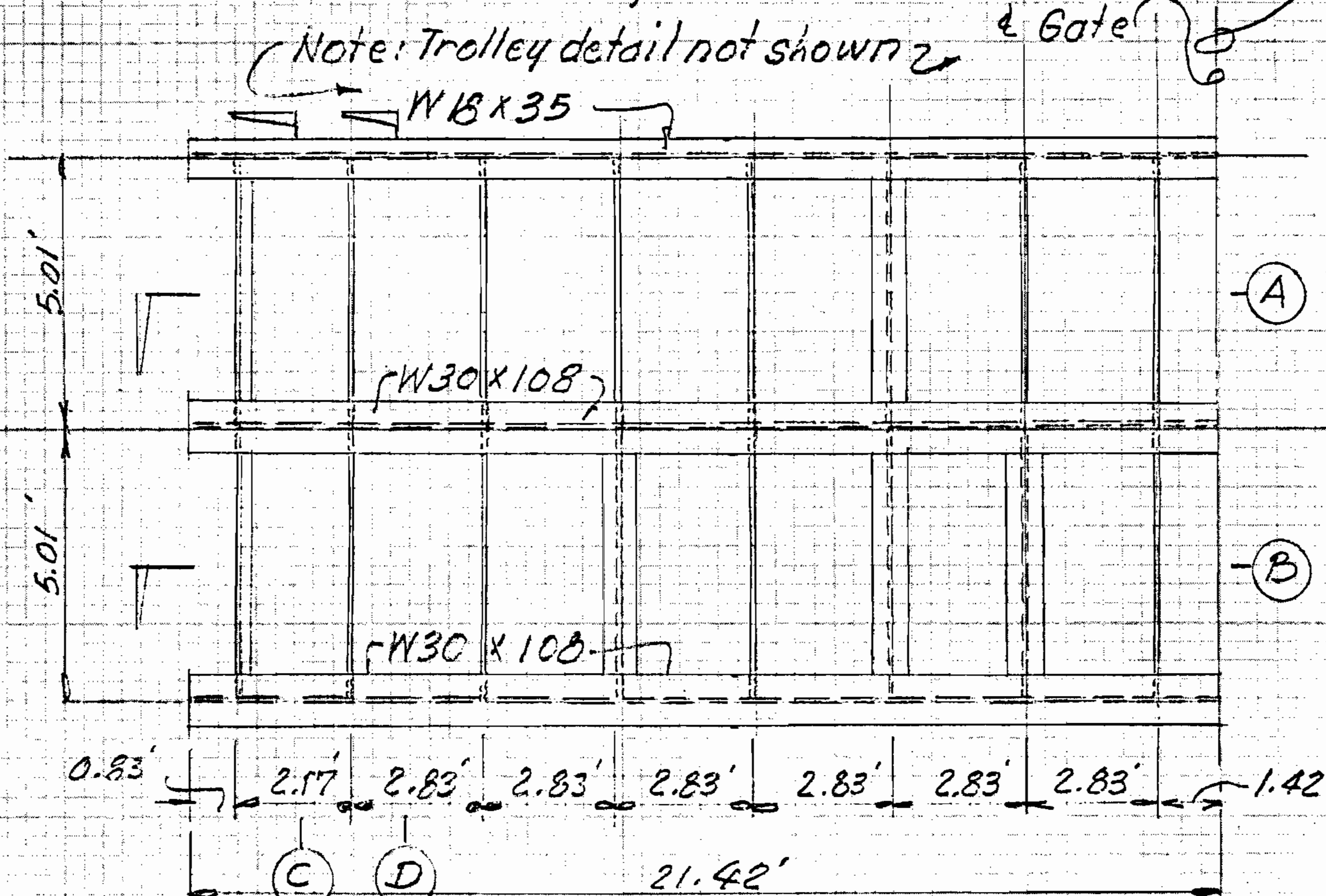
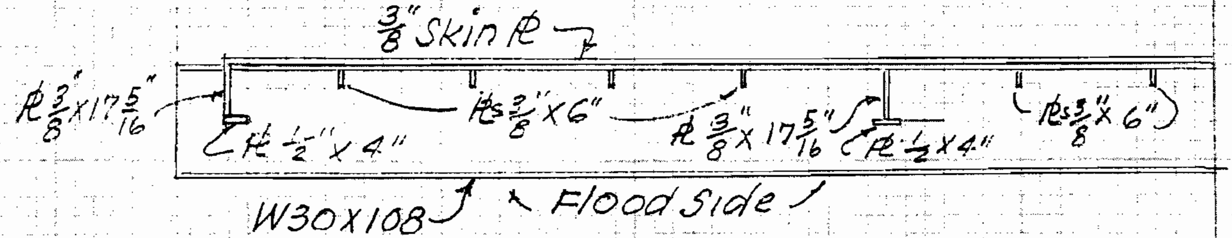
OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

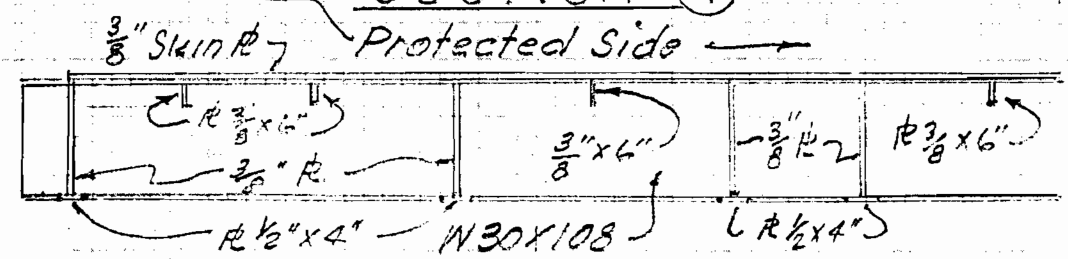
SKIN PLATE DESIGN (Cont.) Symetrical about ℄ unless noted



GATE FRAMING
FLOOD SIDE ELEVATION



SECTION A



SECTION B

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

SKIN PLATE DESIGN (Cont.)

Load max - page 4

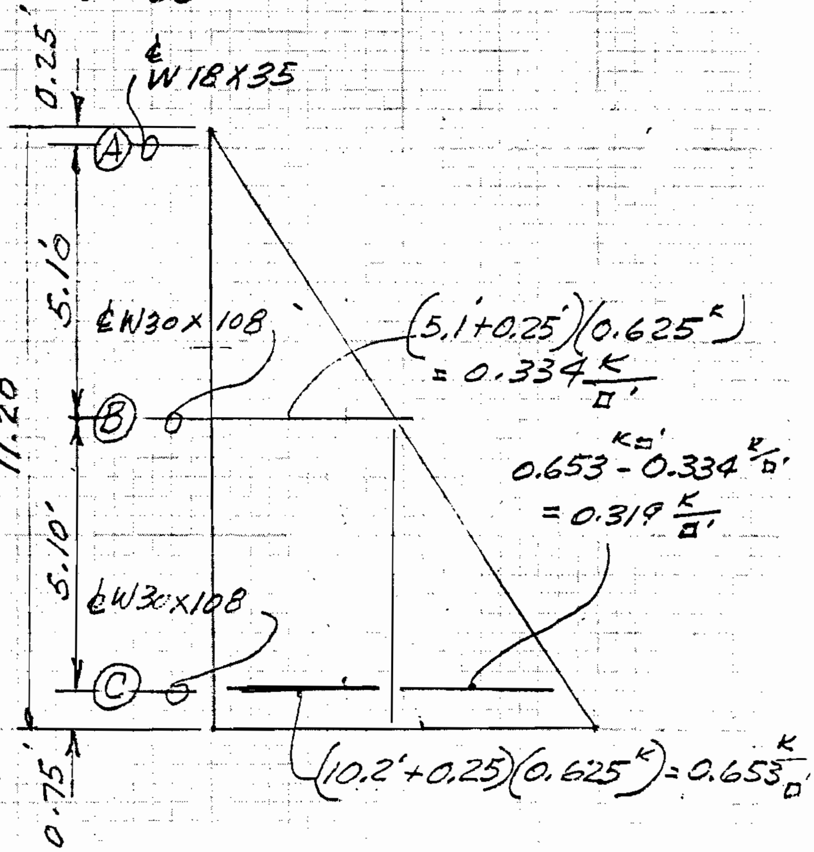
Interior Moment = $\dfrac{626.25 \frac{\#}{ft} \times 2.83^2 \times 12}{12} = 5015.6''\#$

$f_s = \dfrac{5015.6}{0.283} = 17{,}723$ psi

See page 3 S

End Moment $= \dfrac{626.25^{\#} \times 2.58^2 \times 12}{10} = 5002.3''\#$

$f_s = \dfrac{5002.3}{0.283} = 17{,}676$ psi



Simple Max Mom. between (B) and (C)

@ $\dfrac{5.10}{\sqrt{3}} = 2.94'$ from B

$= \left(\dfrac{2}{9\sqrt{3}}\right)\left(\dfrac{0.319^K \times 5.1'}{2}\right)(5.1') = 0.53'^K$

$= \dfrac{0.334^K \times 3.1'}{2}(5.1 - 2.94) = \underline{1.12'^K}$

$\Sigma M_s \; \underline{1.65'^K}$

By observation if ℄ considered fixed at (B) neg. or postive Moms. less than simple Moments

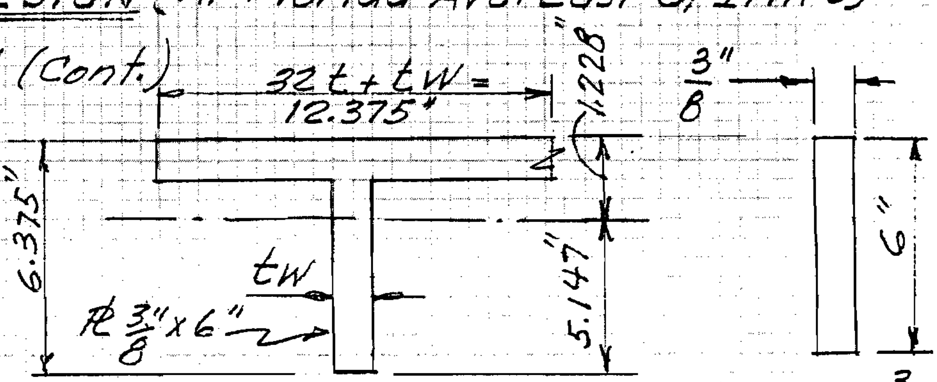
Neg. Moment $= 1.52'^K$

Pos. Moment $= \underline{0.97'^K}$

$2.49 \times \dfrac{2}{3} = 1.66'^K \approx 1.65'^K$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

SKIN PLATE DESIGN (Cont.)



AISC 1.9.1.2

$$\frac{95}{\sqrt{.33}} = 16$$

effective flange width

$2(16 \times 0.375") + 0.375" = 12.375"$

$$I = \frac{0.375(6)^3}{12} = 6.75 \text{ in}^4$$

Type	Area	Y	AY	AY^2	I_o
Pl. 12.375" x 0.375"	4.641	0.1875	0.870	0.163	—
Pl. 6" x 0.375	2.250	3.375	7.594	25.629	6.75
	6.891	3.563	8.464	25.793	6.75

$$\bar{y} = \frac{8.464}{6.891} = 1.228$$

$$I = I_o + \Sigma A\bar{y}^2 - \Sigma Ay \times \bar{y}$$

$$= 6.75 + 25.793 - (\overset{10.394}{8.464 \times 1.228})$$

$$= 22.149 \text{ in}^4$$

$$S_{top} = \frac{22.149 \text{ in}^4}{1.228"} = 18.04 \text{ in}^3$$

$$S_{bott.} = \frac{22.149 \text{ in}^4}{5.147"} = 4.30 \text{ in}^3$$

Page 6

$$f_s = \frac{1.65^k (12)\, 2.83}{4.30 \text{ in}^3} = 13.03 \text{ ksi} < 18.0 \text{ ksi}$$

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OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

SKIN PLATE (Design vertical support members)

Spacing @ 2.83'

$\text{Moment} = 1{,}650\ ^{\prime\#} \times 2.83' = 4{,}669'^{\#}$

$f_s = \dfrac{4{,}669 \times 12}{4.30\ in^3} = 13{,}030\ psi$

$S_{req'd} = \dfrac{4{,}669'^{\#} \times 12}{18{,}000} = 3.11\ in^3 < 4.30\ in^3$

$d_{min} = \dfrac{5.10' \times 12}{24} = 2.55''$ ok

Check Deflection

$$\Delta = \frac{5h^4 m}{768\,EI}(P_1 + P_2)\ psi$$

$$= \frac{5(5.10 \times 12)^4 (2.83 \times 12)}{768(29 \times 10^6)(22.149)}\left(\frac{15.63 + 653.1}{144}\right) = .0224''\ \text{ok}$$

Check Biaxial stresses of skin plate

$$\frac{S_1^2 - S_1 S_2 + S_2^2}{F_y^2} \pm (0.75)^2$$

$$\frac{(20)^2 - [(20)(7.54) + (7.74)^2]}{(36)^2} = .147 < .562$$

$S\ pl = \dfrac{12(0.375)^2}{6} = 0.281\ in^3$

Max. allowable Moment

$= S\,F_b$

$F_b = 24^k \times \frac{5}{6} = 20\ KSI$

(1110-1-2101)

$Mom = 20^k \times 0.281\ in^3 = 5.62''^k$

$S_1 = 20^k$

$S_2 = \dfrac{12{,}534'^k \times 12}{18.04\ in^3} = 8.33\ in^3$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

Top Girder (W18 x 35)

$L_u = 5 \times 2.833 \times 12 = 170''$

$\frac{d}{A_F} = \frac{17.71}{6.0 \times 0.429} = 6.88$

$I_f = \frac{b h^3}{12} = \frac{0.427 \times (6)^3}{12} = 7.685 \text{ in}^4$

$A = A_f + \frac{1}{6} A_w$

$= (6 \times 0.429) + \frac{1}{6}\left[17.71 - 2(0.429)\right] \times 0.298$

$= 3.41 \square''$

$r_y = \sqrt{\frac{I}{A}} = \sqrt{\frac{7.685}{3.41}}$

$= 1.50$

$\frac{L}{r_y} = \frac{170}{1.5} = 113 > 40$ Use Formula (4)

Formula (4) AISC - 1970 (2-46)

$C_b = 1.0 \quad C_c = \sqrt{\frac{2\pi E}{F_y}} = 126.1$

$K_2 = \frac{1 - \left(\frac{L}{r_y}\right)^2}{2(126.1)^2 \times 1} =$

$= 1 - \frac{(113)^2}{2(126.1)^2 \times 1} = 0.60$

$F_b = 0.5 \times 0.60 \times 36000 = 10{,}800 \text{ psi}$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

TOP GIRDER (18x35) (cont.)

Formula (5)

$$F_b = \frac{10,000,000}{170(6.88)} = 8,549 \text{ psi}$$

$$S = \frac{M}{F_p} = \frac{65.03^{'K} \times 12}{18^{K} psi} = 43.35^{in^3} < 57.9^{in^3} \text{ Allowable}$$

MIDDLE GIRDER (W30 x 108) $S = 300^{in^3}$

Lu on top side $= 5 \times 2.83' \times 12'' = 170''$

$$d/A_F = \frac{29.82}{(10.484)(0.76)} = 3.74$$

$$I_F = \frac{bh^3}{12} = \frac{0.76(10.484)^3}{12} = 72.98^{in^4}$$

$$A = A_f + \frac{1}{6} A_W$$
$$= (10.484 \times 0.76) + \frac{1}{6}\left[29.82 - 2(0.76)\right] \times 0.548$$
$$= 10.55$$

$$r_y = \sqrt{\frac{I}{A}} = \sqrt{\frac{72.98}{10.55}} = 2.63$$

$$\frac{L}{r_y} = \frac{170}{2.63} = 64.64 > 40 \quad \text{Use Formula 4}$$

$$K_2 = 1 - \frac{64.64^2}{2(126.1)^2 \times 1} = 0.87$$

$$F_b = 0.50 \times 0.87 \times 36,000 = 15,660$$

Formula 5

$$F_b = \frac{10,000,000}{170(3.74)} = 15,728 \text{ Psi}$$

$$S = \frac{M}{F} = \frac{421.99^{'K} \times 12}{} = 281.13^{in^3} < 300.0^{in^3}$$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

MIDDLE GIRDER (W30 x 108) (Cont) $S = 300.0\ in^3$

L_u on Bottom $= 3 \times 2.8333 \times 12 = 102''$

$\frac{d}{A_F} = 3.74$

$I_F = 72.98$

$A = 10.55$

$r_y = 2.63$

$\frac{L}{r_y} = \frac{102}{2.63} = 38.79 < 40$

Formula 5 $F_b = \frac{10,000,000}{(102)(3.74)} = 26,213\ psi$

Note: Bottom Girder has same properties as Middle Girder on Bottom side with less moment, and max. spacing of bracing at 102".

N-Y ASSOCIATES, INC.
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OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

MEMBER	SIZE	No	W/FT lbs	LENGTH	WT. Tot.	Arm In's	MOM. inch lbs
Top Girder	W18X35	1	35	42.5	1487.5	9.06	13,477
Mid Girder	W30X108	1	108	42.5	4590	15.125	69,424
Bott Girder	W30X108	1	108	42.5	4590	15.125	69,424
Bars	3/8"X6"	12	7.65	4.974	456.6	3.188	1,456
Bars	3/8"X6"	8	7.65	4.964	303.8	3.188	969
Bars	3/8"X17 5/16	4	22.07	4.974	439.1	8.844	3,883
Bars	3/8"X29 13/16"	8	37.21	4.964	1477.7	14.875	21,981
Plates	1/2X4"	4	6.8	4.974	135.3	17.75	2,401
Plates	1/2"X4"	8	6.8	4.135	224.9	29.625	6,664
Skin Plate	3/8"X10.02"	1	168.61	40.83	6884.3	0.1875	1291
Bars	1½"X1½"	2	7.65	11.02	168.6	-.75	-126
Seal Angle	L5X5X½	1	16.2	62.87	1018.5	+0.743	+756
					20,850		191,600

$$\frac{191,600}{20,850} = 9.19''$$

TRUSS

Channel	C15X33.9	2	33.9	14.0	949.2	7.688	7,297
Channel	C15X33.9	2	33.9	4.75	322	7.688	2,476
Channel	C15X33.9	1	33.9	14.17	480.4	7.688	3,693
					1752		13,466

$$\frac{191,600 + 13,466}{20,850 + 1752} = 9.07''$$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 13 OF ______
ITEM ______ BY LWC DATE 9-10-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

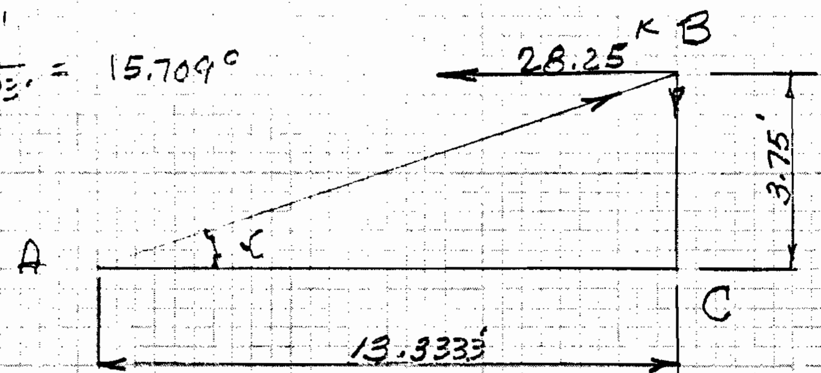
SUPPORT FRAME

Frame Wt = 1752#

Total Wt 1752# + 20,850# = 22,602#

with impact = 1.25 × 22.602^k = 28.25^k

$\tan\alpha = \frac{3.75'}{13.333'} = 15.709°$



$\Sigma F_x = 0$

$= -28.25 + F_{AB}\cos\alpha = 0$

$F_{AB} = 29.35^k$

$\frac{13.3333}{\cos\alpha} \times \frac{1}{13.3333} \times 28.25^k = F_{AB}$

$= 29.35^k$

$F_{AB}\sin\alpha = 7.95$

$\Sigma F_y = 0$

$= -F_{BC} + F_{AC}\sin\alpha = 7.95^k$

$P = 29.35^k$

$L = \frac{13.3333}{\cos\alpha} = 13.85' \quad K = 1.0$

Try C15 × 33.9 $r = 0.904$ $A = 9.96\,\square''$

$\frac{Kl}{r} = K\left(\frac{13.85 \times 12}{0.904}\right) = 183.8 \quad F_a = 4.41$ Page 3-7 1970 AISC

$f_a = \frac{P}{A} = \frac{29.35}{9.96} = 3.14 < 4.41$ k/□"

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 14 OF ______
ITEM ______ BY LWC DATE 9-11-79
JOB No 575-79-E CHKD. BY ______ DATE ______

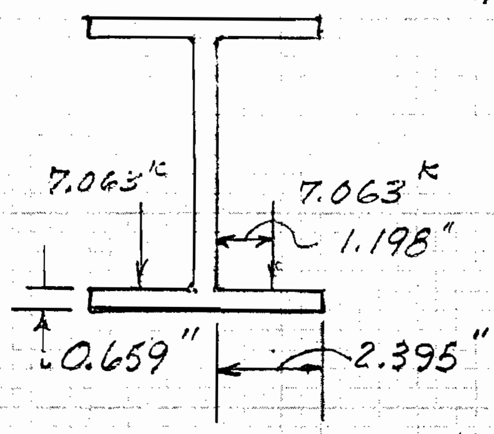
OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

TROLLEY BEAM

Try S12 X 50

$P = 28.25^k$

$\frac{P}{4} = 7.063^k$



Moment @ web edge = $7.063^k \times 1.198'' = 8.45''^k$

$S\ reqd = \frac{M}{F_b} = \frac{8.45''^k}{20\,ksi} = 0.422\ ^{in3}$

Furnished $S = \frac{bh^2}{6} = \frac{12 \times 0.659^2}{6} = 0.869\ ^{in3} > 0.422\ ^{in3}$

Check Δ $\quad \frac{Pb^3}{3EI}$ $\quad I = \frac{12 \times 0.659^3}{12} = 0.28619\ ^{in4}$

$P = 7.063 \quad b = 1.198''$

$\frac{7{,}063^{\#}(1.198)^3}{3\,(29 \times 10^6)(0.28619)} = .000488'' < \frac{2.395''}{360} = .00655$

Allowed

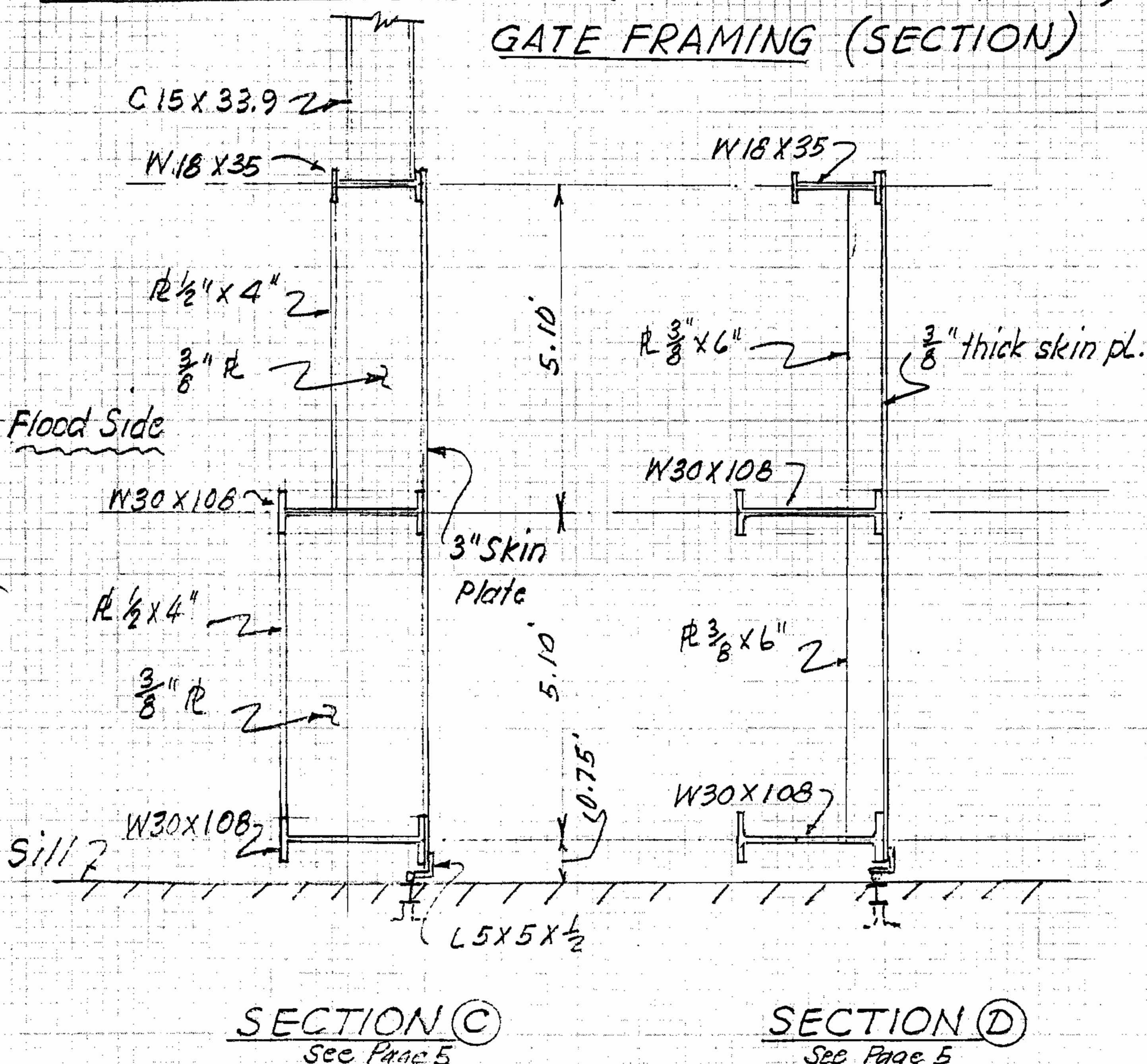
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575.79-E

SHEET No 15 OF
BY LWC DATE 9-11-79
CHKD. BY DATE

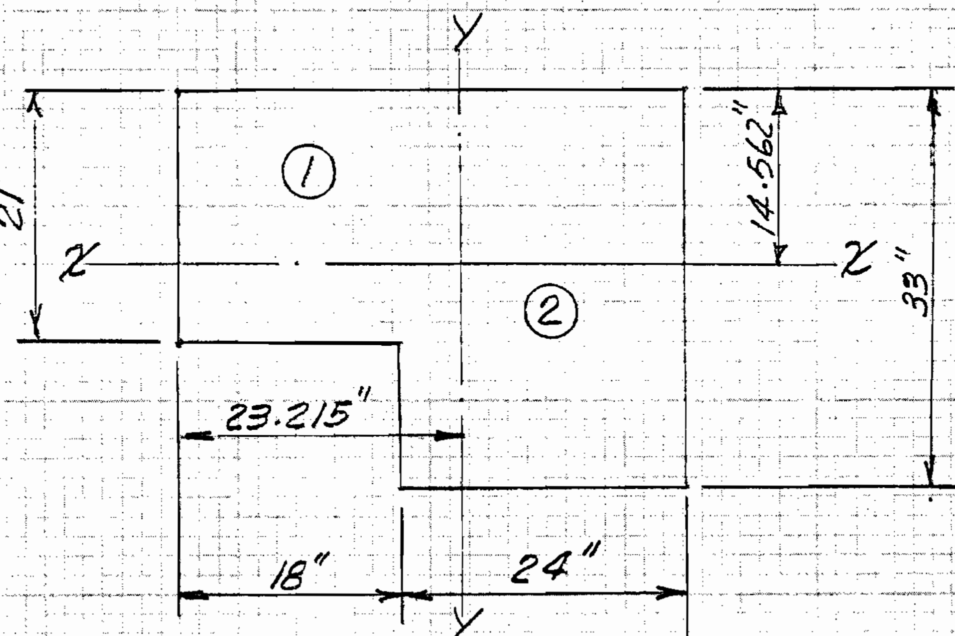
OVERHEAD GATE DESIGN (At Florida Ave., East of IHNC)

GATE FRAMING (SECTION)



OVERHEAD GATE DESIGN (At Flordia Ave. East of IHNC)

CONCRETE GATE FRAME DESIGN



Moment of Inertia (Beam BC · CB)

		Area (A)	Y	AY	$A\bar{Y}^2$	I_o
X-X	1	21 X 18 = 378	10.5"	3,969	41,674.5	13,891.5
	2	24 X 33 = 792	16.5"	13,068	215,622.0	71,874.0
		1170		17,037	257,296.5	85,765.5

$$Y = \frac{17037}{1170} = 14.562$$

$$I = 85{,}765.5 + 257{,}296.5 - (17{,}037 \times 14.562)$$
$$= 94{,}969.2 \text{ inches}^4$$

Y-Y	1	378	9"	3,402	30,618	10,260
	2	792	30"	23,760	712,800	38,016
		1170		27,162	743,418	48,222

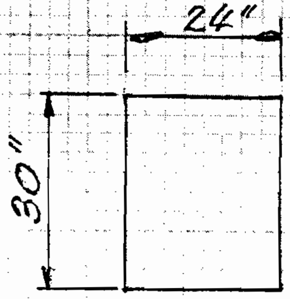
$$Y = \frac{27162}{1170} = 23{,}215$$

$$I = 48{,}222 + 743{,}418 - (27{,}162 \times 23{,}215)$$

$$= 161{,}064$$

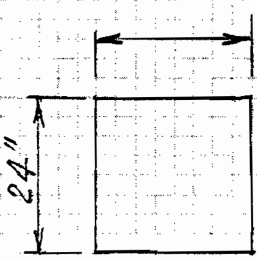
OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

CONCRETE GATE FRAME DESIGN



$$I = \frac{24 \times 30^3}{12} = 54{,}000 \text{ inches}^4$$

Moment of Inertia ~ Columns A-B, EC



$$I = \frac{(24)^4}{12} = 27648 \text{ inches}^4$$

Moment of Inertia ~ Column F-D

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

CONCRETE GATE FRAME DESIGN

Loading

(a) Dead load

Concrete: $2.75' \times 2.0' \times 0.15^k = 0.825^k$

$1.75 \times 1.5 \times 0.15^k = 0.394^k$

Steel : S 12 X 50 $= 0.05$

$1.27 \frac{K}{Lin\ ft.}$

(b) Live Load

Use two 16^k loads 14.17' apart

(c) Wind Load

$0.05 \frac{K}{sq.ft}$

$0.05 \times 2 = 0.10 \frac{K}{Lin\ ft}$ of Column

Load cases considered (Bending about X-X axis)

Case 1x - Gate open, no water, no wind, one hanger load placed 9.17 ft. from end column.

Case 2x - Gate closed, no wind.

Case 3x - Gate open, wind from right (75%)

Case 4x - Gate closed, wind from right (75%)

Case 5x - Gate closed, wind from left (75%)

Case 6x - Gate open, no wind, hanger load placed between center column.

Case 7x - Gate open, no water, no wind, one hanger load, placed 0.92' from end column.

N-Y ASSOCIATES, INC.
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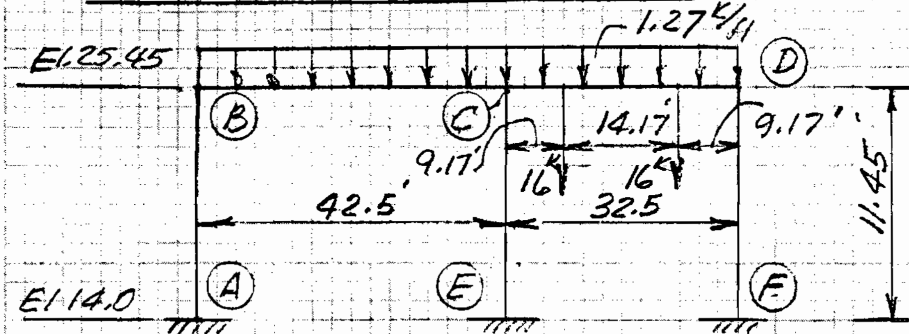
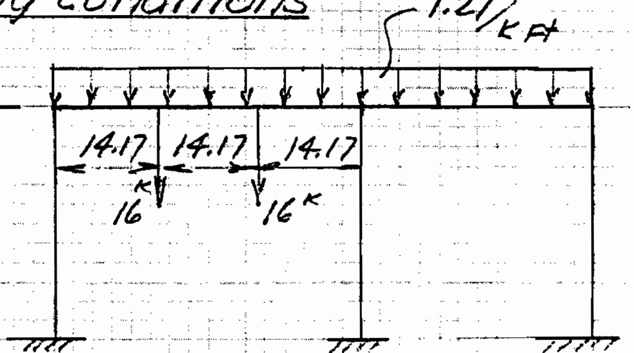
JOB ______ SHEET No 19 OF ______
ITEM ______ BY LWC DATE 8-15-79
JOB No 575-79-E CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

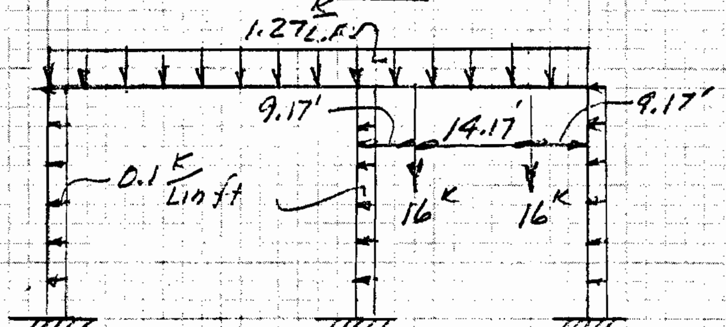
CONCRETE FRAME DESIGN - Loading Conditions



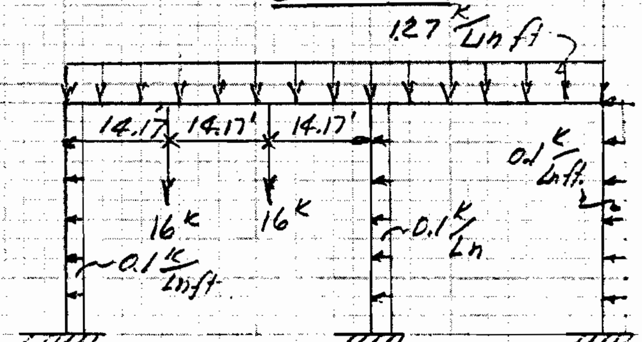
CASE 1X



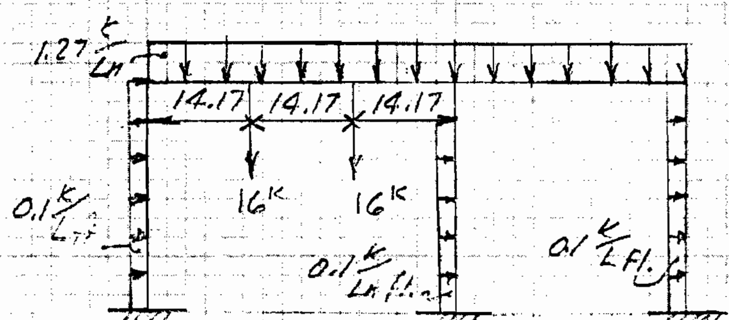
CASE 2X



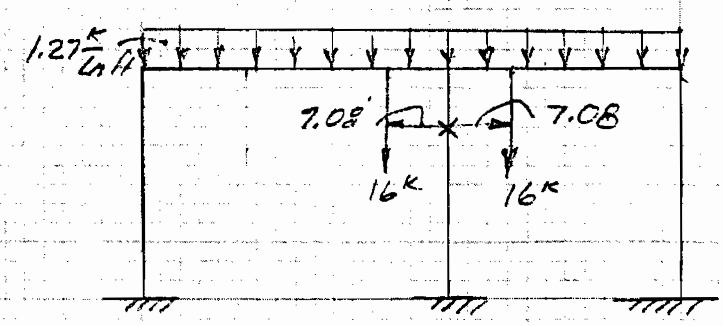
CASE 3X



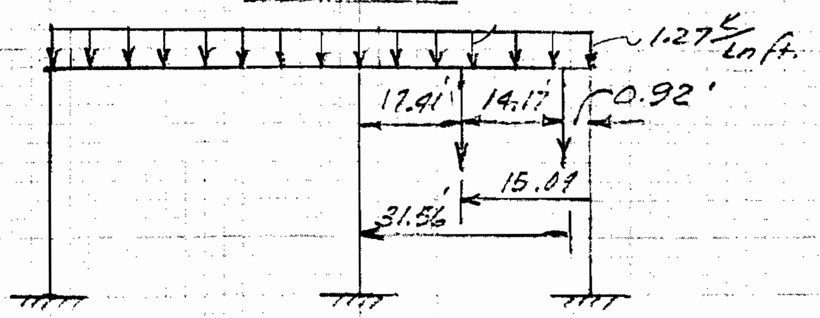
CASE 4X



CASE 5X



CASE 6X



CASE 7X

* GENERAL FRAME ANALYSIS *

FLORIDA EAST O.H. GATE CASES 1X 2X 3X AND 4X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	11.45
3	42.5	0
4	42.5	11.45
5	75	0
6	75	11.45

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	11.45	0.00	+11.45
2	2	4	B	42.50	42.50	+0.00
3	3	4	A	11.45	0.00	+11.45
4	4	6	C	32.50	32.50	+0.00
5	5	6	D	11.45	0.00	+11.45

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 3000

MEMBER TYPE A

LENGTH = 11.45 L(X)= 0 L(Y)= 11.45

UNIFORM LOADS:

HL	Y1	Y2
-.1	0	11.45

I = 54000 A = 720

FIXED-END MOMENTS LOADS

	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	1.09	-1.09	-0.57	-0.57

MEMBER TYPE B

LENGTH = 42.5 L(X)= 42.5 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2

1.27	0	0	42.5

CONCENTRATED LOADS:

DL	LL	X
0	16	14.17
0	16	28.34

I = 94969   A = 1170

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-191.16	191.16	26.98	26.98
LL	-151.07	151.12	15.99	16.00

MEMBER TYPE C

LENGTH = 32.5   L(X)= 32.5   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.27	0	0	32.5

CONCENTRATED LOADS:

DL	LL	X
0	16	9.17
0	16	23.34

I = 94969   A = 1170

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-111.78	111.78	20.63	20.63
LL	-105.27	105.30	15.99	16.00

MEMBER TYPE D

LENGTH = 11.45   L(X)= 0   L(Y)= 11.45

UNIFORM LOADS:

HL	Y1	Y2
-.1	0	11.45

I = 27648   A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	1.09	-1.09	-0.57	-0.57

LOADINGS

LOAD COMBINATION	1	2	3	4
DEAD LOAD FACTOR	1.000	1.000	0.750	0.750
LIVE LOAD FACTOR	-###.###	-###.###	-###.###	-###.###

TYPE

A

'HL' X .75 --LD. COMB 3
'HL' X .75 --LD. COMB 4

B
'LL' X 0 --LD. COMB 1
'LL' X 1 --LD. COMB 2
'LL' X 0 --LD. COMB 3
'LL' X .75 --LD. COMB 4

C
'LL' X 1 --LD. COMB 1
'LL' X 0 --LD. COMB 2
'LL' X .75 --LD. COMB 3
'LL' X 0 --LD. COMB 4

D
'HL' X .75 --LD. COMB 3
'HL' X .75 --LD. COMB 4

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 2

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 3

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 4

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0005	0.0001	0.000371	
3	0.0000	0.0000	0.000000	
4	0.0004	0.0003	0.000090	
5	0.0000	0.0000	0.000000	
6	0.0002	0.0002	-0.000499	

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 2
1	0.0000	0.0000	0.000000	
2	0.0010	0.0002	0.000734	
3	0.0000	0.0000	0.000000	
4	0.0007	0.0003	-0.000301	
5	0.0000	0.0000	0.000000	
6	0.0006	0.0001	-0.000137	

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 3
1	0.0000	0.0000	0.000000	
2	0.0003	0.0000	0.000273	
3	0.0000	0.0000	0.000000	
4	0.0002	0.0002	0.000064	
5	0.0000	0.0000	0.000000	
6	0.0001	0.0001	-0.000376	

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 4
1	0.0000	0.0000	0.000000	
2	0.0007	0.0001	0.000545	
3	0.0000	0.0000	0.000000	
4	0.0004	0.0002	-0.000229	
5	0.0000	0.0000	0.000000	
6	0.0004	0.0000	-0.000105	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-24.03	-13.75	42.27
		2	-24.03	-13.75	115.25
1	2	1	-40.19	-28.39	90.45
		2	-40.19	-28.39	234.69
1	3	1	-18.07	-11.18	35.52
		2	-18.07	-10.32	87.64
1	4	1	-30.19	-22.16	71.66
		2	-30.19	-21.30	177.22
3	1	3	-71.06	-0.76	-4.45
		4	-71.06	-0.76	13.23
3	2	3	-71.17	21.81	-95.30
		4	-71.17	21.81	-154.52
3	3	3	-53.30	-1.54	0.87
		4	-53.30	-0.68	11.91
3	4	3	-53.38	15.39	-67.26
		4	-53.38	16.25	-113.91
TYPE B					
2	1	2	-13.75	24.03	-115.25
		4	-13.75	-29.94	240.86
		MAX.			112.12
2	2	2	-28.39	40.19	-234.69
		4	-28.39	-45.78	353.42
		MAX.			222.40
2	3	2	-10.32	18.07	-87.64
		4	-10.32	-22.40	179.63
		MAX.			83.87
2	4	2	-21.30	30.19	-177.22
		4	-21.30	-34.28	264.05
		MAX.			166.59
TYPE C					
4	1	4	-14.52	41.11	-254.10
		6	-14.52	-32.15	108.28
		MAX.			141.03
4	2	4	-6.57	25.38	-198.89
		6	-6.57	-15.88	44.59
		MAX.			54.80
4	3	4	-11.01	30.89	-191.54
		6	-11.01	-24.06	80.36
		MAX.			105.91
4	4	4	-5.05	19.09	-150.14
		6	-5.05	-11.86	32.59
		MAX.			41.25
TYPE D					
5	1	5	-32.15	14.52	-58.03
		6	-32.15	14.52	-108.28
5	2	5	-15.88	6.57	-30.72
		6	-15.88	6.57	-44.59
5	3	5	-24.06	10.15	-40.84
		6	-24.06	11.01	-80.36
5	4	5	-11.86	4.19	-20.36

(24)

6	-11.86	5.05	-32.59

** GENERAL FRAME ANALYSIS **

FLORIDA EAST O.H. GATE CASE 5X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	11.45
3	42.5	0
4	42.5	11.45
5	75	0
6	75	11.45

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	11.45	0.00	+11.45
2	2	4	B	42.50	42.50	+0.00
3	3	4	A	11.45	0.00	+11.45
4	4	6	C	32.50	32.50	+0.00
5	5	6	D	11.45	0.00	+11.45

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 3000

MEMBER TYPE A

LENGTH = 11.45 L(X)= 0 L(Y)= 11.45

UNIFORM LOADS:

HL	Y1	Y2
.1	0	11.45

I = 54000 A = 720

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-1.09	1.09	0.57	0.57

MEMBER TYPE B

EXISTING DATA
LENGTH = 42.5 L(X)= 42.5 L(Y)= 0

FIXED-END MOMENTS LOADS

	LEFT	RIGHT	LEFT	RIGHT
DL	-191.16	191.16	26.98	26.98
LL	-151.07	151.12	15.99	16.00

MEMBER TYPE C

EXISTING DATA

LENGTH = 32.5   L(X)= 32.5   L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-111.78	111.78	20.63	20.63
LL	-105.27	105.30	15.99	16.00

MEMBER TYPE D

LENGTH = 11.45   L(X)= 0   L(Y)= 11.45

UNIFORM LOADS:

HL	Y1	Y2
.1	0	11.45

I = 27648   A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-1.09	1.09	0.57	0.57

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 0.750
LIVE LOAD FACTOR -###.###

TYPE

A
'HL' X .75 ---LD. COMB 1

B
'LL' X .75 ---LD. COMB 1

C
'LL' X 0 ---LD. COMB 1

D
'HL' X .75 ---LD. COMB 1

JOINT   P(X)   P(Y)   MOMENT   LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT.(CW)
1	0.0000	0.0000	0.000000
2	0.0008	0.0001	0.000555

LOAD COMBINATION 1

3	0.0000	0.0000	0.000000
4	0.0006	0.0002	-0.000223
5	0.0000	0.0000	0.000000
6	0.0005	0.0000	-0.000101

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-30.09	-20.43	64.02
		2	-30.09	-21.28	174.81
3	1	3	-53.37	17.33	-75.68
		4	-53.37	16.47	-117.88
TYPE B					
2	1	2	-21.28	30.09	-174.81
		4	-21.28	-34.39	266.08
		MAX.			167.00
TYPE C					
4	1	4	-4.81	18.98	-148.20
		6	-4.81	-11.97	34.29
		MAX.			40.96
TYPE D					
5	1	5	-11.97	5.67	-25.73
		6	-11.97	4.81	-34.29

** GENERAL FRAME ANALYSIS **

FLORIDA EAST O.H. GATE CASE 6X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	11.45
3	42.5	0
4	42.5	11.45
5	75	0
6	75	11.45

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	11.45	0.00	+11.45
2	2	4	B	42.50	42.50	+0.00
3	3	4	A	11.45	0.00	+11.45
4	4	6	C	32.50	32.50	+0.00
5	5	6	D	11.45	0.00	+11.45

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 3000

MEMBER TYPE A

EXISTING DATA
LENGTH = 11.45 L(X)= 0 L(Y)= 11.45

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	-1.09	1.09	0.57	0.57

MEMBER TYPE B

LENGTH = 42.5 L(X)= 42.5 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.27	0	0	42.5

CONCENTRATED LOADS:

DL	LL	X
0	16	35.42

1 = 94969   A = 1170

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-191.16	191.16	26.98	26.98
LL	-15.72	78.68	1.18	14.81

MEMBER TYPE C

LENGTH = 32.5   L(X)= 32.5   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.27	0	0	32.5

CONCENTRATED LOADS:

DL	LL	X
0	16	7.08

I = 94969   A = 1170

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-111.78	111.78	20.63	20.63
LL	-69.30	19.30	14.05	1.94

MEMBER TYPE D

EXISTING DATA
LENGTH = 11.45   L(X)= 0   L(Y)= 11.45

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-1.09	1.09	0.57	0.57

LOADINGS

LOAD COMBINATION   1

DEAD LOAD FACTOR   1.000
LIVE LOAD FACTOR   1.000

JOINT   P(X)   P(Y)   MOMENT   LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT.(CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0005	0.0001	0.000428	
3	0.0000	0.0000	0.000000	
4	0.0003	0.0004	-0.000035	
5	0.0000	0.0000	0.000000	
6	0.0003	0.0001	-0.000257	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT

TYPE A					
1	1	1	-26.07	-16.71	53.56
		2	-26.07	-16.71	137.86
3	1	3	-82.34	8.46	-39.06
		4	-82.34	8.46	-57.83
TYPE B					
2	1	2	-16.71	26.07	-137.86
		4	-16.71	-43.90	290.03
		MAX.			129.76
TYPE C					
4	1	4	-8.25	38.44	-232.20
		6	-8.25	-18.83	60.22
		MAX.			79.38
TYPE D					
5	1	5	-18.83	8.25	-34.30
		6	-18.83	8.25	-60.22

* GENERAL FRAME ANALYSIS *

FLORRIDA EAST O.H. GATE CASE 7X

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	11.45
3	42.5	0
4	42.5	11.45
5	75	0
6	75	11.45

JOINT RESTRAINTS

1 FIXED
3 FIXED
5 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	11.45	0.00	+11.45
2	2	4	B	42.50	42.50	+0.00
3	3	4	A	11.45	0.00	+11.45
4	4	6	C	32.50	32.50	+0.00
5	5	6	D	11.45	0.00	+11.45

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 3000

MEMBER TYPE A

EXISTING DATA
LENGTH = 11.45 L(X)= 0 L(Y)= 11.45

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-1.09	1.09	0.57	0.57

MEMBER TYPE B

EXISTING DATA
LENGTH = 42.5 L(X)= 42.5 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-191.16	191.16	26.98	26.98
LL	-15.72	78.68	1.18	14.81

MEMBER TYPE C

LENGTH = 32.5   L(X)= 32.5   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.27	0	0	32.5

CONCENTRATED LOADS:

DL	LL	X
0	16	17.41
0	16	31.58

I = 94969   A = 1170

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-111.78	111.78	20.63	20.63
LL	-60.45	83.18	7.18	24.81

MEMBER TYPE D

EXISTING DATA

LENGTH = 11.45   L(X)= 0   L(Y)= 11.45

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-1.09	1.09	0.57	0.57

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR   1.000
LIVE LOAD FACTOR   -###.###

TYPE

A

B

'LL' X 0   ---LD. COMB 1

C

'LL' X 1   ---LD. COMB 1

D

JOINT   P(X)   P(Y)   MOMENT   LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (--->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0005	0.0001	0.000376	
3	0.0000	0.0000	0.000000	
4	0.0003	0.0003	0.000021	
5	0.0000	0.0000	0.000000	

6	0.0002	0.0002	-0.000431

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-24.43	-14.58	46.51
		2	-24.43	-14.58	120.43
3	1	3	-61.92	2.10	-14.12
		4	-61.92	2.10	-9.92
TYPE B					
2	1	2	-14.58	24.43	-120.43
		4	-14.58	-29.53	228.85
		MAX.			114.66
TYPE C					
4	1	4	-12.47	32.38	-218.93
		6	-12.47	-40.88	93.15
		MAX.			152.49
TYPE D					
5	1	5	-40.88	12.47	-49.74
		6	-40.88	12.47	-93.15

OVERHEAD GATE DESIGN (AT Florida Ave East of I.H.C.)

CONCRETE FRAME DESIGN

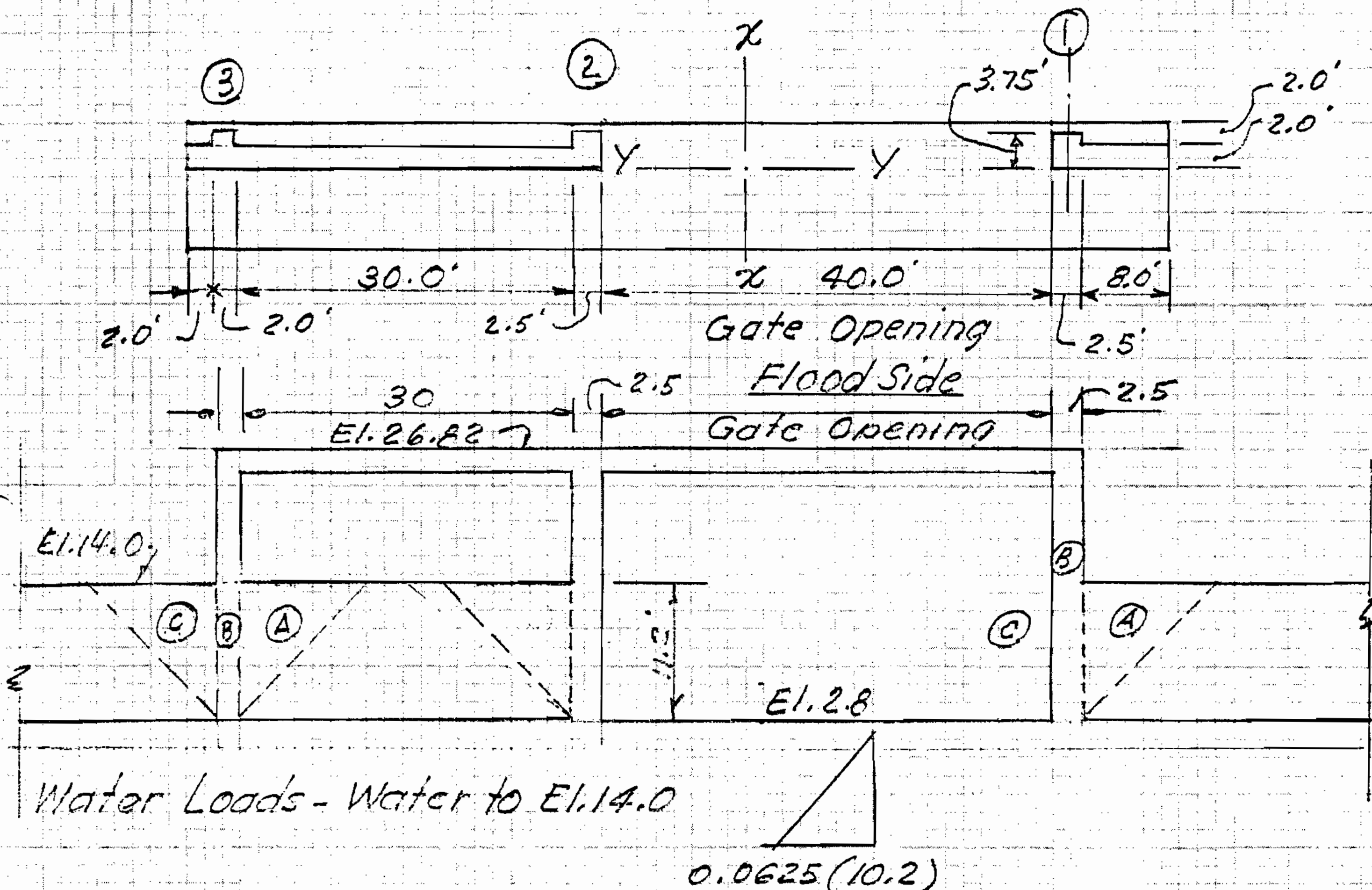
Summary SHEET

Frame Analysis:
Case 1x thru Case 7x
See page 19
(100%)

CASE	M_{AB}	M_{BA}	M_{BC}	M_{CB}	M_{CE}	M_{CD}	M_{DC}	M_{DF}	M_{FD}	M_{EC}	R_A	R_E	R_F	H_A	H_E	H_F
1x	42.53	115.22	-115.22	240.86	13.23	-254.1	108.28	-108.3	-58.03	4.45	-24.0	-71.1	-32.2	-13.8	-0.8	14.5
2x	90.45	234.69	-234.69	353.42	-154.42	-198.39	44.59	-44.6	-30.7	95.30	-40.2	-71.2	-15.9	-28.4	-21.8	6.6
3x	47.52	116.85	-116.85	239.51	15.88	255.39	107.15	-107.1	54.5	-1.16	-24.09	-71.1	-32.1	-14.9	-1.3	13.5
4x	95.53	236.29	237.09	352.07	-154.52	-200.19	43.45	-43.45	-27.2	89.62	-40.3	-71.2	-15.8	-29.5	-20.5	5.6
5x	85.36	233.08	-233.08	354.77	-157.17	-197.6	45.72	-45.7	-34.3	101.17	-41.2	-71.2	-16.0	27.2	23.1	7.5
6x	53.56	137.86	-137.86	290.03	57.83	-232.20	60.22	-34.3	-60.2	39.06	-26.1	-82.3	-18.8	-16.7	8.5	8.3
7x	46.51	120.43	-120.43	228.85	-9.92	-218.93	93.15	-93.2	-49.7	14.12	-24.4	-61.9	-40.9	-14.6	2.1	12.6

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN - Load about Y-Y Axis



Column ①

		Force	Arm	Moment
Ⓐ	$=\frac{1}{3}\left(\frac{1}{2}\times 11.2'\times 0.0625^k\right)(11.2)^2 =$	14.63^k	$5.6'$	$91.93'^k$
Ⓑ	$=\frac{1}{2}(2.5'\times 11.2'\times 0.0625^k)(11.2) =$	9.8^k	$3.73'$	$36.55'^k$
Gate Ⓒ	$=\frac{1}{2}(0.0625^k\times 11.2^2)\left(\frac{40}{2}\right) =$	78.4^k	$3.73'$	$292.43'^k$
		$\Sigma H_y = 102.83^k$		$\Sigma M_y = 420.91'^k$

Column ②

Same as Column ① $\Sigma H_y = 102.83^k$ $\Sigma M_y = 420.91'^k$

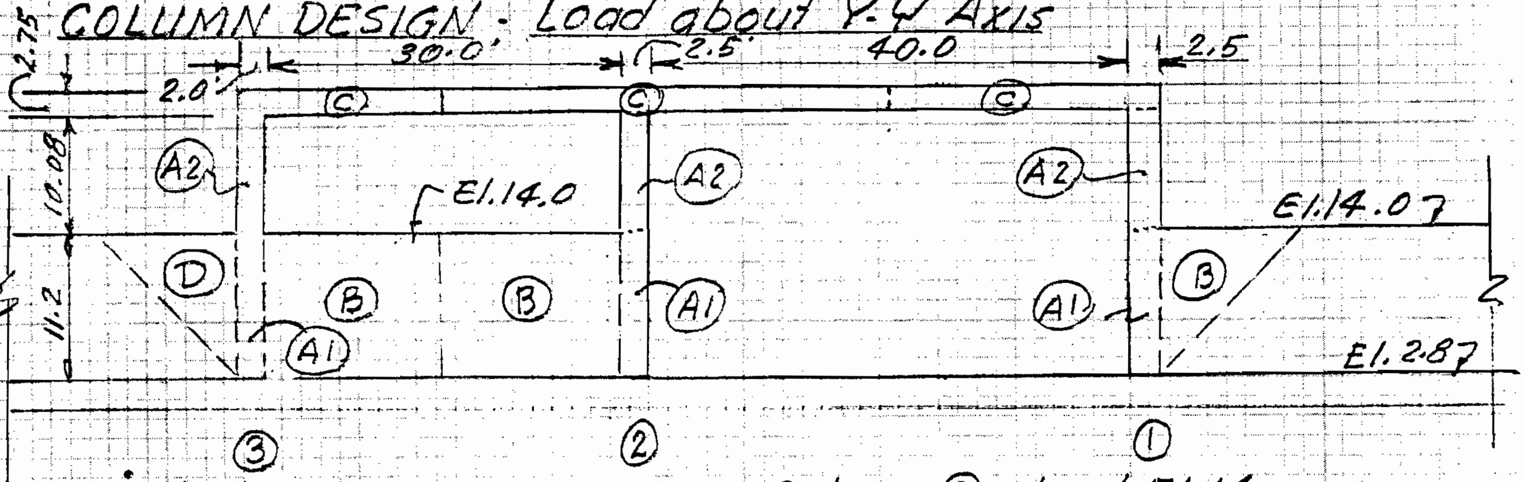
Column ③

Ⓐ	$=\frac{1}{3}\left(\frac{1}{2}\times 11.2\times 0.0625\right)(11.2)^2 =$	14.63^k	5.6	$91.93'^k$
Ⓑ	$\frac{1}{2}(2.0\times 11.2\times 0.0625)(11.2) =$	7.84^k	$3.73'$	$29.24'^k$
Ⓒ	$\frac{1}{3}\left(\frac{1}{2}\times 11.2\times 0.0625\right)(11.2)^2 =$	14.63^k	$5.6'$	$91.93'^k$
		37.10^k		$\Sigma M_y = 213\ldots'^k$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET No 36 OF
	ITEM	BY LWC DATE 9-15-79
	JOB No 575-79-E	CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN - Load about Y-Y Axis



Wind above El. 14.0

Column (2) about El. 14

$1.25^k \times (16.24' - 11.2') = 6.3'^k$

$5.16^k \times (22.66 - 11.2) = 59.13$

$\Sigma M_y = 65.43'^k$

	Force	Arm	Moment
Column (1)			
A2 $(2.5' \times 0.05^k)(10.08') =$	1.25^k	16.24'	$20.3'^k$
C $(2.75' \times 0.05^k)(20' + 2.5) =$	3.09^k	22.66	$70.0'^k$
	ΣH_y 4.34^k		ΣM_y $90.3'^k$
Column (2)			
A_2 $(2.5 \times 0.05)(10.08') =$	1.25^k	16.24'	$20.3'^k$
C $(2.75 \times 0.05)(20' + 2.5 + 15') =$	5.16^k	22.66'	$116.92'^k$
	ΣH_y 6.41^k		ΣM_y $137.22'^k$
Column (3)			
A2 $(2.0' \times 0.05^k)(10.08) =$	1.01^k	16.24'	$16.40'^k$
C $(2.75' \times 0.05^k)(15' + 2.0') =$	2.34^k	22.66'	$53.02'^k$
	ΣH_y 3.35^k		ΣM_y $69.42'^k$

Column (3) about El. 14

$1.01^k \times (16.24' - 11.2') = 5.09'^k$

$2.34^k \times (22.66' - 11.2') = 26.82'^k$

$31.91'^k$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN - Load about Y-Y Axis

Wind below Elev. 14.0

	Force	Arm	Moment
Column ①			
A1 $(2.5' \times 0.05^k)(11.2') =$	1.4^k	5.6'	$7.84'^k$
B $\frac{1}{2}(11.2)^2 \times 0.05^k =$	3.14	7.47'	$23.45'^k$
ΣHy	4.54^k	ΣMy	$31.29'^k$
Column ②			
A_1 $(2.5' \times 0.05^k)(11.2') =$	1.4^k	5.6'	$7.84'^k$
Gate B $\left(\frac{40.83'}{2} \times 11.2'\right)(0.05^k) =$	11.43^k	5.6'	$64.02'^k$
ΣHy	12.83^k	ΣMy	$71.86'^k$
Column ③			
A_1 $(2.0' \times 0.05^k)(11.2') =$	1.12^k	5.6'	$6.28'^k$
Gate B $\left(\frac{40.83'}{2} \times 11.2'\right)(0.05) =$	11.43^k	5.6'	$64.01'^k$
D $\frac{1}{2}(11.2)^2 \times 0.05 =$	3.14^k	7.47'	$23.46'^k$
ΣHy	15.69^k	ΣMy	$93.75'^k$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN (Bending about Y-Y axis)

Load Cases considered

Case 1Y - Gate opened, no water, no wind.
Case 2Y - Gate closed, water to Elev. 14.0, no wind.
Case 3Y - Gate opened, no water, wind from F.S. (75%)
Case 4Y - Gate closed, water to Elev. 14.0 wind from F.S. (75%)
Case 5Y - Gate opened, no water, wind from P.S. (75%)
Case 6Y - Gate closed, water to Elev. 14.0, wind from P.S. (75%)

Case 1Y   No water, no wind

$M1Y = 0.0$
$H1Y = 0.0$
$M2Y = 0.0$
$H2Y = 0.0$
$M3Y = 0.0$
$H3Y = 0.0$

Case 2Y   Water, no wind

$M1Y = 420.91'^{k}$
$H1Y = 102.83^{k}$
$M2Y = 420.91'^{k}$
$H2Y = 102.83^{k}$
$M3Y = 213.1'^{k}$
$H3Y = 37.10^{k}$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)
COLUMN DESIGN (Bending about Y-Y axis)

Case 3Y - Gate opened, no water, wind from F.S. (75%)

$M_1Y = 0.75(90.3^{'k} + 31.29^{'k}) = 0.75\ (121.59^{'k}) = 91.2^{'k}$

$H_1Y = 0.75(4.34^k + 4.54^k) = 0.75\ (8.88^k) = 6.66^k$

$M_2Y = 0.75(137.22^{'k} + 71.86^{'k}) = 0.75\ (209.1^{'k}) = 156.8^{'k}$

$H_2Y = 0.75(6.41^k + 12.83^k) = 0.75\ (19.24^k) = 14.43^k$

$M_3Y = 0.75(69.42^{'k} + 93.75^{'k}) = 0.75\ (163.2^{'k}) = 122.4^{'k}$

$H_3Y = 0.75(3.35^{'k} + 15.69^k) = 0.75\ (19.04^k) = 14.28^k$

Case 4Y - Gate closed, water to El. 14.0, wind from F.S. (75%)

$M_1Y = 0.75(420.91^{'k} + 90.3^{'k}) = 0.75\ (511.2^{'k}) = 383.4^{'k}$

$H_1Y = 0.75(102.83^k + 4.34^k) = 0.75\ (107.17^k) = 80.38^k$

$M_2Y = 0.75(420.91^{'k} + 137.22^{'k}) = 0.75\ (558.1^{'k}) = 418.6^{'k}$

$H_2Y = 0.75(102.83^k + 6.41^k) = 0.75\ (109.24^k) = 81.93^k$

$M_3Y = 0.75(213.1^{'k} + 69.42^{'k}) = 0.75\ (282.52^{'k}) = 211.89^{'k}$

$H_3Y = 0.75(37.10^k + 3.35^k) = 0.75\ (40.45^k) = 30.34^k$

Case 5Y - Gate opened, no water, wind from P.S. (75%)

$M_1Y = 0.75(-90.3^{'k} - 31.29^{'k}) = 0.75\ (-121.6^{'k}) = -91.2^{'k}$

$H_1Y = 0.75(-4.34^k - 4.54^k) = 0.75\ (-8.88^k) = -6.66^k$

$M_2Y = 0.75(-137.22^{'k} - 71.86^{'k}) = 0.75\ (209.1^{'k}) = -156.8^{'k}$

$H_2Y = 0.75(-6.41^k - 11.43^k) = 0.75\ (17.84^k) = -13.38^k$

$M_3Y = 0.75(-69.62^{'k} - 93.75^{'k}) = 0.75\ (167.4^{'k}) = -122.5^{'k}$

$H_3Y = 0.75(-3.35^k - 15.69^k) = 0.75\ (19.04^k) = -14.28^k$

See Case 3Y

Case 6Y - Gate closed, water to El. 14.0, wind from P.S. (75%)

$M_1Y = 0.75(420.91^{'k} - 121.59^{'k}) = 0.75\ (299.32^{'k}) = 224.5^{'k}$

$H_1Y = 0.75(102.83^k - 8.88^k) = 0.75\ (93.95^k) = 70.46^k$

$M_2Y = 0.75(420.91^{'k} - 209.1^{'k}) = 0.75\ (211.81^{'k}) = 158.9^{'k}$

$H_2Y = 0.75(102.83^k - 19.24^k) = 0.75\ (83.59^k) = 62.7^k$

$M_3Y = 0.75(213.1^{'k} - 163.2^{'k}) = 0.75\ (49.9^k) = 37.4^{'k}$

$H_3Y = 0.75(37.1^k - 19.04^k) = 0.75\ (18.06^k) = 13.55^k$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ ITEM ____ JOB No 575-79-E

SHEET No 40 OF ____ BY LWC DATE 9-17-79 CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida East of IHNC)

COLUMN DESIGN (Bending about Y-Y axis)

Load Case	Column No. 1		Column No. 2		Column No 3	
	M_{1Y}	H_{1Y}	M_{2Y}	H_{2Y}	M_{3Y}	H_{3Y}
1	0.00	0.00	0.00	0.00	0.00	0.00
2	420.91'k	102.83k	420.91	102.83	213.1'k	37.10k
3	91.2'k	6.66k	156.8'k	14.43k	122.4'k	14.28k
4	383.4'k	80.34k	418.6'k	81.93k	211.89'k	30.34k
5	-91.2'k	-6.66k	-156.8'k	-13.38k	-122.5'k	-14.28k
6	224.5'k	70.46k	158.9'k	62.7k	37.4'k	13.55k

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN

Combined Load Cases (Bending about x-x and y-y axes)

The following cases are considered:

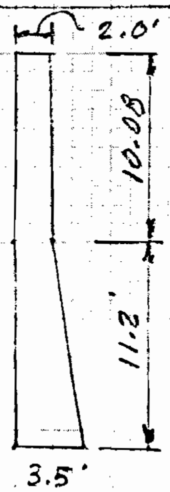
- Case I - Case 1x (75%) + Case 3Y (75%)
- Case II - Case 1x (75% + Case 5Y (75%)
- Case III - Case 2x + Case 2Y
- Case IV - Case 2x (75%) + Case 4Y (75%)
- Case V - Case 2x (75%) + Case 6Y (75%)
- Case VI - Case 3x (75%) + Case 1Y (75%)
- Case VII - Case 4x (75%) + Case 2Y (75%)
- Case VIII - Case 4x (75%) + Case 6Y (75%)
- Case IX - Case 5x (75%) + Case 2Y (75%)
- Case X - Case 6x + Case 1Y
- Case XI - Case 6x (75%) + Case 3Y (75%)
- Case XII - Case 6x (75%) + Case 5Y (75%)
- Case XIII - Case 7x + Case 1Y
- Case XIV - Case 7x (75%) + Case 3Y (75%)
- Case XV - Case 7x (75%) + Case 5Y (75%)

Column Weights

Column 1 and 2 $= [2.0'(10.08 + 11.2')] + [1.5' \times 11.2' \times 0.5] \times [2.5'] \times 0.15$

$= (42.416\,\square' + 8.4\,\square')(2.5')(0.15^{k})$

$= 18.95^{k}$



Column 3 $= (42.416\,\square' + 8.4\,\square')(2.0)(0.15^{k})$

$= 15.25^{k}$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN ~ Summary of Combined Load Cases

Load Case	Column No1					Column No2					Column No3				
	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R
I	86.4	91.2	-10.4	6.7	-18.0	9.9	156.8	0.6	14.43	53.3	-81.2	122.4	10.9	14.28	24.2
II	86.4	-91.2	-10.4	6.7	-18.0	9.9	-156.8	0.6	-13.38	53.3	-81.2	-122.5	10.9	-14.28	24.2
III	234.7	420.91	-28.4	102.8	-40.2	-154.4	420.9	21.8	102.8	71.2	-44.6	213.1	-6.6	37.1	-15.9
IV	175.0	383.4	-21.3	80.4	-30.2	-115.8	418.6	16.4	81.9	53.4	-33.5	-122.5	-5.0	-14.28	-11.9
V	175.0	224.5	-21.3	70.5	-30.2	-115.8	158.9	16.4	62.7	53.4	-33.5	37.4	-5.0	13.55	-11.9
VI	87.6	0.0	-11.2	0.0	-18.1	-11.9	0.0	1.0	0.0	53.3	-80.3	0.0	-10.1	0.0	-24.1
VII	177.2	315.6	-22.1	77.1	-30.3	-115.9	315.7	15.4	77.1	53.4	-32.6	159.8	-4.2	27.8	-30.2
VIII	177.2	224.5	-22.1	70.5	-30.3	-115.9	158.9	15.4	62.7	53.4	-32.6	37.4	-4.2	13.55	-30.2
IX	174.8	315.6	-20.4	77.1	-30.9	-117.9	315.7	17.3	77.1	53.4	-39.2	159.8	-12.0	27.8	-5.6
X	137.9	0.0	-16.7	0.0	-26.1	-57.8	0.0	8.5	0.0	82.3	-34.3	0.0	-18.8	0.0	-8.3
XI	103.4	91.2	-12.5	6.7	-19.6	-43.4	156.8	6.4	14.43	61.7	-25.7	122.4	-14.1	14.28	-6.2
XII	103.4	-91.2	-12.5	6.7	-19.6	-43.4	156.8	6.4	13.4	61.7	-25.7	122.5	-14.1	14.28	-6.2
XIII	120.4	0.0	-14.6	0.0	-29.4	-9.9	0.0	2.1	0.0	61.9	-93.2	0.0	-18.8	0.0	-12.6
XIV	90.3	91.2	-11.0	6.7	-18.3	-7.4	156.8	1.6	14.43	46.4	-69.9	122.4	-14.1	14.28	-9.5
XV	90.3	-91.2	-11.0	6.7	-18.3	-7.4	156.8	1.6	13.38	46.4	-69.9	-122.5	-14.1	-14.28	-9.5

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN Columns 1 and 2 (See ACI SP-3)

Loading - Case 4X, page 34 Col #1 $\overset{My\ {}'k}{(236.29)}$ Case IV page 42 Col #2 $\underset{My}{(418.6'^{k})}$

Reaction Case 5x, page 34 (R_E) 71.2^{KIPS}

$N = 18.95^k + 71.2^k = 90.15^k$

$Mx = 418.6'^{k}$

$Mx = 236.3'^{k}$

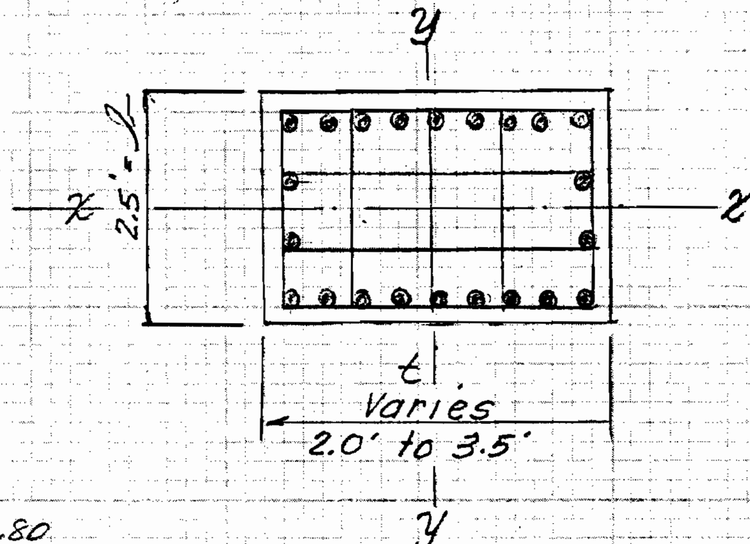
$f_y = 40{,}000\,psi$

$f'_c = 3000$

$n = 9$

$b = 30''$

$t = 24''$ to $42''$



$g_x = 0.80$ } 3" cl. $30-6=24 \quad \frac{24}{30} = 0.80$

$g_y = 0.86$ } $42-6=36 \quad \frac{36}{42} = 0.86$

$A_g = 30'' \times 42'' = 1260$ Sq. inches

② Try 22 #11 bars

$A_{st} = 22 \times 1.56^{\square''} = 34.22^{\square''}$

$P_g = \frac{34.32^{\square''}}{1260^{\square''}} = 0.0272$

1. Compute $\frac{N}{f'_c A_g} = \frac{90.15}{3(1260)} = 0.0239$

f'_c in kips

from table 26 - SP3

For $g_x = 0.80$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0239$

For $g_y = 0.86$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0239$

} Tension controls

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN - Columns 1 and 2

Properties of reinforcement about Y-Y Axis

$As_1 = 2 \times 9 \times 1.56^{\square''} = 28.08^{\square''}$ $\quad P_{y1} = \frac{28.08^{\square''}}{1260^{\square''}} = 0.0228$

$As_2 = 2 \times 2 \times 1.56^{\square''} = 6.24^{\square''}$ $\quad P_{y2} = \frac{6.24^{\square''}}{1260^{\square''}} = 0.00495$

$$P'_y = P_{y1} + \frac{P_{y2}}{2} = 0.0228 + 0.002476 = 0.02476$$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$

$P_{y2} = P_{x2}$ $\quad \therefore P'_y = P'_x = 0.02476$

③ Table 34 (ACI-SP3) $\quad K = \frac{0.00495}{0.0228} = 0.215$

$P_g = 0.0272$ $\quad D'_y = 0.142$

For $g_y = 0.80$

$K = 0.215$ $\quad D'_x = 0.141$

Table 26 (ACI-SP3)

$f_y = 40{,}000$

$f'_c = 3{,}000$

For $g_y = 0.86$

Read $C'_y = 1.76$

For $g_x = 0.80$

Read $C'_x = 1.88$

$$M_{x-x} = N\left(\frac{D'_x b}{12}\right) + p'_x\left(\frac{t b^2}{C'_x}\right)$$

$$= 90.15^k\left(\frac{0.141 \times 30}{12}\right) + 0.02476\left(\frac{42(30)^2}{1.88}\right)$$

$$= 529.61'^k$$

$$M_{y-y} = N\left(\frac{D'_y t}{12}\right) + p'_y\left(\frac{b t^2}{C'_y}\right)$$

$$= 90.15\left(\frac{0.142 \times 42}{12}\right) + 0.02476\left(\frac{30(42)^2}{1.76}\right)$$

$$= 789.29'^k$$

$$\frac{M_x}{M_{xx}} + \frac{M_y}{M_{yy}} \leq 1$$

$$\frac{236.3'^k}{529.6'^k} + \frac{418.6'^k}{789.3'^k} = 0.977 < 1 \quad \text{O/K}$$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN - Columns 1 and 2 at El. 14.0

Loading. Column 2 M_y (see page 36) = $65.43'^k$

EC-Member M_x (see page 34) = $101.17'^k$

Reaction (page 34) = 82.3^k

Column Wt.
$2' \times 2.5' \times 10.08' \times 0.15^k$
$= 7.56^k$

$N = 82.3^k + 7.56^k = 89.86^k$

$M_y = 65.43'^k$

$M_x = 101.17'^k$

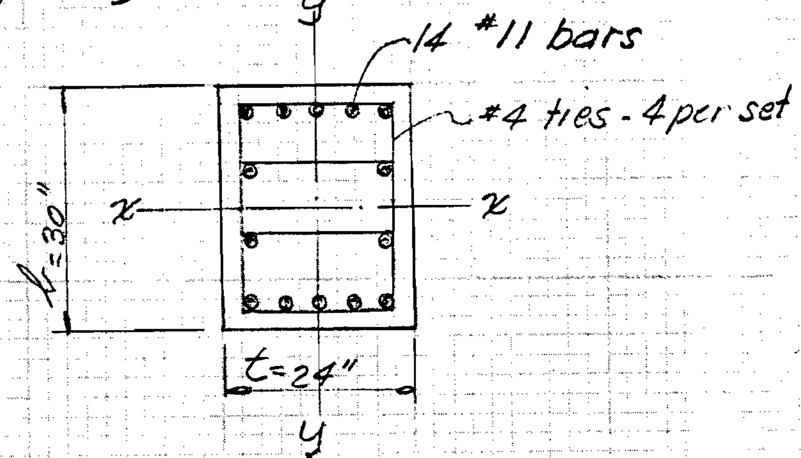
$f_y = 40{,}000$ psi

$f'_c = 3000$ psi

$n = 9$

$b = 30''$

$t = 24''$



$g_x = 0.80 \quad \frac{24}{30} = 0.80$

$g_y = 0.75 \quad \frac{18}{24} = 0.75$

$A_g = 30'' \times 24'' = 720\,\square''$

① Compute $\frac{N}{f'_c A_g} = \frac{89.86^k}{3^k(720\,\square'')} = 0.0416$

(kips)

From Table 26

For $g_x = 0.80$

$\frac{P_b}{f'_c A_g} = 0.207 > 0.0416$

For $g_y = 0.75$

$\frac{P_b}{f'_c A_g} = 0.207 > 0.0416$

② Assume 14 #11 bars

$A_{st} = 14 \times 1.56\,\square'' = 21.84\,\square''$

$\frac{P_g = 21.84\,\square''}{A_g = 720\,\square''} = 0.03033$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN - Columns 1 and 2 @ El. 14.0

Properties of Reinforcement about Y-Y Axis

$A_{s1} = 2 \times 5 \times 1.56\square'' = 11.56\square''$ $P_{y1} = \frac{11.56\square''}{720\square''} = 0.0161$

$A_{s2} = 2 \times 2 \times 1.56\square'' = 6.24\square''$ $P_{y2} = \frac{6.24\square''}{720\square''} = 0.087$

$$P'_y = P_{y1} + \frac{P_{y2}}{2} = 0.0161 + \frac{0.0087}{2} = 0.02045$$

Properties of Reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore P'_y = P'_x = 0.02045$

③ Table 34 (SP-3)

$P_g = 0.03033$

For $g_y = 0.75$

$K = \frac{0.0087}{0.0161} = 0.50$

Read $D'_y = 0.152$

For $g_x = 0.8$ $K = 0.5$

$D'_x = 0.152$

Table 26 (SP-3)

$f_y = 40{,}000$ psi

f'_c 3,000 psi

For $g_y = 0.75$

$C'_y = 2.00$

For $g_x = 0.80$

$C'_y = 1.88$

$$M_{x\text{-}x} = N\left(\frac{D'_x b}{12}\right) + P'_x\left(\frac{t b^2}{C'_x}\right)$$

$$M_{x\text{-}x} = 89.86^k\left(\frac{0.152 \times 30}{12}\right) + 0.02045\left(\frac{24(30)^2}{1.88}\right)$$

$$M_{xx} = 269.1'^k$$

$$M_{y\text{-}y} = N\left(\frac{D'_y t}{12}\right) + P'_y\left(\frac{b t^2}{C'_y}\right)$$

$$= 89.86^k\left(\frac{0.152 \times 24}{12}\right) + 0.02045\left(\frac{30(24)^2}{2.0}\right)$$

$$M_{y\text{-}y} = 204.0'^k$$

$$\frac{M_x}{M_{x\text{-}x}} + \frac{M_y}{M_{yy}} \leq 1$$

$$\frac{101.2'^k}{269.1} + \frac{65.43'^k}{204.0} = 0.6968 < 1$$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN - Column 3

Loading - My (Case IX or VII page 42) $159.8'^{k}$ Mx (Case IX - page 34) $Mx = 108.3'^{k}$

Reaction, Case VII, 30.2^{k} page 42

$N = 30.2^{k} + 15.25^{k} = 45.45^{k}$ (Page 41)

$Mx = 108.3'^{k}$

$My = 159.8'^{k}$

$f_y = 40{,}000$ psi

$f'_c = 3{,}000$ psi

$n = 9$

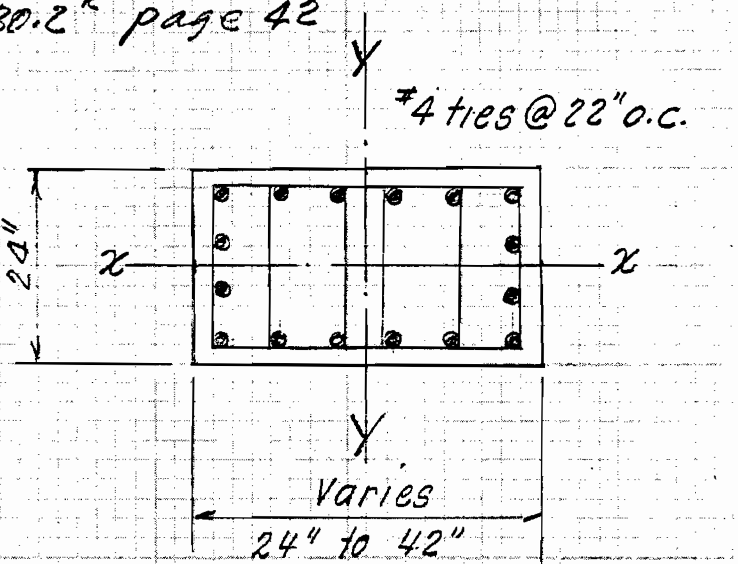
$b = 24''$

$t = 42''$

$g_x = 0.75$ $\quad \frac{18}{24}$

$g_y = 0.86$ $\quad \frac{36}{42}$

$A_g = 24'' \times 42'' = 1008\,\square''$



① Compute $\frac{45.45^{k}}{3^{k}(1008\,\square'')} = 0.015$

$f'_c = 3^{k}$

From table 26 (SP-3)

For $g_x = 0.75$

$$\frac{P_b}{f'_c A_g} = 0.20 > 0.015$$

For $g_x = 0.86$

$$\frac{P_b}{f'_c A_g} = 0.20 > 0.015$$

② Assume 16 - #11 bars as shown

$A_{st} = 16 \times 1.56\,\square'' = 24.96\,\square''$

$$\frac{P_g}{A_g} = \frac{24.96\,\square''}{1008\,\square''} = 0.02476$$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ____ ITEM ____ JOB No 575-79-E

SHEET No 48 OF ____ BY LWC DATE 9-19-79 CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN Column 3

Properties of reinforcement about Y-Y Axis

$As1 = 2 \times 6 \times 1.56^{\square''} = 18.72^{\square''}$; $P_{y1} = \frac{18.72^{\square''}}{1008^{\square''}} = 0.01857$

$As2 = 2 \times 2 \times 1.56'' = 6.24^{\square''}$; $P_{y2} = \frac{6.24^{\square''}}{1008^{\square''}} = 0.00619$

$$P'y = P_{y1} + 0.5\,P_{y2}$$
$$= 0.01857 + 0.003095 = 0.02167$$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$

$P_{y2} = P_{x2}$ $\therefore P'y = P'x = 0.02167$

③ Table 34 (SP-3)

$P_g = 0.02476$

For $g_x = 0.86$

Read $D'y = 0.149$

$K = \frac{0.00619}{0.01857} = 0.33$

For $g_x = 0.75$

Read $D'x = 0.151$

Table 26 (SP-3

$f_y = 40{,}000$

$f'c = 3{,}000$

For $g_y = 0.86$

Read $C'y = 1.76$

For $g_x = 0.75$

Read $C'x = 2.0$

$$M_{x\text{-}x} = N\left(\frac{D'x\,b}{12}\right) + P'x\left(\frac{t\,b^2}{C'x}\right)$$
$$= 45.45\left(\frac{0.151 \times 24}{12}\right) + 0.02167\left(\frac{42 \times 24^2}{2.0}\right)$$
$$M_{x\text{-}x} = 275.9'^{K}$$

$$M_{y\text{-}y} = N\left(\frac{D'y\,t}{12}\right) + P'y\left(\frac{b\,t^2}{C'y}\right)$$
$$= 45.45\left(\frac{0.149 \times 42}{12}\right) + 0.02167\left(\frac{24 \times 42^2}{1.76}\right)$$
$$M_{y\text{-}y} = 545.0'^{K}$$

$$\frac{M_x}{M_{x\text{-}x}} + \frac{M_y}{M_{y\text{-}y}} = \leq 1$$

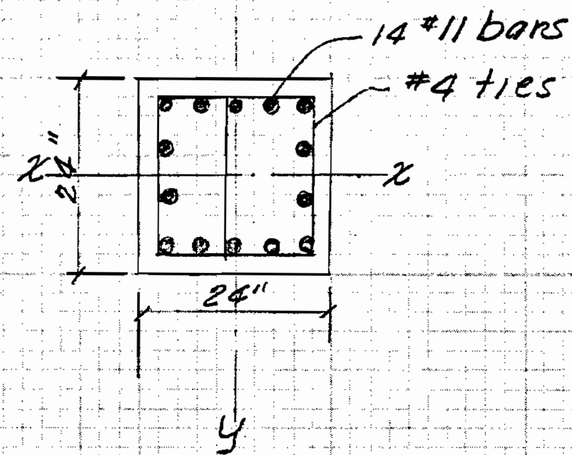
$$\frac{108.3'^{K}}{275.9'^{K}} + \frac{159.8'^{K}}{545.0'^{K}} = 0.686 < 1$$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

COLUMN DESIGN - Column 3 @ El. 14.0

Loading: My = 31.91'k (Bottom pg. 36), Mx = 58.03 {Case 1x page 34

Reaction 32.2k (Case 1x page 34)   Col. wt. = 2x2'x10.08'x0.15k = 6.05k



$N = 32.2^k + 6.05^k = 38.25^k$

$My = 31.91'^k$

$Mx = 58.03'^k$

$f_y = 40{,}000$ psi

$f'_c = 3{,}000$ psi

$n = 9$

$b = 24"$

$t = 24"$

$g_x = 0.75$ } $\frac{18}{24}$

$g_y = 0.75$

$A_g = (24")^2 = 576\,\square"$

① Compute $\frac{N}{f'_c A_g} = \frac{38.25^k}{3(576)} = 0.0221$ (f'_c = 3k)

From table 26 (SP3)

For $g_x = 0.75$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0221$

For $g_y = 0.75$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0221$

② Assume 14 #11 bars as shown

$A_{st} = 14 \times 1.56\,\square" = 21.84\,\square"$

$P_g = \frac{21.84\,\square"}{576\,\square"} = .0379$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)
COLUMN DESIGN - Column 3 @ El. 14.0

Properties of reinforcement about Y-Y Axis

$As_1 = 2 \times 5 \times 1.56^{\square''} = 15.60^{\square''}$; $P_{y1} = \frac{15.60^{\square''}}{576^{\square''}} = 0.0271$

$As_2 = 2 \times 2 \times 1.56^{\square''} = 6.24^{\square''}$; $P_{y2} = \frac{6.24^{\square''}}{576^{\square''}} = 0.0108$

$P'_y = P_{y1} + 0.5\, P_{y2}$
$= 0.0271 + 0.0054 = 0.0325$

Properties of reinforcement about x-x Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore P'_y = P'_x = 0.0325$

③ Table 34 (SP-3)
$P_g = 0.0379$

For $g_y = 0.75$ $K = \frac{0.0108}{0.0271} = 0.40$
Read $D'_y = 0.161$
For $g_x = 0.75$
Read $D'_x = 0.161$

$M_{x-x} = 38.25^{K}\left(\frac{0.161 \times 24}{12}\right) + 0.0325\left(\frac{24 \times 24^2}{2.0}\right)$

$M_{x-x} = 237.0'^{K}$

Table 26 (SP-3)
For $g_y = 0.75$
Read $C'_y = 2.0$
For $g_x = 0.75$
Read $C'_x = 2.0$

$M_{y-y} = 38.25\left(\frac{0.161 \times 24}{12}\right) + 0.0325\left(\frac{24 \times 24^2}{2}\right)$

$M_{y-y} = 237.0'^{K}$

$\frac{58.03'^{K}}{237'^{K}} + \frac{31.91}{237'^{K}} = 0.379 < 1$
ok

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

COLUMN DESIGN Check shear Columns 1 and 2

$V = 102.8^k$ (Case III page 42

$v = \dfrac{102.8^k}{27.5'' \times 42''} = 0.089$ ksi

Allowable $v = 1.1\sqrt{f_c'} = 1.1\sqrt{3.000} = 0.060^{ksi}$

$v' = 0.089$ ksi $- 0.06$ ksi $= 0.029$ ksi $= 29$ psi

$L = 11.2' + 10.08' = 21.28'$

Distant from support for stirrups $= a$

$a = \frac{L}{2}\left(\frac{v'}{v}\right) = \frac{21.28}{2}\left(\frac{0.029}{0.089}\right) = 3.47'$

Spacing of stirrups - Use #4 stirrups $= 0.2^{\square''}$ 5 bend or legs

$S = \dfrac{A_v f_v}{v' b}$ $b = 30''$ $16^{ksi} = f_v$

$S = \dfrac{5 \times 0.20 \times 16^k}{29_{psi} \times 30''} = 18.39''$

Use #4 stirrups @ 18"

Check shear Column 3

$V = 37.1^k$

$v = \dfrac{37.1^k}{21.5 \times 42} = 0.041$ less than 0.060^{ksi} Allowable

Check Embedment #11 bar Perimeter = 4.43" $j = 0.875$ $d = 21.5''$

- Col. 1 and 2 -

$U = \dfrac{V}{\Sigma o j d} = \dfrac{102.8^k}{(22 \times 4.43)(0.875)(21.5)} = 0.056^{ksi}$

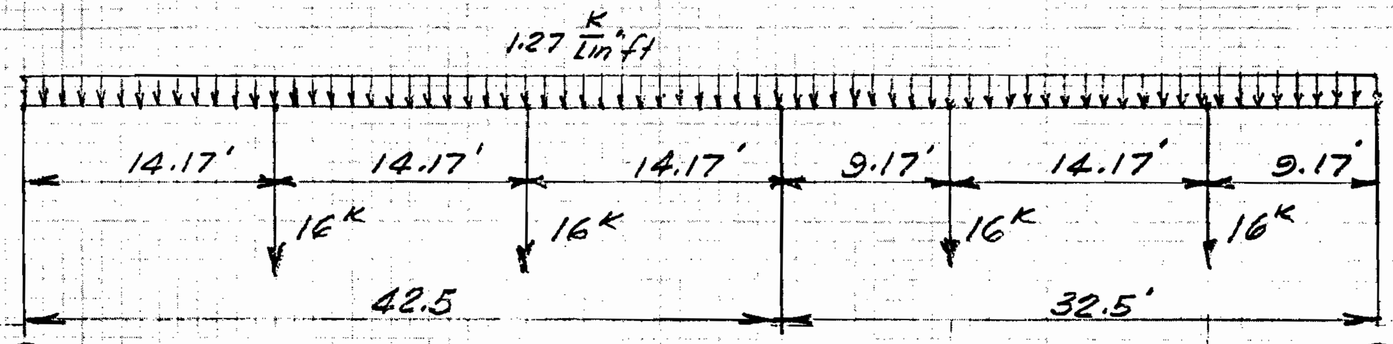
Allowable
#11 = 0.132^{ksi}
Table 14a (SP-3

Col. 3

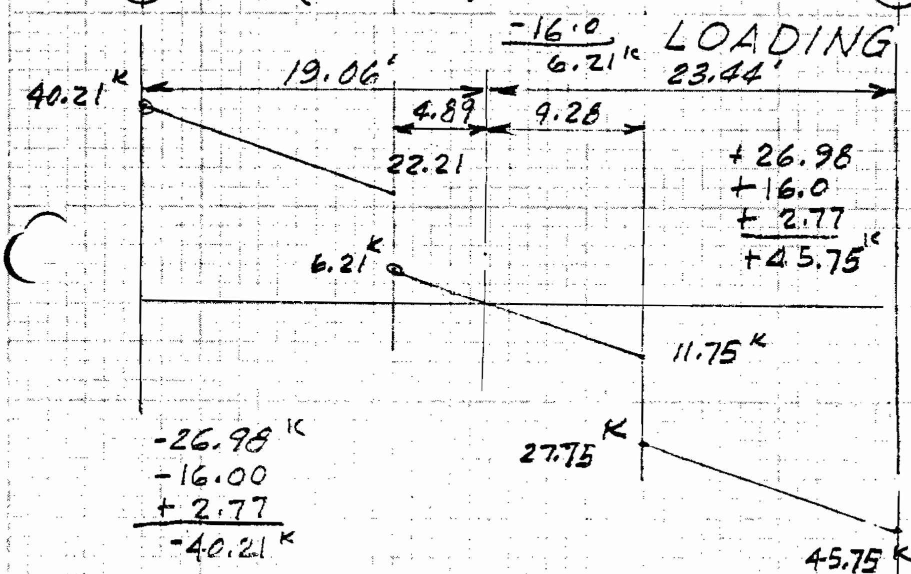
$\dfrac{47.7^k}{(22 \times 4.43)(0.875)(21.5)} = 0.026^{ksi}$

OVERHEAD GATE DESIGN (At Florida Avenue East of IHNC)

CONCRETE BEAM DESIGN



$-40.21-(14.17' \times 1.27) = 22.21^{K}$



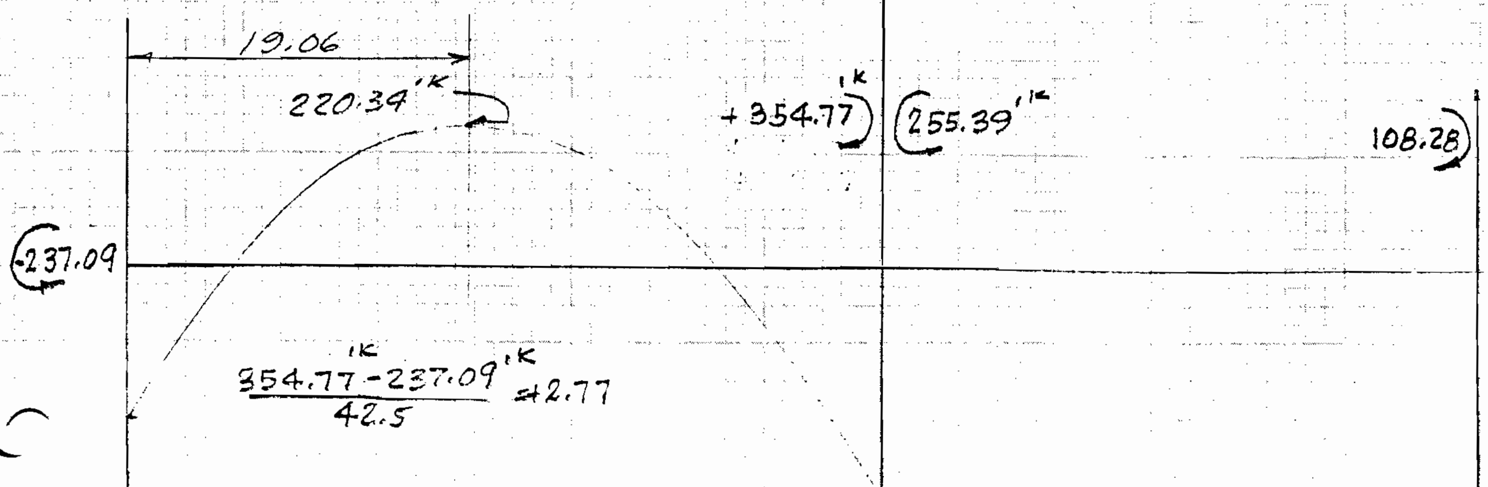
Point of Zero Shear

From (B)

$$\frac{6.21'}{1.27} + 14.17 = 19.06'$$

From (C)

$$\frac{11.77}{1.27} + 14.17 = 23.44'$$



$$\frac{354.77^{'K}-237.09^{'K}}{42.5} = 2.77$$

$$M_{+} = \left[(14.17)(22.21)\right] + \left[\frac{(40.21-22.21)(14.17)}{2}\right] + \left[\frac{(6.21)(4.89)}{2}\right] - 237.09^{'K} \doteq 220.34^{'K}$$

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

CONCRETE BEAM DESIGN Postive Reinforcement

$M = 220.34'^k$

$F = \frac{M}{K} = \frac{220.34'^k}{152} = 1.45$ $\quad d = \sqrt{\frac{1.45 \times 12000}{24''}} = 26.93'' < 30$

Table I $\quad b =$ Page 16

$d = 30$

$As = \frac{M}{ad}$

Reduce to face Column

$220.34'^k - \frac{45.75^k(2.5)}{6} = 201.28'^k$

$As = \frac{201.28'^k}{(1.44)(29.5)} = 4.74^{\square''}$

Use 6 - #9 bars = $6.0^{\square''}$

Negative Reinforcement

$M = 354.77'^k$

$M = 354.77'^k - (45.75^k \times 1.25)$ $\quad d = \sqrt{\frac{1.96 \times 12000}{24''}} = 31.3'' > 30$

$M = 297.6'^k$ $\quad$ ok with compression reinf.

$\frac{F}{K} = \frac{297.6'^k}{152} = 1.96$

$As = \frac{297.6'^k}{1.44 \times 30} = 6.89^{\square''}$ Note: add to torsional reinforcement

Stirrups

Shear @ "d" from support

$V = 45.75^k - [1.27^{k/Ft} \times 2.5] + [\frac{16^k}{14.17'} \times 2.5]$

$V = 39.75^k$

$v = \frac{39.75^k \times 1000}{24 \times 30} = 55.2 \text{ psi} < 1.1\sqrt{3000} = 60 \text{ psi}$

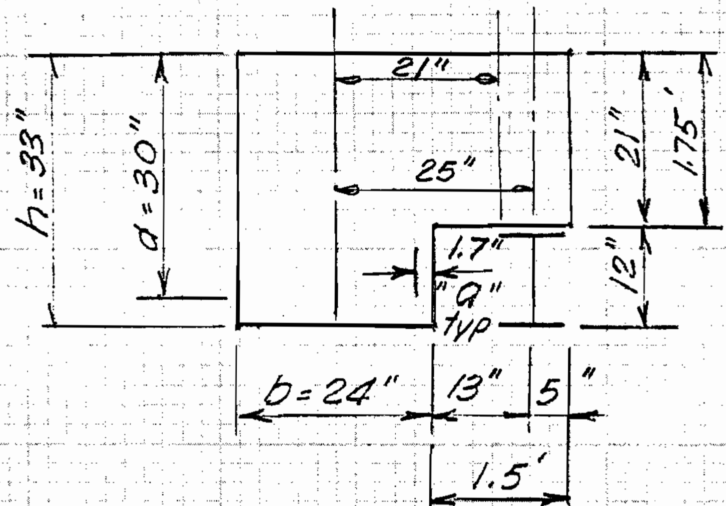
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 54 OF
BY LWC DATE 9-20-79
CHKD. BY DATE

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

CONCRETE BEAM DESIGN (Torison)



Force		Arm	Moment
Concrete	$1.75' \times 1.5' \times 0.15^k$	21"	$8.27''^k$
Steel	0.05^k	25"	$1.25''^k$
			$9.52''^k$

$$\left(9.52''\tfrac{k}{Ft} \times \frac{42.5}{2}\right) + \left(16^k \times 25''\right) = 602.3''^k = M_t$$

The bending moment at face of support:

$$M_f = 354.8'^k - (45.75^k \times 1.25') = 297.6'^k$$

$$C_1 = \frac{(h + 0.5b)}{(b - 2a_1)\left(1 + \frac{0.5d}{h - 2a_2}\right)}$$

$$= \frac{33 + [0.5 \times 24]}{[24 - (2 \times 1.7)]\left[1 + \frac{15}{33 - (2 \times 1.7)}\right]}$$

$$= \frac{45}{(20.6)(1.507)}$$

$$= 1.45$$

$$C_2 = \frac{M_t}{M_f} = \frac{602.3''^k}{297.6'^k \times 12} = 0.1687$$

$$1 + C_1 C_2 = 1 + (1.45 \times 0.1687)$$
$$= 1.245$$

Design Moment

$$M = (\text{Applied bending Mom.})(1 + C_1 C_2)$$
$$= 297.6'^k \times 1.245$$
$$= 370.5'^k$$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

CONCRETE BEAM DESIGN (Torison)

Stirrups required:

$X_1 = 24'' - (2 \times 1.7'') = 20.6''$

$Y_1 = 33'' - (2 \times 1.7'') = 29.6''$

$S = 1.6\, f_s\, A_s\, X_1 Y_1$

$$S = \frac{(1.6)(20^{KSI})(20.6)(29.6)\, A_s}{370.5'^{K} \times 12}$$

$= 4.39''$

Use #4 @ 6 up to 3" from end

Longitudinal Reinforcing Steel

$$A_t = \frac{(2)\, A_s\, (x_1 + y_1)}{S}$$

$$= \frac{(2 \times 0.20^{\square''})(20.6 + 29.6)}{5}$$

$= 4.02^{\square''}$

Total Negative Reinf.

$4.02^{\square''} + 6.89^{\square''} = 10.91^{\square''}$

Use 8 #11 bars = $12.48^{\square''}$

Check bond

Postive Reinforcement

$$U = \frac{V}{\Sigma o j d}$$

6 #11 bars

$$\frac{45.75^{K}}{6 \times 4.43 \times 0.875 \times 31} = 0.0634$$

$U_{allowable} = 0.187^{KSI} > 0.0634$

Torsion

$V = 45.75^{K}$

Negative Reinforcement

$J = 0.875$

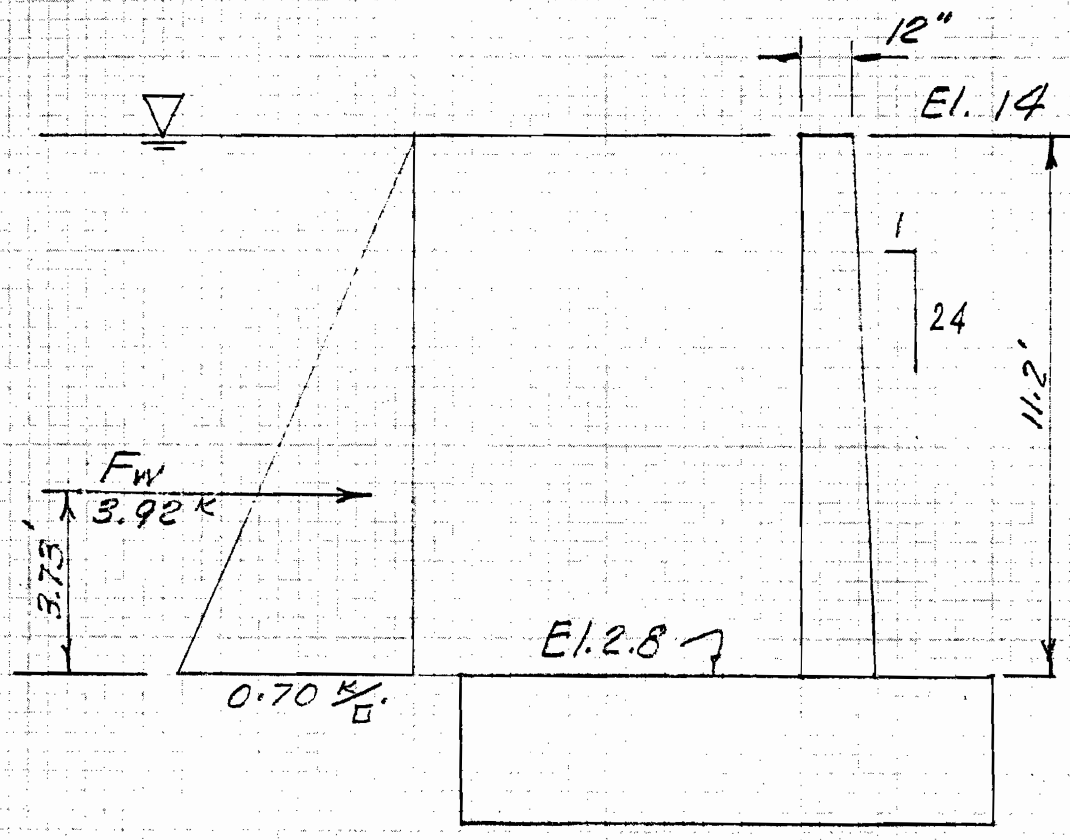
$$\frac{45.75^{K}}{8 \times 4.43 \times 0.875 \times 30} = 0.0492$$

$U_{allowable} = 0.356 > 0.0492$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 56 OF ____
ITEM ______ BY LWC DATE 9-21-79
JOB No 575-79E CHKD. BY ____ DATE ____

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)
T-Wall Design @ Gate Monolith



Horizontal Force on wall

water: $F_w = (0.5)(11.2')(0.70^k) = 3.92^k$

Moment on Wall

water: $M_w = (3.92^k)(3.73') = 14.62'^k$

Reinforcement required

$d = 12'' + \frac{11.2' \times 12}{24} - 3.5'' = 15.1''$

$A_s = \frac{M}{ad} = \frac{14.62'^k}{1.44 \times 15.1''} = 0.67 \square''$

Use #8@12 Floodside : #5@12 Protected side

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

- T-Wall Design @ Gate Monolith -

Shear: $\frac{3920^{\#}}{12'' \times 15.1''} = 21.63$ psi < 60 psi allow.

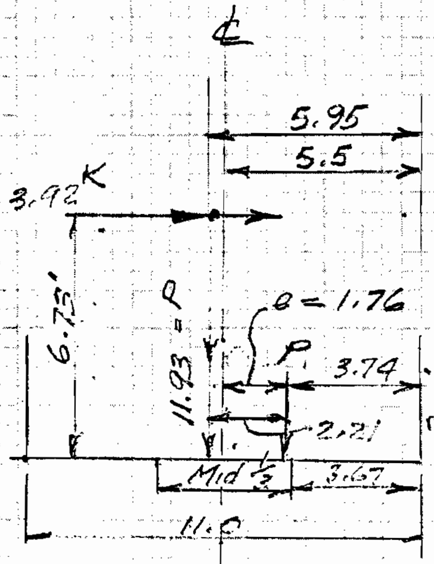
Bond: $U = \frac{3920}{(3.142)(0.875)(15.1)} = 94.42$ psi < 186 allow.

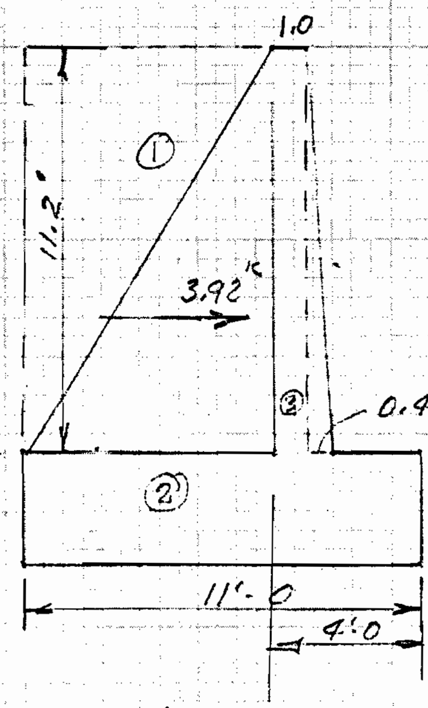
Temperature Steel (Horizontal)

$A_s = (0.0020)(12'')(17.6'') = 0.4224$ □", 0.2112 E.F.

Min. $A_s = 0.0025(12)(15.1) = 0.453$

Use #6 @ 12 e.f. Horizontal





$f_1 = \frac{P}{A}\left(1 + \frac{6e}{d}\right)$

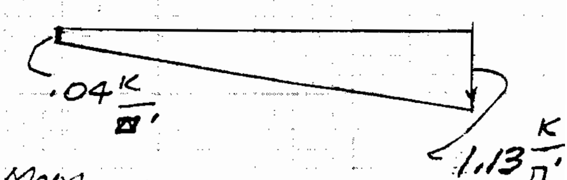
$= \frac{11.93}{11}\left[1 + \frac{(6 \times 1.76)}{11}\right]$

$= 2.13^K$

$f_2 = \frac{P}{A}\left(1 - \frac{6e}{d}\right)$

$= \frac{11.93}{11}\left(1 - \frac{6 \times 1.76}{11}\right)$

$= .04^K$



		Arm	Mom.
① $7 \times 11.2' \times 0.0625^K$ =	4.9^K	7.5'	$36.75'^K$
② $3 \times 11 \times 0.15^K$ =	4.95^K	5.5	$27.23'^K$
③ $1 \times 11.2 \times 0.15^K$ =	1.68^K	3.5	$5.88'^K$
④ $\frac{0.47 \times 11.2}{2} \times 0.15$ =	0.40^K	2.84	$1.12'^K$
	11.93		Σ 70.98

$\frac{70.98}{11.93} = 5.95'$ $\quad \frac{3.92^K}{11.93^K} = \text{Tan} \times 6.73' = 2.21' - 0.45 = 1.76' = e$

$5.95 - 5.5 = 0.45$

NOT FINAL

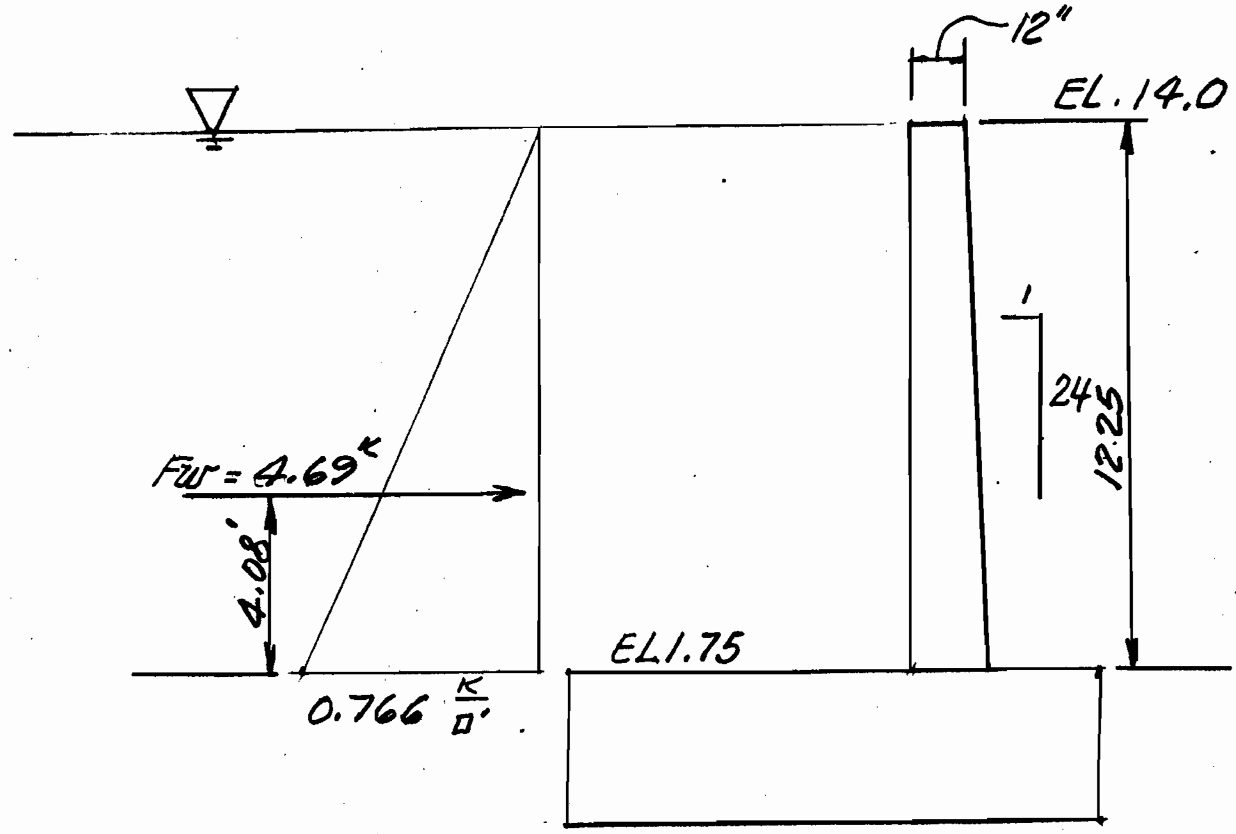
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 58 OF
BY LWC DATE 9-25-79
CHKD. BY DATE

OVERHEAD GATE (At Florida Ave West of IHNC)

T-Wall design @ Gate Monolith



Horizontal Force on wall

Water: $F_w = (0.5)(12.25')(0.766^{K/□'}) = 4.69^{K}$

Moment on Wall

Water: $M_w = (4.69^{K})(4.08') = 19.13'^{K}$

Reinforcement required

$d = 12" + \frac{12.25 \times 12}{24} - 2.5 = 15.63"$

$\therefore A_s = \frac{M}{ad} = \frac{19.13'^{K}}{1.44 \times 15.63"} = 0.85^{□"}$

Use #9@12 Floodside : #5@12 protected side

OVERHEAD GATE (At Florida Ave West of IHNC)

(T-Wall Design @ Gate Monolith)

Shear = Fw = 4.69^k

$\frac{4690^{\#}}{15.63'' \times 12''} = 25\ psi < 60\ psi$ allowed

Bond: $U = \frac{4690}{(3.544)(0.875)(15.63)}$ Perimeter #9 = 3.544"

$= 96.7\ psi < 165$ allowable

Temperature Steel (Horizontal)

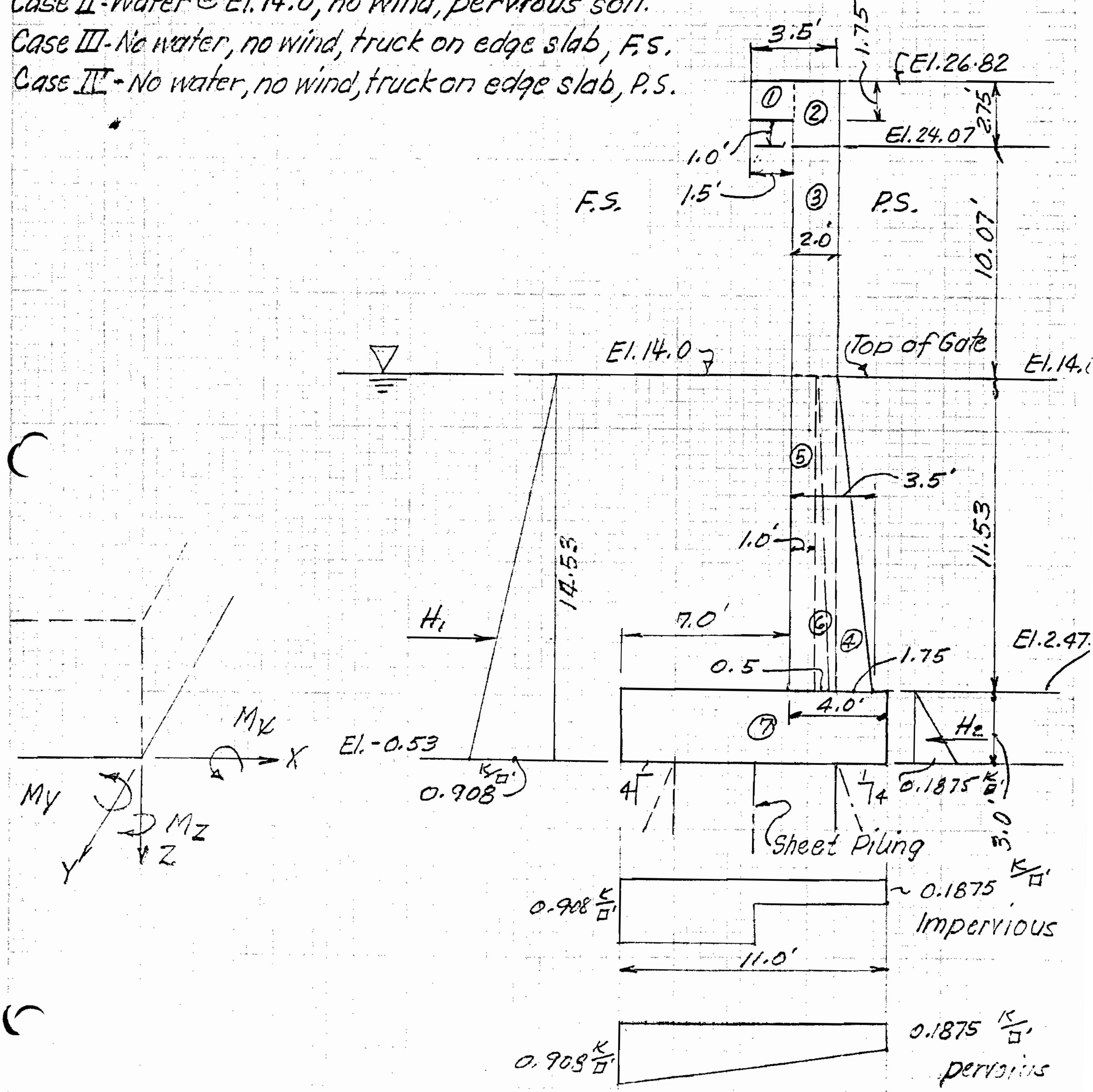
$A_s = (0.0020)(12'')(18.13) = 0.435\ \square''$; $0.218\ \square''$ E.F

Min. A_s = $0.0025(12)(15.63'') = 0.4689$

Use #6@12 e.f. Horizontal

OVERHEAD GATE DESIGN (At Florida Ave - East of IHNC) Pile Loads

Case I - Water @ El. 14.0, no wind, impervious soil.
Case II - Water @ El. 14.0, no wind, pervious soil.
Case III - No water, no wind, truck on edge slab, F.S.
Case IV - No water, no wind, truck on edge slab, P.S.



N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB NO 575-79-E
SHEET NO 61 OF ______
BY LWC DATE 11-5-79
CHKD. BY ______ DATE ______

OVERHEAD GATE DESIGN (At Florida Ave-East of IHNC) Pile Loads

MOMENTS ABOUT X-X AXIS

ITEM	COMPUTATION	F_Z K	F_Y K	ARM FT	M_{X-X} FT.K.
Gate Wt	(Including misc.)	32.0		-5.92	-189
Conc. Bm.①	(1.75)(1.5)(77.0)(0.15)	30.3		-6.25	-189
Conc. Bm②	(2.75)(2.0)(77.0)(0.15)	63.5		-8.0	-508
Conc. Col.③	(2)(2.5)(21.6)(0.15)(2)	32.4		-8.0	-259
Conc. Col.③	(2)(2)(21.6)(0.15)(1)	13.0		-8.0	-104
T-wall ⑤	(1)(11.53)(30.0)(0.15)	51.9		-7.5	-389
T-wall ⑥	(0.5)(0.5)(11.53)(30)(0.15)	13.0		-8.17	-106
Conc. Col.④	(0.5)(1.75)(2.5)(11.53)(0.15)(2)	7.6		-9.58	-73
Conc. Col.④	(0.5)(1.75)(2.0)(11.53)(0.15)	3.0		-9.58	-29
Conc. Slab⑦	(11)(87)(3)(0.15)	430.7		5.5	-2369
T-wall ⑤	(1)(11.53)(10)(0.15)	17.3		7.5	-130
T-wall ⑥	(0.5)(0.5)(11.53)(10)(0.15)	4.3		8.17	-35
	SUB-TOTAL	699.0			-4380
Imp. uplift	$-(14.53)(87)(5.5)(0.0625)$	-434.5		-2.75	1195
Imp. uplift	$-(3.0)(87)(5.5)(0.0625)$	-89.7		-8.25	740
Water Wt.	(11.53)(87)(7)(0.0625)	438.9		-3.5	-1536
H_2O Force H-1	$-\frac{1}{2}(14.53)^2(87)(0.0625)$		-574.0	4.84	-2778
H_2O Force H2	$\frac{1}{2}(3)^2(87)(0.0625)$		24.5	1.0	25
	CASE I TOTALS (100%)	613.7	-549.5		-6759
Perv. Uplift	$-(0.1875)(87)(11)$	-179.4		-5.5	987
Perv. Uplift	$-(0.7205)(11)(87)(0.5)$	-344.8		-3.67	1265
Water Wt.	(11.53)(87)(7)(0.0625)	438.9		-3.5	-1536
H_2O Force H_1	$-\frac{1}{2}(14.53)^2(87)(0.0625)$		-574.0	4.84	-2778
H_2O Force H_2	$\frac{1}{2}(3)^2(87)(0.0625)$		24.5	1.0	25
	CASE II TOTALS (100%)	613.7	-549.5		6417

OVERHEAD GATE DESIGN (At Florida Ave-East of IHNC) Pile Loads

MOMENTS ABOUT X-X AXIS (Cont.)

ITEM	COMPUTION	F_z K	F_y K	ARM FT.	MX-X FT. K
Truck	(2 Trucks) H-20-S16-44	64.0			—
Uplift	-0.1875 (11)(87)	-179.4		-5.5	987.
	CASE III TOTALS	583.6			- 3393
Truck	(2 Trucks) H-20-S16-44	64.0		-11.0	-704
Uplift	-0.1875 (11)(87)	-179.4		-5.5	987
	CASE IV (TOTALS)	583.6			4097

MOMENTS ABOUT Y-Y AXIS

ITEM	COMPUTATION	F_z K	F_x K	Arm FT	MY-Y FT. K
Conc. Slab ⑦	(11)(87)(3)(0.15)	430.7		-43.5	-18735
Conc. Col. ③	(2)(2.5)(21.6)(0.15)	16.2		-9.25	-150
Conc. Col. ③	(2)(2.5)(21.6)(0.15)	16.2		-51.75	-838
Conc. Col. ③	(2)(2)(21.6)(0.15)	13.0		-84.0	-1092
Conc. Col. ④	(0.5)(1.75)(2.5)(11.53)(0.15)	3.8		-9.25	-35
Conc. Col. ④	(0.5)(1.75)(2.5)(11.53)(0.15)	3.8		-51.75	-197
Conc. Col. ④	(0.5)(1.75)(2.0)(11.53)(0.15)	3.0		-84.0	-252
T-Wall ⑤	(1)(11.53)(2)(0.15)	3.5		-86.0	-301
T-Wall ⑥	(0.5)(0.5)(11.53)(2)(0.15)	0.9		-86.0	-77
T-Wall ⑤	(1)(11.53)(30)(0.15)	51.9		-68.0	-3529
T-Wall ⑥	(0.5)(0.5)(11.53)(30)(0.15)	13.0		-68.0	-884
T-Wall ⑤	(1)(11.53)(8)(0.15)	13.8		-4.0	-55
T-Wall ⑥	(0.5)(0.5)(11.53)(8)(0.15)	3.5		-4.0	-14
	SUBTOTAL (100%)	573.3			-26,259

OVERHEAD GATE DESIGN (At Florida Ave. - East of IHNC)

Pile Loads

MOMENTS ABOUT Y-Y AXIS (Cont.)

ITEM	COMPUTATION	F_Z K	F_X K	ARM FT	M_{Y-Y} FT K
Gate BmWt Reactions	See Moment Distribution Case 2X				
(A)	40.2 + 3.8	44.0		-9.25	-407
(E)	71.2	71.2		-51.75	-3685
(F)	15.9 + 3.0	18.9		-84.0	-1588
Water Wt	(11.53)(7)(87)(0.0625)	438.9		-43.5	-19092
Impervious Uplift	-(14.53)(87)(5.5)(0.0625)	-434.5		-43.5	18,900
	-(3.0)(87)(5.5)(0.0625)	-89.7		-43.5	3,902
CASE I TOTAL (100%)		622.1			-28,229
Gate Bm Wt. Reactions	See Moment Distribution Case 2X				
(A)	40.2+3.8	44.0		-9.25	-407
(E)	71.2	71.2		-51.75	-3685
(F)	15.9+3.0	18.9		-84.0	-1588
Water Wt	(11.53)(7)(87)(0.0625)	438.9		-43.5	-19092
Pervious	-0.1875(11)(87)	-179.4		-43.5	7804
Uplift	-0.7205(11)(87)(0.5)	-344.8		-43.5	14,999
CASE II TOTAL (100%)		622.1			-28,229
Gate-Bm Wt. Reactions	See Mom. Dist Case 1Y				
(A)	24.0+4.1	28.1		-9.25	-260
(E)	71.1	71.1		-51.75	-3679
(F)	32.2+3.3	35.5		-84	-2982
Truck Wt	2 trucks H-20-S16-44	64.0		-30.5	-1952
CASES III & IV TOTAL (100%)		772			-35,132

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

Pile Loads

MOMENTS ABOUT Z-Z AXIS

ITEM	COMPUTATION	F_Y K	F_X K	ARM FT	$M_{Z\text{-}Z}$ FT. K
Water on Wall, Gate	$-\frac{1}{2}(14.53)^2(0.0625)(87)$	-574		43.5	-24,969
Cols & slab	$\frac{1}{2}(3)^2(0.0625)(87)$	24.5		43.5	1066
CASES I & II TOTAL (100%)		-549.5			-23,903
CASES III & IV TOTAL (100%)		0.0			0.0

```
11/28/79     15.67

10 FLORIDA AVE EAST 575-79
20 FLA AVE GATE
30 2,4
40 2,0.0,68
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,10
110 1.5,10.5,19.5,28.5,37.5,46.5,55.5,65.67,76.67,85.5
140 10*-1.5
170 10*0.0
200 2,270,24
210 1.5,7.5,12.5,21.0,30.0,39.0,48.0,51.75,55.5,65.67,76.67,85.5,1.5,7.5,
220 12.5,21.0,30.0,39.0,48.0,51.75,55.5,65.67,76.67,85.5
240 12*-6.5,12*-9.5
270 24*0.0
2000 0,-549.5,613.7,-6640,-28229,-23903
2010 0,-549.5,613.7,-6323,-28229,-23903
2020 0,0,763,-4380,-33891,0
2030 0,0,763,-5084,-33891,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        11/28/79     15.689


    PROG. NO. 713-F3-A2-210     15:41:36  11/28/79     MOD 6A, JUN 78


 FLORIDA AVE EAST 575-79
 FLA AVE GATE


TOTAL NUMBER OF PILES =    34
```

7 65

(2)

(66)

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-549.5	613.7	-6640.0	-28229.0	-23903.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z	
1	-0.1	-0.0	-30.3	
2	-0.1	-0.0	-29.5	
3	-0.1	-0.0	-28.7	
4	-0.2	-0.0	-27.9	A
5	-0.2	-0.0	-27.1	
6	-0.2	-0.0	-26.3	
7	-0.2	-0.0	-25.4	
8	-0.2	-0.0	-24.5	
9	-0.2	-0.0	-23.5	
10	-0.2	-0.0	-22.7	
11	0.1	-0.0	26.5	
12	0.1	-0.0	27.6	
13	0.1	-0.0	28.6	
14	0.1	-0.0	30.1	
15	0.1	-0.0	31.8	
16	0.1	-0.0	33.4	B
17	0.1	-0.0	35.1	
18	0.2	-0.0	35.8	
19	0.2	-0.0	36.5	
20	0.2	-0.0	38.3	
21	0.2	-0.0	40.4	
22	0.2	-0.0	42.0	
23	0.1	-0.0	38.3	
	0.1	-0.0	39.4	
25	0.1	-0.0	40.3	C
26	0.1	-0.0	41.9	
27	0.1	-0.0	43.5	
28	0.1	-0.0	45.2	
29	0.1	-0.0	46.8	
30	0.1	-0.0	47.5	
31	0.1	-0.0	48.2	
32	0.1	-0.0	50.1	
33	0.1	-0.0	52.1	
34	0.1	-0.0	53.7	

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-549.5	613.7	-6640.0	-28229.0	-23903.0

LOAD CONDITION 2

(3)

67

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-549.5	613.7	-6323.0	-28229.0	-23903.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.0	-29.6
2	-0.3	-0.0	-28.7
3	-0.3	-0.0	-27.9
4	-0.3	-0.0	-27.1
5	-0.4	-0.0	-26.3
6	-0.4	-0.0	-25.5
7	-0.4	-0.0	-24.7
8	-0.4	-0.0	-23.8
9	-0.4	-0.0	-22.9
10	-0.4	-0.0	-22.1
11	0.3	-0.0	34.7
12	0.3	-0.0	35.8
13	0.3	-0.0	36.7
14	0.3	-0.0	38.3
15	0.3	-0.0	39.9
16	0.3	-0.0	41.6
17	0.3	-0.0	43.2
18	0.3	-0.0	43.9
19	0.3	-0.0	44.6
20	0.3	-0.0	46.4
21	0.3	-0.0	48.5
22	0.3	-0.0	50.1
23	0.3	-0.0	29.7
24	0.3	-0.0	30.8
25	0.3	-0.0	31.7
26	0.3	-0.0	33.3
27	0.3	-0.0	34.9
28	0.3	-0.0	36.6
29	0.3	-0.0	38.2
30	0.3	-0.0	38.9
31	0.3	-0.0	39.6
32	0.3	-0.0	41.4
33	0.3	-0.0	43.5
34	0.3	-0.0	45.1

A

B

C

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-549.5	613.7	-6323.0	-28229.0	-23903.0

(4)

68

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	763.0	-4380.0	-33891.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z	
1	0.5	0.0	36.2	
2	0.5	0.0	37.2	
3	0.5	0.0	38.1	A
4	0.5	0.0	39.0	
5	0.5	0.0	39.9	
6	0.5	0.0	40.9	
7	0.5	0.0	41.8	
8	0.5	0.0	42.8	
9	0.5	0.0	44.0	
10	0.5	0.0	44.9	
11	-0.6	0.0	-3.9	
12	-0.6	0.0	-3.4	
14	-0.6	0.0	-2.3	
15	-0.6	0.0	-1.5	B
16	-0.6	0.0	-0.8	
17	-0.6	0.0	-0.0	
20	-0.6	0.0	1.4	
21	-0.6	0.0	2.3	
22	-0.6	0.0	3.1	
23	-0.6	0.0	34.2	
24	-0.6	0.0	34.7	
26	-0.6	0.0	35.9	
[illegible]7	-0.6	0.0	36.6	
[illegible]	-0.6	0.0	37.4	C
[illegible]	-0.6	0.0	38.1	
32	-0.7	0.0	39.6	
33	-0.7	0.0	40.5	
34	-0.7	0.0	41.3	

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	-0.0	0.0	763.0	-4380.0	-33891.0	-0.0

LOAD CONDITION 4

(5)

(69)

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	763.0	-5084.0	-33891.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.9	0.0	34.5
2	0.9	0.0	35.5
3	0.9	0.0	36.4
4	0.9	0.0	37.4
5	0.9	0.0	38.3
6	0.9	0.0	39.3
7	0.9	0.0	40.2
8	0.9	0.0	41.3
9	0.9	0.0	42.5
10	0.9	0.0	43.4
11	-0.9	0.0	-22.0
12	-0.9	0.0	-21.5
14	-0.9	0.0	-20.3
15	-0.9	0.0	-19.6
16	-0.9	0.0	-18.8
17	-1.0	0.0	-18.1
20	-1.0	0.0	-16.6
21	-1.0	0.0	-15.7
22	-1.0	0.0	-14.9
23	-1.1	0.0	53.3
24	-1.1	0.0	53.8
26	-1.1	0.0	55.0
27	-1.1	0.0	55.7
28	-1.1	0.0	56.5
29	-1.1	0.0	57.2
32	-1.1	0.0	58.7
33	-1.1	0.0	59.7
34	-1.1	0.0	60.4

A

B

C

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4 -0.0 0.0 763.0 -5084.0 -33891.0 0.0

0 15:44:26 11/28/79 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022

0 PROG NO. 713-F3-A2-210 15:41:36 11/28/79 MOD 6A, JUN 78

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

	X	Y	Z	RX	RY	RZ
11021						
11022	0.420E-03	-0.275E-01	-0.131E-01	-0.241E-03	-0.844E-05	-0.575E-05
12022	0.424E-03	-0.535E-01	0.667E-02	0.103E-03	-0.839E-05	-0.581E-05
13022	-0.879E-04	0.767E-01	-0.258E-01	-0.783E-03	-0.574E-05	0.120E-05
14022	-0.976E-04	0.134E 00	-0.697E-01	-0.155E-02	-0.584E-05	0.134E-05

OVERHEAD GATE DESIGN (At Florida Ave · East of IHNC) PILE LOADS

LOAD TABULATION

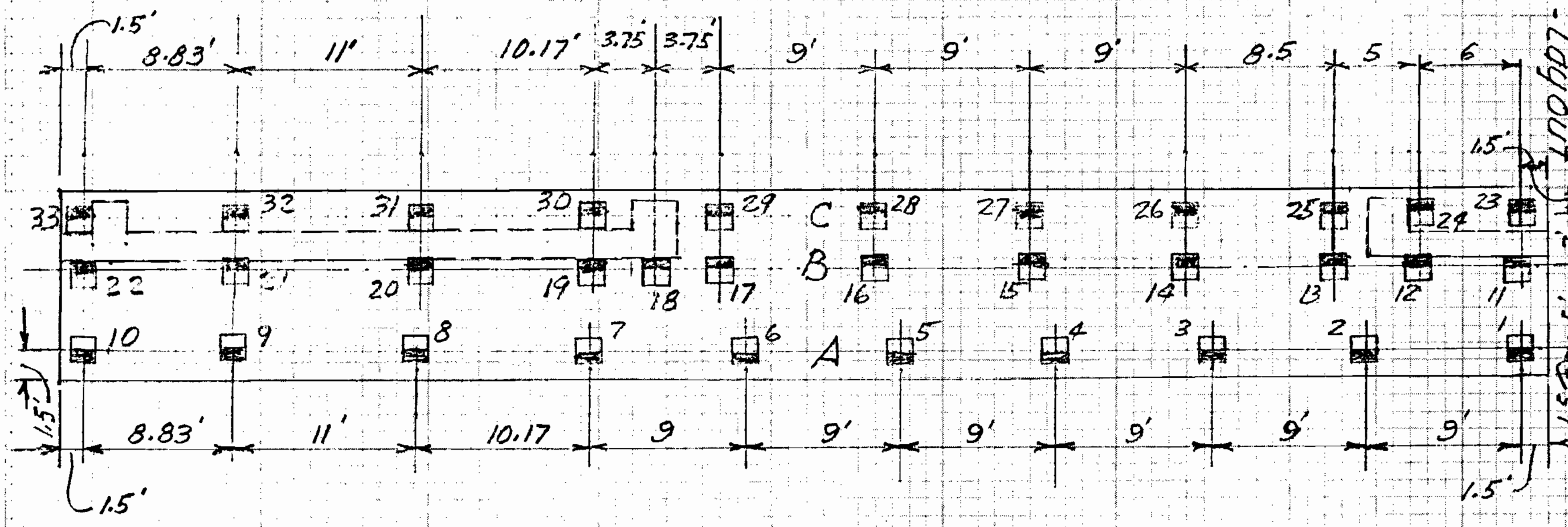
Load No	ITEM	Fx K	Fy K	Fz K	Mx FT K	My FT.K	Mz 'K
1	Concrete plus Gate	0	0	699.0	-4,380	-31,939	0
2	Water-Vertical	0	0	438.9	-1,536	-19,092	0
3	Water-Horiz.	0	-549.5	0	-2659	0	-23,903
4	Uplift-Imperv.	0	0	-524.2	1935	22,802	0
5	Uplift-Perv.	0	0	-524.2	1935	22,802	0
6	Truck-Case III	0	0	64	0	-1,952	0
7	Truck-Case IV	0	0	64	-704	-1,952	0

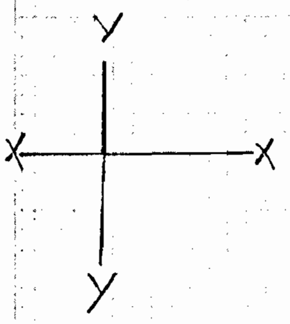
LOAD SUMMATION

CASE	ITEM	Fx K	Fy K	Fz K	Mx 'K	My 'K	Mz 'K
I	1+2+3+4	0	-549.5	613.7	-6,640	-28,229	-23,903
II	1+2+3+5	0	-549.5	613.7	-6,640	-28,229	-23,903
III	1+6	0	0	763	-4380	-33,891	0
IV	1+7	0	0	763	-5084	-33,891	0

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB OVERHEAD GATE DESIGN (At Florida Avenue East of IHNC)
ITEM PILE ANALYSIS - Layout
JOB No 575-79-
SHEET No 71 OF
BY LWC DATE 12-14-79
CHKD. BY DATE





PILE LAYOUT

OVERHEAD GATE DESIGN (At Florida Avenue East of IHNC)

Pile Reactions from Computer Printout

Case I: Water @ El. 14.0, no wind, impervious soil (100%)

		X^K	Y^K	Z^K
Pile Group "A"	=	-0.2	0	-30.3
Pile Group "B"	=	0.2	0	42.0
Pile Group "C"	=	0.1	0	53.7

Case II: Water @ El. 14.0, no wind, pervious soil (100%)

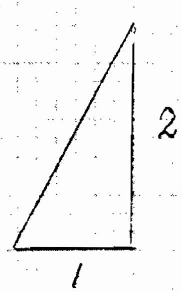
Pile Group "A"	=	0.0	0	-29.6
Pile Group "B"	=	0.3	0	50.1
Pile Group "C"	=	0.3	0	45.1

Case III: No water, no wind, truck on edge slab, flood side (100%)

Pile Group "A"	=	0.5	0	44.9
Pile Group "B"	=	-0.6	0	3.1
Pile Group "C"	=	-07	0	41.3

Case IV: No water, no wind, truck on edge slab, protected side (100%)

Pile Group "A"	=	0.9	0	43.4
Pile Group "B"	=	-0.9	0	-22.0
Pile Group "C"	=	-1.1	0	60.4



$\frac{2}{\sqrt{5}} = 0.8944$

$\frac{1}{\sqrt{5}} = 0.4472$

OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

Monolith - Top face reinforcement (Transverse)

Case II Loading

				Arm	Moment
Pile Av	=	$\frac{(29.6)(0.8944)(11)}{87}$	= 3.34	X 5.5	18.37
Pile $\mathcal{H}$AV	=	$\frac{(0.2)(0.4472)(4)}{87}$	= 0.01	X 5.5	0.06
Pile Bv	=	$\frac{(50.1)(0.8944)(11)}{87}$	= 5.67	X 0.5	2.8
Pile $\mathcal{H}$BV	=	$\frac{(0.3)(0.4472)(11)}{87}$	= 0.02	X 0.5	0.01
+ Wt. Water	=	(7) (11.53) (0.0625)	= 5.04	X 3.5	17.64
- Wt. Water	=	-(4) (14.53)(0.0625)	= -3.63	X 5.0	-18.15
Wt. Slab	=	(3) (7) (0.15)	= 3.15	X 3.5	11.03
			13.6^K		$31.76^{'K}$

$b = 12''$ $f'c = 3000$ psi $fc = 1050$ psi $K = 152$ $a = 1.44$ $j = 0.891$

$$d' reqd = \sqrt{\frac{31.76 \times 12{,}000}{152 \times 12}} = 14.45'' < 32'' \text{ ok}$$

$$As = \frac{M}{ad} = \frac{31.76}{1.44 \times 32} = 0.69 \,\square''$$

Min As $= (0.0025)(12)(32) = 0.96 \,\square''$ use #9@12 = 1.0 □'' Top face transverse

Max. Shear = 13.6^K

$$v = \frac{13{,}600^{\#}}{12 \times 32} = 35.41 \text{ psi} < 60 \text{ psi allowable}$$

Bond: $\frac{13.6^K}{3.544 \times 0.891 \times 32} = 0.135$ psi < 0.165 Top bar o/k

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OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

Monolith - Bottom face reinforcement (transverse)

Case III Loading

Pile $A_V = \frac{(44.9)(0.8944)(11)}{87} = 5.07 \times 5.5 = 27.89$

Pile $X_{AV} = \frac{(0.5)(0.4472)(11)}{87} = 0.03 \times 5.5 = 0.17$

Pile $B_V = -\frac{(3.1)(0.8944)(11)}{87} = -0.35 \times 0.5 = -0.18$

Pile $X_{BV} = -\frac{(0.6)(0.4472)(11)}{87} = -0.03 \times 0.5 = -0.02$

Two truck loads $= \frac{64}{87} = -0.74 \times 7.0 = -5.18$

Wt. Water $= (3)(4)(0.0625) = 0.75 \times 5.0 = -3.75$

Wt. Slab $= (3)(7)(0.15) = -3.15 \times 3.5 = -11.03$

$1.58^k \qquad 15.4'^k$

$b = 12''$ $f'_c = 3000$ psi $f_c = 1050$ $K = 152$ $A = 1.44$ $j = 0.891$

d' reqd $= \sqrt{\frac{15.4 \cdot (12000)}{152 \times 12}} = 10.06''$

$10.06 + 4'' < 36''$ ok

$A_s = \frac{M}{ad} = \frac{15.4'^k}{1.44 \times 32} = 0.33^{\square''}$

Min $A_s = (0.0025)(12)(32) = 0.96^{\square''}$ Use #9@12 = $1.0^{\square''}$

Bottom face - Transverse

Max shear = 7.86

$v = \frac{(1.58)(1000)}{12 \times 32} = 4.11 < 60$ psi allowable

Bond: ok by inspection

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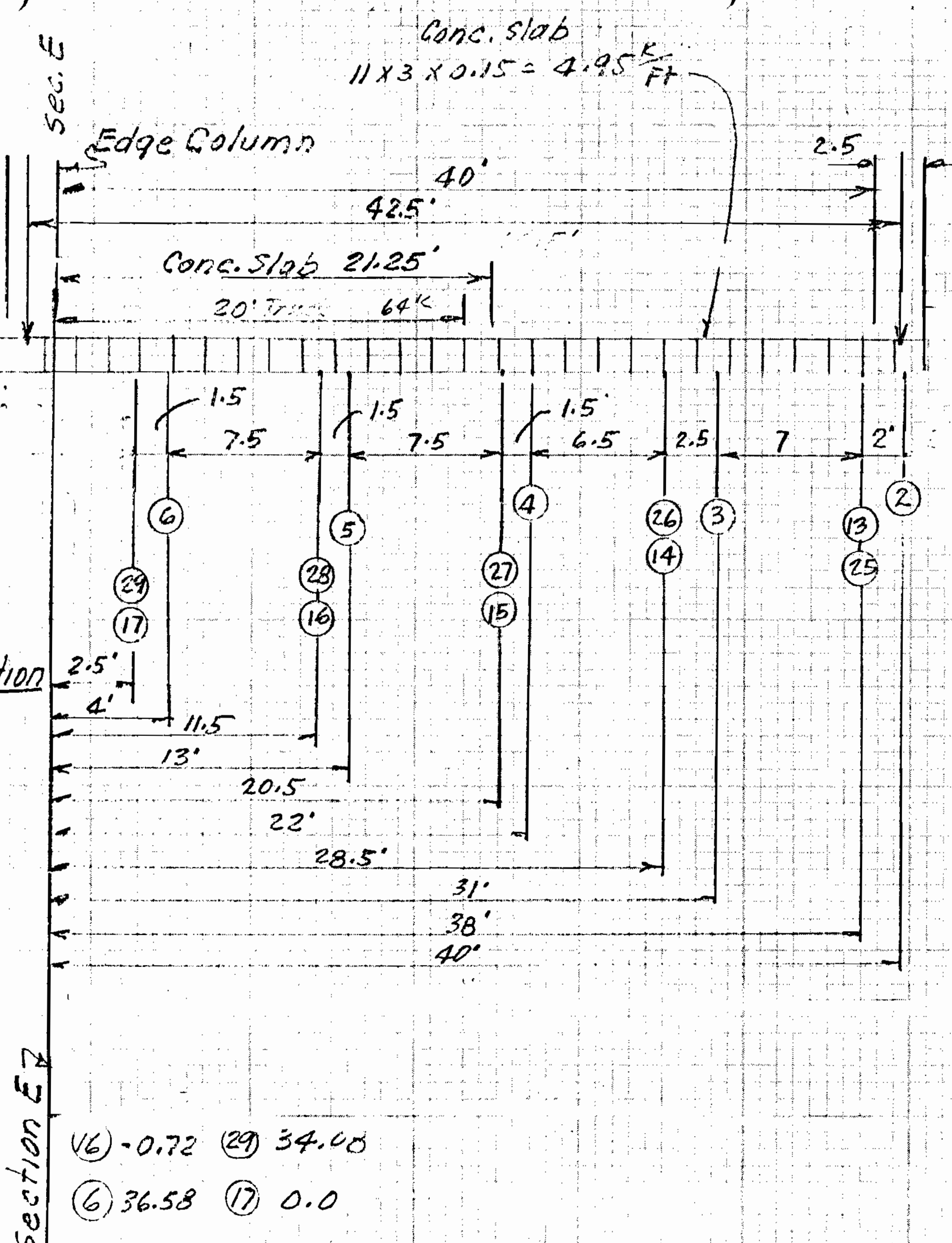
OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)
Monolith - Longit. Reinf. - Top and Bottom faces - Case III



Pile Reaction

(2) 33.27
(13) 32.82
(25) 28.35
(3) 34.08
(26) 32.11
(14) - 2.06
(4) 34.93
(27) 32.74
(15) -1.34
(5) 35.69
(28) 33.45
(16) -0.72
(6) 36.58
(29) 34.08
(17) 0.0

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OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

Monolith - Longitudinal Reinforcement

Moment @ Section E   Load Cond. III

Item	Reaction (K)	Arm (Ft)	Moment (FT. K)
#2	33.27	40.0	1330.8
#13	32.82	38.0	1247.2
#25	28.35	38.0	1077.0
#3	34.08	31.0	1056.5
#26	32.11	28.5	915.1
#14	− 2.06	28.5	− 58.7
#4	34.88	22.0	767.4
#27	32.73	20.5	671.0
#15	− 1.34	20.5	−27.5
#5	35.69	13.0	464.0
#16	− 0.72	11.5	− 8.3
#28	33.45	11.5	384.7
#6	36.58	4.0	146.3
#17	− 0.0	2.5	0
#29	34.08	2.5	85.2
Conc. Slab	−4.95 x 42.5 = −210.4	21.25	− 4471.0
Column	−28.1	41.25	− 1159.1
Trucks	− 64.0	20.0	− 1280.0
	61.42		+1140.6

OVERHEAD GATE DESIGN (At Florida Ave. East of IHNC)

Monolith Longit Reinf. (Cont) Load Condition III

Max. Moment = +1140.6 'K

$b = 11' \times 12 = 132$ $K = 152$ $d = 32''$ $a = 144$

$$d' \text{ reqd} = \sqrt{\frac{1140.6 \times 12000}{152 \times 132}} = 26'' < 32''$$

$$A_s \text{ Bottom face} = \frac{1140.6'^{K}}{1.44 \times 32} = 24.75 \square''$$

$$= \frac{24.75}{11} = 2.25 \square''/ft$$

Use #10 @ 6 bottom face Longit.

$$A_s \text{ Top-face} = 0.0025 \times 12 \times 32 = 0.96 \square''$$

Use #9 @ 12 top face

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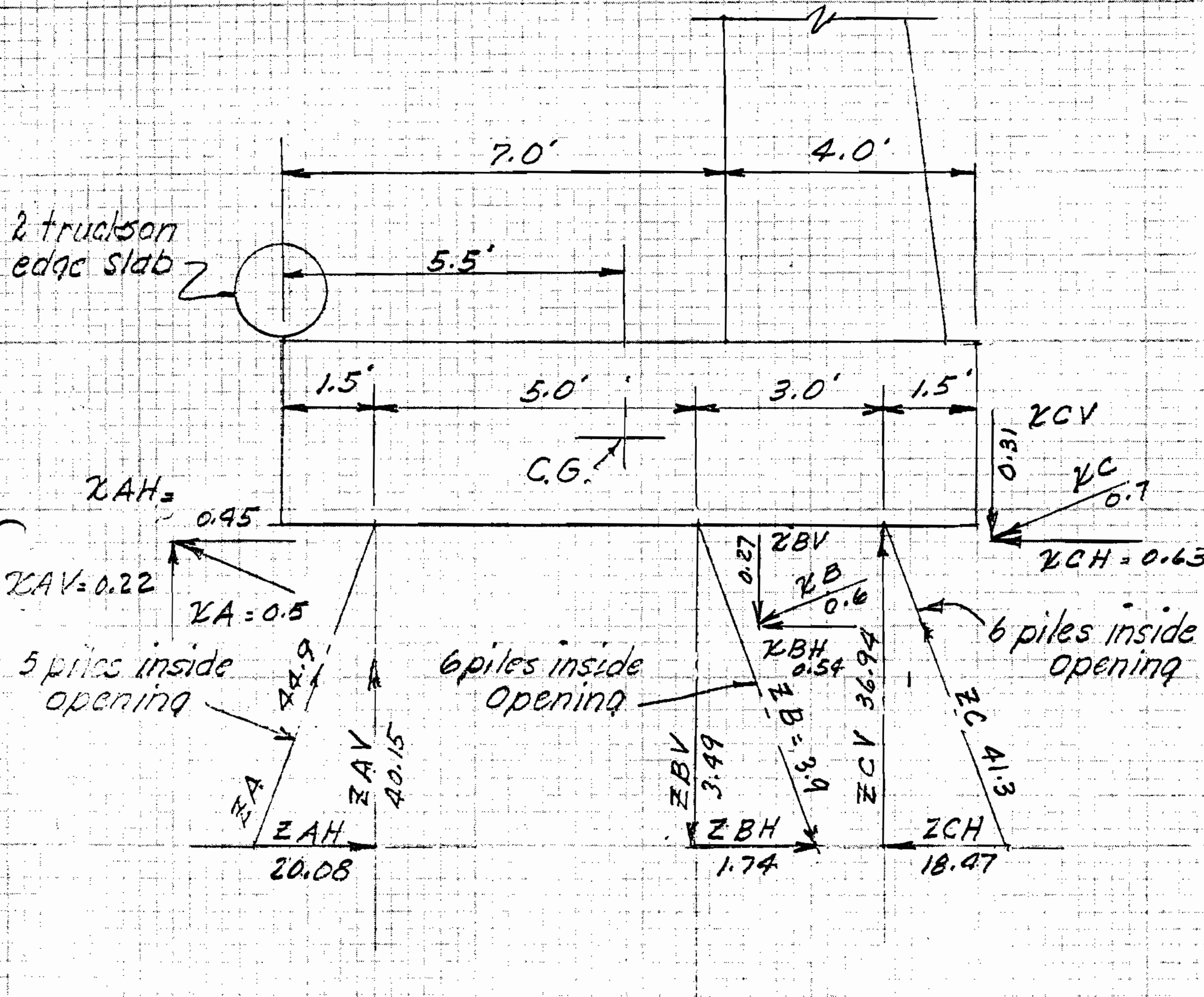
OVERHEAD GATE DESIGN (At Florida Ave East of IHNC)

Torsional Analysis - Monolith

Case III



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O...RHEAD GATE DESIGN (At Florida Ave East of IHNC)

Torsional Analysis - Monolith (cont.)

Item	V^k	H^k	$\bar{x}$ ft	Moments 'k
2 trucks	64		5.5	352.0
ZAV = 5(40.15)	-200.6		4.0	-802.4
ZAH = 5(20.08)		-100.4	-1.5	150.6
XAV = 5(0.22)	-1.1		4.0	-4.4
XAH = 5(0.45)		2.25	-1.5	-3.4
ZBV = 6(3.49)	20.94		-1.0	-20.94
ZBH = 6(1.74)		-10.44	-1.5	15.66
XBV = 6(0.27)	1.62		-1.0	-1.62
XBH = 6(0.54)		3.24	-1.5	-4.86
ZCV = 6(36.94)	-221.6		-4.0	886.4
ZCH = 6(18.47)		110.8	-1.5	-166.2
XCV = 6(0.31)	1.86		-4.0	-7.4
XCH = 6(0.63)		3.78	-1.5	-5.7
				Σ 387.74 'k

Torsional Moment divides equally between Columns.

$$M_t = \frac{387.74}{2} = 193.87\ '^k$$

$b = 3.0'$ $h = 11.0'$

$K_1 = 3.62$

$$v_t = \frac{K_1 M_t}{b^2 h} = \frac{3.62\,(193.87 \times 12000)}{(36)^2(132)} = 49.22\ psi < 1.1\sqrt{3000} = 60.25\ psi$$

No stirrups required.

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

(f'c = 4000 psi, fy = 60,000) design of Gate Structure and covered box

1. Design Load Cases (per CE Memo.)

East Side

Water surface Elev ___ Ft, MSL (NGVD)

Floodside	Protected side	Case
13.0	-8.5	I
4.0	-14.5	II
-14.0	-3.0	III

Case I - Design hurricane (dry inside)
Case II - Mean High Water outside - dry inside
Case III - Reverse head - gates closed.

2. Gate Size - Two Gates, 12'-6" wide X 13'-0" high

3. Gate Type - Electrically operated sluice gates

4. Seating and Unseating Heads
Assume bottom of gate at El. -21.34
Max. seating head = 23.5 feet ±
Max. unseating head = 10.93 feet ±

5. Gate:
Medium service sluice gates with flange frame, full wedge conventional type, flush bottom closure, up to 75 ft. seating head and up to 35 ft. unseating head.

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

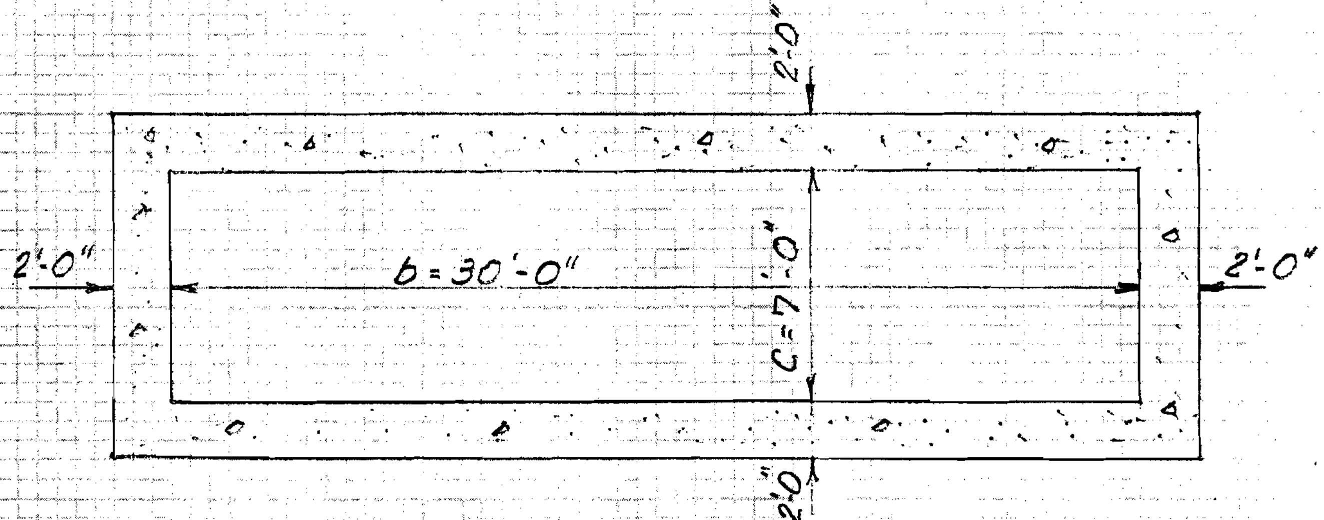
Shaft Design for Gate Structure: Long Walls

Use PCA Publication titled "Rectangular Concrete Tanks".

Assume top free, bottom hinged, top of ground @ El. -5.0

Critical Cases:

1. Water to El. 14.0 outside (Flood side) dry inside (future)
2. Reverse head gates closed
3. Water to El. 14.0 inside dry outside (future)



PLAN - SHAFT

$a = ht = 20.67'$

$\frac{b}{a} = \frac{30}{20.67} = 1.45$ use $\frac{b}{a} = 1.5$

$\frac{c}{a} = \frac{7}{20.67} = 0.33$ use $\frac{c}{a} = 0.5$

Moment Coefficients

y	x/a	Mx	y	x/a	My
0	3/4	± 0.023	0	0	± 0.040
b/4	3/4	± 0.018	b/4	1/2	± 0.020
b/2	1/2	± 0.009	b/2	1/2	± 0.044

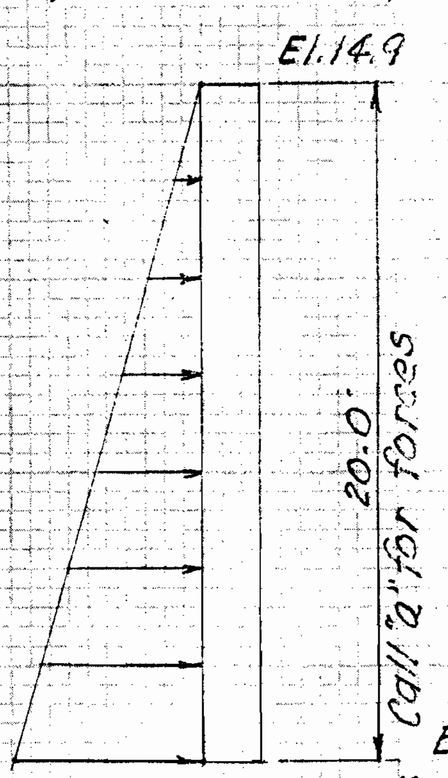
$M = \text{Coef.} \times w a^3$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Shaft design for gate structure : Long Walls

Case I and II - Water outside dry inside - no load inside. (improbable)

Design both long walls thus: Gates closed no water on protected side, water at El. 14.9 inside structure, no outside load.



Wall thickness = 24" d = 21.5"

$f'c = 4000$ psi $fc = 1400$ psi $fs = 20{,}000$ psi

$a = 1.44$ $n = 8$ $K = 221$ $k = 0.359$ $j = 0.88$

Max allowable shear $= 1.1\sqrt{f'c} = 70$ psi

$70 \text{ psi} \times 21.5" \times 12 = 18.06^K$

$d' \text{ reqd} = \sqrt{\dfrac{M}{Kb}}$

Large Mom. $= 0.044 \times 500^K = 22.0'^K$

$d = \sqrt{\dfrac{22 \times 12}{0.221 \times 12}} = 10" < 21.5$

See table VIII, PCA, Fig. 2

Max V $= 0.4 \times wa^2 = 0.4 \times 25^K = 10^K$

$10^K < 18.06^K$ allowable

$wa = 20 \times 0.0625 = 1.25$ K/S.F.

$wa^2 = 25^K$

$wa^3 = 500^K$

Long Wall Design

Horiz. strip (Mid-depth) $M_y = 22.0'^K$ N = axial tension = $V = 10^K$

$e = \dfrac{12M}{N} + d''$ $\quad d'' = \dfrac{21.5}{2} - 2'' = 9.75''$

Table 4 SP-3 $b = 12$ $d = 21.5$

$e = \dfrac{12 \times 22}{-10} + 9.75 = -16.65''$

$F = \dfrac{0.491 + 0.484}{2} = 0.463$

$E = \dfrac{e}{12} = \dfrac{16.65''}{12} = 1.39'$

$i = \dfrac{1}{1 - \dfrac{jd}{e}} = \dfrac{1}{-1 - \dfrac{jd}{-e}} = \dfrac{1}{-1 - \dfrac{0.88 \times 21.5}{-16.65}} = 0.47$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Shaft design for Gate Structure: Long Walls (cont.)

$NE = (-10)(-1.39) = 13.9$

$KF = 221 \times 0.463 = 102.32$ $KF > NE$ no compressive steel reqd.

$As = \frac{NE}{adi} = \frac{13.9}{(1.44)(21.5)(0.47)} = 0.96\square''$ (Try #7@5 $A_s = 1.44\square''$)

$U = 246$ psi
Table 14a

$u = \frac{V}{\Sigma_o jd} = \frac{10{,}000^{\#}}{(6.6)(0.88)(21.5)} = 80\text{ psi} < 246$

$\frac{7}{8} \times \pi = 2.749''$ $\Sigma_o = \frac{12}{5} \times 2.749 = 6.6''$

Mid-point @ Mid-depth

$My = 0.034 \times 500^k = 17^k$ (Tension outside)

Table V
$b/a = 1.5$
$c/a = 0.5$
1/2

wa^2 7
Axial Tension $= 0.174 \times 25^k = 4.35^k$
Table 8-1/2

$e = \frac{12 \times 17^{1k}}{-4.35} + 9.75 = 37.15''$ d'' 7

$E = \frac{37.15}{12} = 3.10'$

$i = \frac{1}{-1 - \frac{jd}{e}} = \frac{1}{\frac{-1 - 0.88 \times 21.5}{-37.15}} = 0.66$

$NE = (-4.35)(-3.1) = 13.49$
Pg. 7

$KF = 221 \times 0.463 = 102.32$

$KF > NE$ no compressive steel reqd.

$As = \frac{NE}{adi} = \frac{3.10 \times 4.35}{(1.44)(21.5)(0.66)} = 0.66\square''$ (Use #7@10 = $0.72\square''$ min)

Vertical Strip

$M_x = 0.028 \times 500^k = 14^k$ by observation (use #7@9" = $0.80\square''$)
Table V

$V = 0.4 \times 25^k = 10^k$ ∴ OK $< 18.05^k$

bond o/k by observation

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Shaft design for Gate Structure

Short Wall Design @ $z = \frac{c}{4}$ $v = \frac{a}{4}$

Table I

$M_z = 0.031 \times 500^k = 15.5'^k$ (Tension outside)

Axial Tension = end shear in long wall = 10^k

$e = \frac{12 \times 15.5'^k}{-10} + 9.75'' = 8.85''$ $E = \frac{8.85}{12} = 0.74$ $j = 0.88$

$i = \frac{1}{-1 - \frac{jd}{e}} = \frac{1}{-1 - \left(\frac{0.88 \times 21.5}{8.85}\right)} = 0.32$

$A_s = \frac{10^k \times 0.74}{(1.44)(0.32)(21.5)} = 0.75^{\square''}$ (Use 7@9)

Bond and Shear O.K. by observation

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Shaft design for Gate Structure - Short Wall Design

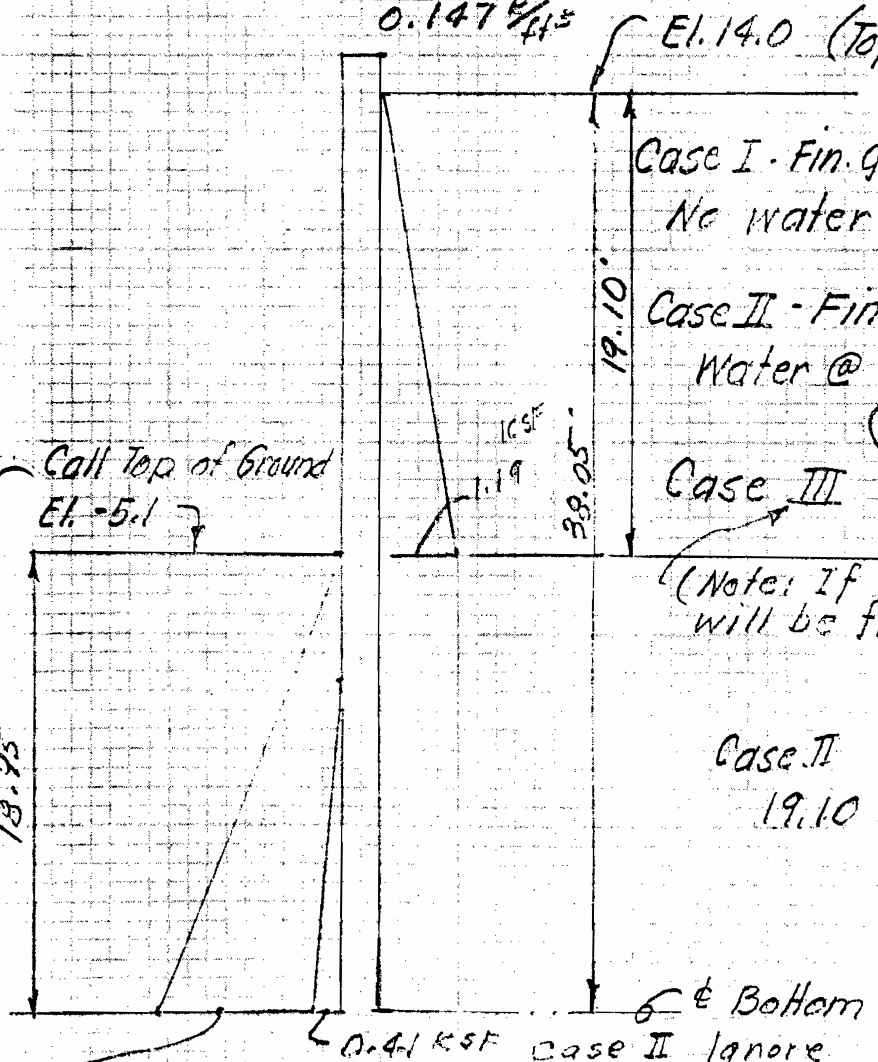
Loading Conditions

K = 0.85 (lateral)

earth = K(100)# = 0.085 k/ft³

Saturated = 0.0625

0.147 k/ft³



Case I - Fin. grade @ -5.1 (Saturated)
No water inside

Case II - Fin. grade @ -5.1
Water @ El. 14.0 (Gate closed)
(Protected Side) use for design

Case III Water Outside to El. 14
Floodside

(Note: If this condition exist Structure will be filled with Water - Load Cancels

Case II

19.10 x 0.0625 = 1.19 KSF

Case I

18.95 x 0.147 = 2.79 KSF

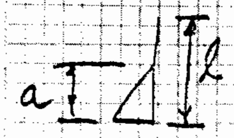
$\frac{1.19}{0.085} =$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of JHNC)

Shaft Design for Gate Structure - Short Wall Design (Cont.)

FEM's

Case I



M TOP

M Bottom

$\frac{a}{l} = \frac{18.95}{38.05} = 0.50$

$(0.0073)(38.05^2)(2.79) = 29.49'^K$

$(0.0239)(38.05^2)(2.79) = 96.54'^K$

Reaction @ Top = 4.38^K

Reaction @ Bott. = 22.05^K

Base Slab

Self Weight + Walls =

$\frac{2' \times 37' \times 0.15^K \times 2}{34'} = 0.65^{KSF} + (5.25 \times 0.15) = 1.44^{KSF}$

$FEM = \frac{1}{12}(1.44)(32)^2 = 122.9'^K$

$V = \frac{1.44 \times 32'}{2} = 23.04$

$\frac{5.25^3}{12} = 12.058^{in^4} \qquad \frac{12.058}{32} = 0.377$

$\frac{2^3}{12} = 0.667^{in^4} \qquad \frac{0.667}{38.05} = 0.017$

Distribution Factors

$\frac{.017}{0.017 + 0.377} = 0.04$

$\frac{0.377}{0.017 + 0.377} = 0.96$

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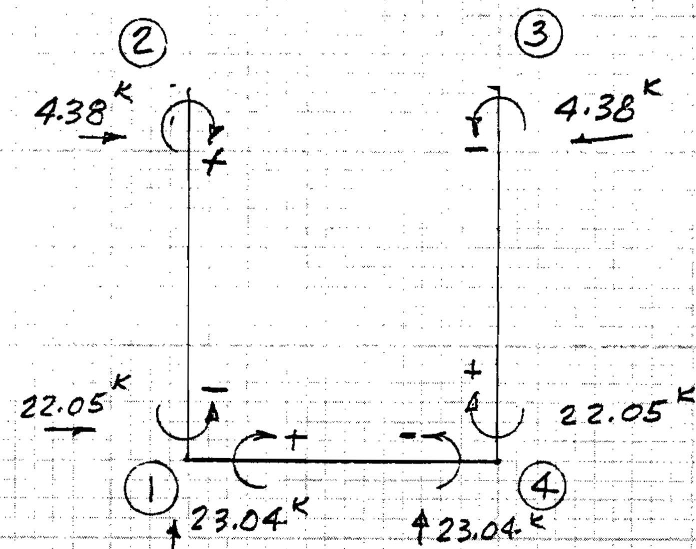
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Shaft Design for Gate Structure (Short Wall Design) cont.

Case I - Moment Distribution



JT.		①		④		
Mem.	2-1	1-2	1-4	4-1	4-3	3-4
DF	1.0	0.04	0.96	0.96	0.04	1.0
FEM	+29.49	-96.54	+122.9	-122.9	+96.54	-29.49
1ST Dist.	-29.49	-1.04	-25.32	+25.32	+1.04	+29.49
CO	-0.52	-14.75	+12.66	-12.66	+14.75	+0.52
2nd Dist	+0.52	+0.08	+2.01	-2.01	-0.08	-0.52
CO	+0.04	+0.26	-1.01	+1.01	-0.26	-0.04
3rd Dist	-0.04	+0.03	+0.72	-0.72	-0.03	+0.04
	0	-111.96	+111.96	-111.96	+111.96	0

$$\begin{matrix}1\text{-}2\\3\text{-}4\end{matrix} + M = \frac{(0.147)(18.95)^2(6.32)}{6(38.05)}\left[(? \times 19) + 37.9\sqrt{\frac{6.32}{38.05}}\right] - 111.96 = -6.10'^{K}$$

$$2\text{-}\mathcal{C}+ \quad = \frac{1}{8}(1.44)(32)^2 - 111.96 = 72.36'^{K}$$

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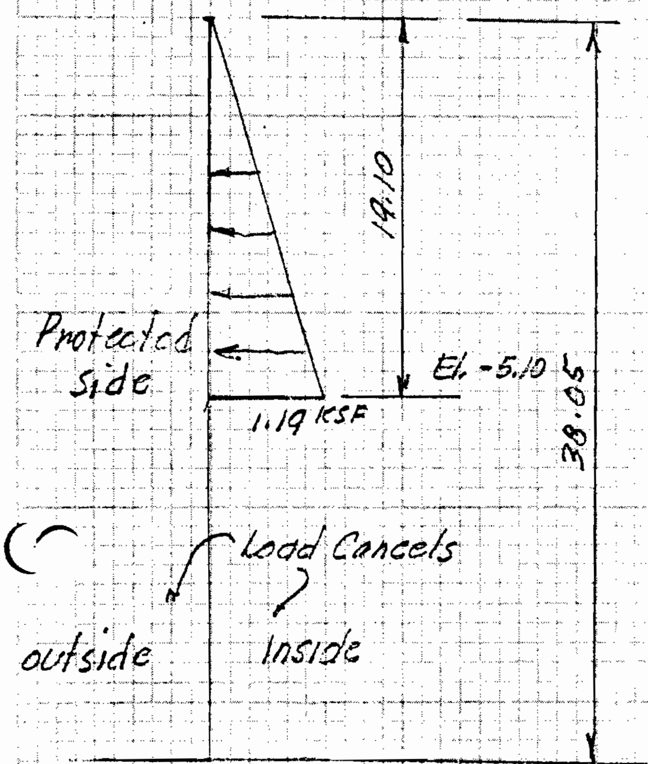
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Shaft design for Gate Structure. Short Wall Design (Cont)

Case II

(Water on Floodside) Gate Closed



FEM's

$\frac{a}{\ell} = \frac{19.10}{38.05} = 0.50$

$M_{top}\ (0.0332)(38.05)^2(1.14) = 54.8'^K$

$M_{Bot.}\ (0.0188)(38.05)^2(1.14) = 31.0'^K$

$R_{BOT} = \left(\frac{1.19 \times 19.10}{2}\right)\left(\frac{2 \times 19.10}{3}\right)\left(\frac{1}{38.05}\right) = 3.8^K$

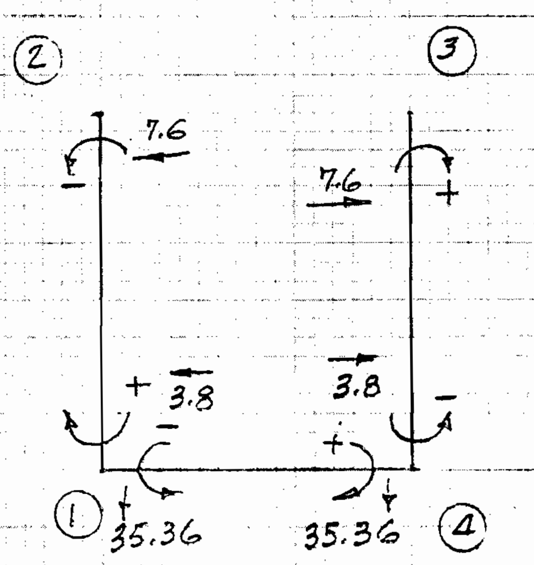
$R_{TOP} = \left(\frac{1.19 \times 19.10}{2}\right) - R_{BOT} = 7.6^K$

Bottom Slab

$W = (35.43 \times 0.0625) = 2.21\ KSF$

$FEM = \frac{1}{12}(2.21 \times 32^2) = 188.58'^K$

$R = \frac{2.21 \times 32}{2} = 35.36^K$



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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Shaft Design for Gate Structure (Short Wall Design) cont.

Case II - Moment Distribution

JT.		1		4		
MEM.	2-1	1-2	1-4	4-1	4-3	3-4
D.F	1.0	0.04	0.96	0.96	0.04	1.0
FEM	- 54.8	+ 31.0	- 188.58	+ 188.58	- 31.0	+ 54.8
1st Dist	+54.8	+6.30	+151.28	-151.28	-6.30	-54.8
CO	+3.15	+27.4	-75.54	+75.54	-27.4	-3.15
2nd Dist	-3.15	+1.93	+46.21	-46.21	-1.93	+3.15
Co	+0.97	-1.58	-23.10	+23.10	+1.58	-0.97
3rd Dist.	-0.97	+0.98	+23.69	-23.69	-0.98	+0.97
	0	+66.03	-66.04	+66.04	-66.03	0

Case I Governs (Page 11

Reduce Final end Moment to face of support

$$-M = \frac{38.05 - \frac{5.25}{2}}{38.05} \times 111.96'^{k} = 104.24'^{k}$$

$$+M = -111.96 - 6.10 = 118.06'^{k}$$

$$= \left(\frac{38.05 - \frac{5.25}{2}}{38.05} \times 118.06\right) - 104.24 = {}^{+}5.67'^{k}$$

$\therefore$ Design Moment $= 104.24'^{k} - 5.67'^{k} = 98.57'^{k}$

d provided 21.5" Mallow $= \sqrt{\frac{(x)(12)}{0.221 \times 12}} = 21.5"$ $x \doteq 102.17^{k} > 98.57'^{k}$ ok
d 21.5"

V reduced @ face of support: $l = 38.05 - \frac{5.25}{2} = 35.43'$

ht. of earth $= 18.95 - \frac{5.25}{2} = 16.32'$ $W = 0.147 \times 16.32 \times \frac{16.32}{2} = 19.58^{k}$ (Page 9)

$V = (19.58)\left(35.43 - \frac{16.32}{3}\right)\left(\frac{1}{35.43}\right) = 16.57^{k}$

$v = \frac{16{,}570}{21.5 \times 12} = 64.22$ psi < 70 psi o/k

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Shaft Design for Gate Structure (Short Wall design) cont.
Reinforcement for Short Wall.

A_s req'd = $\dfrac{98.57'^{k}}{1.44 \times 21.5} = 3.18 \square''$ Use #9@4 ea. face

Case II

From Page (12) Max Moment @ El. -5.10 = $31'^{k}$

Treat as a simple beam

Simple Moment = $(0.1283)\left(\dfrac{1.19 \times 19.10}{2}\right)(19.10) = 27.84'^{k}$

d provide = 21.5" Mom. allow. $102.17'^{k} > 31'^{k}$
Page 13

Simple Shear = $\dfrac{1.19^{k} \times 19.1'}{2} = 11.36^{k}$

$v = \dfrac{11.36^{k}}{21.5 \times 12} = .044$ ksi $< .070$ ksi

Bond: Max shear = 16.57^{k} (Case 1)

$\dfrac{16{,}570^{\#}}{(3 \times 3.544)(0.88)(21.5)} = 82.37$ psi < 234 psi allowable

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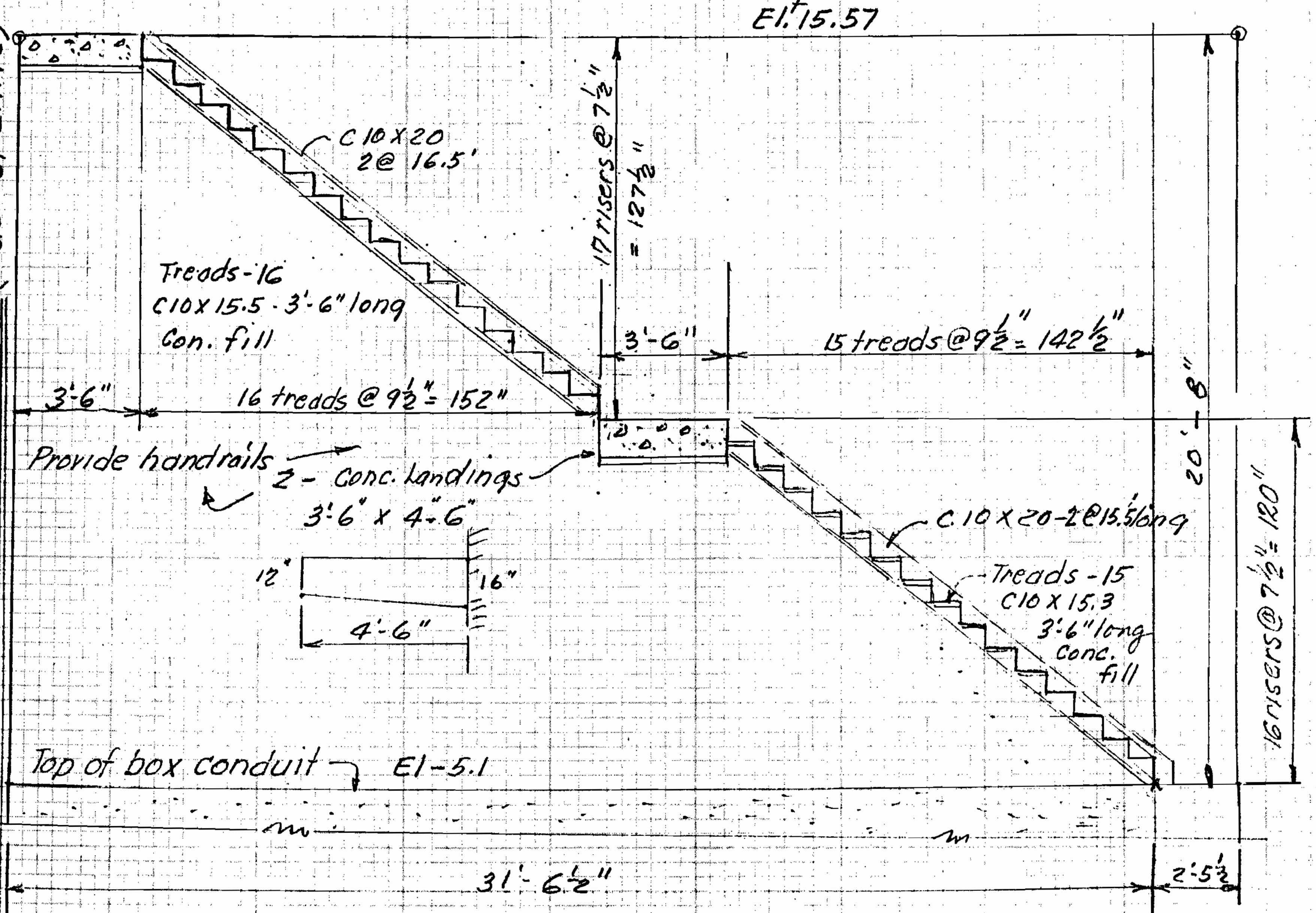
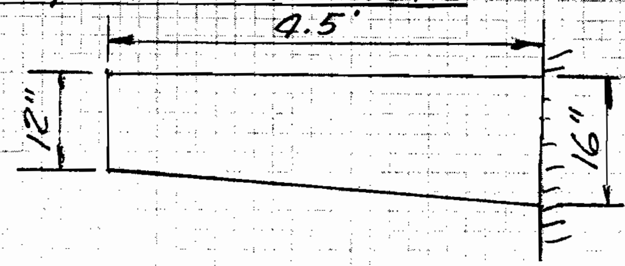
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)



Elevation - East Wall - Stairs and Supports

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Stair Support - East Wall of Gate Structure.



Dead Load

Conc. = $\frac{1+1.33}{2} \times 4.5 \times 0.15^{K}$

$= 0.79\ ^{K}/_{F}$

Steps (Steel) 16.5' long.

2 - C10 X 20 = 0.65^{K}

16 - C10 X 15.3 X 3.5 = 0.88^{K}

Conc. Steps = 1.38^{K}

Misc. (Handrails) = 0.15^{K}

3.06^{K}

Live Load

Steps 0.83 X 3.5 X 16 X 0.15 = 7.0^{K}

Platforms - ? 5 X 4.5 X 0.15 = 2.36^{K}

Live load (7+2.36)(1.15) = 10.76^{K}

All live loads acting at free end of cantilever.

$M = 10.76^{K} \times 4.5' = 48.42$

$\frac{3.06^{K}}{2} \times \frac{3.5'}{2} = 2.68$

$0.79^{K} \times 3.5 \times 2.25 = 6.22$

$57.32'^{K}$

$d_{reqd} = \sqrt{\frac{57.32 \times 12}{0.221 \times 42}} = 8.6" = 10"$ @ free end 14" @ wall

Shear = W = (0.79 X 3.5) + 3.06 + 7.0 + 2.4 = 15.23^{K}

$= \frac{15,230^{\#}}{10 \times 42} = 36\ psi < 70\ psi$

As @ fixed end = $\frac{57.32'^{K}}{1.44 \times 42} = 0.94\ \square''$

$\frac{0.94}{3.5} = 0.27^{\square}$ per ft.

Use same reinf. both landings-

Check Deflection

$p = \frac{A_s}{bd} = \frac{2.64^{\square''}}{42 \times 12} = 0.00524$

$p f_y = 40,000(0.00524) = 210 < 500$

Use uncracked section

Average $I = \frac{(42)(14)^3}{12} = 9604\ in^4$

$\frac{P l^3}{3EI} = \frac{(10,760)(54)^3}{(3)(4 \times 10^6)(9604)} = 0.014"$

$\frac{3.06^{K}}{2} = \frac{(1530)(21)^3}{} = 0.00012"$

$\frac{(2765)\ 27^3}{} = 0.0047"$

$.01882$

$= \frac{1}{2869}$ of K

Top face Use 5 #6 bar = 2.64 □"

Bott. use 3 #6 bar =

#3 double stirrups @ 8"

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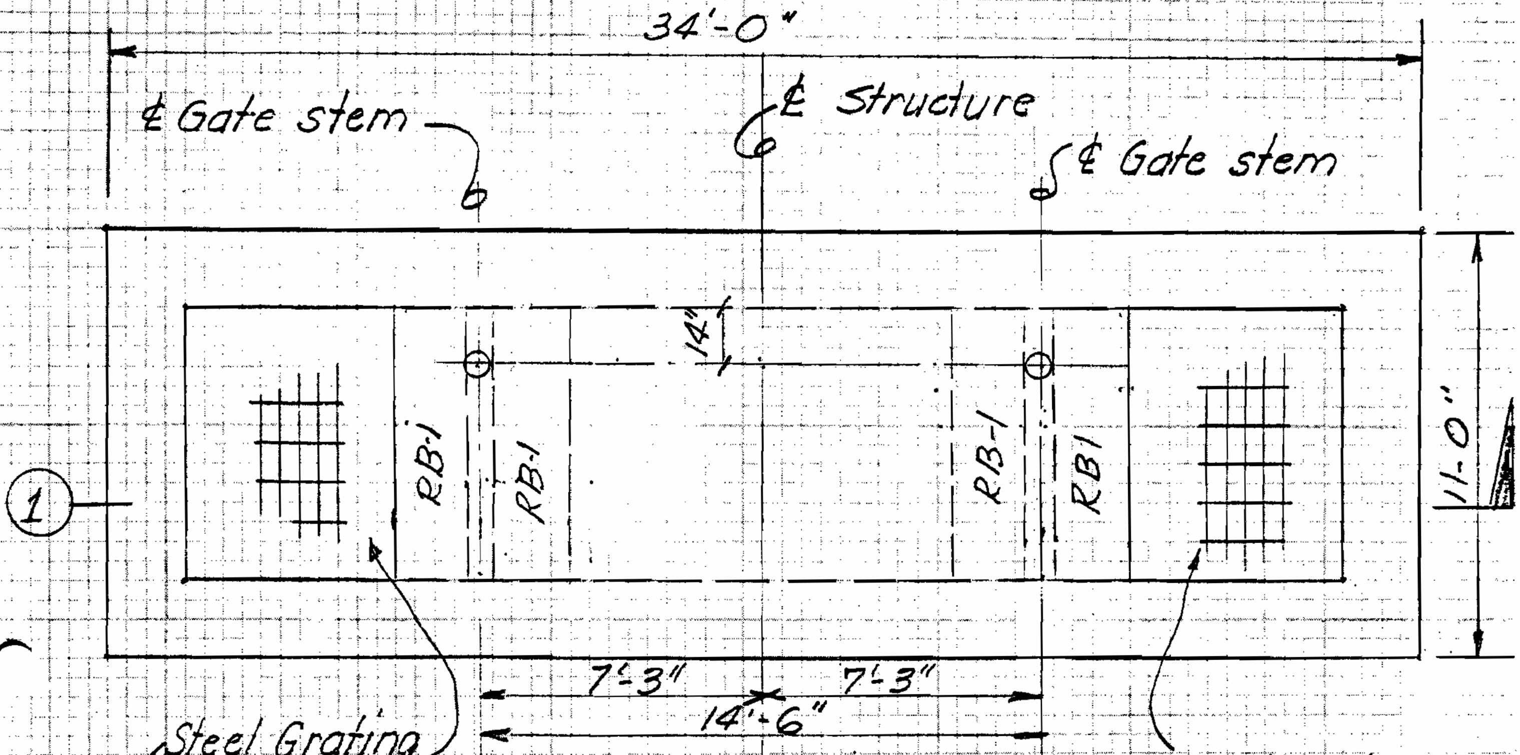
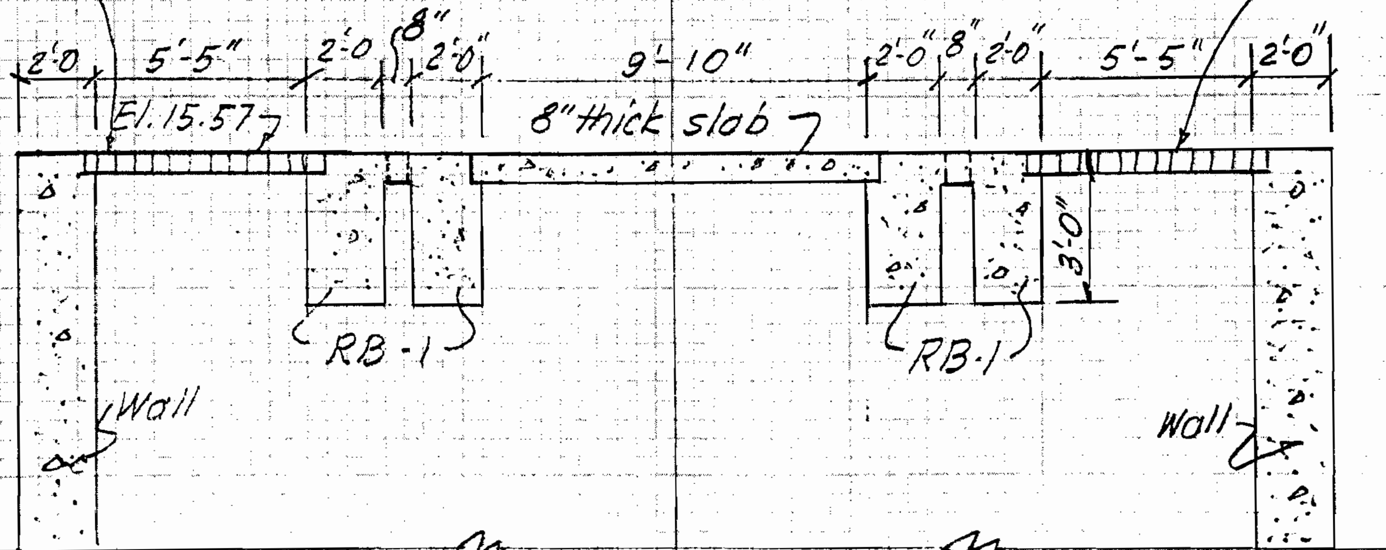
GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Gate Structure - Top Slab Design



PLAN - TOP SLAB



SECTION 1

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Gate Structure - Top Slab Design 2-way slab

Loads

D.L. 8" slab = 0.10^{KSF}

LL = 0.15^{KSF}

0.25^{KSF}

Method 3 ACI-318-63 Page 318-130 Case 5

$K = 221$ $A = 1.44$ $d = 7''$ Allowable shear = 70 psi

Min. $A_s = 0.002 \times 8'' \times 12'' = 0.19^{\square''}$

$m = 7/9 = 0.77$ say 0.8 Short span = 0.064 Long span = 0.050

Short Strip

$M = 0.064 \times 0.25^{KSF} \times 7.0^2 = 0.78^{'K}$

$A_s = \frac{0.78}{1.44 \times 7} = 0.008 <$ min.

Reverse Loading El. 14.0 − 12 = 2 −2 − 21.42 = 23.42 in '

$23.42' \times 0.0625 = 1.46^{KSF}$ $1.46^{KSF} - \underset{\text{wt. slab}}{0.1} = 1.36^{KSF}$

$M = 1.36^{KSF} \times 0.064 \times 7^2 = 4.26^{'K}$

$d = \sqrt{\frac{4.26 \times 12}{0.221 \times 12}} = 4.4'' < 7''$ ok $A_s = \frac{4.26}{1.44 \times} = 0.42^{\square''}$

$V = \frac{1}{2}(7 \times 1.36^K) = 4.76^K$

$\frac{4760^{\#}}{12 \times 7} = 56.66 < 70$ psi ok

Long Strip - bottom face same as short strip = $0.42^{\square''}$

Reverse Loading (Top face)

$M = 1.36^{KSF} \times 0.05 \times 7^2 = 3.33^{'K}$

$A_s = \frac{3.33}{1.44 \times 7} = 0.33^{\square'}$

$V = \frac{1}{2}(9 \times 1.36) = 6.12$

$v = \frac{6120}{12 \times 7''} = 73$ psi $\not\approx$ 71 $^o/_K$

Use #6 @ 12 top face - short direction

Use #5 @ 12 top face - long direction

Use 4 @ 12 ea. way - bottom face

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure - Gate stem support beam.

Loads (8" conc. slab heavy side

Beam wt = $2 \times 3 \times 0.15 = 0.9\ \frac{K}{LF}$
$+ 0.33 \times 0.67 \times 0.15 = 0.03$
$0.93\ \frac{K}{LF}$

Totals
0.93
0.26
0.30
0.41
1.9^{KLF}

Wt. conc. slab
$9.83 \times 7 = 68.8^{\square'}$ $68.8 \times 0.10^{KSF} = 6.88^{K}$

$\frac{7}{7+(2\times 9.83)} = 0.26$ $\frac{0.26 \times 6.88}{7} = 0.26^{KLF}$

L.L. = $2 \times 0.15 = 0.3^{KLF}$ on beam
from 8" slab = $\frac{0.15 \times 68.8 \times 0.28}{7} = 0.41^{KLF}$

Force req'd to open Sluice Gates

Head = 30.0' Area of opening = $12.5 \times 13 = 162.5^{\square'}$
f = friction coefficent = 0.35
5" dia stem wt = $67^{\#}/ft \times 33' = 2.2^{K}$
Gate @ $185^{\#}$/sq ft. $\times 162.5 = 30^{K}$
$F = 30' \times 0.0625 \times 162.5 \times 0.35 + [1.5(30^{K}) + 2.2^{K}]$
$F = 153.8^{K}$ use 154^{K} @ ½ per beam = 77^{K}

Head = 20.0 (Water @ El. 4 - Flood side)

$F = 20 \times 0.0625 \times 162.5 \times 0.35 + [1.5(30^{K}) + 2.2^{K}] = 118.3^{K}$
Use 119^{K}

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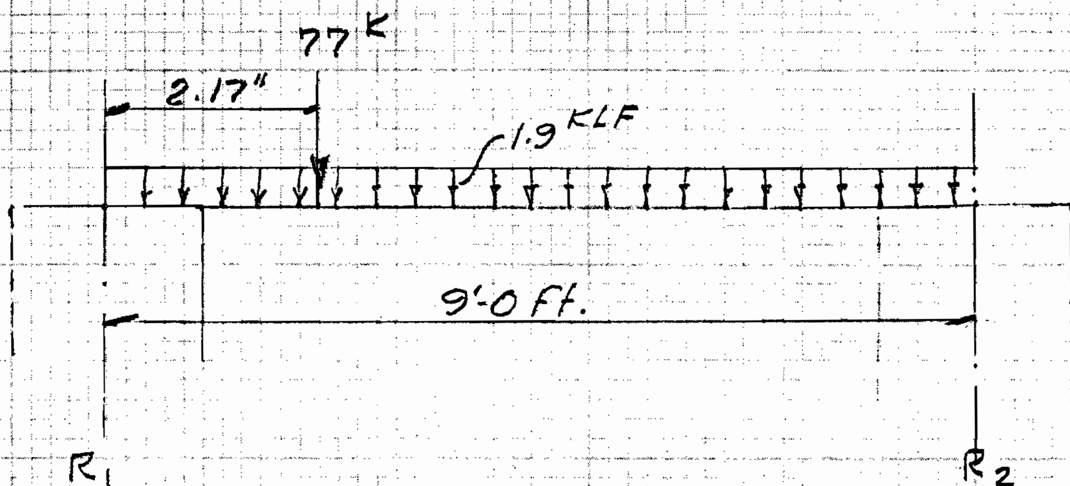
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure - Gate Stem support beams



$R_1 = \frac{1.9 \times 9}{2} = 8.55^K$ $\qquad R_2 = 8.55^K$

$\frac{77(9-2.17)}{9} = 58.42$ $\qquad 77 - 58.42 = 18.58$

$\overline{66.98^K}$ $\qquad \overline{27.13^K}$

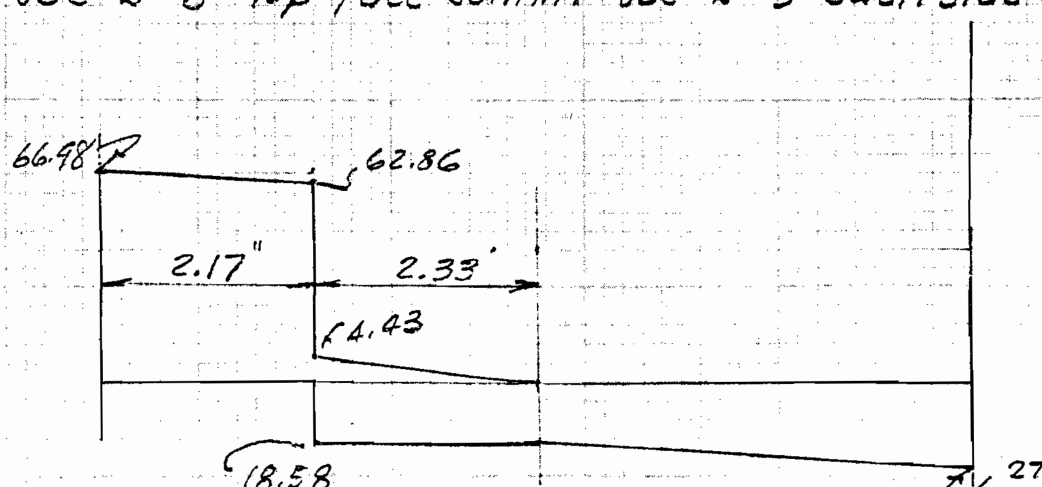
Max. Beam Moment

$\left[\left(\frac{66.98+62.86}{2}\right) \times 2.17'\right] + \left(\frac{4.43 \times 2.33}{2}\right) = 146.03'^K$ $\qquad 66.98 - (2.17 \times 1.9) = 62.86^K$

$d\ reqd = \sqrt{\frac{146.03 \times 12}{.221 \times 24}} = 18.17'' < 33.5''$

$A_s\ reqd = \frac{146.03^K}{1.44 \times 33.5} = 3.02^{\square''}$ Use 4#8 bottom face = $3.16^{\square''}$

Use 2#8 top face contin. Use 2#5 each side @ Middle points



SHEAR DIAGRAM

See page 21

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Gate Structure - Gate Stem Support Beam (Cont.)

Max. allowable shear = 70 psi X 24 X 33.5 = 56.28^K

$66.98^K - 56.28 = 10.7^K$

$\frac{10.7^K}{24 \times 33.5} = .013^{KSI} = 13.3 \text{ psi} = v_1$

#3 Stirrups

$S = \frac{2 \times 0.11 \times 20{,}000 \text{ psi}}{13.3 \times 24} = 13.78''$ Use #3 @ 10 all the way

Design of Box Section Under East Wall Gate Structure

Loading 2.0' Wide Strip $+15.57 - 8.43 = 24'$

Roof Slab (2' wide wall above) X 24' high

Wt = $2 \times 24 \times 0.15^K = 7.2^{KLF}$

Wt of Operating Floor on West Wall

Gate (two = @ 30^K) = 60^K

Stem (2 @ 2.2^K) = 4.4^K

½ Con. slab

$(\frac{9.83 \times 7}{2}) \times 0.67' \times 0.15 = 3.46^K$

Beams

$2(2 \times 3 \times 7)(0.15) = 6.30^K$

$1(0.67^2 \times 7 \times 0.15) = 0.47^K$

Steel Grating @ 35#/Ft = 1.3^K

Steel Stairs = 6.12^K

Landing (2)

$2(3.5 \times 4.5 \times 1.17 \times 0.15) = 5.52$

Cracking Force (one)

$154 - 32.2 = \quad = 121.8$

209.37

$\frac{209.37^K}{34} = 6.16^K$ Lin ft : 2' strip of Roof Slab

$+ \quad 7.2$

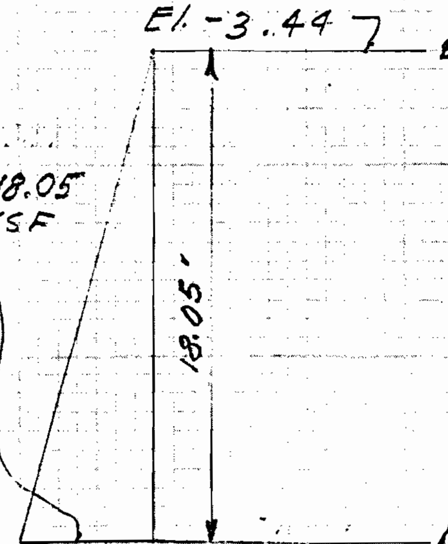
13.36^K

Walls

2 Outside Walls (Gates closed)

$w = 0.085$
$+ = 0.0625$
0.148

$(2)\ 0.148 \times 18.05$
$w = 5.34^{KSF}$
(2 Ft strip)



$W = \frac{5.34 \times 18.05}{2} = 48.2^K$

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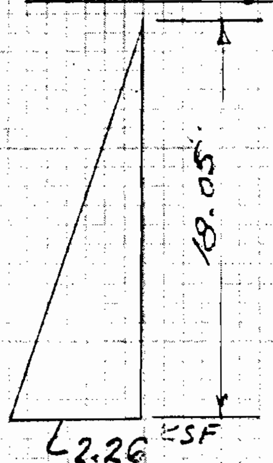
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall-Gate Structure

Middle Wall

Assume H_2O on one side only (condition could exist)



2' Strip

$2(18.05 \times 0.0625) = 2.26$

$W = \dfrac{2.26 \times 18.05}{2} = 20.4^{K}$

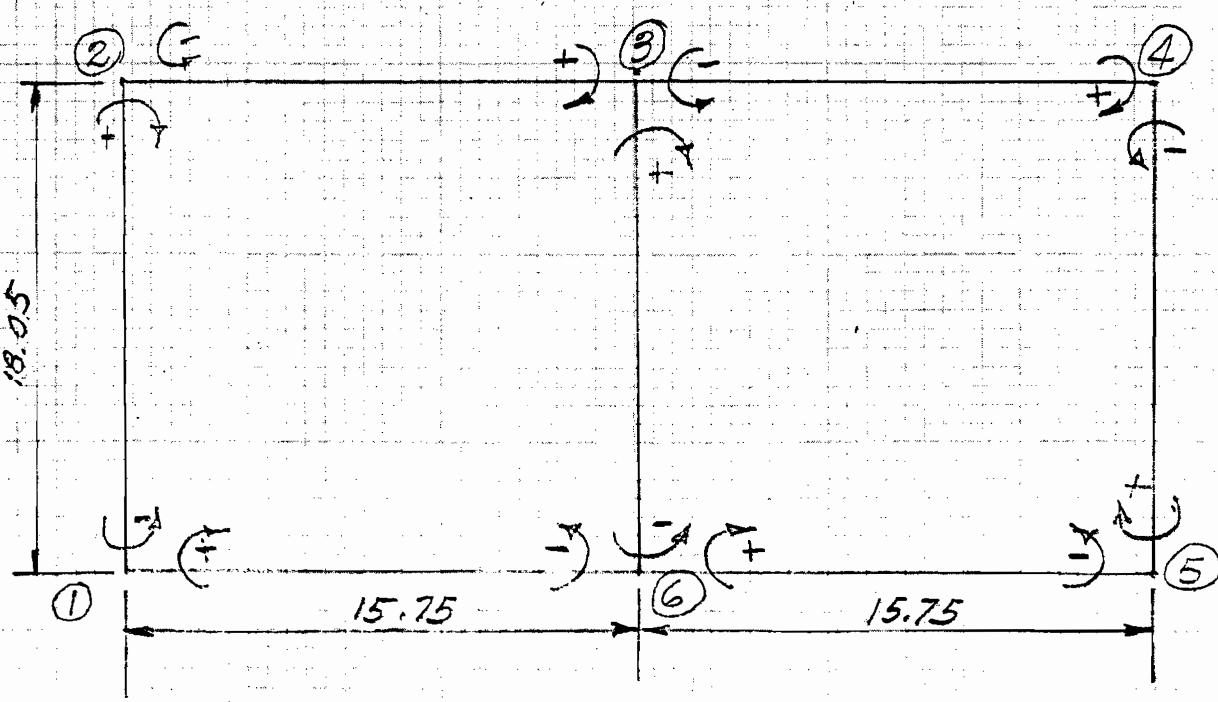
Floor Slab = (2 FT strip) Self-wt. $= 5.25' \times 2' \times 0.15 = 1.58^{KSF}$

Roof 13.36^{KSF}

Walls $= 2(3.5 \times 13 \times 2 \times 0.15) = 27.3^{K}$ $\dfrac{35.1}{34} = 1.03^{KSF}$

$1(2 \times 13 \times 2 \times 0.15) = 7.8$ 15.97^{KSF}

35.1



GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall - Gate Structure

FEM's and Shears -

Roof Slab (2)(3) and (3)(4)

$$FEM = \frac{(15.75)^2 \times 13.36^{KLF}}{12} = 276.2'^{K}$$

$$V = \frac{15.75 \times 13.36}{2} = 105.21^{K}$$

Out side Walls - (1)(2) and (5)(4)

FEM @ (1) or (5)

$$= \frac{48.2^{K} \times 18.05}{10} = 87.0'^{K}$$

FEM @ (2) or 4

$$= \frac{48.2 \times 18.05}{15} = 58.0'$$

V @ (1) or (5)

$0.35 W \ell$

$= (0.35)(5.34)(18.05) = 33.7^{K}$

V @ (2) or (4)

$0.15 w \ell$

$(0.15)(5.34)(18.05) = 14.5^{K}$

Middle Wall (3)(6)

FEM @ (6)

$$\frac{20.4^{K} \times 18.05}{10} = 36.82'^{K}$$

FEM @ (3)

$$\frac{20.4^{K} \times 18.05}{15} = 24.5'^{K}$$

V @ (6)

$0.35 \times 2.26 \times 18.05 = 14.27^{K}$

V @ (3)

$0.15 \times 2.26 \times 18.05 = 6.12^{K}$

Floor Slab (1)(6)(6)(5)

FEM @ (1) or (6) and @ (6) or (5)

$$\frac{15.97 \times 15.75^2}{12} = 330.13'^{K}$$

$$\frac{15.97 \times 15.75}{2} = 125.76^{K}$$

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall - Gate Structure

Distribution Factors

Roof Slab :

2', 3.333' $I = \dfrac{2 \times 3.333^3}{12} = 6.17\ ft^4$ $\dfrac{I}{l} = \dfrac{6.17}{15.75} = 0.3917$

Walls

2, 3.5 $I = \dfrac{2 \times 3.5^3}{12} = 7.15\ ft^4$ $\dfrac{I}{l} = \dfrac{7.15}{18.05} = 0.3961$

Bott. Slab

2, 5.25 $I = \dfrac{2 \times 5.25^3}{12} = 24.114\ ft^4$ $\dfrac{I}{l} = \dfrac{24.114}{15.75} = 1.531$

@ 2, 4 $\dfrac{0.3917}{0.3961 + 0.3917} = 0.67$ - 2 to 3 0.67 4 to 3
0.33 2 to 1 0.33 4 to 5

@ 3 $\dfrac{0.3917}{0.3917 + 0.0737 + 0.3917} =$ 0.46 3 to 2
0.46 3 to 4
0.08 3 to 6

@ 1, 5 $\dfrac{1.5310}{1.5310 + 0.3961}$ 0.79 - 1-6 0.79 5 to 6
0.21 1-2 0.21 5 to 4

@ 6 $\dfrac{1.531}{1.531 + 0.0737 + 1.531} =$ 0.49 6 to 1
0.49 6 to 5
0.02 6 to 3

Middle Wall

2, 2 $= \dfrac{2^4}{12} = 1.33\ ft^4$ $\dfrac{1.33}{18.05} = .0737$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL - (East of IHNC)
Design of Box Structure under East Wall-Gate Structure
Water on on side of divider wall

Jt.	②		③			④		⑤		⑥			①	
Mem	2-1	2-3	3-2	3-6	3-4	4-3	4-5	5-4	5-6	6-5	6-3	6-1	1-6	1-2
D.F.	0.33	0.67	0.46	0.08	0.46	0.67	0.33	0.21	0.79	0.49	0.02	0.49	0.79	0.23
FEM	+58.0	-276.2	+276.2	+24.5	-276.2	+276.2	-58.0	+87.0	-330.2	+330.2	-36.2	-330.2	+330.2	-87.0
1st Dist	+72.0	+146.2	-11.3	-1.9	-11.3	-146.2	-72.0	+51.1	+192.1	+17.7	+0.8	+17.7	-192.1	-51.1
CO	-25.6	-5.7	+73.1	+0.4	-73.1	-5.7	+25.6	-36.0	+8.9	+96.1	-1.0	-96.1	+8.9	+36.0
2nd Dist	+10.3	+21.0	-0.2	0	-0.2	-13.3	-6.6	+5.7	+21.4	+0.5	0	+0.5	-35.5	-9.4
CO	-4.7	-0.1	+10.5	0	-6.7	-0.1	+2.9	-3.3	+0.3	+10.7	0	-17.8	+0.3	+5.2
3rd Dist	+1.6	+3.2	-1.7	-0.4	-1.7	-1.9	-0.9	+0.6	+2.4	+3.5	+0.1	+3.5	-3.9	-1.0
	+111.6	-111.6	+346.6	+22.6	-369.2	+109.0	-109.0	+165.1	-105.1	+458.7	-36.3	-423.4	+107.5	-107.5

Top Slab $w = 13.36^{KLF}$

Shear adj

$$\frac{-111.6+346.6}{15.75} = +14.92$$

-105.21
+14.92
-90.29

$$\frac{-90.29}{13.36} = 6.76'$$

$$\frac{120.13}{13.36} = \frac{8.99}{15.75'}$$

shear adj.

$$\frac{-369.2+109.0}{15.75} = -16.52$$

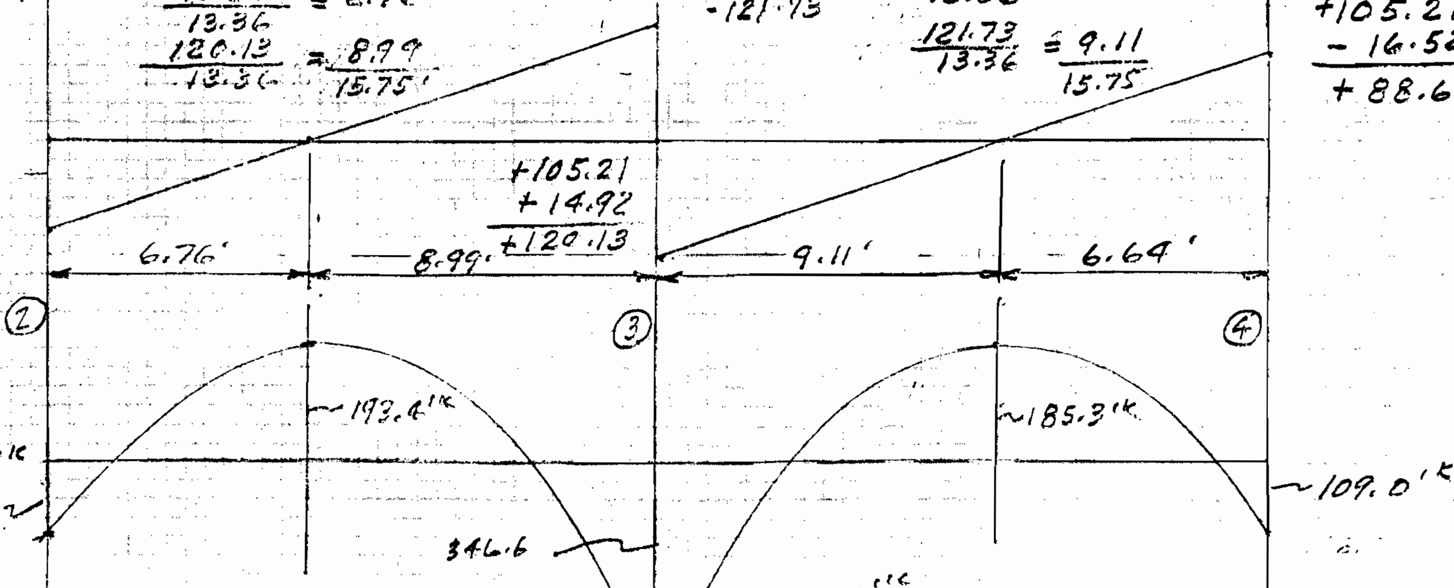
-105.21
-16.52
-121.73

$$\frac{88.69}{13.36} = 6.64'$$

$$\frac{121.73}{13.36} = \frac{9.11}{15.75}$$

+105.21
-16.52
+88.69

+105.21
+14.92
+120.13



$+M = 0.5 \times 90.29^{k} \times 6.76 - 111.6'^{k} = 193.4'^{k}$
$+M = 0.5 \times 120.13 \times 8.99 - 346.6'^{k} = 193.4'^{k}$

$+M = 0.5 \times 121.73^{k} \times 9.11' - 369.2'^{k} = 185.3'^{k}$
$+M = 0.5 \times 88.69 \times 6.64 - 109.0 = 185.3'^{k}$

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

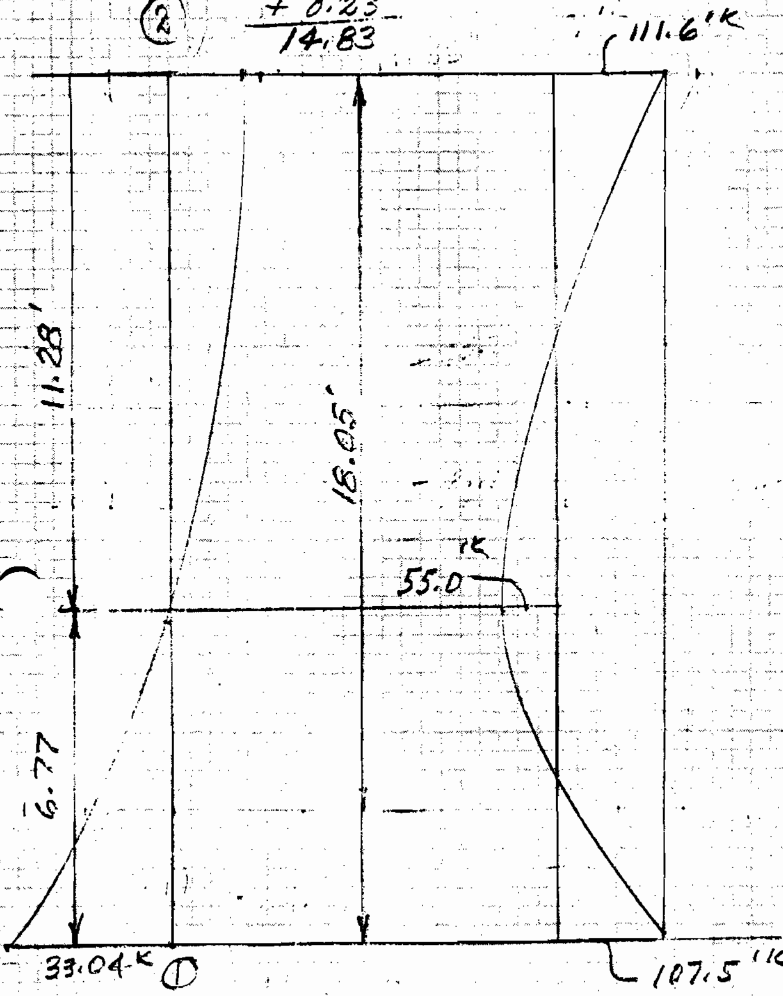
Design of Box Structure under East Wall-Gate Structure

Outside Walls ② - ① and ④ - ⑤

$w = 0.146 \times 2$ (2' strip) $= 0.296$

shear adjust. $= \dfrac{+111.6 - 107.5}{18.05} = +0.23^{k}$

② $\begin{array}{r} +14.5 \\ +0.23 \\ \hline 14.83 \end{array}$



$\begin{array}{r} -33.27 \\ +0.23 \\ \hline 33.04^{k} \end{array}$

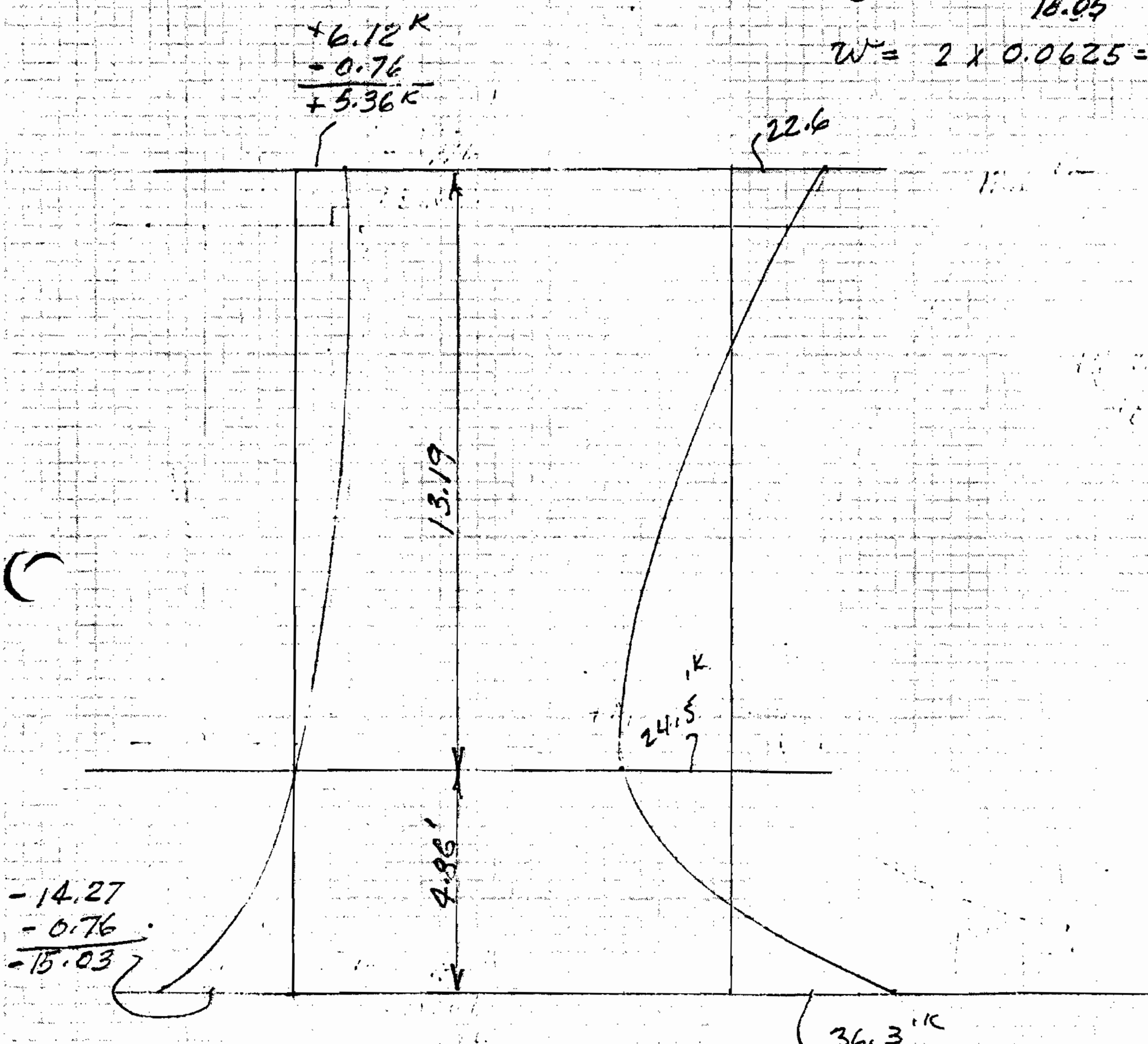
$$\text{"0" shear} = \frac{(0.296 \times 18.05^3)\left(\frac{1}{9\sqrt{3}}\right)}{0.667} \times \frac{1}{14.83^k} = 11.28' \text{ from } ②$$

$$+M = (11.28' \times 14.83^{k} \times 0.667) - 111.6 = 55.01'^{k}$$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Design of Box Structure under East Wall - Gate Structure
Middle Wall - 2' strip

$$\text{Shear adj} = \frac{+22.6 - 36.3}{18.05} = -0.76\ ^{K}/_{Ft}$$

$$w = 2 \times 0.0625 = 0.125$$



$$\text{"0" Shear} = \frac{(0.125 \times 18.05^3)\left(\frac{1}{9\sqrt{3}}\right)}{0.667}\left(\frac{1}{5.36}\right) = 13.19' \text{ from } ③$$

$$+M = 13.19' \times 5.36 \times 0.667 - 22.6 = 24.55^{'K}$$

$$\text{Simple Moment} = 0.128\left(\frac{0.125 \times 18.05}{2}\right) 18.05 = 24.53$$

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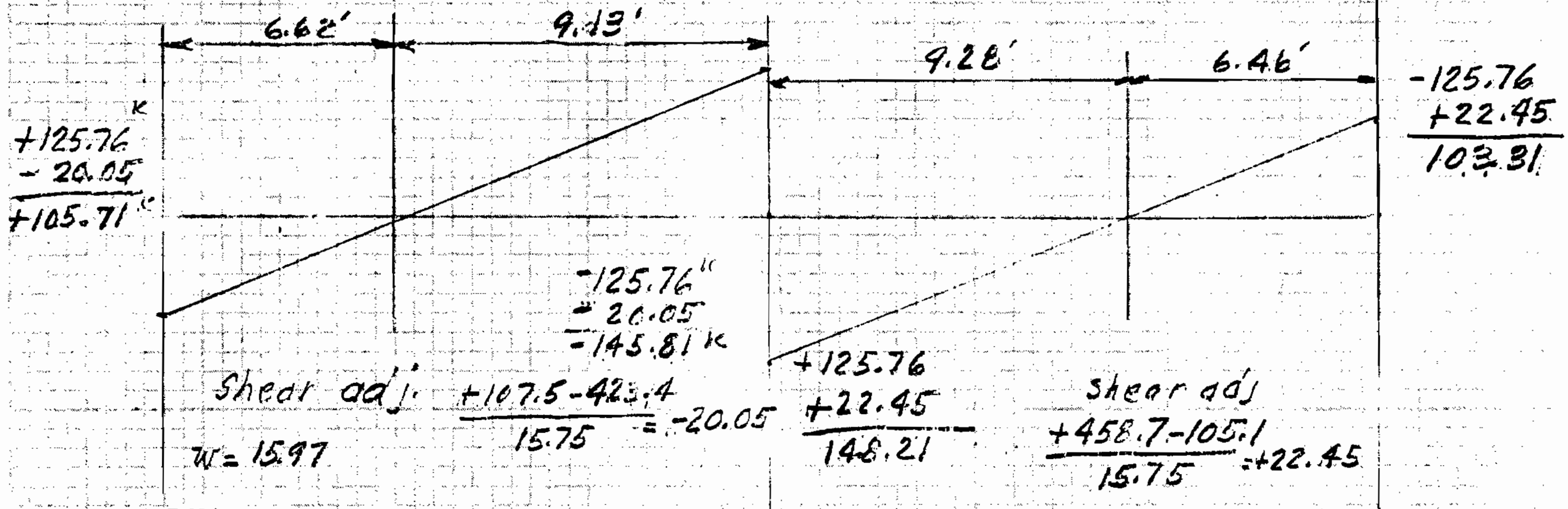
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall - Gate Structure

Floor Slab

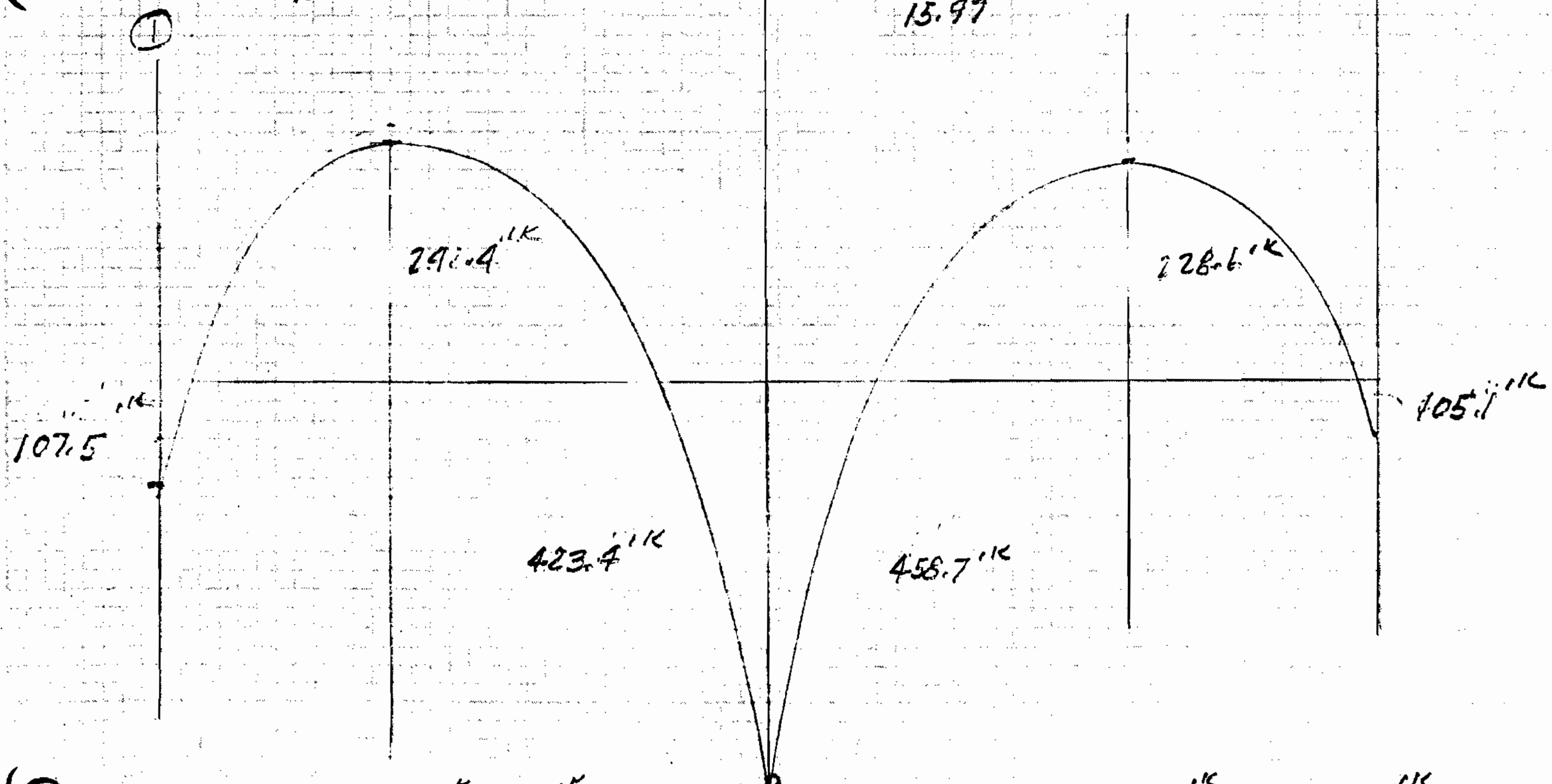


$\frac{105.71}{15.97} = 6.62'$

$\frac{145.81}{15.97}$ $\frac{9.13}{15.75}$

$\frac{148.21}{15.97} = 9.28'$

$\frac{103.31}{15.97} = 6.46'$



$+M = \frac{6.62 \times 105.71^{K}}{2} - 107.5^{'K} = 242.4^{'K}$

$\frac{6.46 \times 103.31}{2} - 105.1^{'K} = 228.6^{'K}$

$+M = \frac{9.13 \times 145.81^{K}}{2} - 423.4^{'K} = 242.4^{'K}$

$\frac{9.28 \times 148.21}{2} - 458.7^{'K} = 228.6^{'K}$

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall - Gate Structure

Top Slab (2' wide strip) (See page 25)

Max Moment = 369.2'k (Top face @ center Wall)

193.4'k (Bott. face middle of span

Max V = +121.73k

K = 221 fs = 20ksi f'c = 4000 A = 1.44 b = 24" d = 54" Allowable v = 70 psi j = 0.88

$$d'reqd = \sqrt{\frac{369.2 \times 12}{0.221 \times 24}} = 28.9'' < 54''$$

Max allowable shear = 70psi × 24 × 54 = 90,720# = 90.72k

Reduce "V" to edge Middle Wall

$$121.73 - \left(\frac{121.73}{9.11} \times 1.0\right) = 108.37^{k}$$

$$108.37^{k} - 90.72^{k} = 17.65^{k}$$

$$\frac{17.65^{k}}{24 \times 54} = 0.0136\ ksi = 13.6\ psi = v_1$$

$$S = \frac{2 \times 0.11 \times 20{,}000^{psi}}{13.6 \times 24} = \frac{4400}{326.4} = 13.48$$ use #3 ties @ 10"

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall-Gate Structure

Side walls - 2 ft. strip. d = 39" b = 24" K = 221 a = 1.44 allowable shear = 70psi

Max Moment - 111.6 Max V = 33.09 $v = \frac{33,090}{24 \times 39} = 35 psi < 70 psi$

$d \text{ reqd} = \sqrt{\frac{111.6 \times 12}{.221 \times 24}} = 18.37" < 39"$

Shear and Bond ok by inspection

$As = \frac{111.6}{1.44 \times 39} = 1.99 \square"$ #8@6 = 3.16 □" Use same reinf outside and inside faces vertical bars

Middle Wall

Max Mom. = 33.6 K d = 20"

$d' \text{required} = \sqrt{\frac{33.6 \times 12}{0.221 \times 24}} = 8.71" < 20"$

Shear and bond ok by inspection

$As = \frac{33.6}{1.44 \times 20} = 1.16 \square$ #8@12 = 1.58 □" (2' wide strip)

Floor Slab

Max Mom. (Bott. face reinf) - 458.8

Max Mom (Top face reinf) = 242.4

d = 57" V = 148.21 K

$d' \text{reqd} = \sqrt{\frac{458.8 \times 12}{0.221 \times 24}} = 32.21" < 57"$

$v = \frac{76,430}{24 \times 57} = 56. < 70 psi$

Reduce V $\frac{148.21^K}{9.21} \times \frac{d}{12} = 76.43^K$

148.21 - 76.43 = 71.78

Top face

$As = \frac{258.1^K}{1.44 \times 57} = 3.14 \square"$

4 #10 = 3.81 □"

As. Bottom face @ center wall 2'0 strip

$As = \frac{458.8}{1.44 \times 57} = 5.58 \square"$ (4 #11 = 6.24 □")

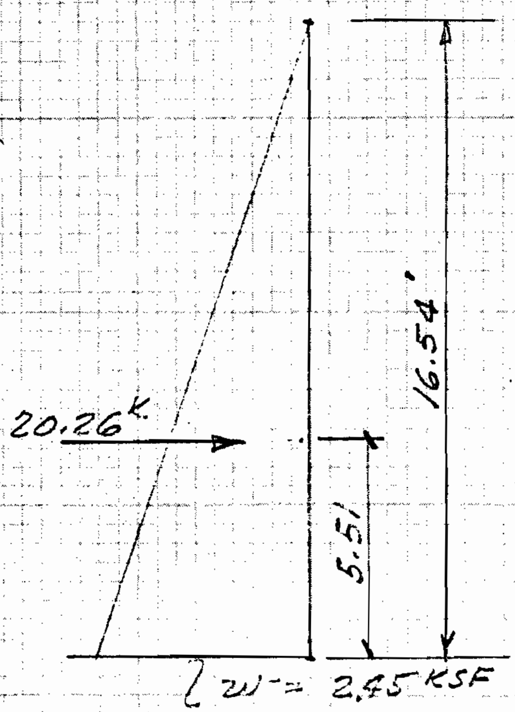
bond ok by inspection

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Protected side of Gate Structure

Use 2'-6" Outside Wall
2'-0" Center Wall
3'-9" Floor Slab
3'-4" Roof Slab
(14'-8") 2 places, ℄ center wall to ℄ Outside Wall.
16.54' ℄ Floor Slab to Roof Slab

Loading Side Walls (1 ft. of width)



$w = 0.085$
$+ = 0.0625$
0.148^{KSF}

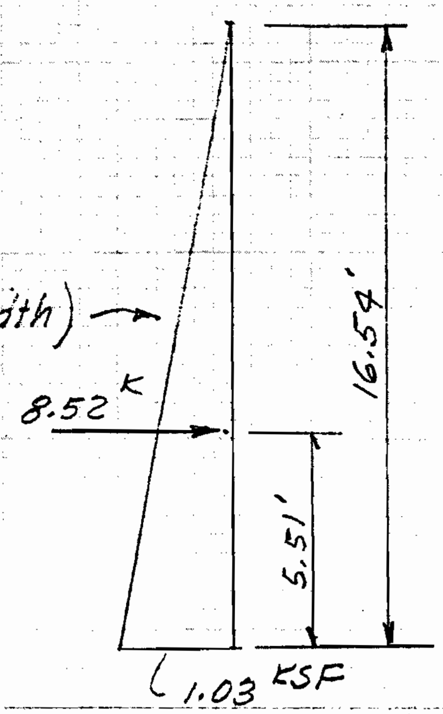
$0.148 \times 16.54' = 2.45^{KSF}$

$W = \frac{2.45 \times 16.54}{2} = 20.26^{K}$

Center Wall - Water on one side. (1 ft of width)

$16.54 \times 0.0625 = 1.03^{KSF}$

$W = \frac{1.03 \times 16.54}{2} = 8.52^{K}$



GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure · Protected side of Gate Structure

Loading (Cont.)

Roof Slab Self weight

$(3.33 \times 1.0 \times 0.15) + 100^{lb}$ L.Load $= 0.60^{KSF}$

Floor Slab

Walls $= 2(2.5 \times 16.54 \times 0.15) = 12.41$

$1(2 \times 16.54 \times 0.15) = 4.96$

Roof $= 2(14.67 \times 0.60) = 17.6$

Σ 34.97

$\frac{34.97}{2 \times 14.67} = 1.19^{KSF}$

FEM's and Shears

Roof Slab

$\frac{0.60 \times 14.67^2}{12} = 10.76'^{K}$

$\frac{0.6 \times 14.67}{2} = 4.4^{K}$

Floor Slab

$\frac{1.19 \times 14.67^2}{12} = 21.34^{K}$

$\frac{1.19 \times 14.67}{2} = 8.72^{K}$

Outside Walls

FEM @ Bottom

$= \frac{20.26 \times 16.54}{10} = 33.51'^{K}$

Shear @ Bott.

$0.35\,w\,l$

$= (0.35)(2.45)16.54 = 14.18^{K}$

Outside Wall

FEM @ Top

$= \frac{20.26 \times 16.54}{15} = 22.34'^{K}$

Shear @ Top

$(0.15)(2.45)(16.54) = 6.08^{K}$

Middle Wall

FEM @ Bott

$\frac{8.52 \times 16.54}{10} = 14.1'^{K}$

Shear @ Bott

$(0.35)(1.03)(16.54) = 5.96$

FEM @ TOP

$\frac{8.52 \times 16.54}{15} = 9.39'^{K}$

Shear @ Top

$(0.15)(1.03)(16.54) = 2.56$

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GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Design of Box Structure Protected side of Gate Structure

Distribution Factors

Roof Slab

3.33 × 1'

$I = \frac{3.333^3}{12} = 3.0864 \text{ ft}^4 \qquad \frac{I}{l} = \frac{3.0864}{14.67} = 0.2103$

Floor Slab

3.75 × 1

$I = \frac{3.75^3}{12} = 4.3945 \text{ ft}^4 \qquad \frac{I}{l} = \frac{4.3945}{14.67} = 0.2996$

Outside Walls

2.5 × 1

$I = \frac{2.5^3}{12} = 1.3020 \text{ ft}^4 \qquad \frac{I}{l} = \frac{1.3020}{16.54} = 0.0787$

Center Wall

2.0 × 1

$I = \frac{2.0^3}{12} = 0.6667 \text{ ft}^4 \qquad \frac{I}{l} = \frac{0.6667}{16.54} \; 0.0403$

@ Joint (2) (4)

$\frac{0.2103}{0.2103 + 0.0787}$

= 0.72

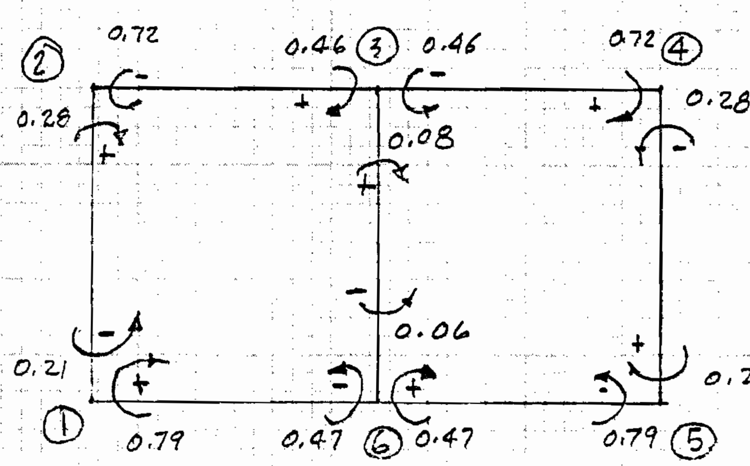
0.28

@ Joint (1) (5)

$\frac{0.2996}{0.2996 + 0.0787}$

= 0.79

= 0.21



@ Joint (3)

$\frac{0.2103}{0.2103 + 0.2103 + 0.0403}$

0.46

0.46

0.08

@ Joint (6)

$\frac{0.2996}{0.2996 + 0.2996 + 0.0403} = $ 0.47

0.47

0.06

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure · Protected Side of Gate Structure

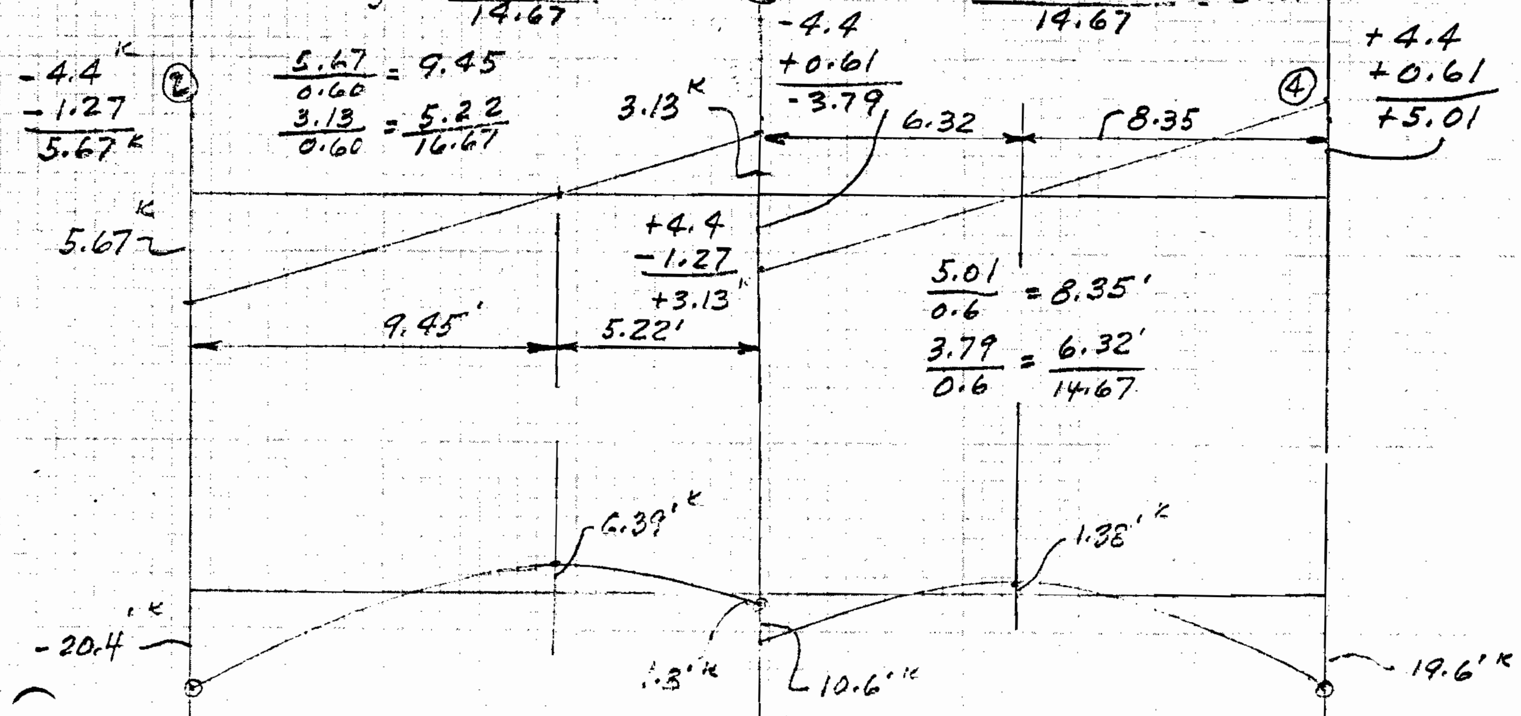
Moment Distribution

Jt	②		③			④		⑤		⑥			①	
Mem	2-1	2-3	3-2	3-6	3-4	4-3	4-5	5-4	5-6	6-5	6-3	6-1	1-6	1-2
DF	0.29	0.71	0.46	0.08	0.46	0.72	0.28	0.21	0.79	0.47	0.06	0.47	0.79	0.21
FEM	+22.4	-10.8	+10.8	+9.4	-10.8	+10.8	-22.4	+33.5	-21.3	+21.3	-14.1	-21.3	+21.3	-33.5
1st DIST.	-3.4	-8.2	-4.3	-0.8	-4.3	+8.2	+3.4	-2.6	-9.6	+6.6	+0.9	+6.6	+9.6	+2.6
CO	+1.3	-2.1	-4.1	+0.5	+4.1	-2.2	-1.3	+1.7	+3.3	-4.8	-0.4	+4.8	+3.3	-1.7
2nd Dist.	+0.2	+0.6	-0.2	-0.1	-0.2	+2.5	+1.0	-1.0	-4.0	+0.2	0	+0.2	-1.3	-0.3
CO	-0.2	-0.1	+0.3	0	+1.3	-0.1	-0.5	+0.5	+0.1	-2.0	0	-0.7	+0.1	+0.1
3rd Dist	+0.1	+0.2	-0.7	-0.2	-0.7	+0.4	+0.2	-0.2	-0.4	+1.3	+0.1	+1.3	-0.2	0.0
	+20.4	-20.4	+1.8	+8.8	-10.6	+19.6	-19.6	+31.9	-31.9	+22.6	-13.5	-9.1	+32.8	-32.8

Top Slab $w = 0.60$

Shear adj. $= \frac{-20.4 + 1.8}{14.67} = -1.27$

Shear adj $\frac{-10.6 + 19.6}{14.67} = +0.61$



$+M = \frac{5.67 \times 9.45}{2} - 20.4 = 6.39'^k$

$+M = \frac{3.13 \times 5.22}{2} - 1.8 = 6.37'^k$

$+M = \frac{6.32 \times 3.79}{2} - 10.6 = 1.38'^k$

$+M = \frac{8.35 \times 5.01}{2} - 19.6 = 1.32'^k$

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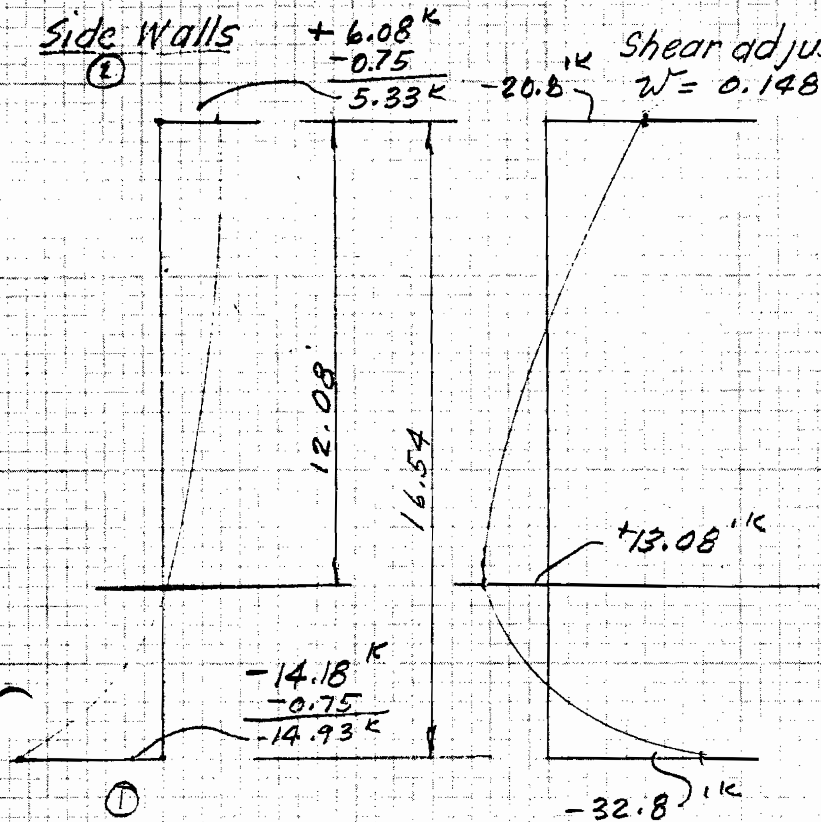
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Protected Side of Gate Structure

Side Walls

Shear adjustment = $\frac{-32.8+20.4}{16.54'} = -0.75$

$w = 0.148$



"0" Shear =

$\frac{(0.148 \times 16.54^3)(\frac{1}{9\sqrt{3}})}{0.667} \times \frac{1}{5.33} = 12.08'$

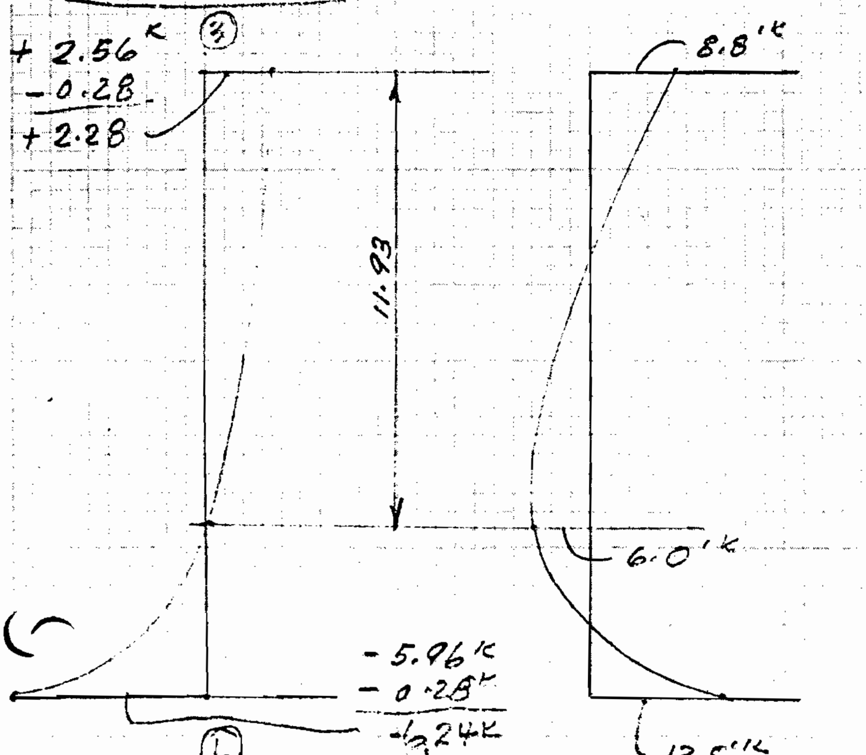
Simple Moment

$12.08' \times 5.33^K \times 0.667 = 42.94'^K$

$+M = 42.94'^K - [20.8 + (12.08 \times 0.75)]$

$= 13.08'^K$

Middle Wall $w = 0.0625$



Shear Adj.

$\frac{+8.8-13.5}{16.54} = -0.28$

0 Shear

$\frac{(0.0625 \times 16.54^3)}{0.667}(\frac{1}{9\sqrt{3}}) \times \frac{1}{2.28} = 11.9$

Simple Moment

$= 11.93 \times 2.28^K \times 0.667 = 18.14'^K$

$+M = 18.14 - [8.8 + (11.93 \times 0.28)] = 6.0'^K$

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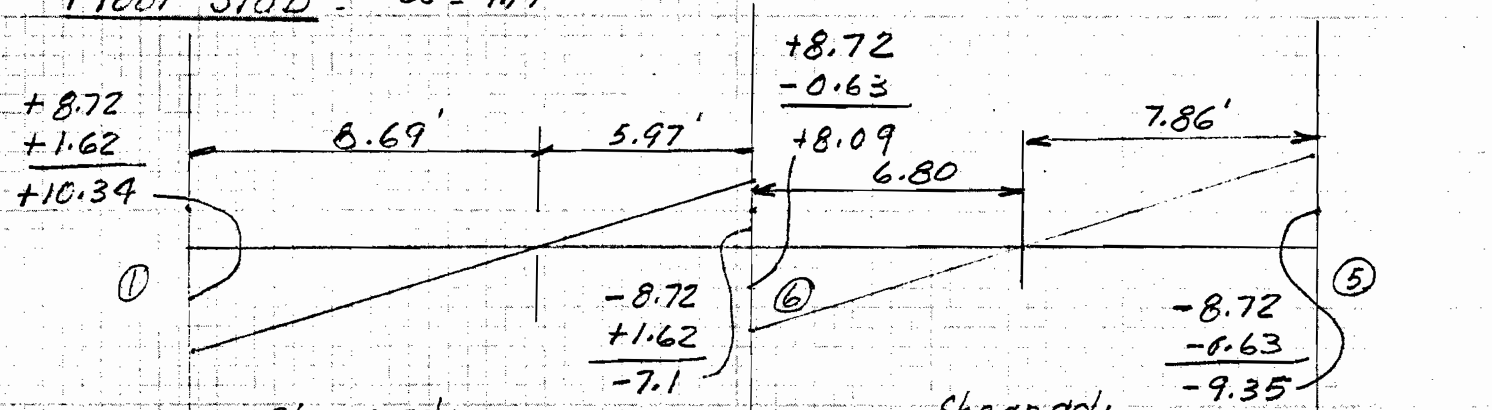
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Protected Side of Gate Structure

Floor Slab. $w = 1.19^k$



shear adj.

$$\frac{+32.8 - 9.1}{14.67} = +1.62$$

Shear adj.

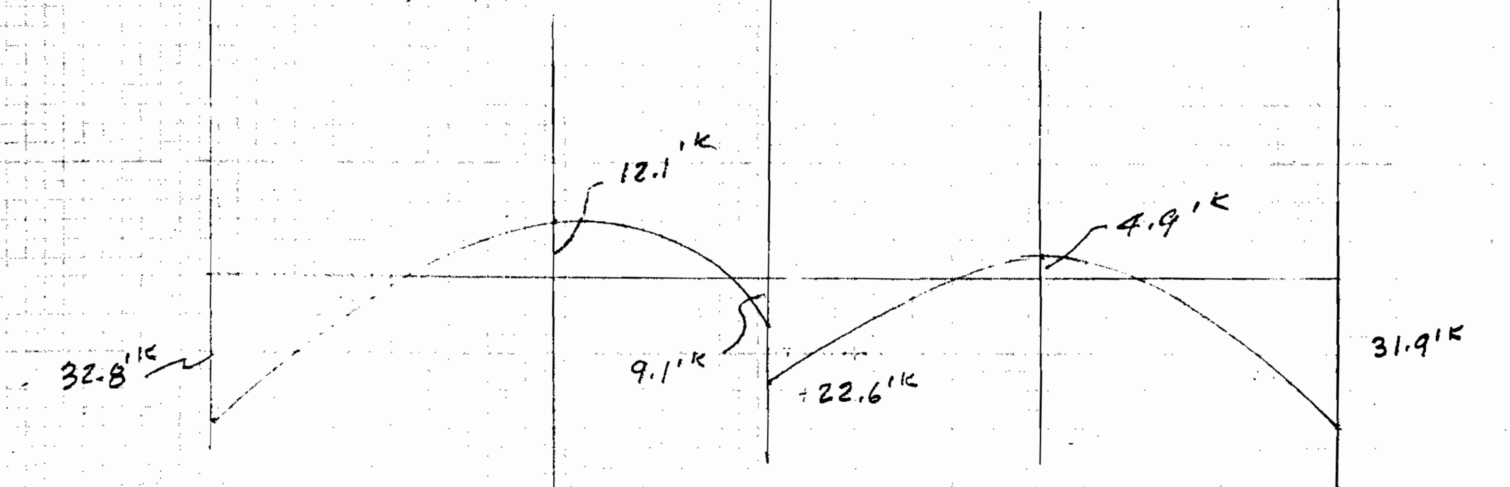
$$\frac{+22.6 - 31.9}{14.67} = -0.63$$

$$\frac{10.34}{1.19} = 8.69'$$

$$\frac{7.1}{1.19} = \frac{5.97'}{14.66'}$$

$$\frac{8.09}{1.19} = 6.80'$$

$$\frac{9.35}{1.19} = \frac{7.86}{14.66'}$$



$$+M = \frac{10.34 \times 8.69}{2} - 32.8 = 12.1'^k$$

$$+M = \frac{5.97 \times 7.1}{2} - 9.1 = 12.1'^k$$

$$+M = \frac{8.09 \times 6.8}{2} - 22.6 = 4.9'^k$$

$$+M = \frac{9.35 \times 7.86}{2} - 31.9 = 4.9'^k$$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Design of Box Structure - Protected side of Gate Structure

Top Slab Max Mom. = $20.4^{'k}$ Max. V = 5.67^{k}

$K = 221$ $f_s = 20^{ksi}$ $f'_c = 4000$ $a = 1.44$ $b = 12$ $d = 37''$ Allow shear = 70 psi

d req'd $\sqrt{\dfrac{20.4 \times 12}{0.221 \times 12}} = 9.6 < 37$ o/k

v and bond o/k by inspection.

$A_s = \dfrac{20.4}{1.44 \times 37} = 0.38^{\square'}$

Min. $A_s = (0.0025)(12)(37) = 1.11^{\square''}$ (Top and Bottom face)

Use #7 @ 6" Bottom face

Use 8 - #9 Bars top face $= \dfrac{8}{7} = 1.14^{\square''}$ ok

Outside Walls Max Mom = $32.8^{'k}$ $d = 29''$ $V = 14.93$

d req'd $= \sqrt{\dfrac{32.8 \times 12}{0.221 \times 12}} = 12.18'' < 29''$

$v = \dfrac{14{,}930}{12 \times 29} = 42.9 < 70$ psi bond o/k by inspection

$A_s = \dfrac{32.8}{1.44 \times 29} = 0.785^{\square''}$ - 8 #8 bars each face (7.0')

Middle Wall

Use #8 @ 12 ea. face (see page 30)

Floor Slab - Max Mom. = $32.8^{'k}$ $d = 40''$ $V = 10.34^{k}$

d'req'd $= \sqrt{\dfrac{32.8 \times 12}{0.221 \quad 12}} = 12.8'' < 40''$ 9#9 $u = \dfrac{10{,}340 \times 7}{(9 \times 3.544)(0.88)(40)} = 64\text{psi} < 269$ Bond, Bottom bar

$A_s = \dfrac{32.8}{1.44 \times 40} = 0.57^{\square''}$ 15#7 $u = \dfrac{10{,}340 \times 7}{(15 \times 2.749)(0.88)(40)} = 49\text{ psi} < 246$ Top

Min $A_s = (0.0025)(12)(40) = 1.2^{\square''}$

$1.2^{\square''} \times 7 = 8.4^{\square''}$ Use 15 #7 top face $= 9^{\square''}$ $v = \dfrac{10{,}340}{12 \times 40} = 21.54$ psi < 70 psi

See Page 75 Use 9 #9 bottom face

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Design of Box Section under East Wall-Gate Structure

Loading 2' wide strip.

Roof slab (2' wide wall above) x 24' high

$Wt = 2 \times 24 \times 0.15^{K} = 7.2^{KLF}$

Wt. Operating Floor

½ Conc. Slab = 3.46^{K}
Beams = 6.30^{K}
Steel Grating = 1.3
Cracking Force = 121.8
Between Beam = 0.47

$\Sigma = 136.78$

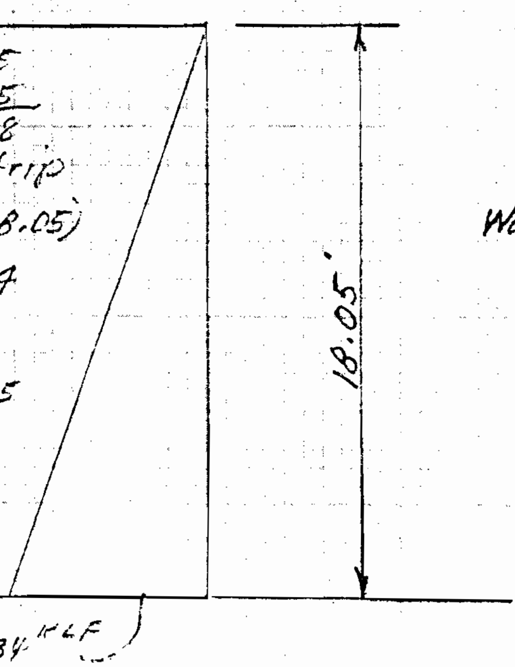
$\frac{136.78}{34} = 4.02^{KLF}$
$+ 7.2$
11.22^{KLF} call 11.2^{KLF}

Walls (outside) ℄ Top Beam = El. -6.01 El. ℄ Bott. Slab = -24.06

ht Wall = -24.06 - 6.01 = 18.05'

w = 0.085
+ 0.065
0.148
2 ft. strip
2(0.148)(18.05)
= 5.34

W =
$\frac{5.34 \times 18.05}{2}$
$= 48.2^{K}$



FLOOR SLAB

Self Wt = 1.58^{KLF}
Roof = 11.22^{KLF}
Walls $\frac{2 \times 3.5 \times 13 \times 2 \times 0.15}{34}$ .80
13.6^{KSF}

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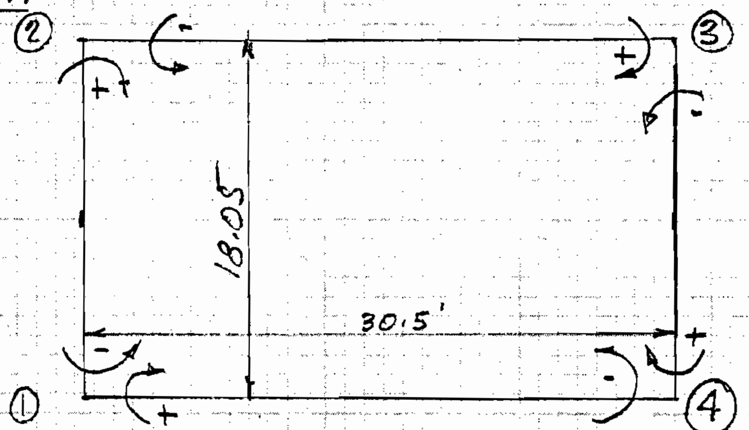
JOB
ITEM
JOB No 575-79-E

SHEET No 39 OF
BY LWC DATE 2-28-90
CHKD. BY DATE

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Section under East Wall-Gate Structure

Moment Distribution



$27+3.5=30.5'$

Distribution Factors

Roof Slab: 2×4.66: $\frac{2 \times 4.66^3}{12} = 16.865\ ft^4 = \frac{16.866}{30.5} = 0.5529$

Floor Slab: 2×5.25: $= \frac{2 \times 5.25^3}{12} = 24.114\ ft^4 = \frac{24.114}{30.5} = 0.7906$

Walls: 2×3.5: $= \frac{2 \times 3.5^3}{12} = 7.15\ ft^4 = \frac{7.15}{18.05} = 0.3961$

@ ② and ③

$\frac{0.5529}{0.5529+0.3961} = 0.58$ (2 to 3) (3 to 2)
0.42 (2 to 1) (3 to 4)

@ ① and ④

$\frac{0.7906}{0.7906+0.3961} = 0.67$ (1 to 4) (4 to 1)
0.33 (1 to 2) (4 to 3)

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Section under East Wall - Gate Structure

Moment Distribution (Cont.)

FEM's and Shears

Roof Slab:

$$FEM = \frac{7.2^k \times 30.5^2}{12} = 558.2'^k$$

$$V = \frac{7.2 \times 30.5}{2} = 109.8^k$$

Floor Slab:

$$FEM = \frac{11.2^k \times 30.5^2}{12} = 868.2'^k$$

$$V = \frac{11.2 \times 30.5}{2} = 170.8^k$$

Jt.	①		②		③		④	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
D.F.	0.67	0.33	0.42	0.58	0.58	0.42	0.33	0.67
FEMs	+868.2	-87.0	+58.0	-558.2	+558.2	-58.0	+87.0	-868.2
1st D.	-523.4	-257.8	+210.1	+290.1	-290.1	-210.1	+257.8	+523.4
CO	+261.7	+105.1	-128.9	-145.1	+145.1	+128.9	-105.1	-261.7
2nd D	-245.8	-121.0	+115.1	+158.9	-158.9	-115.1	+121.0	+245.8
CO	+122.9	+57.6	-60.5	-79.5	+79.5	+60.5	-57.6	-122.9
3rd D	-121.1	-59.7	+58.8	+81.2	-81.2	-58.8	+59.7	+121.1
	+362.8	-362.8	+252.6	-252.6	+252.6	-252.6	+362.8	-362.8

Side Walls

@Top

$$FEM = \frac{48.2 \times 18.05}{15} = 58.0'^k$$

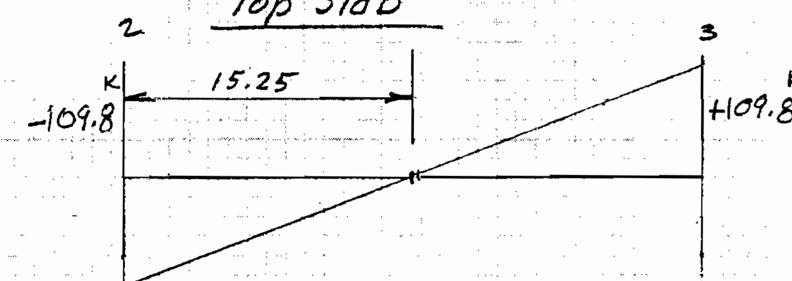
$$V = (5.34^k)(0.15)\,18.05 = 14.5^k$$

@Bottom

$$FEM \quad \frac{48.2 \times 18.05}{10} = 87.0'^k$$

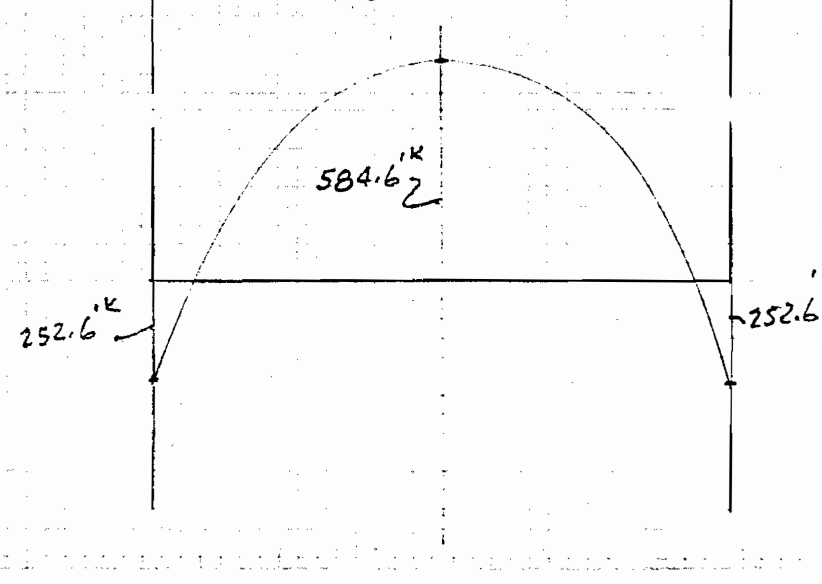
$$V = (5.34^k)(0.35)(18.05) = 33.7$$

Top Slab



$$+M = \frac{15.25 \times 109.8}{2} - 252.6 = 584.6'^k$$

No shear adjustment



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GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

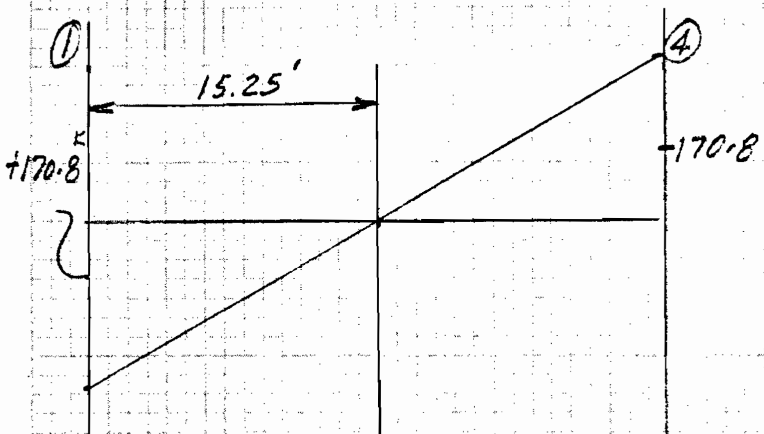
Design of Box Section under East Wall - Gate Structure

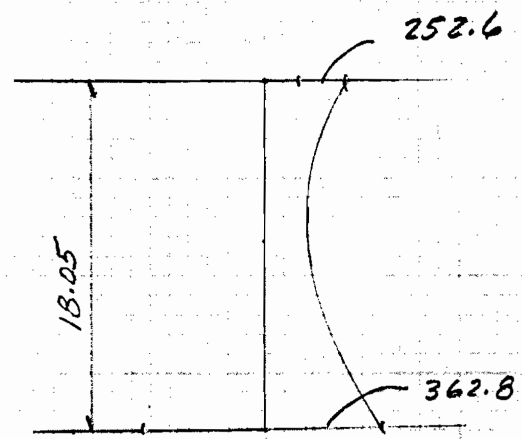
Moment Distribution (Cont

Bottom Slab

Side Walls

$+14.5$
-6.1
$+8.4$





$$+M = \frac{15.25' \times 170.8}{2} - 362.8 = 939.6'^{k}$$

-33.7
-6.1
-39.8^{k}

shear adjustment

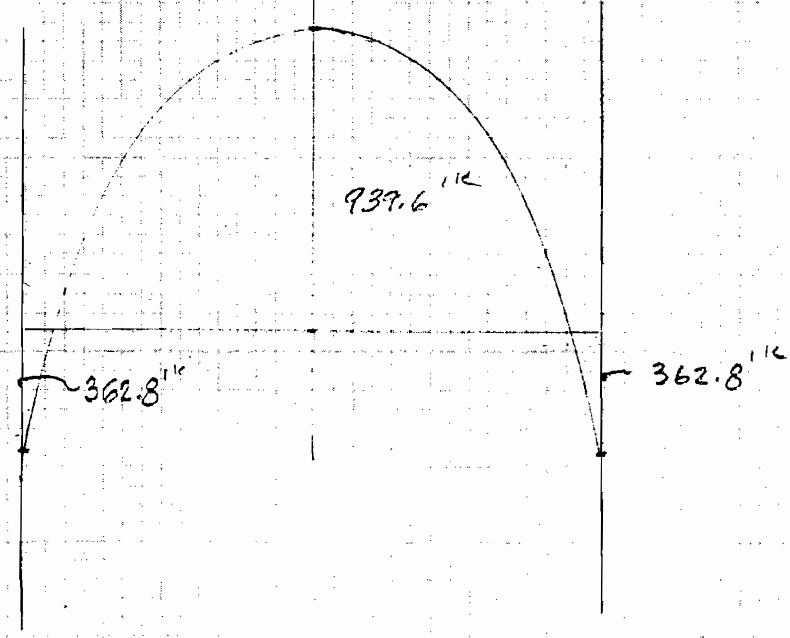
$$\frac{-362.8 + 252.6}{18.05} = -6.1$$

$w = 2 \times 4148 = 0.296$

Simple $M = 111.6'^{k}$

$-252.6 + 111.6 = -141'^{k}$

No post. Moment



GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall-Gate Structure

Top Slab - Max - Mom. = 252.6'K Max + Moment = 584.6'K

k = .221 fs = 20 ksi f'c = 4000 psi b = 24" d = 54" Allowable v = 70 psi V = 109.8

J = 0.88

$d'reqd \sqrt{\frac{584.6 \times 12}{0.221 \times 24}} = 36.36'' < 54$

Reduce V $109,800^{lb} - \left(\frac{109,800}{15.25} \times \frac{54}{12}\right) = 77,400^{lbs}$

$v = \frac{77,400}{24 \times 54} = 59.72\ psi < 70\ psi$

Check Bond

Top Bars

$\frac{109,800}{(4 \times 3.142)(0.88)(54)} = 184 < 215$

Bott. Bars

$As = \frac{584.6^K}{1.44 \times 54} = 7.51 \square''$ 6 #11 bars = 9.36 □"

Bott bars

$\frac{109,800}{(6 \times 4.43)(0.88)(54)} = 87 < 269$

Top Bars

$As = \frac{252.6^K}{1.44 \times 54} = 3.25 \square''$ 4 #8 bars = 3.16 □"

Provide #3 ties @ 10" o.c.

Bottom Slab Max Moment = +939.6'K Max - Mom. = 362.8'K

d = 59"

$d'reqd = \sqrt{\frac{939.6 \times 12}{0.221 \times 24}} = 46'' < 59''$

$V = 170.8^K$ Reduce by "d" $170,800^{\#} - \left(\frac{170,800}{15.25} \times \left(\frac{60}{12} + 1.75'\right)\right) = 95,600^{\#}$

$v = \frac{195,200}{24 \times 59} = 67.23\ psi$

Top face $As = \frac{939.6}{1.44 \times 59} = 11.05 \square''$ 8 #11 bars = 12.24 □"

$As = \frac{362.8}{1.44 \times 59} = 4.27 \square''$ 4 #9 bars = 4.0 □" o.k.

Bond: Top Bars

$\frac{170,800}{(8)(4.43)(0.88)(59)} = 92.82 < 132$ psi psi

Bottom Bars

$\frac{170,800}{(4)(3.54)(0.88)(59)} = 232 < 269$

GATES ACROSS FLORIDA DRAINAGE CANAL (East of IHNC)

Design of Box Structure under East Wall-Gate Structure

Walls $b = 24$ $d = 39''$ Max Mom. = 362.8'K

$d' reqd = \sqrt{\dfrac{362.8 \times 12}{0.221 \times 24}} = 28.6'' < 39''$

$V = 39.8$'K

$v = \dfrac{39{,}800}{24 \times 39} = 42.52$ psi

As: Outside face

$As = \dfrac{362.8}{1.44 \times 39} = 6.46$□ for 2' wide strip 7 #9 bars

bond o/k by inspection

As - Inside face - use simple Moment = 111.6'K

$As = \dfrac{111.6'K}{1.44 \times 39}$ 1.99□' Use #9 @ 12 = 2.0□"

bond o/k by inspection

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Flood Side of Gate Structure

Wall ht = $13' + \frac{3.33}{2} + \frac{3.75}{2} = 16.54'$ 2.5" thick   d = 39"

Wt. of Span = Call 29.34 = (2 x 14.67') ℄ Page 32

Floor thickness = 3.75'   d = 42"

Roof thickness = 3.33'   d = 37"

Loading

Roof Slab = $(3.33 \times 1.0 \times 0.15) + 100 \frac{lb}{\square'}$ Live Load = 0.60^{KSF}

Floor Slab

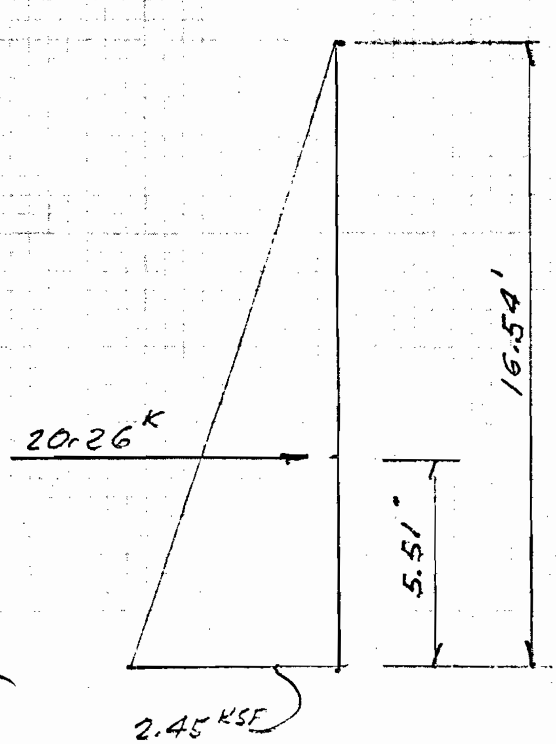
Walls = $2(2.5 \times 16.5 \times 0.15) = 12.41^{K}$

Roof = $29.34 \times 0.60 = 17.6$

$\quad 30.01$

$\frac{30.01}{29.34} = 1.02$ KSF

Side Walls



w = 0.085
+ = 0.0625 (H_2O)
0.148 KSF

$0.148 \times 16.54 = 2.45^{KSF}$

$W = \frac{2.45 \times 16.54}{2} = 20.26^{K}$

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Flood Side of Gate Structure

FEM's and Shears

Roof Slab

$\frac{0.60 \times 29.34^2}{12} = 43.1'^k$

$\frac{0.60 \times 29.34}{2} = 8.80^k$

Floor Slab

$\frac{1.02 \times 29.34^2}{12} = 73.2'^k$

$\frac{1.02 \times 29.34}{2} = 14.96^k$

Outside Walls

FEM @ Top

$= \frac{20.26 \times 16.54}{15} = 22.4'^k$

Shear @ Top

$= (0.15)(2.45)(16.54) = 6.08^k$

FEM @ Bott.

$= \frac{20.26 \times 16.54}{10} = 33.51'^k$

Shear @ Bott

$= (0.35)(2.45)(16.54) = 14.18^k$

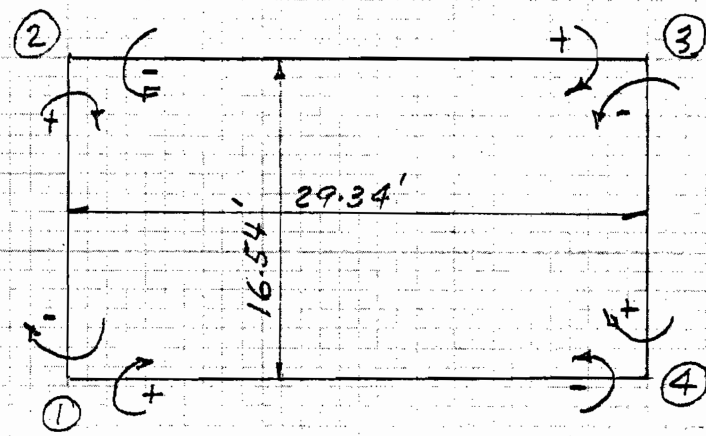
Distribution Factors

For I See page 33

Roof Slab $\frac{3.0864}{29.34} = 0.1052$

Floor Slab $\frac{4.3945}{29.34} = 0.1498$

Walls $\frac{1.3020}{16.54} = 0.0787$



@ 2 and 3

$\frac{0.1052}{0.1052 + 0.0787} = 0.57$ (2 to 3) (3 to 2)

0.43 (2 to 1) (3 to 4)

@ 1 and 4

$\frac{0.1498}{0.1498 + 0.0787} = 0.66$ (1 to 4) (4 to 1)

0.34 (1 to 2) (4 to 3)

Jt.	1		2		3		4	
MEM	1-4	1-2	2-1	2-3	3-2	3-4	4-3	4-1
DF	0.66	0.34	0.43	0.57	0.57	0.43	0.34	0.66
FEM	+73.2	-33.5	+22.4	-43.1	+43.1	-22.4	+33.5	-73.2
1st D.	-26.2	-13.5	+8.9	+11.8	-11.8	-8.9	+13.5	+26.2
CO	+13.1	+4.5	-6.8	-5.9	+5.9	+6.8	-4.5	-13.1
2nd D	-11.6	-6.0	+5.5	+7.2	-7.2	-5.5	+6.0	+11.6
CO	+5.8	+2.8	-3.0	-3.6	+3.6	+3.0	-2.8	-5.8
3rd D	-5.7	-2.9	+2.8	+3.8	-3.8	-2.8	+2.9	+5.7
	+48.6	-48.6	+27.8	-29.8	-29.8	+29.8	+48.6	-48.6

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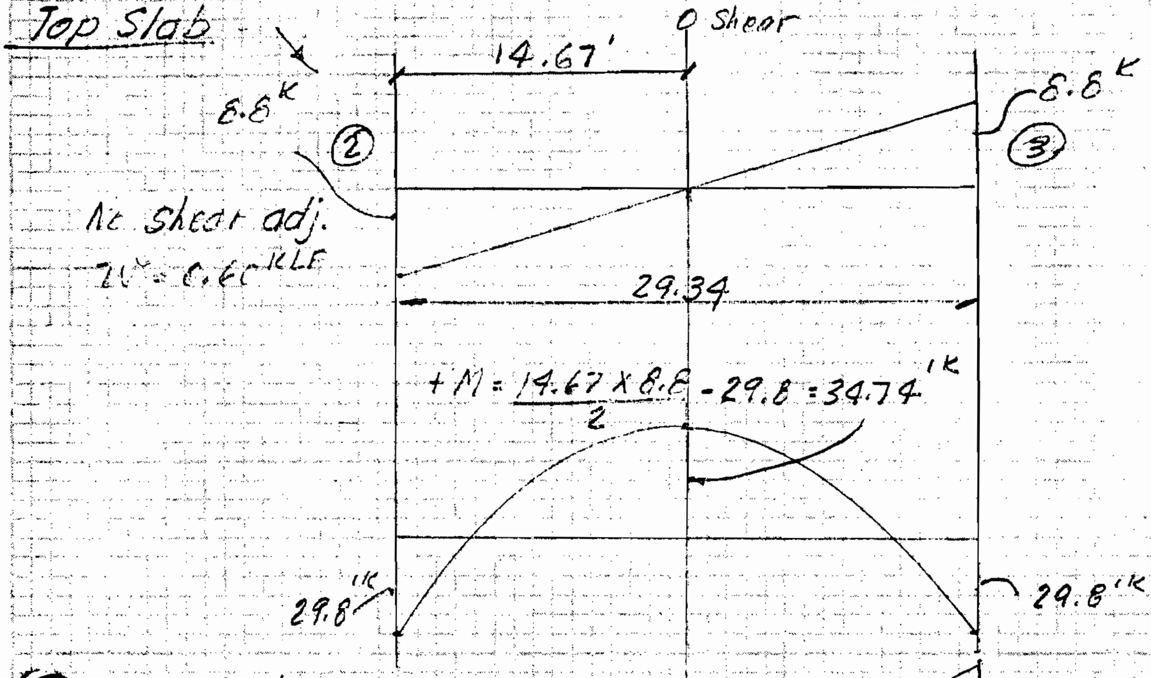
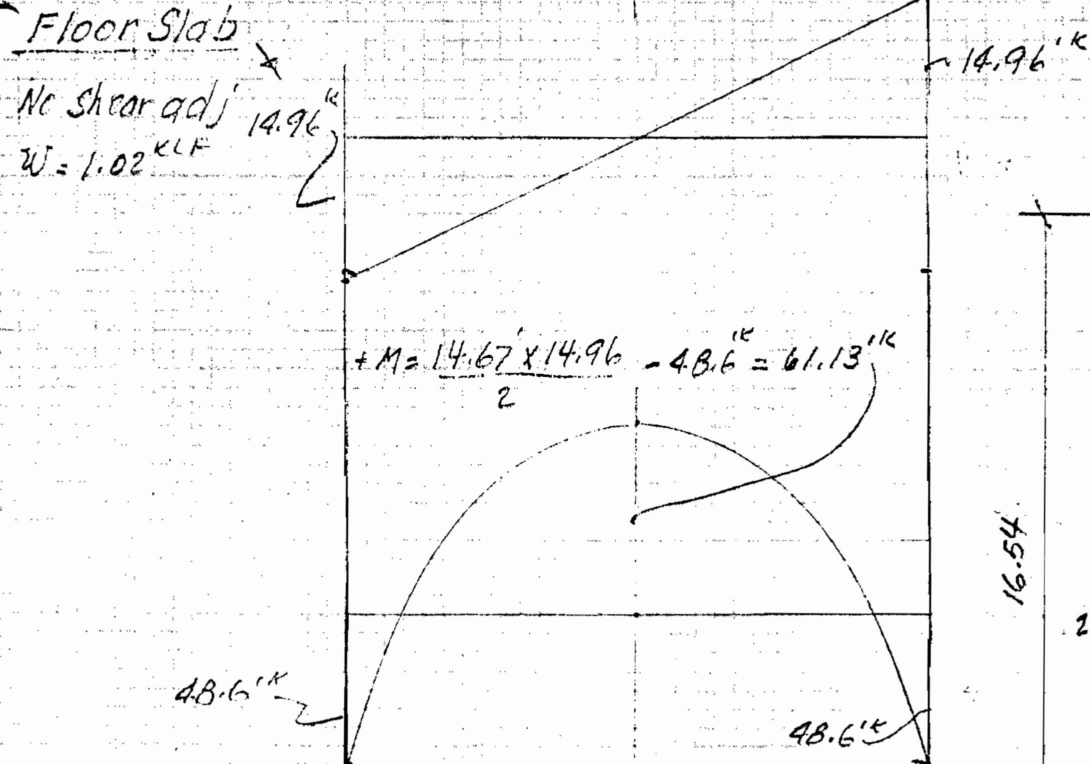
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Design of Box Structure - Flood side of Gate Structure

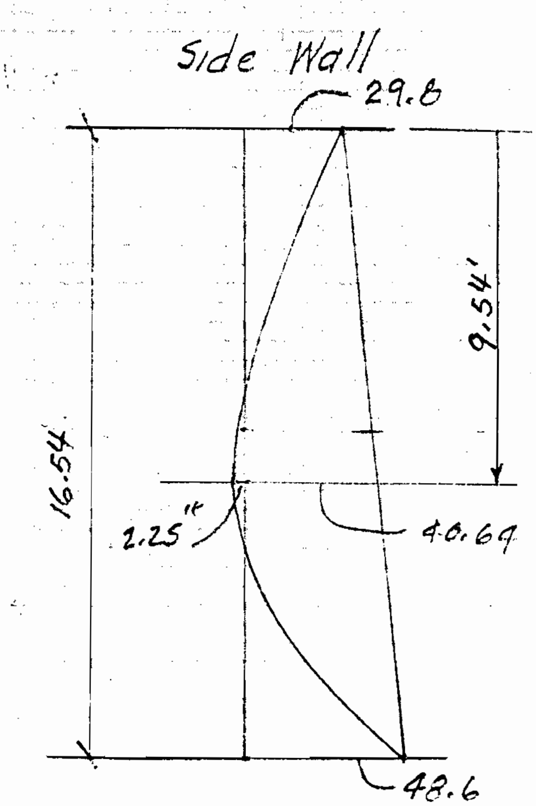
Top Slab



Floor Slab



Side Wall



$$\left(29.8 + \left(\frac{48.6 - 29.8}{16.54} \times 9.54\right)\right) = 40.64$$

Simple Moment = 0.128 × 20.26 × 16.54 = 42.89'^K

W - page 44

42.89 - 40.64 = 2.25

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Top Slab Max − Mom = −29.8'k Max +M = 34.74'k d = 37" Allow. Shear = 70 psi
V = 8.8k b = 12"

$d\ reqd = \sqrt{\frac{34.74 \times 12}{0.221 \times 12}} = 12.53"$

As bottom face

$As = \frac{34.74'k}{1.44 \times 37} = 0.65 \square"$

7' × 1.11□' = 7.77□" Use 8 #9 = 8□'

Min As = 0.0025 × 12 × 37 = 1.11" Use 8 #9 Bars Top and bottom face

Top face

$As = \frac{29.8}{1.44 \times 37} = 0.56 \square"$

Shear and Bond ok by inspection

Bottom Slab +M = 61.13 −M = 48.6 V = 14.96 d = 40"

$d\ reqd = \sqrt{\frac{61.13 \times 12}{0.221 \times 12}} = 16.63 < 40"$ ok

$v = \frac{14{,}960\#}{12 \times 40} = 31\ psi < 70$

$bond = \frac{14{,}960}{(3.54)(0.88)(40)} = 120\ psi <$ 153 top bars, 215 other bars

As top face

$As = \frac{61.13}{1.44 \times 40} = 1.06 \square"$

Min As = 0.0025 × 12 × 40 = 1.2□"

As bottom face

1.2 × 7 = 8.4□" ≈ Use 8 #9 = 8.0□" (95%) ok

$As = \frac{48.6}{1.44 \times 40} = 0.84 \square"$

Side Walls Max Mom (@Bott) = 48.6'k d = 27" V = 14.18

$d\ reqd = \sqrt{\frac{48.6 \times 12}{0.221 \times 12}} = 14.32" < 27"$

$v = \frac{14{,}180}{12 \times 27} = 44 < 70\ psi$

Outside face

$As = \frac{48.6}{1.44 \times 27} = 1.25 \square"$ #8 @ 6 = 1.58□" use top and Bottom

Inside face · Use simple Moment

bond % by inspection

$As = \frac{42.89}{1.44 \times 27} = 1.10 \square"$

1.10 × 7 = 7.70□"

8 #8 = 6.32□ ok because simple moment

Min. As = 0.0025 × 12 × 27 = 0.81□"

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Gate Structure Foundation Loads

Load Cases

Case I - Construction Case, No backfill, Gates raised, no Water.

Case II - Water level, El. 14.0, Flood side, El. -8.5 Protected side, Impervious cutoff.

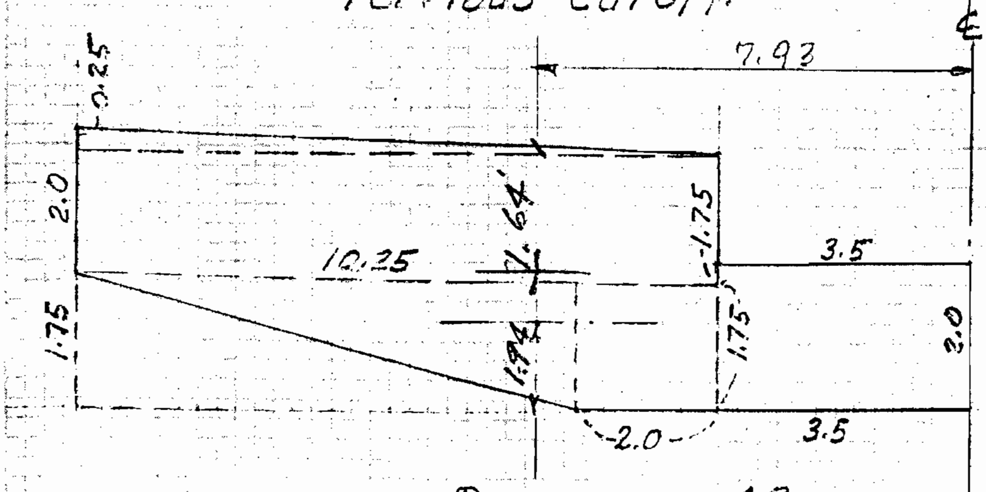
Case III - Water level, El. 14.0, Flood side, El. -8.5 Protected side, Pervious cutoff.

Case IV - Water level, El. 4.0, Flood side, El. -14.5 Protected side, Impervious cutoff.

Case V - Water level, El. 4.0, Flood side, El. -14.5 Protected side, Pervious cutoff.

Case VI - Water level, El. -14.0, Flood side, El. -3.0 Protected side, Impervious cutoff.

Case VII - Water level, El. -14.0, Flood side, El. -3.0 Protected side Pervious Cutoff.



D: see page 49

$\frac{12.25 \times 0.25}{2} = 1.531 \times 11.667 = 17.86$

$\frac{10.25 \times 1.75}{2} = 8.969 \times 8.917 = 79.08$

$12.75 \times 1.75 = 21.438 \times 9.875 = 211.70$

$2 \times 1.75 = 3.5 \times 4.5 = 15.75$

$2 \times 3.5 = 7 \times 1.75 = 12.25$

Totals: 42.438 — 336.64

$\frac{336.64}{42.438} = 7.93'$

$1.531 \times \left(1.75 + 2.0 + \frac{0.25}{3}\right) = 5.86$

$8.969 \times \left(\frac{1.75}{3} \times 2\right) = 10.46$

$21.438 \times \left(\frac{1.75}{2} + 1.75\right) = 56.27$

$3.5 \times \frac{1.75}{2} = 3.06$

$7 \times \frac{?}{2} = 7.0$

$\frac{82.65}{42.438} = 1.94'$

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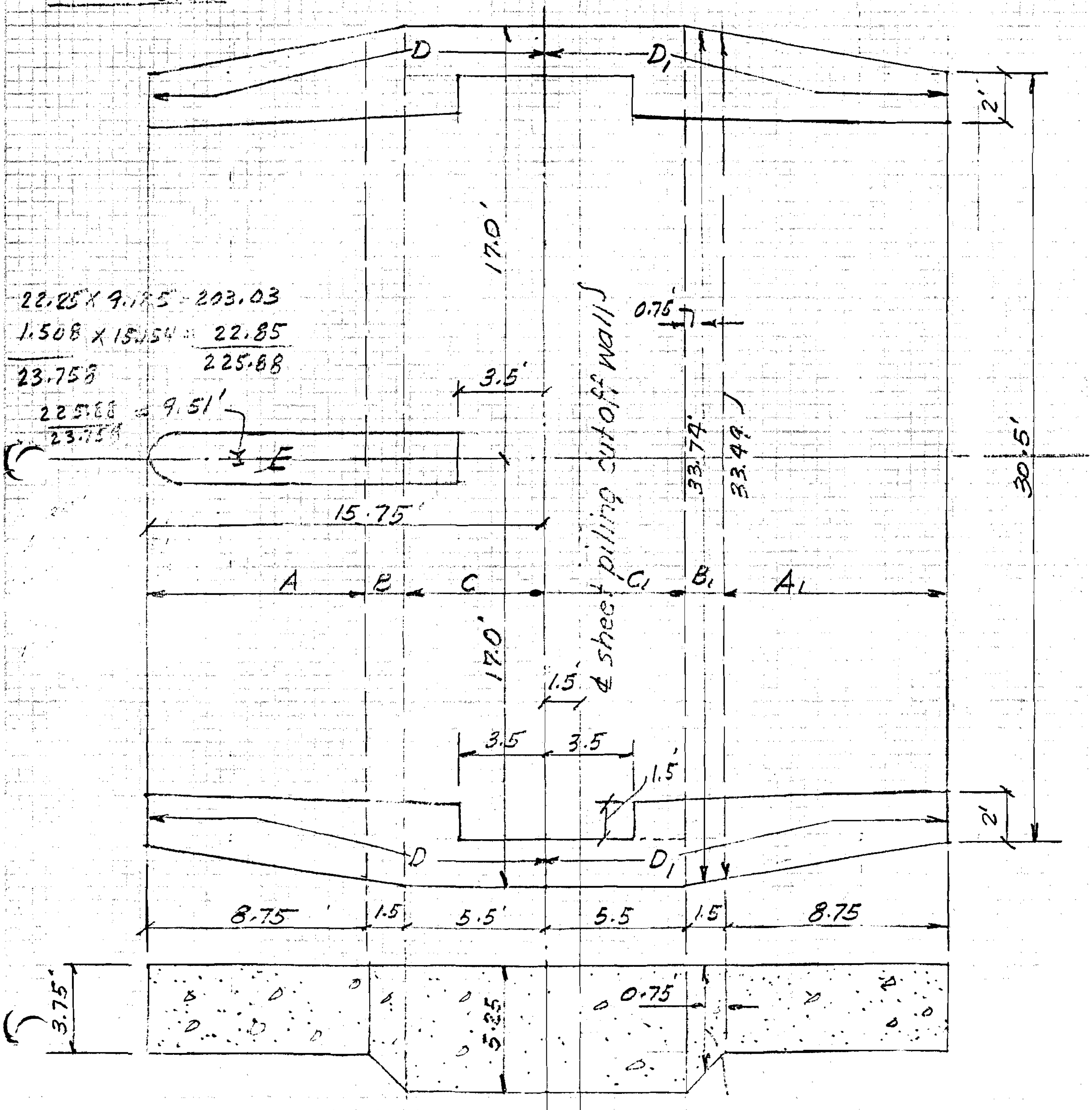
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

Floor Slab

22.25 × 9.125 = 203.03
1.508 × 15.154 = 22.85
23.758 225.88

$\frac{225.88}{23.758} = 9.51'$

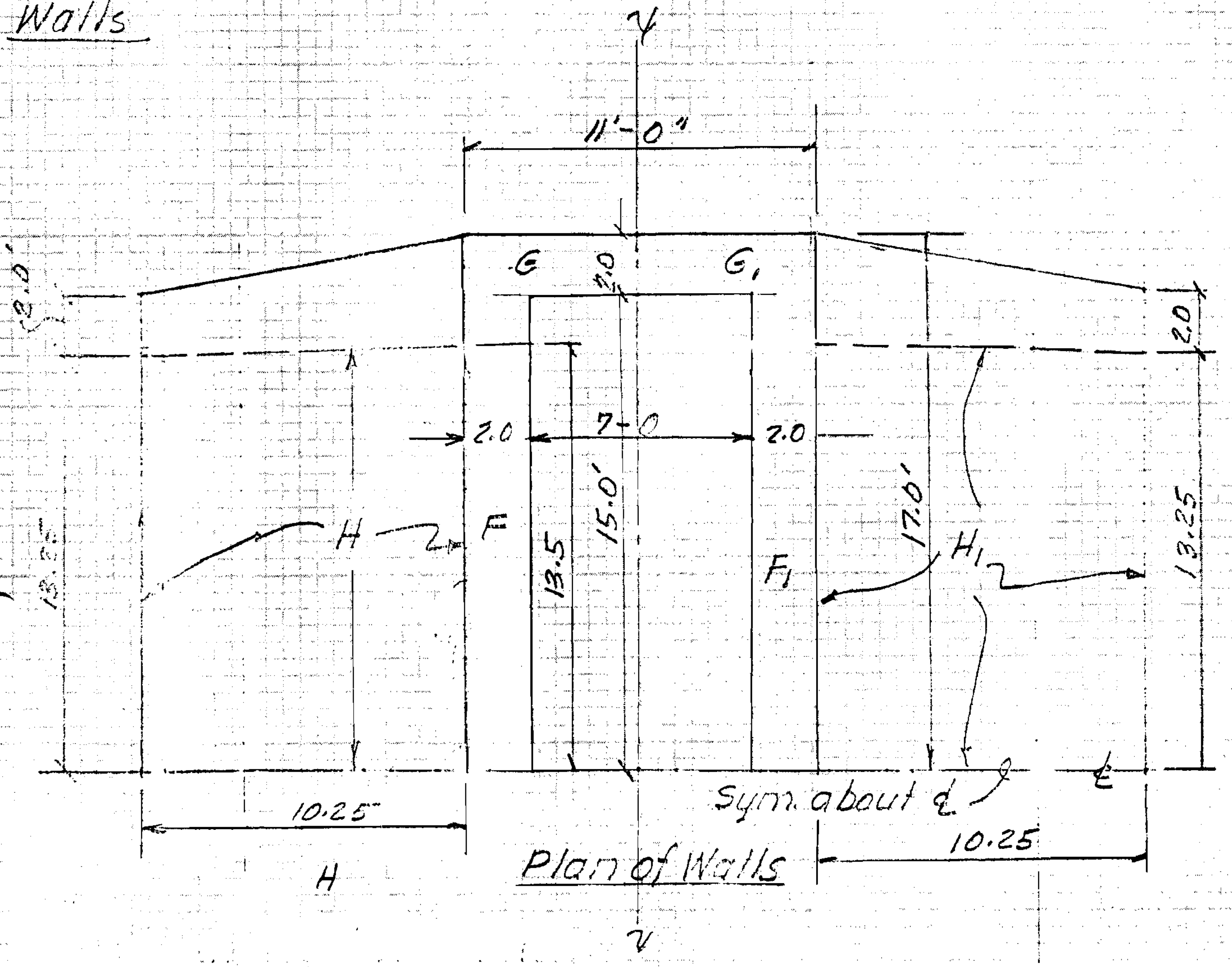


Floor Slab

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

Walls



Plan of Walls

$$\frac{0.25 \times 10.25}{2} \times \left(\frac{10.25}{3} + 5.5\right) = 11.42$$

$$\underset{137.09}{10.25 \times 13.25} \times \left(\frac{10.25}{2} + 5.5\right) = 1443.01$$

$$\overline{1454.43}$$

$$\frac{1454.43}{137.09} = 10.61'$$

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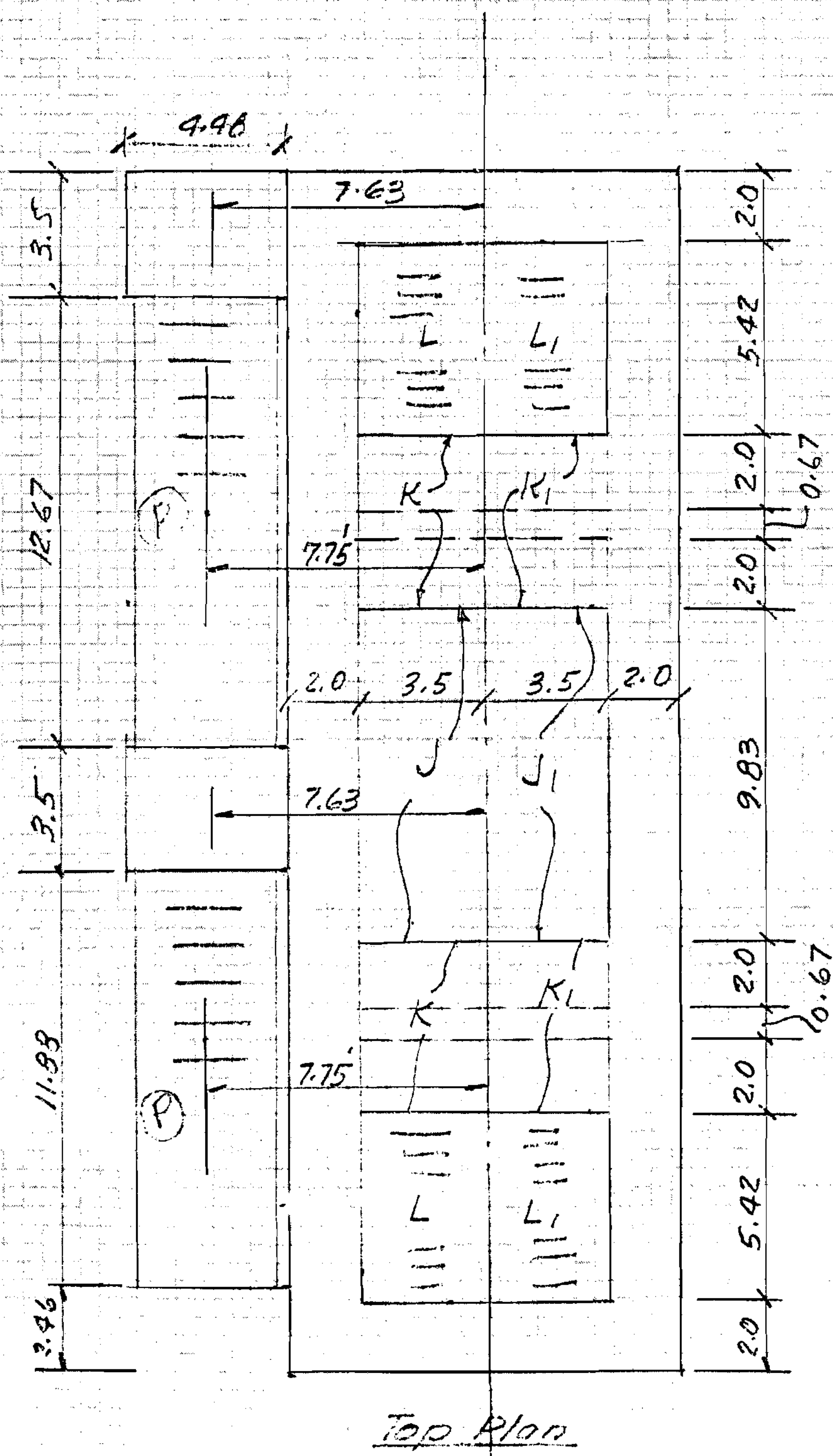
GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

Roof Plan



Top Plan

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ITEM ____ BY LWC DATE 3-4-80
JOB NO 575-79-E CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Gate Structure Foundation Loads

Moments about X-X Axis

Item	Computation	Fz K	Fy K	Arm FT	Mx-x 'K
Floor Slab					
A	$\left(\frac{33.49+30.5}{2}\right)(8.75)(3.75)(0.15)$	157.5		-11.375	-1792
A1	" " " "	157.5		11.375	1792
B	(1.5)(4.5)(33.74)(0.15)	34.2		-6.25	-214
B1	" " " "	34.2		6.25	214
C	(5.5)(34)(5.25)(0.15)	147.3		-2.75	-405
C1	" " " "	147.3		2.75	405
Walls					
D	(42.44)(13)(0.15)	83.0		-7.93	-658
D	" " "	83.0		-7.93	-658
D1	" " "	83.0		7.93	658
D1	" " "	83.0		7.93	658
E	(23.76)(13)(0.15)	46.3		-9.51	-440
F	(30)(2)(20.67)(0.15)	186.0		-4.5	-837
F1	" " " "	186.0		4.5	837
G	(5.5)(2)(20.67)(0.15)(2)	68.2		-2.75	-188
G1	" " " " "	68.2		2.75	188
Top Slab					
H	(137.1)(3.33)(0.15)(2)	137.0		-10.61	-1454
H1	" " " "	137.0		10.61	1454
J	(3.5)(9.83)(0.15)(2)	3.5		-1.75	-6
J1	" " " "	3.5		1.75	6
K	(2)[7.0 x 2 x 3 + 7.0 x 0.67 x 1](0.15)	22		-1.75	-39
K1	" " " " " " " "	22		1.75	39

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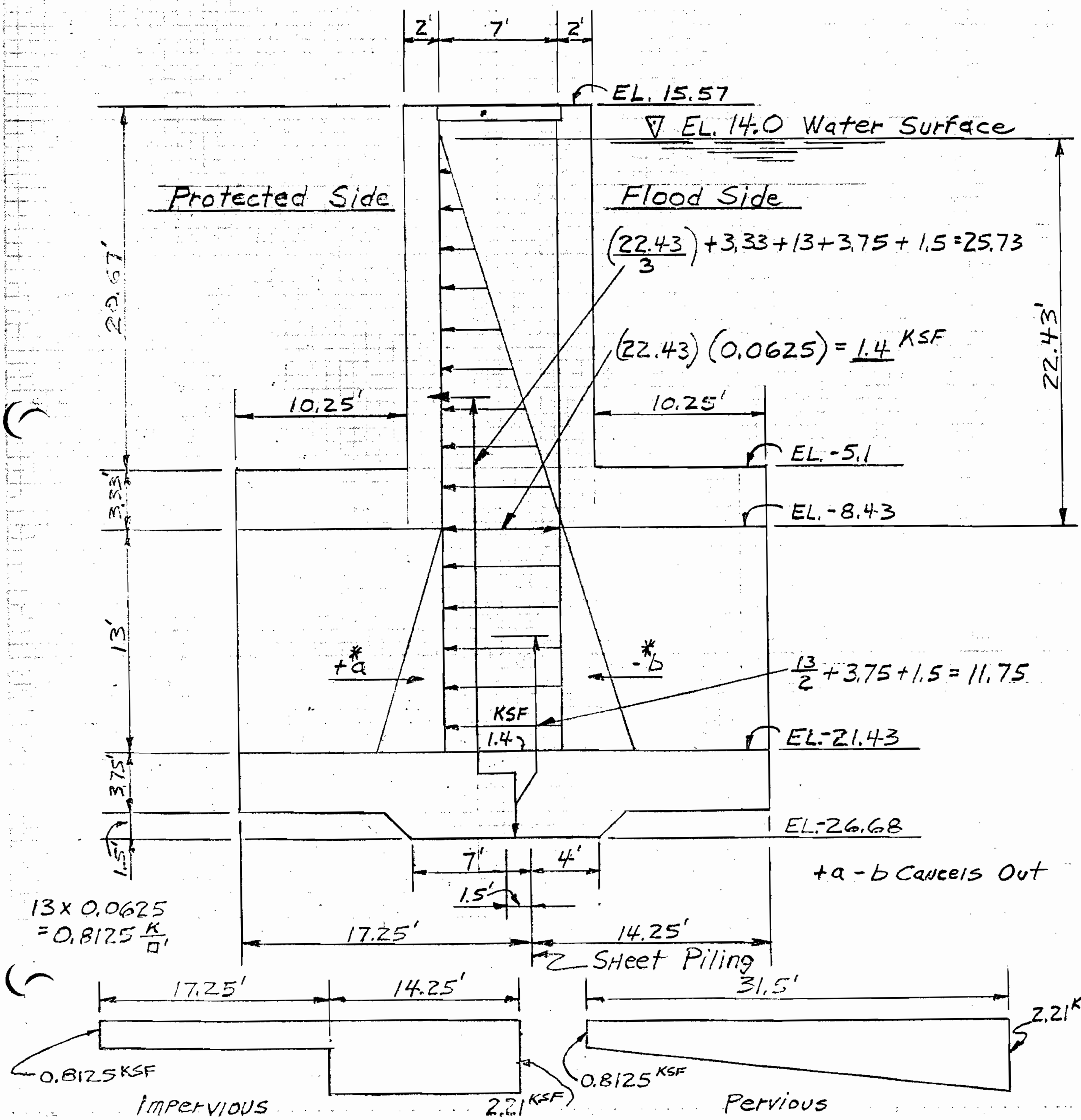
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

Moment about X-X Axis (Cont.)

Item	Computations	Fz K	Fy K	Arm Ft	Mx-x 'K
Oper. Fl. (L) Grating	5.42 X 7 X 0.035	1.3		-1.75	-2
(L1)	" " "	1.3		1.75	2
Gate + Stem +Cracking F.	=154 K x 2	308		-2.33	-718
(M) Stair Land. (N)	$\left[\frac{0.33 \times 4.48}{2}\right] + (1.0 \times 4.48)(3.5)(2)(0.15)$	5.5		-7.63	-42
(P) Steel Stairs	6.2 K	6.2		7.75	- 48.
L. Load	24.54' X 3.5 X 0.1	8.6		7.75	- 67
L. Load	4.48 X 3.5 X 2 X 0.1	3.2		7.63	- 24
	Sub-Total Case II, III, IV, V, VI, VII	2223.8 K			- 1339
* Wt. 2 gates + Stem		- 308 K 1916.0 64.4 K		-2.33	+718 - 150
	Sub Total Case I	1692.4			- 771 'K
	Sub Total Case II, III, IV, V, VI, VII	2223.8 K			- 1170 'K

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (EAST OF IHNC) Gate Structure Foundation - Case I, Pressure Diagram



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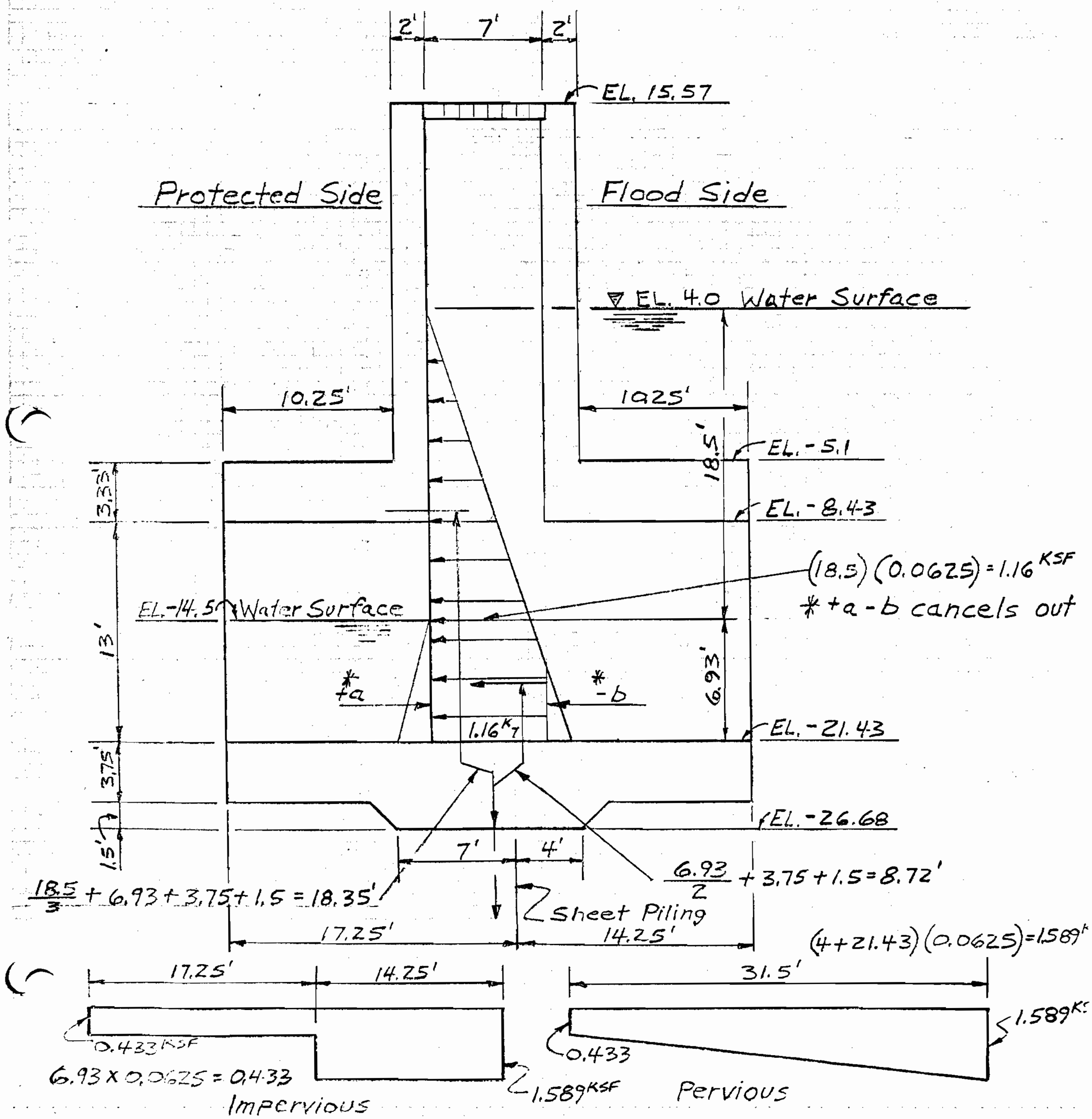
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL - (East Of IHNC)

Gate Structure Foundation - Case II, Pressure Diagram



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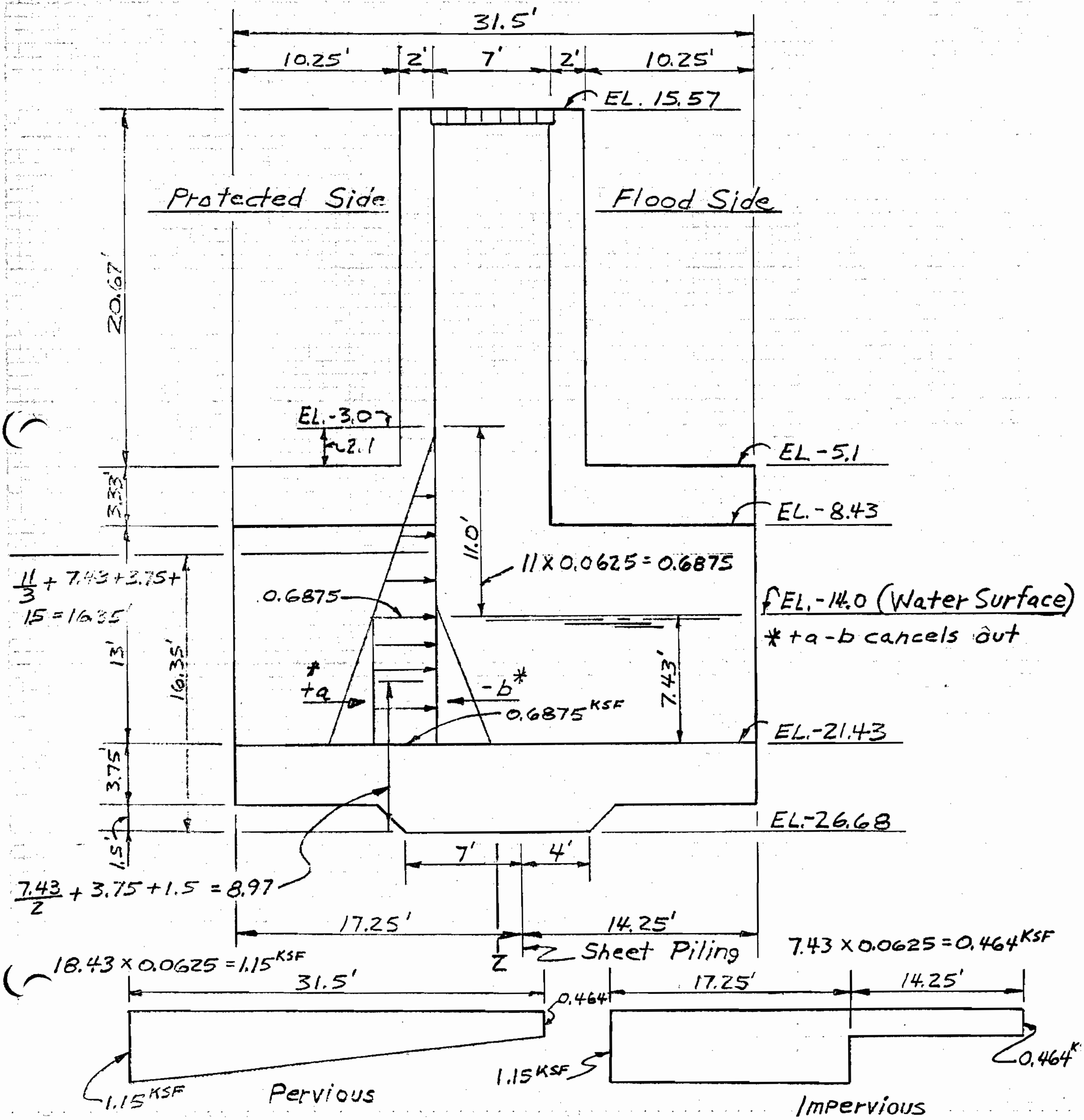
CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation - Case III Pressure Diagram



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JOB ______ ITEM ______ JOB No 575-79-E

SHEET No 57 OF ____
BY LWC DATE 3-6-80
CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

	Flood side (IHNC)	Protected Side (Fla. Ave Canal)
Case I	El. 14.0	El. - 8.5
Case II	El. 4.0	El. - 14.5
Case III	El. - 14.0	El. - -3.0

Item	Computation	F_Z K	F_y K	Arm Ft.	$M_{x \cdot x}$ FT. K
	Case I (See Pressure Diagram, Page 54)				
Horiz.	$(1.4)^K(13')(30')$		-546	11.75	-6,416
Horiz.	$\left(\frac{1.4 \times 22.43}{2}\right)(30')$		-471 -1017	25.23	-12,119 18,535
	Case II (See Pressure Diagram, Page 55)				
Horiz.	$(1.16)(6.93)(30)$		-241	8.72	-2102
Horiz.	$\left(\frac{1.16 \times 18.5}{2}\right)(30)$		-322 -563	18.35	-5909 8,011
	Case III (See Pressure Diagram, Page 56)				
Horiz.	$(0.6875)(7.43)(30)$		+153	8.97	+1732
Horiz.	$\left(\frac{0.6875 \times 11}{2}\right)(30)$		+113 266	16.35	+1848 3580

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Gate Structure Foundation Loads

Moments about X-X Axis - (Case I - Water Load)

Item	Computation	F_z K	Fy	Arm'	Mx-x 'K
Vert H_2O Case I	(35.43)(30)(7)(0.0625)	465			
"	(13)(27)(2)(0.0625)	44		4.5	198
"	(9.1)(10.25)((34+30.5)/2)(0.0625)	395		10.53	4155
"	(13)(10.25)((26.5+24.92)/2)(0.0625)	222		10.53	2338
"	(13)(25)(2)(0.0625)	41		-4.5	-185
"	(13)(10.25)((24.5+24.5)/2)(0.0625)	206		-10.53	-2169
			1373		4337
Case I Uplift-[illegible]	(2.21)(4)(34)	-301		3.5	-1054
"	(2.21)(10.25)((30.5+34)/2)	-730		10.53	-7687
"	(0.8125)(7)(34)	-193		-2	386
"	(0.8125)(10.25)((30.48+34)/2)	-269		-10.53	2833
			-1493		-5522
Uplift Pen	(0.8125)(1 x34+2 x10.25 x (30.5+34)/2)	-841			
"	((2.21-0.8125)/2)(1 x34+2 x10.25 x (30.5+34)/2)	-606		5.25	-3182
			-1447		

(Case II Water Load)

Item	Computation	F_z	Fy	Arm'	Mx-x
Vert H_2O Case II	(25.43)(30)(7)(0.0625)	334			
"	(13)(27)(2)(0.0625)	44		4.5	198
"	(9.1)(10.25)((30.5+34)/2)(0.0625)	188		10.53	1979
"	(13)(10.25)((27+26.5)/2)(0.0625)	223		10.53	2348
"	(6.93)(2)(25)(0.0625)	22		-4.5	-99
"	(6.93)(10.25)((25+24.5)/2)(0.0625)	110		-10.53	-1158
		921			+3268

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Gate Structure Foundation Loads

Moments about X-X Axis (Cont.) (Case II Water Load)

Item	Computation	Fz K	Fy K	Arm '	Mx-x 'K
Case II					
Uplift-Imperv.	1.589 X 4 X 34	-216		3.5	-756
"	1.589 X 10.25 X (30.5/2 + 34)	-525		10.53	-5528
"	0.433 X 7 X 34	-103		-2	206
"	0.433 X 10.25 X (30.5/2 + 34)	-143	-987	-10.53	1505
					-4573
Uplift-Perv.	0.433 (7 X 34 + 2 X 10.25 (30.5+34)/2)	-389			
"	(1.589-0.433)/2 (7 X 34 + 2 X 10.25 (30.5+34)/2)	-520	-909	5.25	-2730

(Case III Water Load)

Item	Computation	Fz K	Fy K	Arm '	Mx-x 'K
Vert. H2O					
Case III	7.43 X 30 X 7 X 0.0625	98			
"	7.43 X 30 X 2 X 0.0625	28		4.5	126
"	2.1 X 10.25 X (30.5+34)/2 X 0.0625	-43		10.53	-453
"	13 X 10.25 X (30.5+34)/2 X 0.0625	-268		10.53	-2822
"	13 X 2 X 25 X 0.0625	-41		4.5	-185
					-3336
Uplift Imp.	7 X 34 X 1.15	-274		-2	548
"	10.25 X (30.5+34)/2 X 1.15	-380		-10.53	4001
"	4 X 0.464 X (30.5 + 34)/2	-60		3.5	-210
"	10.25 X 0.464 X (30.5 + 34)/2	-153	-867	10.53	-1611
					2728
Uplift-Perv.	0.464 (7 X 34 + 2 X 10.25 X (30.5+34)/2)	-417			
"	(1.15-0.464)/2 (7 X 34 + 2 X 10.25 X (30.5+34)/2)	-308	-725	-5.25	1617

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL - (East of IHNC)
Gate Structure Foundation Loads

Load Tabulation

Load No	Item	Fx K	Fy K	Fz K	Mx 'K	My 'K	Mz 'K
1a	Concrete, Misc.	0	0	1916		0	0
2a	Gates; Water @ El. 14.0, FS	0	0	308	-718	0	0
2b	Gates, Water @ El. 4.0, FS	0	0	238	-555	0	0
2c	Gates open (Normal)	0	0	64.4	-150	0	0
3a	Earth (Vert.)	0	0	0	0	0	0
3b	Earth (Horiz.)	0	0	0	0	0	0
4a	Water (Horiz.) El. 14.0 FS, El. -8.5, PS	0	-1017	0	-18,535	0	0
4b	Water (Horiz.) El. 4.0 FS, El. -14.5 PS	0	-563	0	-8,011	0	0
4c	Water (Horiz) El. -14.0 FS, El. -3.0 PS	0	-266	0	3580	0	0
5a	Water (Vert.) El. 14.0 FS, El. -8.5 PS	0	0	1,373	4337	0	0
5b	Water (Vert.) El. 4.0 FS, El. -14.5 PS	0	0	921	3268	0	0
5c	Water (Vert.) El. -14.0 FS El. -3.0 PS	0	0	266	-3336	0	0
6a	Uplift - Impervious Water El. 14.0 FS El. -8.5 PS	0	0	-1493	-5522	0	0
6b	Uplift - Impervious Water El. 4.0 FS El. -14.5 PS	0	0	-1447	-3182	0	0
6c	Uplift - Impervious Water El. -14.0 FS El. -3.0 PS	0	0	-987	-4573	0	0
7a	Uplift - Pervious Water El. 14.0 FS El. -8.5 PS	0	0	-909	-2730	0	0
7b	Uplift - Pervious Water El. 4.0 FS El. -14.5 PS	0	0	-867	2728	0	0
7c	Uplift - Pervious Water El. -14.0 FS El. -3.0 PS	0	0	-725	1617	0	0

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

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GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)
Gate Structure Foundation Loads

Load Summation

Case	Item	F_x K	F_y K	F_z K	M_x 'K	M_y 'K	M_z 'K
I	1a + 2c	0	0	1980	-921	0	0
II	1a+2a+3a+3b+4a+5a+6a	0	-1017	1493	-21,209	0	0
III	1a+2a+3a+3b+4a+5a+7a	0	-1017	2688	-18,417	0	0
IV	1a+2b+3a+3b+4b+5b+6b	0	-563	1628	-10,584	0	0
V	1a+2b+3a+3b+4b+5b+7b	0	-563	2208	-3,341	0	0
VI	1a+2c+3a+3b+4c+5c+6c	0	266	1219	-5250	0	0
VII	1a+2c+3a+3b+4c+5c+7c	0	266	1481	940	0	0

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JOB ______ SHEET NO 62 OF ______
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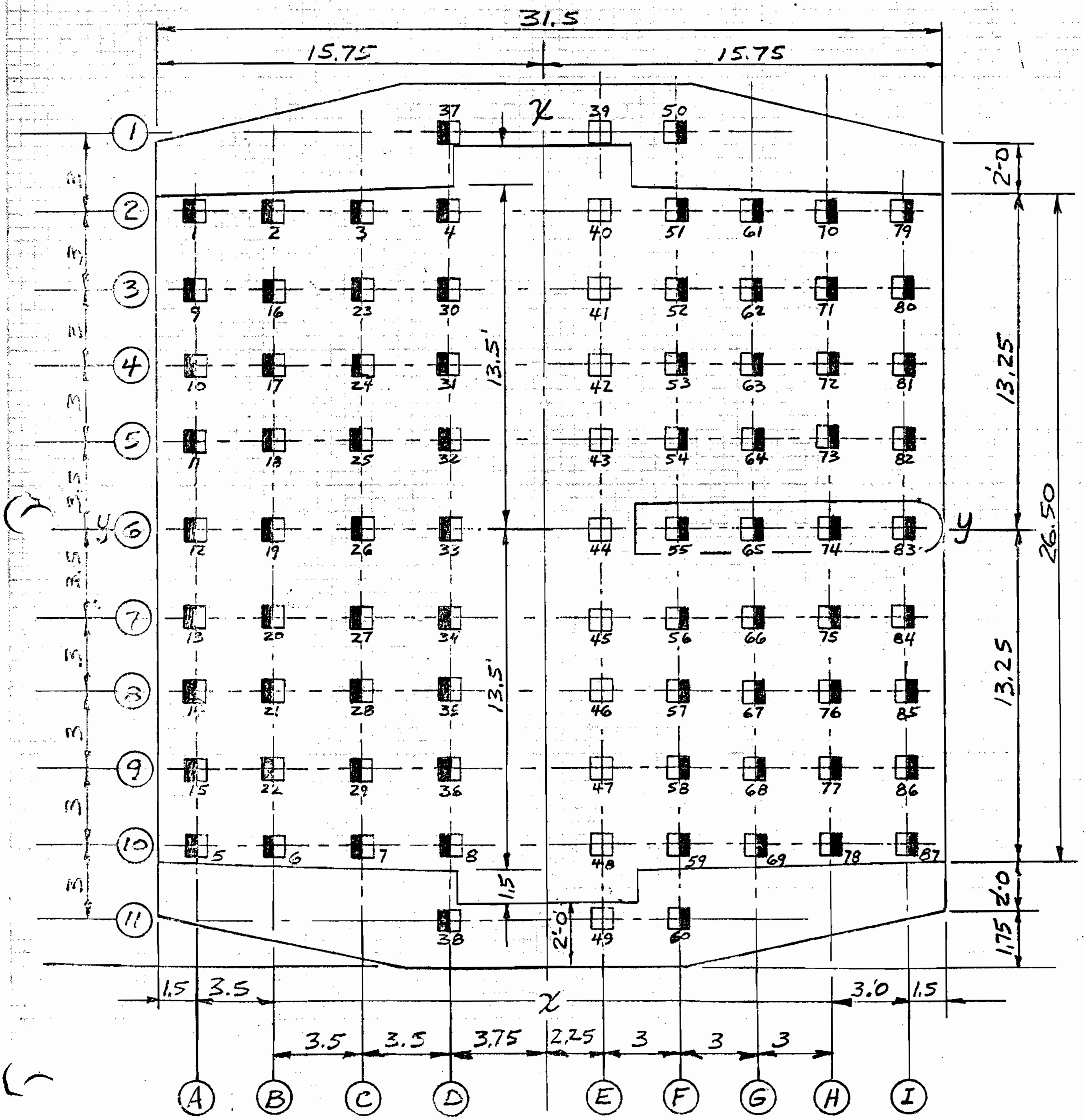
GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (EAST IHNC)

Pile Analysis - Gate Structure



Pile Layout

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JOB ____ ITEM ____ JOB NO 575-79-E

SHEET NO 63 OF ____
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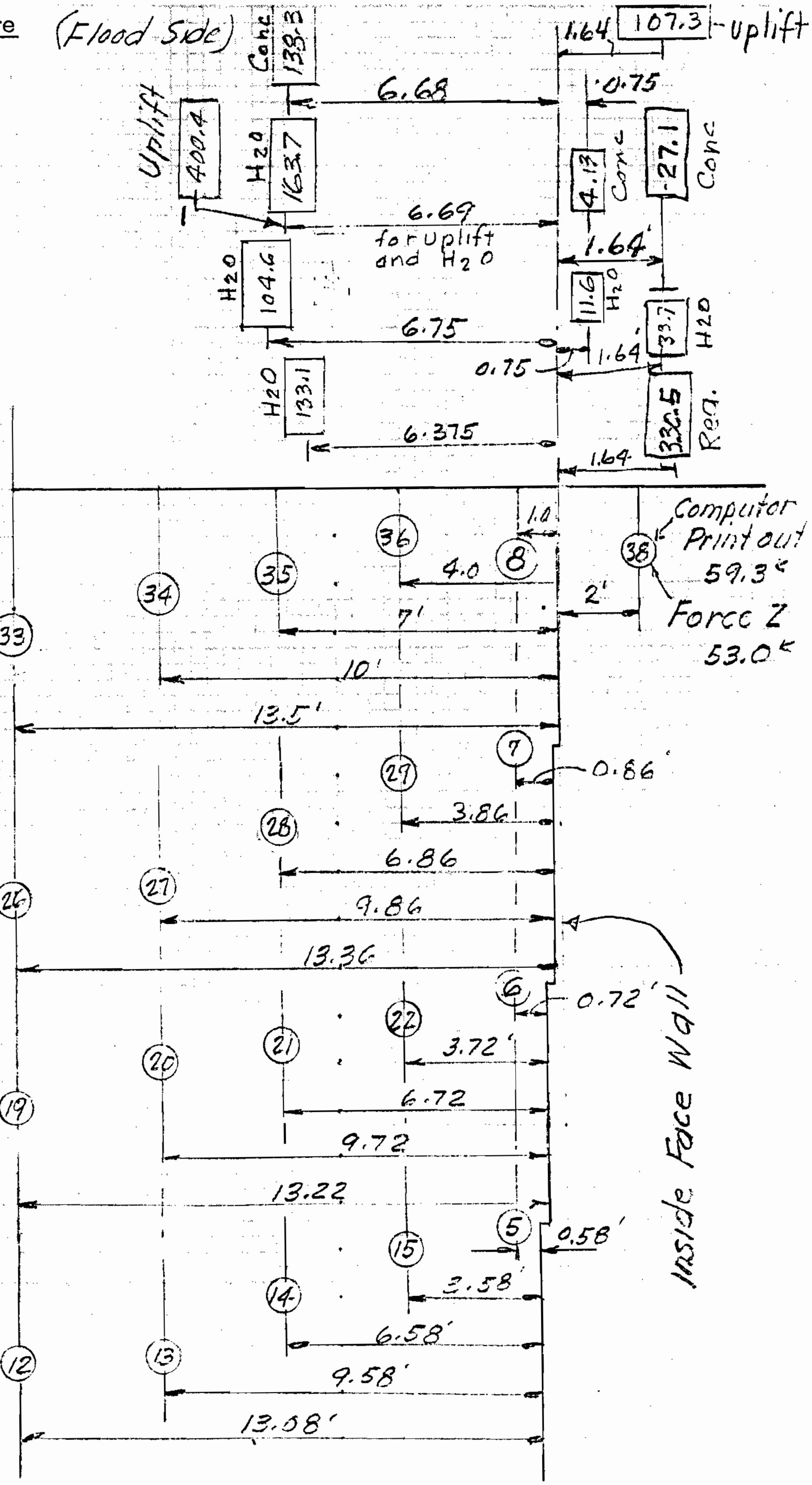
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure



Computer Printout[k]		Force Z↓[k]
33	59.3	53.0
34	.	"
35		"
36		"
8		"
26	30.9	27.6
27	"	"
28	"	"
29	"	"
7	"	"
19	29.4	26.3
20	"	"
21	"	"
22	"	"
6	"	"
12	55.0	49.2
13	"	"
14	"	"
15	"	"
5	"	"

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JOB ______ ITEM ______ JOB NO 575-79-E

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GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure (Flood side)

Floor Slab Wt. (See Sheets 49 and 52)

$A_1 = 157.5^k$

$B_1 = 34.2$

$C_1 = 147.3$

$337^k \times 0.5 = 169.5^k - (27.1 + 4.13) = 138.3^k$

Reactions From Structure (Wts. conc.) See Pages 50, 51, 52, 53, 49 +Cracking force (use ¼)

$D_1 = 166^k$

$F_1 = 186^k$

$G_1 = 68.2^k$

$H_1 = 137.0^k$

$J_1 = 3.5^k$

$K_1 = 22^k$

$L_1 = 13^k$

Crack.F = 174^k

$-661^k \times 0.5 = -330.5^k$

See page 49 & 49

$3.5' \times 2' \times 5.25' \times 0.15 = 5.5^k$

$1.75\left(1.75 + \frac{0.25}{12.25} \times 2\right)(5.25)(0.15) = 4.9$

$\frac{(2 + 1.79) + 2}{2}(10.25)(3.75)(0.15) = 16.7$

$\Sigma = -27.1$

H_2O Case II, Page 48, Case I Page 54

$0.15 \times 1.5 \times 3.5 \times 5.25 = 4.13^k$

$\frac{13.5 + 13.25}{2}(14.0 + 5.1)(10.25)(0.0625) = 163.7$

$(14 + 21.43)(3.5)(13.5)(0.0625) = 104.6$

$\left(\frac{13.5 + 13.25}{2}\right) \times 12.25 \times 13 \times 0.0625 = 133.1$

$-(1.5)(3.5)(14 + 21.43)(0.0625) = -11.6$

$-(0.25)\left(\frac{2.0 + 3.5}{2}\right)(14.0 + 5.1)\, 0.0625 = -33.7$

Uplift Impervious (Page 54)

$14.25\left(\frac{17 + 15.25}{2}\right)(2.21) - 107.3 = -400.4$

-107.3

$42.438 + (1.75 \times 3.5) \times 2.21 = 107.3$

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JOB
ITEM
JOB NO 575-79-E

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CHKD. BY DATE

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure (Flood Side)

Pile	Force "Z" K	Lever Arm Ft	Moments 'K
Pile #33	-53	13.5	-716
#34	-53	10.0	-530
#35	-53	7.0	-371
#36	-53	4.0	-212
#6	-53	1.0	-53
#26	-27.6	13.36	-369
#27	-27.6	9.86	-272
#28	-27.6	6.86	-189
#29	-27.6	3.86	-107
#7	-27.6	0.86	-24
#19	-26.3	13.32	-350
#20	-26.3	9.72	-256
21	-26.3	6.72	-178
22	-26.3	3.72	-99
6	-26.3	0.72	-19
12	-49.2	13.08	-645
13	-49.2	9.58	-471
#14	-49.2	6.58	-324
#15	-49.2	3.58	-176
#5	-49.2	0.58	-29
#38	-53	-2.0	106
			-5284 'K

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JOB ___ ITEM ___ JOB NO 575-79-E

SHEET NO 66 OF ___ BY ___ DATE ___ CHKD. BY ___ DATE ___

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure (Flood Side)

Item	Force Z K	Lever Arm Ft	Moment 'K
Conc. Slab	138.3	6.68	924
Conc. Slab	4.13	-0.75	-3
Conc. Slab	27.1	-1.64	-44
Reaction from above	330.5	-1.64	-542
H_2O	133.1	6.375	849
H_2O	104.6	6.75	706
H_2O	163.7	6.69	1095
H_2O	33.7	-1.69	-55
H_2O	11.6	-0.75	-9
Uplift	-400.6	6.69	-2680
Uplift	-107.3	-1.64	176
			417

Final Moment = Σ -5284 + 417 = -4867 'K

Shears

Distances on Page 63

#33	13.5	53.0	#34	10.0	#35	7.0
#26	13.36	27.6	#27	9.86	#28	6.86
#19	13.22	26.3	#20	9.72	#21	6.72
#12	13.08	49.2	#13	9.58	#14	6.58

Av = 13.29' Σ 156.1 K Av = 9.79' Σ 156.1 Av 6.79' Σ = 156.1

#36	4.0	#8	1.0
#29	3.86	#7	0.86
#22	3.72	#6	0.72
#15	3.58	#5	0.58

Av 3.79' Σ 156.1 Av 0.79 Σ = 156.1

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JOB GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)
ITEM Pile Analysis - Gate Structure (Flood Side)
JOB No 575-79-E

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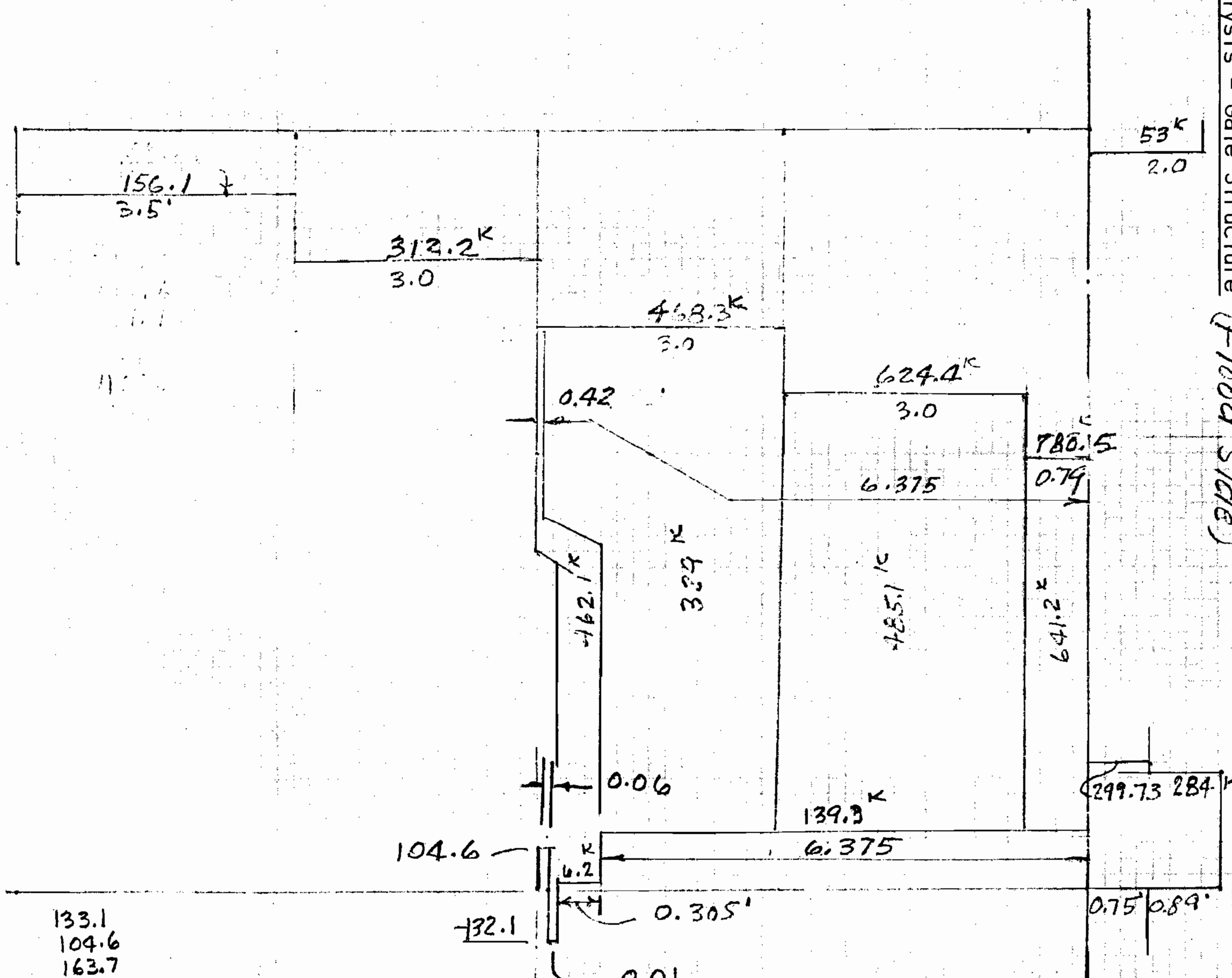
$$\overset{546.35}{(3.5\times 156.1)}+\overset{936.6}{(312.2\times 3)}+\overset{1405.04}{(468.3\times 3)}+\overset{1873.2}{(624.4\times 3)}+\overset{616.6}{(780.5\times 0.79)}-\overset{106}{(53\times 2)}-5284=0$$



AV. = 6.69, 6.68, 6.69, 6.65, 6.38

A = 6.618 ΣR.

133.1
104.6
163.7
138.3
−400.4
139.3

$$\overset{6.28}{(104.6\times 0.06)}+\overset{1.89}{(6.2\times 0.305)}+\overset{880.04}{(139.3\times 6.375)}-\overset{224.8}{(299.73\times 0.75)}-\overset{252.76}{(284\times 0.89)}$$

$$-417 = 0 \approx -6.01$$ round off error

JOB	
ITEM	
JOB NO	575-79-E
SHEET NO	66
OF	
BY	LWC
DATE	3-21-80
CHKD. BY	
DATE	

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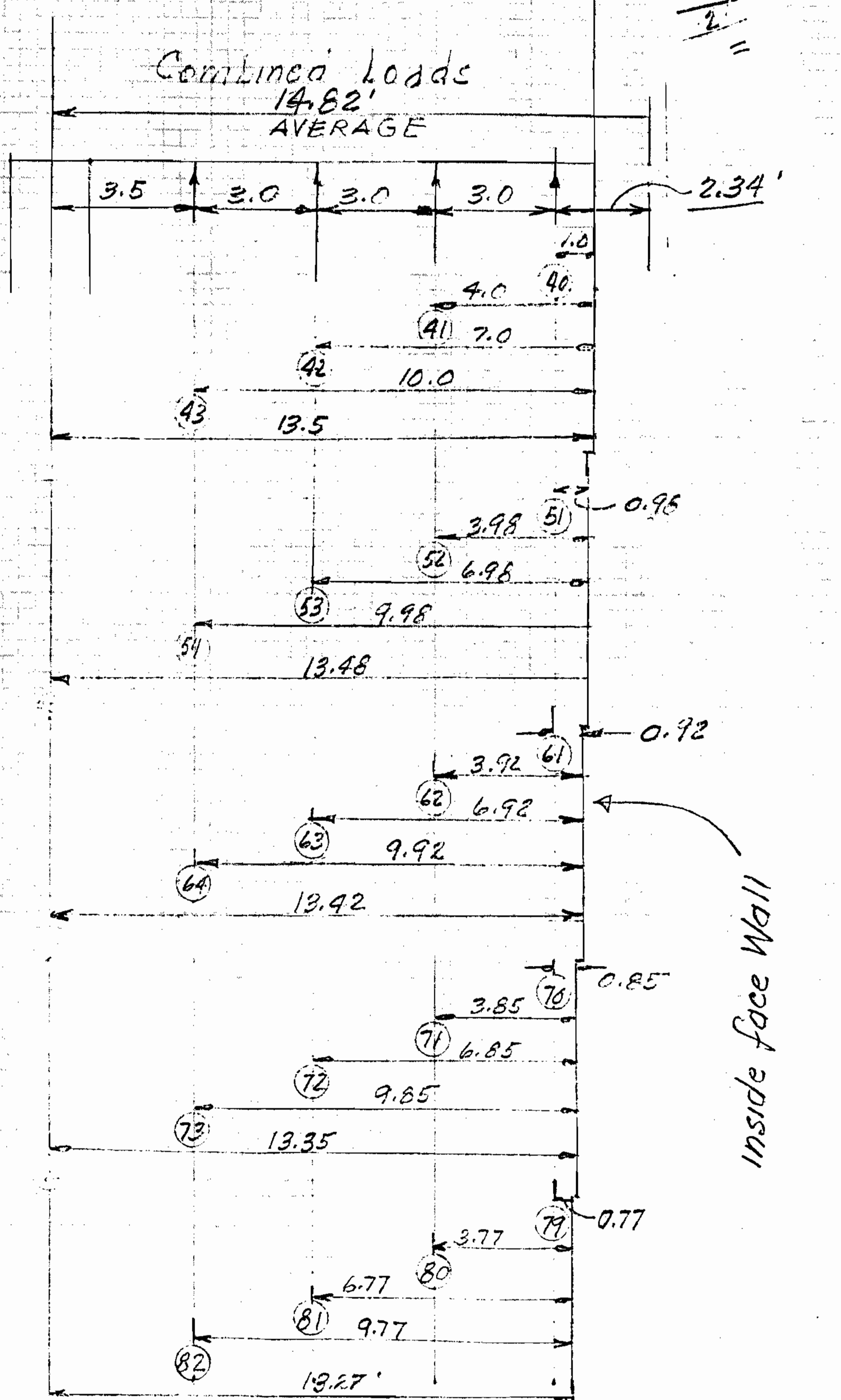
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure (Protected side)

$\frac{2.88}{2} + 0.9 =$

Pile	Compression [illegible]	Force Z
51	73.3	67.3
52	"	"
53	"	"
54	"	"
61	64.7	57.9
62	"	"
63	"	"
64	"	"
70	60.6	54.2
71	"	"
72	"	"
73	"	"
79	56.5	50.5
80	"	"
81	"	"
82	"	"



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JOB
ITEM
JOB NO 575-79-E

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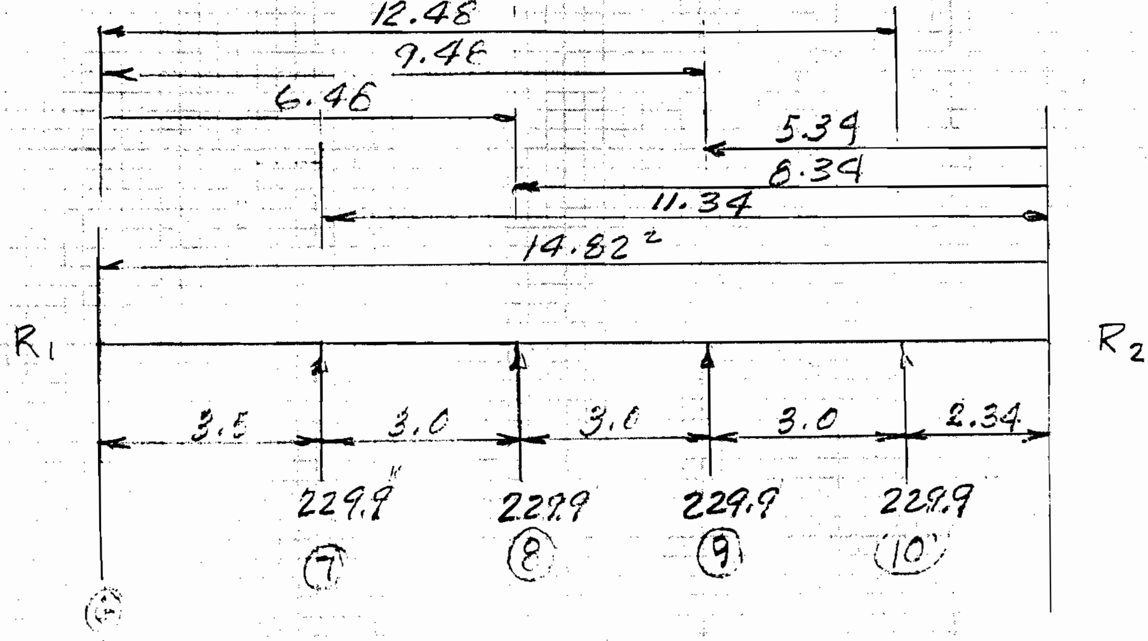
GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure



$R_1 = \frac{Pb^2}{l^3}(3a+b)$

$R_2 = \frac{Pa^2}{l^3}(a+3b)$

(10) $R_1 = 0.0706\,(2.34)^2(39.78) = 15.38^k$ $R_2 = 0.0706\,(12.48)^2(19.5) = 214.42^k$

(9) $R_1 = 0.0706\,(5.34)^2(33.81) = 66.07^k$ $= 161.69^k$

(8) $R_1 = 0.0706\,(8.34)^2(27.78) = 136.42^k$ $= 93.33^k$

(7) $R_1 = 0.0706\,(11.34)^2(21.84) = 198.28^k$ $= 31.48^k$

M_1 $M_2 =$

(10) $M_1 = (1.047)(12.48)(2.34)^2 = 71.53'^k$ $M_2 = (1.047)(12.48)^2(2.34) = 381.49'^k$

(9) $M_1 = (1.047)(9.48)(5.34)^2 = 282.96'^k$ $(1.047)(9.48)^2(5.34) = 502.34'^k$

(8) $M_1 = (1.047)(6.48)(8.34)^2 = 471.78'^k$ $(1.047)(6.48)^2(8.34) = 366.57'^k$

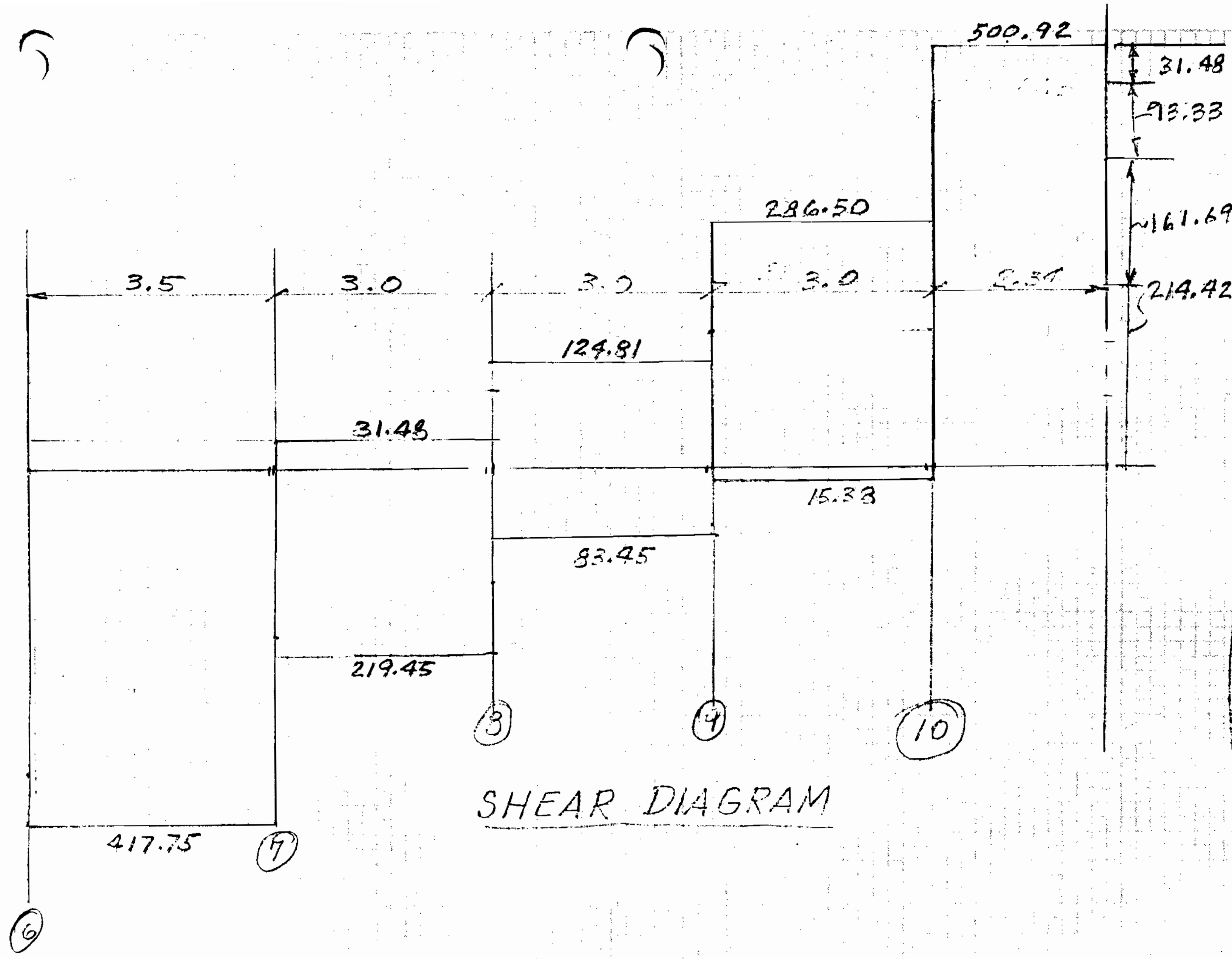
(7) $M = (1.047)(3.5)(11.34)^2 = 471.23'^k$ $(1.047)(3.5)^2(11.34) = 145.40'^k$

(10) $M_3 = (0.1413)(12.48)^2(2.34)^2 = 120.5'^k$

(9) $= (0.1413)(9.48)^2(5.34)^2 = 362.11'^k$

(8) $= (0.1413)(6.48)^2(8.34)^2 = 412.69'^k$

(7) $= (0.1413)(3.5)^2(11.34)^2 = 222.59'^k$



SHEAR DIAGRAM

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JOB GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)
ITEM Pile Analysis - Gate Structure
Protected Side
JOB No 575-79-E

SHEET No 70 OF
BY LWC DATE 2-29-80
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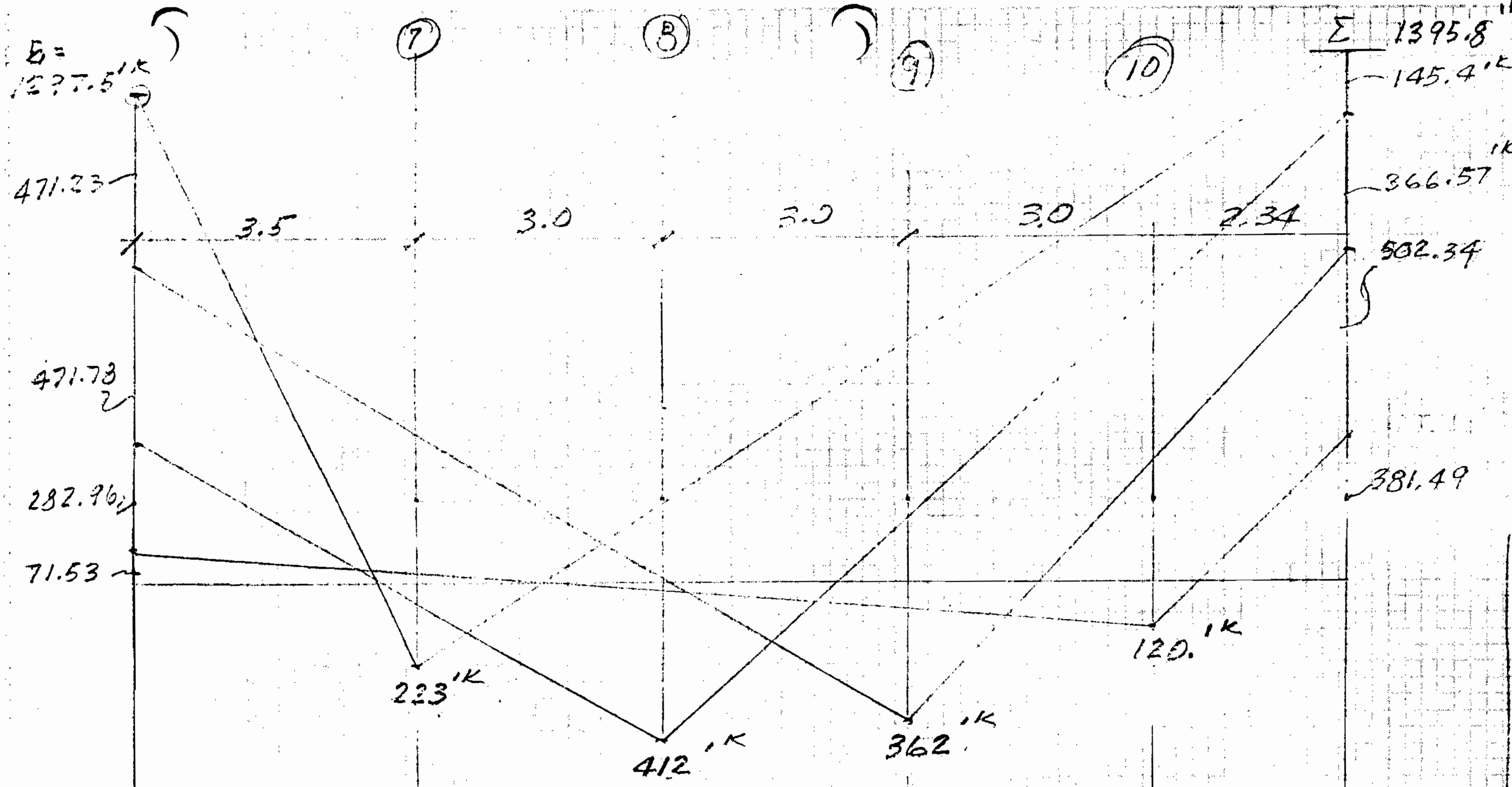
JOB: GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)
ITEM: Pile Analysis - Gate Structure
Protected Side
JOB No: 575-79-E
SHEET No 71 OF
BY LWC DATE 3-24-80
CHKD. BY DATE



See page 71

$+M = 214.42 \times 2.34 - 381.49 = 120.25$

$+M = 161.69 \times 5.34 - 502.34 = 362$

$+M = 93.33 \times 8.34 - 366.57 = 412$

$+M = 31.48 \times 11.34 - 145.40 = 223$

1750.46

6

Moment Diagram

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (East of IHNC)

Pile Analysis - Gate Structure (Protected Side)

Floor Slab Wt (See page 64)(Page 53)(Page 52)

$\frac{1}{2} A = \frac{157.5}{2} =$ 78.75

$\frac{1}{2} B = \frac{34.2}{2} =$ 17.1

$\frac{1}{2} C \times \frac{2}{5.5} = \frac{147.3}{2} \times \frac{2}{5.5} =$ 26.8

sub-T 122.65^K

$+ \frac{1}{2} E = \frac{46.3}{2} =$ 23.15

$+D$ $42.44^{\square'} - (3.5 \times 2) \times 13 =$ 69.11

Su 214.91

$+H$ $\frac{137.0}{2} =$ 68.5

$+F$ $\frac{186.2}{2} =$ 93.1

$+G$ $(2)(2)(20.67)(0.15) =$ 12.4

Gate + Stem 154

stairs etc 11.8

554.71^K

$-\frac{1}{2}$ (55) 65 (74) (83) $= \frac{229.9}{2} = 114.95$

439.76

$-$ (60) 67.3

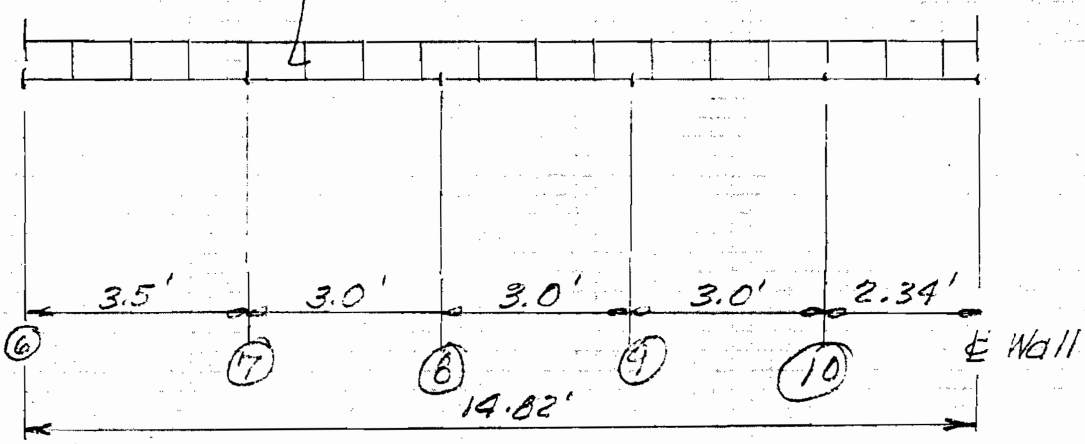
372.46^K

$\frac{372.46}{14.82} = 25.13^{KLF}$

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure (Protected Side)

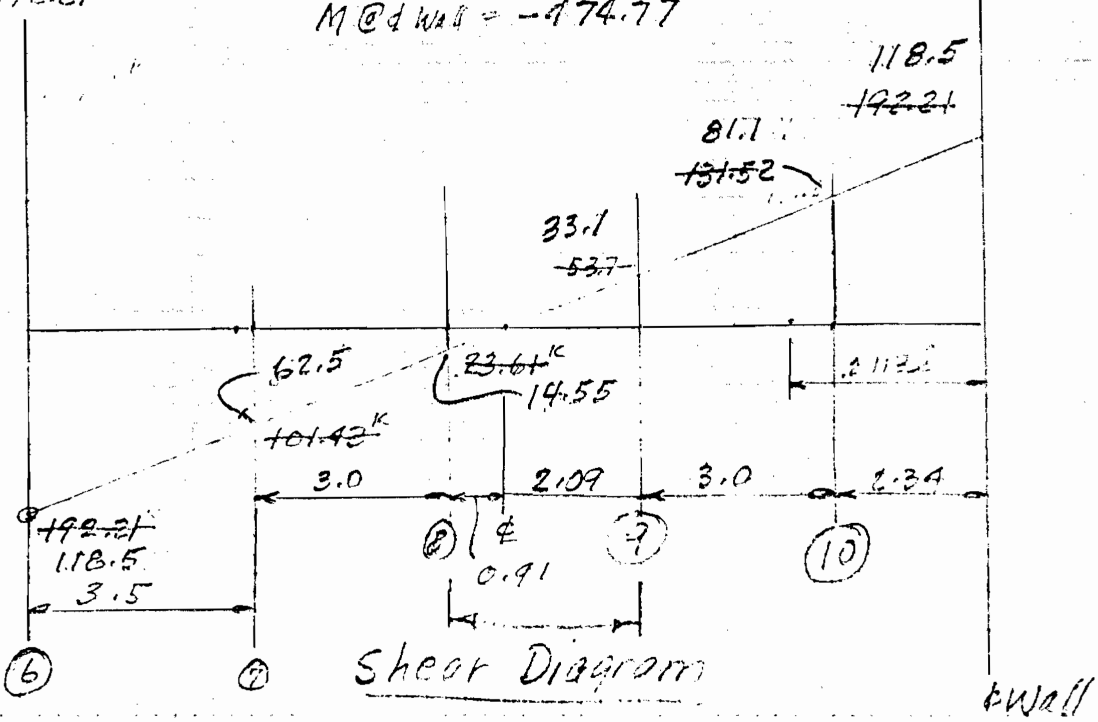
$25.13^{KLF} + (13 \times 0.0625) = 25.94$



$V_x = w\left(\frac{l}{2} - x\right)$

$V@6 = 192.21^K$	$M@6 = -474.77'^K$
$V@7 = 101.43^K$	$M@7 = +39.1$
$V@8 = 23.61^K$	$M@8 = +226.2$
	$M@℄ = +237.38$
$V@9 = 53.70^K$	$M@9 = 186.59$
$V@10 = 131.52^K$	$M@10 = -96.00$
$V@℄wall = 192.21^K$	$M@℄wall = -474.77$

Reduce Shear
See page 74.



Shear Diagram

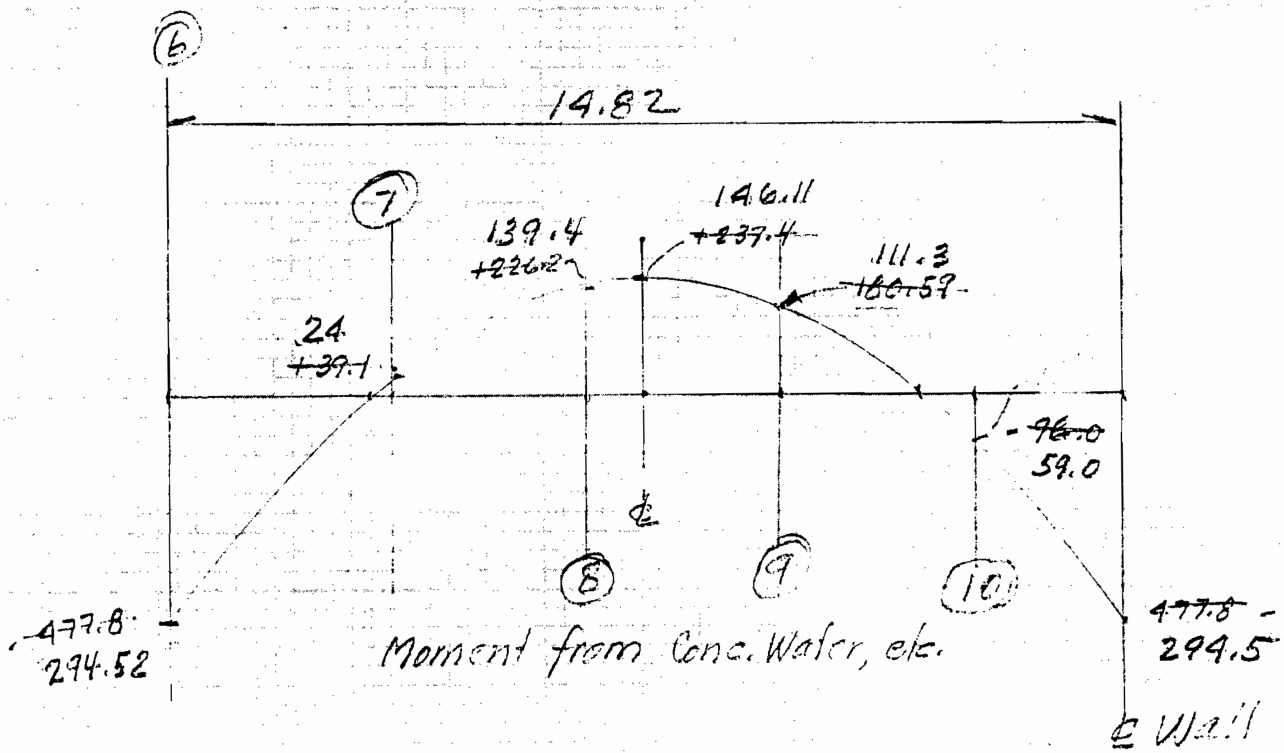
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 74 OF
BY LWC DATE 3-25-80
CHKD. BY DATE

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

<u>Pile Analysis - Gate Structure</u> (Protected Side)



Reduce above Moment by uplift. (Page 54)

Uplift = 0.8125/sq ft

$0.8125 \times 12.25 = 9.95^{K}$

Reduce Moments and Shears by $\frac{25.94 - 9.95}{25.94} = 0.6164$

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure Protected Side

Final Moments - Floor Slab - 1' Width

@ 6: $+1297.5'^{k}$ -294.5 = $+1003.5'^{k}$

$\frac{1003'^{k}}{12.25} = 81.87'^{k}$

@ 7: -223 $+29$ = -194

$\frac{194}{12.25} = -15.83'^{k}$

@ 8: -412 $+139.4$ = -272.6

$\frac{272.6}{12.25} = -22.25'^{k}$

@ 9: -362 $+111.3$ = -250.7

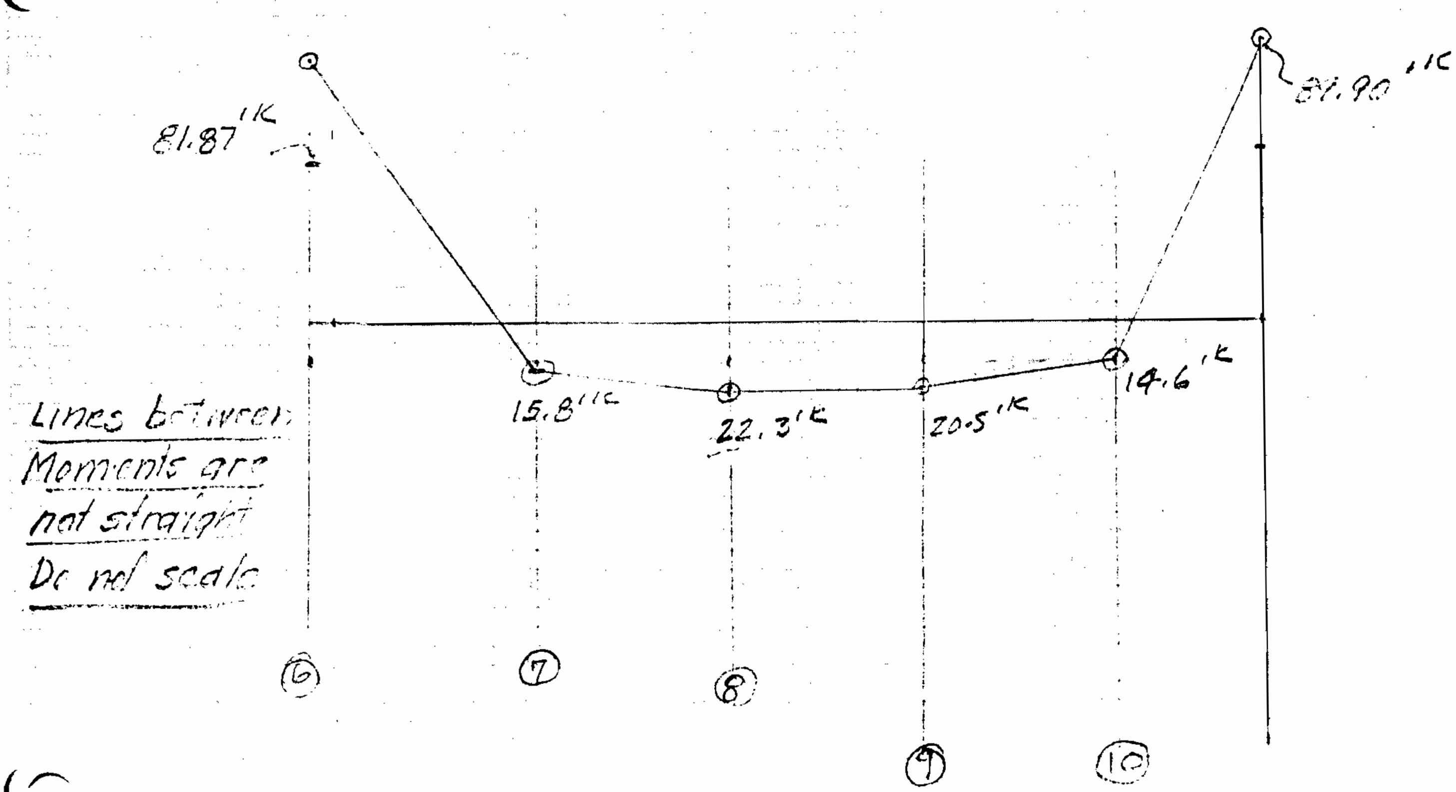
$\frac{250.7}{12.25} = 20.46'^{k}$

@ 10: -120 -59 = -179

$\frac{179}{12.25} = -14.61'^{k}$

@ ℄ Wall: $+1395.8$ -294.5 = 1101.3

$\frac{1101.3}{12.25} = 89.90$



Final Moments

n-y ASSOCIATES, INC.
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JOB ______ ITEM ______ JOB No 575-79-E

SHEET No 76 OF ______ BY ______ DATE 3-25-80 CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure - Protected Side

Final Shears - Floor Slab - 1' Wide Transv. strip

@ 6

417.75^k
-118.5
299.25

$\frac{299.25}{12.25} = 24.43^k$

@ 7

219.45
-62.5
156.95

$\frac{31.48}{12.25} = 2.57^k$

$\frac{156.95}{12.25} = 12.18^k$

@ 8

83.45
-14.55
68.90

$\frac{124.81}{12.25} = 10.2^k$

$\frac{68.9}{12.25} = 5.62^k$

@ 9

281.5
-33.1
253.4^k

$\frac{253.9}{12.25} = 20.68^k$

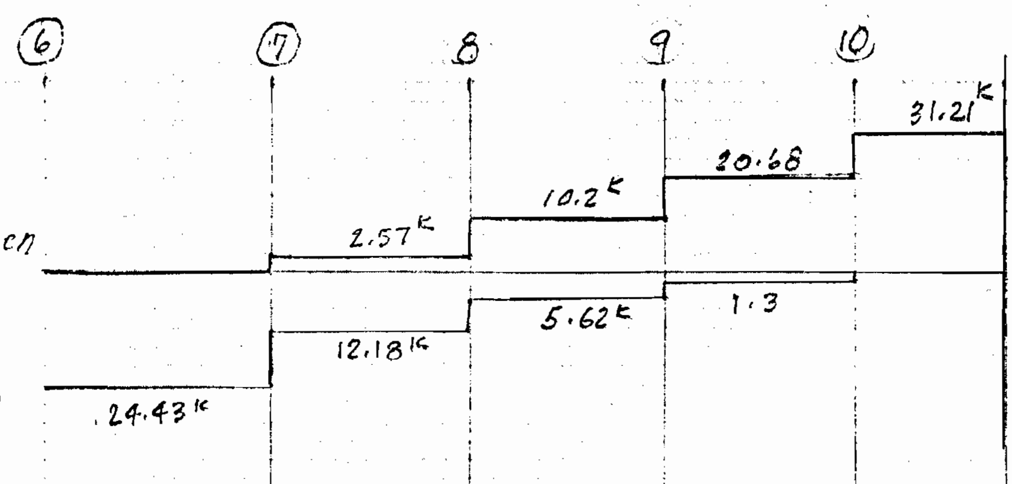
$\frac{15.38}{12.25} = 1.3^k$

@ 10

500.92^k
-118.5
382.42

$\frac{382.42}{12.25} = 31.21^k$

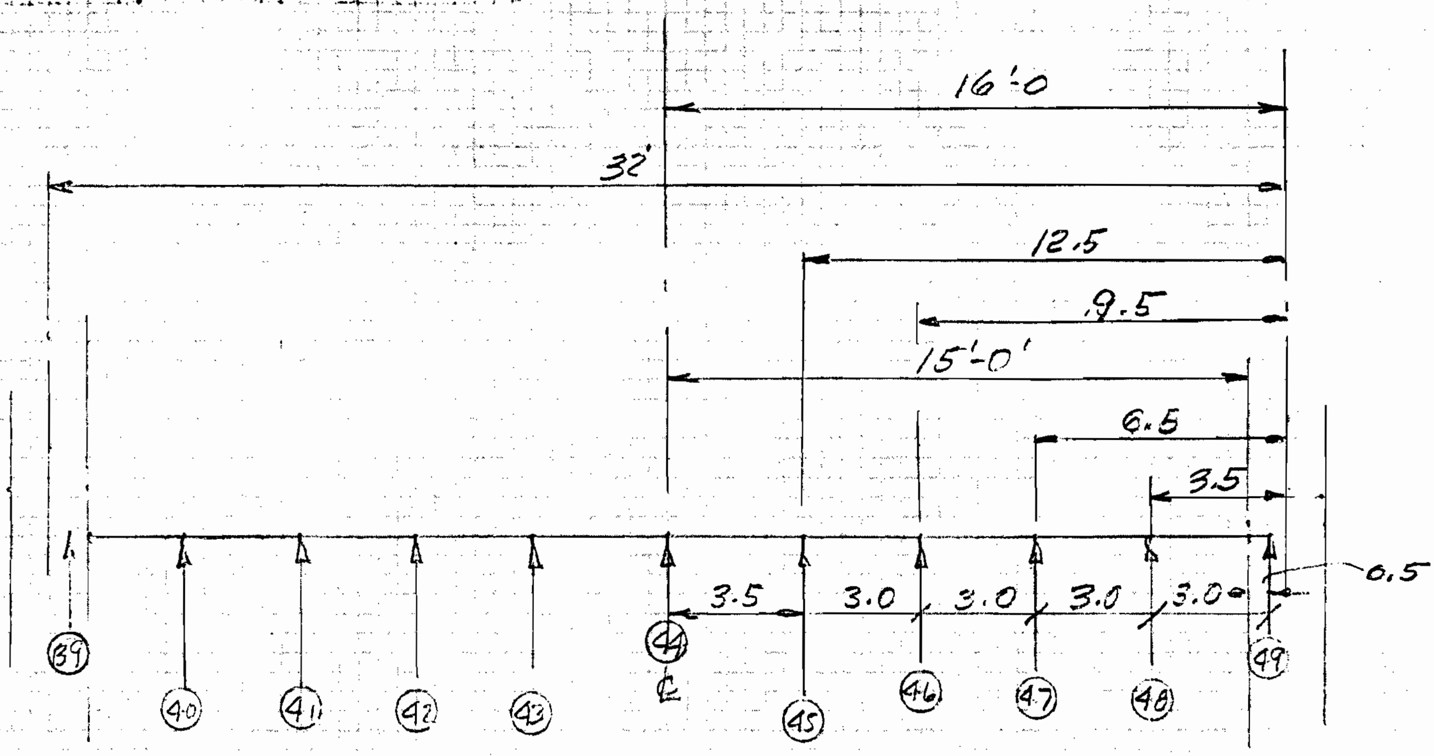
Note: Shears between Lines are not a true picture.
See page 73 and 70



Final Shear Diagram

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis - Gate Structure Flood Side



All piles vertical @ per 35^k each compression

	R_1	R_2
48	$0.001068\,(3.5)^2(89) = 1.16^k$	$0.001068\,(28.5)^2(37) = 33.84^k$
47	$(6.5)^2(83) = 3.75^k$	$(25.5)^2(45) = 31.25$
46	$(9.5)^2(77) = 7.42^k$	$(22.5)^2(51) = 27.58$
45	$(12.5)^2(71) = 11.84^k$	$(19.5)^2(57) = 23.16$
44	$(16)^2(64) = 17.5^k$	$(16)^2(64) = 17.5^k$
43	23.16^k	11.84^k
42	$= 27.58^k$	7.42^k
41	$= 31.25^k$	3.75^k
40	$= 33.84^k$	$= 1.16^k$

Shears

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ ITEM ____ JOB No 575-79-E

SHEET No 78 OF ____
BY LWC DATE 3-25-80
CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (EAST OF IHNC)

Pile Analysis · GATE STRUCTURE — Flood Side

End Moments from Piles

48	$0.03418(28.5)(3.5)^2 = 11.93'^{K}$	$0.03418(28.5)^2(3.5) = 97.16$
47	$(25.5)(6.5)^2 = 36.82'^{K}$	$(25.5)^2(6.5) = 144.46$
46	$(22.5)(9.5)^2 = 69.41'^{K}$	$(22.5)^2(9.5) = 164.38$
45	$(19.5)(12.5)^2 = 104.14$	$(19.5)^2(12.5) = 162.46$
44	$(16.0)(16)^2 = 140.0$	$(16)^2(16) = 140.0$
43	162.46	104.14
42	= 164.38	69.41
41	= 144.46	36.82
40	$= 97.16'^{K}$	$11.93'^{K}$

+ Moments

48	$.002136(28.5)^2(3.5)^2$	$= 21.25'^{K}$
47	$(25.5)^2(6.5)^2$	= 58.68
46	$(22.5)^2(9.5)^2$	= 97.60
45	$(19.5)^2(12.5)^2$	= 126.92
44	$(16)^2(16)^2$	= 140
43		126.92
42		97.60
41		58.68
40		$= 21.25'^{K}$

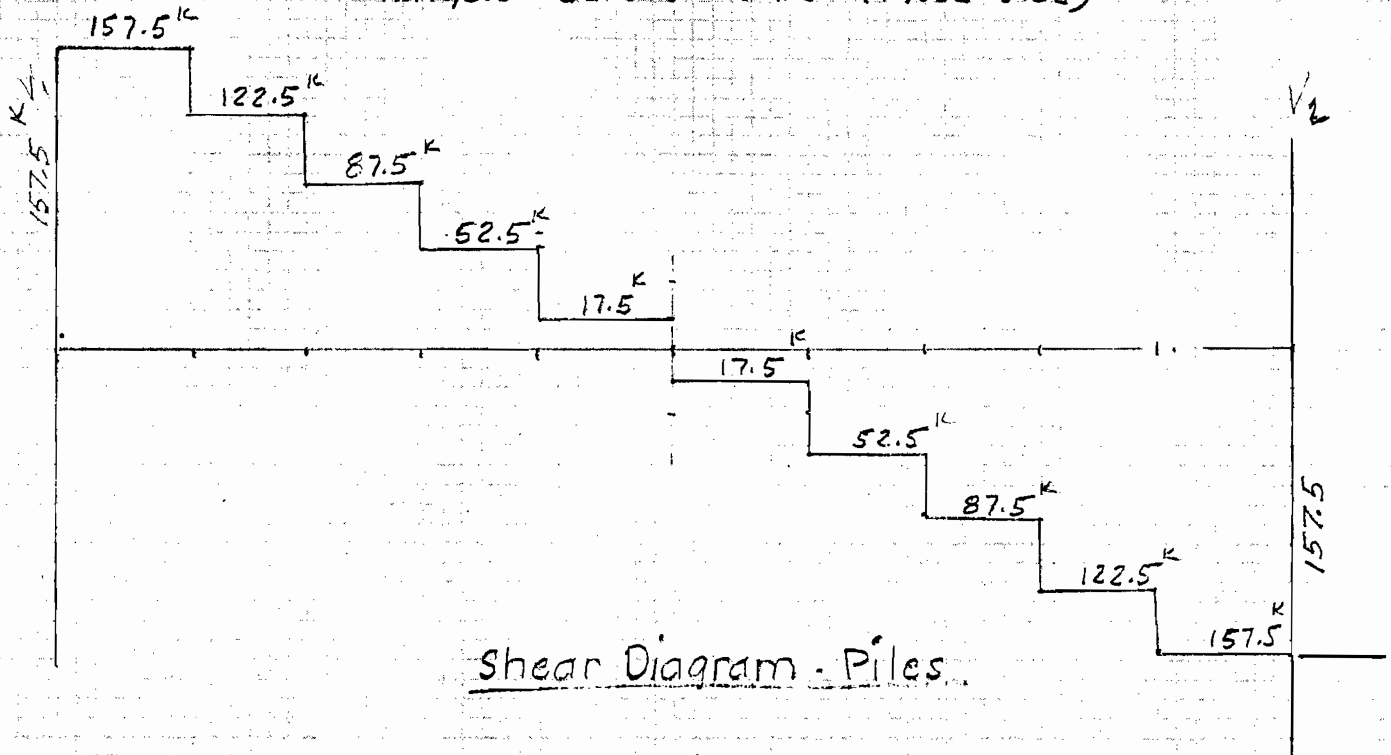
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 79 OF
BY LWC DATE 3-25-80
CHKD. BY DATE

GATES ACROSS FLORIDA AVENUE DRAINAGE CANAL (East of IHNC)

Pile Analysis - Gate Structure (Flood Side)



Shear Diagram - Piles.

Loading from Conc., H_2O, Reaction Etc.

Conc. $34 \times 3.5 \times 5.25 \times 0.15 = 93.7^k$

$2 \times 3.5 \times 37 \times 0.15 = 38.9^k$

K $= 22^k$

J 3.5^k

L 1.3^k

159.4 Sub-total

H_2O $31.5 \times 30 \times 35.43 \times 0.0625 = 232.5$

391.9 Sub-total

-Uplift - $3.5 \times 34 \times 0.8125$ -96.7

295.2 Sub-total

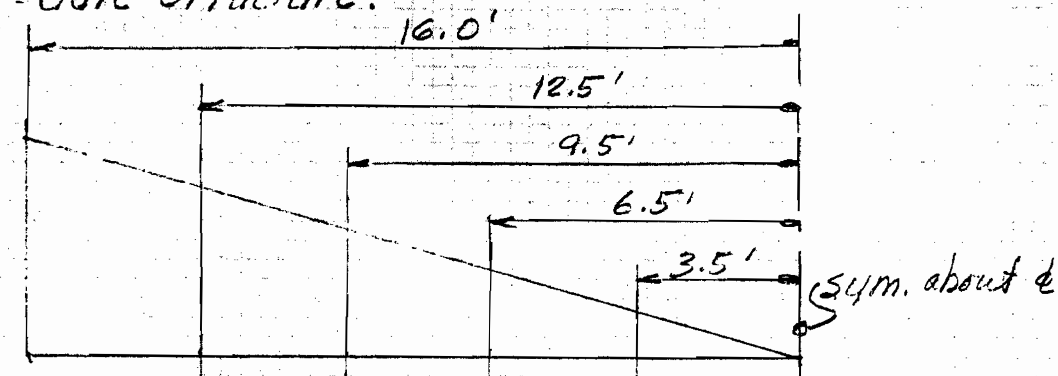
2 piles - 39 and 49 vert. -70.0^k

225.2^k Final!

$$\frac{225.2}{32} = 7.04^k \text{ sq ft.}$$

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (East of IHNC)

Pile Analysis - Gate Structure.



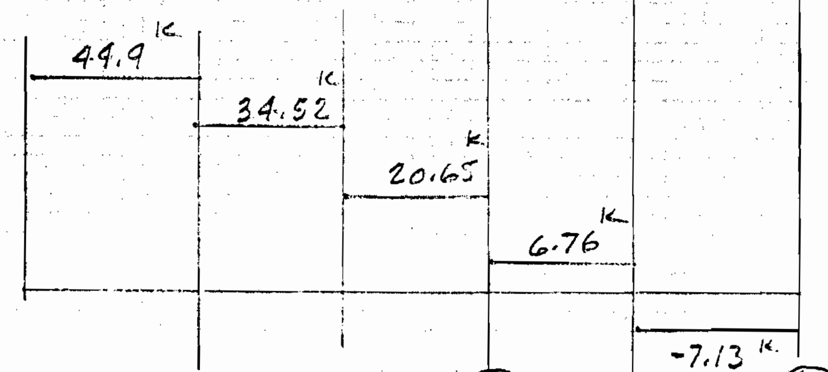
Shear = $\frac{225.2^K}{2}$ = 112.6^K

40 / 48	41 / 47	42 / 46	43 / 45	44
87.98^K	66.85^K	45.74^K	24.63^K	

Shear from Conc. H_2O, Reactions, etc.

See Sheet 79

157.5
- 112.6
44.9



(Do not scale

40 / 48	41 / 47	42 / 46	43 / 45	44
122.5	87.5	52.5	17.5	
- 87.98	- 66.85	- 45.74	- 24.63	
39.52	20.65	6.76	-7.13	

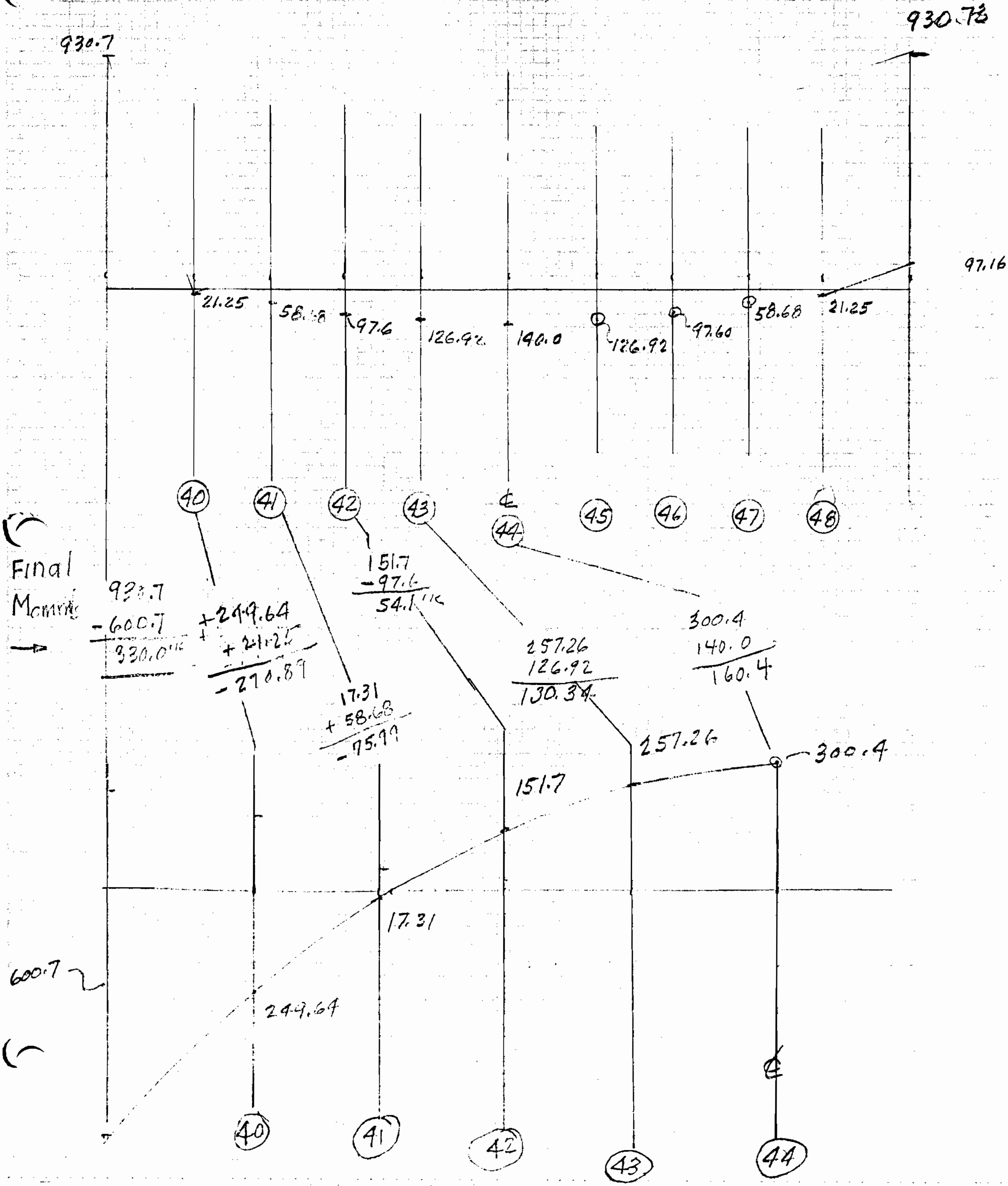
Final Shears

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____
ITEM ____
JOB NO 575-79-E

SHEET NO 81 OF ____
BY LWC DATE 3-25-80
CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE. DRAINAGE CANAL (EAST of IHNC)



n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB NO 575-79-E

SHEET NO 82 OF ______ BY LWC DATE 3-26-80 CHKD. BY ______ DATE ______

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Pile Analysis - Gate Structure (Flood side)

Top face reinforcement (℄ to Flood side limits of structure - 15.75')

Max Moment per 1 foot strip

$\frac{-4867'^{K}}{15.75'} = 309'^{K}$ (Page 66) Page 81 $\frac{330'^{K}}{3.5} = 94.8'^{K}$ ∴ use $309'^{K}$

Max Shear per 1 foot strip

$\frac{641}{15.75} = 40.69^{K}$ (Page 67) Page 80 $\frac{44.9}{3.5} = 15'^{K}$ use $40.69'^{K}$

$f_s = 20^{ksi}$ $f'_c = 4000psi$ $f_c = 1400psi$ $K = 221$ $J = 0.88$ $d = 41.5''$ (Min.) $b = 12''$

d' reqd $= \sqrt{\frac{309 \times 12}{0.221 \times 12}} = 37.39'' < 41.5''$ o/k

48.5" Ave

Ave "d" = 4.33' = 52" - 3½ = 48.5"

Page 48

$a\ell = \frac{42.438}{15.75} = 2.69'$

$v = \frac{40.69^{K}}{12 \times 48.5''} = 0.070$ ksi o/k

Reduce $M = 309 - \frac{Va\ell}{3} = 309 - \left(\frac{40.69}{3} \times 2.69\right) = 272.5'^{K}$

$A_s = \frac{272.5}{1.44 \times 48.5} = 3.9 \square''/ft = 61.43\square$ for ½ structure

Use 3 #11 per ft. or 2 layers

bond $= \frac{V}{\Sigma o j d} = \frac{40,690}{(3 \times 4.43)(0.88)(48.5)} = 71.73 < 153$ allow

For bottom face reinforcement see page 42

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ____ ITEM ____ JOB NO 575-79-E

SHEET NO 83 OF ____ BY LWC DATE 3-26-80 CHKD. BY ____ DATE ____

GATES ACROSS FLORIDA AVE DRAINAGE CANAL (East of IHNC)

Pile Analysis - Gate Structure (Protected Side)

Top face reinforcement

Max Moment = $89.90^{'K}$ (Page 75) Max. V = 31.21^{K} (Page 76) (one foot strip)

d varies 41.5 to 46.5

$d' reqd = \sqrt{\frac{89.90 \times 12}{0.221 \times 12}} = 20.1'' < 41.5$

$v = \frac{31.21^{K}}{12 \times 41.5} = .0625 < 0.070$ ksi allow — Page 82

Reduce M by $\frac{Va}{3}$ = $89.90^{'K} - \left(\frac{31.21}{3} \times 2.69\right) = 61.9^{'K}$

$As = \frac{61.9}{1.44 \times 41.5} = 1.04^{\square''}$

$\#7 @ 6 = 1.2^{\square''}$

$u\,end = \frac{V}{\Sigma_0 j d} =$ 2 - #7 $\frac{31.21^{K}}{(2 \times 2.79)(0.86)(41.5)} = 0.155 < 0.296^{KSI}$

for bottom face see page 27

03/14/80   14.11

```
10 FLORIDA AVE EAST 575-79
20 FLORIDA AVE CANAL GATE
30 10,7
40 2,0.1,[illegible]
50 1,16,16
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,8
110 4♦-12.5,4♦12.5
140 14.25,10.75,7.25,3.75,14.25,10.75,7.25,3.75
170 8♦0.0
200 2,90,7
210 -9.5,-6.5,-3.5,0.0,3.5,6.5,9.5
240 7♦14.25
270 7♦0.0
300 2,90,7
310 -9.5,-6.5,-3.5,0.0,3.5,6.5,9.5
340 7♦10.75
370 7♦0.0
400 2,90,7
410 -9.5,-6.5,-3.5,0.0,3.5,6.5,9.5
440 7♦7.25
470 7♦0.0
500 2,90,9
510 -9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,-15.5,15.5
540 9♦3.75
570 9♦0.0
700 0,90,11
710 -15.5,-12.5,-9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,12.5,15.5
740 11♦-2.25
770 11♦0.0
800 2,270,11
810 -15.5,-12.5,-9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,12.5,15.5
840 11♦-5.25
870 11♦0.0
900 2,270,9
910 -12.5,-9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,12.5
940 9♦-8.25
970 9♦0.0
1000 2,270,9
1010 -12.5,-9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,12.5
1040 9♦-11.25
1070 9♦0.0
1100 2,270,9
1110 -12.5,-9.5,-6.5,-3.5,0.0,3.5,6.5,9.5,12.5
1140 9♦-14.25
1170 9♦0.0
2000 0,0,1980,-921,0,0
2010 0,-1017,1493,-21209,0,0
2020 0,-1017,2688,-18417,0,0
2030 0,-563,1628,-10584,0,0
2040 0,-563,2208,-3341,0,0
2050 0,266,1219,-5250,0,0
2060 0,266,1481,940,0,0

READY

CLEAR
LFT CLEARED
```

Allowables

Comp = 73^{k}

Tens. = 42^{k}

84

*RUN RK29010A

03/14/80 14.134

(84)

PROG. NO. 713-F3-A2-210 14:08:18 03/14/80 MOD 6B, FEB 80

FLORIDA AVE EAST 575-79
FLORIDA AVE CANAL GATE

TOTAL NUMBER OF PILES = 87

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	1980.0	-921.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	0.0	26.9
2	-0.1	0.0	25.6
3	-0.1	0.0	24.3
4	-0.1	0.0	23.0
5	-0.1	0.0	26.9
6	-0.1	0.0	25.6
7	-0.1	0.0	24.3
8	-0.1	0.0	23.0
9	-0.1	0.0	26.9
16	-0.1	0.0	25.6
23	-0.1	0.0	24.3
30	-0.1	0.0	23.0
39	-0.0	0.0	26.9
50	-0.0	-0.0	26.3
61	-0.0	-0.0	25.1
70	-0.0	-0.0	24.0
79	-0.0	-0.0	22.9

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

29.6

(85)

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-1017.0	1493.0	-21209.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	0.0	-21.8
2	-0.1	0.0	-15.4
3	-0.1	0.0	-9.0
4	-0.1	0.0	-2.6
5	-0.1	0.0	-21.8
6	-0.1	0.0	-15.4
7	-0.1	0.0	-9.0
8	-0.1	0.0	-2.6
9	-0.1	0.0	-21.8
16	-0.1	0.0	-15.4
23	-0.1	0.0	-9.0
30	-0.1	0.0	-2.6
39	-0.1	0.0	24.0
50	0.1	-0.0	40.0
61	0.0	-0.0	45.5
70	0.0	-0.0	51.0
79	0.0	-0.0	56.5

12.3

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-1017.0	1493.0	-21209.0	0.0	-0.0

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-1017.0	2688.0	-18417.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	12.3
2	-0.4	0.0	7.5
3	-0.4	0.0	2.7
4	-0.4	0.0	-2.0
5	-0.4	0.0	12.3
6	-0.4	0.0	7.5
7	-0.4	0.0	2.7
8	-0.4	0.0	-2.0
9	-0.4	0.0	12.3
16	-0.4	0.0	7.5
23	-0.4	0.0	2.7
30	-0.4	0.0	-2.0
39	-0.4	0.0	35.0
50	0.3	-0.0	68.8
61	0.3	-0.0	64.7
70	0.3	-0.0	60.6
79	0.3	-0.0	56.5

-21.8

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	-1017.0	2688.0	-18417.0	-0.0	-0.0

86

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-563.0	1628.0	-10584.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	7.0
2	-0.2	0.0	5.3
3	-0.2	0.0	3.5
4	-0.2	0.0	1.8
5	-0.2	0.0	7.0
6	-0.2	0.0	5.3
7	-0.2	0.0	3.5
8	-0.2	0.0	1.8
9	-0.2	0.0	7.0
16	-0.2	0.0	5.3
23	-0.2	0.0	3.5
30	-0.2	0.0	1.8
39	-0.2	0.0	21.8
50	0.1	-0.0	38.7
61	0.1	-0.0	37.2
70	0.1	-0.0	35.7
79	0.1	-0.0	34.2

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4 0.0 -563.0 1628.0 -10584.0 -0.0 -0.0

LOAD CONDITION 5

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-563.0	2208.0	-3341.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	0.0	55.0
2	-0.9	0.0	29.5
3	-0.8	0.0	4.1
4	-0.8	0.0	-21.4
5	-0.9	0.0	55.0
6	-0.9	0.0	29.5
7	-0.8	0.0	4.1
8	-0.8	0.0	-21.4
9	-0.9	0.0	55.0
16	-0.9	0.0	29.5
23	-0.8	0.0	4.1
30	-0.8	0.0	-21.4
39	-0.7	0.0	17.9
50	0.7	-0.0	75.3
61	0.7	-0.0	53.5
70	0.7	-0.0	31.7
79	0.8	-0.0	9.9

5 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

5 0.0 -563.0 2208.0 -3341.0 0.0 -0.0

LOAD CONDITION 6

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	266.0	1219.0	-5250.0	0.	0.

87

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.8	0.0	-26.1
2	0.8	0.0	2.4
3	0.7	0.0	30.9
4	0.7	0.0	59.3
5	0.8	0.0	-26.1
6	0.8	0.0	2.4
7	0.7	0.0	30.9
8	0.7	0.0	59.3
9	0.8	0.0	-26.1
16	0.8	0.0	2.4
23	0.7	0.0	30.9
30	0.7	0.0	59.3
39	0.7	0.0	31.3
50	-0.7	-0.0	-27.8
61	-0.8	-0.0	-3.4
70	-0.8	-0.0	21.0
79	-0.9	-0.0	45.4

6 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

6	0.0	266.0	1219.0	-5250.0	-0.0	0.0

88

LOAD CONDITION 7

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	266.0	1481.0	940.0	0.	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.3	0.0	11.2
2	0.3	0.0	19.9
3	0.2	0.0	28.6
4	0.2	0.0	37.3
5	0.3	0.0	11.2
6	0.3	0.0	19.9
7	0.2	0.0	28.6
8	0.2	0.0	37.3
9	0.3	0.0	11.2
16	0.3	0.0	19.9
23	0.2	0.0	28.6
30	0.2	0.0	37.3
39	0.3	0.0	25.0
50	-0.3	-0.0	-0.0
61	-0.3	-0.0	7.4
70	-0.3	-0.0	14.9
79	-0.3	-0.0	22.3

7 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

7	0.0	266.0	1481.0	940.0	0.0	-0.0

0 14:12:47 03/14/80 *** END OF RUN ***

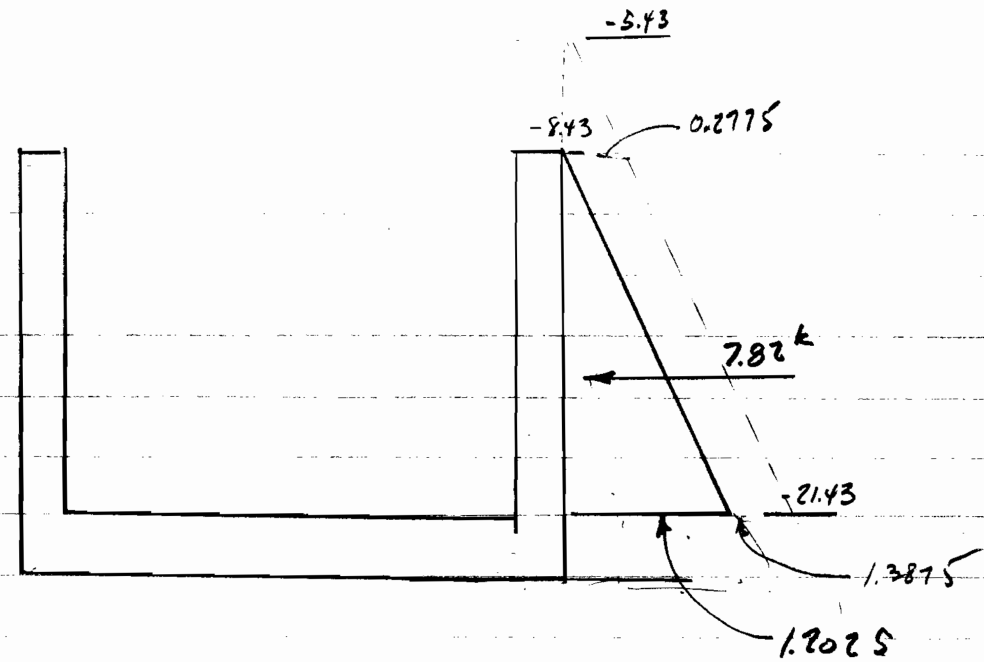
STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022,15022,16022,17022

0 PROG NO. 713-F3-A2-210 14:08:18 03/14/80 MOD 6B, FEB

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

11021	X	Y	Z	RX	RY	RZ
11022	-0.571E-08	-0.274E-02	0.102E-01	0.128E-04	-0.758E-13	-0.133E-11
12022	-0.999E-08	-0.107E-01	0.710E-02	-0.625E-04	0.637E-13	-0.228E-11
13022	-0.135E-07	-0.340E-01	0.141E-01	0.466E-04	0.113E-12	-0.311E-11
14022	-0.788E-08	-0.169E-01	0.844E-02	0.169E-04	0.480E-13	-0.181E-11
15022	-0.972E-08	-0.664E-01	0.133E-01	0.248E-03	0.239E-12	-0.227E-11
16022	-0.180E-08	0.657E-01	0.395E-02	-0.278E-03	-0.363E-12	-0.397E-12
17022	-0.270E-08	0.244E-01	0.686E-02	-0.847E-04	-0.194E-12	-0.628E-12



$0.6(50) = 30$

$30 + 62.5 = 92.5$

$0.0925(13) = 1.2025$

$F = \frac{1}{2}(1.2025)(13) = 7.82^{k}$

$M = \left(\frac{13}{3}\right)(7.82) = 33.9^{'k}$

Try @ -5.43

$0.0925(16) = 1.48$ $\qquad$ $0.0925(3) = 0.2775$

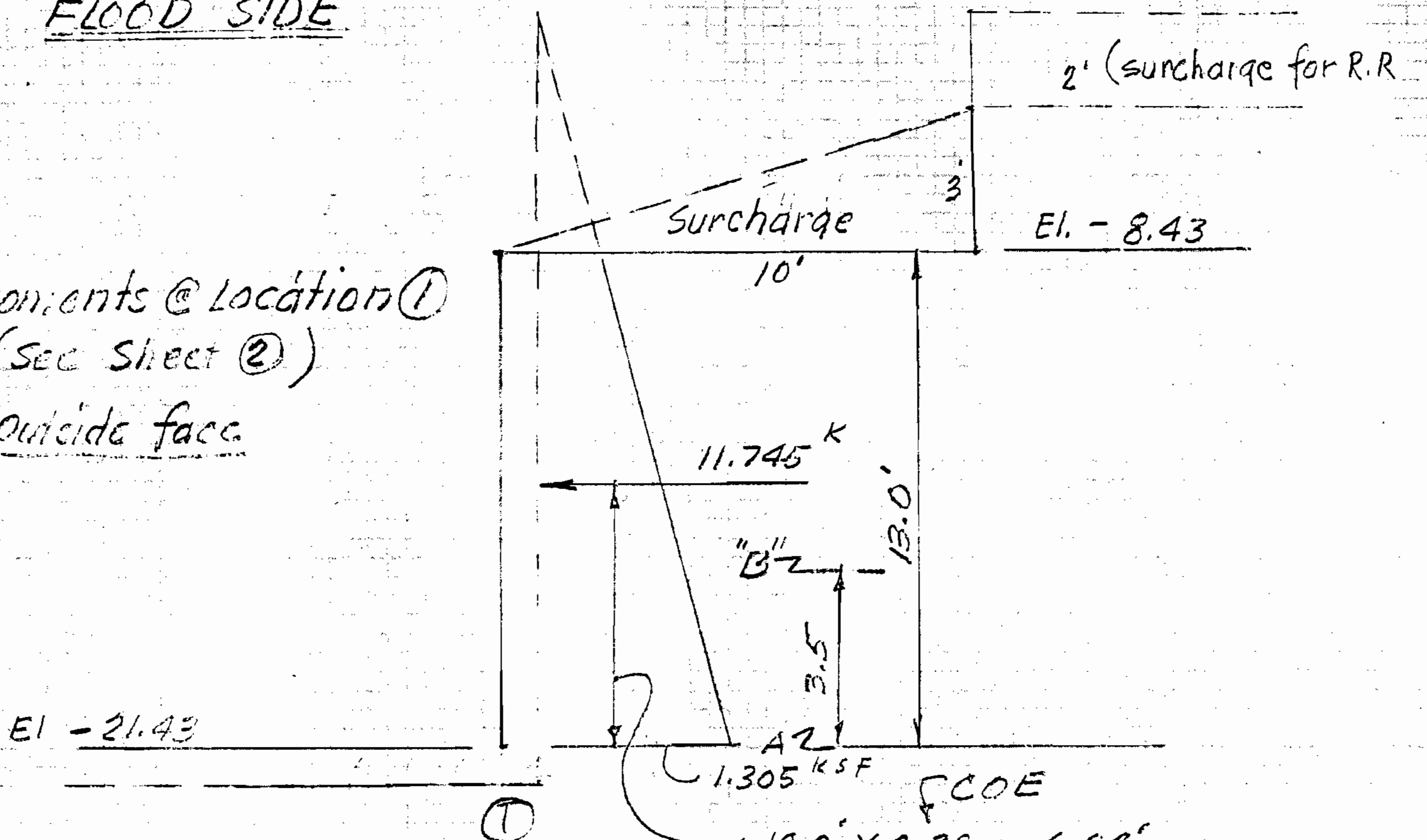
$F = \frac{1}{2}(1.48)(16) - \frac{1}{2}(0.2775)(3) = 11.8 - 0.4 = 11.4^{k}$

$M = \frac{1}{6}(1.48)(16)^2 - \frac{1}{6}(0.2775)(3)^2 = 63.1 - 0.4 = 62.7^{'k}$

CANAL ADJACENT TO SLUICE GATE (East of IHNC)

FLOOD SIDE

Moments @ Location ①
(See Sheet ②)
Outside face



$18.0' \times 0.38 = 6.84'$

$F_S: 20^{KSI}$ $f'_c: 4000$ $K: 221$ $f_c = 1400$

$w\ (10 + 62.5) = 72.5^{\#}$

$.0725^{K}(3+3+2) = 1.305^{KSF}$

$F = \frac{1.305^{KSF} \times 18}{2} = 11.745^{K}$

Moment @ A $= 6.84'(11.745^{K}) = 80.34'^{K}$

$d' req'd = \sqrt{\frac{80.34 \times 12}{0.221 \times 12}} = 19.06" <$ Use 24" Wall $d = 21.5"$

Reduce to 8@6 with Lap from bars @ "B"

$As = \frac{80.34}{1.44 \times d} = 2.59^{\square"} = \#10 @ 6$ $\quad v = \frac{11.745^{K}}{12 \times 21.5} = .046\ KSI < 0.070\ ksi$

Moment @ "B" 3.5' above "A"

$(6.84 - 3.5)(11.745^{K}) = 39.23'^{K}$

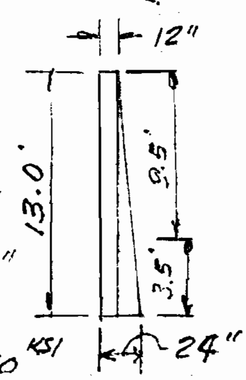
$d\ req'd = \sqrt{\frac{39.23 \times 12}{0.221 \times 12}} = 13.32$

Actual "d" @ B.

$\frac{12"}{13'} \times 9.5' + 12" - 3.5" = 17.25"$

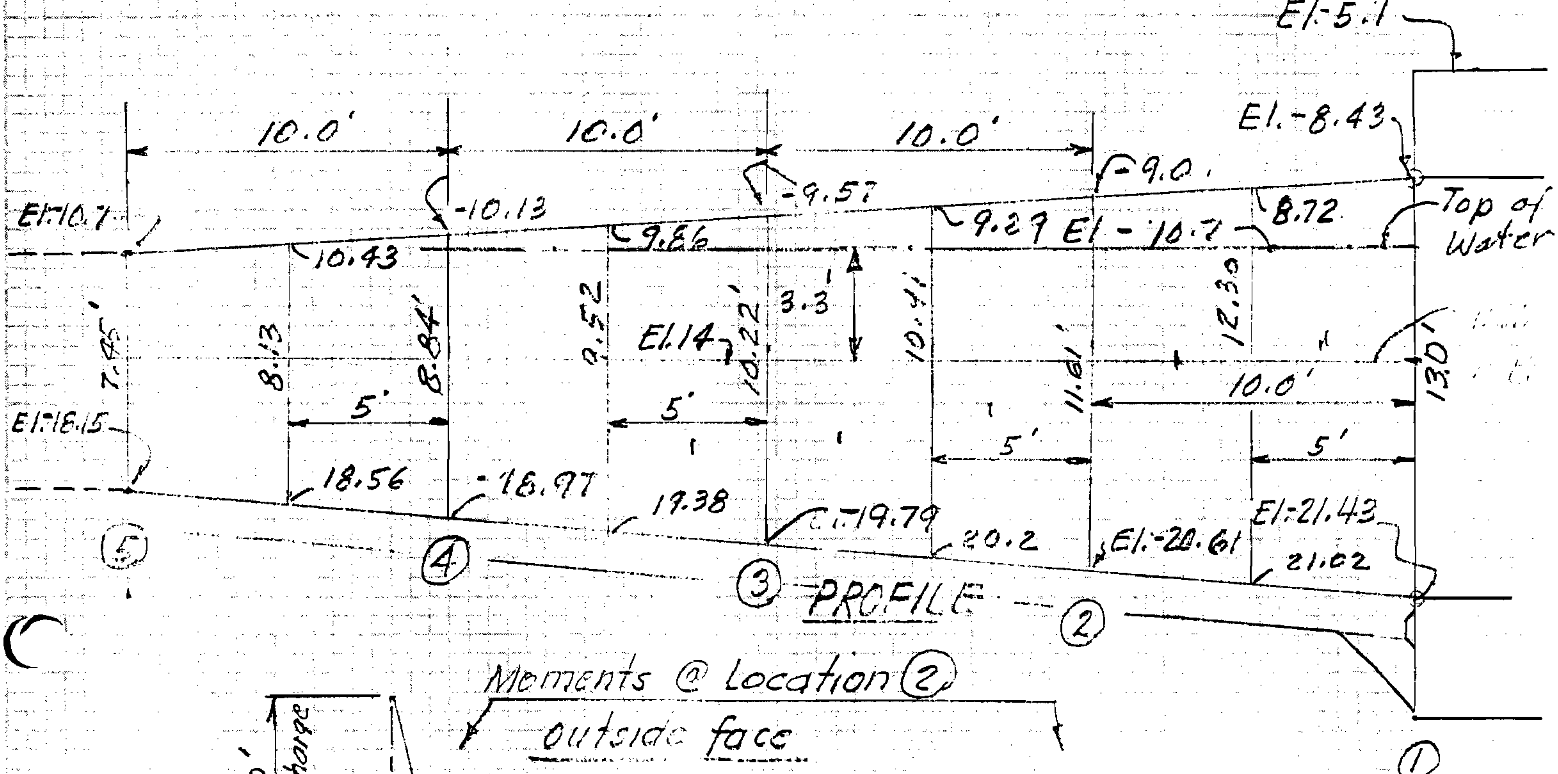
Say 17"

$As = \frac{39.23}{1.44 \times 17} = 1.6^{\square"}$ #8@6 $\quad v = \frac{11.785^{K}}{12 \times 17} = 0.058^{KSI} < 0.070^{KSI}$

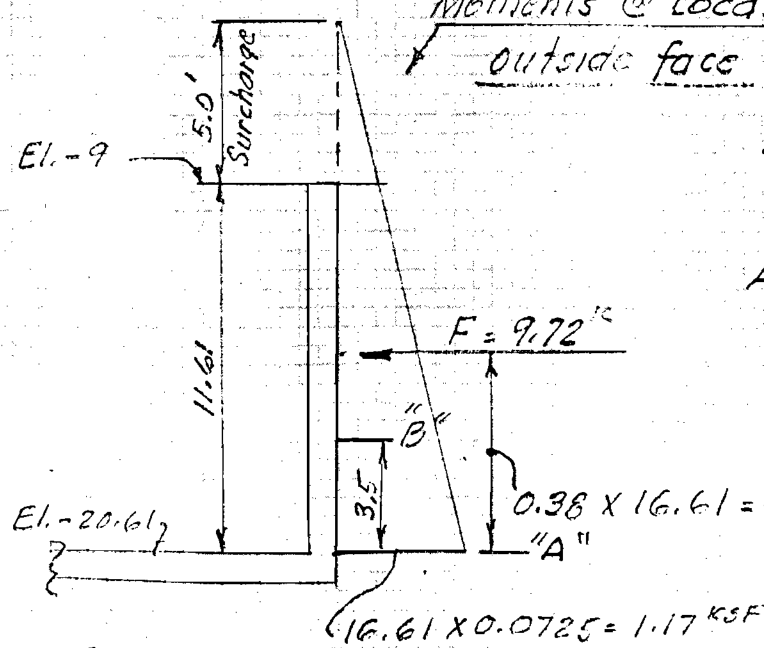


CANAL ADJACENT TO SLUICE GATE STRUCTURE (East of IHNC)

Flood Side



Moments @ Location (2) outside face



$F = \frac{1.17 \times 16.61}{2} = 9.72^{K}$

Moment @ "A" $= 6.31' \times 9.72^{K} = 61.33'^{K}$

$d' \text{req'd} = \sqrt{\frac{61.33 \times 12}{0.221 \times 12}} = 16.7''$

$\text{Actual "}d\text{"} = \frac{12''}{13'} \times 11.61' + 12 - 3.5 = 19.22$

$A_s = \frac{61.33'^{K}}{1.44 \times 19.22} = 2.22^{\square''} = 10@6$ Reduce to #9@6

$v = \frac{9.72^{K}}{12 \times 19.22} = 0.042^{KSI} < 0.070^{KSI}$

Moment @ B

$(6.31 - 3.5)\, 9.72^{K} = 27.31'^{K}$

$d' \text{req'd} = \sqrt{\frac{27.31 \times 12}{0.221 \times 12}} = 11.11''$

$\text{Actual } d = \frac{12''}{13'} \times (11.61 - 3.5) + 12'' - 3.5'' = 16''$

$A_s = \frac{27.31'^{K}}{1.44 \times 16} = 1.19^{\square''}$ #7@6 $= 1.2^{\square''}$

$v = \frac{9.72^{K}}{12 \times 16} = 0.051^{KSI} < 0.070^{KSI}$

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB No 575-79-E

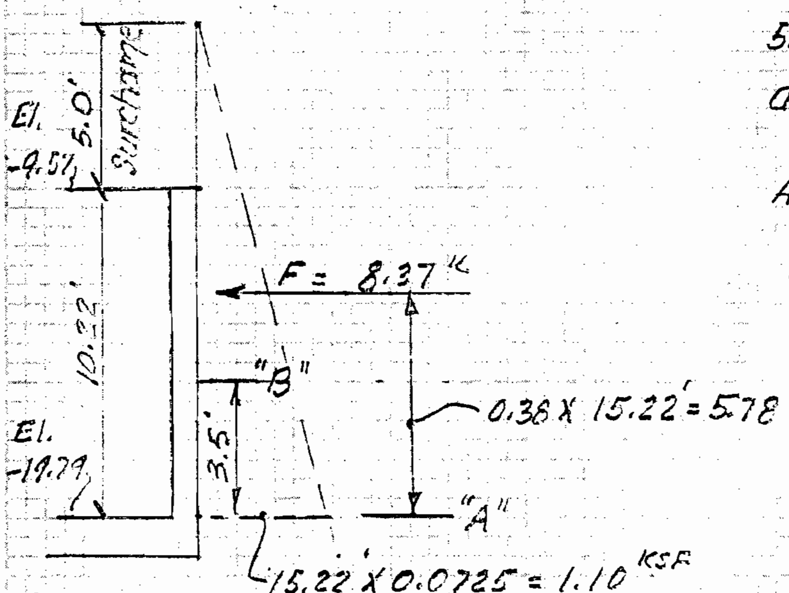
SHEET No 91 OF ____ BY LWC DATE 3-27-80 CHKD. BY ____ DATE ____

CANAL ADJACENT TO SLUICE GATE STRUCTURE (East of IHNC)

Flood Side:

Moments, Etc @ Location (3)

"Outside face"



$F = \dfrac{15.22 \times 1.10}{2} = 8.37^K$

Moment @ "A"

$5.78' \times 8.37^K = 48.38'^K$

$d\ req'd = \sqrt{\dfrac{48.38 \times 12}{0.221 \times 12}} = 14.8''$

Actual "d" $= \dfrac{12''}{13'} \times 10.22 + 12'' - 3.5'' = 17.9''$

$A_s = \dfrac{48.38'^K}{1.44 \times 17.9} = 1.88\,\square''$ #9@6 Reduce to #7@6

$v = \dfrac{8.37^K}{12 \times 17.9} = 0.04 < 0.07$

Moment @ "B"

$(5.78' - 3.5')(8.37^K) = 19.08'^K$

$d = \sqrt{\dfrac{19.08 \times 12}{(0.221)(12)}} = 9.29''$

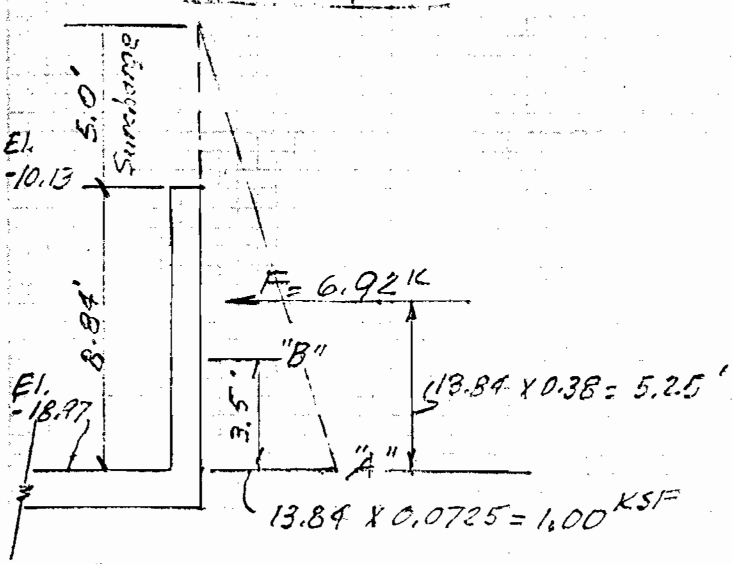
Actual "d" $= \dfrac{12''}{13'} \times (10.22' - 3.5') + 12'' - 3.5'' = 14.7''$

$A_s = \dfrac{19.08^K}{1.44 \times 14.7} = 0.90\,\square'' = $ #7@6

$v = \dfrac{8.37^K}{12 \times 14.7} = 0.047 < 0.070$

Moments Etc @ Location (4)

"Outside face"



$F = \dfrac{13.84 \times 1.0^{KSF}}{2} = 6.92^K$

$v = \dfrac{6.92^K}{12 \times 13.4} = 0.043^{KSI} < 0.07^{KSI}$

Moment @ "A"

$5.25' \times 6.92^K = 36.33'^K$

$d\ req'd = \sqrt{\dfrac{36.33 \times 12}{0.221 \times 12}} = 12.82''$

Actual "d" $= \dfrac{12''}{13'} \times 8.84' + 12'' - 3.5'' = 16.66''$

$A_s = \dfrac{36.33'^K}{1.44 \times 16.66} = 1.51\,\square''$ #8@6 Reduce to #6@6

$v = \dfrac{6.92^K}{12 \times 16.66} = 0.035^{KSI} < 0.070^{KSI}$

Moment @ "B"

$(5.25 - 3.5)(6.92^K) = 12.11'^K$

$d\ req'd = \sqrt{\dfrac{12.11 \times 12}{0.221 \times 12}} = 7.4$

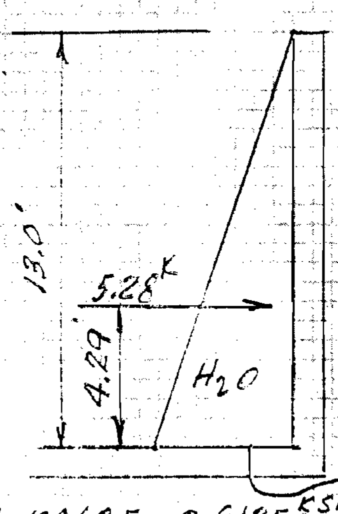
Actual "d" $= \dfrac{12''}{13'} \times (8.84 - 3.5) + 12'' - 3.5'' = 13.4''$

$A_s = \dfrac{12.11}{1.44 \times 13.4} = 0.63\,\square''$ #6@6

CANAL ADJACENT TO SLUICE GATE STRUCTURE (East of IHNC)

Flood Side

Inside Face @ Location ①



$13 \times 0.33 = 4.29'$

"A"

$13 \times 0.0625 = 0.8125^{KSF}$

$F = \dfrac{13 \times 0.8125}{2} = 5.28^K$

Moment @ A = $4.29' \times 5.28^K = 22.65'^K$

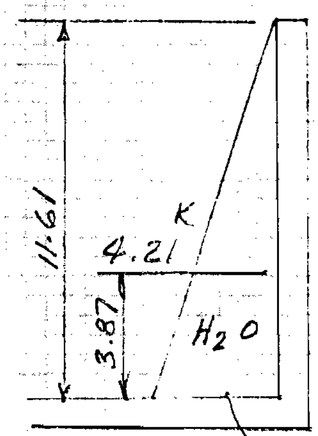
"d" from page = 21.5"

$As = \dfrac{22.65}{1.44 \times 21.5} = 0.73^{\square''}$ #8@12

"d" ok by inspection see Page 1

v " " " " "

Inside face @ Location ②



$11.61 \times 0.33 = 3.87'$

"A"

$11.61 \times 0.0625 = 0.7256^{KSF}$

$F = \dfrac{11.61 \times 0.7256}{2} = 4.21^K$

Moment @ "A" = $3.87' \times 4.21^K = 16.29'^K$

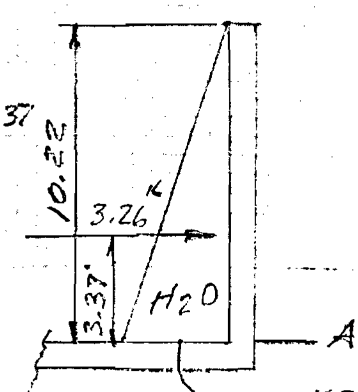
d from page 2 = 19.21"

$As = \dfrac{16.29'^K}{1.44 \times 19.21} = 0.59^{\square''}$ #7@12

"d" ok by inspection see page 2

Inside face @ Location ③

$10.22 \times 0.33 = 3.37'$



$10.22 \times 0.0625 = 0.6388^{KSF}$

$F = \dfrac{10.22' \times 0.6388^{KSF}}{2} = 3.26^K$

Mom. @ A = $3.37' \times 3.26^K = 11.0'^K$

d from page 3 = 17.9"

$As = \dfrac{11'^K}{1.44 \times 17.9''} = 0.43^{\square''}$

Use #6@12 from ③ to ⑤

Use #6@12 Horizontal bars ea. face

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB No 575-79-E

SHEET No 93 OF ____ BY LWC DATE 4-1-80 CHKD. BY ____ DATE ____

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Flood Side)

Pile Analysis Flood Side

At "A" 12.65

W 18.80 x 10 x 0.15 = 28.2

Floor Slab = 2.67 x 5 x 30.67 x 0.15 = 61.42

H_2O – 3.3 x 26.50 x 5 x 0.0625 = 31.21

121.62 k

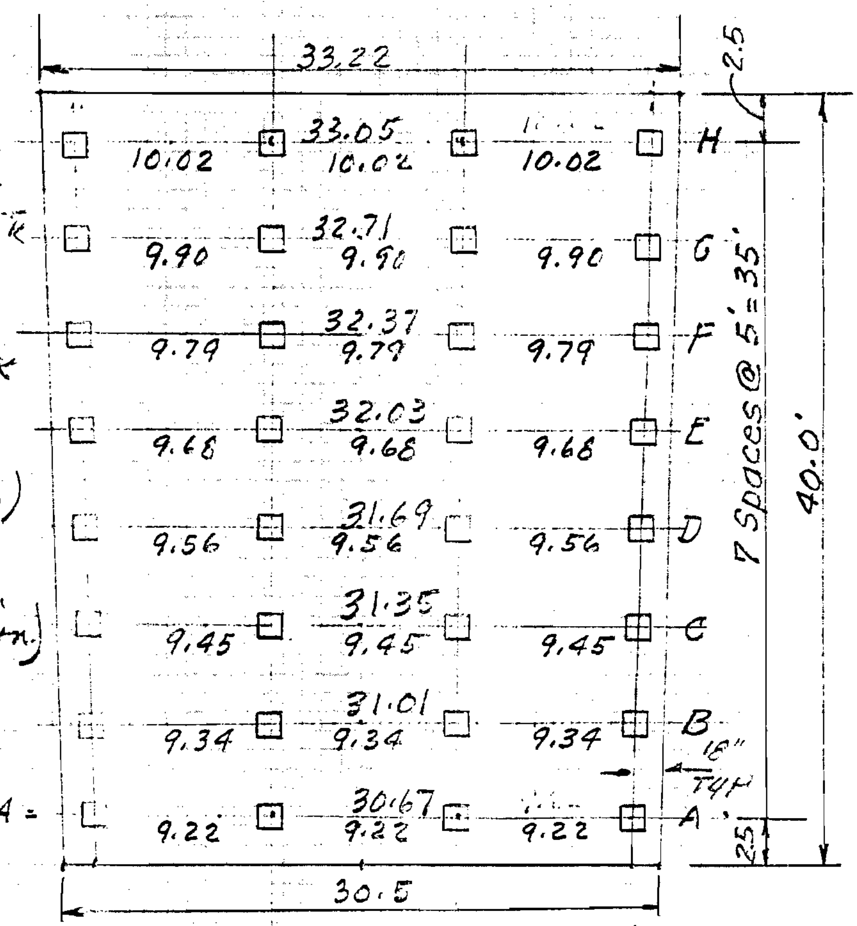
Uplift

= (12.65 + 2.67)(0.0625)(5)(30.67)

= 146.83 k

$\frac{120.83}{4}$ = 30.4 k (Compression)

$\frac{146.83 - (28.2 + 61.42)}{4}$ = 14.3 k (Tension)



@H: 7.79' high

= 10.12'

10 x 10.12 x 0.15 = 15.18 k

Fl. Slab 33.05 x 5 x 2.67 x 0.15 = 66.18

H_2O = 3.3 x 30 x 5 x 0.0625 = 30.94

112.3

Compression

$\frac{112.3}{4}$ = 28.08 k

Uplift

= (33.05 x 5)(7.79 + 2.67)(0.0625) = 108.03

$\frac{108.03 - (66.18 + 15.18)}{4}$ = 6.67 k Tension

	Compression	Tension
H =	28.08	6.67
G =	28.41	7.76
F	28.74	8.85
E	29.07	9.94
D	29.41	11.03
C	29.74	12.12
B	30.07	13.21
A	30.4	14.3

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Flood Side)

Line (A) Floor Slab

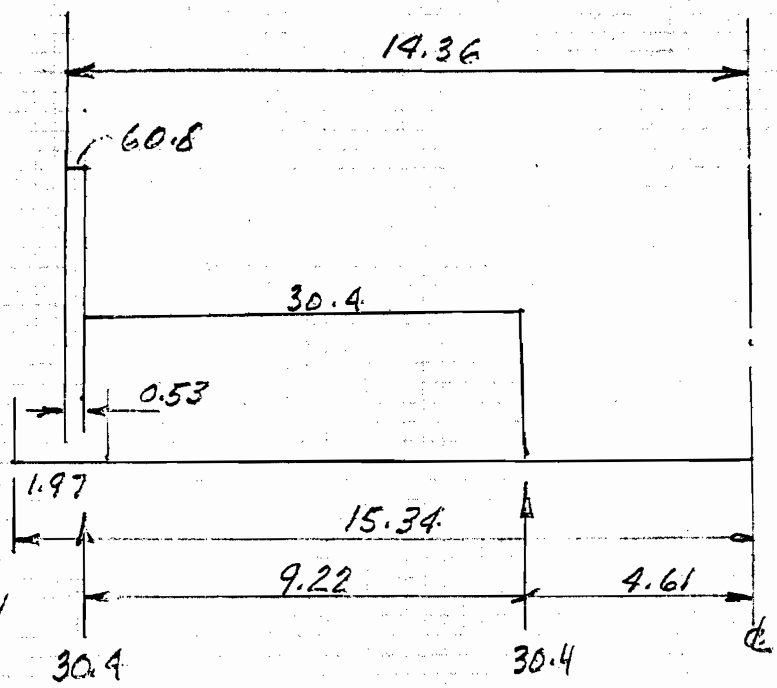
Shear from Conc, H_2O

$\frac{120.82}{2} = {}^{+}60.41$

Shear from Uplift

$\frac{146.83}{2} = -73.42$

-13.01^k



V per ft of Width

$\frac{13.01^k + 60.8^k}{5} = 17.36^k$

$v = \frac{17.36}{12 \times 29} = 0.050^{ksi} < 0.07^{ksi}$

Mom @ ℄ =

$60.8 \times 0.53 = 32.22$

$30.4 \times 9.22 = 280.29'^k$

$\frac{13.01 \times 14.36}{2} = 93.41'^k$

$405.92'^k$

$\frac{405.92'^k}{5} = 81.18'^k$ per 1' width

d' required $= \sqrt{\frac{81.18 \times 12}{0.221 \times 12}} = 19.17'' < 29''$

Top face $A_s = \frac{81.18'^k}{1.44 \times 29} = 1.94^{\square''}$ #9@6"

Bottom face - Moment @ ℄ $= \frac{{}^{+}60.41 \times 14.36}{2} = 433.74'^k$

$\frac{433.74}{5} = 86.75'^k$ $A_s = \frac{86.75}{1.44 \times 29} = 2.07^{\square''}$ #9@6

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JOB ______ SHEET NO 95 OF ______
ITEM ______ BY LWC DATE 4-1-86
JOB NO ______ CHKD. BY ______ DATE ______

CANAL ADJACENT TO SLUICE GATE STRUCTURE (East of IHNC) Flood Side

Line ④ Floor Slab

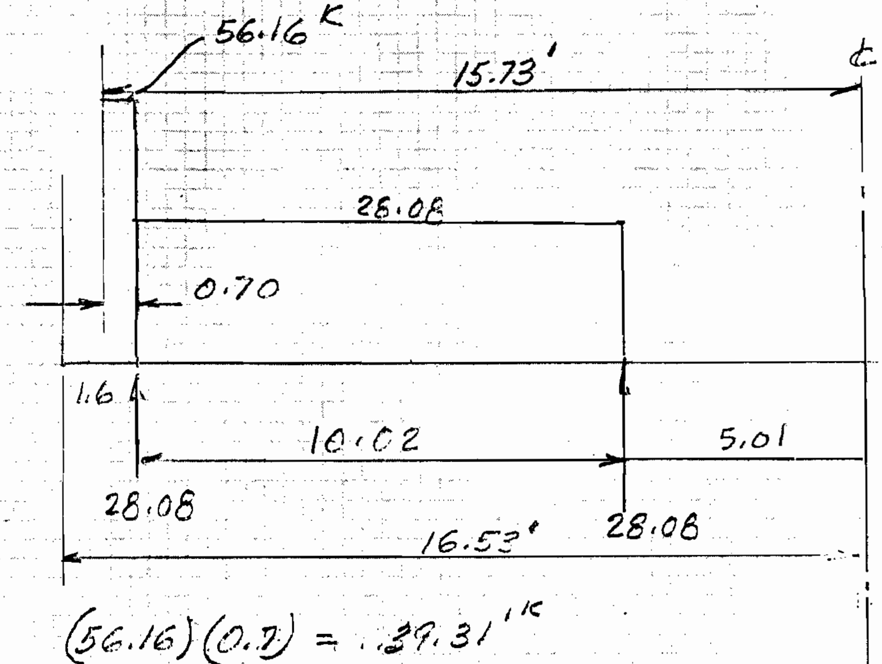
Shear from Conc. H20

$\frac{112.3}{2} = +56.15^k$

Shear from Uplift

$\frac{108.03}{2} = -54.02$

$+2.13$



V per ft of Width

$\frac{-56.16 + 2.13}{5} = 10.81^k$

$v = \frac{10.81}{12 \times 29} = 0.031^{ksi} < 0.07^{ksi}$

$(56.16)(0.7) = 39.31'^k$

$10.02 \times 28.08 = 281.36$

$-\frac{2.13 \times 15.73}{2} = -16.75$

$303.92'^k$

$\frac{303.92}{5} = 60.78'^k$

Top face $As = \frac{60.78}{1.44 \times 29} = 1.45^{\square''} = \#8@6$

Bott. Face $= \frac{56.15 \times 15.73}{2} \times \frac{1}{5} = 88.83'^k$

$As = \frac{88.83}{1.44 \times 29} = 2.12 = 9@6''$

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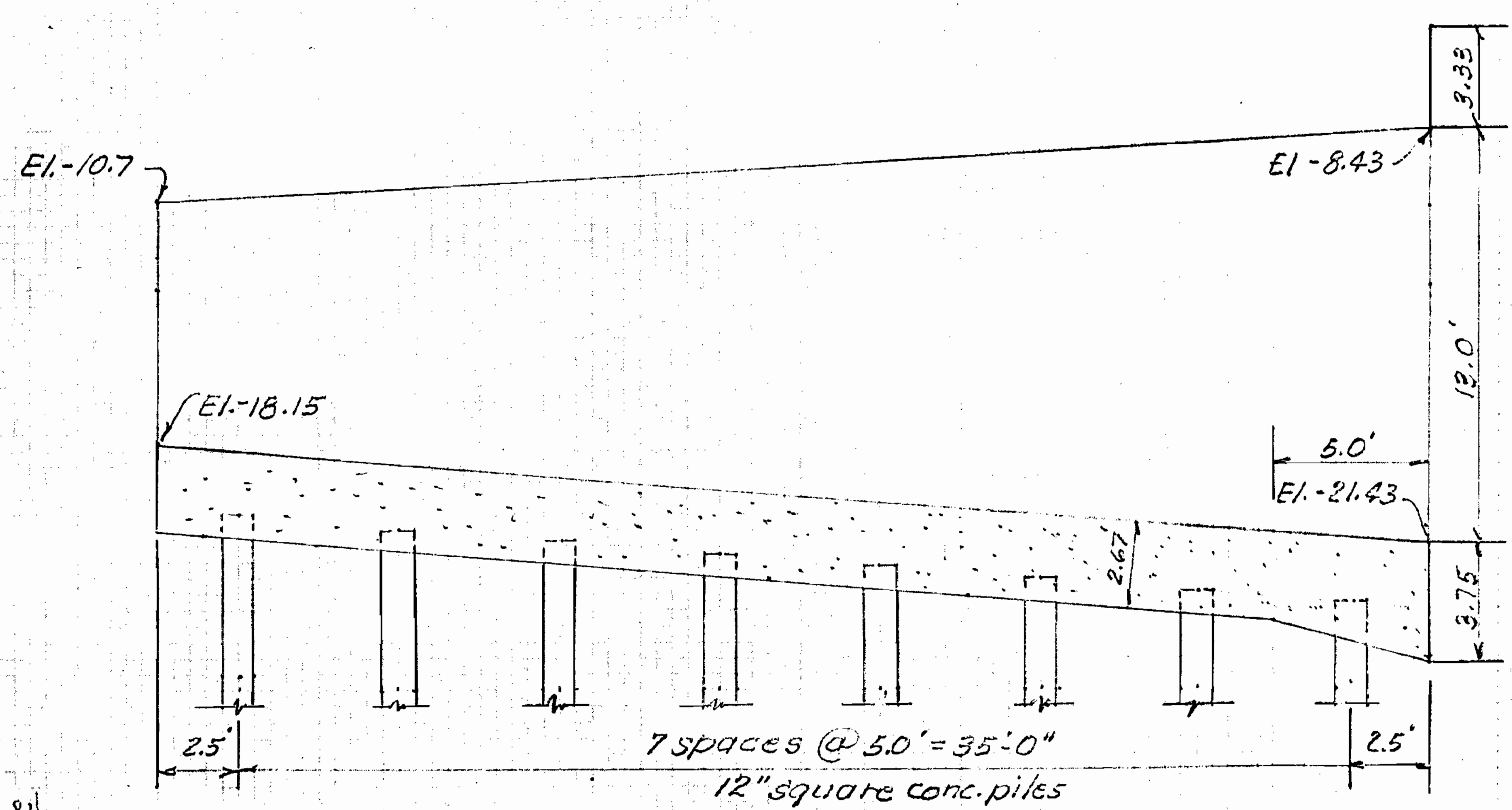
JOB ______ ITEM ______ JOB Nº 575-79-E

SHEET Nº 96 OF ______
BY LWC DATE 3-29-80
CHKD. BY ______ DATE ______

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.)

Flood Side



Longit. Section along ℄ Structure

n-y ASSOCIATES, INC.
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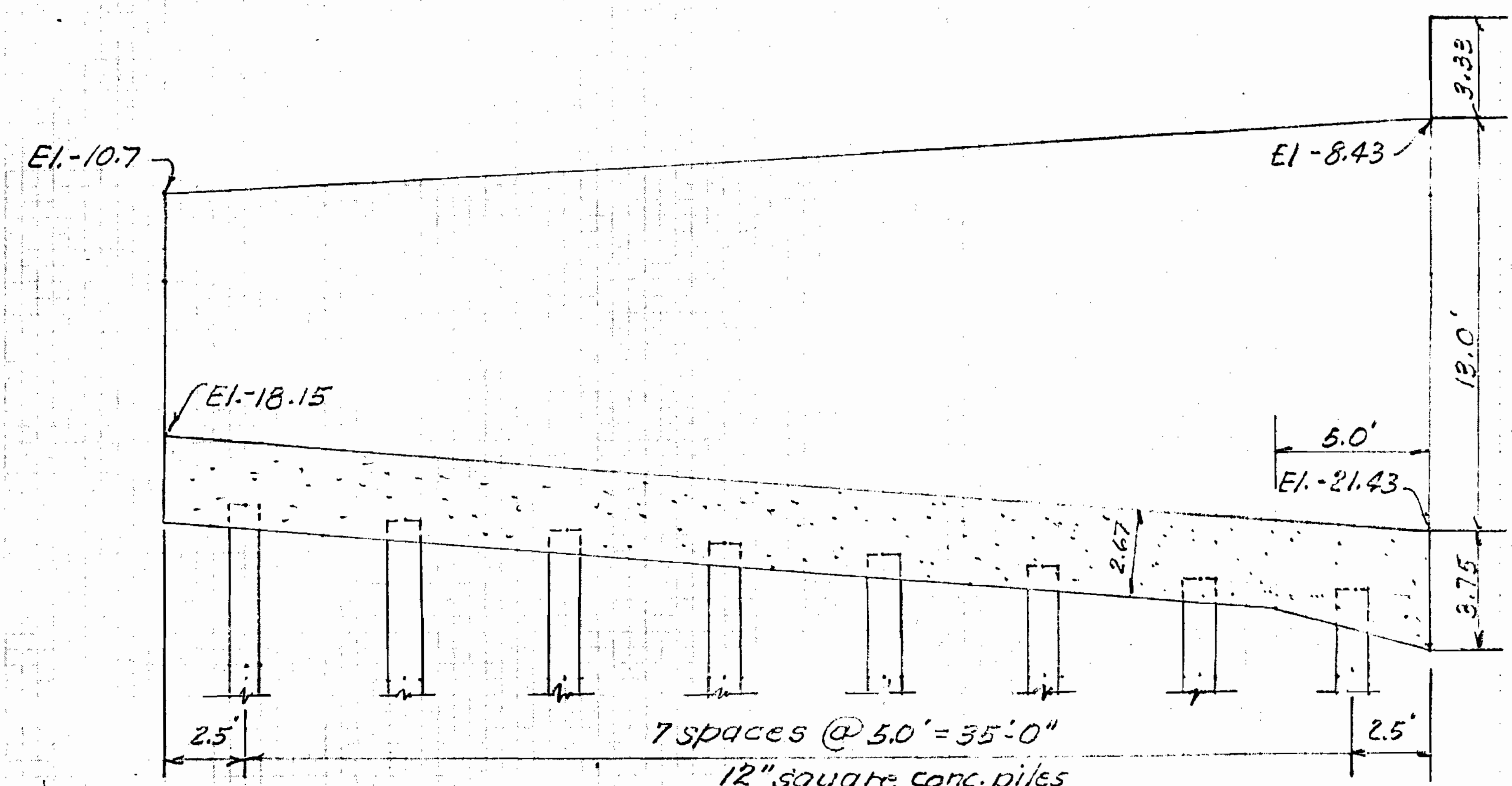
JOB
ITEM
JOB No 575-79-E

SHEET No 96 OF
BY LWC DATE 3-29-80
CHKD. BY DATE

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.)

Flood Side

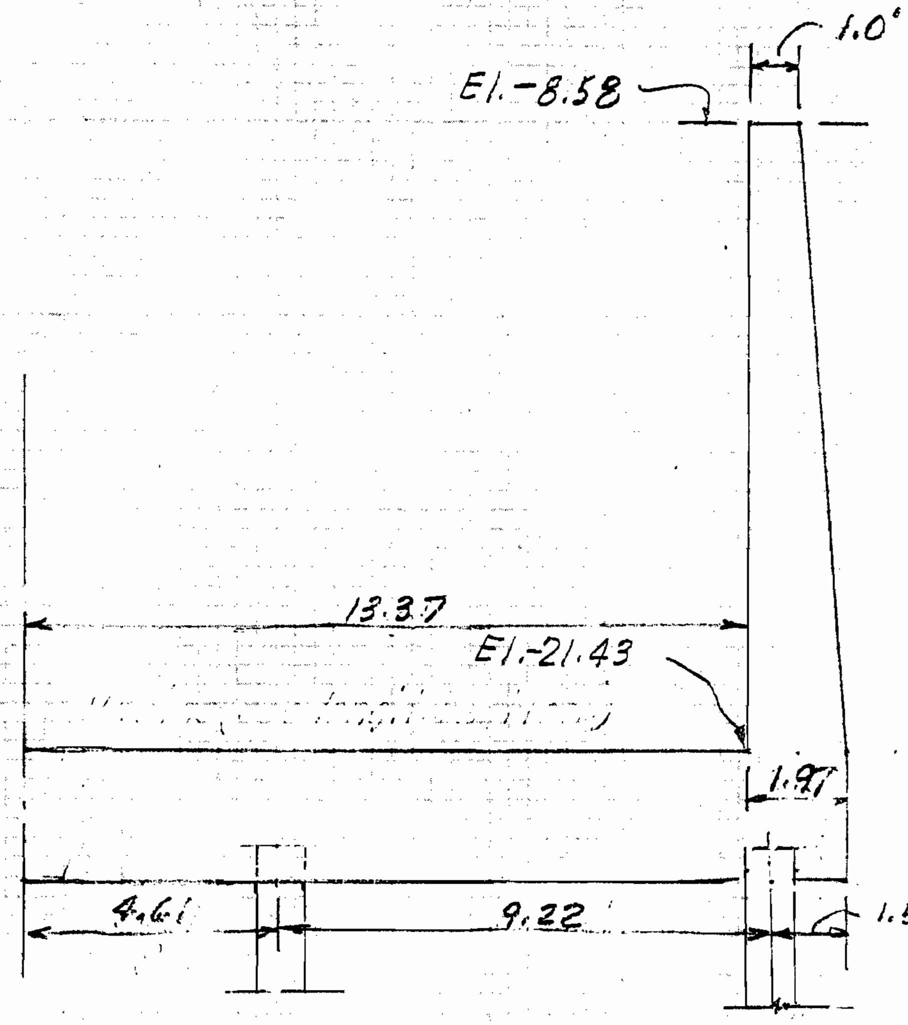


Longit. Section along ℄ Structure

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.)

Flood Side

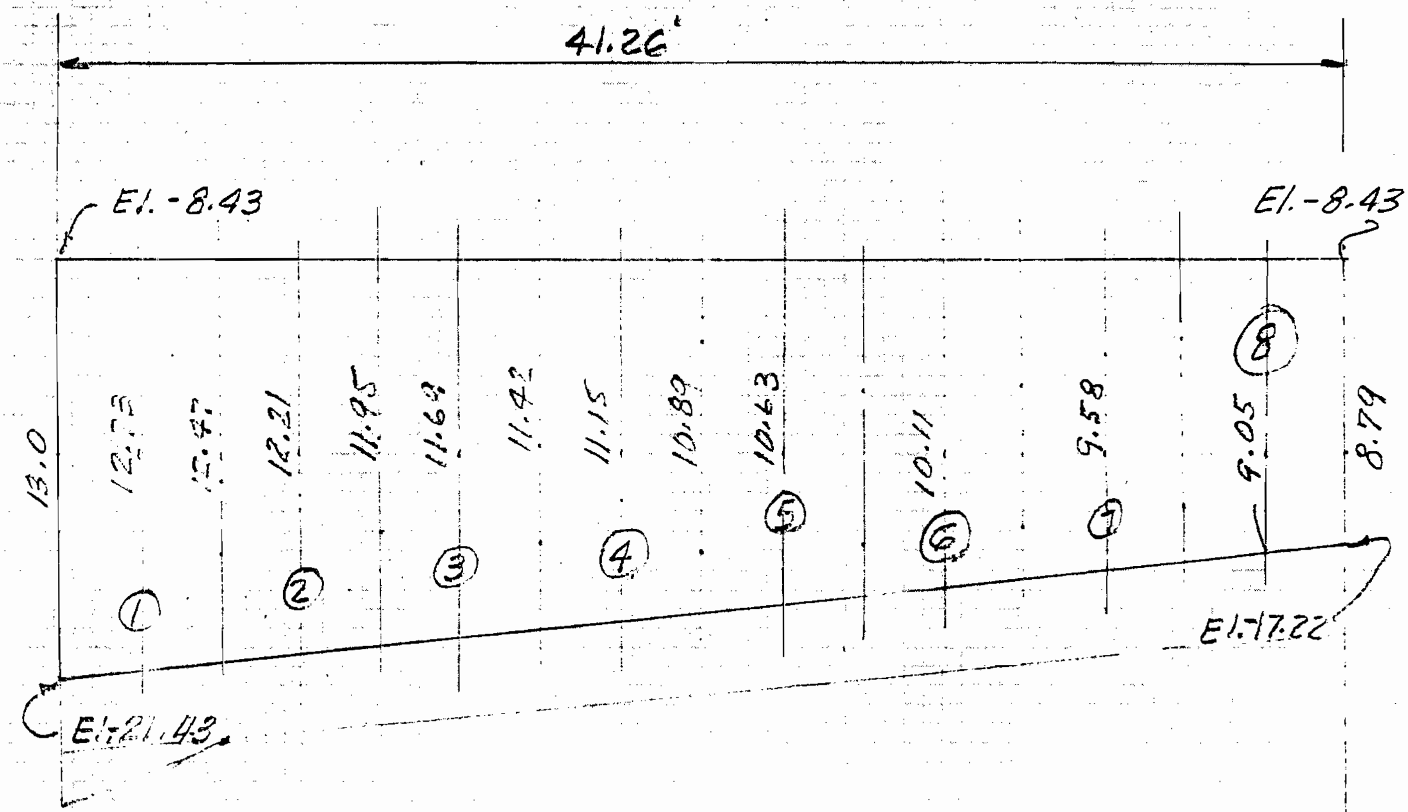
Section @ A



Section @ End of Canal nearest sluice gate.

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.)

Protected Side



Area of Floor Slab (Bottom) = 40 X 15.25 X 2 = 1220 □'

$\frac{24.42-15.25}{2}$ X 40 X 2 = 366.8 □'

1586.8 □' Vertical for Uplift

Try 2.67 Slab

Area Conc. Slab = $\frac{1586.8 □'}{Cos}$ = 1595.57 □' 1595.57 X 2.67 X 0.15 K/FT = 639 K

21.43 - 17.22 = 4.21'

40' 4.21'

Tan = $\frac{4.21}{40}$ = 0.10525

Cos = .99450682

$\frac{40}{Cos}$ = 40.22'

Walls = @ Struct. = 1.0 / 13 / 4.0 = 13 + $\left(\frac{1 \times 13}{2}\right)$ = 19.5 □'

@ End = 1' + $\left(\frac{1.0}{13} \times 8.79\right)$ = 1.67 8.79 / 1.67 = 8.79 + $\left(\frac{0.67 \times 8.79}{2}\right)$ = 11.73

Length Wall $\left[(24.42-15.25)^2 + (40)^2\right]^{\frac{1}{2}} \left(\frac{1}{0.9945}\right)$ = 41.26'

$\frac{19.5□ + 11.73□'}{2}$ X 2 X 41.26' X 0.15 K/FT³ = 193.28 K

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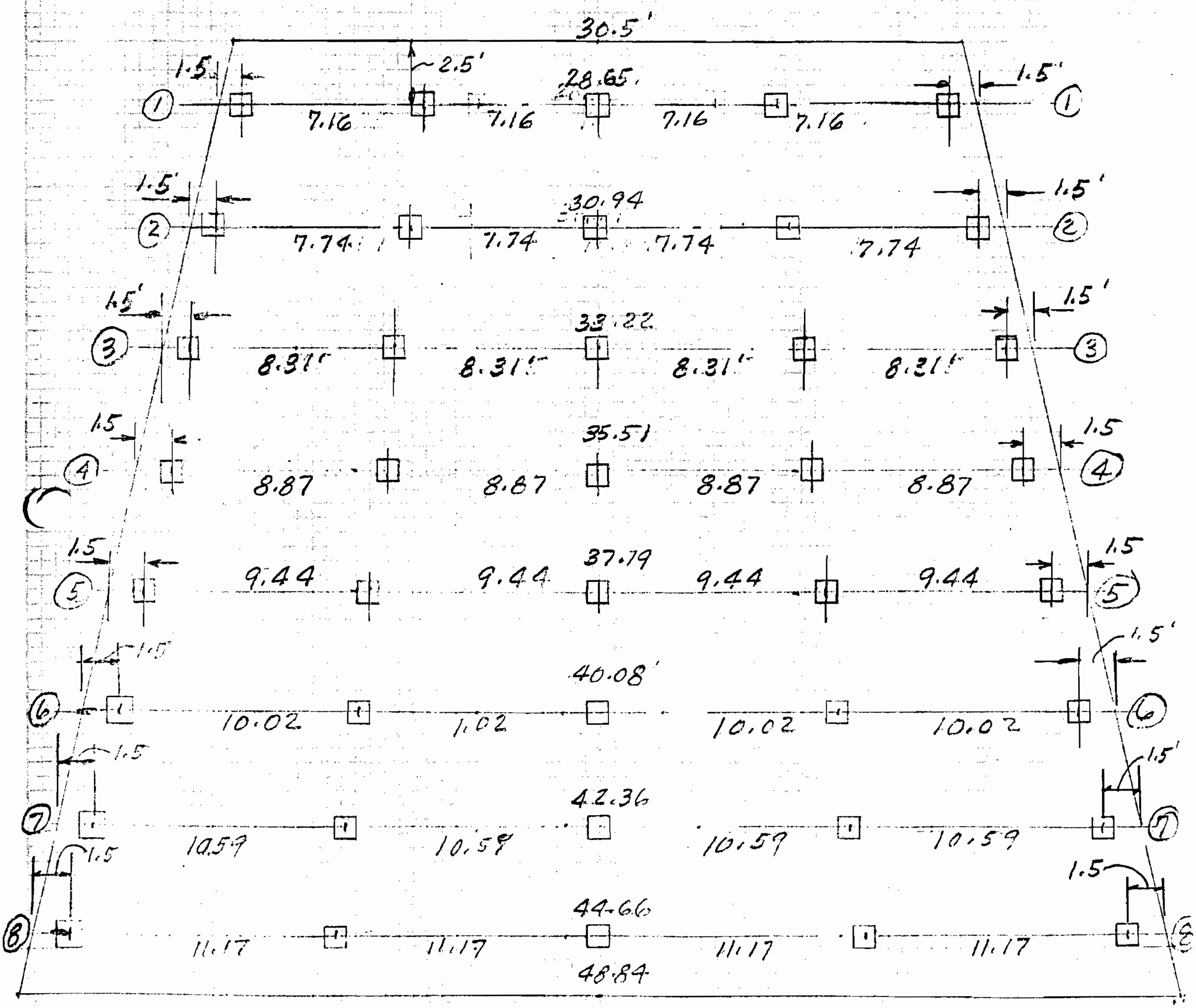
JOB
ITEM
JOB NO 575-79-E

SHEET NO 100 OF
BY LWC DATE 3-31-80
CHKD. BY DATE

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected Side)



CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected side)

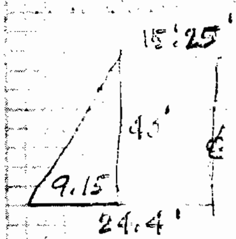
Line ① Wt for 5' of Canal $\frac{5.0}{\cos \angle}$ = 5.13

Wt Walls $\frac{19.5^{\square'} + 18.46^{\square'}}{2}$ (10.26')(0.15) = 29.21^k

Wt Slab = 2.67 X 5.03 X 31.65 X 0.15 = 63.76^k

92.97^K

$\frac{92.97}{5}$ = 18.6^k per pile (Comp.)



5 X Tan = 1.143 X 2 = 2.29

Profile: 30.5 + 2.29 = 32.79; 32.79 + 30.50 = 63.29

Slope of Floor

$\frac{63.29}{2}$ = 31.65

Tan = $\frac{9.15}{4.0}$ = .22875

$\frac{21.43-17.22}{4.0}$ = 0.10525

Cos = .9748

Cos = 0.9945

Uplift

$\frac{5}{.9748}$ = 5.13

$\frac{5}{0.9945}$ = 5.03'

(2.67 + 12.73) X 0.0625 = 0.9625 KSF

Plan

5 X 31.65 X 0.9625 = 152.32^K

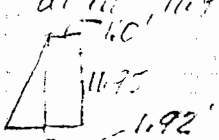
$\frac{152.32^k - 92.97}{5}$ = 11.87^k (Tension)

Line ②

Walls

at ht = 12.47 Area = 18.46$^{\square'}$

at ht 11.95 Area = 17.45$^{\square'}$



Wt Wall = $\frac{18.46 + 17.45}{2}$ X 10.26 X 0.15 = 27.63

WT Slab = 170.72$^{\square'}$ X 2.67 X 0.15 = 68.37^K

96.0^K

$\frac{96.0}{5}$ = 19.2^k (compress.)

11.95 X $\frac{1}{13}$ + 1.0' = 1.92'

Area = 11.95 + $\frac{0.92 \times 11.95}{2}$ = 17.45

Uplift

(2.67 + 12.21) X 0.0625 = 0.93 KSF

33.94' X 5 X 0.93 = 157.82^K

Area of Floor Slab

31.65 + 2.29 = 33.94'

33.94 X 5.03 = 170.72$^{\square'}$

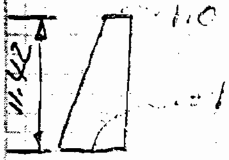
$\frac{157.82 - 96}{5}$ = 12.36^k (Tension)

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected side)

Line (3)

Wt Walls. @ ht = 11.95 Area = 17.45 □'

@ Ht. 11.42 Area = 16.44 □'



$1 + \frac{1}{13} \times 11.42 = 1.88'$

$\text{Area} = 11.42 + \frac{11.42 \times 0.88}{2} = 16.44$ □'

$\ell = \frac{9.15}{40} \times 12.5 \times 2 + 30.5 = 36.22'$

$\text{Wt Wall} = \frac{17.45 + 16.44}{2} (10.26)(0.15) = 26.08^K$

$\text{Slab} = 36.22 \times 5.03 \times 2.67 \times 0.15 = 72.97$

99.05^K

Uplift

$(2.67 + 11.69)\ 0.0625 = 0.8975$

$36.22 \times 5.0 \times 0.8975 = 162.53^K$

$\frac{99.05}{5} = 19.81^K$ (Compress.)

$\left(\frac{162.53 - 99.05}{5}\right) = 12.7^K$ (Tension

Line (4)

$\text{Wt.} \left(\frac{16.44 + 15.45}{2}\right)(10.26)(0.15) = 24.53^K$

$\ell = \frac{9.15}{40} \times 17.5' \times 2 + 30.5 = 38.51$

$\text{Slab} = 38.51 \times 2.67 \times 0.15 \times 5.03 = 77.58^K$

102.11^K

Uplift

$(2.67 + 11.15)(0.0625)(38.51)(5) = 166.31$

$\frac{102.11}{5} = 20.42$

$\frac{166.31 - 102.11}{5} = 12.88^K$ (Tension)

Line (5)

Conc Wt. = 105.17

$\text{Uplift} = (10.63 + 2.67)(0.0625)\ 40.79)(5) = 169.53$

$\ell = \frac{9.15}{40} \times 22.5 \times 2 + 30.5 = 40.79$

$\frac{105.17}{5} = 21.03$ Compression

$\frac{169.53 - 105.17}{5} = 12.872$ Tension

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CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected Side)

Line (6)

Conc. Wt = 108.06^K

$l = \frac{9.15}{40} \times 27.5 \times 2 + 30.5 = 43.08'$

$43.08' \times 5 \times (10.11 + 2.67)(0.0625)\ 172.05$

$\frac{108.06}{5} = 21.61^K$ (Compression)

$\frac{172.05 - 108.06}{5} = 12.79^K$ Tension

(7)

Conc Wt = 110.95^K

$l = \frac{9.15}{40} \times 32.5 \times 2 + 30.5 = 45.36'$

Uplift $(9.58 + 2.67)(0.0625)(5)(45.36) = 173.64^K$

$\frac{110.95^K}{5} = 22.19^K$ (Compression)

$\frac{(173.64 - 110.95)}{5} = 12.64^K$ tension

(8)

Con. Wt = 113.84^K

$l = \frac{9.15}{40} \times 37.5 \times 2 \times 30.5 = 47.66$

Uplift $(9.05 + 2.67)(0.0625)(5)\ 47.66 = 174.55^K$

$\frac{113.84^K}{5} = 22.8^K$ Compression

$\frac{174.55 - 113.84}{5} = 12.142^K$ Tension

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JOB ______ ITEM ______ JOB NO 575-79-E

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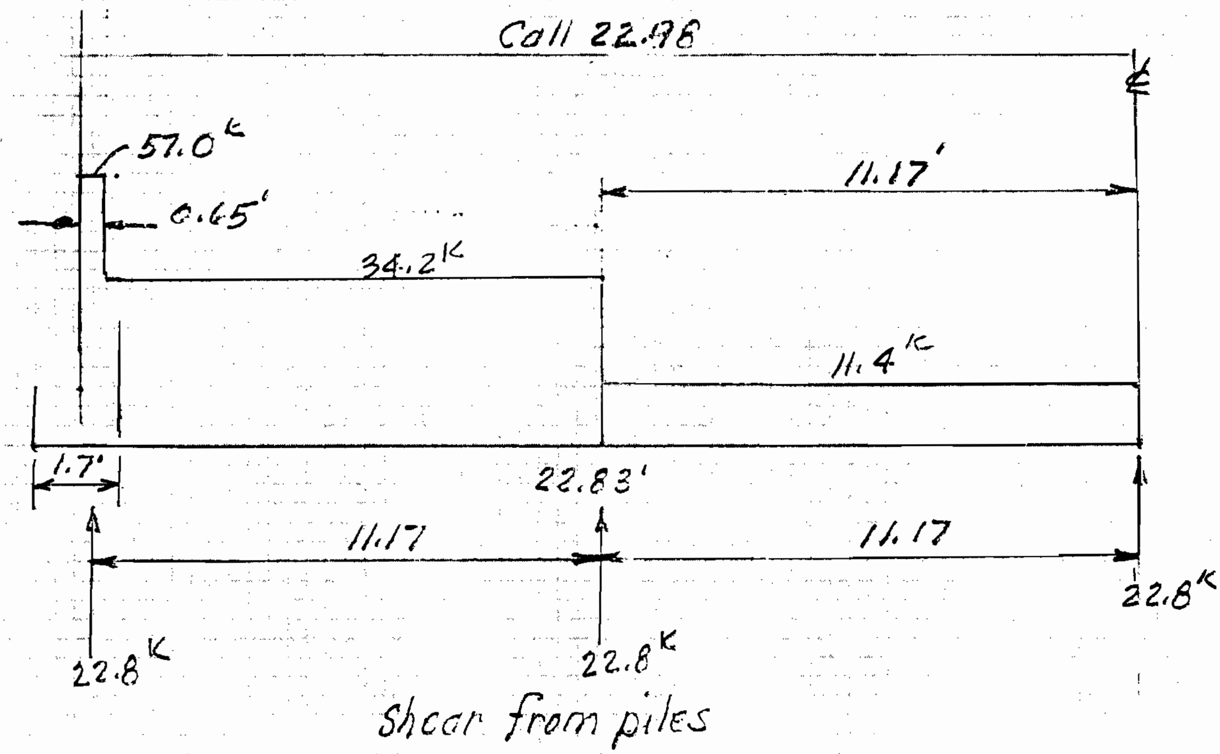
CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected side)

Line 6 - Floor Slab

22.98
22.33
.65



$$\text{Total Shear} - 57^{K} - 30.36^{K} = -87.36$$

$$\frac{-87.36^{K}}{5} = -17.47^{K} \quad v = \frac{17.47^{K}}{12 \times 29} = 0.50^{KSI} < .070^{KSI}$$

Shear from Conc $= \dfrac{113.84^{K}}{45.96} = 2.477^{K}/_{F}$ $\quad V = +56.92^{K}$

Page 16

Shear from Uplift $= \dfrac{174.55}{45.96} = 3.798^{K}/_{F}$ $\quad V = -87.28^{K}$

-30.36^{K}

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM ______ JOB NO 575-79-E

SHEET NO 105 OF ______ BY LHC DATE 4-1-80 CHKD. BY ______ DATE ______

CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected Side

Line 8 - Floor Slab

Max Moment @ ℄ Structure

$57^K \times 0.65' = 37.05'^K$

$34.2^K \times 11.17 = 382.01$

$11.4^K \times 11.17 = 127.34$

$\frac{30.36^K \times 22.98}{2} = 348.84$

$\Sigma\ 895.24'^K$

$\frac{895.24'^K}{5} = 179.05'^K \quad d' reqd. = \sqrt{\frac{179.05 \times 12}{0.221 \times 12}} = 28.46 < 29$

Top face $As = \frac{179.05'^K}{1.44 \times 29} = 4.28^{\square''} = 3\ \#11$ bars

$Bond = \frac{17,470^{\#}}{(13.29)(0.88)(29)} = 51.50\,psi < 153\,psi$

Bott. face $+\frac{56.92^K \times 22.98}{2} \times \frac{1}{5} = 130.8'^K$

$As = \frac{130.8}{1.44 \times 29} = 3.13^{\square''} = \#11 @ 6$

Line ① Floor Slab.

Shear from Conc.

$= \frac{92.97}{2} = +46.49^K$

Shear from Uplift

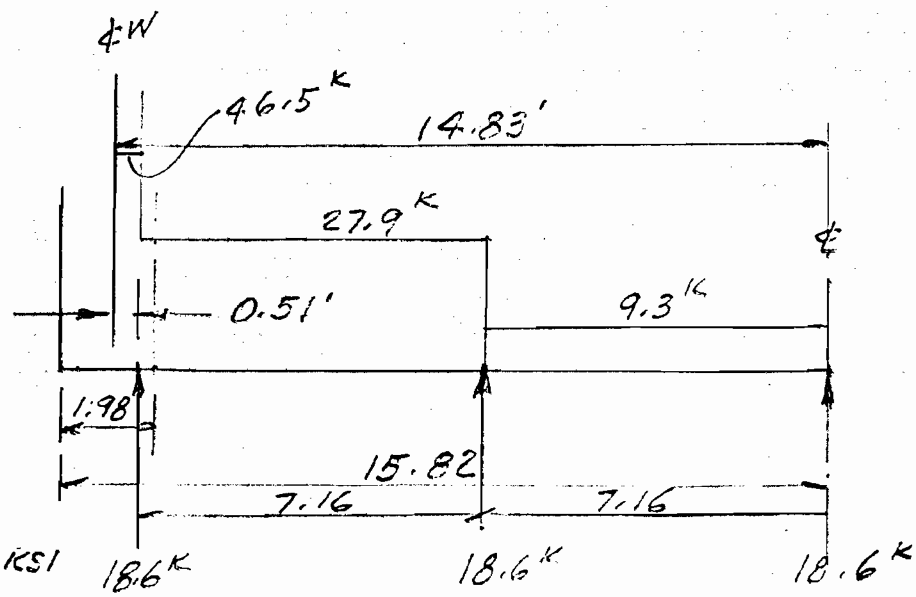
$= \frac{152.32}{2} = -76.16^K$

-29.67^K

V per ft wide Strip

$\frac{46.5^K + 29.67^K}{5} = 15.23^K$

$v = \frac{15.23}{12 \times 29} = 0.044^{KSI} < 70^{KSI}$



CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected Side)

Line (1) Floor Slab

Moment @ ℄

$46.5^{k} \times 0.51 = 23.72^{'k}$
$27.9 \times 7.16 = 199.76$
$9.3 \times 7.16 = 66.59$
$\frac{29.67}{2} \times 14.83 = 220.00$
$\Sigma\ 516.07^{'k}$

$\frac{516.07}{5} = 102.01^{'k}$ $d\ reqd = \sqrt{\frac{102.01(12)}{0.221\ (12)}} = 21.48'' < 29''$

Top face $A_s = \frac{102.01^{'k}}{1.44 \times 29} = 2.44^{\square''} = \#10 @ 6$

Bond ok by inspection

Bottom face $= +\frac{46.49 \times 14.83}{2} \times \frac{1}{5} = 68.94^{'k}$

$A_s = \frac{68.94^{'k}}{1.44 \times 29} = 1.65^{\square''} = \#8 @ 6 = 1.58$

Line (E) Floor Slab

Shear from Conc.

$\frac{105.12^{k}}{2} = +52.56^{k}$

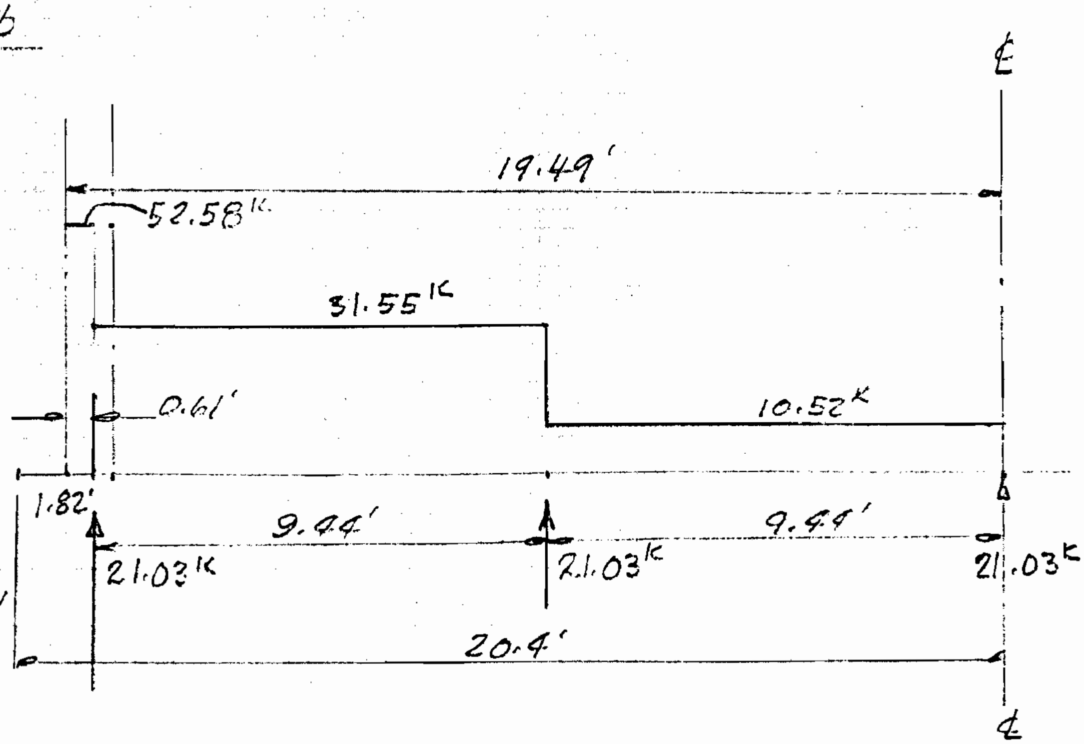
Shear from Uplift

$\frac{169.53^{k}}{2} = -84.77$
-32.19

V per ft of Width

$\frac{52.58 + 32.19}{5} = 16.96^{k}$

$v = \frac{16.96''}{12 \times 29} = 0.049^{ksi} < 70^{ksi}$



CANAL ADJACENT TO SLUICE GATE STRUCTURE (EAST OF I.H.N.C.) (Protected Side)

Line ⑤ Floor Slab

Moment @ ℄

$52.58^k \times 0.61 = 32.07$
$31.55 \times 9.44 = 329.91$
$10.52 \times 9.44 = 99.31$
$\frac{32.19 \times 19.49}{2} = 313.69$
$774.98^{\prime k}$

$\frac{774.98^{\prime k}}{5} = 155^{\prime k}$ d req'd $= \sqrt{\frac{155 \times 12}{0.221 \times 12}} = 26.48'' < 29''$

Top face reinf.

$As = \frac{155^{\prime k}}{1.44 \times 29} = 3.71^{\square''} = 3\ \#10$ bond ok by inspection

Bottom face reinf.

$M = \frac{52.58 \times 19.49}{2} \times \frac{1}{5} = 102.47^{\prime k}$

$As = \frac{102.47}{1.44 \times 29} = 2.45^{\square''} = 10@6$ bond ok by inspection

FLORIDA AVENUE COMPLEX
LAKE PONTCHARTRAIN AND VICINITY
HURRICANE PROTECTION PLAN
DESIGN MEMORANDUM
CONTRACT NO. DACW29-79-C-0253

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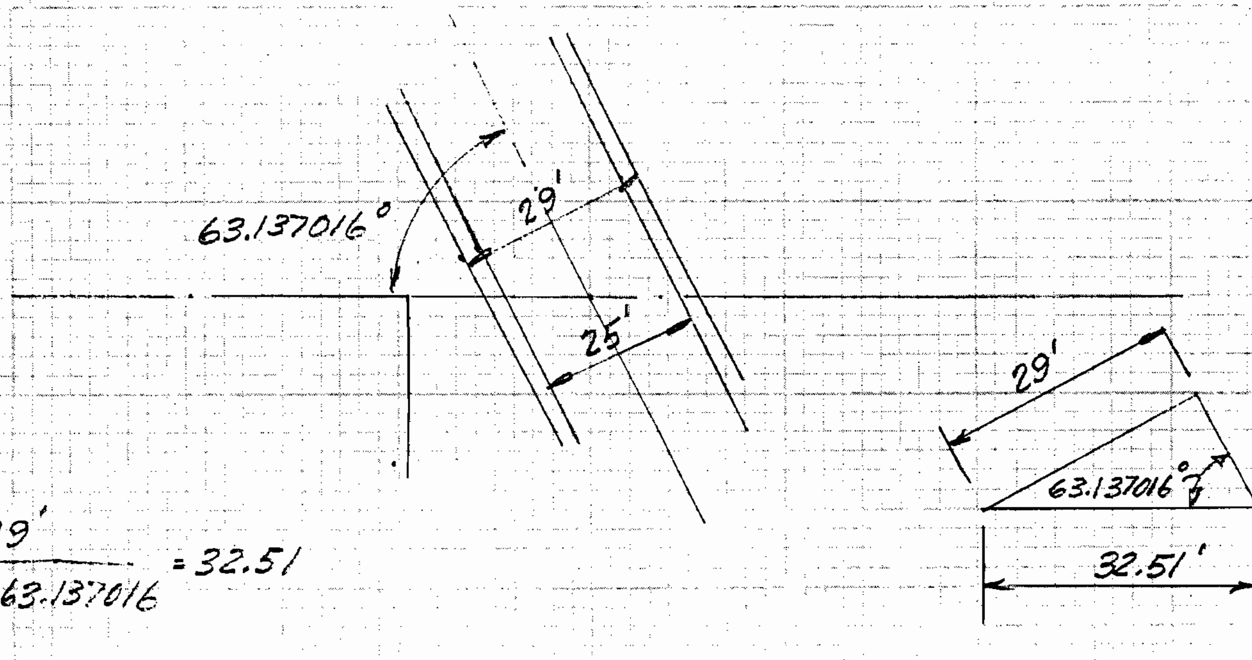
36' OVERHEAD ROLLER GATE AT HARBOUR ROAD EXTEN. (East Side)

Design Data: from Modeski and Masters Consulting Engrs. Co.

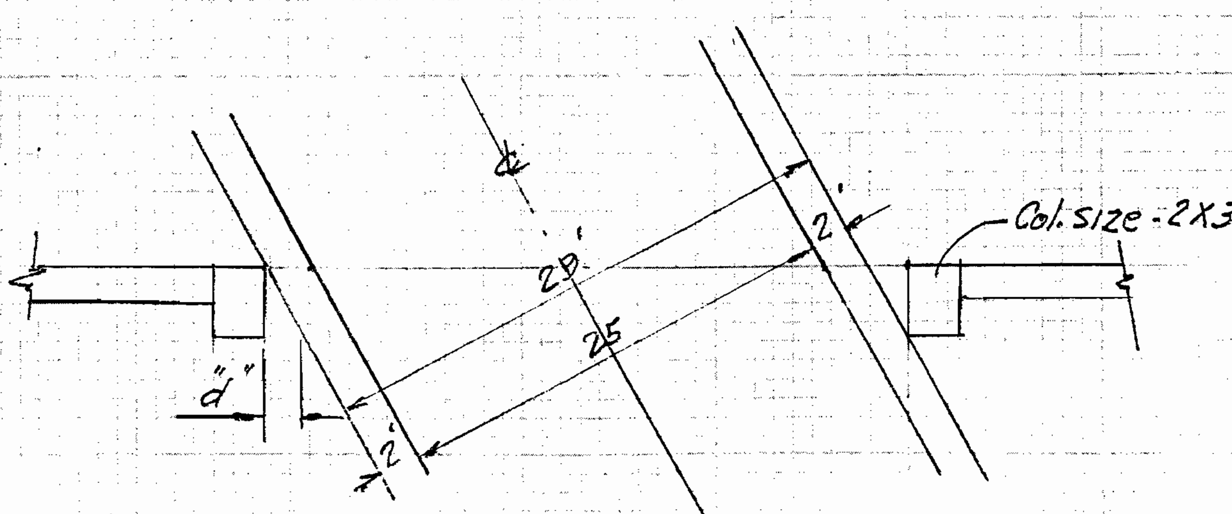
Edge to Edge conc. roadway = 25.0', plus 2' shoulder ea. side = 29.0'

Skew Angle = 63.137016° Sin = 0.89209

Tan = 1.97427



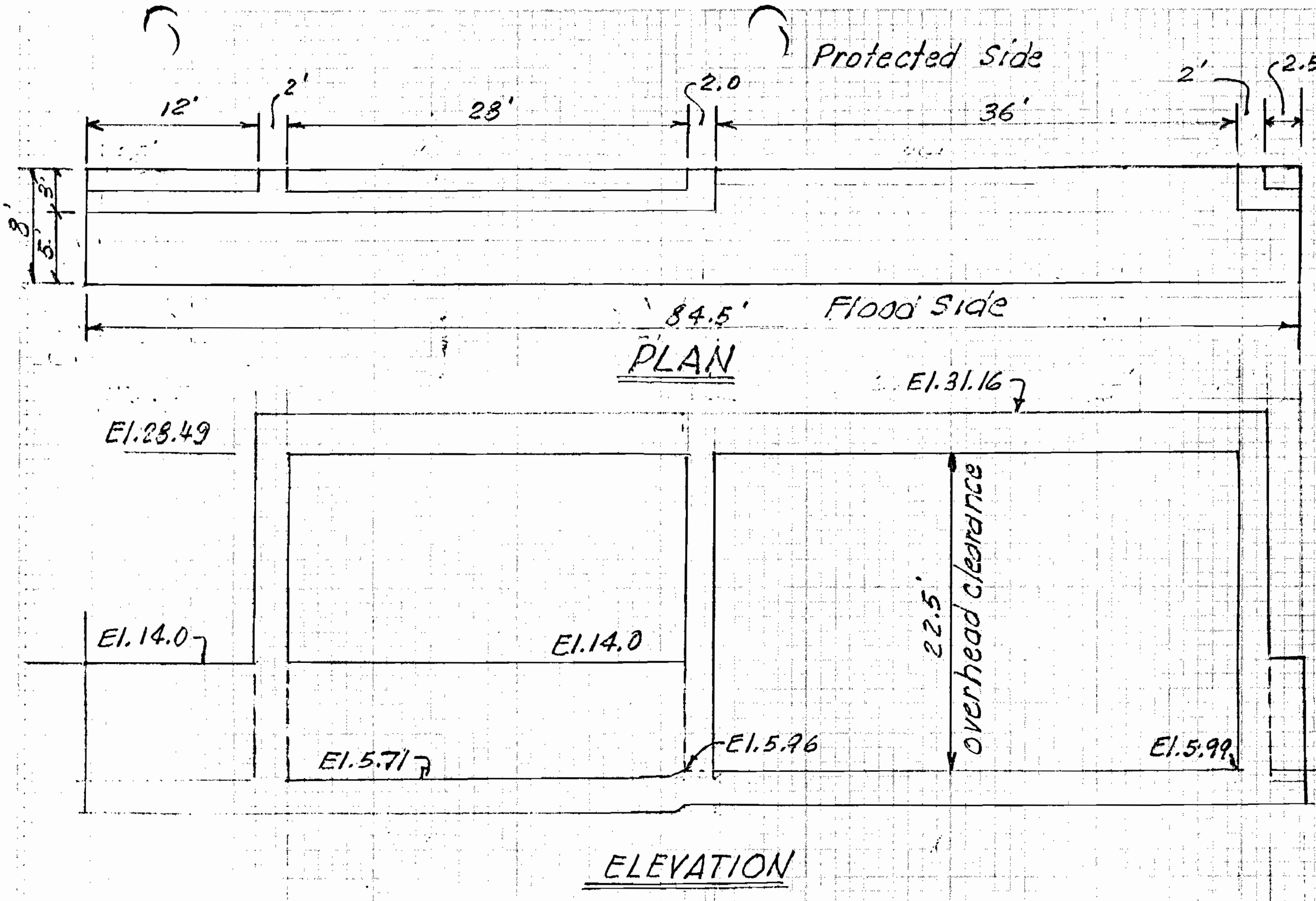
$$\frac{L = 29'}{\text{Sin } 63.137016} = 32.51$$



$$d = \frac{3}{\text{Tan } 63.137016°}$$

$d = 1.52$

$L + d = 34.03$ Use 36.0'



36' OVERHEAD ROLLER GATE AT HARBOUR ROAD EXTEN (East Side)

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB
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SHEET No 2 OF
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N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 3 OF ____
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36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

(Steel Gate Design) Water to El. 14.0, No dynamic H_2O Force, $F_b = 20{,}000$ psi

Reactions

$0.0625 \times 8.01 = 0.501^{KSF}$

$0.502 \times 8.01 \times 0.5 = 2.01^{K}$

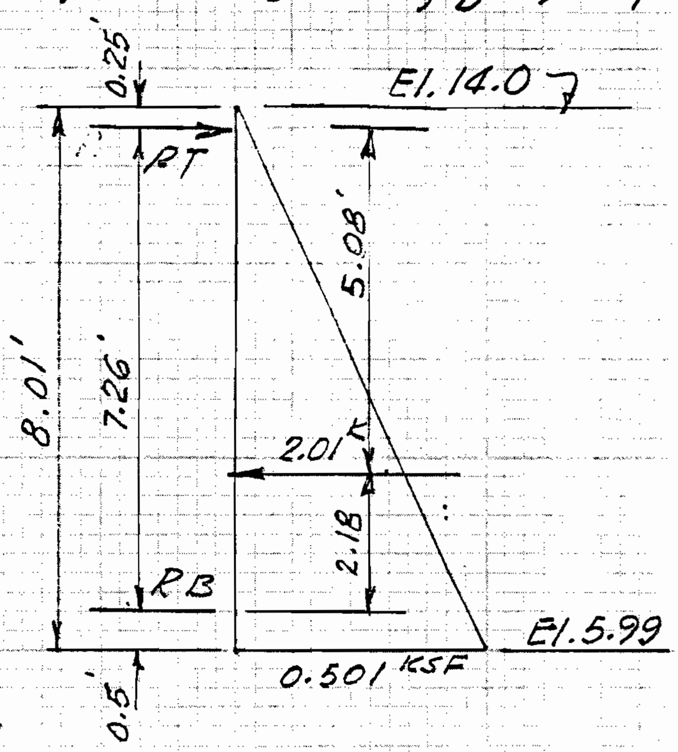
$\frac{8.05}{3} - 0.5 = 2.18'$

$(7.26 + 0.25) - 2.18 = 5.33'$

$RT = \frac{2.01 \times 2.18}{7.26} = 0.603^{K}$

$R_B = \frac{2.01 \times 5.08}{7.26} = 1.406^{K}$

2.01



Girder Design

Top Girder - Span $= 36\text{-}9\frac{1}{2}'' = 36.792'$

Load $= 0.603 \frac{K}{Lin}$ ft.

Moment $= (0.603)(36.792)^2(0.125) = 102.03^{'K}$

$S_{req'd} = \frac{102.03 \times 12{,}000}{20{,}000} = 61.22 \text{ in}^3$

Try W21X44, $S = 81.6''^3$ $I = 843$

$\Delta = \frac{5(603^{\#} \times 36.792)(36.792 \times 12)^3}{384(29 \times 10^6)(843)} = 1.017'' < 1.226''$

1:434 1:360

Use: W21X44

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Steel Gate Design (Cont.)

Girder Design (Cont.)

Bottom Girder Span = 36.792' Load = 1.476 $\frac{K}{Lin.ft.}$

Moment = $(1.406)(36.792)^2(0.125) = 237.90'^K$

$$S_{req'd} = \frac{237.90'^K \times 12000}{20{,}000} = 142.74\ in^3$$

Try : W24X76 $S = 176\ in^3$ $I = 2100\ in^4$

$$\frac{(5)(1{,}406 \times 36.792)(36.792 \times 12)^3}{(384)(29 \times 10^6)(2100)} = 0.952'' < 1.226''$$

1:464 1:360

Use W24X76

Skin Plate

Use $\frac{3}{8}''$ plate $I = \frac{12 \times 0.375^3}{12} = 0.053\ in^4$

$$S = \frac{0.053}{(0.5)(0.375)} = 0.283\ in^3$$

Load Max. = $(62.5)(8.01 - 0.25) = 485\ \#/\square'$

Moment Max = $0.283\ in^3 \times 20{,}000 = 5660$ in/lbs.

(Interior Span) $M = \frac{485^\# \times L^2 \times 12}{12} = 5660$ in lbs,

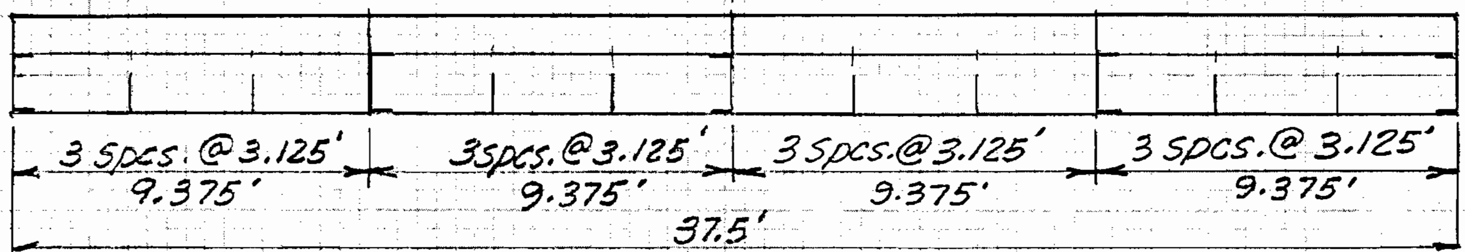
$$L = \sqrt{\frac{5660}{485}} = 3.42'$$

(End Span) $M = \frac{485 \times L^2 \times 12}{10} = 5660$ in lbs.

$$L = \sqrt{\frac{5660}{\frac{12}{10} \times 485}} = 3.12'$$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

STEEL GATE DESIGN - Skin Plate (Cont.)



(Interior) $M = \dfrac{485^{\#} \times 3.125^2 \times 12}{12} = 4736$ in lbs

$f_s = \dfrac{4736''^{\#}}{0.283\ in^3} = 16{,}734$ psi

End $M = \dfrac{485 \times 3.125^2 \times 12}{10} = 5683$ in lbs

$f_s = \dfrac{5683''^{\#}}{0.283} = 20{,}081\ psi > 20{,}000$ ok

$62.5^{\#}/ft^3 \times 0.25 = 15.63\ ^{\#}/\square'$

$62.5^{\#}/ft^3 \times 7.26 = 453.75$

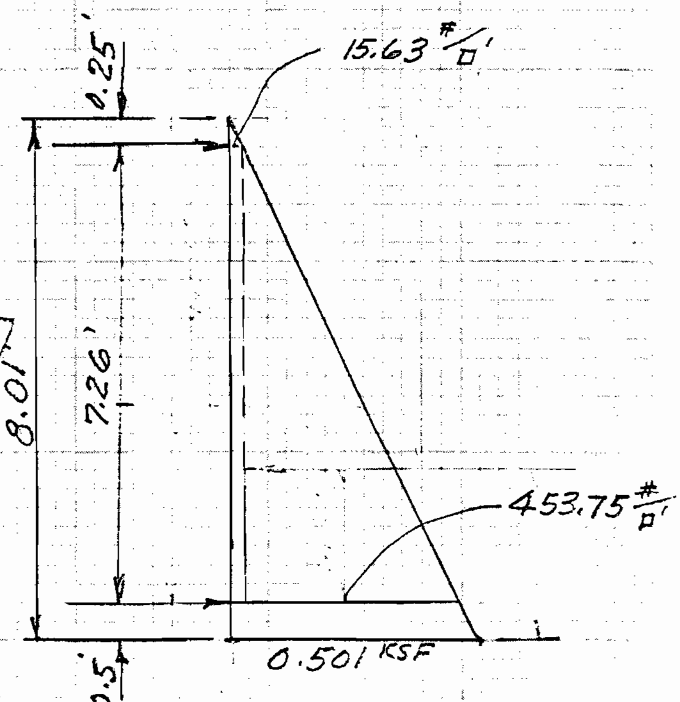
$W = \dfrac{453.75^{\#} \times 7.26}{2} = 1647^{\#}$

$M_{max} @ \dfrac{7.26}{\sqrt{3}} = 4.19'$

$M_{max} = \left[\dfrac{(15.63)(4.19)}{2}(7.26 - 4.19)\right] + \left[(0.1283)(1647)(7.26)\right]$

$= 100.5'^{lb} + 1534'^{lb}$

$= 1635'^{\#}$



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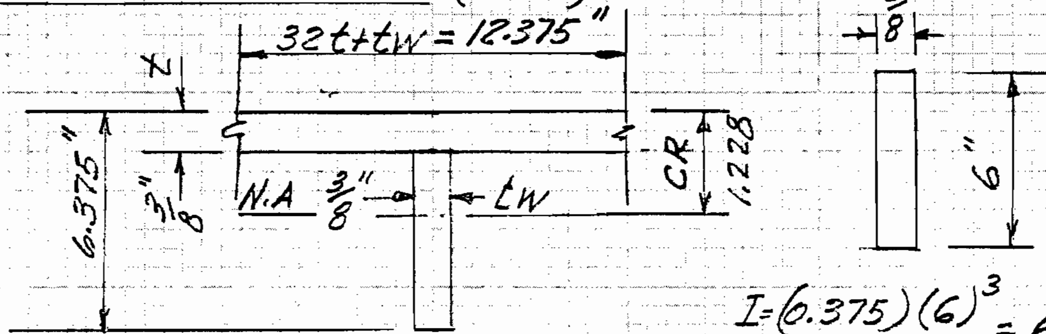
36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

STEEL GATE DESIGN - Skin Plate (Cont.)



$$I = \frac{(0.375)(6)^3}{12} = 6.75 \text{ in}^4$$

Type	Area	y	AY	AY²	Io
PL 12.375 X 0.375	4.641	0.1875	0.870	0.163	—
PL 0.375 X 6	2.25	3.375	7.594	25.630	6.75
	6.891	3.563	8.464	25.793	6.75

$$\bar{y} = \frac{8.464}{6.891} = 1.228''$$

$$I = I_o + \Sigma A y^2 - (\Sigma AY \times \bar{y})$$

$$= 6.75 + 25.793 - (8.464 \times 1.228)$$

$$= 22.149 \text{ in}^4$$

$$S_{TOP} = \frac{22.149}{1.228} = 18.04 \text{ in}^3$$

$$S_{BOTT} = \frac{22.149}{6.375 - 1.228} = 4.3 \text{ in}^3$$

$$f_s = \frac{1635 \times 12}{18.04} = 1087 \text{ PSI}$$

$$f_s = \frac{1635 \times 12}{4.3} = 4{,}562 \text{ PSI}$$

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JOB
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BY LWC DATE 11-20-79
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

STEEL GATE DESIGN - Skin ℞ (Cont)

Design of vertical support members ($\frac{3}{8} \times 6''$ ℞)

Spacing @ 3.125'

$M = 1.635(3.125) = 5.109^{'K}$

$\frac{5109 \times 12}{18.04} = 3{,}398$ psi

$\frac{5109 \times 12}{4.3} = 14{,}257$ psi

$S_{reqd} = \frac{5109^{'\#} \times 12}{18{,}000} = 3.41^{in^3} < 4.3^{in^3}$ available

$d''_{min} = \frac{7.26 \times 12}{24} = 3.63$ in.

Check Deflection

$$\Delta = \frac{5h^4m}{768EI}(P_1 + P_2)$$

$$= \frac{(5)(7.26 \times 12)^4(3.125 \times 12)}{(768)(29 \times 10^6)(22.149)} \left(\frac{\overset{3.26}{15.63 + 453.75}}{144}\right)$$

$= 0.071''$ 1:1227

Check biaxial stresses

$$\frac{S_1^2 - S_1 S_2 + S_2^2}{F_y^2} \leq (0.75)^2$$

$S_1 = 20.081$ psi ← Page 5

$0.75^2 = 0.5625$

$S_2 = 3.398$ ksi (see above)

$$\frac{(20.081)^2 - \overset{11.546}{[(20.081)(3.398)]} + (3.398)^2}{\underset{1296}{(36)^2}} = 0.267 < 0.5625$$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

STEEL GATE

Top Girder = (W21X44) $L_u = 9.375' \times 12 = 112.5''$

$$\frac{d}{A_F} = \frac{20.66}{6.5 \times .451} = 7.05$$

$$I_f = \frac{b h^3}{12} = \frac{0.451(6.5)^3}{12} = 10.32 \text{ in}^4$$

web thick

$$A = A_F + \tfrac{1}{6}A_W = \underset{2.9315}{(6.5 \times 0.451)} + \left[\frac{20.66 - 2(0.451)}{6}\right](0.348)$$

$$= 4.0775$$

$$r_y = \sqrt{\frac{I}{A}} = \left(\frac{10.32}{4.0775}\right)^{1/2} = 1.591$$

$$\frac{L}{r_y} = \frac{112.5}{1.591} = 70.7 > 40 \text{ use Formula (4)}$$

Formula (4) AISC

$$C_b = 1.00 \quad C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = \left[\frac{(2)(\pi)^2(29 \times 10^6)}{36000}\right]^{1/2} = 126.1$$

$$K_2 = 1 - \frac{\left(\frac{L}{r_y}\right)^2}{2 C_c^2 C_b} = 1 - \frac{(70.7)^2}{(2)(126.1)^2(1)} = 0.843$$

$$F_b = 0.5 \times 0.843 \times 36{,}000 = 15{,}174 \text{ psi}$$

Formula (5) AISC

$$F_b = \frac{12{,}000{,}000}{L_u \frac{d}{A_F}} = \frac{12{,}000{,}000}{112.5(7.05)} = 12{,}609 \text{ psi}$$

Use 18000 psi

See page 3

$$S_{req'd} = \frac{102.03'^{k} \times 12{,}000}{18000} = 68.02 \text{ in}^3 < 81.6 \text{ in}^3$$

(W21X44)

36' OVERHEAD GATE AT HARBOUR ROAD EXTEN. (East Side)

STEEL GATE

Bottom Girder = (W 24 x 76) $L_u = 9.375' \times 12 = 112.5''$

$$\frac{d}{A_F} = \frac{23.91}{8.985 \times 0.682} = 3.90$$

$$I_f = \frac{b h^3}{12} = \frac{0.682 \times 8.985^3}{12} = 41.22 \text{ in}^4$$

$$A = A_F + \frac{1}{6} A_W = (8.985 \times 0.682) + \left[\frac{23.91 - 2(0.682)}{6}\right](0.440)$$

$$= 7.781$$

$$r_y = \sqrt{\frac{I}{A}} = \left(\frac{41.22}{7.781}\right)^{1/2} = 2.302$$

$$\frac{L}{r_y} = \frac{112.5}{2.302} = 48.87 > 40 \quad \text{Use Formula (4)}$$

$$K_2 = 1 - \frac{(48.87)^2}{2(126.1)^2} = 0.925$$

$$F_b = 0.5 \times 0.925 \times 36000$$

$$= 16{,}650$$

Formula (5)

$$F_b = \frac{10{,}000{,}000}{112.5\,(3.90)} = 22{,}792 \text{ psi} \quad \text{use } 18{,}000$$

$$S = \frac{249.75 \times 12{,}000}{18{,}000} = 166.5 \text{ in}^3 < 176 \text{ in}^3$$

(W 24 x 76)

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JOB ______ SHEET № 10 OF ______
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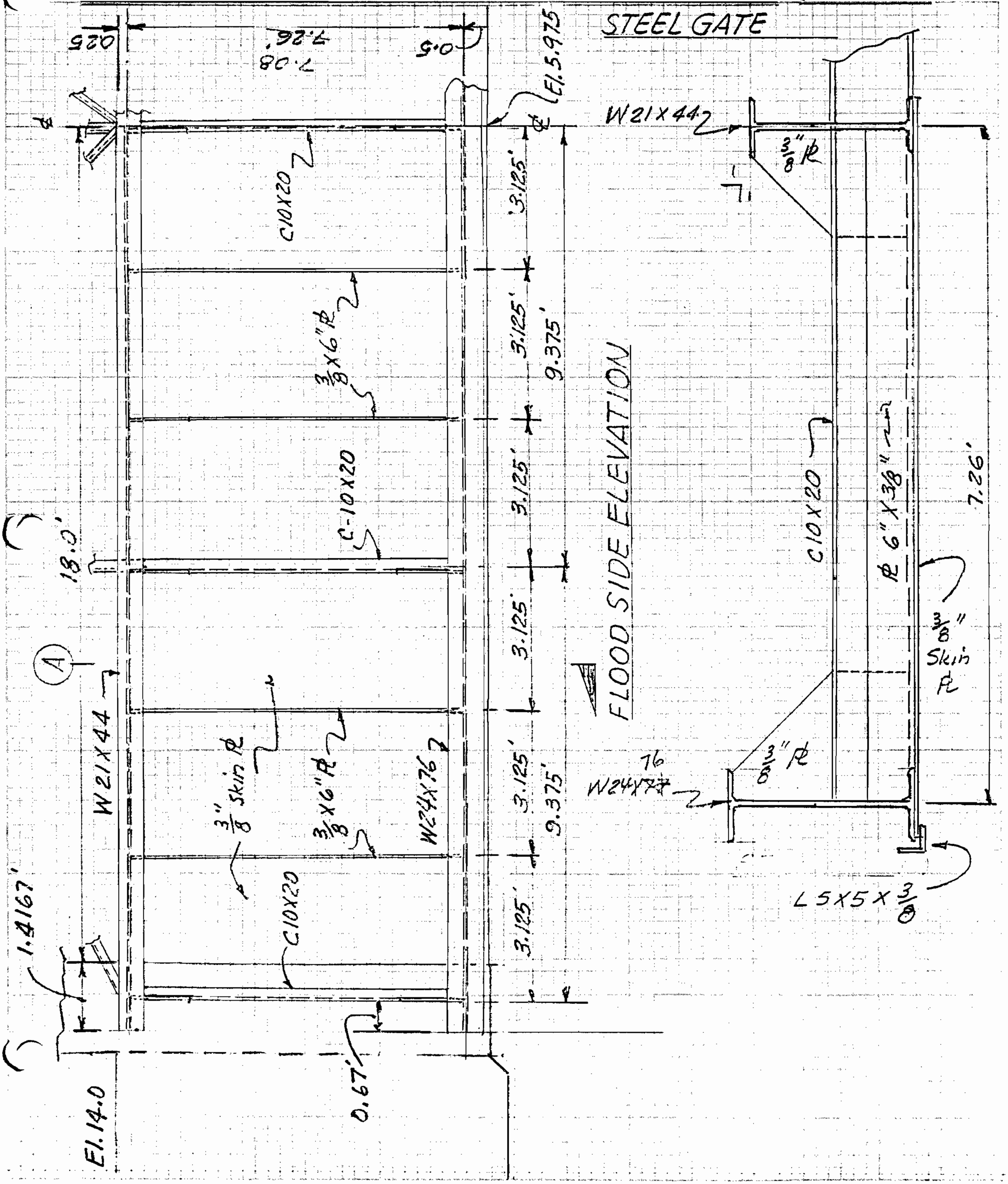
JOB № 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)



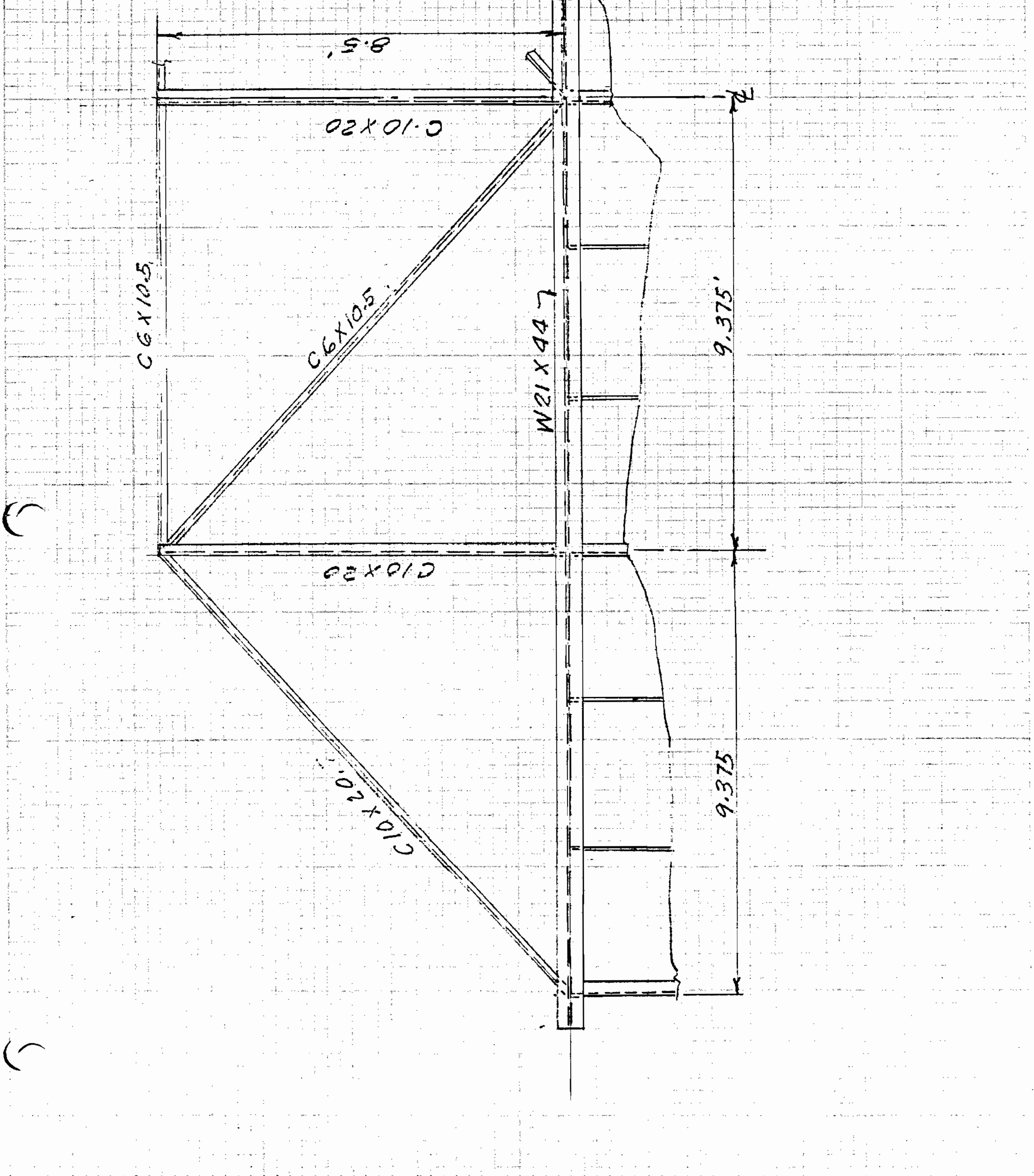
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 11 OF
BY LWC DATE 11-21-79
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

STEEL GATE



36' OVERHEAD GATE DESIGN AT HARBOR ROAD EXTEN. (East Side)

Member	Size	Nº	Wt/ft.	Length	Weight Total	Arm "	Moment "#'
Top Girder	W21X44	1	44	38.83	1709	10.71	18,303
Bott. Girder	W 24X76	1	76	38.83	2912	12.34	35,934
Skin Plate	3/8" X 7.26'	1	111.1	37.5	4166	0.188	783
Vert Plates	3/8 X 6"	8	7.65	7.29	446	3.38	1,507
Vert. Channel	C10X20	2	20	7.29	290	5.38	1,560
" "	C10X20	3	20	15.79	947	5.38	5,095
Diag. "	C10X20	2	20	12.65	506	5.38	2,722
" "	C6X10.5	2	10.5	12.65	266	3.38	899
Hor. "	C6X10.5	2	10.5	9.375	197	3.38	666
Hor. L	5X5X 1/2	1	16.2	37.5	608	0.93	565
Bar (Both sides)	1 3/4 X 1 3/4	2	10.413	7.26	151	0.88	133
Gusset PL	7 1/4" X 3/8	5	9.244	0.89	41	14.48	594
" "	8 1/2" X 3/8	5	14.19	1.16	82	15.48	1269
Horiz. L	5X5X 3/8	1	9.8	37.1	364	7.08	2577
					12,685 #	5.723 "	72,607

<u>36' OVERHEAD GATE AT HARBOR ROAD EXTEN.</u> (East Side)

<u>STEEL GATE</u> (Gate support channels)

Total Wt of gate plus support frame = $12{,}685^{\#}$

With impact = $12{,}685^{\#} \times 1.25 = 15{,}856^{\#} = 15.86^{K}$

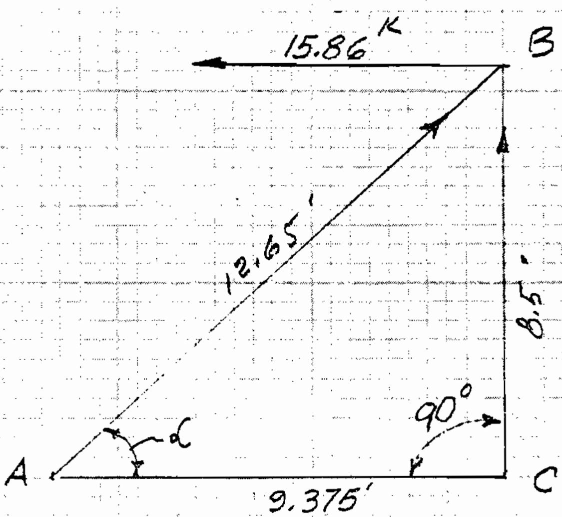
$\Sigma F_x = 0 = -15.86 + F_{AB} \cos\alpha$

$F_{AB} = \left(\frac{12.65}{\cos\alpha}\right)\left(\frac{1}{12.65}\right)(15.86) = \underline{21.41^{K}}$

$\tan\alpha = \frac{8.5}{9.375} = 0.9067$

$\sin = 0.6717$

$\cos = 0.7408$



$F_{AB} = \frac{15.86^{K}}{\cos\alpha} = \underline{21.41^{K}}$

$F_{CB} = 21.41^{K} \sin\alpha = 14.38^{K}$

$P = 21.41^{K}$

$L = \sqrt{9.375^2 + 8.5^2} = 12.65'$ $K = 1.0$

Try C10 x 20 $r = 0.691$ $A = 5.88^{\square''}$

$\frac{Kl}{r} = \frac{(1)12.65 \times 12}{0.691} = \underline{220 \text{ exceeds } 200}$

$f_a = \frac{21.41^{K}}{5.88} = 3.64$

Try C-12 x 20.7 $r = 0.799$

$A = 6.09$

$\frac{Kl}{r} = \frac{(1)(12.65 \times 12)}{0.799} = 189.99$

$F_a = 4.14$

$f_a = \frac{21.41^{K}}{6.09} = 3.51 < 4.14$

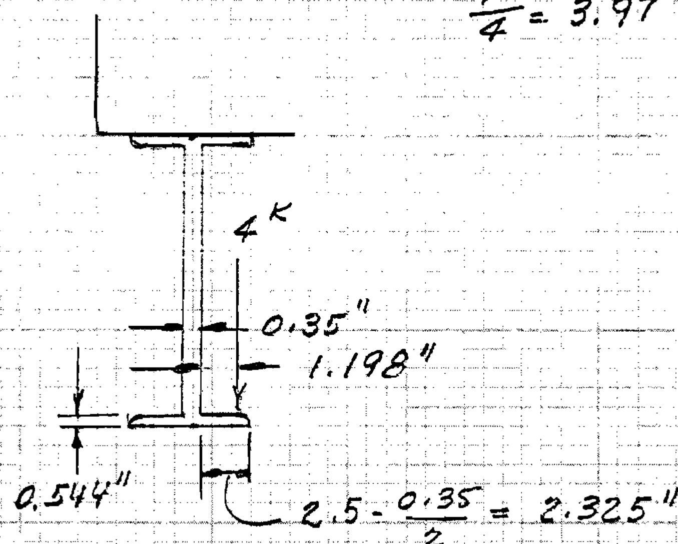
36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Trolley Beam

Try S 12 X 31.8

$P = 15.86^K$

$\frac{P}{4} = 3.97^K$ Use $4^K = P_1$



Moment @ web edge $= 4^K \times 1.198'' = 4.792^{in.K}$

$S_{reqd.} = \frac{4.792''^K}{20^K} = 0.2396''^3$

Furnished $S = \frac{bh^2}{6} = \frac{12 \times 0.544^2}{6} = 0.592^{in^3} > 0.2396^{in^3}$

Check $\Delta = \frac{P_1 b^3}{3EI}$ $\qquad I = \frac{12 \times 0.544^3}{12} = 0.161$

$b = 1.198 \quad P_1 = 4^K = 4000^{\#}$

$\frac{4000\,(1.198)^3}{3\,(29\times10^6)(0.161)} = .000491 < \frac{2.325}{360} = .00646$

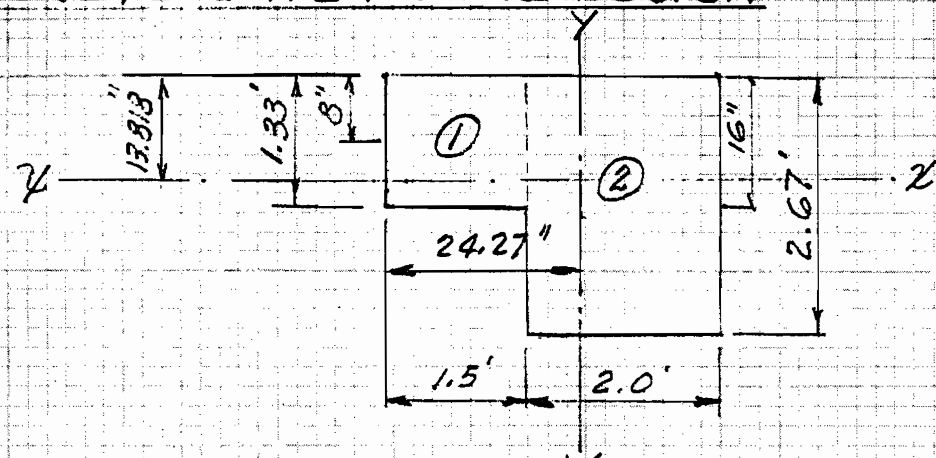
Allowed

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 15 OF ______
ITEM ______ BY LWC DATE 11-21-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

CONCRETE GATE FRAME DESIGN



Moment of Inertia - Beam

Area (A)	Y	AY	AY^2	I_o	
① 16"x18" = 288	8	2304	18432	6144	
② 24"x32" = 768	16	12288	196608	65536	X - X
1056		14592	215040	71680	

$$y = \frac{14592}{1056} = 13.818$$

$$I = 71680 + 215040 - (14592 \times 13.818)$$
$$= 65088 \text{ in.}^4$$

① = 288	9	2592	23328	7776	
② = 768	30	23040	691,200	36864	Y - Y
1056		25,632	714,528	44,640	

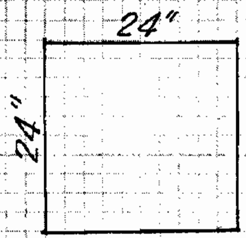
$$x = \frac{25,632}{1056} = 24.27''$$

$$I = 44,640 + 714,528 - (25,632 \times 24.27)$$
$$I = 137,079 \text{ in}^4$$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

CONCRETE GATE FRAME DESIGN

Moment of Inertia (Col's AB - CF - DE)



$$\frac{24 \times 24^3}{12} = 27648 \text{ in}^4$$

Distribution Factors

$E = 1$

Col's AB - CF - DE $\quad \frac{EI}{L} = \frac{(1)(27648)}{16.01 \times 12} = 143.91$

Beam BC $\quad \frac{EI}{L} = \frac{(1)\,85088}{38 \times 12} = 186.60$

Beam CD $\quad \frac{EI}{L} = \frac{(1)\,85088}{30 \times 12} = 236.36$

Distribution

Jt. (B)
- Member BA $= \frac{143.91}{143.91 + 186.6} = 0.44$
- Member BC $= \frac{186.6}{143.91 + 186.6} = 0.56$

Jt. (C)
- Member CB $= \frac{186.6}{186.6 + 143.91 + 236.36} = 0.33$
- Member CF $= \frac{143.91}{186.6 + 143.91 + 236.36} = 0.25$
- Member CD $= \frac{236.36}{186.6 + 143.91 + 236.36} = 0.42$

Jt D
- Member D-C $= \frac{236.36}{236.36 + 143.91} = 0.62$
- Member DE $= \frac{143.91}{236.36 + 143.91} = 0.38$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

CONCRETE GATE FRAME DESIGN

Loading

Dead Load

Concrete: $\frac{1056^{\square''}}{144} \times 0.15^{K} = 1.1\ ^{K}/_{Lin\ ft.}$

Steel (S12 x 31.8) $= 0.03^{K}/_{Lin\ ft}$

$1.13\ ^{K}/_{Lin\ ft.}$

Live Load

Two 8^{K} load @ 18.75 feet apart

Wind Load

$0.05\ ^{K}/_{Sq.\ Ft}$

Load Cases considered (About X-X axis)

Case 1x - Gate open, no water, no wind, one hanger load placed 5.125' from end column.

Case 2x - Gate closed, no wind

Case 3x - Gate open, no water, wind from right (75%)

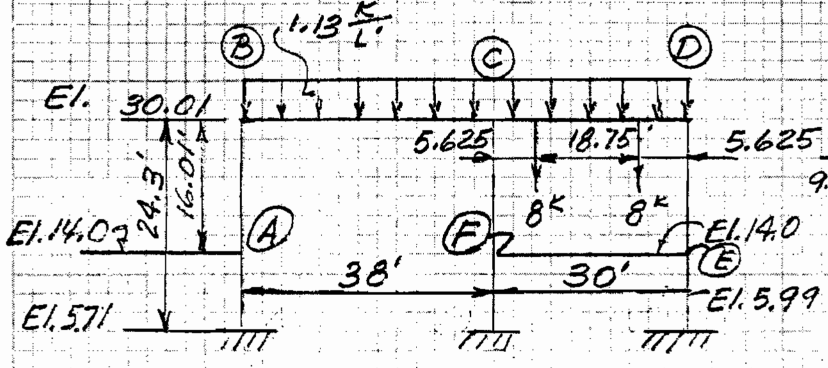
Case 4x - Gate closed, wind from right (75%)

Case 5x - Gate closed, wind from left (75%)

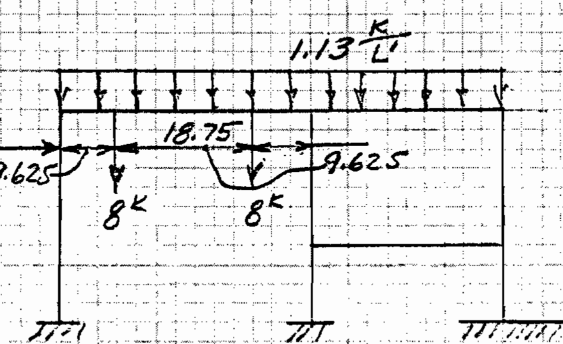
Case 6x - Gate open, no water, no wind, hanger loads placed between center columns.

Case 7x - Gate open, no water, no wind, one hanger load placed 0.92' from end column.

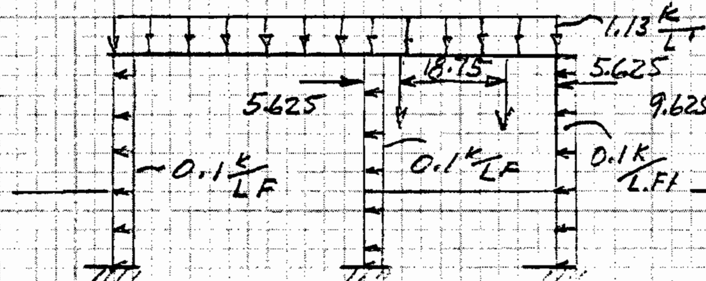
36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)
CONCRETE GATE FRAME DESIGN (Loading Conditions)



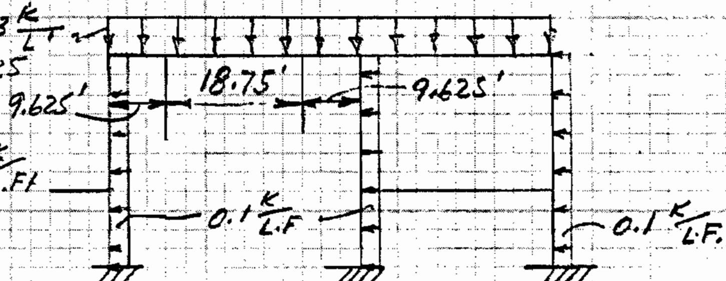
CASE 1X



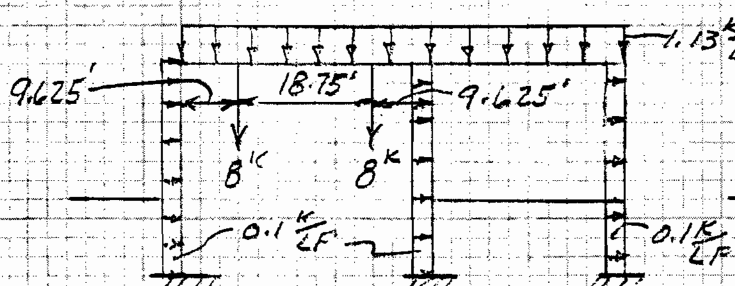
CASE 2X



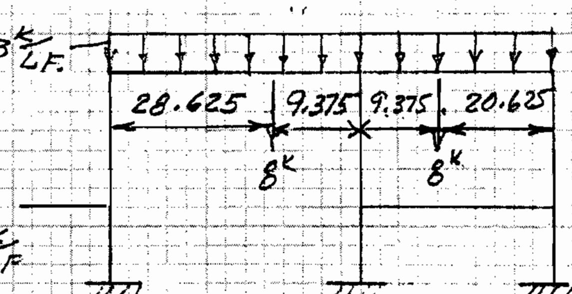
CASE 3X



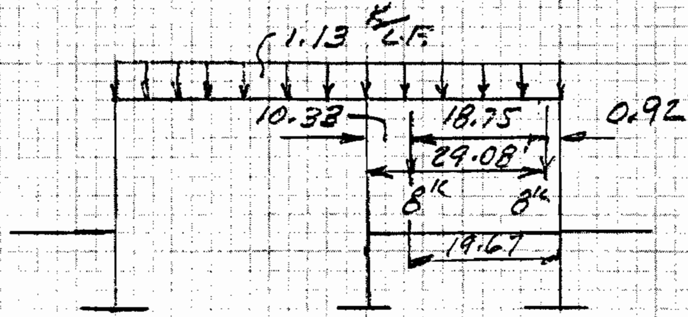
CASE 4X



CASE 5X



CASE 6X



CASE 7X

LOAD CASES ABOUT x-x AXIS

CASE	M_{1-2}	M_{2-1}	M_{2-3}	M_{3-2}	M_{3-4}	M_{4-3}	M_{3-5}	M_{5-3}	M_{5-6}	M_{6-5}	R_1	R_4	R_6	H_1	H_4	H_6
1x	27.31	58.96	-58.96	169.21	-7.67	-5.67	-161.53	+47.72	-47.72	-25.3	-18.56	-53.11	-21.15	5.38	-0.82	-4.56
2x	38.39	89.01	-89.01	207.38	-49.37	-30.15	-158.01	28.39	-28.39	-19.47	-26.35	-53.85	-12.62	-7.95	4.96	-2.99
3x	35.94	62.22	-62.22	166.96	-2.87	3.82	-164.09	44.15	-44.15	-16.52	-18.71	-53.17	-20.95	-6.93	-0.86	2.98
4x	47.02	92.26	-92.26	205.14	-44.56	20.75	-60.57	+24.82	-24.82	-10.69	-26.49	-53.91	-12.42	-9.5	-3.27	-1.41
5x	26.76	85.75	-85.75	209.63	-54.18	-39.55	-155.45	31.97	-31.97	-28.26	-26.2	-53.79	-12.83	-6.41	6.65	4.56
6x	30.75	68.17	-68.17	199.07	-25.23	-15.44	-173.83	37.10	-37.10	-21.14	-19.99	-57.94	-14.89	-6.17	2.54	3.63
7x	26.48	58.50	-58.50	168.55	-9.88	-7.28	-158.67	43.82	-43.82	-23.98	-18.57	-50.63	-23.63	-5.3	1.07	4.23

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB 36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE) CONC. FRAME DESIGN
ITEM
JOB No 575-79-E
SHEET No ___ OF ___
BY ___ DATE ___
CHKD. BY ___ DATE ___

MEMBER TYPE C

LENGTH = 16.01   L(X)= 0   L(Y)= 16.01

I = 27648   A = 576

MEMBER TYPE D

LENGTH = 30   L(X)= 30   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	30

CONCENTRATED LOADS:

DL	LL	X
8	0	5.625
8	0	24.375

I = 85085   A = 1056

FIXED-END MOMENTS / LOADS

	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	121.31	121.31	24.94	24.95
LL				

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT	P(X)	P(Y)	MOMENT	LOAD COMBINATION

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0002	0.0001	0.000325	
3	0.0001	0.0003	-0.000021	
4	0.0000	0.0000	0.000000	
5	0.0001	0.0001	-0.000233	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-18.56	-5.38	27.[illegible]
		2	-18.56	-5.38	58.[illegible]
5	1	6	-21.15	4.56	-25.50
		5	-21.15	4.56	-47.72

** GENERAL FRAME ANALYSIS **

N LOGAN 11-29-79

(A)

FLA AVE EAST ROLLER GATE CASE 1 ← CASES NOT NUMERICAL ORDER

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

I = 27648 A = 576

MEMBER TYPE B

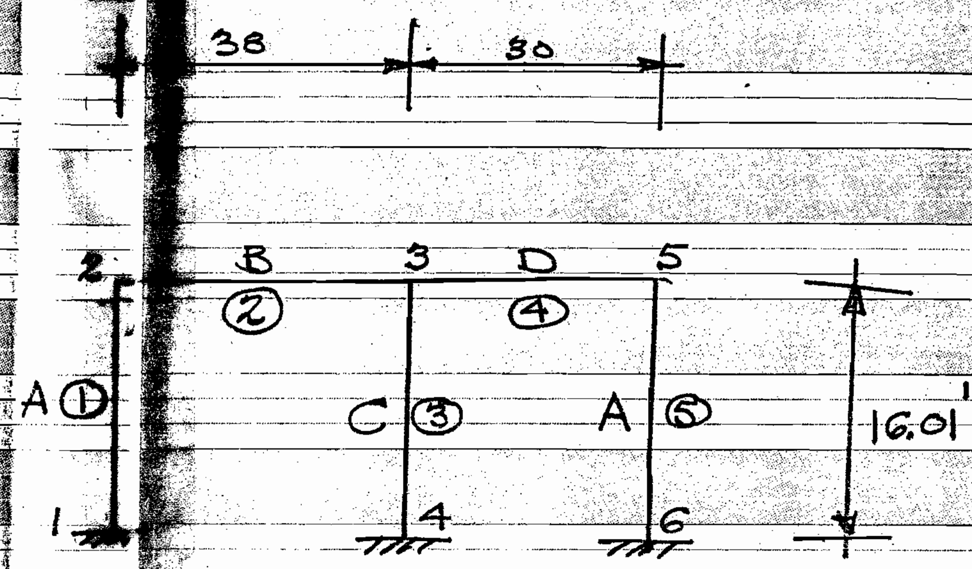
LENGTH = 38 L(X)= 38 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	38

I = 85085 A = 1056

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-135.97	135.97	21.46	21.47
LL				



(2) — MEMBER NUMBER

HORIZ LOAD POS TO RIGHT

$I_{COL} = 27,648 \text{ IN}^4$

$A_{COL} = 576 \text{ IN}^2$

Leo Clay

TYPE B					
2	1	2	-5.38	18.56	-58.96
		3	-5.38	24.37	169.21
		MAX.			93.59
TYPE C					
3	1	4	-53.11	0.22	-5.57
		3	-53.11	0.22	-7.67
TYPE D					
4	1	3	-4.56	28.74	161.53
		5	-4.56	-21.15	47.72
		MAX.			73.86

** GENERAL FRAME ANALYSIS **

FLA AVE EAST ROLLER GATE CASE VII

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01

D

4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

MEMBER TYPE B

EXISTING DATA
LENGTH = 38 L(X)= 38 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-135.97	135.97	21.46	21.47
LL				

MEMBER TYPE C

EXISTING DATA
LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

MEMBER TYPE D

LENGTH = 30 L(X)= 30 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	30

CONCENTRATED LOADS:

DL	LL	X
8	0	10.33
8	0	29.08

I = 85085 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-120.49	110.32	22.77	27.12
LL				

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

E

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0003	0.0001	0.000333	
3	0.0002	0.0003	-0.000027	
4	0.0000	0.0000	0.000000	
5	0.0002	0.0001	-0.000206	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

MEMBER	LD. COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-18.57	-5.30	26.48
		2	-18.57	-5.30	58.50
5	1	6	-23.63	4.23	-23.98
		5	-23.63	4.23	-43.82
TYPE B					
2	1	2	-5.30	18.57	-58.50
		3	-5.30	-24.36	168.55
		MAX.			94.14
TYPE C					
3	1	4	-50.63	1.07	-7.25
		3	-50.63	1.07	-9.88
TYPE D					
4	1	3	-4.23	26.26	158.67
		5	-4.23	-23.63	43.82
		MAX.			71.64

* GENERAL FRAME ANALYSIS *

FLA AVE EAST ROLLER GATE CASE II

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01

6 68 0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA
LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

MEMBER TYPE B

LENGTH = 38 L(X)= 38 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	38

CONCENTRATED LOADS:

DL	LL	X
8	0	9.625
8	0	28.375

I = 85085 A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-193.47	193.47	29.47	29.46
LL				

MEMBER TYPE C

EXISTING DATA
LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

MEMBER TYPE D

LENGTH = 30 L(X)= 30 L(Y)= 0

(G)

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	30

I = 85085   A = 1056

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
DL	-84.75	84.75	16.94	16.95
LL				

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

JOINT	P(X)	P(Y)	MOMENT	LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0006	0.0001	0.000527	
3	0.0006	0.0003	-0.000200	
4	0.0000	0.0000	0.000000	
5	0.0005	0.0000	-0.000092	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-26.35	-7.95	38.39
		2	-26.35	-7.95	89.01
5	1	6	-12.62	2.99	-19.47
		5	-12.62	2.99	-28.39
TYPE B					
2	1	2	-7.95	26.35	-89.01
		3	-7.95	-32.58	207.38
		MAX.			137.05
TYPE C					
3	1	4	-53.85	4.96	-30.15
		3	-53.85	4.96	-49.37
TYPE D					
4	1	3	-2.99	21.27	158.01
		5	-2.99	-12.62	28.39
		MAX.			42.17

H

** GENERAL FRAME ANALYSIS **

FLA AVE EAST ROLLER GATE CASE IV

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

UNIFORM LOADS:

	HL	Y1	Y2
	-.1	0	16.01

I = 27648 A = 576

FIXED-END	MOMENTS LEFT	MOMENTS RIGHT	LOADS LEFT	LOADS RIGHT
HL	2.13	-2.13	0.80	-0.80

MEMBER TYPE B

EXISTING DATA

LENGTH = 38 L(X)= 38 L(Y)= 0

I

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-193.47	193.47	29.47	29.46
LL				

MEMBER TYPE C

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

UNIFORM LOADS:

	HL	Y1	Y2
	.1	0	16.01

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.13	-2.13	0.80	-0.80

MEMBER TYPE D

EXISTING DATA
LENGTH = 30 L(X)= 30 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-84.75	84.75	16.94	16.95
LL				

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

TYPE

A
'HL' X 1 --LD. COMB 1

B

C
'HL' X 1 --LD. COMB 1

D

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT.(CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0002	0.0001	0.000516	

3	0.0001	0.0003	0.000203
4	0.0000	0.0000	0.000000
5	0.0001	0.0000	-0.000102
6	0.0000	0.0000	0.000000

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-26.49	-9.50	47.02
		2	-26.49	-7.89	92.26
5	1	6	-12.42	1.41	-10.69
		5	-12.42	3.01	-24.82
TYPE B					
2	1	2	-7.89	26.40	-92.26
		3	-7.89	-32.44	205.14
		MAX.			136.16
TYPE C					
3	1	4	-53.91	3.27	-20.75
		3	-53.91	4.88	-44.56
TYPE D					
4	1	3	-3.01	21.47	-160.57
		5	-3.01	-12.42	24.82
		MAX.			43.48

** GENERAL FRAME ANALYSIS **

FLA AVE EAST ROLLER GATE CASE V

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

UNIFORM LOADS:

	HL	Y1	Y2
	.1	0	16.01

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.13	2.13	0.80	0.80

MEMBER TYPE B

EXISTING DATA
LENGTH = 38 L(X)= 38 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	193.47	193.47	29.47	29.46
LL				

MEMBER TYPE C

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

UNIFORM LOADS:

	HL	Y1	Y2
	.1	0	16.01

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.13	2.13	0.80	0.80

K

MEMBER TYPE D

EXISTING DATA
LENGTH = 30 L(X)= 30 L(Y)= 0

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-84.75	84.75	16.94	16.95
LL				

LOADINGS

LOAD COMBINATION 1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

TYPE

A
'HL' X 1 --LD. COMB 1

B

C
'HL' X 1 --LD. COMB 1

D

JOINT P(X) P(Y) MOMENT LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0011	0.0001	0.000539	
3	0.0010	0.0003	-0.000196	
4	0.0000	0.0000	0.000000	
5	0.0010	0.0000	-0.000083	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-26.20	-6.41	29.76
		2	-26.20	-8.01	85.75
5	1	6	-12.83	4.56	-28.26
		5	-12.83	2.96	-31.97
TYPE B					
2	1	2	-8.01	26.56	-85.75
		3	-8.01	32.73	209.63
		MAX.			137.97

(M)

TYPE C

3	1	4	-53.79	6.05	-39.55
		3	-53.79	5.05	-54.18

TYPE D

4	1	3	-2.96	21.06	-155.45
		5	-2.96	-12.83	31.07
		MAX.			40.90

** GENERAL FRAME ANALYSIS **

CASE 6 ~~4~~ or VI

FLA AVE EAST ROLLER GATE

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

EXISTING DATA

LENGTH = 16.01   L(X)= 0   L(Y)= 16.01

(N)

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.13	2.13	0.80	0.80

MEMBER TYPE C

LENGTH = 38   L(X)= 38   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	38

CONCENTRATED LOADS:

DL	LL	X
8	0	28.625

I = 85085   A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-149.01	178.53	22.69	28.24
LL				

MEMBER TYPE C

EXISTING DATA

LENGTH = 16.01   L(X)= 0   L(Y)= 16.01

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	-2.13	2.13	0.80	0.80

MEMBER TYPE D

LENGTH = 30   L(X)= 30   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	30

CONCENTRATED LOADS:

DL	LL	X
8	0	9.375

I = 85085   A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-120.19	100.86	25.09	18.80
LL				

LOADINGS

LOAD COMBINATION   1

DEAD LOAD FACTOR 1.000
LIVE LOAD FACTOR 1.000

0

JOINT	P(X)	P(Y)	MOMENT	LOAD COMBINATION 1

DISPLACEMENTS

JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	0.0003	0.0001	0.000280	
3	0.0003	0.0004	-0.000108	
4	0.0000	0.0000	0.000000	
5	0.0002	0.0001	-0.000165	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-10.29	-6.17	30.73
		2	-15.99	-6.17	68.17
5	1	6	-14.89	3.63	-21.14
		5	14.89	3.63	-37.13
TYPE B					
2	1	2	-6.17	19.90	-68.17
		3	-6.17	30.94	199.07
		MAX.			108.79
TYPE C					
3	1	4	-57.94	2.54	15.44
		3	-57.94	2.54	-25.23
TYPE D					
4	1	3	3.63	27.00	173.83
		5	3.63	14.89	37.13
		MAX.			61.02

* GENERAL FRAME ANALYSIS *

P

FLA AVE EAST ROLLER GATE CASE III

JOINT COORDINATES

JOINT	X	Y
1	0	0
2	0	16.01
3	38	16.01
4	38	0
5	68	16.01
6	68	0

JOINT RESTRAINTS

1 FIXED
4 FIXED
6 FIXED

NO. OF EQ. = 9

MEMBER IDENTIFICATION

MEMBER	JT.	JT.	TYPE	LENGTH	L(X)	L(Y)
1	1	2	A	16.01	0.00	+16.01
2	2	3	B	38.00	38.00	+0.00
3	4	3	C	16.01	0.00	+16.01
4	3	5	D	30.00	30.00	+0.00
5	6	5	A	16.01	0.00	+16.01

MEMBER PROPERTIES IN INCH UNITS AND FRAME DIMENSIONS IN FEET

E = 4000

MEMBER TYPE A

LENGTH = 16.01 L(X)= 0 L(Y)= 16.01

UNIFORM LOADS:

	HL	Y1	Y2
	-.1	0	16.01

I = 27648 A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.13	-2.13	0.80	-0.80

MEMBER TYPE B

LENGTH = 38 L(X)= 38 L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2

1.13	0		0	38

I = 85085   A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-135.97	135.97	21.46	21.47
LL				

MEMBER TYPE C

LENGTH = 16.01   L(X)= 0   L(Y)= 16.01

UNIFORM LOADS:

HL	Y1	Y2
-.1	0	16.01

I = 27648   A = 576

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
HL	2.13	-2.13	0.80	-0.80

MEMBER TYPE D

LENGTH = 30   L(X)= 30   L(Y)= 0

UNIFORM LOADS:

DL	LL	X1	X2
1.13	0	0	30

CONCENTRATED LOADS:

DL	LL	X
8	0	5.625
8	0	24.375

I = 85085   A = 1056

FIXED-END	MOMENTS		LOADS	
	LEFT	RIGHT	LEFT	RIGHT
DL	-121.31	121.31	24.94	24.05
LL				

LOADINGS

LOAD COMBINATION   1

DEAD LOAD FACTOR   1.000
LIVE LOAD FACTOR   1.000

TYPE

A
'HL' X 1   --LD. COMB 1

B

C
'HL' X 1 --LD. COMB 1

D

JOINT	P(X)	P(Y)	MOMENT	LOAD COMBINATION 1

DISPLACEMENTS

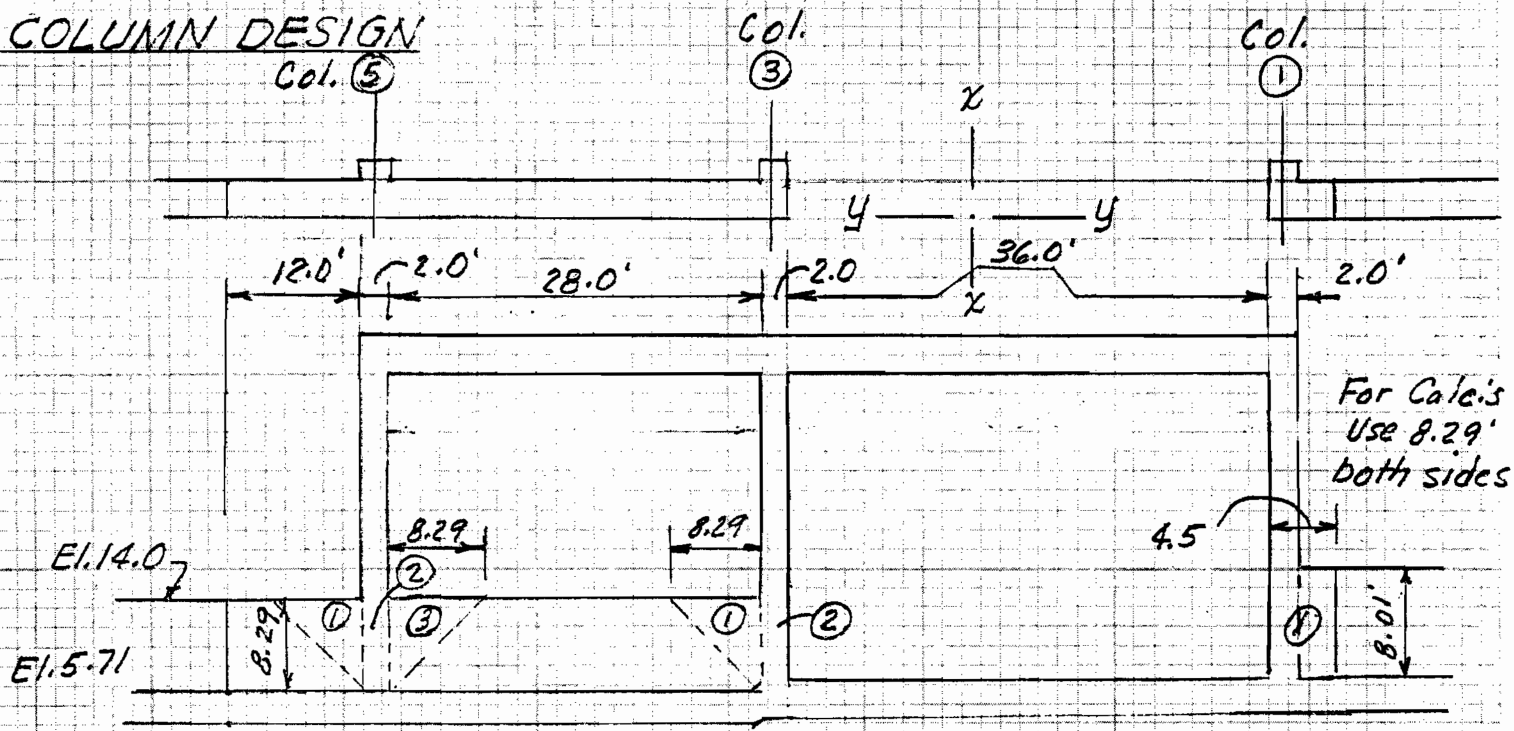
JOINT	X (-->)	Y (DOWN)	ROT. (CW)	LOAD COMBINATION 1
1	0.0000	0.0000	0.000000	
2	-0.0001	0.0001	0.000318	
3	-0.0002	0.0003	-0.000025	
4	0.0000	0.0000	0.000000	
5	-0.0002	0.0001	-0.000243	
6	0.0000	0.0000	0.000000	

MEMBER FORCES

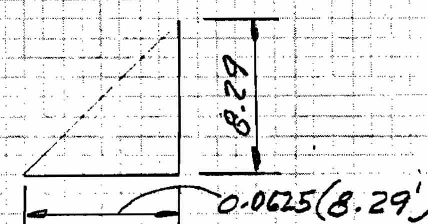
MEMBER	LD.COMB.	JOINT	AXIAL	SHEAR	MOMENT
TYPE A					
1	1	1	-18.71	-6.93	35.04
		2	-18.71	-5.33	62.22
5	1	6	-20.95	2.98	-16.52
		5	-20.95	4.59	-44.15
TYPE B					
2	1	2	-5.33	18.71	-62.22
		3	-5.33	24.22	160.06
		MAX.			92.73
TYPE C					
3	1	4	-53.17	-0.80	3.82
		3	-53.17	0.74	-2.81
		MAX.			0.12
TYPE D					
4	1	3	-4.59	28.94	-164.09
		5	-4.59	-20.95	44.15
		MAX.			75.07

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN



Load about Y-Y Axis - Water Loads · Water to Elev. 14.0



Column (1)		Force	Arm	Moment
(1)	$\frac{1}{2}(4.5)(8.29)^2(0.0625)$ =	9.66	2.76	26.66
Gate	$\frac{1}{2}(0.0625)(8.29)^2(\frac{36}{2})$ =	38.65	2.76	106.67
		ΣH = 48.31 K		ΣM = 133.33 'K

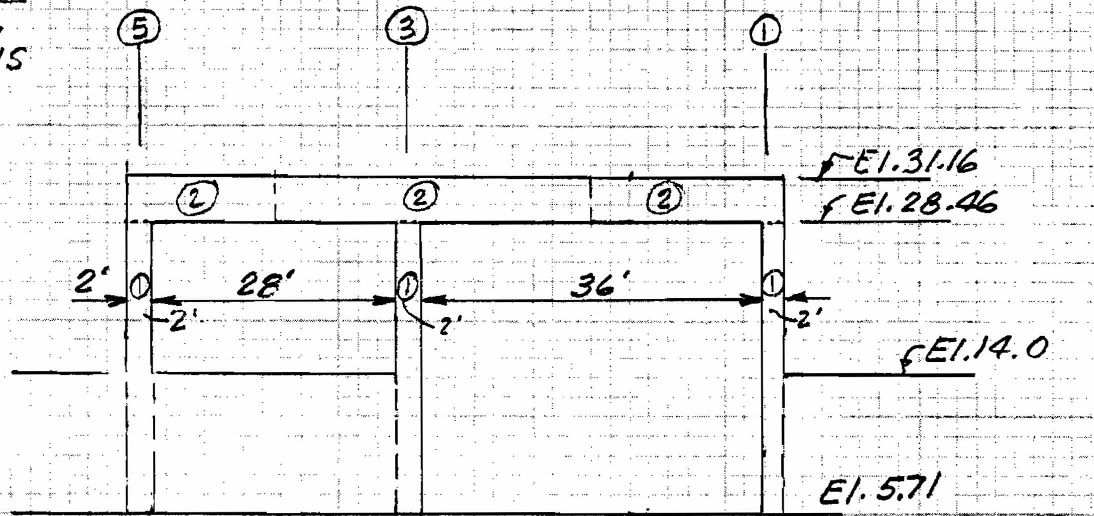
Column (3)		Force	Arm	Moment
(1)	$\frac{1}{3}(\frac{1}{2})(8.29)^3(0.0625)$ =	5.93	4.15	24.61
(2)	$\frac{1}{2}(2.0')(8.29)^2(0.0625)$ =	4.29	2.76	11.84
Gate (Same as Col. (1))	=	38.65	2.76	106.67
		ΣH = 48.87 K		ΣM = 143.12 'K

Column (5)		Force	Arm	Moment
(1)	$\frac{1}{3}(\frac{1}{2})(12.0)(8.29)^2(0.0625)$ =	8.59	4.15	35.65
(2)	$\frac{1}{2}(2.0)(8.29)^2(0.0625)$ =	4.29	2.76	11.84
(3)	$\frac{1}{3}(\frac{1}{2})(8.29)^3(0.0625)$ =	5.93	4.15	24.61
		ΣH = 18.81		ΣM = 72.10 'K

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

COLUMN DESIGN

Loads about Y-Y axis
Wind above El. 14.0



Col. 1

	Force	Arm	Moment
1 2.0(14.46)(0.05) =	1.46	15.52	22.66
2 20(2.67)(0.05) =	2.67	24.09	64.32
	$\Sigma H = 4.13^k$		$\Sigma M = 86.98'^k$

Col. 3

	Force	Arm	Moment
1 2.0(14.46)(0.05) =	1.46	15.52	22.66
2 34(2.67)(0.05) =	4.54	24.09	109.37
	$\Sigma H = 6.0^k$		$\Sigma M = 132.03'^k$

Col. 5

	Force	Arm	Moment
1 2.0(14.46)(0.05) =	1.46	15.52	22.66
2 16(2.67)(0.05) =	2.13	24.09	51.31
	$\Sigma H = 3.59$		$\Sigma M = 73.97'^k$

36' OVERHEAD GATE AT HARBOUR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN

Loads about Y-Y Axis

Wind below El. 14.0

		Force	Arm	Moment
Col. ①				
①	(4.5)(8.29)(0.05) =	1.87	4.15	= 7.76
Gate (18.0)	(8.29)(0.05) =	7.46	4.15	= 30.86
		$\Sigma H = 9.33^k$		$\Sigma M = 38.62$
Col. ③				
Gate (see above)	=	7.46	4.15	= 30.86
①	(16)(8.29)(0.05) =	6.63	4.15	= 27.51
		$\Sigma H = 14.09^k$		$\Sigma M = 58.37$
Col. ⑤				
①	16(8.29)(0.05) =	6.63	4.15	= 27.51
②	12(8.29)(0.05) =	4.97	4.15	= 20.62
		$\Sigma H = 11.6^k$		$\Sigma M = 48.13$

Load Cases considered (Bending about Y-Y axis)

Case 1Y - Gate opened, no water, no wind.

Case 2Y - Gate closed, water to El. 14.0, no wind.

Case 3Y - Gate opened, wind from F.S. (75%)

Case 4Y - Gate closed, water to El. 14, wind from F.S. (75%)

Case 5Y - Gate opened, no water, wind from P.S. (75%)

Case 6Y - Gate closed, water to El. 14, wind from P.S. (75%)

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Bending about Y-Y axis)

Case 1Y - No water, no wind

$M_{1Y} = 0$

$H_{1Y} = 0$

$M_{3Y} = 0$

$H_{3Y} = 0$

$M_{5Y} = 0$

$H_{5Y} = 0$

Case 2Y - Water, no wind

$M_{1Y} = 133.3'^{k}$

$H_{1Y} = 48.31^{k}$

$M_{3Y} = 143.1'^{k}$

$H_{3Y} = 48.87^{k}$

$M_{5Y} = 72.1'^{k}$

$H_{5Y} = 18.81^{k}$

Case 3Y - Gate opened, no water, wind from F.S. (75%)

$M_{1Y} = 0.75(86.98+38.62) = 0.75(125.60) = 94.2'^{k}$

$H_{1Y} = 0.75(4.13+9.33) = 0.75(13.46) = 10.10^{k}$

$M_{3Y} = 0.75(132.03+58.37) = 0.75(190.40) = 142.8'^{k}$

$H_{3Y} = 0.75(6.0+14.09) = 0.75(20.09) = 15.06^{k}$

$M_{5Y} = 0.75(73.97+48.13) = 0.75(122.10) = 91.6'^{k}$

$H_{5Y} = 0.75(3.59+11.6) = 0.75(15.19) = 11.39^{k}$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Bending about Y-Y axis)

Case 4Y-Gate closed, Water to El. 14.0, wind from F.S. (75%)

$M_{1Y} = 0.75(133.33 + 86.98) = 0.75(220.31) = 165.2'^{K}$

$H_{1Y} = 0.75(48.31 + 4.13) = 0.75(52.44) = 39.33^{K}$

$M_{3Y} = 0.75(143.12 + 132.03) = 0.75(275.15) = 206.4'^{K}$

$H_{3Y} = 0.75(48.87 + 6.0) = 0.75(54.87) = 41.15^{K}$

$M_{5Y} = 0.75(72.10 + 73.97) = 0.75(146.07) = 109.6'^{K}$

$H_{5Y} = 0.75(18.81 + 3.59) = 0.75(22.4) = 16.8^{K}$

Case 5Y-Gate opened, no water, wind from P.S. (75%)

$M_{1Y} = 0.75(-86.98 - 38.62) = 0.75(-125.6) = -94.2'^{K}$

$H_{1Y} = 0.75(-4.13 - 9.33) = 0.75(-13.46) = -10.09^{K}$

$M_{3Y} = 0.75(-132.03 - 58.37) = 0.75(-190.4) = -142.8'^{K}$

$H_{3Y} = 0.75(-6.0 - 14.09 = 0.75(-20.09) = -15.06^{K}$

$M_{5Y} = 0.75(-73.97 - 48.13) = 0.75(-122.1) = -91.6'^{K}$

$H_{5Y} = 0.75(-3.59 - 11.6) = 0.75(-15.19) = -11.39^{K}$

Case 6Y-Gate closed, Water to El. 14.0, wind from P.S. (75%)

$M_{1Y} = 0.75(133.33 - 125.6) = 0.75(7.73) = -5.8'^{K}$

$H_{1Y} = 0.75(48.31 - 13.46) = 0.75(34.85) = 25.14^{K}$

$M_{3Y} = 0.75(143.12 - 190.4) = 0.75(-47.28) = -35.46'^{K}$

$H_{3Y} = 0.75(48.87 - 20.09) = 0.75(28.78) = 21.59^{K}$

$M_{5Y} = 0.75(72.10 - 122.1) = 0.75(-50) = -37.5'^{K}$

$H_{5Y} = 0.75(18.81 - 15.19) = 0.75(3.62) = 2.72^{K}$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Bending about Y-Y Axis)

Summary of Resultants (Bending about Y-Y axis)

Load Case	Column Nº1		Column Nº3		Column Nº5	
	M_{1Y} 'K	H_{1Y} K	M_{3Y} 'K	H_{3Y} K	M_{5Y} 'K	H_{5Y} K
1Y	0	0	0	0	0	0
2Y	133.3	48.31	143.1	48.87	72.1	18.81
3Y	94.2	10.10	142.8	15.06	91.6	11.39
4Y	165.2	39.33	206.4	41.15	109.6	16.8
5Y	-94.2	-10.09	-142.8	-15.06	-91.6	-11.39
6Y	-5.8	25.14	-35.46	21.59	-37.5	2.72

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)
COLUMN DESIGN

Combined Load Cases (Bending about X-X Axis and Y-Y Axis)
The following Cases are considered.

Case I — Case 1X (75%) + Case 3Y (75%)

Case II — Case 1X (75%) + Case 5Y (75%)

Case III — Case 2X + Case 2Y

Case IV — Case 2X (75%) + Case 4Y (75%)

Case V — Case 2X (75%) + Case 6Y (75%)

Case VI — Case 3X (75%) + Case 1Y (75%)

Case VII — Case 4X (75%) + Case 2Y (75%)

Case VIII — Case 4X (75%) + Case 6Y (75%)

Case IX — Case 5X (75%) + Case 2Y (75%)

Case X — Case 6X + Case 1Y

Case XI — Case 6X (75%) + Case 3Y (75%)

Case XII — Case 6X (75%) + Case 5Y (75%)

Case XIII — Case 7X + Case 1Y

Case XIV — Case 7X (75%) + Case 3Y (75%)

Case XV Case 7X (75%) + Case 5Y (75%)

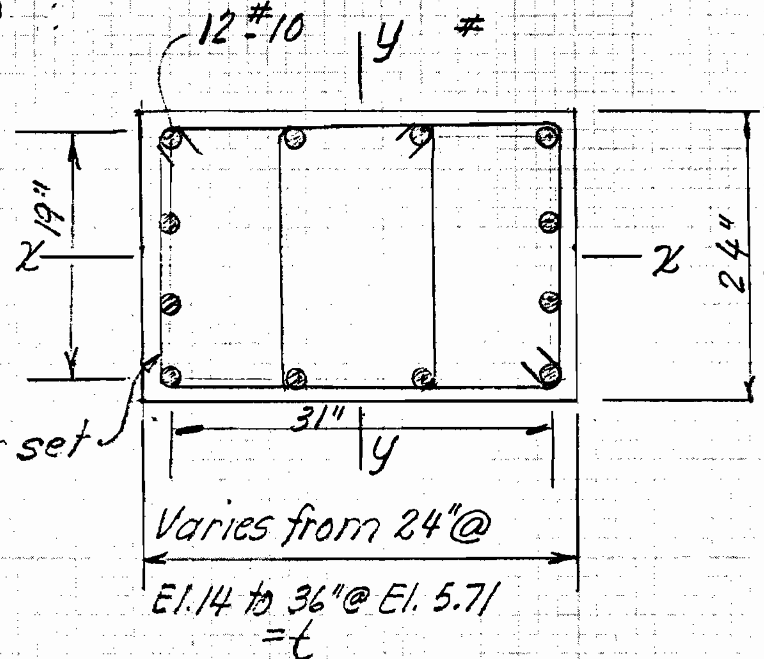
36' OVERHEAD GATE AT HARBOUR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN Col. Wt = $13.65^k + 1.24 = 14.9^k$

Load Case	Column No. 1					Column No. 3					Column No. 5				
	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R	Mx	My	Hx	Hy	R
I	44.2	94.2	4.04	10.10	-13.9	-5.8	142.8	-0.62	15.06	-39.8	-35.8	91.6	-3.42	11.4	-16.9
II	44.2	-94.2	4.04	-10.1	-13.9	-5.8	-142.8	-0.62	-15.06	-39.8	-35.8	-91.6	-3.42	-11.4	-16.9
III	89.0	133.3	-7.95	48.31	-26.4	-49.4	143.1	4.96	48.9	-53.9	-28.4	72.1	-2.99	18.81	-12.62
IV	66.8	165.2	-5.96	39.33	-19.8	-37.1	206.4	3.72	41.15	-40.4	-21.3	109.6	-2.24	16.8	-9.5
V	66.8	-94.2	-5.96	25.1	-19.8	-37.1	-35.46	3.72	-21.6	-40.4	-21.3	-37.5	-2.24	2.72	-9.5
VI	46.7	0	-5.2	0	-14.0	-2.9	0	-0.65	0	-39.9	-33.1	0	2.24	0	-15.7
VII	69.2	133.3	-7.13	48.31	-19.9	-33.4	107.3	-2.45	36.6	-40.4	-22.4	54.1	-1.06	14.1	-9.3
VIII	69.2	-5.8	-7.13	25.14	-19.9	-33.4	-35.46	-2.45	-15.06	-40.4	-22.4	-37.5	-1.06	2.72	-9.3
IX	64.4	133.3	-4.81	48.31	-19.7	-40.6	107.3	4.99	36.6	-40.3	-24.0	54.1	3.42	14.1	-8.6
X	68.2	0	-6.17	0	-20.0	-25.23	0	2.54	0	-57.9	-37.1	0	3.63	0	-14.9
XI	51.2	94.2	-4.63	10.10	-15.0	-18.9	142.8	1.91	15.06	-43.5	-27.8	91.6	2.72	11.4	-11.2
XII	51.2	-94.2	-4.63	-10.10	-15.0	-18.9	-142.8	1.91	-15.06	-43.5	-27.8	-91.6	2.72	-11.4	-11.2
XIII	58.5	0	-5.3	0	-18.6	-9.9	0	1.07	0	-50.63	-43.8	0	4.23	0	-23.6
XIV	43.9	94.2	-3.98	10.10	-14.0	-7.4	142.8	0.80	15.06	-38.0	-32.9	91.6	3.17	11.4	-17.7
XV	43.9	-94.2	-3.98	-10.10	-14.0	-7.4	-142.8	0.80	-15.06	-38.0	-32.9	-91.6	3.17	-11.4	-17.7

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Column No 1) :



Loading Condition - Case III

$N = 26.4^k + 14.9^k = 41.3^k$

$M_x = 89.0'^k$

$M_y = 133.3'^k$

$f_y = 40{,}000$ psi

$f'_c = 3000$ psi

$n = 9$

$b = 24''$

$t = 36''$

$g_x = \frac{19''}{24''} = 0.80$

$g_y = \frac{31}{36} = 0.86$

$A_g = 24 \times 36 = 864 \square''$

Compute $\frac{N}{f'_c A_g} = \frac{41.3}{3(864)} = 0.0159$

ACI-SP3
From Table 26

For $g_x = 0.80$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0159$

For $g_y = 0.86$

$\frac{P_b}{f'_c A_g} = 0.20 > 0.0159$

Tension Controls

Assume 12-#10 bars

$A_{stl} = 15.24$

$P_g = \frac{15.24}{864} = 0.0176$

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 4 \times 1.27 = 10.16 \square''$; $P_{y1} = \frac{10.16}{864} = 0.0118$

$A_{s2} = 2 \times 2 \times 1.27 = 5.08 \square''$ $P_{y2} = \frac{5.08}{864} = 0.0059$

$P'_y = P_{y1} + 0.5 P_{y2}$
$= 0.0118 + 0.0030$
$= 0.0148$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore P'_y = P'_x = 0.0148$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN (EAST SIDE)

COLUMN DESIGN (Column No 1)

Table 34 (ACI-SP3)

$P_g = 0.0176$

For $g_y = 0.86$

$K = \frac{.0059}{.0118} = 0.50$

Read $D'_y = 0.155$

For $g_x = 0.80$

$K = 0.50$

Read $D'_x = 0.154$

Table 26

$f_y = 40{,}000$ psi

$f'_c = 3000$ psi

For $g_y = 0.86$

Read $C'_y = 1.76$

For $g_x = 0.80$

Read $C'_x = 1.88$

$$M_{x-x} = N\left(\frac{D'_x b}{12}\right) + P'_x\left(\frac{t b^2}{C'_x}\right)$$

$$= 41.3\left(\frac{0.154(24)}{12}\right) + 0.0148\left(\frac{36(24)^2}{1.88}\right)$$

$$= 175.96'^{k}$$

$$M_{y-y} = N\left(\frac{D'_y (t)}{12}\right) + P'_y\left(\frac{b t^2}{C'_y}\right)$$

$$= 41.3\left(\frac{0.155(36)}{12}\right) + 0.0148\left(\frac{24(36)^2}{1.76}\right)$$

$$= 280.76'^{k}$$

Column #1

$$\frac{M_x}{M_{x-x}} + \frac{M_y}{M_{y-y}} \leq 1$$

$$\frac{89}{175.96} + \frac{133.3}{280.76} = 0.9805 < 1$$

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No 30 OF ______
ITEM ______ BY LWC DATE 12-4-79
JOB No 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Column 1)

$d = 21.5''$ $n = 9$ $As = 4 \times 1.27 = 5.08$ $b = 36$ $x = kd$ about x-x Axis

$bx \times \frac{1}{2}x = n\,As\,(d-x)$

$36x \times \frac{1}{2}x = (9)(5.08)(21.5-x)$

$18x^2 + 45.72x = 982.98$

$0.3937x^2 + x = 21.5$

$x = 6.228$

jd = lever arm $= d - \frac{x}{3} = 19.424''$

Moment x $= 89.0'^{k} = 89{,}000 \times 12 = 1{,}068{,}000''\#$

$1{,}068{,}000 = C \times 19.424$ $C = 54{,}983\#$

$54{,}983 = \frac{1}{2} fc \times 36 \times 6.228$

$fc = 490$ psi

$T = 54{,}983\# = 5.08 \times fs$

$fs = 10{,}823$ psi

$d = 33.5$ $n = 9$ $As = 4 \times 1.27 = 5.08$ $b = 24$ $x = kd$ about Y-Y Axis

$bx \times \frac{1}{2}x = n\,As\,(d-x)$

$24x \times \frac{1}{2}x = (9)(5.08)(33.5-x)$

$12x^2 + 45.72x = 1531.62$

$0.2625x^2 + x = 33.5$

$x = 9.552$

jd = lever arm $= d - \frac{x}{3} = 30.316$

My $= 133.3'^{k} = 1{,}599{,}600''$ lbs

$1{,}599{,}600 = C \times 30.316''$

$C = 52{,}754\#$

$52{,}754 = \frac{1}{2} fc \times 24 \times 9.552$

$fc = 460$ psi

$T = 52{,}754\# = 5.08 \times fs$

$fs = 10{,}384$

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. EAST SIDE

COLUMN DESIGN (Column 3)

Loading Condition - Case III $M_x = 49.4'^k$ Case IV $M_y = 206.4'^k$ Case III $R = 53.9^k$

$N = 53.9^k + 14.9^k = 68.8^k$

$M_x = 49.4'^k$

$M_y = 206.4'^k$

$f_y = 40{,}000$

$f'_c = 3{,}000$

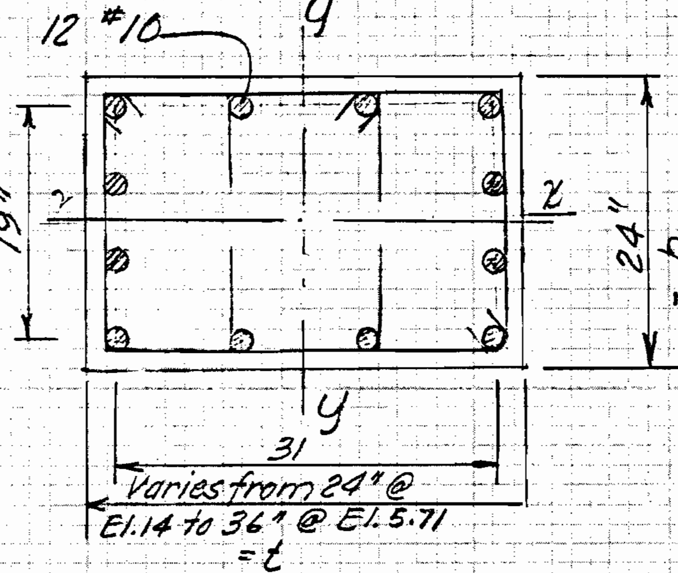
$n = 9$

$b = 24$

$t = 36$

$g_x = \frac{19}{24} = 0.80$

$g_y = \frac{31}{36} = 0.86$



$A_g = 24 \times 36 = 864^{\square''}$ Compute $\frac{N}{f'_c A_g} = \frac{68.8}{3 \times 864} = 0.0265$

ACI-SP3

From Table 26

For $g_x = 0.80$

$\frac{P_b}{f'_c A_g} = 0.207 > 0.0265$

For $g_y = 0.86$

$\frac{P_b}{f'_c A_g} = 0.207 > 0.0265$

Tension Controls

Assume 12 - #10 bars

$A_{stl.} = 15.24^{\square''}$

$P_g = \frac{15.24}{864} = 0.0176$

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 4 \times 1.27 = 10.16^{\square''}$; $P_{y1} = \frac{10.16}{864} = 0.0118$

$A_{s2} = 2 \times 2 \times 1.27 = 5.08^{\square''}$; $P_{y2} = \frac{5.08}{864} = 0.0059$

$P'_y = P_{y1} + 0.5 P_{y2}$
$= 0.0118 + 0.0030$
$= 0.0148$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$
$P_{y2} = P_{x2}$ $\therefore$ $P'_y = P'_x = 0.0148$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ SHEET No 32 OF ____
ITEM ______ BY LWC DATE 12-4-79
JOB No 575-79-E CHKD. BY ____ DATE ____

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

COLUMN DESIGN (Column 3)

Table 34 (ACI-SP3)

$Pg = 0.0176$

For $gy = 0.86$

$k = \frac{.0059}{.0118} = 0.50$

Read $D'y = 0.155$

For $g_x = 0.80$

$k = 0.50$

Read $D'_x = 0.154$

Table 26

$f_y = 40{,}000$ psi

$f'c = 3{,}000$ psi

for $gy = 0.86$

Read $C'y = 1.76$

for $g_x = 0.80$

Read $C'_x = 1.88$

$$Mx\text{-}x = N\left(\frac{D'_x \times b}{12}\right) + P'_x\left(\frac{t\,b^2}{C'_x}\right)$$

$$= 68.8\left(\frac{0.154(24)}{12}\right) + 0.0148\left[\frac{36(24)^2}{1.88}\right]$$

$$= 184.43'^k$$

$$My\text{-}y = N\left(\frac{D'y \times b}{12}\right) + P'y\left(\frac{b\,t^2}{C'y}\right)$$

$$= 68.8\left(\frac{0.155(36)}{12}\right) + 0.0148\left[\frac{24(36)^2}{1.76}\right]$$

$$= 293.55'^k$$

Column 3

$$\frac{M_x}{M_{x\text{-}x}} + \frac{M_y}{M_{y\text{-}y}} \le 1$$

$$\frac{49.4}{184.43} + \frac{206.4}{295.55} = 0.79 < 1$$

ok

Stresses (see Col. 1)

lever arm x-x Axis = 19.424" kd = 6.228

" " y-y Axis = 30.316" kd = 9.552

$M_x = 49.4'^k = 592{,}800''^{\#}$

$592{,}800^{\#} = C \times 19.424 \quad C = 30{,}518^{\#}$

$30{,}518^{\#} = \frac{1}{2} f_c \times 36 \times 6.228 \quad f_c = 272$ psi

$T = 30{,}518^{\#} = 5.08 \times f_s \quad f_s = 6007$ psi

$My = 154.8'^k = 1{,}857{,}600''^{\#}$

$1{,}857{,}600 = C \times 30.316'' \quad C = 61{,}275^{\#}$

$61{,}275 = \frac{1}{2} f_c \times 24 \times 9.552 \quad f_c = 534$ psi

$T = 61{,}275 = 5.08 \times f_s \quad f_s = 12{,}062$ psi

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

COLUMN DESIGN (Column 5)

Loading Condition - Case I or II, M_x Case I or II M_y, Case I or II R.

$N = 16.9 + 14.9 = 31.8^k$

$M_x = 35.8'$

$M_y = 91.6'^k$

$f_y = 40{,}000$ psi

$f'_c = 3{,}000$ psi

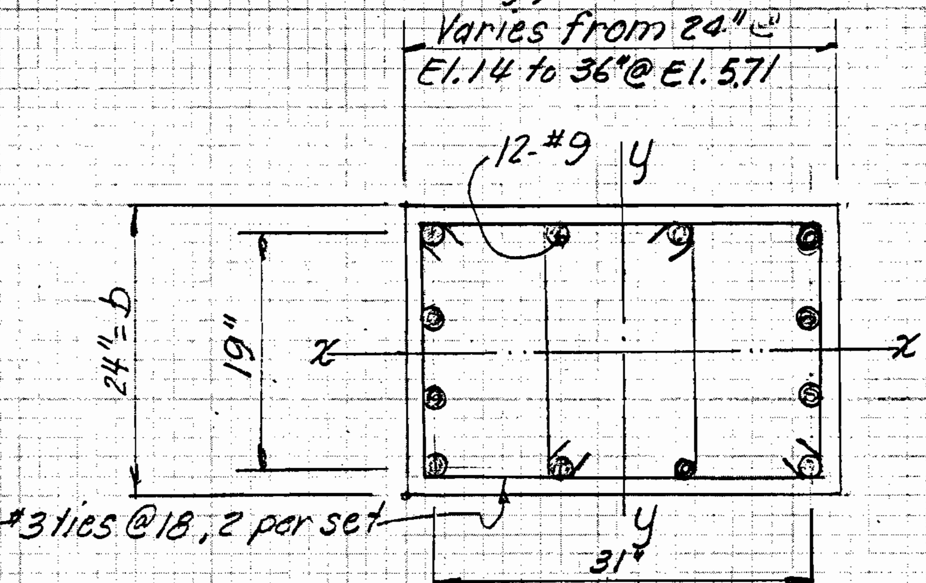
$n = 9$

$b = 24''$

$t = 36''$

$g_x = 0.80$

$g_y = 0.86$



$A_g = 24'' \times 36'' = 864$ sq in

ACI-SP-3

From Table 26

For $g_x = 0.80$

$\frac{P_h}{f'_c A_g} = 0.20 > 0.0123$

For $g_y = 0.86$

$\frac{P_h}{f'_c A_g} = 0.20 > 0.0123$

Tension Controls

Compute $\frac{N}{f'_c A_g} = \frac{31.8}{3(864)} = 0.0123$

$A_{stl.} = 12 \times 1^{\square''} = 12^{\square''}$ Assume 12, #9

$P_g = \frac{12}{864} = 0.0139$

Properties of reinforcement about Y-Y Axis

$A_{s1} = 2 \times 4 \times 1.0 = 8.0^{\square''}$; $P_{y1} = \frac{8.0}{864} = 0.0093$

$A_{s2} = 2 \times 2 \times 1.0 = 4.0^{\square''}$; $P_{y2} = \frac{4}{864} = 0.0047$

$P'_y = P_{y1} + 0.5 P_{y2}$

$= 0.0093 + 0.0024$

$= 0.0117$

Properties of reinforcement about X-X Axis

$P_{y1} = P_{x1}$

$P_{y2} = P_{x2}$

$\therefore P'_y = P'_x = 0.0117$

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

COLUMN DESIGN (Column 5)

Table 34 (ACI-SP3)

$P_g = 0.0139$

For $g_y = 0.86$

$K = \frac{.0047}{.0093} = 0.50$

Read $D'_y = 0.155$

For $g_x = 0.80$

$K = 0.50$

Read $D'_x = 0.154$

Table 26 (ACI-SP3)

$f_y = 40{,}000$ psi

$f'_c = 3{,}000$ psi

for $g_y = 0.86$

Read $C'_y = 1.76$

for $g_x = 0.80$

Read $C'_x = 1.88$

$$M_{x\text{-}x} = N\left(\frac{D'_x \times b}{12}\right) + P'_x\left(\frac{t\,b^2}{C'_x}\right)$$

$$= 41.3\left[\frac{0.154(24)}{12}\right] + 0.0117\left[\frac{36(24)^2}{1.88}\right]$$

$$= 141.77'^{k}$$

$$M_{y\text{-}y} = N\left(\frac{D'_y \times b}{12}\right) + P_y\left(\frac{b\,t^2}{C'_y}\right)$$

$$= 41.3\left[\frac{0.155(24)}{12}\right] + 0.0117\left[\frac{24(36)^2}{1.76}\right]$$

$$= 219.57$$

$$\frac{M_x}{M_{x\text{-}x}} + \frac{M_y}{M_{y\text{-}y}} \leqq 1$$

$$\frac{35.8}{141.77} + \frac{91.6}{141.77} = 0.898 < 1$$

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

COLUMN DESIGN (Column 5)

Stresses: $d = 21.5''$ $n = 9$ $As = 4.0^{\square''}$ $b = 36$ $x = kd$ about X-X Axis

$bx \times \frac{1}{2}x = n\,As\,(d-x)$

$36x \times \frac{1}{2}x = (8)(4)(21.5-x)$

$18x^2 + 32x = 688$

$0.5625x^2 + x = 21.5$

$x = 5.3566$

jd = lever Arm $= 21.5 - \frac{5.3566}{3} = 19.715''$

$Mx = 43.8'^{K} = 525,600''^{\#}$

$525,600 = 19.715 \times C$ $\quad C = 26,660^{\#}$

$26,600^{\#} = \frac{1}{2} fc \times 36 \times 5.3566$

$fc = 276$ psi

$26,600 = 4 \times fs$

$fs = 6,650$ psi

$d = 33.5$ $n = 9$ $As = 4.00$ $b = 24$ $x = kd$ about Y-Y Axis

$bx \times \frac{1}{2}x = n\,As\,(d-x)$

$24x \times \frac{1}{2}x = (8)(4)(31.5-x)$

$12x^2 + 32x = 1088$

$0.375x^2 + x = 33.5$

$x = 8.212$

jd = lever Arm $= 33.5 - \frac{8.212}{3} = 30.763''$

$My = 82.2'^{K} = 986,400''^{\#}$

$986,400 = 30.763 \times C$

$C = 32,064^{\#}$

$32,064 = \frac{1}{2} fc \times 24 \times 8.212$

$fc = 325$ fc

$32,064 = 4 \times fs$

$fs = 8016$ psi

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E
SHEET No 36 OF
BY LWC DATE 12-4-79
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

COLUMN DESIGN - Col. 1

Check Shear

$V = 48.3^k$ (Hy Case III)

$v = \frac{48.3}{33.5 \times 24} = .060 \simeq .060$

No web reinforcement required

Col. 3 - Check Shear

$V = 48.87^k$ (Hy Case III)

$v = \frac{48.87}{33.5 \times 24} = 0.0607 \approx 0.0600$

No web reinforcement required

Col. 5 - Check Shear

$V = 18.81$ (Hy Case III)

$v = \frac{18.81}{33.5 \times 24} = 0.023 < .060$

No web reinforcement required

Note: Use #3 ties @ 18" o.c., 2 per set in the entire column.

Check bond (Columns #1 & 3) $j = \frac{30.316}{33.5} = 0.904$

Perimeters #10 x 12 = 47.88

$\frac{48.87^k}{(47.88)(0.904)(33.5)} = 0.0337 < 0.147$

Column No. 5 o.k by Inspection.

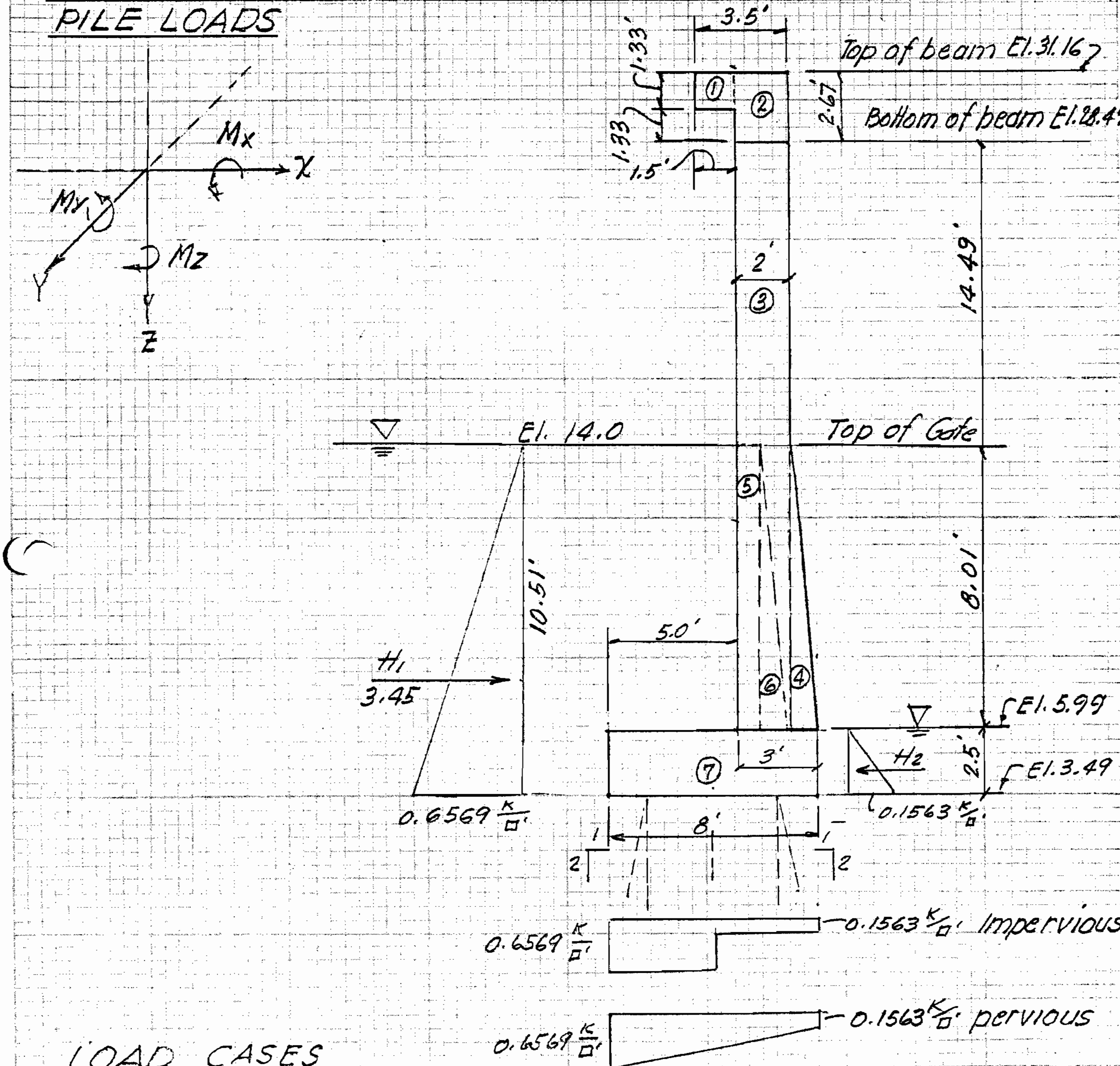
(A)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 37 OF ______
ITEM ______ BY LWC DATE 12-5-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

PILE LOADS



LOAD CASES

Case I - Water @ El. 14, no wind, impervious soil.

Case II - Water @ El. 14, no wind, pervious soil.

Case III - No water, no wind, truck on edge slab, F.S.

Case IV - No water, no wind, truck on edge slab, P.S.

(B)

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 38 OF ______
ITEM ______ BY LWC DATE 12-5-79
JOB Nº 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

PILE LOADS

MOMENTS ABOUT X-X AXIS

ITEM	COMPUTATION	F_Z K	F_Y K	ARM FT.	M_{X-X} FT. K
Gate	Including Misc.	16.0		-3.92	-63
Conc. Bm ①	(1.5)(1.33)(70.0)(0.15)	21.0		-4.25	-89
Conc. Bm ②	(2)(2.67)(70.0)(0.15)	56.1		-6.0	-337
Conc. Col ③	(2)(2)(22.5)(0.15)(3)	40.5		-6.0	-243
T-wall ⑤	(1)(8.01)(42.5)(0.15)	50.8		-5.5	-279
T-wall ⑥	$(0.5)^2(8.01)(42.5)(0.15)$	12.8		-6.17	-79
Conc. Col. ④	(0.5)(1)(8.01)(3)(0.15)	1.8		-7.33	-13
Conc. Slab ⑦	(8)(2.5)(84.5)(0.15)	253.5		-4.0	-1014
SUB-TOTAL		452.5			-2117
Imp. Uplift	-(10.51)(84.5)(4.0)(0.0625)	-222.0		-2.0	444
" "	-(2.5)(84.5)(4.0)(0.0625)	-52.8		-6.0	317
Water Wt	(8.01)(84.5)(5.0)(0.0625)	211.5		-2.5	-529
H_2O Force H_1	$-\frac{1}{2}(10.51)^2(84.5)(0.0625)$		-291.7	3.5	-1021
H_2O Force H_2	$\frac{1}{2}(2.5)^2(84.5)(0.0625)$		16.5	0.833	14
CASE I TOTALS (100%)		395.5	-275.2		-2892
Perv. Uplift	-(0.1563)(84.5)(8)	-105.7		-4.0	423
" "	$-\frac{1}{2}(0.5006)(84.5)(8)$	-169.2		-2.67	452
Water Wt.	(8.01)(84.5)(5)(0.0625)	211.5		-2.5	-529
$-H_2O$ Force H_1	$-\frac{1}{2}(10.51)^2(84.5)(0.0625)$		-291.7	3.5	-1021
H_2O Force H_2	$\frac{1}{2}(2.5)^2(84.5)(0.0625)$		16.5	0.833	14
CASE II TOTALS (100%)		395.5	-275.2		-2778

(C)

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº 39 OF
	ITEM	BY LWC DATE 12-5-79
	JOB Nº 575-79-E	CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)

PILE LOADS

MOMENTS ABOUT X-X AXIS (Cont.)

ITEM	COMPUTATION	F_Z K	F_Y K	ARM FT.	M_{X-X} FT. K
Truck	(2 Trucks) H-20 S-16-44	64.0		–	–
Uplift	-0.1563(8)(84.5)	-105.4		-4	422
	CASE III TOTALS	411.1			-1695
Truck	(2 Trucks) H-20 S-16-44	64.0		-8	-512
Uplift	-0.1563(8)(84.5)	-105.4		-4	422
	CASE IV TOTALS	411.1			2207

MOMENTS ABOUT Y-Y AXIS

ITEM	COMPUTATION	F_Z K	F_X K	ARM FT	M_{Y-Y} FT. K
Conc Slab ②	(8)(2.5)(84.5)(0.15)	253.5		-42.25	-10,710
Conc. Col. ③	(2)(2)(22.5)(0.15)	13.5		-3.5	-47
Conc. Col. ③	"	13.5		-41.5	-560
Conc. Col. ③	"	13.5		-71.5	-965
Conc. Col. ④	(0.5)(1)(8.01)(0.15)	0.6		-3.5	-2
Conc. Col. ④	"	0.6		-41.5	-25
Conc. Col. ④	"	0.6		-71.5	-43
T-Wall ⑤	(1)(8.01)(2.5)(0.15)	3.0		-1.25	-4
T-Wall ⑤	(1)(8.01)(28)(0.15)	33.6		-56.5	-1898
T-Wall ⑤	(1)(8.01)(12)(0.15)	14.4		-78.5	-1130
T-Wall ⑥	$(0.5)^2(8.01)(2.5)(0.15)$	0.8		-1.25	-1
T-Wall ⑥	$(0.5)^2(8.01)(28)(0.15)$	8.4		-56.5	-475
T-Wall ⑥	$(0.5)^2(8.01)(12)(0.15)$	3.6		-78.5	-283
	SUBTOTAL	359.6			-16,143

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

PILE LOADS

MOMENTS ABOUT Y-Y AXIS (Cont.)

	ITEM	COMPUTATION	Fz K	Fx K	ARM FT	MY-Y FT.K
	Gate Bm Wt.		359.6			-16,143
	Reactions					
Case 4K	①	26.5	26.5		-3.5	-93
6K	③	57.94	57.9		-41.5	-2403
	⑤	21.15	21.2		-71.5	-1516
	Water Wt.	(8.01)(5)(82.5)(0.0625)	206.5		-41.25	-8,518
	Imp. Uplift	-(10.51)(82.5)(4)(0.0625)	-216.8		-41.25	8,943
		-(2.5)(82.5)(4)(0.0625)	-51.6		-41.25	2,129
	CASE I TOTAL (100%)		403.2			-17,601
	Gate Bm. Wt Reactions					
	①	26.5	26.5		-3.5	-93
	③	57.94	57.9		-41.5	-2403
	⑤	21.15	21.2		-71.5	-1516
	Water Wt	(8.01)(5)(82.5)(0.0625)	206.5		41.25	-8,518
	Pervious	-0.1563 (8)(82.5)	-103.2		41.25	4257
	Uplift	-0.5006 (8)(82.5)(0.5)	-165.2		41.25	6815
	CASE II TOTAL (100%)		403.4			-17,601
	Gate Bm. Wt. Reaction	See Case IX Moment Dist.				
	①	18.56	18.6		-3.5	-65
	③	53.11	53.1		-41.5	-2,204
	⑤	21.15	21.2		-71.5	-1,516
	Truck Wt	2 trucks H-20 516-44	64.0		-22.5	-1440
	CASES III & IV TOTAL 100%		516.5			21,368

36' OVERHEAD GATE AT HARBOR ROAD EXTENTION (EAST SIDE)

PILE LOADS

MOMENTS ABOUT Z-Z Axis

ITEM	COMPUTATION	F_Y ᴷ	F_X ᴷ	ARM FT	$M_{Z\text{-}Z}$ FT.K
Water on Wall, Gate Cols & Slab	$-\frac{1}{2}(10.51)^2(0.0625)(82.5)$	-284.8		41.25	-11,748
	$\frac{1}{2}(2.5)^2(0.0625)(82.5)$	16.1		41.25	664
CASES I & II TOTALS (100%)		-268.7			-11084
CASES III & IV TOTALS (100%)		0.0			0.0

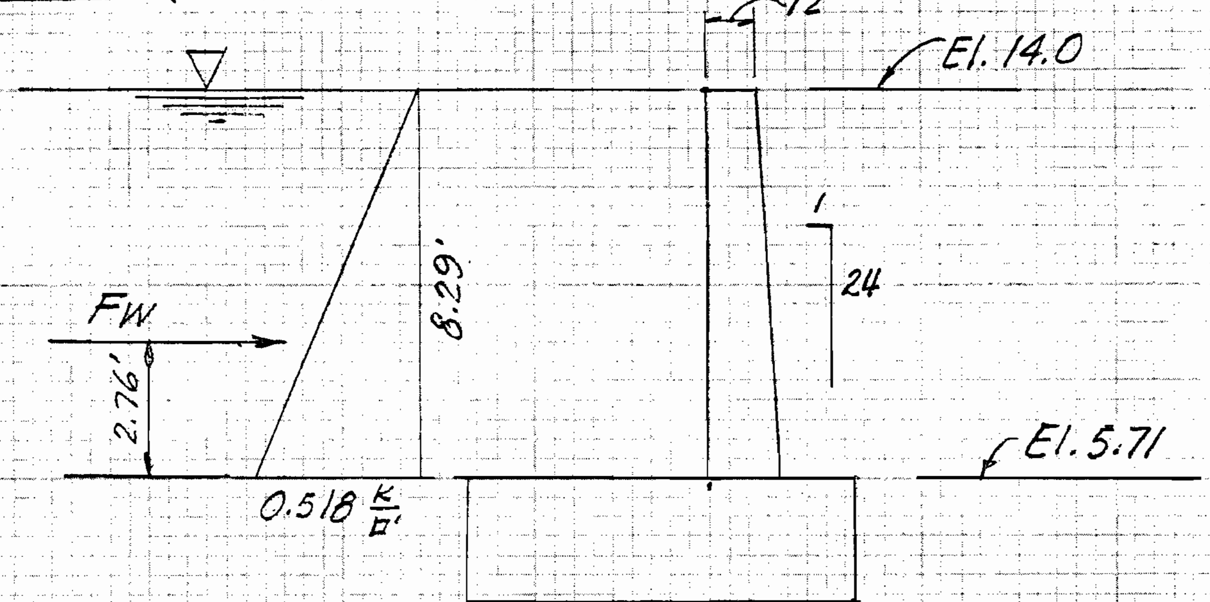
LOAD TABULATION

Load No	ITEM	F_X K	F_Y K	F_Z K	M_X FT.K	M_Y FT.K	M_Z FT.K
1	Conc.+Gate	0	0	452.5	-2117	-20,155	0
2	Water - Vertical	0	0	211.5	-529	-8,518	0
3	Water - Horiz.	0	-275.2	0	-963	0	-11,084
4	Uplift-Impervious	0	0	-268.4	761	11,072	0
5	Uplift-Pervious	0	0	-268.4	761	11,072	0
6	Truck - Case III	0	0	64	0	-1440	0
7	Truck - Case IV	0	0	64	-512	-1440	0

LOAD SUMMATION

Case	ITEM	F_X K	F_Y K	F_Z K	M_X 'K	M_Y 'K	M_Z 'K
I	1+2+3+4	0	-275.2	395.6	-2848	-17601	-11,084
II	1+2+3+5	0	-275.2	395.6	-2848	-17601	-11,084
III	1+6	0	0	516.5	-2117	-21,595	0
IV	1+7	0	0	516.5	-2629	-21,595	0

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)
T-WALL DESIGN (AT MONOLITH)



Horizontal Force on Wall

Water ∴ $F_W = (0.518)(8.29)(0.5) = 2.15^k$

Moment on wall

$M_W = 2.15^k(2.76') = 5.93^{'k}$

Reinforcement required:

$d = 12'' + \frac{8.29'}{2} - 2.5'' = 13.64''$

$A_S = \frac{5.93^{'k}}{(1.44)(13.64)} = 0.30^{\square''}$

Min. $A_S = (0.0025)(12)(13.64) = 0.406^{\square''}$

Use #6 @ 12 floodside; #5 @ 12 protected side.

Check shear and bond.

$v = \frac{2150^{\#}}{12 \times 13.64} = 13\text{ psi} < 60\text{ psi}$ ok

Bond $= \frac{2150}{(2.4)(0.875)(13.64)} = 75\text{ psi} < 186\text{ psi}$ ok

Temp. Steel: $A_S = (0.0020)(12)(13.64 + 2.5) = 0.387^{\square''}$

Min. $A_S = 0.0025(12)(13.64) = 0.406^{\square''}$

Use #6 @ 12 Hor. ea. face.

N-Y ASSOCIATES, INC.
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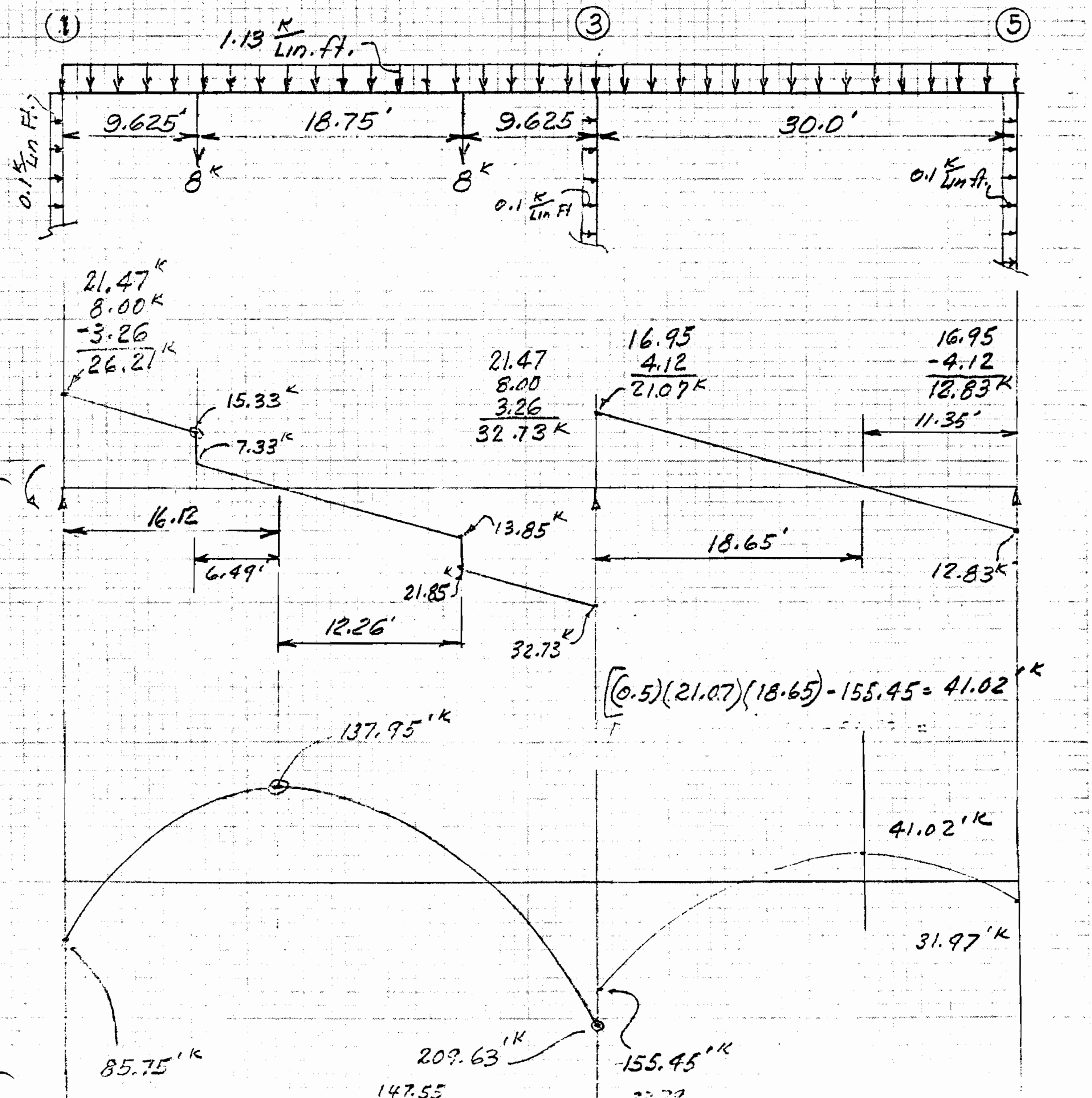
JOB ________ SHEET Nº 43 OF ____
ITEM ________ BY LWC DATE 12-6-79
JOB Nº 575-79-E CHKD. BY ____ DATE ____

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)
CONCRETE BEAM DESIGN (case 5k load)



$+M = [(26.21-15.33)(9.625)(.5)] + [15.33 \times 9.625] + [7.33 \times 6.49 \times 0.5] - 85.75 = 137.95$ 'K

(c)

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JOB ________ SHEET No 44 OF ____
ITEM ________ BY LWC DATE 12-6-79
JOB No 575-79-E CHKD. BY ____ DATE ____

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)
CONCRETE BEAM DESIGN (Cont.)

Postive Reinforcement

Moment = $137.95^{'k}$ b = 24" d = 29" K = 152

$d'reqd = \sqrt{\frac{137.95 \times 12{,}000}{152 \times 24}} = 21.30 < 29"$ o/k

$As = \frac{137.95}{1.44 \times 29} = 3.30\ \square"$

Use ~~4 #9 bar~~ = 4.0 □", Σ_o = 14.18"

Neg. Reinforcement

Moment = 209.63

$d'reqd = \sqrt{\frac{209.63 \times 12000}{152 \times 24}} = 26.25 < 29"$ o/k

$As = \frac{209.63^{'k}}{1.44 \times 29} = 5.02\ \square"$

~~Use 4-#10 bars, As = 5.08 Σ_o = 15.96"~~

Torsion

Conc (1.33')(1.5')(0.15) 21" = 6.28 "k

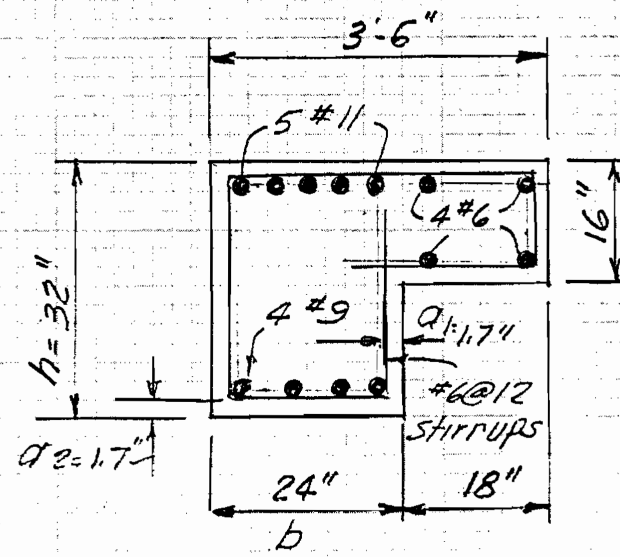
Steel (0.0318) 21 = 0.67 "k
512 x 31.8

6.95 "k

$6.95^{"k} \times \frac{38'}{2} = 132.05^{"k}$

Pt. Load → 8 k × 21 = 168.00

Mt = 300.05 "k



36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)
CONCRETE BEAM DESIGN (cont.)

Bending Moment @ face of support

$M_f = 209.63'^k - (32.73^k \times 1) = 176.9'^k$ $d = 29''$ $h = 32''$ $b = 24''$
$a = 1.7''$ (typ)

$$C_1 = \frac{(h + 0.5b)}{(b - 2a_1)\left(1 + \frac{0.5d}{h - 2a_2}\right)}$$

$$= \frac{(32 + 12)}{(24 - 3.4)\left(1 + \frac{14.5}{32 - 3.4}\right)}$$

$$= \frac{44}{20.6 \times 1.51}$$

$C_1 = 1.414$

$$C_2 = \frac{M_t}{M_f} = \frac{300.05''^k}{176.9'^k \times 12} = 0.141$$

$1 + C_1 C_2 = 1.199$

Design $M = 1.199 \times 176.9 = \underline{212.1'^k}$

Shear @ "d" from support

$$V = 32.73^k - \left[\left(1.13^{k/ft} \times 2\right) + \left(\frac{8^k}{9.625} \times 2\right)\right]$$

$V = 28.8^k$

$$v = \frac{28.8 \times 1000}{24 \times 29} = 41\ psi < 60\ psi\ \text{o/k}$$

Stirrup required:

$X_1 = 24'' - (2 \times 1.7) = 20.6$
$Y_1 = 32 - (2 \times 1.7) = 28.6$

$$\frac{212.1 \times 12000}{(0.8)(20.6)(28.6)(20,000)} = 0.27^{\square''}\quad \frac{0.27}{2} = 0.135^{\square''}$$

#4 @ 12 would do however
#6 @ 12 shown.

Longit. Steel Req'd

$$\frac{212,100\,(20.6 + 28.6)}{(0.8)(20.6)(28.6)(20,000)} = 1.1^{\square''}$$

49.2

Combined Flex. + torsion
$= 5.02 + 1.1 = 6.12^{\square''}$

Use 5 #11 = $7.8^{\square''}$

(E)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB Nº 575-79-E

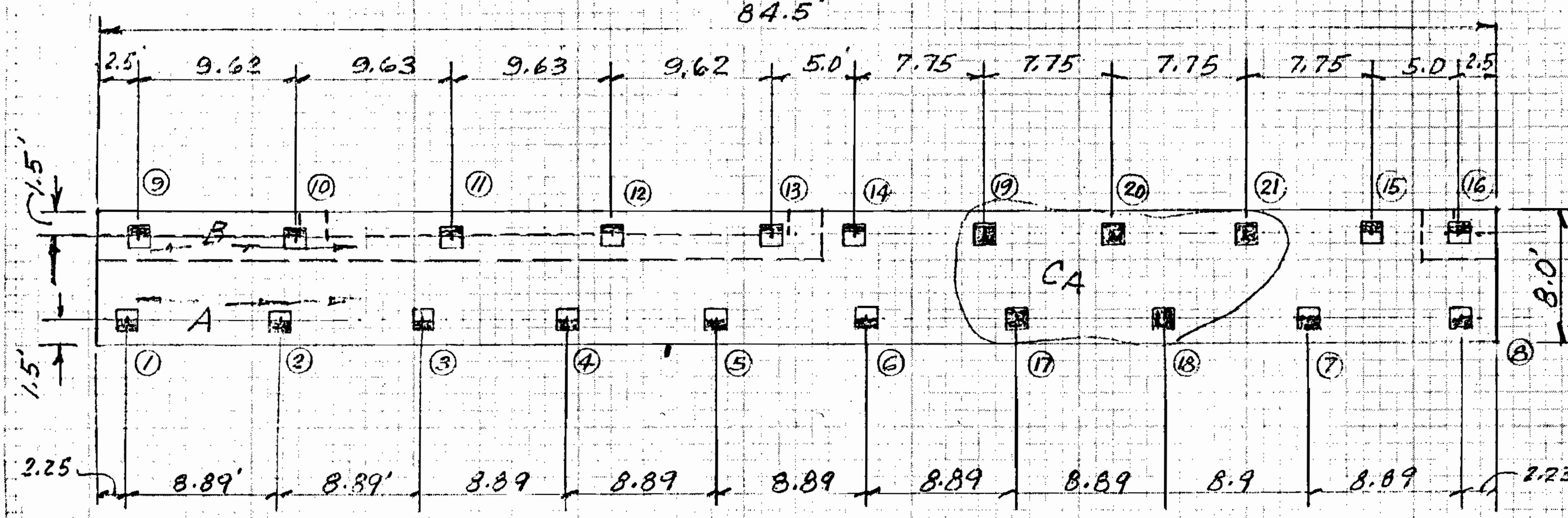
SHEET Nº 46 OF
BY LWC DATE 12-7-79
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTENSION (EAST SIDE)

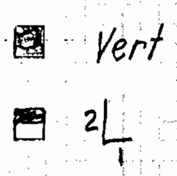
CONCRETE BEAM DESIGN (Cont.)

Bond Max $V = 32.73^{k}$

$$u = \frac{32,730}{(5)(4.43)(0.875)(29)} = 95.7\ psi < 165\ psi \quad \%$$



PILE LAYOUT



N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB 36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (EAST SIDE)
ITEM
JOB No 575-79-E

SHEET No 47 OF
BY LWC DATE 1-8-80
CHKD. BY DATE

01/03/80 13.41

47a

```
10 FLORIDA AVE EAST 575-79
20 HARBOR ROAD EXTENSION ROLLER GATE
30 3,4
40 2,0.0,65
50 1,14,14
60 1,5
70 -1,7.14
80 0,0,0
100 2,90,8
110 2.25,11.14,20.03,28.92,37.81,46.7,73.38,82.27
140 8*-1.5
170 8*0.0
200 2,270,8
210 2.5,12.12,21.75,31.38,41.0,46.0,77.0,82.0
240 8*-6.5
270 8*0.0
300 0,90,5
310 55.59,64.48,53.75,61.5,69.25
340 -1.5,-1.5,3*-6.5
370 5*0.0
2000 0,-275.2,395.6,-2848,-17601,-11084
2010 0,-275.2,395.6,-2848,-17601,-11084
2020 0,0,516.5,-2117,-21595,0
2030 0,0,516.5,-2629,-21595,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        01/03/80     13.428


    PROG. NO. 713-F3-A2-210     13:25:55   01/03/80     MOD 6A, JUN 78

 FLORIDA AVE EAST 575-79
 HARBOR ROAD EXTENSION ROLLER GATE

TOTAL NUMBER OF PILES =    21
```

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-275.2	395.6	-2848.0	-17601.0	-11084.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	-0.0	-13.8
2	-0.4	-0.0	-14.6
3	-0.4	-0.0	-15.4
4	-0.4	-0.0	-16.2
5	-0.4	-0.0	-17.0
6	-0.4	-0.0	-17.8
7	-0.4	-0.0	-20.2
8	-0.4	-0.0	-20.9
9	0.3	-0.0	56.5
15	0.3	-0.0	59.6
17	-0.4	-0.0	32.5
19	-0.4	0.0	12.5

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-275.2	395.6	-2848.0	-17601.0	-11084.0

47c

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-275.2	395.6	-2848.0	-17601.0	-11084.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	-0.0	-13.8
2	-0.4	-0.0	-14.6
3	-0.4	-0.0	-15.4
4	-0.4	-0.0	-16.2
5	-0.4	-0.0	-17.0
6	-0.4	-0.0	-17.8
7	-0.4	-0.0	-20.2
8	-0.4	-0.0	-20.9
9	0.3	-0.0	56.5
15	0.3	-0.0	59.6
17	-0.4	-0.0	32.5
19	-0.4	0.0	12.5

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-275.2	395.6	-2848.0	-17601.0	-11084.0

47d

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	516.5	-2117.0	-21595.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	0.0	30.2
2	-0.1	0.0	29.4
3	-0.1	0.0	28.5
4	-0.1	0.0	27.6
5	-0.1	0.0	26.8
6	-0.1	0.0	25.9
7	-0.0	0.0	23.3
8	-0.0	0.0	22.5
9	-0.0	0.0	32.2
10	-0.0	0.0	30.7
11	-0.0	0.0	29.3
12	-0.0	0.0	27.9
13	-0.0	0.0	26.5
14	-0.0	0.0	25.7
15	-0.0	0.0	21.2
16	-0.0	0.0	20.4
17	-0.0	0.0	28.7
18	-0.0	0.0	27.5
19	-0.0	-0.0	26.7
20	-0.0	-0.0	25.7
21	-0.0	-0.0	24.6

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	0.0	516.5	-2117.0	-21595.0	0.0

47e

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	516.5	-2629.0	-21595.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	0.0	30.4
2	0.2	0.0	28.9
3	0.2	0.0	27.4
4	0.2	0.0	25.9
5	0.2	0.0	24.4
6	0.3	0.0	22.9
7	0.3	0.0	18.5
8	0.3	0.0	17.0
9	-0.3	0.0	33.4
10	-0.3	0.0	31.4
11	-0.3	0.0	29.5
12	-0.3	0.0	27.6
13	-0.3	0.0	25.6
14	-0.3	0.0	24.6
15	-0.3	0.0	18.3
16	-0.3	0.0	17.3
17	0.3	0.0	-13.2
18	0.3	0.0	-15.0
19	0.3	-0.0	62.9
20	0.3	-0.0	61.3
21	0.3	-0.0	59.7

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	0.0	0.0	516.5	-2629.0	-21595.0	0.0

0 13:28:41 01/03/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022

0 PROG NO. 713-F3-A2-210 13:25:55 01/03/80 MOD 6A, JL

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

11021	X	Y	Z	RX	RY	RZ
11022	0.279E-03	-0.456E-01	0.186E-01	0.155E-03	0.105E-05	-0.565E-05
12022	0.279E-03	-0.456E-01	0.186E-01	0.155E-03	0.105E-05	-0.565E-05
13022	-0.108E-03	-0.212E-02	0.172E-01	0.174E-04	0.529E-05	0.218E-05
14022	-0.752E-04	0.335E-01	-0.113E-01	-0.585E-03	0.798E-05	0.152E-05

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 48 OF ______
ITEM ______ BY LWC DATE 1-8-80
JOB Nº 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Pile Reactions from Computer Printout

Case I: Water @ El. 14.0, no wind, impervious soil (100%)

		X^K	Y^K	Z^K
Pile Group "A"	=	-0.4	0	32.5
Pile Group "B"	=	0.3	0	59.6

Case II: Water @ El. 14.0, no wind, pervious soil (100%)

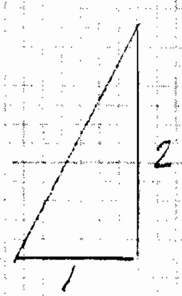
Pile Group "A"	=	-0.4	0	32.5
Pile Group "B"	=	0.3		59.6

Case III: No water, no wind, truck on edge slab, flood side (100%)

Pile Group "A"	=	0.1	0	30.2
Pile Group "B"	=	0.0	0	32.2

Case IV: No water, no wind, truck on edge slab, protected side (100%)

Pile Group "A"	=	0.3		30.4
Pile Group "B"	=	0.3		33.4



$\frac{2}{\sqrt{5}} = 0.8944$

$\frac{1}{\sqrt{5}} = 0.4472$

Pile C_A Vertical Piles

		X^K	Y^K	Z^K
Case II ·	C_A			32.5
Case III	C_A			28.7

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 49 OF
BY LWC DATE 1-8-80
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Monolith - Top face reinforcement (Transverse)

Case II Loading

				Arm	Moment 'K
Pile Av	$= \frac{(32.5)(0.8944)(8)}{84.5} =$	2.75^K	X	3.5	9.63
Pile ℄Av	$= \frac{(0.4)(0.4472)(8)}{84.5} =$	0.02	X	3.5	0.07
+Wt Water	$= (5)(8.01)(0.0625) =$	2.5	X	2.5	6.25
-Wt. Water	$= (3)(10.51)(0.0625) =$	-1.97	X	3.0	-5.91
Wt. Slab	$= (2.5)(5)(0.15) =$	1.88	X	2.5	4.69
Pile CA	$= \frac{(32.5) \times 2}{84.5} =$	0.77	X	3.5	2.70
		5.95^K			17.43 'K

$b = 12''$ $f'c = 3000psi$ $fc = 1050$ $K = 152$ $A = 1.44$ $j = 0.891$ $d = 26''$

$d' reqd = \sqrt{\frac{17.43 \times 12000}{152 \times 12}} = 10.7 < 26''$ ok

$As = \frac{17.43}{1.44 \times 26} = 0.47^{\square''}$

Min $As = (0.0025)(12)(26) = 0.78$ use #8@12 top of slab

Shear and bond ok by inspection

36' OVERHEAD GATE AT HAROR ROAD EXTENSION (EAST SIDE)

Monolith - Bottom Face Reinforcement

Case III Loading

			Arm	
Pile AV	$= \frac{(30.2)(0.8944)(8)}{84.5}$	$= 2.56^k$	$\times 3.5$	$= 8.96$
Pile XAV	$= \frac{(0.1)(0.4471)(8)}{84.5}$	$= 0.004^k$	$\times 3.5$	$= .01$
Pile CA	$= \frac{28.7 \times 2}{84.5}$	$= 0.68$	$\times 3.5$	$= 2.38$
+Water Wt	$= \cancel{13} \times 2.5 \times 0.0625$	$= 0.47$	$\times 3.0$	$= 1.41$
2 trucks	$= -\frac{64}{84.5}$	$= -0.76$	$\times 5.0$	$= -3.8$
Wt slab	$= -2.5 \times 5 \times 0.15$	$= -1.88$	$\times 2.5$	$= -4.7$
		1.07^k		$4.26'^k$

Use Min. $A_s = 0.0025 \times 12 \times 26 = 0.78\,\square''$

Use #8 @ 12 bottom face transverse

Shear and bond ok by inspection.

N-Y ASSOCIATES, INC.
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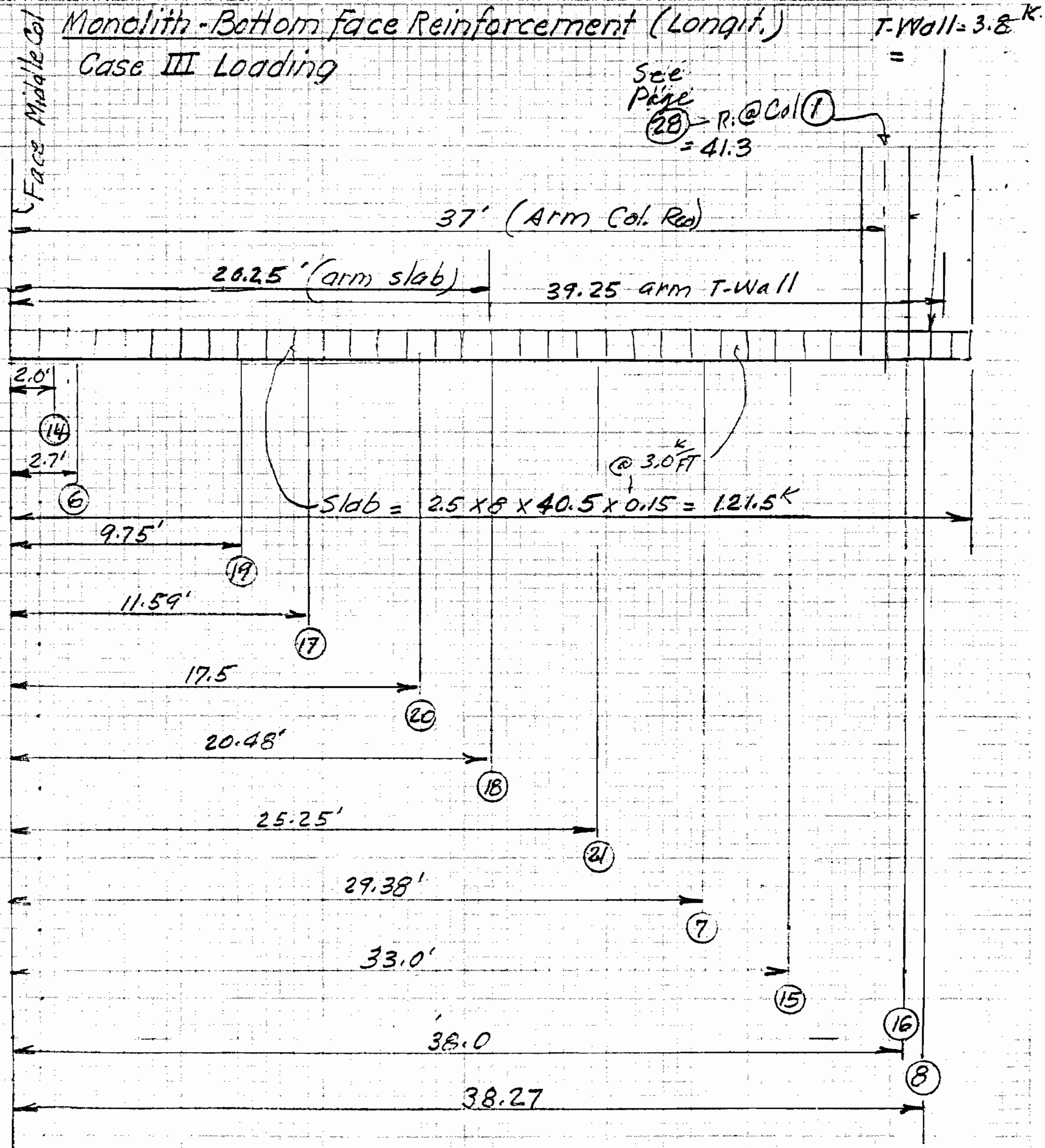
JOB ________ SHEET No 51 OF ____
ITEM ________ BY LWC DATE 1-9-80
JOB No 575-79-E CHKD. BY ____ DATE ____

36' OVERHEAD GATE AT HARBOR ROAD EXTENT. (East Side)

Monolith - Bottom face Reinforcement (Longit.)

Case III Loading



N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 575-79-E

SHEET No 52 OF
BY LWC DATE 1-9-80
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTENT. (EAST SIDE)

Monolith - Longitudinal Reinforcement (Bottom face)

Moment @ Edge Middle Col. @ Gate Opening Load Cond. III

Item	Pile load	Reaction	Arm	Moment	
Pile #14	25.7	23.0	2.0	46	
#6	25.9	23.2	2.7	63	
Vert. Piles #19	26.7	26.7	9.75	260	
#17	28.7	28.7	11.59	333	
#20	25.7	25.7	17.5	450	
#18	27.5	27.5	20.48	563	
#21	24.6	24.6	25.25	621	
#7	23.3	20.8	29.38	611	
#15	21.2	19.0	33.0	627	3574
#16	20.4	18.2	38	692	
#8	22.5	257.5 20.1	38.27	769	5035
Conc. Slab		-121.5	20.25	- 2460	
T-Wall		- 3.8	39.25	- 149	
See Page 28 Col. 1		-41.3	37.0	- 1528	
Trucks		-64	18	- 1152	
		26.9		- 254 ''K	

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JOB
ITEM
JOB No 575-79-E

SHEET No 53 OF
BY LWC DATE 1-10-80
CHKD. BY DATE

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Monolith - Bottom Face Reinforcement (Longitudinal)

$M = 254'^{K}$ $b = 8 \times 12 = 96''$ $K = 152$ $d = 26''$ $a = 1.44$

$d = \sqrt{\dfrac{254 \times 12{,}000}{152 \times 96}} = 14.45'' < 26''$

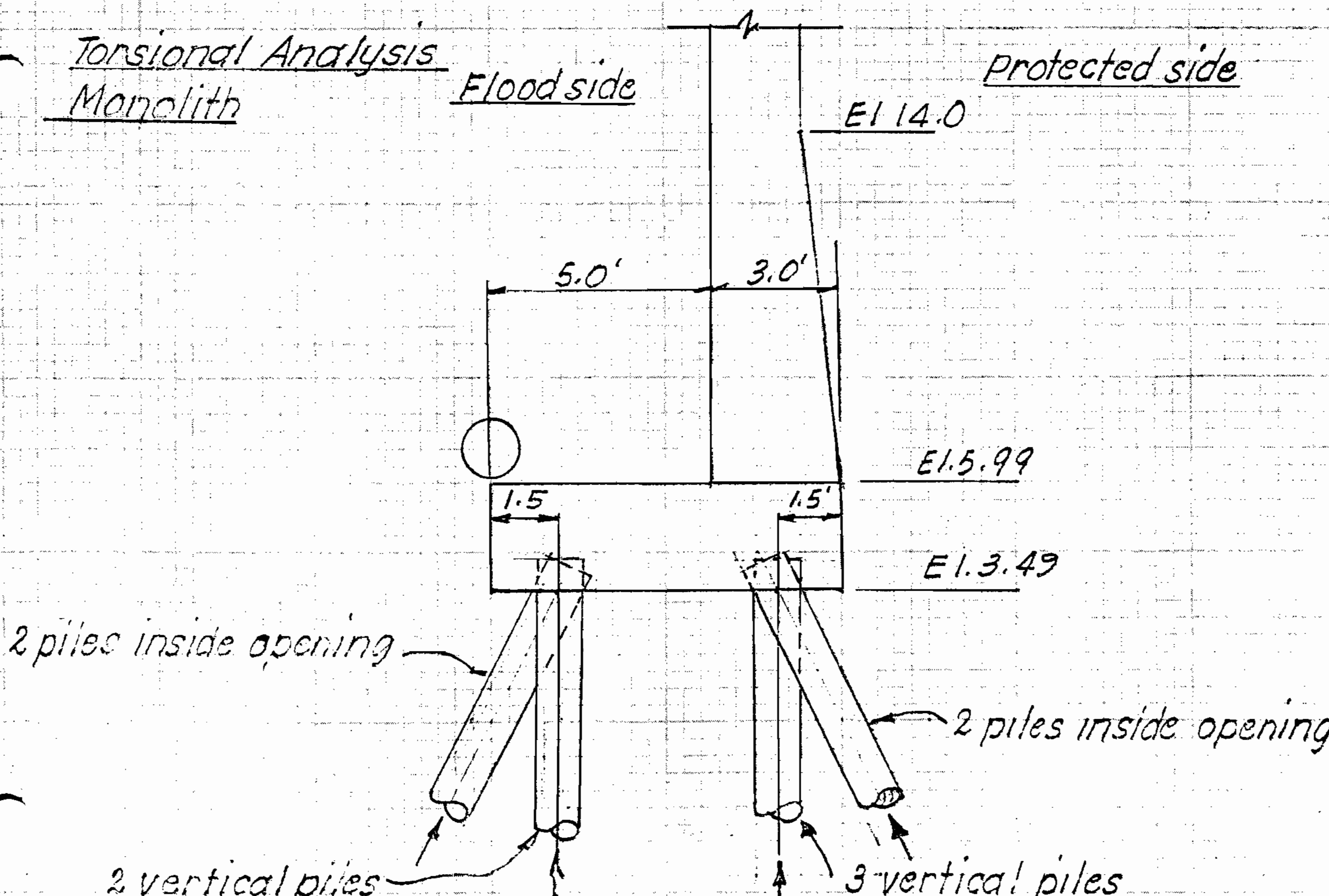
$A_s = \dfrac{254}{1.44 \times 26} = 6.784^{\square''}$

$\dfrac{6.784}{8} = 0.85^{\square''}$ State Highway drawing show #11@12 bott. face
" #8@12 top face

Min reinf. top face $= 0.0025 \times 12 \times 26 = 0.78^{\square''}$

Shear and bond ok by inspection.

Torsional Analysis
Monolith



Case III Loading, no water, no wind, truck on edge slab, Flood side

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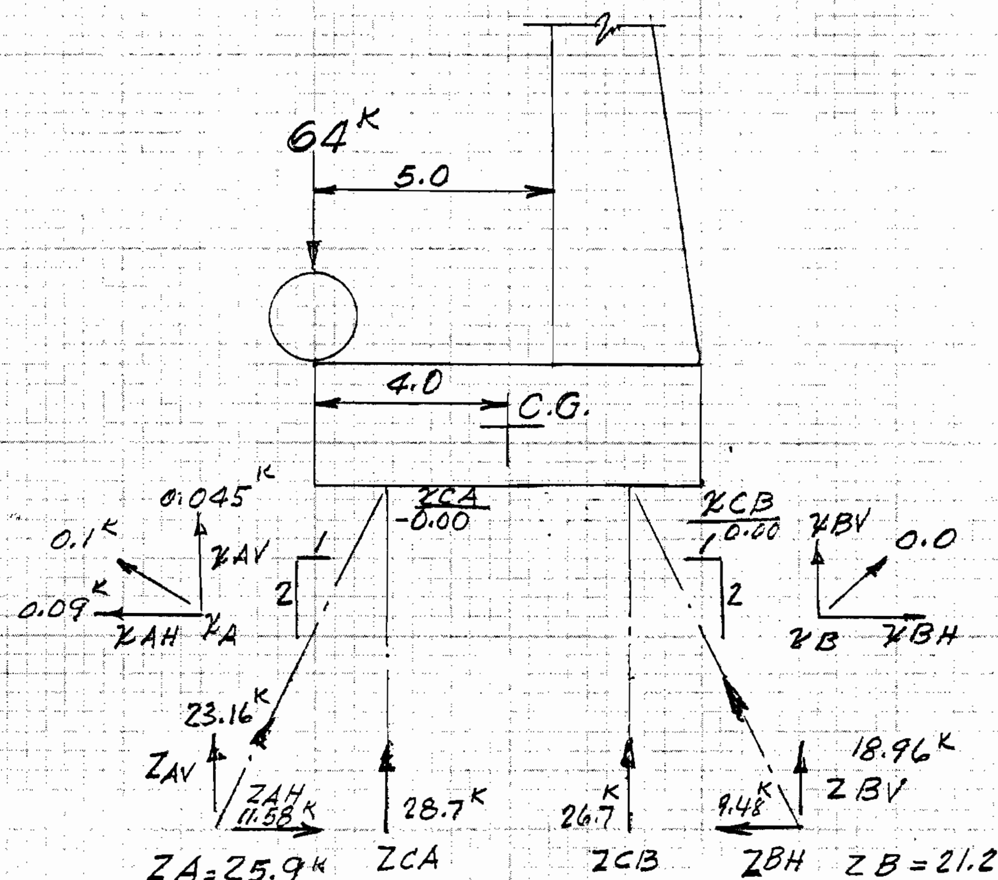
JOB ______ SHEET No 54 OF ______
ITEM ______ BY LWC DATE 1-10-79
JOB No 575-79-E CHKD. BY ______ DATE ______

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Torsional Analysis (Cont.) Monolith ~ Case III



ITEM	V (K)	H (K)	Arm (K)	Moment (Ft.K)
2 Trucks	-64		4.0	-256.0
ZAV = 2 (23.16)	46.32		2.5	115.8
ZAH = 2 (11.58)		23.16	-1.25	-29.0
XAV = 2 (0.045)	0.09		2.5	0.23
XAH = 2 (0.09)		0.18	-1.25	-0.23
ZCA = 2 (28.7)	57.4		2.5	143.75
ZCB = 2 (26.7	53.4		-2.5	-133.5
ZBV = 2 (18.96)	37.92		-2.5	-94.8
ZBH = 2 (9.48)		18.96	-1.25	-23.7
				-277.45

36' OVERHEAD GATE AT HARBOR ROAD EXTEN. (East Side)

Torsional Anaylsis (Cont) Monolith

Note: Torsional moment divides equally between columns.

$$Mt = \frac{277.45}{2} = 138.73'^{K}$$

$n = 5$ (Australian Code)

$b = 2.5' \times 12 = 30''$

$h = 8' \times 12 = 96''$

$$v_t = \frac{n\,mt}{b^2 h} = \frac{(5)(138.73)(12000)}{(30)^2\,96} = 96.34 > 60\ psi$$

Stirrups Req'd

$$\text{Min. stirrup spacing} = \frac{27}{2} = 13.5''$$

Torsional Moment taken by concrete

$$Mt = \frac{(0.75)v_t\,b^2 h}{5} = \frac{(0.75)(0.06)(30)^2 96}{5} = 777.6''^{K} = 64.8'^{K}$$

Reinf Req.

bc Call small dim. 24''

bh Call large dim 90''

$$A_{ST.} = \frac{Mt's}{(0.8)(24)(90)(20{,}000)}$$

$$Mt's = 138.73 - 64.8 = 73.93'^{K}$$

$$A_{st} = \frac{64{,}800(12)(12)}{(0.8)(24)(90)(20{,}000)} = 0.27\,\square''$$

Use #5 @ 12 ties (Highway Plan)

Additional Longit. Steel req'd @ Gate Opening

$$As = \frac{M't\,(bc + bh)}{0.8\,bc\,bh\,fs} = \frac{64800(12)(24+90)}{(0.8)(24)(90)(20{,}000)} = 2.57\,\square''$$

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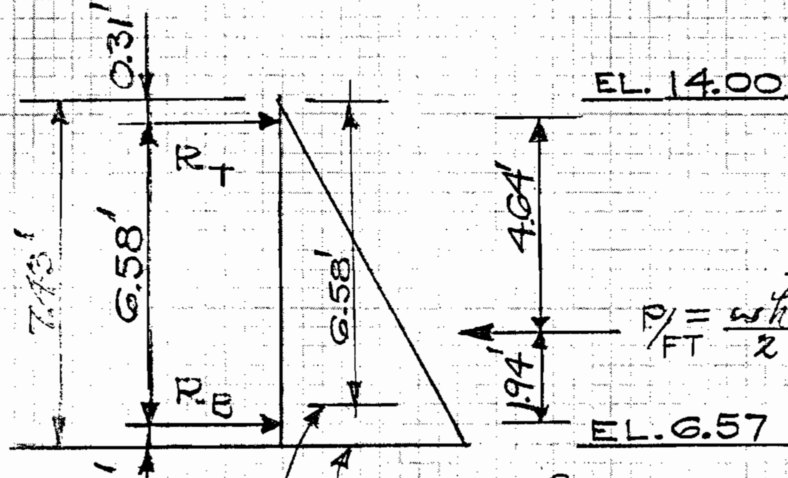
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST PP GATE BY NDL DATE 8-29-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN



$$\begin{array}{r} 23.25 \\ 7.11 \\ \hline 16.14 \end{array} \qquad \begin{array}{r} 16.14 \\ 1.94 \\ \hline 14.20 \end{array}$$

$$P/_{FT} = \frac{wh^2}{2} = \frac{62.5 \times 7.43^2}{2} = 1{,}720 \text{ PLF}$$

$$p = wh = 62.5 \times 7.43 = 464 \text{ PSF}$$

MAX. SKIN STRESS — $w = 62.5 \times 6.58 = 411$ PSF

REACTIONS

$$R_T = 1{,}720 \times \frac{1.94}{6.58} = 510 \text{ PLF} \qquad R_{HTW} = 1{,}720 \times 16.12 \times \frac{1.94}{16.14} = -3.33^K$$

$$R_B = 1{,}720 - 510 = 1{,}210 \text{ PLF} \qquad R_{HBW} = 1{,}720 \times 16.12 \times \frac{14.2}{16.14} = -24.39^K$$

GIRDER DESIGN

LENGTH = OPENING + TO THE HINGE ℄ + TO THE BAR ℄
= 31.5 + 1.08 + 0.56 = 33.14 FT

TOP GIRDER

$$M = \frac{wl^2}{8} = \frac{510 \times 33.14^2 \times 12}{8} = 840{,}200 \text{ IN·LB}$$

$$S_{REQ'D} = \frac{840{,}200}{20{,}000} = 42.0 \text{ IN}^3$$

TRY W18x55

$S = 98.4 \text{ IN}^3$

$I_x = 891 \text{ IN}^4$

$A = 16.2 \text{ IN}^2$

SWING GATE DESIGN

$$\Delta = \frac{5 w \ell^4}{384 EI} = \frac{5 \times 510 \times \overline{(33.14 \times 12)}^4}{384 \times 29 \times 10^6 \times 891 \times 12} = 0.54\ IN$$

$$\Delta_{ALLOW} = \frac{\ell}{360} = \frac{33.14 \times 12}{360} = 1.10\ IN > 0.54\ IN$$

$$f = \frac{M}{S} = \frac{840,200}{98.4} = 8,540\ PSI$$

USE W18X55 ⟸

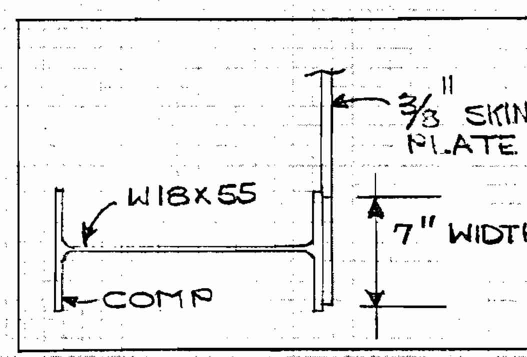
BOTTOM GIRDER

$$M = \frac{w\ell^2}{8} = \frac{1,210 \times \overline{33.14}^2 \times 12}{8} = 1,993,300\ IN\text{-}LB$$

$$S_{REQ'D} = \frac{1,993,300}{20,000} = 99.67\ \overline{IN}^3$$

TRY W18X55
WITH 7" WIDTH
OF 3/8" SKIN
PLATE EFF.

$S_c = 104.6\ \overline{IN}^3$
$I_x = 1,083\ \overline{IN}^4$
$A = 18.8\ \overline{IN}^2$



$$\Delta = \frac{5 w\ell^4}{384 EI} = \frac{5 \times 1,210 \times (\overline{33.14 \times 12})^4}{384 \times 29 \times 10^6 \times 1,083 \times 12} = 1.05\ IN$$

$$\Delta_{ALLOW} = \frac{\ell}{360} = \frac{33.14 \times 12}{360} = 1.10\ IN > 1.05\ IN$$

$$f = \frac{M}{S} = \frac{1,993,300}{104.6} = 19,060\ PSI$$

USE W18X55 ⟸

N-Y ASSOCIATES, INC.
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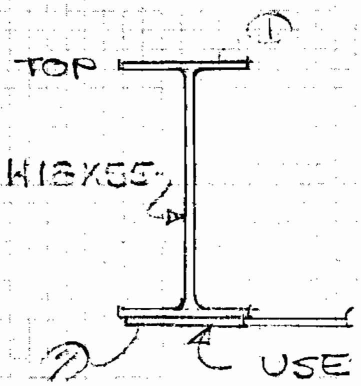
JOB ______ SHEET Nº ______ OF ______
ITEM WEST RR GATE BY NDL DATE 9-18-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN



	A	y	Ay	Ay²	I_o
1	16.2	0	0	0	891
2	2.62	9.25	24.23	224.1	
	18.82		24.23	224.1	891

$\bar{y} = 24.23 / 18.82 = 1.29\ IN$

$I = 891 + 224.1 - 18.82 \times \overline{1.29}^2 = 1083\ \overline{IN}^4$

USE 7" WIDTH OF 3/8" SKIN PLATE IN CALCULATION OF "I".

$S_{TOP} = \dfrac{1{,}083}{10.35} = 104.64\ \overline{IN}^3$

N-Y ASSOCIATES, INC.
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JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 9-6-79
JOB No 575-79 CHKD. BY ______ DATE ______

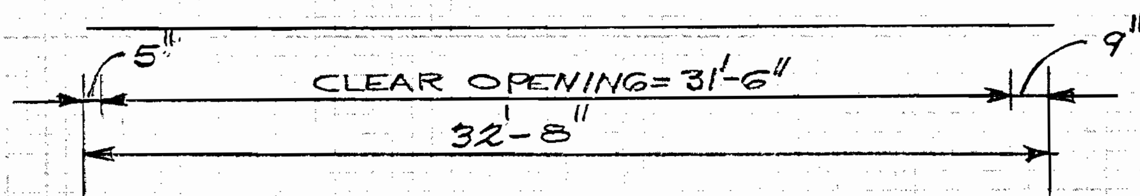
SWING GATE DESIGN

SKIN PLATE

MINIMUM THICKNESS = 5/16" USE 3/8" THICK PLATE

$$S = \frac{bt^2}{6} = \frac{12 \times (0.375)^2}{6} = 0.281 \ IN^3/FT$$

$$M_{ALLOW} = f S = 20{,}000 \times 0.281 = 5{,}620 \ IN \cdot LB$$



TRY 8 CENTER SPACES AT 3'-3" AND 2 END SPACES AT 3'-4".

LENGTH = 8 X (3-3) + 2 X (3-4) = 32'-8"

EXTERIOR SPAN

$$M = \frac{wl^2}{10} = \frac{411 \times 3.33^2}{10} = 456 \ FT \cdot LB/FT$$

OR 5,470 IN·LB/FT

$$ALLOW. \ SPAN = \left[\frac{10 \times M}{w}\right]^{1/2} = \left[\frac{10 \times 5{,}620}{411 \times 12}\right]^{1/2} = 3.37 \ FT$$

INTERIOR SPAN

$$ALLOW. \ SPAN = \left[\frac{12 \times 5{,}620}{411 \times 12}\right]^{1/2} = 3.69 \ FT$$

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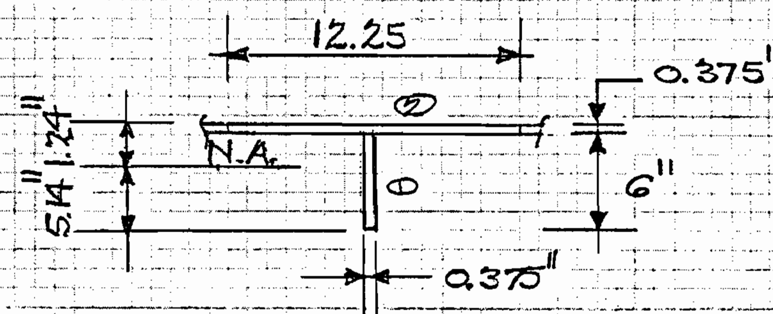
JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 9-6-79
JOB No 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

STIFFENER

TRY BAR 6X3/8



USE AISC 1.9.1.2, $\frac{b}{t} = 95.0/\sqrt{F_y} = 95.0/\sqrt{36} = \frac{b}{0.375}$

$\therefore b = 5.94''$

$W = 2b + t_w = 2 \times 5.94 + .375 = 12.25''$

SHEAR LAG CONTROLS DUE TO FLANGE BEING IN TENSION, HOWEVER, ABOVE WIDTH IS CONSERVATIVE.

	A	y	Ay	Ay²	I₀
1	2.25	3.375	7.59	25.6	6.75
2	4.59	.188	0.86	0.2	0.05
	6.84		8.45	25.8	6.80

$\bar{y} = \frac{\Sigma Ay}{\Sigma A} = \frac{8.45}{6.84} = 1.24 \text{ IN}$

$I = I_o + \Sigma Ay^2 - A\bar{y}^2 = 6.80 + 25.8 - 6.84 \times \overline{1.24}^2$
$= 22.1 \text{ IN}^4$

$S_{TOP} = \frac{I}{\bar{y}} = \frac{22.1}{1.24} = 17.82 \text{ IN}^3$

$S_{BOT} = \frac{I}{d - \bar{y}} = \frac{22.1}{6.375 - 1.24} = 4.30 \text{ IN}^3$

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JOB ______ SHEET No ______ OF ______
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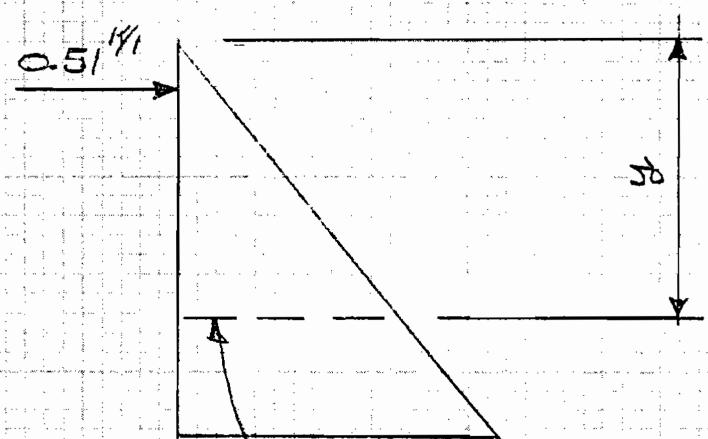
SWING GATE DESIGN



POINT OF ZERO SHEAR = POINT OF MAXIMUM MOMENT

$$\tfrac{1}{2}(0.0625)\,\bar{y}^2 = 0.51^{K/I}$$

$$y = 4.04 \text{ FT}$$

$$\text{MOMENT} = 0.51(4.04-0.31) - \tfrac{1}{6}(0.0625)\,\overline{(4.04)}^3$$

$$= 1.22 \text{ FT-KIPS/FT}$$

$$\text{M/STIFF} = 1.22 \times 12 \times 3.25 = 47.6 \text{ IN-KIPS/STIFF}$$

OR 47,600 IN-LB/STIFF

$$f_{COMP} = \frac{47{,}600}{4.30} = 11{,}070 \text{ PSI}$$

$$\frac{b}{t} = \frac{6}{0.375} = 16 \quad \text{FOR BAR } 6 \times 3/8$$

$$\frac{b}{t}_{ALLOW} = \frac{95.0}{\sqrt{F_y}} = \frac{95.0}{\sqrt{33}} = 16 \text{ O.K.}$$

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JOB ______ SHEET Nº ______ OF ______
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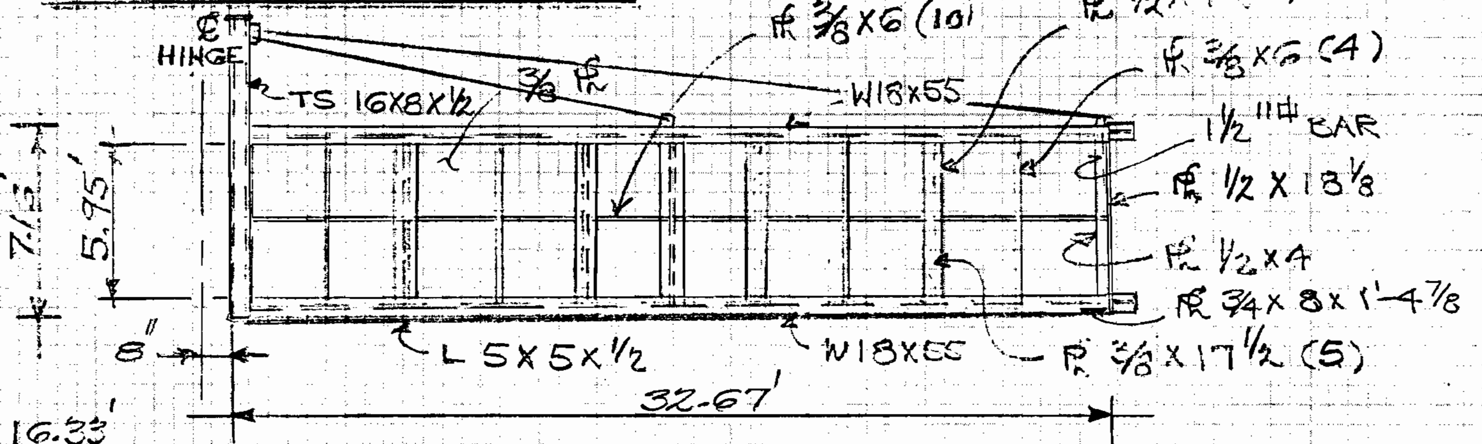
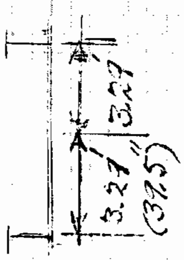
SWING GATE DESIGN



16.33'
.67
17.00 FT

		WEIGHT	x	Wx
3/8 PL	7.15X32.67X15.3 =	3,580 LB	17.0 FT	60,860 FT-LB
W18X55	2X55X33.58 =	3,690	17.0	62,730
PL 1/2X18 1/8	6.52X31.5 =	210	33.33	7,000
PL 3/8X17 1/2 (5)	5X6.52X22.3 =	730	17.0	12,410
PL 3/8X6 (10)	32.67X7.65 =	250	17.0	4,250
PL 3/8X6(4)	4X6.52X7.65 =	200	17.0	3,400
PL 1/2X4(5)	5X5.95X6.8 =	200	17.0	3,400
PL 1/2X4	5.95X6.8 =	40	33.17	1,330
L5X5X1/2	31.16X16.2 =	510	17.0	8,670
1 1/2" ⌀ BAR	7X 7.65 =	50	33.14	1,660
PL 3/4X8X1-4 7/8	1.41X 20.4 =	30	33.14	990
WELD 1/4	0.21X(4X32.7+16X6.84)=	50	17.0	850
SEAL		90	17.0	1,530
TS 16X8X1/2	17 X 78 =	1,330	1.0	1,330
		10,960 LB		170,410 FT-LB



$$I = \overset{90}{2 \times 45} + \overset{50{,}552}{2 \times 16.2 \times \overline{37.5}^{2}} + \overset{15{,}112}{0.375 \times \frac{\overline{78.5}^{3}}{12}}$$

$$= 65{,}757 \ \mathrm{IN}^4$$

$$A = 0.375 \times 78.5 = 29 \ \mathrm{IN}^2$$

$$d = 170{,}410 / 10{,}960 = 15.55'$$

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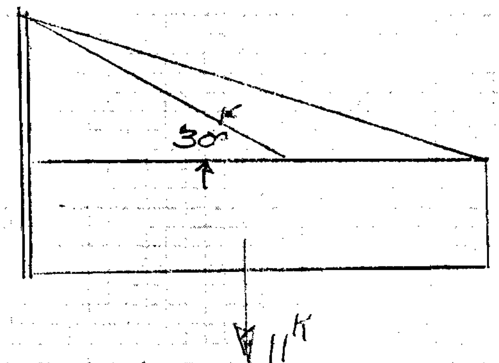
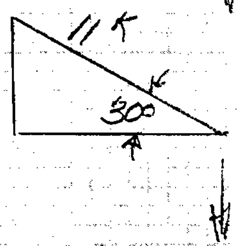
JOB
ITEM WEST RR GATE
JOB No 575-79

SHEET No OF
BY NDL DATE 4-3-80
CHKD. BY DATE

TURNBUCKLES

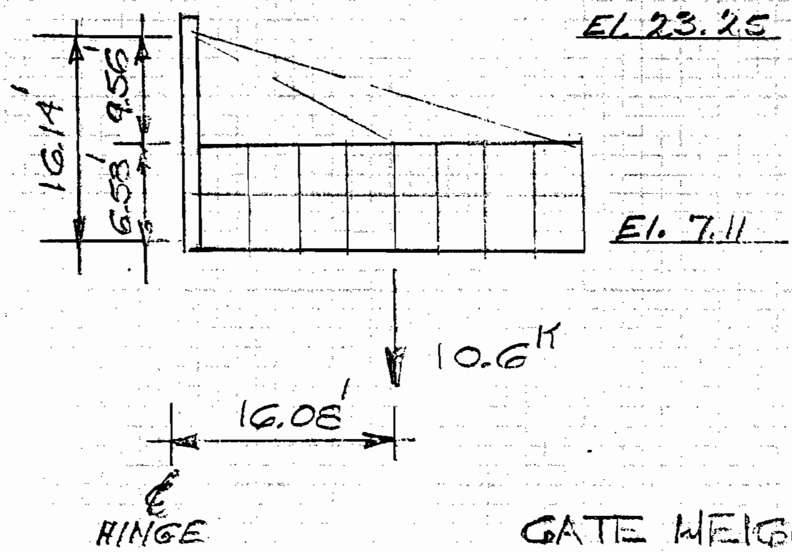


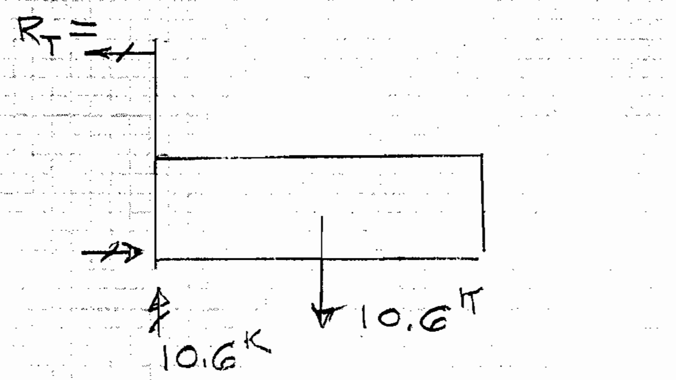


$\frac{11}{2} = 5.5^K$ COULD USE $1\frac{1}{8}$" ROD TURNBUCKLE

BASED ON WEST SPUR GATE ANALYSIS (p. 62c), THE DEAD WEIGHT FORCE IS CRITICAL.

HINGE POST





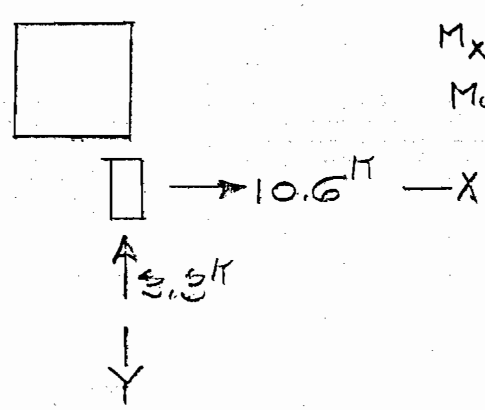
$R_T = 10.6 \times 16.08 / 16.14 = 10.6^K$

GATE WEIGHT FORCE

WATER FORCE

$R_{T_W} = 3.3^K$ (P. 1)

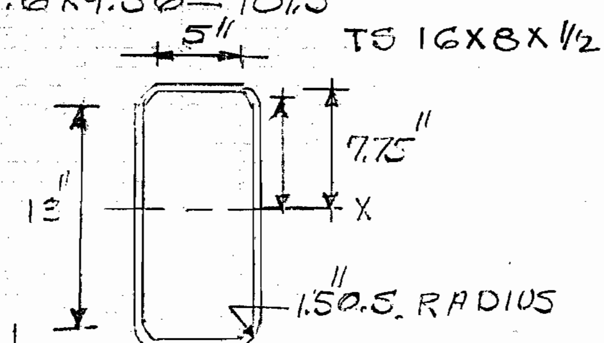
MOMENT



$M_x = 3.3 \times 9.56 = 31.5^{'K}$

$M_y = 10.6 \times 9.56 = 101.3^{'K}$

TS 16X8X1/2



$f_x = \dfrac{31.5 \times 12}{87} = 4.4$ KSI

$f_y = \dfrac{101.3 \times 12}{59} = 20.6$ KSI

$A = 0.5 \times 2(15 + 5) + 2 \times 1.5708 (\overline{1.5^2 - 1^2})$ 7.05

$= 25.1$ IN^2

$I_x = \dfrac{15^3}{12} + 2 \times 5 \times 0.5 \times \overline{7.75}^2 +$

$\dfrac{4.4}{27.6} + \dfrac{20.6}{27.6} = 0.16 + 0.75 = 0.91 < 1.0$ $= 183 + 300 + 210 = 694$ IN^4

▷ $27.6 = 0.6 f_y = 0.6 \times 46 = 27.6$ KSI

$S_x = 694/8 = 87$ IN^3 $S_y = 59$ IN^3

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JOB ______ SHEET Nº ______ OF ______
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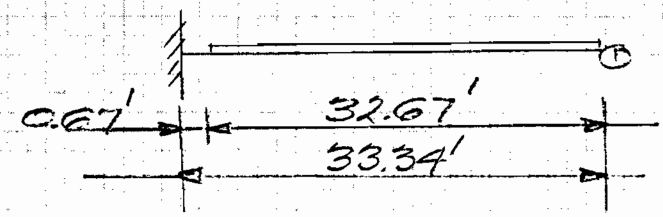
SWING GATE DESIGN

DEFLECTION AT END



$$\omega = \frac{9{,}620}{32.67} = 295 \text{ PLF}$$

USE LOAD OVER FULL LENGTH

$$\Delta_{\textcircled{\scriptsize T}} = \frac{w l^4}{8EI} = \frac{295 \times \overline{(33.34 \times 12)}^4}{8 \times 29 \times 10^6 \times 65{,}759 \times 12}$$

$$= 0.04 \text{ IN}$$

HINGE FORCE

$$F = \frac{164{,}830}{6.58} = 25{,}000 \text{ LB}$$ (HORIZ, TOP & BOTTOM HINGE)

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JOB ______ SHEET No ______ OF ______
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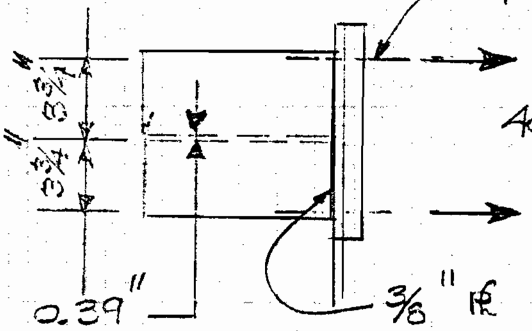
SWING GATE DESIGN

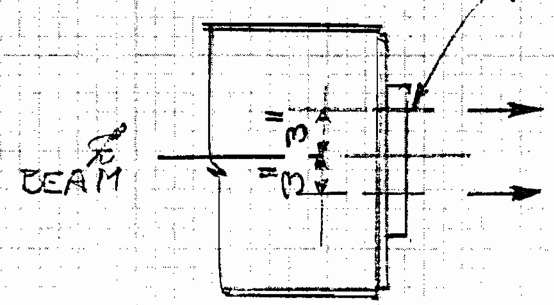
UPPER HINGE CONNECTION

$$F = \frac{M}{4d} = \frac{164{,}830}{4 \times 6.58} = 6{,}260\ LB$$



$$S = \frac{bt^2}{6} = \frac{15 \times \overline{0.375}^2}{6} = 0.35\ IN^3$$

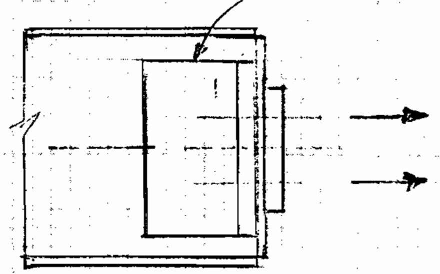
$$M = 60\%\ Fd = 0.6 \times 2 \times 6{,}260 \times 3.75$$
$$= 28{,}170\ IN{\cdot}LB$$



$$f = \frac{M}{S} = \frac{28{,}170}{0.35} = 89000\ PSI$$
N.G.

TRY ANGLE
L 6x6x3/4x1'-3"

$$M = 0.6 \times 2 \times 6{,}260 \times \left(3.75 - \frac{0.39}{2} - \frac{0.75}{2}\right)$$
$$= 23{,}900\ IN{\cdot}LB$$



$$S = \frac{bt^2}{6} = \frac{15 \times \overline{0.75}^2}{6} = 1.4\ IN^3$$

$$f = \frac{M}{S} = \frac{23{,}900}{1.4} = 17{,}000\ PSI$$

USE L6x6x3/4

Changed to Turnbuckles

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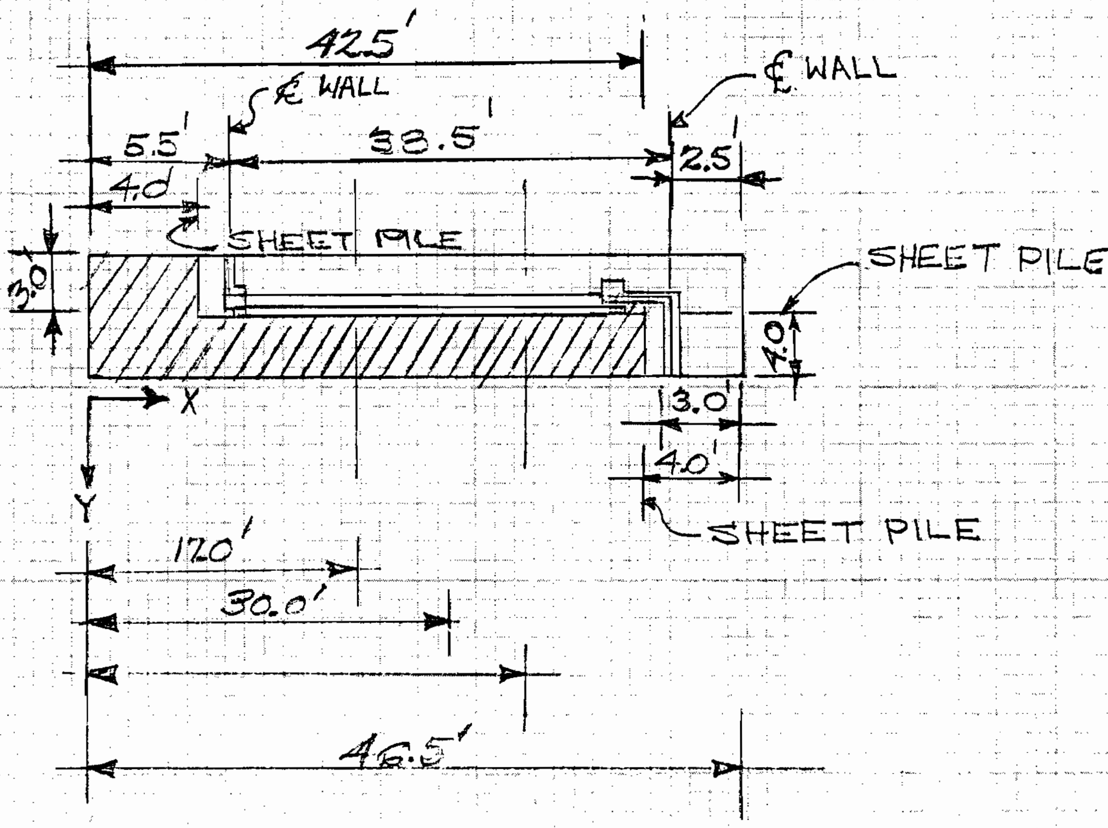
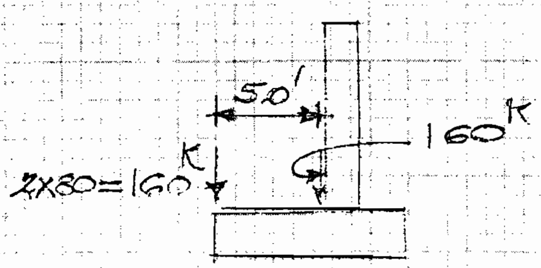
JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 9-10-79
JOB No 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

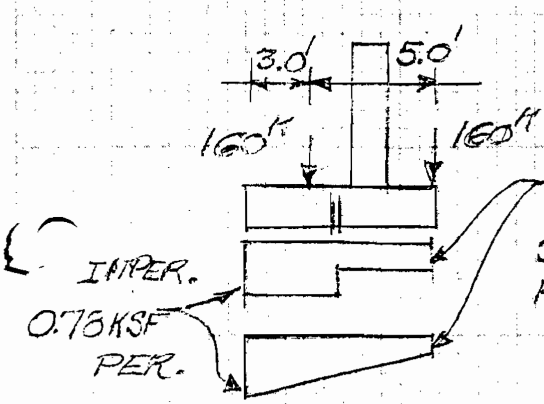
LOADS ON SUPPORT STRUCTURE





$M_X = 5 \times 160 = 800^{K}$

$M_Y = (80)(17+30)(2) = 7{,}520^{K}$



$M_X = (3+8) \times 160 = 1{,}760^{K}$

$3 \times 0.0625 = 0.19 KSF \quad 12.43 \times 0.0625 = 0.78 KSF$

$F_{IMPER_Z} = 0.78 \times 4 \times 42.5 + 0.78 \times 4 \times 4 + 0.19 \times 4 \times 4 + 0.19 \times 4 \times 42.5 =$

$= 132 + 12 + 3 + 32 = 179^{K}$

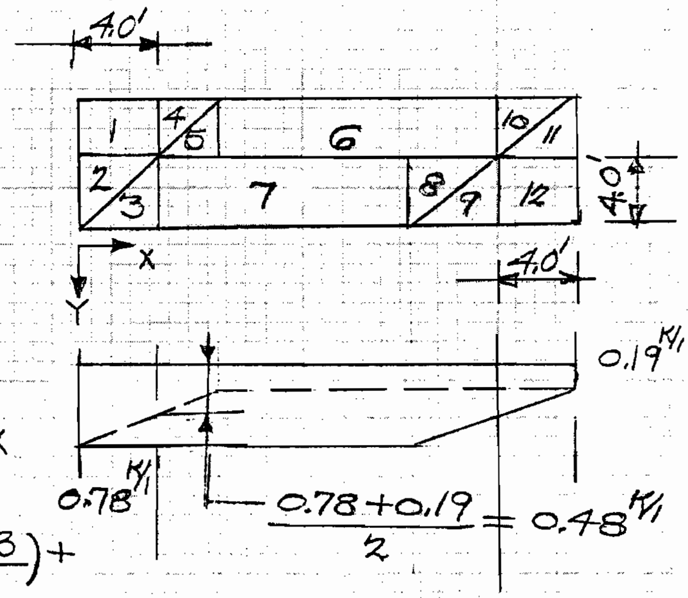
SWING GATE DESIGN

$$M_{IMPER_Y} = 132 \times \frac{42.5}{2} + 12 \times \frac{4}{2} + 3 \times 44.5 + 32 \times \left(4 + \frac{42.5}{2}\right)$$

$$= 2{,}805 + 24 + 134 + 808 = 3{,}771^{1K}$$

$$M_{INPER_X} = 132 \times 2 + 12 \times 6 + 3 \times 2 + 32 \times 6$$

$$= 264 + 72 + 6 + 192 = 534^{1K}$$



$$F_{PERV_Z} = \left(\overset{8}{4 \times 4 \times 0.48} + \overset{2}{\frac{4 \times 4}{2} \times 0.3}\right)$$

$$+ \left(\overset{4}{\frac{4 \times 4}{2} \times 0.48} + \overset{2}{\frac{4 \times 4 \times 0.3}{3}}\right) +$$

$$+ (4+2) + \left(\overset{2}{\frac{4 \times 4}{2} \times 0.19} + \overset{2}{\frac{4 \times 4 \times 0.29}{3}}\right) +$$

$$+ (2+2) + \left(\overset{26}{34.5 \times 4 \times 0.19} + 34.5 \times\right.$$

$$\left.\overset{20}{\frac{\times 4}{2} \times 0.29}\right) + \left(\overset{66}{34.5 \times 4 \times 0.48} + 34.5 \times\right.$$

$$\left.\overset{21}{\times \frac{4}{2} \times 0.3}\right) + \left(\overset{4}{\frac{4 \times 4 \times 0.48}{2}} + \overset{1}{\frac{4 \times 4 \times 0.3}{6}}\right) +$$

$$+ (4+1) + \left(\overset{2}{\frac{4 \times 4 \times 0.19}{2}} + \overset{1}{\frac{4 \times 4 \times 0.29}{6}}\right) + (2+1) + \left(\overset{3}{4 \times 4 \times 0.19} +\right.$$

$$\left.+ \overset{2}{\frac{4 \times 4}{2} \times 0.29}\right) = -184^{K}$$

$$M_{PERV_Y} = \left(\overset{16}{8 \times 2} + \overset{3}{2 \times \frac{4}{3}}\right) + \left(\overset{5}{4 \times \frac{4}{3}} + \overset{2}{2 \times 1}\right) + \left(\overset{10}{4 \times \frac{2 \times 4}{3}} + \overset{5}{2 \times 2.5}\right) +$$

$$+ \left(\overset{11}{2 \times 5.33} + \overset{10}{2 \times 5}\right) + \left(\overset{13}{2 \times 6.67} + \overset{13}{2 \times 6.5}\right) + \left(\overset{656}{26 \times 25.25} + \overset{505}{20 \times 25.25}\right) +$$

$$+ \left(\overset{1{,}402}{66 \times 21.25} + \overset{446}{21 \times 21.25}\right) + \left(\overset{159}{4 \times 39.83} + \overset{40}{1 \times 39.5}\right) + \left(\overset{165}{4 \times 41.16} +\right.$$

$$\left.+ \overset{40}{1 \times 40.5}\right) + \left(\overset{87}{2 \times 43.83} + \overset{44}{1 \times 43.5}\right) + \left(\overset{90}{2 \times 45.16} + \overset{44}{1 \times 44.5}\right) +$$

$$+ \left(\overset{134}{3 \times 44.5} + \overset{88}{2 \times 43.83}\right) = 3{,}988 \text{ FT} \cdot \text{KIPS}$$

$$M_{PERV_X} = \left(\overset{48}{8 \times 6} + \overset{12}{2 \times 6}\right) + \left(\overset{11}{4 \times 2.67} + \overset{5}{2 \times 2.5}\right) + \left(\overset{5}{4 \times 1.33} + \overset{2}{2 \times 1}\right) + \left(\overset{13}{2 \times 6.67} +\right.$$

$$\left.+ \overset{12}{2 \times 6}\right) + \left(\overset{11}{2 \times 5.33} + \overset{10}{2 \times 5}\right) + \left(\overset{156}{26 \times 6} + \overset{107}{20 \times 5.33}\right) + \left(\overset{132}{66 \times 2} + \overset{28}{21 \times 1.33}\right) +$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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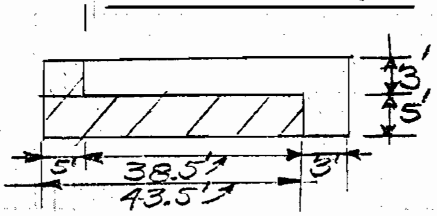
JOB ______ SHEET NO ______ OF ______
ITEM WEST RR GATE BY NDL DATE 9-28-79
JOB NO 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

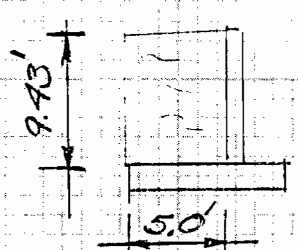
$$+(4\times 2.66+1\times 2)+(4\times 1.33+1\times 1)+(2\times 6.66+1\times 2)+(2\times 5.33+1\times 5)+(3\times 2+2\times 2)=612\ \text{FT·KIPS}$$

(11, 2, 5, 1, 13, 2, 11, 5, 6, 4)

WATER–VERT



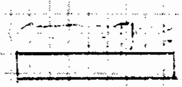
$$F_z = 9.43\times 0.0625(43.5\times 5+5\times 3)$$
$$=128+9=137\ \text{KIPS}$$



$$M_Y=-(128\times\frac{43.5}{2}+9\times\frac{5}{2})=-2{,}806\ \text{FT·KIPS}$$

$$M_X=-(128\times\frac{5}{2}+9\times 6.5)=-378\ \text{FT·KIPS}$$

BALLAST



$$\omega_{SATURATED}=140\ \text{PCF}$$
$$\omega_{SUBMERGED}=77.5\ \text{PCF}$$

$$F_{Z_{SAT}}=140\times 8\times 2\times 31.5=71^{K}$$

$$F_{Z_{SUB}}=77.5\times 8\times 2\times 31.5=39^{K}$$

$$M_{Y_{SAT}}=-71\times 22.75=-1{,}615^{1K} \qquad M_{X_{SAT}}=-4\times 71=-284^{1K}$$

$$M_{Y_{SUB}}=-39\times 22.75=-837^{1K} \qquad M_{X_{SUB}}=-4\times 39=-156^{1K}$$

GATE $F=9.7^{K}$ USE 10^{K}

$$M_Y=-9.7\times 5.92-164.8=-222^{1K}$$

$$M_X=-9.7\times 4.75=-46^{1K}$$

$$F_{WATER\ HOR\ Y}=38.5\times 0.0625\left(\frac{12.43^2}{2}-\frac{3.0^2}{2}\right)=-175^{K}$$

(156, 11)

$$M_X=-\left(\frac{156\times 12.43}{3}-\frac{11\times 3}{3}\right)=-760^{1K}$$

SWING GATE DESIGN

$F_{WATER_{HOR_X}} = \frac{8}{38.5} \times 175 = 36^K$

$M_Z = 4 \times 36 - 175 \times 24.25 = -4{,}100^{1K}$

$M_Y = \frac{8}{38.5}\left(\frac{186 \times 12.43}{3} - 11 \times \frac{3}{3}\right) = -158^{1K}$

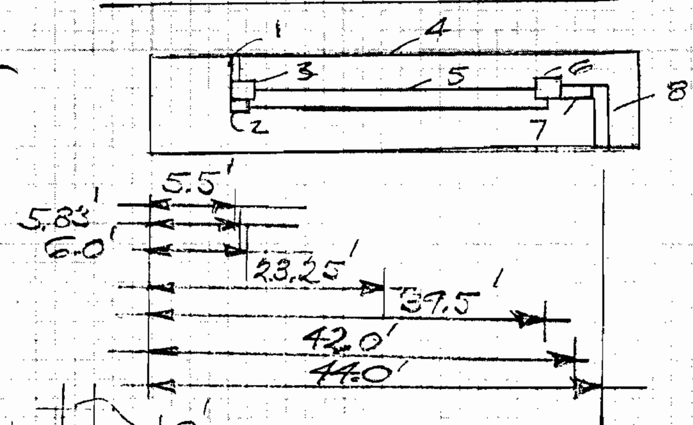
GATE – OPEN

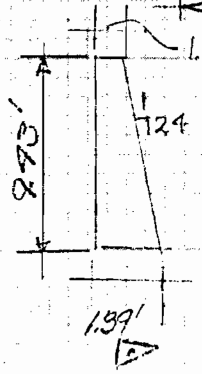
$F_Z = 5^K$

$M_X = 5 \times 4.75 = -24^{1K}$

$M_Y = 5 \times 5.92 = -30^{1K}$

CONCRETE WEIGHT





$WT/_{FT} = \frac{(1.0 + 1.39)}{2} \times 9.43 \times 0.15$

$= 1.69^{K/1}$

	F	X	MY	Y	MX
1	1.69	5.5	9	7.5	13
2	0.83	5.83	5	4.17	3
3	6.11	6.0	37	6.0	37
4	167.40	23.25	3,892	4.0	670
5	16.09	23.58	379	4.71	76
6	6.11	39.5	241	6.0	37
7	5.07	42.0	213	5.5	28
8	10.14	44.0	446	3.0	30
	213^K		-5222^{1K}		-894^{1K}

▷ (REV. 11-6-79)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST RR GATE BY NDL DATE 9-29-79
JOB No 575-79 CHKD. BY ____ DATE ____

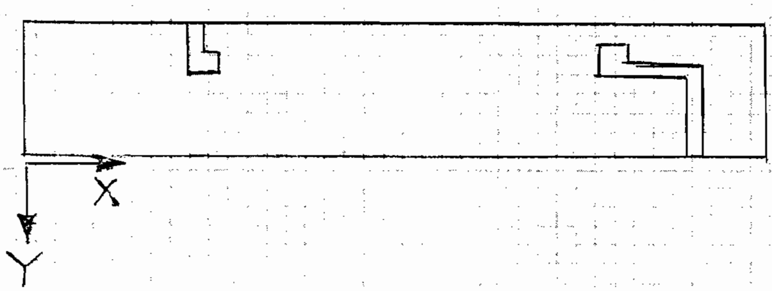
SWING GATE DESIGN

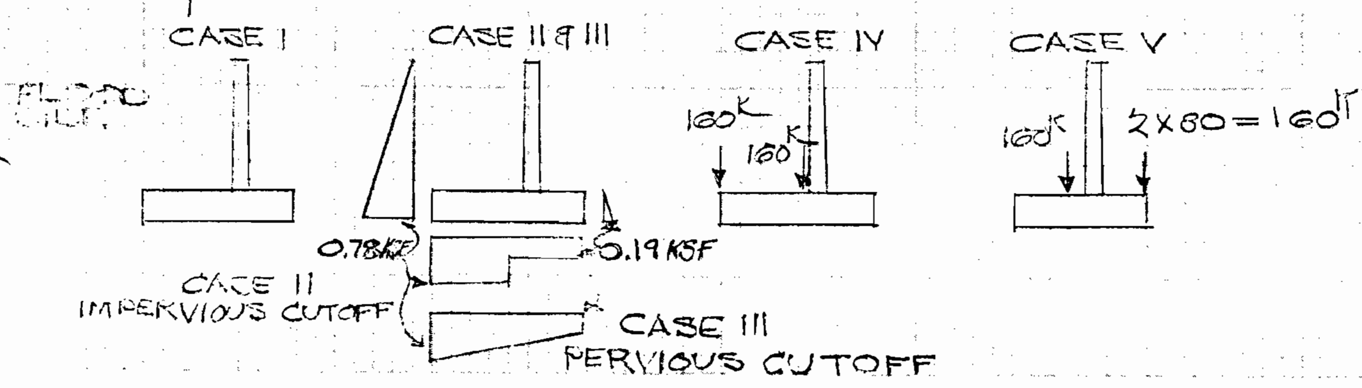
LOAD TABULATION

LOAD NO.	ITEM	F_x K	F_y K	F_z K	M_x 1K	M_y 1K	M_z 1K
1	CONCRETE	0	0	211	-884	-5,131	0
2	GATE-OPEN	0	0	5	-24	-30	0
3	GATE-CLOSED	0	0	10	-46	-222	0
4	BALLAST-SAT.	0	0	71	-284	-1,615	0
5	BALLAST-SUB.	0	0	39	-156	-887	0
6	WATER-VERT.	0	0	137	-378	-2,806	0
7	WATER-HORIZ.	36	-175	0	-760	-158	-4,100
8	UPLIFT-IMP.	0	0	-179	534	3,771	0
9	UPLIFT-PERV.	0	0	-184	612	3,988	0
10	TRAIN-CASE IV	0	0	320	-800	-7,520	0
11	TRAIN-CASE V	0	0	320	-1,760	-7,520	0

LOAD SUMMATION

CASE	ITEM	F_x K	F_y K	F_z K	M_x 1K	M_y 1K	M_z 1K
I	1+3+4	0	0	292	-1,214	-6,968	0
II	1+3+5+6+7+8	36	-175	218	-1,690	-5,433	-4,100
III	1+3+5+6+7+9	36	-175	218	-1,612	-5,216	-4,100
IV	1+2+4+10	0	0	607	-1,992	-14,296	0
V	1+2+4+11	0	0	607	-2,952	-14,296	0





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N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-10-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

BASE DESIGN

COMPUTER INPUT

$E_c = 4{,}290$ KSI
$E_s = 2{,}150$ KSI

LINE		DATA
10	1) LINE FEED	FLORIDA AVE WEST 575-79
20	2) RETURN 3) 2 DEL	RR SWING GATE MONOLITH
30	"	5, (PILE GROUPS)
	"	5 (LOAD CONDITIONS)
40		2, (FRICTION PILE)
		0.0, (END CONDITION, DEGREE OF FIXITY)
		64 (LENGTH OF PILES IN FEET)
50		1, (RECTANGULAR PILE)
		12, (PILE DIMENSION IN INCHES PARALLEL TO X-AXIS)
		12 (" " " " " " Y-AXIS)
60		1, (CONCRETE PILE)
		5, (CONCRETE ULT. STRENGTH IN KSI)
70		-1 (CONSTANT SOIL)
		8.33 (MODULUS OF HORIZ. SUBGRADE REACTION - PSI/INCH)
80		0, (PILEHEAD FREE TO TWIST)
		0, (SHAPE FACTOR)
		0 . (E_s)
100		2, (VERT. COMPONENT OF BATTER FOR GROUP 1)
		180, (CLOCKWISE ANGLE IN DEGREES
		1 (NUMBER OF PILES IN GROUP 1)
110		1.5 (X-COORD IN FEET)
140		-6.5 (Y-COORD IN FEET)
170		0.0 (Z-COORD IN FEET)
200		4,
		0,
		2
210		44.0, 44.0
240		-6.5, -1.5
270		0.0, 0.0
300		2,
		90,
		7

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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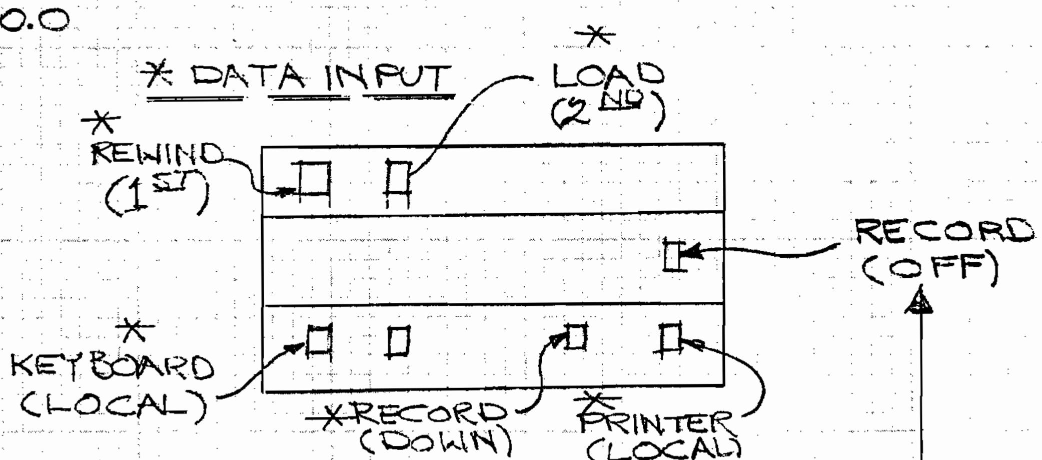
JOB ______ SHEET Nº ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-10-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

BASE DESIGN

310 1) LINE FEED (2) RETURN 3) 2 DEL 1.5, 5.83, 10.16, 23.5, 32.33, 36.16, 40.0
340 7 * -1.5
370 7 * 0.0
400 2,
270,
4
410 5.83, 10.16, 23.5, 36.16
440 4 * -6.5
470 4 * 0.0
500 0,
90, (ORIENT UNBATTERED PILES SAME AS MAJORITY OF BATTERED PILES - FOR Φ-FORCE ORIENTATION)
8
510 14.67, 19.33, 27.67, 14.67, 19.33, 27.67, 32.33, 40.0
540 3 * -1.5, 5 * -6.5
570 8 * 0.0

TO CHANGE DATA
1) OLD NL1011
2) TYPE NEW LINE
(400 4, 270, 4)
3) RESAVE NL 1011
4) RELE D29010
5) OLD NL1011
6) SAVE D29010
7) LISTH NL1011
(IF WANT LIST)



AFTER DATA IS INPUT:
PUNCH → CTRL DC3
SHIFT

```
*LISTH D29010

10/12/79     09.66


10 FLORIDA AVE WEST 575-79
20 RR SWING GATE MONOLITH
30 5,5
40 2,0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,180,1
110 1.5
140 -6.5
170 0
200 4,0,2
210 44,44
240 -6.5,-1.5
270 0,0
300 2,90,7
310 1.5,5.83,10.16,23.5,32.33,36.16,40
340 7*-1.5
370 7*0
400 2,270,4
410 5.83,10.16,23.5,36.16
440 4*-6.5
470 4*0
500 0,90,8
510 14.67,19.33,27.67,14.67,19.33,27.67,32.33,40.0
540 3*-1.5,5*-6.5
0 8*0.0
00 0,0,292,-1214,-6968,0
10 36,-175,218,-1690,-5433,-4100
20 36,-175,218,-1612,-5216,-4100
30 0,0,607,-1992,-14296,0
2040 0,0,607,-2952,-14296,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        10/12/79     09.690


    PROG. NO. 713-F3-A2-210     9:41:42  10/12/79    MOD 6A, JUN 78


 FLORIDA AVE WEST 575-79
 RR SWING GATE MONOLITH


TOTAL NUMBER OF PILES =    22
```

LOAD CONDITION 1 WEST RR SWING GATE 18 B

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	292.0	-1214.0	-6968.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	0.0	14.5
2	-0.1	-0.1	12.5
3	-0.1	-0.1	17.8
4	-0.1	0.0	10.4
11	0.0	-0.0	14.8
12	0.0	-0.0	15.6
13	0.0	-0.0	18.2
14	0.0	-0.0	20.6
15	-0.0	0.0	17.6
17	-0.1	0.0	19.0
18	-0.0	0.0	12.4
20	-0.1	0.0	13.7
22	-0.1	0.0	15.0

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-0.0	292.0	-1214.0	-6968.0	-0.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
36.0	-175.0	218.0	-1690.0	-5433.0	-4100.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.2	-23.3
2	0.4	-0.5	32.9
3	0.4	-0.5	36.9
4	-0.3	-0.4	-5.2
5	-0.3	-0.4	-9.1
6	-0.3	-0.4	-13.1
7	-0.4	-0.4	-25.4
8	-0.4	-0.4	-33.5
9	-0.4	-0.4	-37.0
10	-0.5	-0.4	-40.5
11	0.2	0.4	46.3
12	0.2	0.4	48.4
13	0.3	0.4	54.9
14	0.4	0.4	61.2
15	-0.3	-0.4	19.7
16	-0.3	-0.4	18.6
17	-0.4	-0.4	16.6
18	-0.3	-0.4	17.6
19	-0.3	-0.4	16.5
20	-0.4	-0.4	14.5
21	-0.4	-0.4	13.4
22	-0.5	-0.4	11.5

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	36.0	-175.0	218.0	-1690.0	-5433.0	-4100.0

LOAD CONDITION 3

WEST RR SWING GATE

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
36.0	-175.0	218.0	-1612.0	-5216.0	-4100.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.3	-24.3
2	0.4	-0.5	29.3
3	0.4	-0.5	38.8
4	-0.3	-0.4	-4.0
5	-0.3	-0.4	-8.1
6	-0.3	-0.4	-12.2
7	-0.4	-0.4	-24.9
8	-0.4	-0.4	-33.3
9	-0.5	-0.4	-36.9
10	-0.5	-0.4	-40.6
11	0.2	0.4	47.9
12	0.3	0.4	49.7
13	0.3	0.4	55.2
14	0.4	0.4	60.5
15	-0.3	-0.4	23.6
16	-0.4	-0.4	22.2
17	-0.4	-0.4	19.7
18	-0.3	-0.4	15.6
19	-0.4	-0.4	14.2
20	-0.4	-0.4	11.7
21	-0.5	-0.4	10.3
22	-0.5	-0.4	8.0

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	36.0	-175.0	218.0	-1612.0	-5216.0	-4100.0

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	607.0	-1992.0	-14296.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	0.2	23.6
2	-0.2	-0.3	4.7
3	-0.3	-0.3	56.8
4	-0.3	0.2	22.1
7	-0.4	0.2	24.0
8	-0.4	0.2	24.8
11	0.2	-0.2	30.7
12	0.2	-0.2	33.2
13	0.2	-0.2	40.8
14	0.3	-0.2	47.9
15	-0.3	0.2	59.5
16	-0.3	0.2	61.2
17	-0.3	0.2	64.3
18	-0.3	0.2	6.5
19	-0.3	0.2	8.2
20	-0.3	0.2	11.2
21	-0.3	0.2	12.9
22	-0.3	0.2	15.7

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	-0.0	0.0	607.0	-1992.0	-14296.0	0.0

LOAD CONDITION 5 WEST RR SWING GATE

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	607.0	-2952.0	-14296.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	-0.0	35.2
2	-0.0	0.0	42.1
3	0.0	0.0	19.4
4	0.0	-0.0	22.9
5	0.0	-0.0	22.2
6	-0.0	-0.0	21.5
7	-0.0	-0.0	19.4
8	-0.0	-0.0	18.0
9	-0.0	-0.0	17.4
10	-0.0	-0.0	16.7
11	-0.1	0.0	33.8
13	-0.1	0.0	35.2
14	-0.1	0.0	36.1
15	0.0	-0.0	19.0
18	0.0	-0.0	42.8

5 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

5	0.0	0.0	607.0	-2952.0	-14296.0	0.0

0 9:44:30 10/12/79 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022,15022

0 PROG NO. 713-F3-A2-210 9:41:42 10/12/79 MOD 6A,

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

11021	X	Y	Z	RX	RY	RZ
11022	-0.558E-02	-0.559E-02	0.110E-01	0.545E-04	-0.546E-05	-0.112E-04
12022	0.645E-01	-0.342E-01	0.149E-01	0.224E-04	0.124E-04	-0.817E-04
13022	0.643E-01	-0.384E-01	0.189E-01	0.822E-04	0.155E-04	-0.790E-04
14022	-0.286E-01	-0.367E-01	0.436E-01	0.550E-03	-0.189E-04	-0.279E-04
15022	0.615E-02	0.763E-02	0.785E-02	-0.246E-03	0.246E-05	-0.137E-04

READY

*

N-Y ASSOCIATES, INC.
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JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-13-79
JOB No 575-77 CHKD. BY ______ DATE ______

BASE SLAB

D.L.

GATE CLOSED (CASES I, II & III)
10K (5.92')
170'K

GATE OPEN (CASES IV & V)
5K (5.92')

COLUMN 11.8K (6.0')

COLUMN = 6.1K (39.5')

WALL, W = 3.1K (40.5'-42.6')

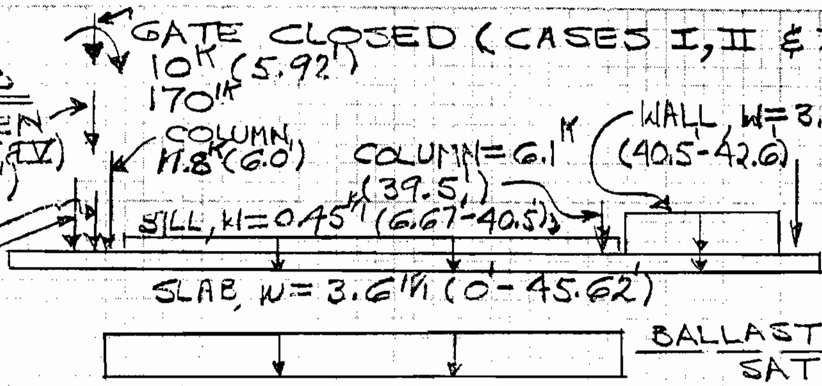
WALL = 8.8K (43.12')

PEDESTAL 0.8K (5.83')

WALL 1.5K (5.5')

SILL, W = 0.45K/' (6.67'-40.5')

SLAB, W = 3.6K/' (0'-45.62')



BALLAST
SAT W = 2.24 K/'
(CASES I, IV & V)
SUB W = 1.24 K/'
(CASES II & III)

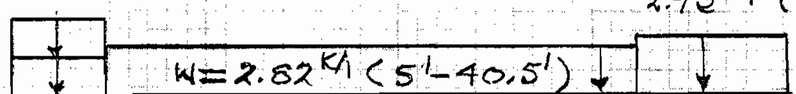
7.0 38.5

WATER

1.77 K/' (0'-5')

2.95 K/' (40.5'-43.5')

W = 2.82 K/' (5'-40.5')



2.95 K/' (0'-5')

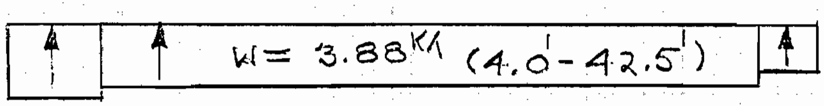
UPLIFT

(IMPERVIOUS - CASE II)

6.24 K/' (0'-4.0')

W = 3.88 K/' (4.0'-42.5')

1.52 K/' (42.5'-45.6')

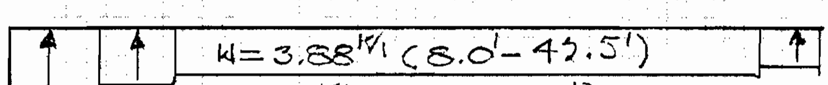


(PERVIOUS - CASE III)

5.5 K/' (0'-4.0')

W = 3.88 K/' (8.0'-42.5')

2.75 K/' (42.5'-45.6')

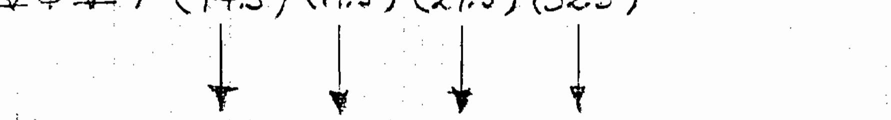


4.52 K/' (4.0'-8.0')

TRAIN

(CASES IV & V)

80K (14.5') 80K (19.5') 80K (27.5') 80K (32.5')

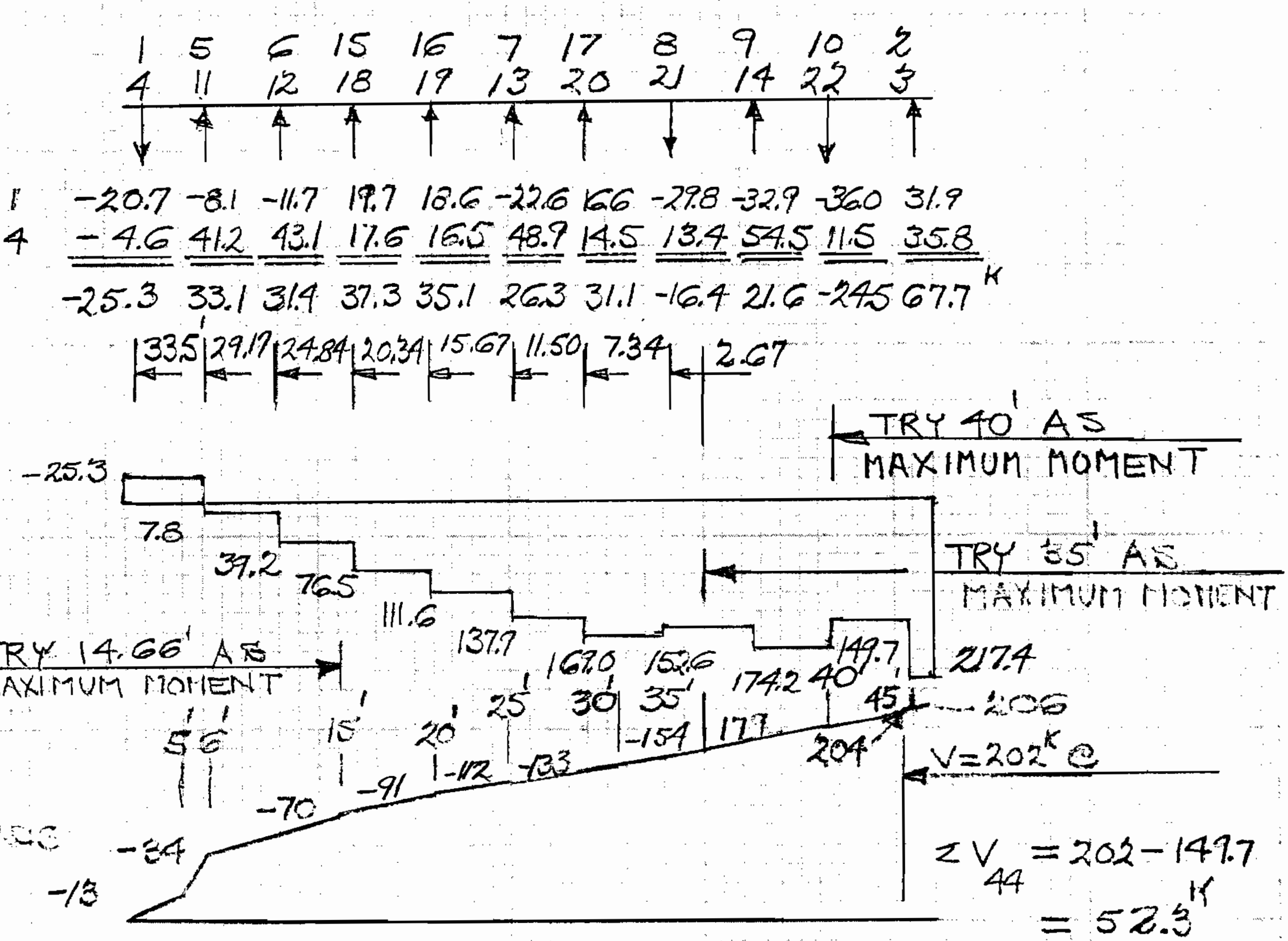


N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
JOB
ITEM WEST RR GATE
JOB Nº 575-79
SHEET Nº OF
BY NDL DATE 10-13-79
CHKD. BY DATE

BASE SLAB

PILE LOADS

CASE II



$\Sigma V_{44} = 202 - 149.7 = 52.3^K$

PILES $M_{35} = (-25.3 \times 33.5) + (33.1 \times 29.17) + (31.4 \times 24.84) + (37.3 \times 20.34) +$ (−847.6, 965.5, 780.0, 758.7)

$+ (35.1 \times 15.67) + (26.3 \times 11.5) + (31.1 \times 7.34) - (16.4 \times 2.67) =$ (550.0, 302.4, 228.3, 43.8)

$= 2673.5$ FT. KIPS

APP LOADS $M_{35} = (1.5 \times 29.5) + (0.8 \times 29.17) + (10 \times 29.08) + (6.1 \times 29.0) +$ (44.2, 23.3, 290.8, 176.9)

$\left(\frac{0.45 \times 28.33^2}{2}\right) + \left(\frac{3.6 \times 35^2}{2}\right) + \left(\frac{1.24 \times 28.0^2}{2}\right) +$ (180.6, 2205, 486.1)

$+ \left(23.6 \times 32.5 + \frac{2.82 \times 30^2}{2}\right) - \left(25.0 \times 33.0 + \frac{3.88 \times 31^2}{2}\right) =$ (767, 1,269, 823.7, 1864.3)

$= 2754.9$ FT. KIPS

$\Sigma M_{35} = 61.4$ FT. KIPS

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JOB ______ SHEET NO ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-15-77
JOB NO 575-79 CHKD. BY ______ DATE ______

BASE SLAB

PILES $M_{14.66} = (\overset{-332.9}{-25.3 \times 13.16}) + (\overset{292.3}{33.1 \times 8.83}) + (\overset{141.3}{31.4 \times 4.5}) = 100.7$ FT·KIPS

APP LOADS $M_{14.66} = \overset{13.7}{1.5 \times 9.16} + \overset{7.1}{0.8 \times 8.83} + \overset{87.4}{10 \times 8.74} + \overset{52.8}{6.1 \times 8.66} +$

$+ (\overset{386.8}{3.6 \times \frac{14.66^2}{2}}) + (\overset{14.4}{0.45 \times \frac{7.99^2}{2}}) + (\overset{36.4}{1.24 \times \frac{7.66^2}{2}}) +$

$+ (\overset{287.0}{23.6 \times 12.16} + \overset{131.6}{2.82 \times \frac{9.66^2}{2}}) - (\overset{316.5}{25.0 \times 12.66} + \overset{220.5}{\frac{3.88 \times 10.66^2}{2}}) =$

$= 221.7$ FT·KIPS

$\Sigma M_{14.66} = 121.2$ FT·KIPS

PILES $M_{40} = 67.7 \times 4 = 270.8$ FT·KIPS

APP LOADS $M_{40} = \overset{27.5}{8.8 \times 3.12} + \overset{4.8}{3.1 \times 1.55} + \overset{56.4}{\frac{3.6 \times 5.6^2}{2}}) + \overset{10.0}{\frac{2.95 \times 2.6^2}{2}}) - ($

$-(\overset{19.0}{4.7 \times 4.05} + \overset{12.1}{\frac{3.88 \times 2.5^2}{2}}) = 67.6$ FT·KIPS

$\Sigma M_{40} = 203.2$ FT·KIPS

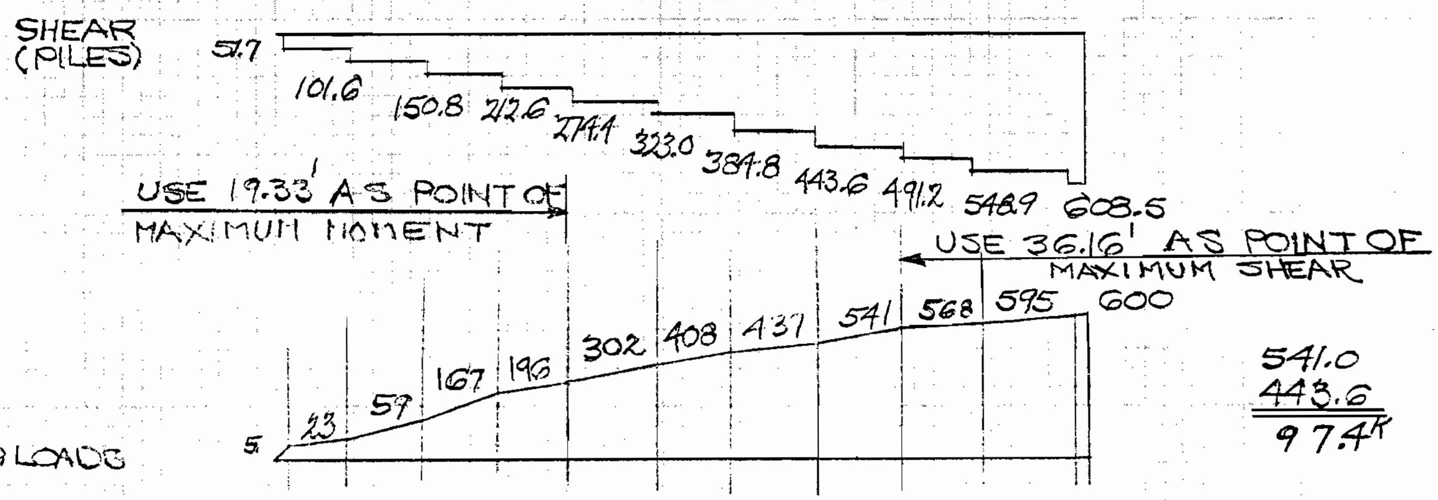
$V_{44} = 67.7 - \overset{5.8}{1.62 \times 3.6} + \overset{2.5}{1.52 \times 1.62} = 64.3^K$

BASE SLAB

PILE LOADS

CASE V

	1, 4	5, 11	6, 12	15, 18	16, 19	7, 13	17, 20	8, 21	9, 14	10, 22	2, 3
PILE LOADS FROM COMPUTER	31.3	19.8	19.1	19.0	19.0	17.3	19.0	16.0	15.5	14.9	40.8
	20.4	30.1	30.1	42.8	42.8	31.3	42.8	42.8	32.1	42.8	18.8
	51.7	49.9	49.2	61.8	61.8	48.6	61.8	58.8	47.6	57.7	59.6
	1.5'	5.83'	10.16'	14.66'	19.33'	23.5'	27.66'	32.33'	36.16'	40.0'	44.0'



$$\begin{array}{r} 541.0 \\ 443.6 \\ \hline 974^{K} \end{array}$$

PILES $M_{19.33} = \overset{921.8}{51.7 \times 17.83} + \overset{673.6}{49.9 \times 13.5} + \overset{451.2}{49.2 \times 9.17} + \overset{288.6}{61.8 \times 4.67} =$

$= 2{,}335.2$ FT·KIPS

APP. LOADS $M_{19.33} = \overset{386.4}{80 \times 4.83} + \overset{672.6}{3.6 \times \frac{19.33^2}{2}} + \overset{170.3}{2.24 \times \frac{12.33^2}{2}} +$

$+ \overset{36.1}{0.45 \times \frac{12.66^2}{2}} + \overset{81.3}{6.1 \times 13.33} + \overset{67.0}{5 \times 13.41} + \overset{10.8}{0.8 \times 135} +$

$+ \overset{20.7}{1.5 \times 13.83} = 1445.2$ FT·KIPS

$\Sigma M_{19.33} = 2{,}335.2 - 1{,}445.2 = 890$ FT·KIPS

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JOB ______ SHEET Nº ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-18-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

BASE SLAB

$M = K\,b\,\bar{d}^2$, $d = \sqrt{\dfrac{M}{Kb}} = \sqrt{\dfrac{890.0 \times 12}{0.152 \times 96}} = 27.05\ IN$

$d_{PROVIDED} = 31\ IN$

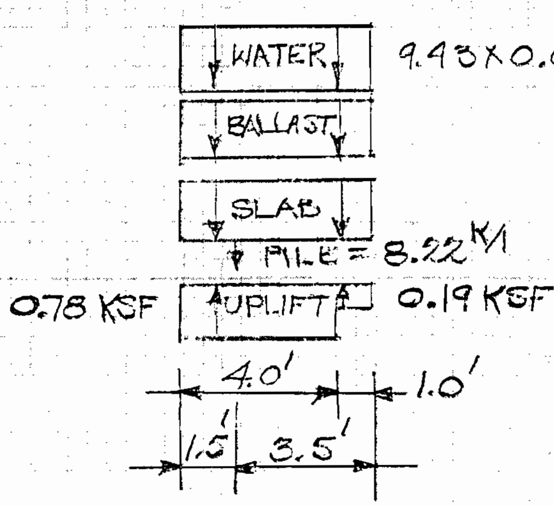
$v_f = \dfrac{V}{bd} = \dfrac{97.4}{96 \times 31} = 0.033\ KSI$

ALLOW $v_f = 0.060$ KSI (WITHOUT SHEAR REINFORCEMENT)

MOMENTS ABOUT X-X AXIS

CONSIDER PILES 8, 9, AND 10 ACTING OVER 12 FEET OF WALL.

29.8
32.9
36.0
12 | 98.7
8.22 K/l



9.43 X 0.0625 = 0.59 KSF

FORCE F_z		ARM$_y$	M_x
PILES 8, 9 & 10	8.22	3.5	28.77
SLAB (3.0 X 5.0 X 0.15) =	2.25	2.5	5.62
WATER (0.59 X 5.0) =	2.95	2.5	7.38
BALLAST (1.29 X 8.5/2 X 12) =	0.44	2.5	1.10
UPLIFT (0.78 X 4.0) =	-3.12	3.0	-9.36
(0.19 X 1.0) =	-0.19	0.5	-0.10
	10.55 K		33.41 IK

$M = Kbd^2$ $d = \sqrt{\dfrac{M}{Kb}} = \sqrt{\dfrac{33.41 \times 12}{0.152 \times 12}}$

$= 14.82\ IN$ $d_{PROVD.} = 32.5\ IN$

$v_f = \dfrac{V}{bd} = \dfrac{10.55}{12 \times 32.5} = 0.027\ KSI$

ALLOW. $v_f = 0.060$ KSI (WITHOUT SHEAR REINFORCEMENT)

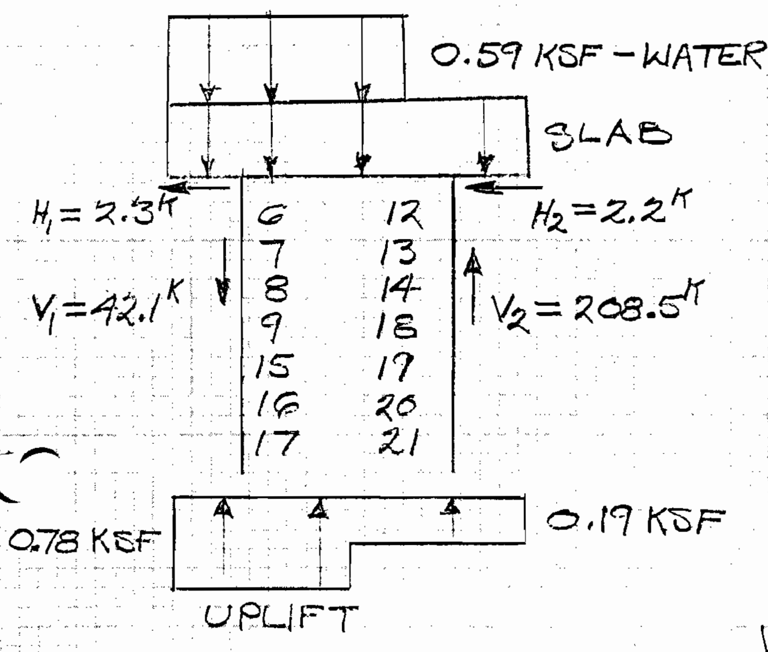
BASE SLAB

TORSIONAL ANALYSIS

ANALYZE SECTION WITHIN GATE OPENING

CASE II

PILES: 6, 7, 8, 9, 15, 16, 17, 12, 13, 14, 18, 19, 20 & 21



$$H_1 = \frac{2}{\sqrt{5}}(\overset{6}{0.3} + \overset{7}{0.4} + \overset{8}{0.4} + \overset{9}{0.4}) + \overset{15}{0.3} + \overset{16}{0.4} + \overset{17}{0.4} = 2.3^K$$

$$V_1 = \overset{6}{-11.7} \overset{7}{-22.6} \overset{8}{-27.8} \overset{9}{-32.7} + \overset{15}{19.7} + \overset{16}{18.6} + \overset{17}{16.6} = -42.1^K$$

$$H_2 = \frac{2}{\sqrt{5}}(\overset{12}{0.2} + \overset{13}{0.3} + \overset{14}{0.4}) + \overset{18}{0.3} + \overset{19}{0.3} + \overset{20}{0.4} + \overset{21}{0.4} = 2.2^K$$

$$V_2 = \overset{12}{43.1} + \overset{13}{48.9} + \overset{14}{54.5} + \overset{18}{17.6} + \overset{19}{16.5} + \overset{20}{14.5} + \overset{21}{13.4} = 208.5^K$$

FORCE		DISTANCE FROM SLAB CENTER	TORSIONAL MOMENT
WATER (0.59 X 5.0 X 31.5)	= 92.92	1.5	139.38
UPLIFT (0.78 X 4.0 X 31.5)	= -98.28	2.0	-196.56
UPLIFT (0.19 X 4.0 X 31.5)	= -23.94	-2.0	47.88
H_1	= 2.3	-1.5	-3.45
H_2	= 2.2	-1.5	-3.30
V_1	= 42.1	2.5	105.25
V_2	= -208.5	-2.5	521.25
			610.45^{K}

ASSUME TORSIONAL MOMENT DIVIDES EQUALLY BETWEEN COLUMNS

$M_T = 610.45/2 = 305.22^{\prime K}$

SHEAR STRESS DUE TO TORSION, $v_T = \frac{\eta M_T}{b^2 h} = \frac{5 \times 305.22 \times 12}{36^2 \times 96} = 0.147$ KSI

$v = v_T + v_f = 0.147 + 0.033 = 0.180 > 0.060, < 0.274$ KSI (NEED SHEAR REIN)

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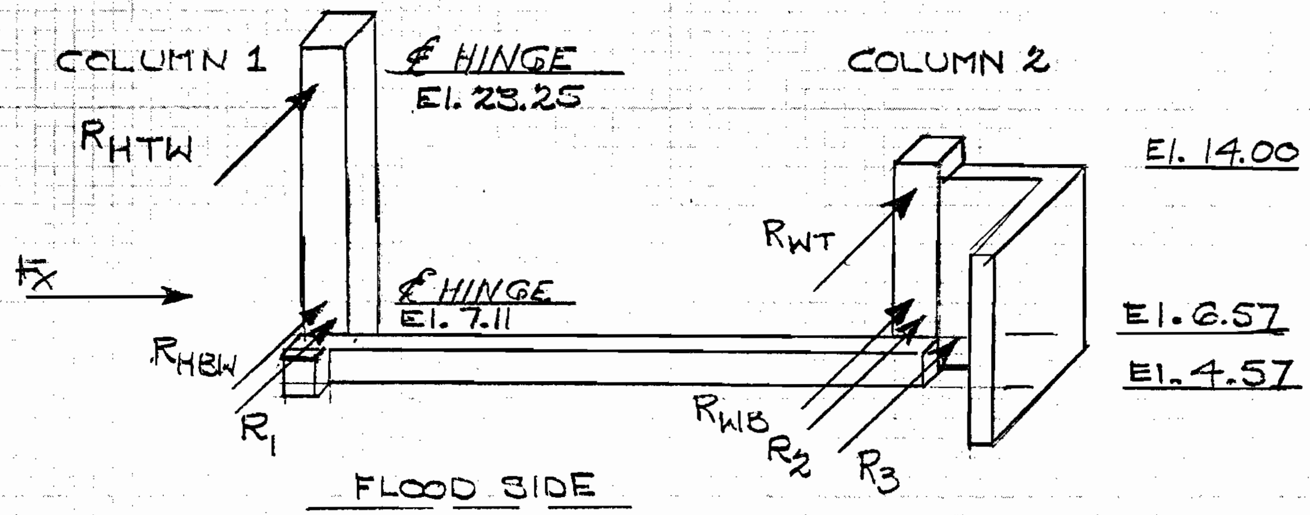
JOB ______ SHEET NO ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-22-79
JOB NO 575-79 CHKD. BY ______ DATE ______

COLUMNS



COLUMN 1

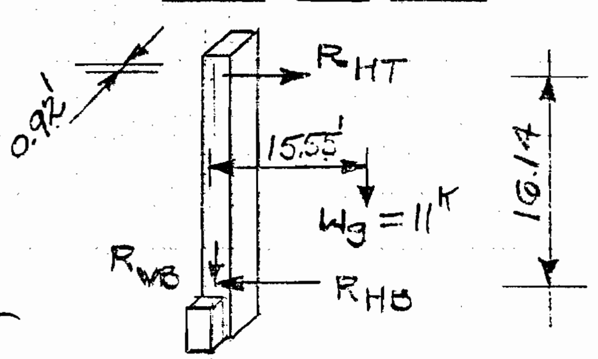
CHECK AT El. 4.57

WATER FORCES

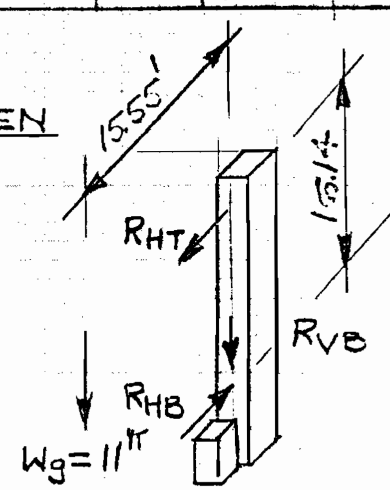
COMPUTATIONS	F_x	F_y	Arm_z	M_x	M_y	Arm_y	M_z
R_{HTW}	—	-3.33	18.68	-62.20			
R_{HBW}	—	-24.39	2.54	-61.95			
R_1 $(1/2 \times 2.0 \times \overline{9.43}^2 \times 0.0625)$	—	-5.56	3.14	-17.45			
F_x $(1/2 \times 3.0 \times \overline{9.43}^2 \times 0.0625)$	8.34	—	3.14	—	-26.19	0	0
TOTAL	8.34	-33.28		-141.60	-26.19		0

GATE DEAD LOAD

GATE CLOSED



GATE OPEN



$$R_{HT} = R_{HB} = \frac{11 \times 15.55}{16.14} = 10.6^K$$

$$R_{VB} = 11.0^K$$

$$R_{HT} = R_{HB} = \frac{11 \times 15.55}{16.14} = 10.6^K$$

$$R_{VB} = 11.0^K$$

5-4 15-29 REB

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 10-22-79
JOB No 575-79 CHKD. BY ______ DATE ______

COLUMNS

GATE CLOSED	F_z	F_x	Arm_z	M_y	Arm_y	M_z	Arm_y	M_x
R_{HT}	—	10.6	18.68	-198.01	2.42	-25.65	—	—
R_{HB}	—	-10.6	2.54	26.92	2.42	25.65	—	—
R_{VB}	11.0	—	—	—	—	—	2.42	26.62
TOTAL	11.0	0.00		-		0.00		26.62

GATE OPEN	F_z	F_x	Arm_z	M_x
R_{HT}	—	10.6	18.68	198.01
R_{HB}	—	-10.6	2.54	-26.92
R_{VB}	11.0	—	2.42	26.62
TOTAL	11.0	0.0		197.71

COLUMN DEAD LOAD	F_z	Arm_y	M_x
COLUMN (2.0X2.0X19.68X0.15) ▷	11.81	—	—
HINGE PEDESTAL (1.67X1.67X2.0X0.15)	0.84	1.54	1.29
TOTAL	12.65		1.29

▷ DOES NOT INCLUDE PORTION OF LOWER COLUMN

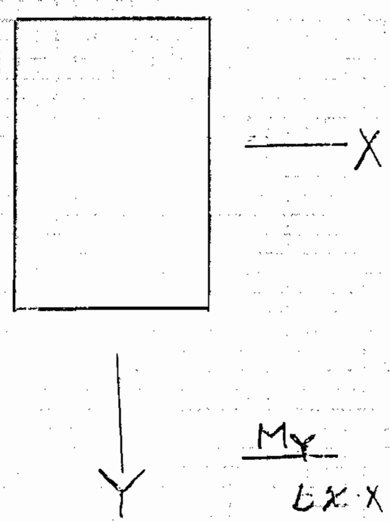
CASE I – FLOOD CONDITION, WATER @ El. 14.0, GATE CLOSED
CASE II – DEAD LOAD ONLY, GATE OPEN

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	WATER	8.34	-33.28	—	-141.60	-26.19	0
	GATE CLOSED	—	—	11.0	26.62	-171.09	—
	COLUMN DEAD LOAD	—	—	12.65	1.29	—	—
	TOTAL	8.34	-33.28	23.65	-113.69	-197.28	0
II	GATE OPEN	—	—	11.0	197.71	—	—
	COLUMN DEAD LOAD	—	—	12.65	1.29	—	—
	TOTAL			23.65	199.00		

VOID

HINGE COLUMN



$M_y = 197.28^{1K}$ (2,367,000 IN-LB)
$M_x = 119.19^{1K}$ (1,430,000 IN-LB)
$d = 24 - 2.5 - 0.70^{\#11} = 20.3''$
$d' = 2.5 + 0.5 + 0.7 = 3.7''$
$n = 9.2$, $j = 0.891$, $K = 0.326$
$d_x = 36 - 2.5 - 0.31 = 33.2''$

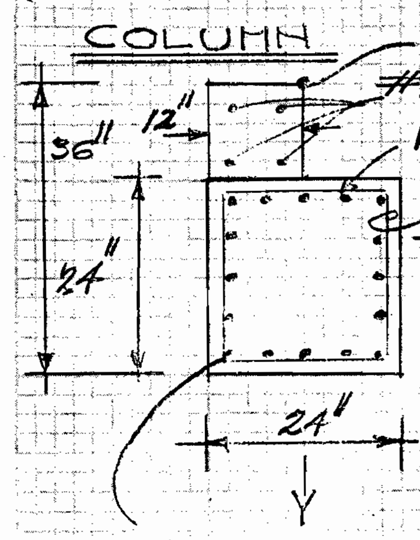
M_y

$bx \cdot x\ \frac{1}{2} x = n A_S (d - x)$
$36x \times 0.5x = 9.2 \times 8 \times 1.56 (20.3 - x)$
$18x^2 + 114.81x - 2{,}330.8 = 0 \quad x = 8.6''$
$M_{ARM} = 20.3 - 8.6/3 = 17.4''$
$2{,}367{,}000 = T \times 17.4$, $T = C = 136{,}000$ LB
$f_s = 136{,}000 / 8 \times 1.56 = 10{,}900$ PSI
$f_c = 136{,}000 \times 2/36 \times \quad =$ PSI

M_x

$24x \times 0.5x = 9.2 \times 5 \times 1.56 (33.2 - x)$
$12x^2 + 71.76x - 2382.4 = 0 \quad x = 11.4''$
$M_{ARM} = 33.2 - 11.4 = 21.8''$
$1{,}430{,}000 = T \times 21.8$, $T = C = 66{,}000$ LB
$f_s = 66{,}000 / 5 \times 1.56 = 8{,}500$ PSI
$f_c = 66{,}000 \times 2 / 24 \times 11.4 = 480$ PSI

COLUMN



$M_Y = 197.28$ FT·KIPS (2,367,000 IN-LB)

$M_X = 119.19$ FT·KIPS (1,430,000 IN-LB)

$d_Y = 24 - 2.5 - 0.5 - \underset{\#11}{0.70} = 20.3''$

$d' = 2.5 + 0.5 + 0.7 = 3.7''$

$n = 9.2$, $j = 0.891$, $k = 0.326$

$d_X = 36 - 2.5 - 0.31 = 33.2''$

M_X

USE $b = 12''$

$bx \times \frac{1}{2}x = nA_s(d - x)$

$12x \times 0.5x = 9.2 \times 5 \times 1.56(33.2 - x)$

$6x^2 + 71.76x - 2{,}382.4 = 0$

$x = 14.8''$ $M_{ARM} = 33.2 - 14.8/3 = 28.3''$

$1{,}430{,}000 = T \times 28.3$, $T = C = 50{,}500$ LB

$f_s = 50{,}500 / 5 \times 1.56 = 6{,}500$ PSI

$f_c = 50{,}500 \times 2 / 12 \times 14.8 = 570$ PSI

VOID

M_Y

$b = 24''$

$24x \times 0.5x = 9.2 \times (5 \times 1.56 + 2 \times 0.31)(20.3 - x)$ 8.42

$12x^2 + 77.46x - 1{,}572.5 = 0$

$x = 8.7''$ $M_{ARM} = 20.3 - 8.7/3 = 17.4''$

$2{,}367{,}000 = T \times 17.4$, $T = C = 136{,}000$ LB

$f_s = 136{,}000 / (5 \times 1.56 + 2 \times 0.31) = 16{,}200$ PSI

$f_c = 136{,}000 \times 2 / 24 \times 8.7 = 1{,}300$ PSI

$P/FT = 62.5 \times \overline{6.43}^2 =$

$= 1{,}292$ PLF

$R_{HTW} = 1{,}292 \times 16.12 \times \frac{1.60}{15.14}$

$= -2.20^K$

$R_{HBW} = 1{,}292 \times 16.12 \times \frac{13.54}{15.14}$

$= -18.63^K$

$M_X = 2.2 \times 18.68 + 18.63 \times 3.54 + 17.45 = 124.5'^K$

REDUCED GATE MOMENT

ACCOUNT FOR COMP. STEEL

$M_1 = Kbd^2 = 152 \times 24 \times \overline{20.3}^2 = 1{,}500{,}000$ IN-LB

$M_2 = 2{,}367{,}000 - 1{,}500{,}000 = 867{,}000$ IN-LB

$A_{s_1} = 1{,}500{,}000 / 20{,}000 \times 0.891 \times 20.3 = 4.1\ \overline{IN}^2$

$A_{s_2} = 867{,}000 / 20{,}000(20.3 - 3.7) = 2.6\ \overline{IN}^2$

$\Sigma A_s = 4.1 + 2.6 = 6.7\ \overline{IN}^2$

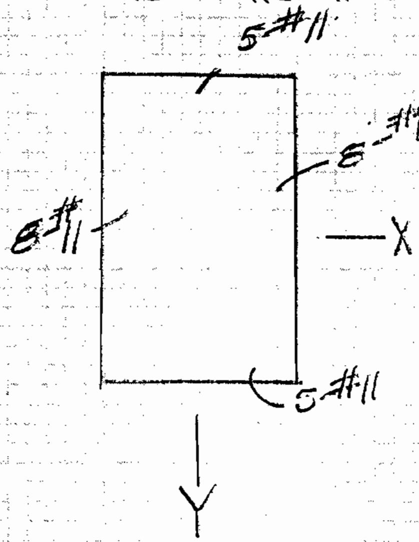
$(9.2 - 1)A'_s(0.326 \times 20.3 - 3.7) = 9.2 \times 2.6 \times (20.3 - 0.326 \times 20.3) = 13.7\ \overline{IN}^2$

ACI SP-3 p. 23

25 a

HINGE COLUMN

REF. "REIN. CONC. DES. HNDBK" ACI - SP3



$m_x = \frac{9.2 \times 5 \times 1.56}{24 \times 33.2} + \frac{(2 \times 9.2 - 1) \times 5 \times 1.56}{24 \times 33.2}$

$= 0.090 + 0.17 = 0.26$

$g_x = 0.09 + 0.17 \times \frac{3.7}{33.2} = 0.09 + 0.019 = 0.109$

$K = 0.274$

$\frac{1}{0.274} \times 0.17 = 0.62 \qquad \frac{1}{0.274} \times \frac{3.7}{33.2} = 0.41$

$z = 0.36 \qquad j = 0.9$

$f_s = \frac{1,364,000}{0.9 \times 33.2 \times 5 \times 1.56} = 5,800 \text{ psi}$

$M_Y = 197.28^{1K} (2,367,000^{1\#})$

$M_X = 113.69 (1,364,000^{1\#})$

$f_c = \frac{5,800}{9.2} \times \frac{0.274}{1-0.274} = 240 \text{ psi}$

$m_Y = \frac{9.2 \times 8 \times 1.56}{36 \times 20.3} + \frac{(2 \times 9.2 - 1) \times 8 \times 1.56}{36 \times 20.3} = 0.157 + 0.279 = 0.454$

$g_Y = 0.157 + 0.279 \times \frac{3.7}{20.3} = 0.157 + 0.051 = 0.208$

$K = 0.335$

$\frac{1}{0.335} \times \frac{3.7}{20.3} = 0.544 \qquad \frac{1}{0.335} \times 0.279 = 0.833$

$z = 0.43$ (EXTRAPOLATED) $\qquad j = 0.86$ (X-TRPLD)

$f_s = \frac{2,367,000}{0.86 \times 20.3 \times 8 \times 1.56} = 10,900 \text{ psi}$

$f_c = \frac{10,900}{9.2} \times \frac{0.335}{1-0.335} = 600 \text{ psi}$

$\Sigma f_s = 5,800 + 10,900 = 16,700 \text{ psi}$

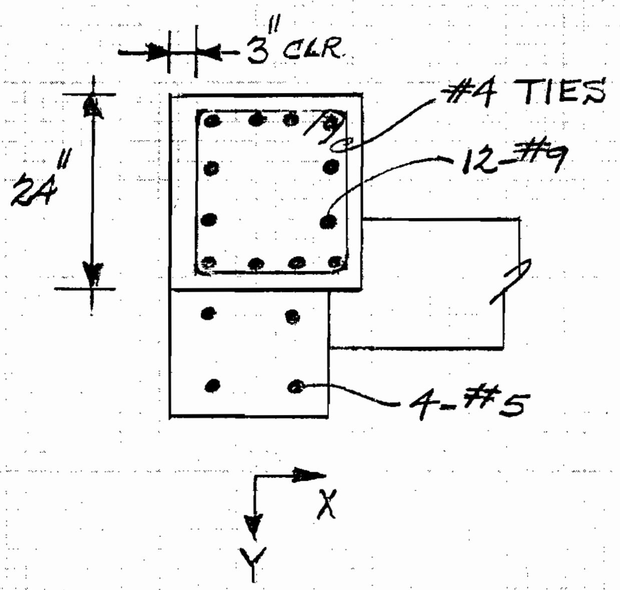
$\Sigma f_c = 240 + 600 = 840 \text{ psi}$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY ______ DATE ______
JOB No 575-79 CHKD. BY ______ DATE ______

COLUMNS

VOID



$d = 24 - 3 - 0.5 - \frac{1.13}{2} = 19.94''$

$d' = 3 + 0.5 + \frac{1.13}{2} = 4.06''$

$A_s = 6 \times 1.0 = 6.0\ \overline{IN}^2$

$A'_s = 6.0\ \overline{IN}^2$

$M_y = 192.00^{IK}$

$M_x = 122.04^{IK}$

$n = 9.2$

$m = \frac{nA_s}{bd} + \frac{(2n-1)A'_s}{bd}$

$= \overset{0.095}{\frac{9.2 \times 6.0}{24 \times 24}} + \overset{0.181}{\frac{(2 \times 9.2 - 1) \times 6.0}{24 \times 24}} = 0.276$

$q = \frac{nA_s}{bd} + \frac{(2n-1)A'_s}{bd} \times \frac{d'}{d} = 0.095 + 0.181 \times \overset{0.037}{\frac{4.06}{19.94}}$

$= 0.132$

$K = 0.307$

$\frac{1}{K} \times \frac{(2n-1)A'_s}{bd} = \frac{1}{0.307} \times \frac{(2 \times 9.2 - 1) \times 6.0}{24 \times 24} = 0.59$

$\frac{1}{K} \times \frac{d'}{d} = \frac{1}{0.307} \times \frac{4.06}{19.94} = 0.66$

$z = \frac{1}{6} + \frac{(2n-1)A'_s}{Kbd} \times \frac{d'}{Kd} \times \left(1 - \frac{d'}{Kd}\right) \Big/ \frac{1}{2} + \frac{(2n-1)A'_s}{Kdb} \times \left(1 - \frac{d'}{Kd}\right)$

$= \frac{1}{6} + 0.57 \times 0.66 \times (1 - 0.66) \Big/ \frac{1}{2} + 0.59 \times (1 - 0.66)$

$= 0.166 + 0.132 \Big/ 0.500 + 0.201 = 0.425$

$j = 1 - zK = 1.00 - 0.425 \times 0.307 = 0.87$

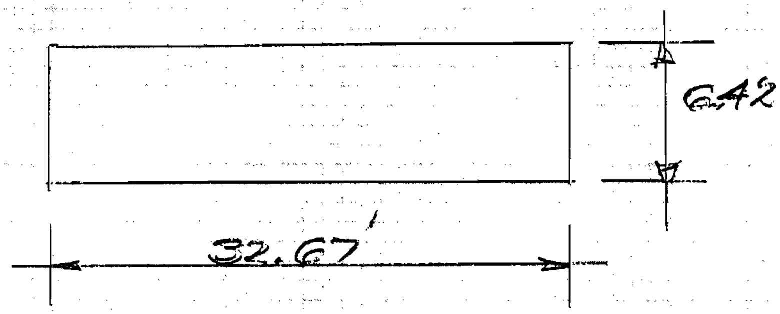
$f_s = \frac{12{,}000\,M}{jd\,A_s} = \frac{12{,}000 \times 192}{0.87 \times 19.94 \times 6.0} = 22{,}140\ psi$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST RR GATE BY NDL DATE 4-2-80
JOB No 575-79 CHKD. BY ______ DATE ______

GATE STORAGE

USE 20 PSF WIND LOAD



$A = \frac{1}{2} \times 32.67 \times 6.42 = 105$ FT

$F = 20 \times 105 = 2{,}100$ LB

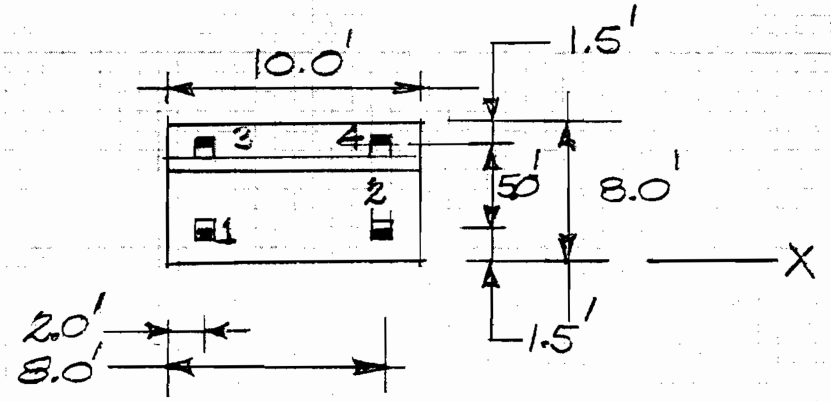
USE 50' LONG 12"x12" SQ. CONC. PILE IN ORDER TO IMBED IN SAND ABOUT 5'

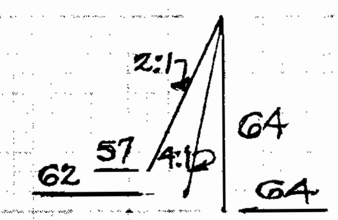
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

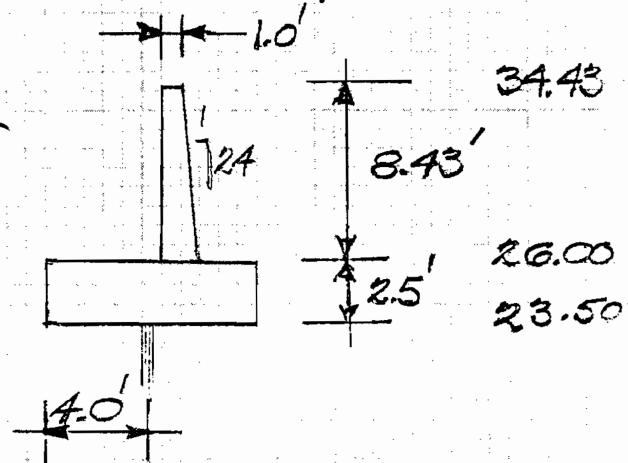
JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 2 BY NDL DATE 11-2-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

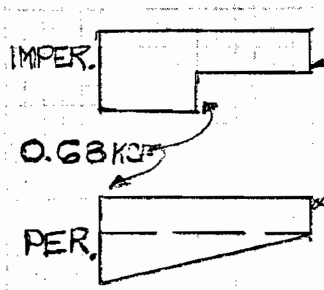
34.43	34.43
26.00	23.50
8.43'	10.93'







23.50
20.43
3.07
57
-54 TIP EL. NGVD



$2.5 \times 0.0625 = 0.16\ KSF$

$10.93 \times 0.0625 = 0.68\ KSF$

$F_{IMPER_Z} = \overset{27}{0.68 \times 4 \times 10.0} + \overset{6}{0.16 \times 4 \times 10.0} = -33^K$

$M_{IMPER_Y} = 27 \times 5 + 6 \times 5 = 165^{1K}$

$M_{IMPER_X} = 27 \times 2 + 6 \times 6 = 90^{1K}$

$F_{PER_Z} = \overset{13}{0.16 \times 8 \times 10} + \overset{21}{\frac{(0.68-0.16)}{2} \times 8 \times 10} = -34^K$

$M_{PER_Y} = 13 \times 5 + 21 \times 5 = 170^{1K}$

$M_{PER_X} = 13 \times 4 + 21 \times \frac{8}{3} = 108^{1K}$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 2 BY NDL DATE 11-6-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 8.43 \times 5 \times 10 \times 0.0625 = 26^K$

$M_y = 26 \times 5 = -130^{IK}$

$M_x = 26 \times 2.5 = -65^{IK}$

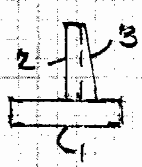
WATER-HORIZ

$F_y = 10 \times 0.0625 \left(\frac{\overset{37}{10.93^2}}{2} - \frac{\overset{-2}{2.5^2}}{2} \right) = -35^K$

$M_x = -37 \times \frac{\overset{-135}{10.93}}{3} + 2 \times \frac{2.5^2}{3} = -133^{IK}$

$M_z = -37 \times 5 + 2 \times 5 = -175^{IK}$

CONCRETE WEIGHT



$t = \frac{8.43}{2} + 12 = 16.22''$

	F_z	X	M_y	Y	M_x
1	30	5	150	4	120
2	12.6	5	63	5.5	69
3	2.2	5	11	6.12	13
	44.8^K		-224^{IK}		-202^{IK}

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	45	-202	-224	0
2	WATER-VERT	0	0	26	-65	-130	0
3	WATER-HORIZ	0	-35	0	-133	0	-175
4	UPLIFT-IMP	0	0	-33	90	165	0
5	UPLIFT-PERV	0	0	-34	108	170	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-35	38	-310	-189	-175
II	1+2+3+5	0	-35	37	-292	-184	-175

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 2 BY NDL DATE 11-6-79
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
      MONOLITH 2
38    2,2
40    2, 0.0, 64
50    1, 12, 12
60    1, 5,
70    -1, 8.33
80    0, 0, 0
100   2, 90, 2
110   2.0, 8.0
140   -1.5, -1.5
170   0.0, 0.0
200   2, 270, 2
210   2.0, 8.0
240   -6.5, -6.5
270   0.0, 0.0
2000  0, -35, 38, -310, -187, -175
2010  0, -35, 37, -292, -184, -175
```

-54 TIP EL

CALCULATE Q_{ALLOW} CORRESPONDING TO P_{MAX} (P. 56)

$$Q_{ALLOW} = \frac{750 - 0.006944 \times 27{,}200}{0.1611} = 3.48^K$$

GROUP	MAX. PILE LOAD P	MAX. PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW. PILE LOAD P	ALLOW. PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-7.3	-1.4	I	II	-40	3.49	18.2	40.1
B	28.7	1.4	I	II	61	3.48	47.0	40.1

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº 28 a	OF
	ITEM WEST MONOLITH 2	BY NDL	DATE 12-3-79
	JOB Nº 675-79	CHKD. BY	DATE

PILES

```
11/13/79     15.62


10 FLORIDA AVE WEST 575-79
20 MONOLITH 2 <=
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1 8.33
80 0,0,0
100 2,90,2
110 2.0,8.0
140 -1.5,-1.5
170 0.0,0.0
200 2,270,2
210 2.0,8.0
240 -6.5,-6.5
270 0.0,0.0
2000 0,-35,38,-310,-189,-175
2010 0,-35,37,-292,-184,-175

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        11/13/79     15.640


    PROG. NO. 713-F3-A2-210     15:38:52   11/13/79     MOD 6A, JUN 78

 FLORIDA AVE WEST 575-79
 MONOLITH 2

TOTAL NUMBER OF PILES =     4
```

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO 28 b OF ____
ITEM WEST MONOLITH 2 BY NDL DATE 12-3-79
JOB NO 575-79 CHKD. BY ____ DATE ____

PILES

LOAD CONDITION 1 MONOLITH 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-35.0	38.0	-310.0	-189.0	-175.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.8	0.0	-7.3
3	0.7	-0.0	28.7

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-35.0	38.0	-310.0	-189.0	-175.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-35.0	37.0	-292.0	-184.0	-175.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.4	0.0	-6.4
3	1.4	-0.0	27.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-35.0	37.0	-292.0	-184.0	-175.0

```
0    15:39:00   11/13/79    *** END OF  RUN ***

STOP        EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

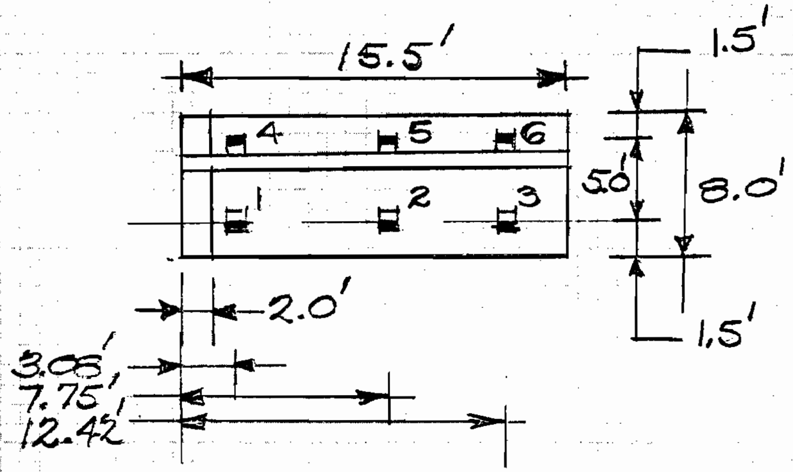
0          PROG NO. 713-F3-A2-210     15:38:52  11/13/79            MOD 6A,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X           Y            Z            RX           RY           RZ
11022 -0.864E-08 -0.109E 00   0.744E-01   0.139E-02   0.180E-05 -0.479E-10
12022 -0.584E-08 -0.194E 00   0.144E 00   0.284E-02   0.180E-05 -0.916E-10
```

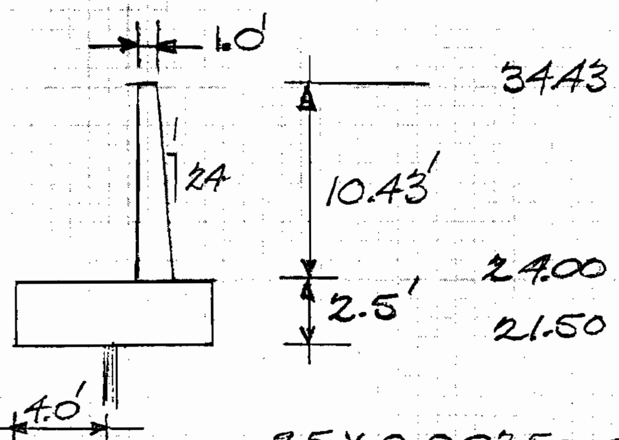
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB		SHEET NO	OF
ITEM	WEST MONOLITH 3	BY NDL	DATE 11-2-79
JOB NO	575-79	CHKD. BY	DATE

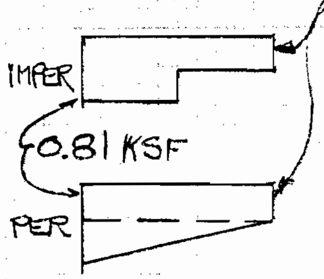
PILES

34.43	34.43
24.00	21.50
10.43'	12.93'





21.50
20.43
1.07
57
-56 TIP EL. NGVD



$2.5 \times 0.0625 = 0.16$ KSF

$12.93 \times 0.0625 = 0.81$ KSF

$F_{IMPER_Z} = 0.81 \times \overset{50}{4} \times 15.5 + \overset{10}{0.16 \times 4 \times 15.5} = 60^K$

$M_{IMPER_Y} = 50 \times 7.75 + 10 \times 7.75 = 465^{IK}$

$M_{IMPER_X} = 50 \times 2 + 10 \times 6 = 160^{IK}$

$F_{PER_Z} = \overset{20}{0.16 \times 8 \times 15.5} + \overset{40}{\frac{(0.81 - 0.16)}{2}} \times 8 \times 15.5 = 60^K$

$M_{PER_Y} = 20 \times 7.75 + 40 \times 7.75 = 465^{IK}$

$M_{PER_X} = 20 \times 4 + 40 \times \frac{8}{3} = 187^{IK}$

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 3 BY NDL DATE 11-7-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$$F_z = 10.43 \times 5 \times 15.5 \times 0.0625 = 51^K$$

$$M_y = 51 \times 7.75 = -395^{1K}$$

$$M_x = 51 \times 2.5 = -128^{1K}$$

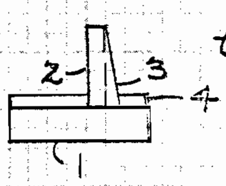
WATER-HORIZ

$$F_y = 15.5 \times 0.0625 \left(\overset{81}{\frac{12.93^2}{2}} - \overset{-3}{\frac{2.5^2}{2}} \right) = -78^K$$

$$M_x = -81 \times \frac{12.93}{3} + 3 \times \frac{2.5}{3} = -347^{1K}$$

$$M_z = -81 \times 7.75 + 3 \times 7.75 = -604^{1K}$$

CONCRETE WEIGHT



$$t = \frac{10.43}{2} + 12 = 17.22''$$

	F_z	X	M_y	Y	M_x
1	46.5	7.75	360	4	186
2	24.2	7.75	188	5.5	133
3	5.3	7.75	41	6.14	33
4	4.2	1.0	4	3.78	16
	80^K		593^{1K}		368^{1K}

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	80	-368	-593	0
2	WATER-VERT	0	0	51	-128	-395	0
3	WATER-HORIZ	0	-78	0	-347	0	-604
4	UPLIFT-IMP	0	0	-60	160	465	0
5	UPLIFT-PERV	0	0	-60	187	465	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-78	71	-683	-523	-604
II	1+2+3+4	0	-78	71	-656	-523	-604

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 3 BY NDL DATE 11-7-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER INPUT

```
10   FLORIDA AVE  WEST  575-79
20   MONOLITH 3
30   2,2
40   2,0.0,64
50   1,12,12 < 60 1,5
70   -1, 8.33
80   0,0,0
100  2,90,3
110  308, 7.75, 12.42
140  3*-1.5
170  3*0.0
200  2,270,3
210  3.08,7.75,12.42
240  3*-6.5
270  3*0.0
2000 0,-78,71,-683,-523,-604
2010 0,-78,71,-656,-523,-604
```

-56 TIP EL

GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW. PILE LOAD P	ALLOW. PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-18.0	-0.6	I	II	-40	3.49	45.0	17.2
B	44.5	0.5	I	II	65	1.21	68.5	41.3

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO 5/2 ___ OF ___
ITEM WEST MONOLITH 3 BY NDL DATE 12-3-79
JOB NO 575-79 CHKD. BY ___ DATE ___

PILES

```
11/13/79    15.22


10 FLORIDA AVE WEST 575-79
20 MONOLITH 3
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 3.08,7.75,12.42
140 3*-1.5
170 3*0.0
200 2,270,3
210 3.08,7.75,12.42
240 3*-6.5
270 3*0.0
2000 0,-78,71,-683,-523,-604
2010 0,-78,71,-656,-523,-604

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        11/13/79    15.241


    PROG. NO. 713-F3-A2-210    15:14:49  11/13/79    MOD 6A, JUN 78

 FLORIDA AVE WEST 575-79
 MONOLITH 3


TOTAL NUMBER OF PILES =    6
```

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB 31 b SHEET NO ___ OF ___
ITEM WEST MONOLITH 3 BY NDL DATE 12-3-79
JOB NO 575-79 CHKD. BY ___ DATE ___

PILES

LOAD CONDITION 1 MONOLITH 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-78.0	71.0	-683.0	-523.0	-604.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	0.0	-14.8
2	0.2	0.0	-16.4
3	0.2	0.0	-18.0
4	-0.3	0.0	44.5
5	-0.3	0.0	42.8
6	-0.3	0.0	41.1

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-78.0	71.0	-683.0	-523.0	-604.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-78.0	71.0	-656.0	-523.0	-604.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	0.0	-13.2
2	-0.6	0.0	-14.8
3	-0.6	0.0	-16.3
4	0.5	0.0	42.9
5	0.5	0.0	41.2
6	0.5	0.0	39.5

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-78.0	71.0	-656.0	-523.0	-604.0

0 15:15:21 11/13/79 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022
```

0 PROG NO. 713-F3-A2-210 15:14:49 11/13/79 MOD 6A

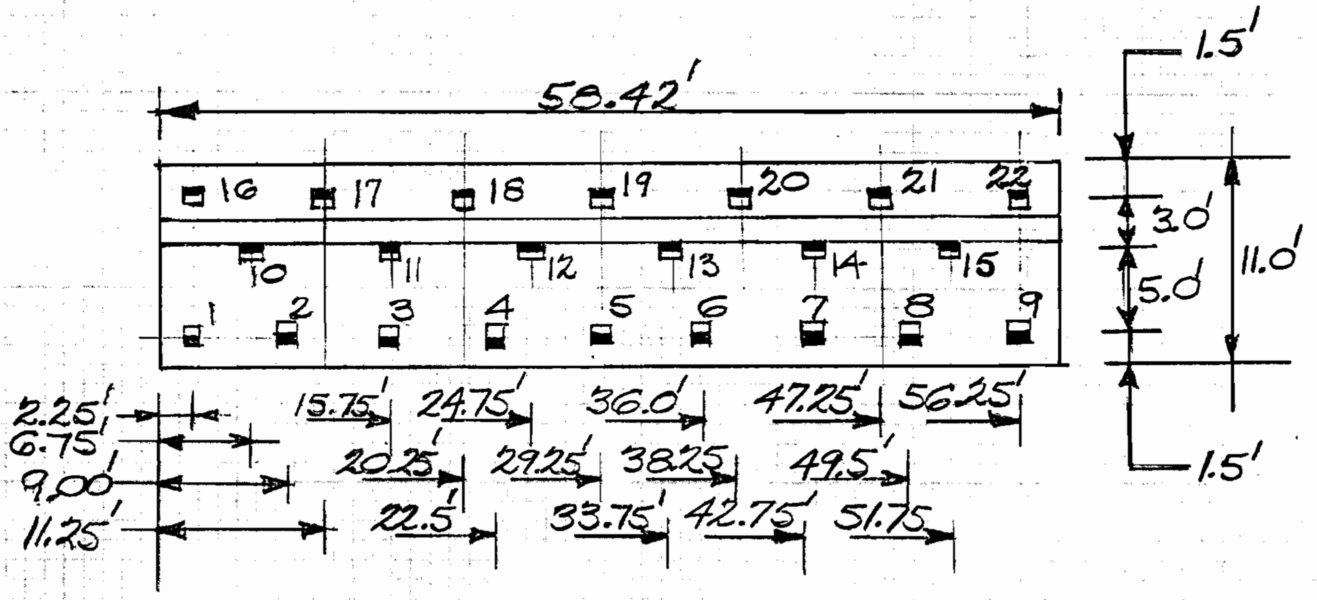
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

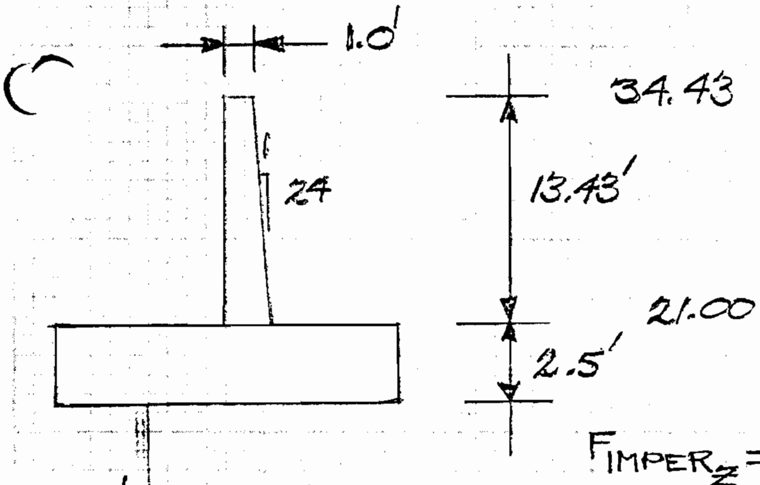
	X	Y	Z	RX	RY	RZ
11021						
11022	-0.696E-04	0.282E-01	-0.446E-01	-0.116E-02	0.202E-04	0.145E-05
12022	-0.696E-04	-0.811E-01	0.447E-01	0.701E-03	0.202E-04	0.145E-05

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 5 BY NDL DATE 11-2-79
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

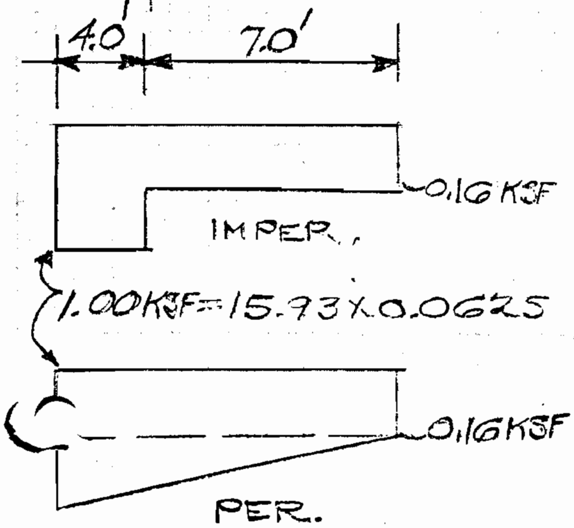




18.50
2043
-1.93
57
-59 TIP EL NGVD

34.43 − 21.00 = 13.43'

34.43 − 18.50 = 15.93'



$$F_{IMPER_Z} = \overset{234}{1.00 \times 4 \times 58.42} + \overset{65}{0.16 \times 7 \times 58.42} = 299^K$$

$$M_{IMPER_Y} = 234 \times 29.21 + 65 \times 29.21 = 8{,}734^{1K}$$

$$M_{IMPER_X} = 234 \times 2 + 65 \times 7.5 = 956^{1K}$$

$$F_{PER_Z} = \overset{103}{0.16 \times 11 \times 58.42} + \overset{270}{\frac{(1.00-0.16)}{2} \times 11 \times 58.42} = 373^K$$

$$M_{PER_Y} = 103 \times 29.21 + 270 \times 29.21 = 10{,}895^{1K}$$

$$M_{PER_X} = 103 \times 5.5 + 270 \times \frac{11}{3} = 1{,}556^{1K}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 5 BY NDL DATE 11-7-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 13.43 \times 7 \times 58.42 \times 0.0625 = 343^K$

$M_Y = 343 \times 29.21 = -10{,}019^{1K}$

$M_X = 343 \times 3.5 = -1{,}200^{1K}$

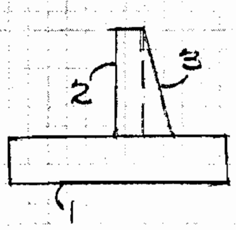
WATER-HORIZ

$F_Y = 58.42 \times 0.0625 \left(\frac{\overset{463}{\overline{15.93^2}}}{2} - \frac{\overset{-11}{\overline{2.5^2}}}{2} \right) = -452^K$

$M_X = -463 \times \frac{15.93}{3} + 11 \times \frac{2.5}{3} = -2{,}449^{1K}$

$M_Z = -463 \times 29.21 + 11 \times 29.21 = -13{,}203^{1K}$

CONCRETE WEIGHT



$t = \frac{13.43}{2} + 12 = 18.72''$

	F_Z	X	M_Y	Y	M_X
1	241	29.21	7,040	5.5	1,326
2	118	29.21	3,447	7.5	885
3	33	29.21	964	8.19	270
	392^K		$-11{,}451^{1K}$		$-2{,}481^{1K}$

LOAD TABULATION

LOAD NO	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	392	-2,481	-11,451	0
2	WATER-VERT	0	0	343	-1,200	-10,019	0
3	WATER-HORIZ	0	-452	0	-2,449	0	-13,203
4	UPLIFT-IMP	0	0	-299	956	8,734	0
5	UPLIFT-PERV	0	0	-373	1,556	10,895	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	0	-452	436	-5,174	-12,736	-13,203
II	1+2+3+5	0	-452	362	-4,574	-10,575	-13,203

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 5
JOB No 575-79

SHEET No ____ OF ____
BY NDL DATE 11-7-79
CHKD. BY ____ DATE ____

PILES

COMPUTER INPUT

```
10   FLORIDA AVE WEST 575-79
20   MONOLITH 5
30   2,2
40   2, 0.0, 64
50   1, 12, 12
60   1, 5
70   -1, 8.33
80   0,0,0
100  2, 90, 9
110  2.25, 9.00, 15.75, 22.5, 29.25, 36.0, 42.75, 49.5, 56.25
140  9* -1.5
170  9*0.0
200  2, 270, 13
210  6.75, 15.75, 24.75, 33.75, 42.75, 51.75, 2.25, 11.25, 20.25,
     29.25, 38.25, 47.25, 56.25
240  6* -6.5, 7* -9.5
270  13*0.0
2000 0, -452, 436, -5,174, -12,736, -13,203
2010 0, -452, 362, -4,574, -10,575, -13,203
```

-59 TIP ELEV

GROUP	MAX. PILE LOAD P	MAX. PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW. PILE LOAD P	ALLOW. PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-32.6	-0.5	II	II	-40	3.49	81.5	14.3
B	63.8	0.4	I	II	73	1.21	87.4	33.1

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 5
JOB № 575-79
SHEET № 592 OF
BY NDL DATE 12-3-79
CHKD. BY DATE

PILES

```
11/13/79     15.75


10 FLORIDA AVE WEST 575-79
20 MONOLITH 5
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,9
110 2.25,9.0,15.75,22.5,29.25,36.0,42.75,49.5,56.25
140 9*-1.5
170 9*0.0
200 2,270,13
210 6.75,15.74,24.75,33.75,42.75,51.75,2.25,11.25,20.25,29.25,38.25,
    47.25,56.25
240 6*-6.5,7*-9.5
270 13*0.0
2000 0,-452,436,-5174,-12736,-13203
2010 0,-452,362,-4574,-10575,-13203

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        11/13/79     15.769


    PROG. NO. 713-F3-A2-210     15:47:17  11/13/79     MOD 6A, JUN 78

 FLORIDA AVE WEST 575-79
 MONOLITH 5

TOTAL NUMBER OF PILES =    22
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº 54b OF ______
ITEM WEST MONOLITH 5 BY NDL DATE 12-3-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

```
            LOAD CONDITION   1                    MONOLITH 5 <=

          LOADS ON PILE CAP
       X          Y          Z          MX          MY          MZ
       0.       -452.0      436.0     -5174.0    -12736.0    -13203.0

            PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1     -0.2     0.0     -28.7
 10      0.2     0.0      50.1
 16      0.2     0.0      63.8
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1         -0.0   -452.0    436.0    -5174.0   -12736.0   -13203.0


            LOAD CONDITION   2

          LOADS ON PILE CAP
       X          Y          Z          MX          MY          MZ
       0.       -452.0      362.0     -4574.0    -10575.0    -13203.0

            PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1     -0.5     0.0     -32.6
 10      0.4     0.0      59.0
 16      0.4     0.0      49.5
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         -0.0   -452.0    362.0    -4574.0   -10575.0   -13203.0


   0    15:47:25   11/13/79    *** END OF  RUN ***


STOP        EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

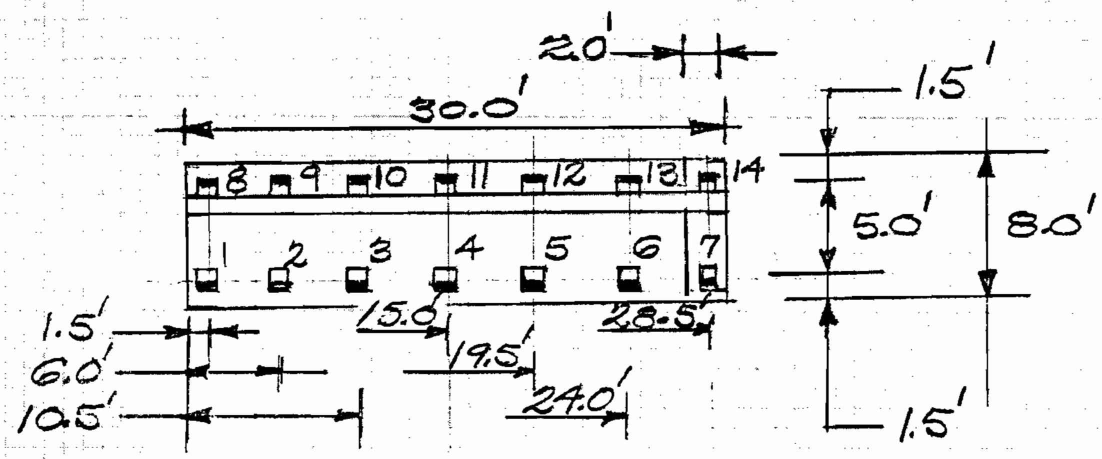
0           PROG NO. 713-F3-A2-210       15:47:17   11/13/79          MOD 6A,
11020    DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X           Y           Z           RX           RY           RZ
11022 -0.436E-04 -0.390E-01 -0.524E-02 -0.264E-03  0.117E-06  0.671E-06
12022 -0.442E-04 -0.748E-01  0.180E-01  0.184E-03  0.806E-07  0.680E-06

READY

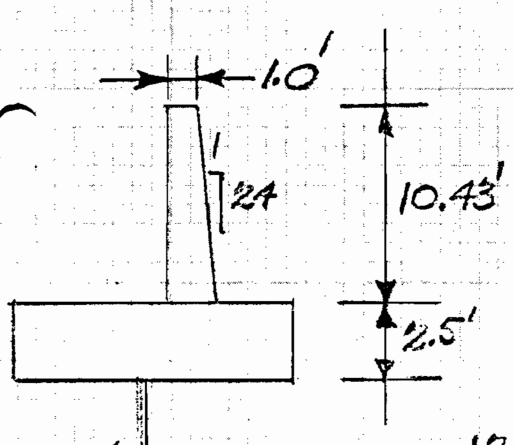
*
```

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	
JOB	SHEET Nº ____ OF ____
ITEM WEST MONOLITH 7	BY NDL DATE 11-2-79
JOB Nº 575-79	CHKD. BY ____ DATE ____

PILES

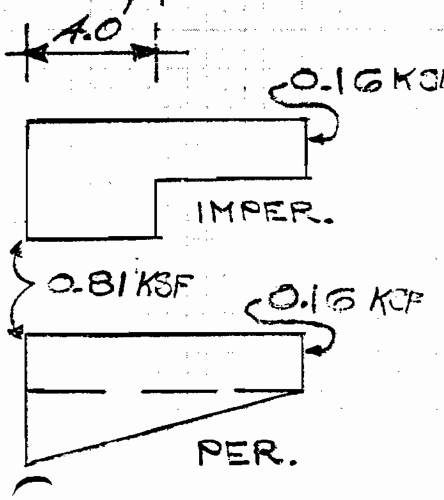


$$\begin{array}{r} 34.43 \\ \underline{24.00} \\ 10.43' \end{array} \qquad \begin{array}{r} 34.43 \\ \underline{21.50} \\ 12.93' \end{array}$$



$$\begin{array}{r} 21.50 \\ \underline{20.43} \\ 1.07 \\ \underline{57} \end{array}$$

-56 TIP EL. NGVD



$12.93 \times 0.0625 = 0.81$ KSF

$$F_{IMPER_z} = \overset{97}{0.81 \times 4 \times 30} + \overset{19}{0.16 \times 4 \times 30} = -116^{K}$$

$$M_{IMPER_y} = 97 \times 15 + 19 \times 15 = 1{,}740^{1K}$$

$$M_{IMPER_x} = 97 \times 2 + 19 \times 6 = 308^{1K}$$

$$F_{PER_z} = \overset{38}{0.16 \times 8 \times 30} + \overset{78}{\left(\frac{0.81 - 0.16}{2}\right) \times 8 \times 30} = -116^{K}$$

$$M_{PER_y} = 38 \times 15 + 78 \times 15 = 1{,}740^{1K}$$

$$M_{PER_x} = 38 \times 4 + 78 \times \frac{8}{3} = 360^{1K}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM WEST MONOLITH 7 BY NDL DATE 11-8-79
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 10.43 \times 5 \times 30 \times 0.0625 = 98^K$

$M_y = 98 \times 15 = -1470^{1K}$

$M_x = 98 \times 2.5 = -245^{1K}$

WATER-HORIZ

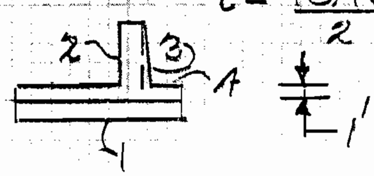
$F_y = 30 \times 0.0625 \left(\overset{157}{\overline{\dfrac{12.93}{2}}}^{2} - \overset{-6}{\overline{\dfrac{2.5}{2}}}^{2} \right) = -151^K$

$M_x = -157 \times \dfrac{12.93}{3} + 6 \times \dfrac{2.5}{3} = -672^{1K}$

$M_z = -157 \times 15 + 6 \times 15 = -2{,}265^{1K}$

CONCRETE WEIGHT

$t = \dfrac{10.43}{2} + 12 = 17.22''$



	F_z	X	M_y	Y	M_x
1	96.1	15	1,442	4	384
2	46.9	15	704	5.5	258
3	10.2	15	153	6.14	63
4	2.1	29	61	3.78	8
	155^K		$-2{,}360^{1K}$		-713^{1K}

LOAD TABULATION

LOAD NO	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	155	-713	-2,360	0
2	WATER-VERT	0	0	98	-245	-1,470	0
3	WATER-HORIZ	0	-151	0	-672	0	-2,265
4	UPLIFT-IMP	0	0	-116	308	1,740	0
5	UPLIFT-PERV	0	0	-116	360	1,740	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-151	137	-1,322	-2,090	-2,265
II	1+2+3+5	0	-151	137	-1,270	-2,090	-2,265

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº	OF
	ITEM WEST MONOLITH 7	BY NDL	DATE 11-9-79
	JOB Nº 575-79	CHKD. BY	DATE

PILES

COMPUTER INPUT

```
10 FLORIDA AVE WEST 575-79
20 MONOLITH 7(8)
30 2,2
40 2, 0.0, 64
50 1, 12, 12
60 1, 5
70 -1, 8.33
80 0, 0, 0
100 2, 90, 7
110 1.5, 6.0, 10.5, 15.0, 19.5, 24.0, 28.5
140 7*-1.5
170 7*0.0
200 2, 270, 7
210 1.5, 6.0, 10.5, 15.0, 19.5, 24.0, 28.5
240 7* -6.5
270 7* 0.0
2000 0, -151, 137, -1,322, -2,090, -2,265
2010 0, -151, 137, -1,270, -2,090, -2,265
```

-56 TIP EL.

GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-14.1	-0.4	I	II	-40	3.49	35.2	11.5
B	35.1	0.4	I	II	65	1.21	54.0	33.1

37a

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 7 BY NDL DATE 12-3-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

```
11/13/79     15.41


10 FLORIDA AVE WEST 575-79
20 MONOLITH 7
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,7
110 1.5,6.0,10.5,15.0,19.5,24.0,28.5
140 7*-1.5
170 7*0.0
200 2,270,7
210 1.5,6.0,10.5,15.0,19.5,24.0,28.5
240 7*-6.5
270 7*0.0
2000 0,-151,137,-1322,-2090,-2265
2010 0,-151,137,-1270,-2090,-2265

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        11/13/79     15.434


    PROG. NO. 713-F3-A2-210     15:26:50   11/13/79     MOD 6A, JUN 78

  FLORIDA AVE WEST 575-79
  MONOLITH 7


TOTAL NUMBER OF PILES =    14
```

376

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 7 BY NDL DATE 12-3-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

```
            LOAD CONDITION   1                 MONOLITH 7 <=

          LOADS ON PILE CAP
        X           Y           Z          MX          MY          MZ
        0.       -151.0       137.0    -1322.0     -2090.0     -2265.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1     0.2     0.0     -14.1
  8    -0.3    -0.0      35.1
   1       SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1          0.0   -151.0    137.0    -1322.0    -2090.0    -2265.0


            LOAD CONDITION   2

          LOADS ON PILE CAP
        X           Y           Z          MX          MY          MZ
        0.       -151.0       137.0    -1270.0     -2090.0     -2265.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -0.4     0.0     -12.8
  8     0.4    -0.0      33.7
   2       SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2          0.0   -151.0    137.0    -1270.0    -2090.0    -2265.0


   0    15:27:04    11/13/79     *** END OF  RUN ***


STOP        EOJ

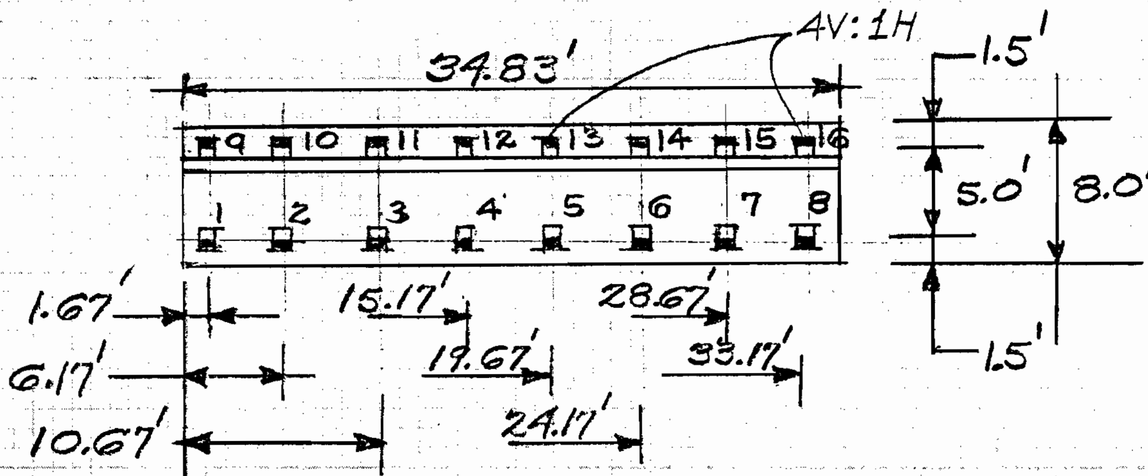
*OLD P29010
READY
*LIST 11020-11022,12022

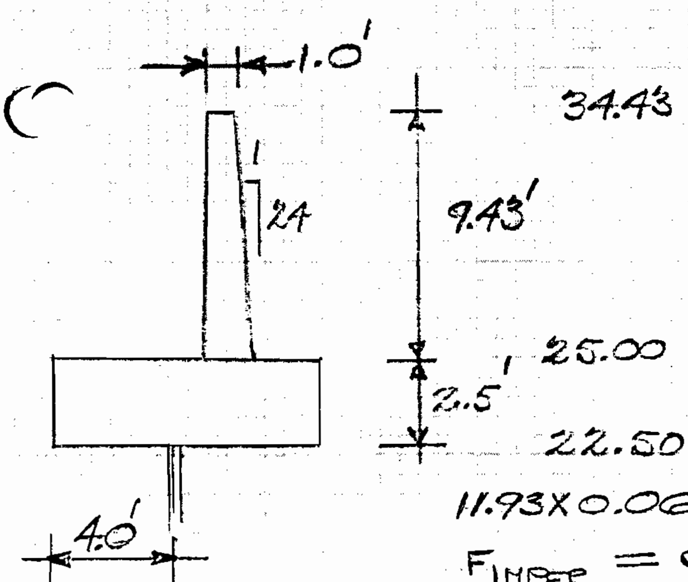
0          PROG NO. 713-F3-A2-210        15:26:50   11/13/79              MOD 6A,
11020    DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X          Y          Z          RX          RY          RZ
11022 -0.157E-07  0.263E-01 -0.411E-01 -0.101E-02 -0.200E-05  0.384E-10
12022 -0.122E-07 -0.640E-01  0.325E-01  0.527E-03 -0.200E-05 -0.198E-10
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 9 BY NDL DATE 11-2-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES



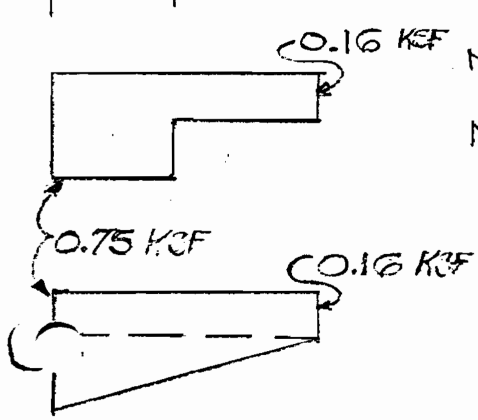


34.43	34.43	22.50
25.00	22.50	20.43
9.43'	11.93'	2.07
		57

−55 TIP No. NGVD

$11.93 \times 0.0625 = 0.75$ KSF

$F_{IMPER_Z} = \overset{104}{0.75 \times 4 \times 34.83} + \overset{22}{0.16 \times 4 \times 34.83} = -126^K$



$M_{IMPER_Y} = 104 \times 17.42 + 22 \times 17.42 = 2{,}195^{IK}$

$M_{IMPER_X} = 104 \times 2 + 22 \times 6 = 340^{IK}$

$F_{PER_Z} = \overset{45}{0.16 \times 8 \times 34.83} + \overset{82}{\left(\frac{0.75 - 0.16}{2}\right) \times 8 \times 34.83}$
$= -127^K$

$M_{PER_Y} = 45 \times 17.42 + 82 \times 17.42 = 2{,}212^{IK}$

$M_{PER_X} = 45 \times 4 + 82 \times \frac{8}{3} = 399^{IK}$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 9 BY NDL DATE 11-9-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 9.43 \times 5 \times 34.83 \times 0.0625 = 103^K$

$M_Y = 103 \times 17.42 = -1{,}794^{IK}$

$M_X = 103 \times 2.5 = -258^{IK}$

WATER-HORIZ

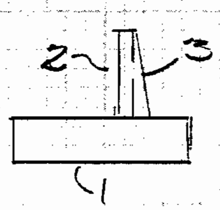
$$F_Y = 34.83 \times 0.0625\left(\overset{155}{\left(\frac{11.93}{2}\right)^2} - \overset{-7}{\left(\frac{2.5}{2}\right)^2}\right) = -148^K$$

$$M_X = -155 \times \frac{11.93}{3} + 7 \times \frac{2.5}{3} = -611^{IK}$$

$$M_Z = -155 \times 17.42 + 7 \times 17.42 = -2{,}578^{IK}$$

CONCRETE WEIGHT

$$t = \frac{9.43}{2} + 12 = 16.72''$$



	F_z	X	M_Y	Y	M_X
1	104.5	17.42	1,820	4	418
2	49.3	17.42	859	5.5	271
3	9.7	17.42	169	6.13	59
	164^K		$-2{,}848^{IK}$		-748^{IK}

LOAD TABULATION

LOAD NO.	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	164	-748	-2,848	0
2	WATER-VERT	0	0	103	-258	-1,794	0
3	WATER-HORIZ	0	-148	0	-611	0	-2,578
4	UPLIFT-IMP	0	0	-126	340	2,195	0
5	UPLIFT-PERV	0	0	-127	399	2,212	0

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	0	-148	141	-1,277	-2,447	-2,578
II	1+2+3+5	0	-148	140	-1,218	-2,430	-2,578

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 9 BY NDL DATE 11-9-79
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    MONOLITH 9
30    ,2
40    2,0.0,64
50    1,12,12
60    1,5
70    -1, 8.33
80    0,0,0
100   2,90,8
110   1.67,6.17,10.67,15.17,19.67,24.17,28.67,33.17
140   8*-1.5
170   8*0.0
200   2,270,6
210   1.67,6.17,10.67,15.17,24.17,28.67
240   6*-6.5
270   6*0.0
300   4,270,2
310   19.67,33.17
340   2*-6.5
370   2*0.0
2000  0,-146,141,-1277,-2447,-2578
2010  0,-148,140,-1218,-2430,-2578
```

```
03/27/80     14.17


10 FLORIDA AVE WEST 575-79
20 MONOLITH 9
30 3,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,8
110 1.67,6.17,10.67,15.17,19.67,24.17,28.67,33.17
140 8*-1.5
170 8*0.0
200 2,270,6
210 1.67,6.17,10.67,15.17,24.17,28.67
240 6*-6.5
270 6*0.0
300 4,270,2
310 19.67,33.17
340 2*-6.5
370 2*0.0
2000 0,-148,141,-1277,-2447,-2578
2010 0,-148,140,-1218,-2430,-2578

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/27/80     14.199


    PROG. NO. 713-F3-A2-210    14:12:26   03/27/80     MOD 6B, FEB 80

 FLORIDA AVE WEST 575-79
 MONOLITH 9


TOTAL NUMBER OF PILES =    16
```

LOAD CONDITION 1 MONOLITH 9 41B

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-148.0	141.0	-1277.0	-2447.0	-2578.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	-0.0	-9.1
9	0.5	-0.0	26.1
10	0.6	-0.0	29.5
11	0.6	-0.0	33.0
12	0.6	-0.0	36.5
13	0.6	-0.0	43.4
14	0.6	-0.0	46.8
15	0.6	-0.0	7.5
16	0.7	-0.0	15.6

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-148.0	141.0	-1277.0	-2447.0	-2578.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-148.0	140.0	-1218.0	-2430.0	-2578.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	-0.0	-8.7
9	0.8	-0.0	24.0
10	0.9	-0.0	28.9
11	0.9	-0.0	33.8
12	0.9	-0.0	38.7
13	0.9	-0.0	48.6
14	0.9	-0.0	53.5
15	0.9	-0.0	-5.5
16	1.0	-0.0	6.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-148.0	140.0	-1218.0	-2430.0	-2578.0

0 14:12:49 03/27/80 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022
```

0 PROG NO. 713-F3-A2-210 14:12:26 03/27/80 MOD 6B,

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

	X	Y	Z	RX	RY	RZ
11021						
11022	0.236E-02	-0.802E-01	0.509E-01	0.945E-03	-0.199E-04	-0.493E-04
12022	0.310E-02	-0.120E 00	0.837E-01	0.165E-02	-0.309E-04	-0.647E-04

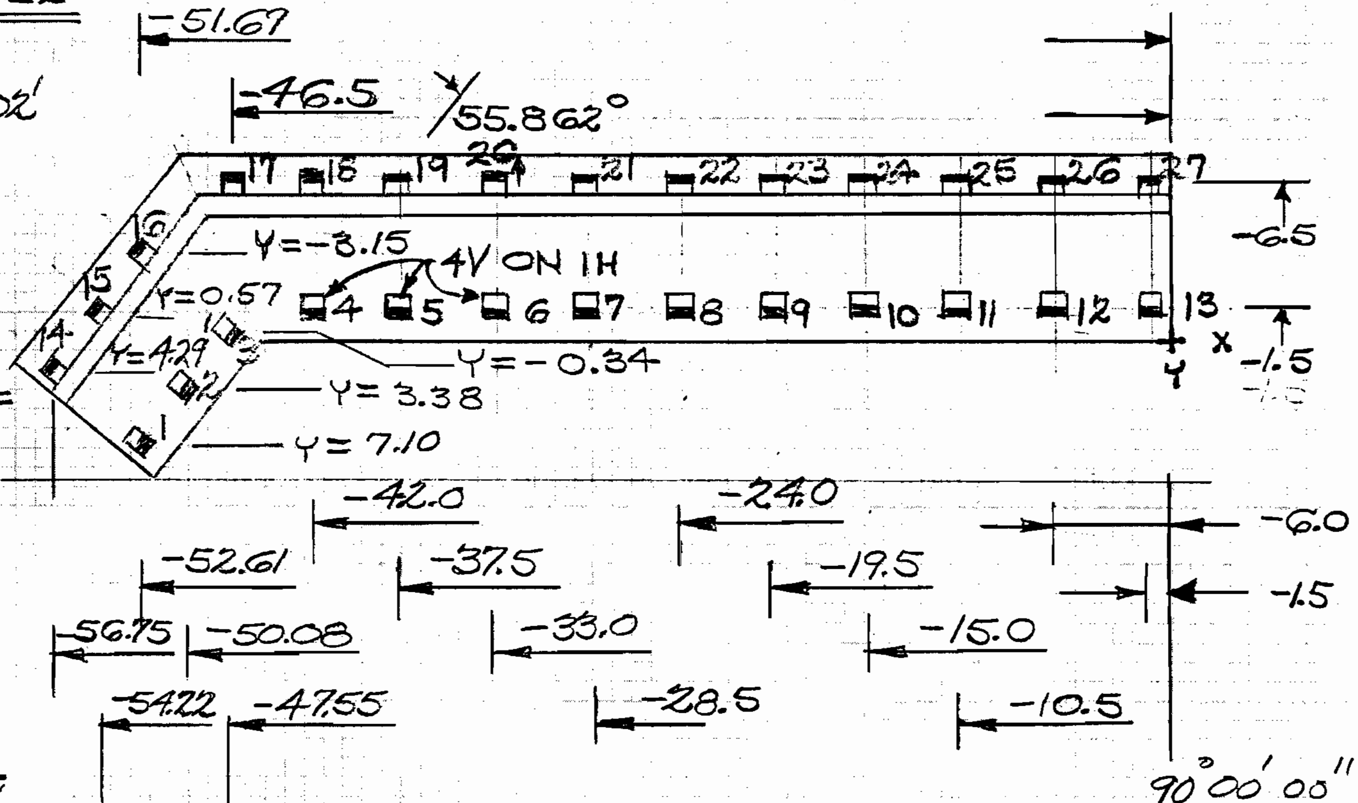
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 6 BY NDL DATE 11-2-79
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

$\frac{1.5}{\tan\phi} = 1.02'$

3.26
1.02
2.24'



$\cos\phi\, 2.24 = 1.26'$

43.62
1.26
49.88'

$\frac{1.5}{\sin\phi} = 1.81$

49.88
1.81
51.69'

90° 00' 00"
55 51 43.61
34° 8' 16.39"
34.138°
55.862°

$\cos\phi\, 4.5 = 2.53$

51.67
54.22'
4.14
50.08'

54.22
2.53
56.75'
4.14
52.61'

$\sin\phi\, 5 = 4.14'$

51.67
47.55'

$2.24 \sin\phi = 1.85'$

3.50
1.65'
1.50
3.15'

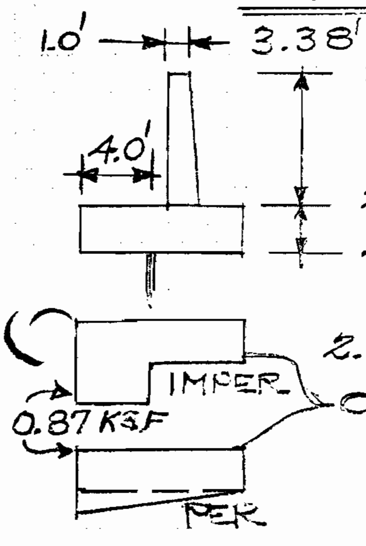
$\sin\phi\, 4.5 = 3.72'$

3.15
0.57'
2.81
3.38'

0.57
3.72
4.29'
2.81
7.10'

$\cos\phi\, 5 = 2.81'$

3.15
-0.34



34.43
20.50
13.93 X 0.0625 = 0.87 KSF

2.5 X 0.0625 = 0.16 KSF

0.16 KSF

20.50
20.43
.07
57

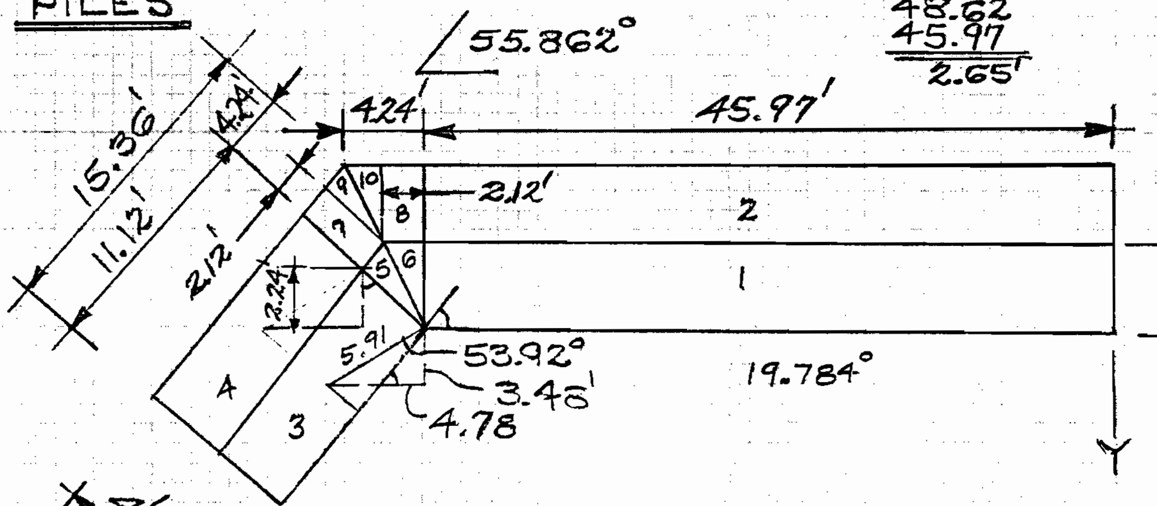
-57 NGVD (2:1)

-62 NGVD (4:1)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 6 BY NDL DATE 11-15-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

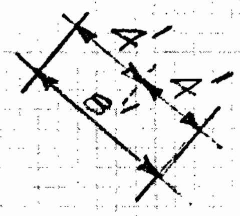


48.62'
45.97
2.65'

TAN $\frac{\phi}{2}$ 8 = 4.24'
11.12
15.36'
15'-4 5/16"

0.162

0.87 K/'



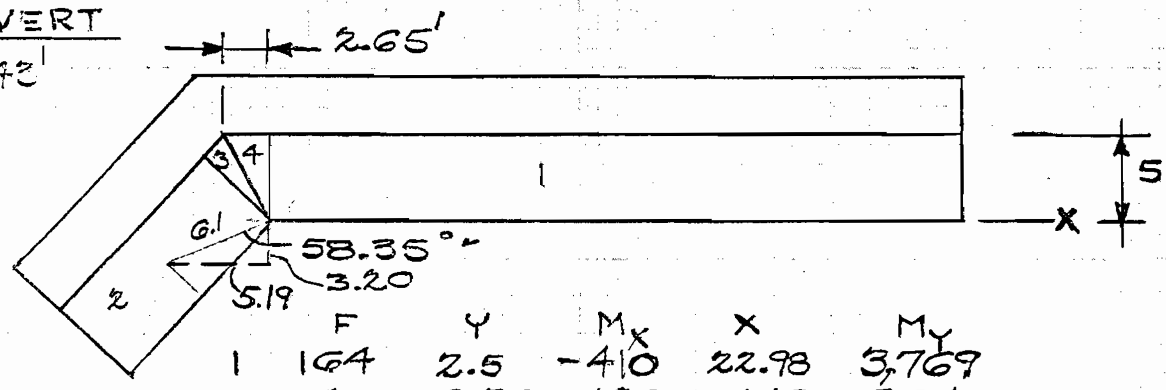
84.212

IMPER	A	F	Y	Mx	X	My
1	183.88	160	2	320	22.98	-3,677
2	183.88	29	6	174	22.98	- 666
3	44.48	39	3.48	- 136	50.75	-1,979
4	44.48	7	1.24	- 9	54.06	- 378
5	4.24	4	2.1	8	48	- 192
6	4.24	4	2.67	11	46.68	- 187
7	8.48	1	4.4	4	50.6	- 51
8	8.48	1	6	6	47.03	- 47
9	4.24	1	6.1	6	50	- 50
10	4.24	1	6.67	7	48.80	- 49
	490.64	-247 K		391 1K		-7,276 1K

WATER-VERT

h_ω = 11.43'

24.21



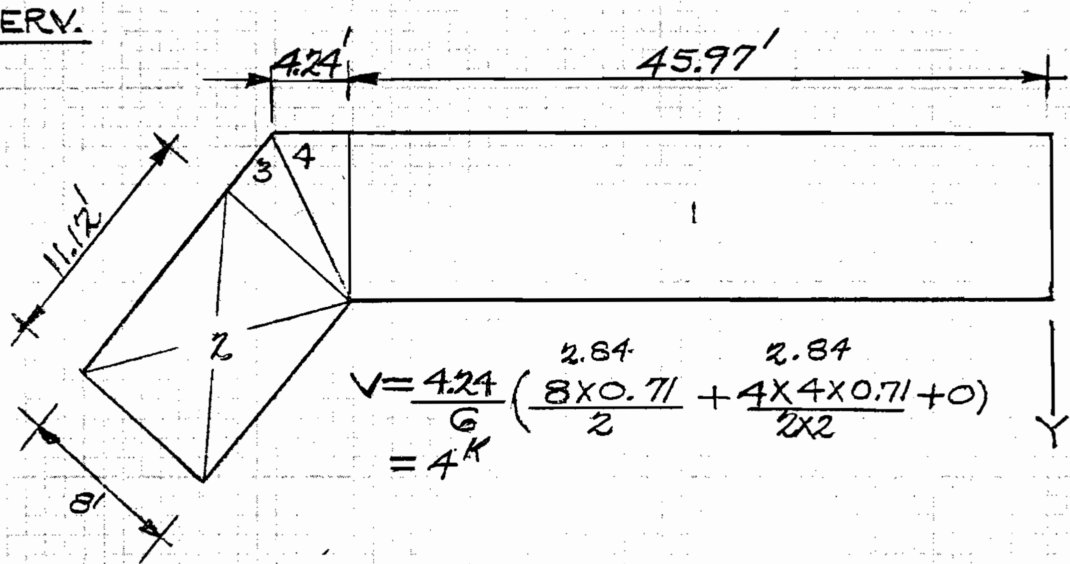
	F	Y	Mx	X	My
1	164	2.5	-410	22.98	3,769
2	40	3.20	128	51.16	2,046
3	5	2.5	- 12	48.5	242
4	5	3.33	- 17	46.85	234
	214 K		-311 1K		6,291 1K

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

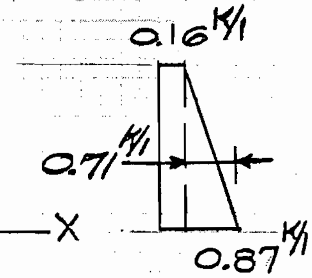
JOB
ITEM WEST MONOLITH 6
JOB No 575-79
SHEET No ____ OF ____
BY NDL DATE 11-15-79
CHKD. BY ____ DATE ____

PILES

PERV.



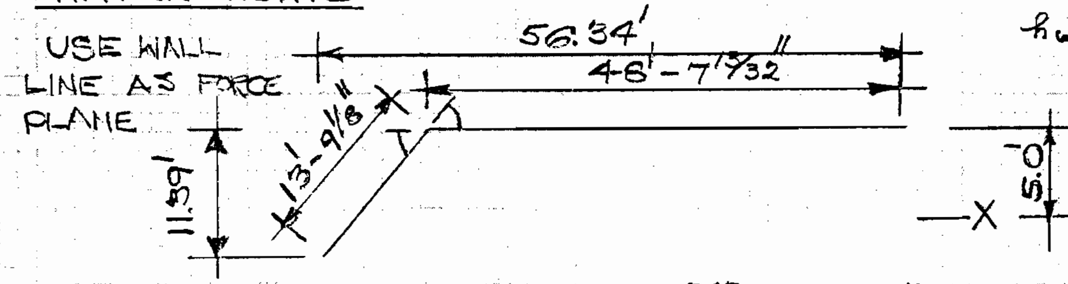
$$V=\frac{4.24}{6}\left(\frac{\overset{2.84}{8\times 0.71}}{2}+\frac{\overset{2.84}{4\times 4\times 0.71}}{2\times 2}+0\right)=4^{K}$$



	FORCE		Y		M_X	X		M_Y
	UNI	TRI	UNI	TRI		UNI	TRI	
1	59	731	4	2.67	586	22.98		-4,366
2	14	32	2.4	3.2	-136	52.6	51.5	-2,384
3	3	4	4.2	3	25	49.8	48.7	-344
4	3	4	5.33	4.00	32	47.38	47.03	-330
	-250^{K}				$507^{'K}$			$-7424^{'K}$

WATER-HORIZ

USE WALL LINE AS FORCE PLANE



$h_w = 11.43'$

$$\begin{array}{r} 7.72 \\ 48.62 \\ \hline 56.34' \end{array}$$

$$F_Y = 56.34\times 0.0625\left(\overset{342}{13.93^2/2}-\overset{11}{2.5^2/2}\right)=-331^{K}$$

$$M_X = 342\times 13.93/3 - 11\times 2.5/3 = -1,579^{'K}$$

$$F_X = 11.39\times 0.0625\left(\overset{69}{13.93^2/2}-\overset{2}{2.5^2/2}\right)=-67^{K}$$

$$M_Y = 69\times 13.93/3 - 2\times 2.5/3 = 319^{'K}$$

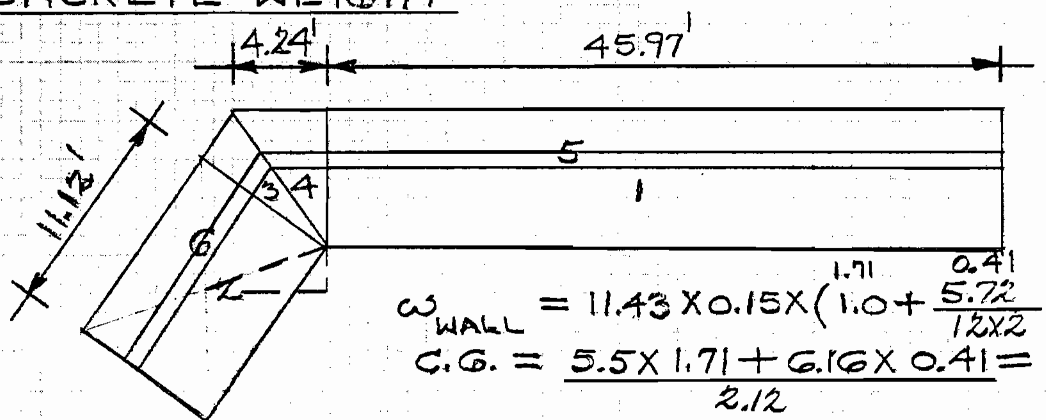
$$M_Z = 331\times 56.34/2 + 67\times(11.39/2-5.0) = 9,371^{'K}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 6
JOB NO 575-79
SHEET NO OF
BY NDL DATE 11-16-79
CHKD. BY DATE

PILES

CONCRETE-WEIGHT



$4.24 \times \frac{5.63}{8} = 2.98'$

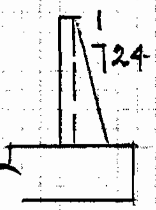
11.12	45.97
2.98	2.98
14.10'	48.95'

$$\omega_{WALL} = 11.43 \times 0.15 \times \left(1.0 + \frac{5.72}{12 \times 2}\right) = 2.12^{K/'}$$

(1.71 above 1.0; 0.41 above $\frac{5.72}{12\times2}$)

$$C.G. = \frac{5.5 \times 1.71 + 6.16 \times 0.41}{2.12} = 5.63'$$

$$t = 12 + \frac{11.43}{2} = 17.72''$$



	F	Y	Mx	X	My
1	138	4	-552	22.98	3,171
2	33	2.4	79	52.6	1,736
3	6	4.2	-25	49.8	299
4	6	5.33	-32	47.38	284
5	104	5.63	-586	22.98	2,390
6	30	0.2	6	53.1	1,593
	317K		-1,110'K		9,473'K

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	317	-1,110	9,473	0
2	WATER-VERT	0	0	214	-311	6,291	0
3	WATER-HORIZ	-67	-331	0	-1,579	319	9,371
4	UPLIFT-IMP	0	0	-247	427	-7,298	0
5	UPLIFT-PERV	0	0	-250	507	-7,424	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	1+2+3+4	-67	-331	284	-2,573	8,785	9,371
2	1+2+3+5	-67	-331	281	-2,493	8,659	9,371

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 6 BY NDL DATE 11-16-79
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER INPUT

```
10   FLORIDA AVE WEST 575-79
20   MONOLITH 6
30   5, 2
40   2, 0.0, 64
50   1, 12, 12
60   1, 5
70   -1, 8.33
80   0, 0, 0
100  2, 34.14, 3
110  -52.61, -50.08, -47.55
140  7.1, 3.38, -1.5
170  0.0, 0.0, 0.0
200  4, 90, 3
210  -42.0, -37.5, -33.0
240  3* -1.5
270  3* 0.0
300  2, 90, 7
310  -28.5, -24.0, -19.5, -15.0, -10.5, -6.0, -1.5
340  7* -1.5
370  7* 0.0
400  2, 214.14, 3
410  -56.75, -54.22, -51.69
440  4.29, 0.57, -3.15
470  3* 0.0
500  2, 270, 11
510  -46.5, -42.0, -37.5, -33.0, -28.5, -24.0, -19.5, -15.0, -10.5, -6.0, -1.5
540  11* -6.5
570  11* 0.0
2000 -67, -331, 284, -2573, 8785, 9371
2010 -67, -331, 281, -2493, 8659, 9371
```

GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-25.0	-0.3	I	I	-40	3.49	62.5	8.6
B	-17.3	-0.4	II	II	-40	3.49	43.2	11.6
C	-28.8	-0.3	II	II	-40	3.49	72.0	8.6
D	41.9	0.3	II	II	68	1.21	61.6	24.8
E	47.4	0.4	I	II	68	1.21	69.7	33.1

45 A

11/28/79   13.71

```
10 FLORIDA AVE WEST 575-79
20 MONOLITH 6
30 5,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,34.14,3
110 -52.61,-50.08,-47.55
140 7.1,3.38,-1.5
170 0.0,0.0,0.0
200 4,90,3
210 -42.0,-37.5,-33.0
240 3*-1.5
270 3*0.0
300 2,90,7
310 -28.5,-24.0,-19.5,-15.0,-10.5,-6.0,-1.5
340 7*-1.5
370 7*0.0
400 2,214.14,3
410 -56.75,-54.22,-51.69
440 4.29,0.57,-3.15
470 3*0.0
500 2,270,11
510 -46.5,-42.0,-37.5,-33.0,-28.5,-24.0,-19.5,-15.0,-10.5,-6.0,-1.5
540 11*-6.5
570 11*0.0
2000 -67,-331,284,-2573,8785,9371
2010 -67,-331,281,-2493,8659,9371
```

READY

*CLEAR

AFT CLEARED

*RUN RK29010A

ILLEGAL CHARACTER IN FIELD FOLLOWING   DESCRIPTION
*CLEAR
AFT CLEARED

*RUN RK29010A

11/28/79   13.799

PROG. NO. 713-F3-A2-210   13:48:53   11/28/79   MOD 6A, JUN 78

FLORIDA AVE WEST 575-79
MONOLITH 6

TOTAL NUMBER OF PILES =   27

LOAD CONDITION 1

LOADS ON PILE CAP MONOLITH 6

X	Y	Z	MX	MY	MZ
-67.0	-331.0	284.0	-2573.0	8785.0	9371.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.3	-25.0
2	-0.3	-0.3	-23.9
3	-0.2	-0.3	-22.7
4	-0.4	0.0	-15.3
5	-0.4	0.0	-13.5
6	-0.3	0.0	-11.7
7	-0.3	0.0	-27.2
8	-0.3	0.0	-24.6
9	-0.3	0.0	-22.1
10	-0.3	0.0	-19.6
11	-0.3	0.0	-17.1
12	-0.2	0.0	-14.6
13	-0.2	0.0	-12.1
14	0.3	0.3	38.2
15	0.2	0.3	35.7
16	0.2	0.3	33.3
17	0.3	-0.0	47.4
18	0.3	-0.0	46.3
19	0.3	-0.0	45.3
20	0.3	-0.0	44.2
21	0.3	-0.0	43.2
22	0.3	-0.0	42.1
23	0.2	-0.0	41.1
24	0.2	-0.0	40.0
25	0.2	-0.0	39.0
26	0.2	-0.0	37.9
27	0.2	-0.0	36.9

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-67.0	-331.0	284.0	-2573.0	8785.0	9371.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-67.0	-331.0	281.0	-2493.0	8659.0	9371.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.3	-21.5
2	-0.3	-0.3	-22.7
3	-0.2	-0.3	-24.7
4	-0.4	0.0	-17.3
5	-0.4	0.0	-15.0
6	-0.4	0.0	-12.8
7	-0.3	0.0	-28.8
8	-0.3	0.0	-25.7
9	-0.3	0.0	-22.7
10	-0.3	0.0	-19.7
11	-0.3	0.0	-16.6
12	-0.3	0.0	-13.6
13	-0.3	0.0	-10.5
14	0.3	0.3	41.9
15	0.2	0.3	36.8
16	0.2	0.3	31.8
17	0.4	-0.0	45.8
18	0.4	-0.0	45.0
19	0.3	-0.0	44.2
20	0.3	-0.0	43.4
21	0.3	-0.0	42.5
22	0.3	-0.0	41.7
23	0.3	-0.0	40.9
24	0.2	-0.0	40.1
25	0.2	-0.0	39.3
26	0.2	-0.0	38.5
27	0.2	-0.0	37.7

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 -67.0 -331.0 281.0 -2493.0 8659.0 9371.0

0 11:35:32 12/03/79 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

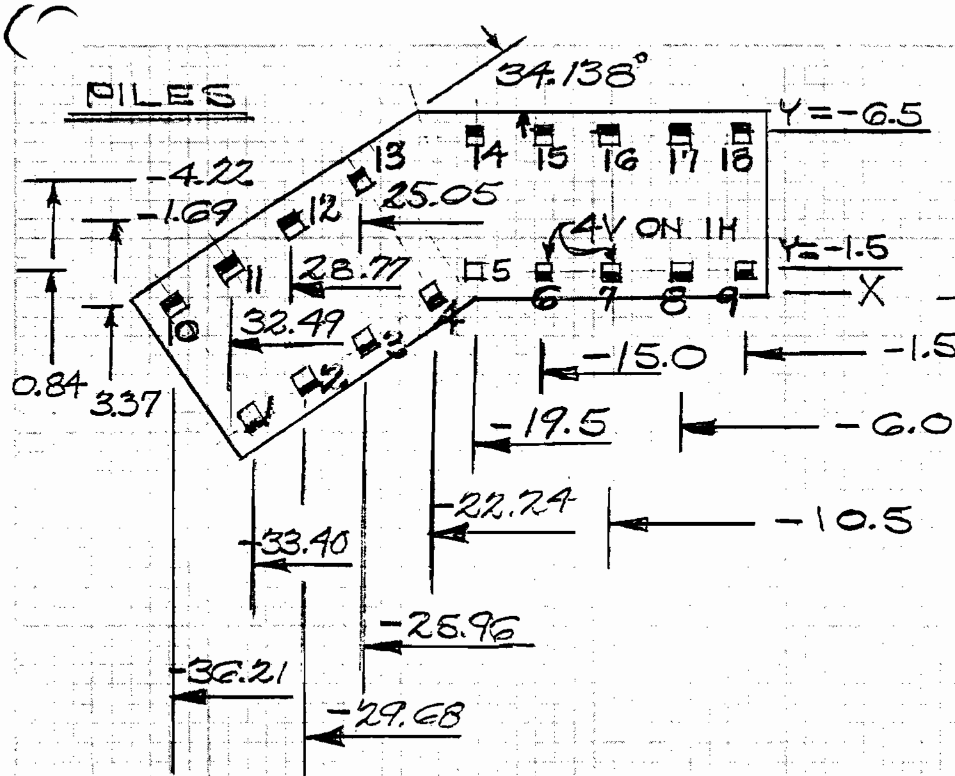
0 PROG NO. 713-F3-A2-210 11:35:24 12/03/79 MOD 6A, JU

11020	DEFLECTION OF PILE CAP (INCHES & RADIANS)					
11021	X	Y	Z	RX	RY	RZ
11022	-0.759E-02	-0.342E-01	0.958E-02	0.168E-04	-0.937E-05	0.459E-04
12022	-0.655E-02	-0.362E-01	0.125E-01	0.587E-04	-0.144E-04	0.496E-04

READY

*

PILES



$$\begin{array}{r} 17'-1'' \\ 15-0 \\ \hline 2'-1'' \end{array} \qquad \begin{array}{r} 2-1 \\ 4-6 \\ \hline 6'-7'' \\ (6.58') \end{array}$$

SIN ∅ 6.58 = 3.69'

COS ∅ 1.5 = 1.24'

$$\begin{array}{r} 3.69 \\ 1.24 \\ \hline 2.45' \end{array}$$

SIN ∅ 4.5 = 2.53'

$$\begin{array}{r} 2.45 \\ \hline -0.08' \end{array}$$

$$\begin{array}{r} 2.53 \\ 2.45 \\ \hline 4.98' \end{array} \qquad \begin{array}{r} 4.98 \\ 2.53 \\ \hline 7.51' \end{array}$$

COS ∅ 2.08 = 1.72'

$$\begin{array}{r} 1.50 \\ \hline .22' \end{array}$$

COS ∅ 4.5 = 3.72'

COS ∅ 6.58 = 5.45'

SIN ∅ 1.5 = 0.84

$$\begin{array}{r} \hline 6.29' \end{array}$$

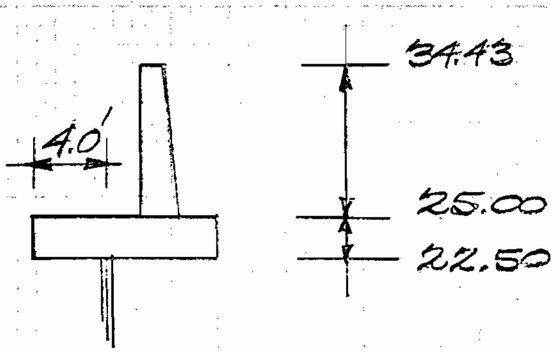
$$\begin{array}{r} 19.67 \\ 6.29 \\ \hline 25.96' \\ 2.81 \\ \hline 28.77' \end{array}$$

$$\begin{array}{r} 25.96 \\ 3.72 \\ \hline 22.24' \\ 2.81 \\ \hline 25.05' \end{array} \qquad \begin{array}{r} 25.96 \\ 3.72 \\ \hline 29.68' \\ 2.81 \\ \hline 32.49' \end{array} \qquad \begin{array}{r} 29.68 \\ 3.72 \\ \hline 33.40' \\ 2.81 \\ \hline 36.21' \end{array}$$

SIN ∅ 5 = 2.81'

COS ∅ 5 = 4.14'

$$\begin{array}{r} 7.51 \\ 4.14 \\ \hline 3.37' \end{array} \qquad \begin{array}{r} 4.98 \\ 4.14 \\ \hline 0.84' \end{array} \qquad \begin{array}{r} 4.14 \\ 2.45 \\ \hline -1.69' \end{array} \qquad \begin{array}{r} 0.08 \\ 4.14 \\ \hline -4.22' \end{array}$$



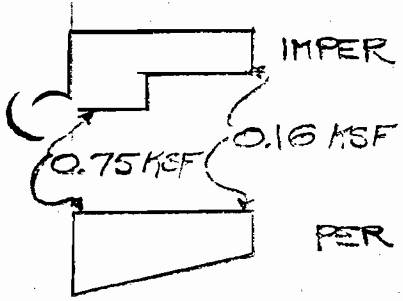
$$\begin{array}{r} 34.43 \\ 22.50 \\ \hline 11.93' \end{array} \times 0.0625 = 0.75 \text{ KSF}$$

$$\begin{array}{r} 22.50 \\ 20.43 \\ \hline 2.07 \\ 57 \\ \hline \end{array}$$

-55 NGVD (2:1)

-60 NGVD (4:1)

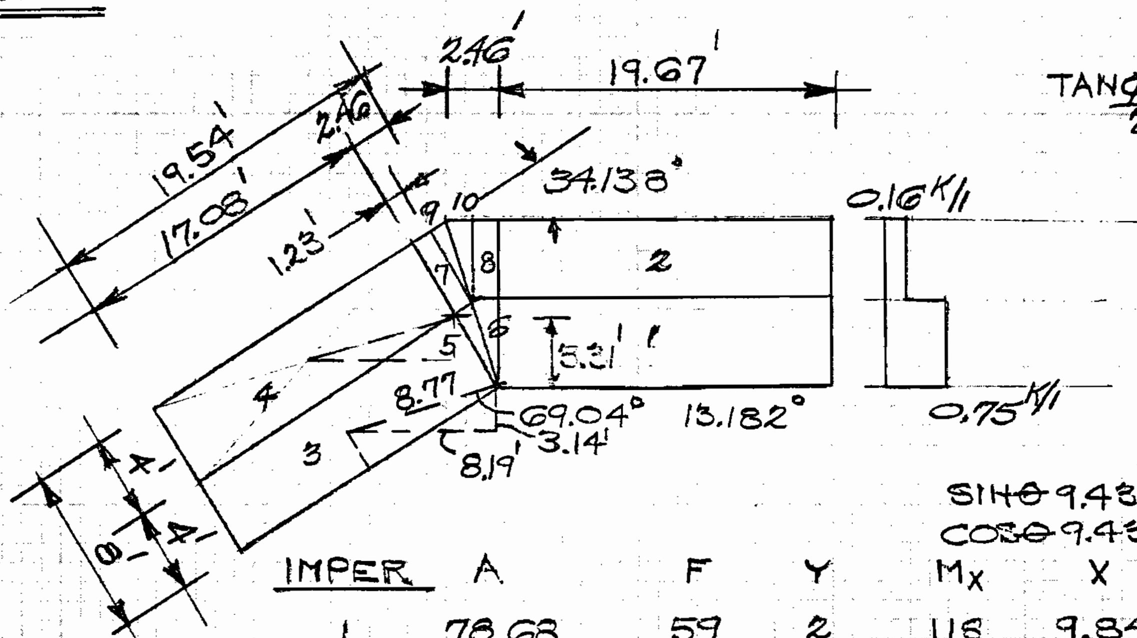
-62 NGVD (VERT)



N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 8
JOB No 575-79
SHEET No OF
BY NDL DATE 11-19-79
CHKD. BY DATE

PILES



TAN $\frac{\phi}{2}$ 8 = 2.46'
17.08
19.54'

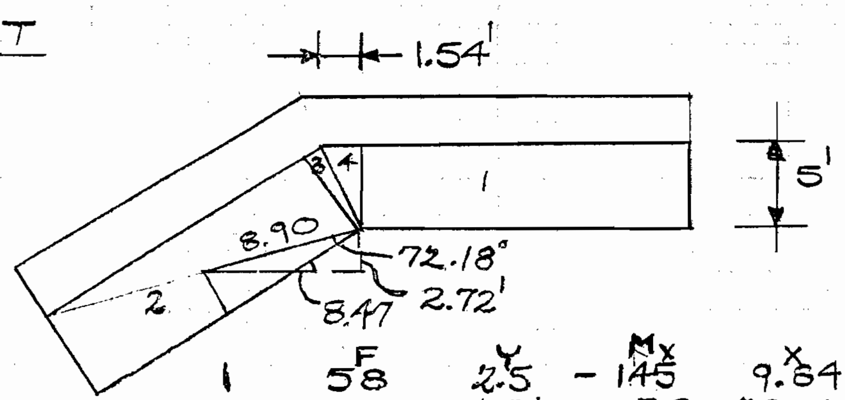
25.098°
55.862
80.960°

SIN 9.43 = 9.31'
COS 9.43 = 1.48'

IMPER	A	F	Y	M_X	X	M_Y
1	78.68	59	2	118	9.84	-581
2	78.68	13	6	78	9.84	-128
3	68.32	51	3.14	-160	27.86	-1,421
4	68.32	11	0.17	2	30.10	-331
5	2.46	2	2.4	5	21.0	-42
6	2.46	2	2.67	5	20.03	-40
7	4.92	1	5.2	5	22.6	-23
8	4.92	1	6	6	20.29	-20
9	2.46	1	6.5	6	21.7	-22
10	2.46					
	313.68 S.F.	-141K		65 1K		-2,608 1K

WATER-VERT

$h_w = 9.43'$



16.317°
90.000
-34.138
72.18°

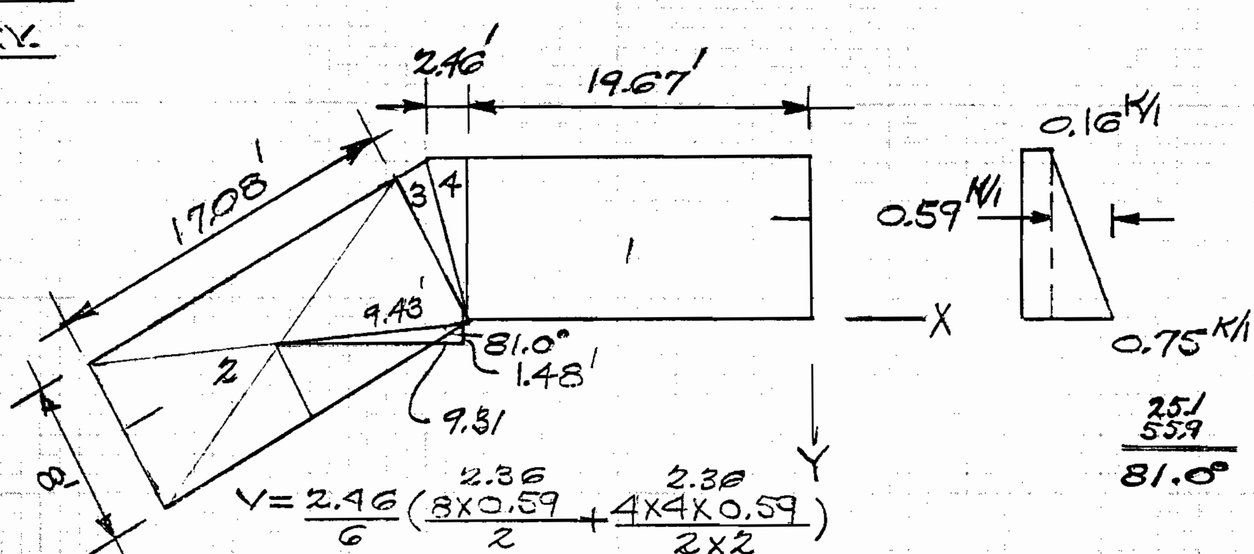
	F	Y	M_X	X	M_Y
1	58	2.5	-145	9.84	571
2	50	2.72	136	28.14	1,407
3	2	3.1	-6	21.3	43
4	2	3.33	-7	20.18	40
	112K		-22 1K		2,061 1K

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 8 BY NDL DATE 11-20-79
JOB Nº 575-'79 CHKD. BY ______ DATE ______

PILES

PERY.



$$\begin{array}{r} 25.1 \\ 55.9 \\ \hline 81.0^\circ \end{array}$$

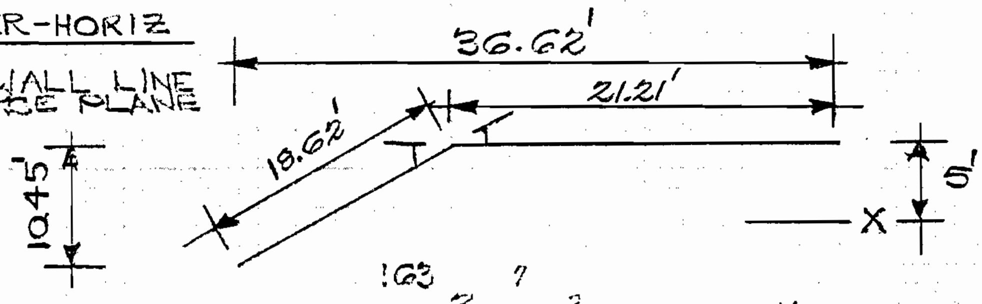
$$V = \frac{2.46}{6}\left(\frac{8 \times 0.59}{2} + \frac{4 \times 4 \times 0.59}{2 \times 2}\right)$$ (2.36, 2.36)

$$= 2^K$$

	FORCE UNI	FORCE TRI	Y UNI	Y TRI	Mx	X UNI	X TRI	MY
1	25	46	4	2.67	223	9.84		−699
2	22	40	1.48	2.7	−119	28.98	28.2	−1,768
3	2	2	4.7	3.5	16	22.1	21.7	−88
4	2	2	5.33	4.00	19	20.49	20.28	−82
	−141K				139 IK			−2,635 IK

WATER-HORIZ

USE WALL LINE AS FORCE PLANE



$$h_w = \begin{array}{r} 9.43' \\ 2.50 \\ \hline 11.93' \end{array}$$

$$\tan\frac{\phi}{2} \times 5 = 1.54'$$

$$\begin{array}{r} 19.67 \\ 1.54 \\ \hline 21.21' \\ 15.41 \\ \hline 36.62' \end{array} \qquad \begin{array}{r} 17.08 \\ 1.54 \\ \hline 18.62' \end{array}$$

$$F_y = 36.62 \times 0.0625\left(\frac{11.93^2}{2} - \frac{2.5^2}{2}\right) = -156^K$$ (163, 7)

$$M_x = 163 \times 11.93/3 - 7 \times 2.5/3 = -642^{IK}$$

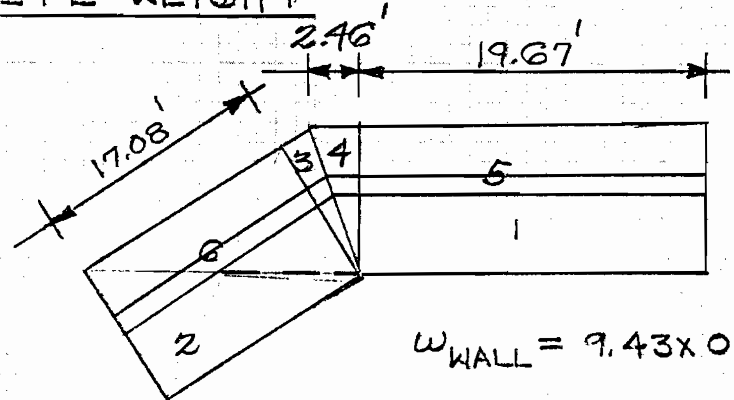
$$F_x = 10.45 \times 0.0625\left(11.93^2/2 - 2.5^2/2\right) = -44^K$$ (46, 2)

$$M_y = 46 \times 11.93/3 - 2 \times 2.5/3 = 181^{IK}$$

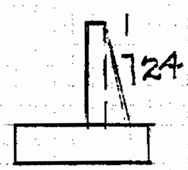
$$M_z = 156 \times 36.62/2 + 44 \times (10.45/2 - 5.0) = 2,366^{IK}$$

PILES

CONCRETE-WEIGHT



$$\begin{array}{r} 19.67 \\ 2.46 \\ \hline 22.13' \end{array} \qquad \begin{array}{r} 17.08 \\ 2.46 \\ \hline 19.54' \end{array}$$



$$\omega_{WALL} = 9.43 \times 0.15 \left(\overset{1.41}{1.0} + \overset{0.28}{\frac{4.72}{12 \times 2}} \right) = 1.69 \ ^{K}/_{1}$$

$$t = 12 + \frac{9.43}{2} = 16.72''$$

$$C.G. = \frac{5.5 \times 1.41 + 6.13 \times 0.28}{1.69} = 5.60'$$

	F	Y	M_X	X	M_Y
1	59	4	−236	9.84	581
2	51	1.48	75	28.98	1,478
3	4	4.9	−20	22.2	89
4	4	5.33	−21	20.49	82
5	37	5.60	−207	21.39	791
6	33	0.2	7	29.8	983
	188^K		−402^1K		4,004^1K

LOAD TABULATION

LOAD NO	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	188	−402	4,004	0
2	WATER-VERT	0	0	112	−22	2,061	0
3	WATER-HORIZ	−44	−156	0	−642	181	2,866
4	UPLIFT-IMP	0	0	−141	65	−2,608	0
5	UPLIFT-PERV	0	0	−141	139	−2,635	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	1+2+3+4	−44	−156	159	−1,001	3,638	2,866
2	1+2+3+5	−44	−156	159	−927	3,611	2,866

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET Nº ____ OF ____
ITEM WEST MONOLITH 8 BY NDL DATE 11-26-79
JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES
COMPUTER-INPUT

```
10   FLORIDA AVE WEST 575-79
20   MONOLITH 8
30   6,2
40   2,0.0,64
50   1,12,12
60   1,5
70   -1, 8.33
80   0,0,0
100  2, 55.86, 4
110  -33.4, -29.68, -25.96, -22.24
140  7.51, 4.98, 2.45, -0.08
170  4* 0.0
200  0, 90, 1
210  -17.5
240  -1.5
270  0.0
300  4,90,2
310  -15, -10.5
340  2* -1.5
370  2* 0.0
400  2, 90, 2
410  -6.0, -1.5
440  2* -1.5
470  2* 0.0
500  2, 235.86, 4
510  -36.21, -32.49, -28.77, -25.05
540  3.37, 0.84, -1.69, -4.22
570  4* 0.0
600  2, 270, 5
610  -19.5, -15.0, -10.5, -6.0, -1.5
640  5* -6.5
670  5* 0.0
2000 -44, -156, 157, -1001, 3638, 2866
2010 -44, -156, 157, -927, 3611, 2866
```

GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-15.4	-0.2	II	II	-40	3.49	38.5	5.7
B	8.8	-0.3	I	II	80	1.21	11.0	24.8
C	-8.3	-0.3	I	II	-40	3.49	20.8	8.6
D	-23.1	-0.2	I	I	-40	3.49	57.8	5.7
E	36.5	0.2	II	II	64	1.21	57.0	16.5
F	34.3	0.2	I	I	64	1.21	53.6	16.5

11/28/79   14.68

```
10 FLORIDA AVE WEST 575-79
20 MONOLITH 8
30 6,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,55.86,4
110 -33.4,-29.68,-25.96,-22.24
140 7.51,4.98,2.45,-0.08
170 4*0.0
200 0,90,1
210 -19.5
240 -1.5
270 ( )
300 4,90,2
310 -15,-10.5
340 2*-1.5
370 2*0.0
400 2,90,2
410 -6.0,-1.5
440 2*-1.5
470 2*0.0
500 2,235.86,4
510 -36.21,-32.49,-28.77,-25.05
540 3.37,0.84,-1.69,-4.22
570 4*0.0
600 2,270,5
610 -19.5,-15.0,-10.5,-6.0,-1.5
640 5*-6.5
670 5*0.0
2000 -44,-156,159,-1001,3638,2866
2010 -44,-156,159,-927,3611,2866
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

11/28/79   14.704

PROG. NO. 713-F3-A2-210   14:43:18 11/28/79   MOD 6A, JUN 78

FLORIDA AVE WEST 575-79
MONOLITH 8

TOTAL NUMBER OF PILES =   18

LOAD CONDITION 1 MONOLITH 8

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-44.0	-156.0	159.0	-1001.0	3638.0	2866.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.1	-12.7
2	-0.2	-0.1	-12.1
3	-0.2	-0.1	-11.5
4	-0.2	-0.1	-10.9
5	-0.2	0.0	8.8
6	-0.2	0.0	-5.6
7	-0.2	0.0	-8.3
8	-0.2	0.0	-20.7
9	-0.2	0.0	-23.1
10	0.1	0.1	31.1
11	0.1	0.1	31.6
12	0.1	0.1	32.1
13	0.1	0.1	32.6
14	0.1	-0.0	34.3
15	0.2	-0.0	31.8
16	0.2	-0.0	29.3
17	0.2	-0.0	26.8
18	0.2	-0.0	24.3

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-44.0	-156.0	159.0	-1001.0	3638.0	2866.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-44.0	-156.0	159.0	-927.0	3611.0	2866.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.1	-8.5
2	-0.2	-0.1	-10.8
3	-0.2	-0.1	-13.1
4	-0.2	-0.1	-15.4
5	-0.3	0.0	7.6
6	-0.3	0.0	-7.7
8	-0.2	0.0	-20.3
10	0.2	0.1	36.5
11	0.2	0.1	33.5
12	0.2	0.1	30.5
13	0.2	0.1	27.6
14	0.2	0.0	29.8

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-44.0	-156.0	159.0	-927.0	3611.0	2866.0

54

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No

SHEET No OF
BY DATE
CHKD. BY DATE

BLANK

PILE DESIGN

ALLOWABLES FOR 12" SQUARE PRECAST PRESTRESSED CONCRETE PILES:

COMPRESSION — 80^K
TENSION — 40^K

P = AXIAL PILE LOAD
Q = TRANSVERSE PILE LOAD

MAXIMUM BENDING MOMENT = 0.5RQ

R = EFFECTIVE LENGTH

$$R = \sqrt[4]{\frac{EI}{K}} \qquad E = \omega^{1.5}\,33\sqrt{f'_c} = 4.29\times10^6\,psi \ (1)$$

E = MODULUS OF ELASTICITY OF PILE = 4.29×10^6 PSI

I = MOMENT OF INERTIA OF PILE = $\frac{bh^3}{12} = \frac{12\times12^3}{12} = 1{,}728\ IN^4$

K = MODULUS OF SUBGRADE REACTION = 100 PSI

$$R = \sqrt[4]{\frac{(4.29\times10^6)(1{,}728)}{100}} = 92.8\ IN$$

$$M = 0.5RQ = 0.5 \times 92.8 \times Q = 46.4Q$$

f_b = ACTUAL BENDING STRESS; $f_b = \frac{M}{S}$; S = SECTION MODULUS OF PILE $= \frac{bh^2}{6} = \frac{12(12)^2}{6} = \frac{12(12)^2}{6} = 288\ IN^3$

$$f_b = \frac{46.4Q}{288} = 0.1611Q$$

f_a = ACTUAL AXIAL STRESS; $f_a = \frac{P}{A}$; A = AREA OF PILE = $144\ IN^2$

$$f_a = \frac{P}{144} = 0.006944P$$

F_b = ALLOWABLE BENDING STRESS

F_a = ALLOWABLE AXIAL STRESS

(1) ACI 318-77, PARA. 8.5.1

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM ____ BY NDL DATE 12-5-79
JOB No 575-79 CHKD. BY ____ DATE ____

PILE DESIGN

COMPRESSION PILES

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

$F_a = F_b = 750$ psi $(0.35f'_c - \text{MAX. PRESTRESS } 0.2f'_c = 1{,}750 - 1000)$

$$\frac{0.006944P}{750} + \frac{0.1611Q}{750} = 1.0$$

$$0.006944(80{,}000) + 0.1611Q = 750$$

$$Q_{ALLOW} = 1{,}207 \text{ LB} \approx 1.21^K$$

TENSION PILES

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

$F_a = F_b = 840$ psi (MIN. EFFECTIVE PRESTRESS AFTER LOSSES)

$$\frac{0.006944P}{840} + \frac{0.1611Q}{840} = 1.0$$

$$0.006944(40{,}000) + 0.1611Q = 840$$

$$Q_{ALLOW} = 3{,}490 \text{ LB} = 3.49^K$$

PILE DESIGN

ALLOWABLES FOR 14" SQUARE PRECAST PRESTRESSED CONCRETE PILES:

COMPRESSION – 100^K
TENSION – 50^K

$$I = \frac{bh^3}{12} = \frac{14 \times 14^3}{12} = 3{,}201 \text{ IN}^4$$

$$R = \sqrt[4]{\frac{EI}{K}} = \sqrt[4]{\frac{(4.29 \times 10^6)(3{,}201)}{100}} = 108.3 \text{ IN}$$

$$M = 0.5R\varphi = 0.5 \times 108.3\varphi = 54.2\varphi$$

$$S = \frac{bh^2}{6} = \frac{14 \times 14^2}{6} = 457.3 \text{ IN}^3$$

$$f_b = \frac{54.2\varphi}{457.3} = 0.1185\varphi$$

$$A = 14 \times 14 = 196 \text{ IN}^2$$

$$f_a = \frac{P}{196} = 0.0051P$$

COMPRESSION PILES

$$\frac{0.0051P}{750} + \frac{0.1185\varphi}{750} = 1$$

$$\frac{0.0051(100{,}000)}{750} + \frac{0.1185\varphi}{750} = 1$$

$$\varphi_{ALLOW} = 2{,}025 \text{ LB} \approx 2.02^K$$

TENSION PILES

$$\frac{0.0051P}{840} + \frac{0.1185\varphi}{840} = 1$$

$$\frac{0.0051(50{,}000)}{840} + \frac{0.1185\varphi}{840} = 1$$

$$\varphi_{ALLOW} = 4{,}937 \text{ LB} \approx 4.94^K$$

5?

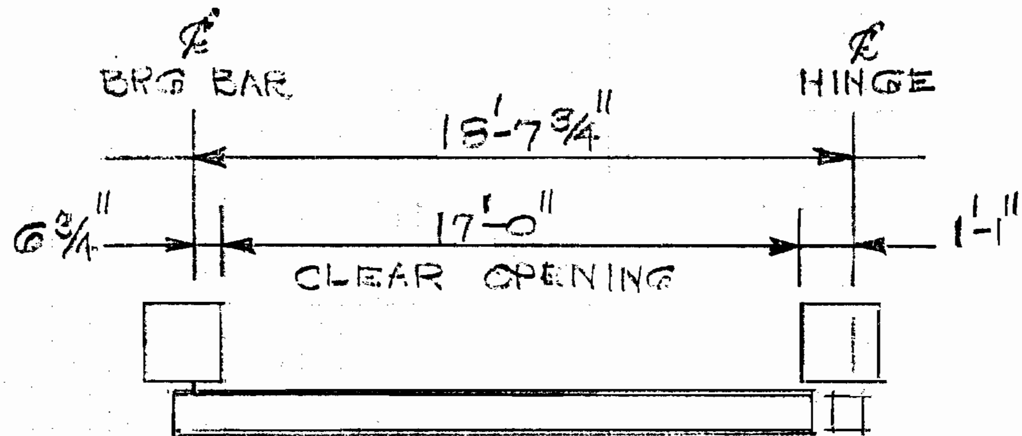
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

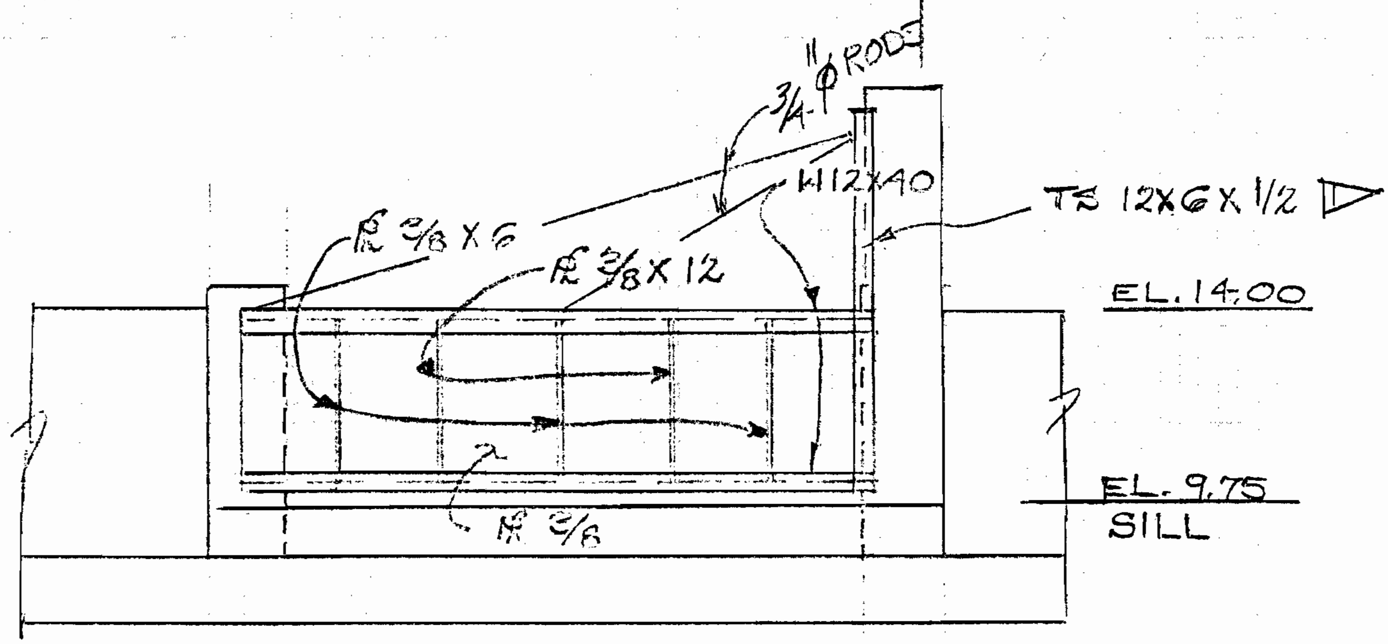
JOB ______ SHEET No ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-6-79
JOB No 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

CLEAR OPENING — 17'-0"
SILL ELEVATION — 9.75 MEAN SEA LEVEL

MR. SUDHIR MEHTA
PEPPER & ASSOCIATES
TELECON 12-6-79





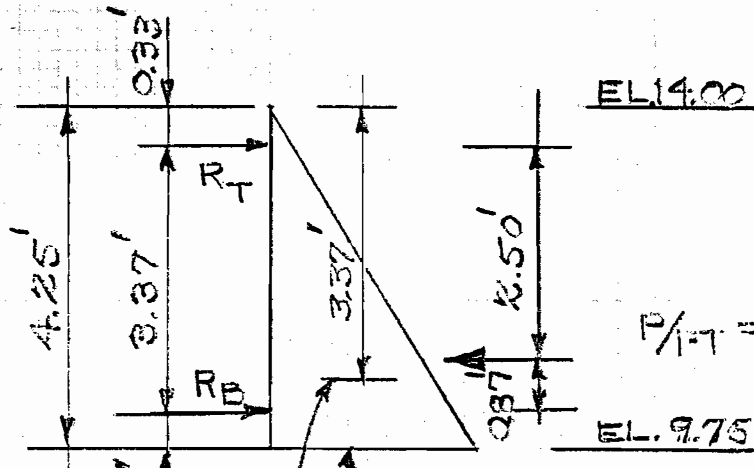
$$\begin{array}{r} 14.00 \\ 9.75 \\ \hline 4.25 \text{ FT} \end{array}$$

▷ TUBING POST & TURNBUCKLE RODS ADDED, BUT NOTES NOT REVISED. BASED ON COMPARISON TO WEST RR GATE (P. 76), TS 12X6X1/2 IS ADEQUATE.

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-7-79
JOB No 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN



$$P/FT = \frac{w\bar{h}^2}{2} = \frac{62.5 \times \overline{4.25}^2}{2} = 564 \text{ PLF}$$

$p = wh = 62.5 \times 4.25 = 266$ PSF

MAX. SKIN STRESS — $w = 62.5 \times 3.37 = 211$ PSF

REACTIONS

$$R_B = 564 \times \frac{2.50}{3.37} = 418 \text{ PLF}$$

$$R_T = 564 \times \frac{0.87}{3.37} = 146 \text{ PLF}$$

GIRDER DESIGN

LENGTH = OPENING + TO THE HINGE ℄ + TO THE BAR ℄

= 17.0 + 1.08 + 0.56 = 18.64 FT

TOP GIRDER

$$M = \frac{w\bar{l}^2}{8} = \frac{146 \times \overline{18.64}^2 \times 12}{8} = 76{,}090 \text{ IN·LB}$$

$$S_{REQ'D} = \frac{76{,}090}{20{,}000} = 3.8 \text{ IN}^3$$

TRY W12X40

$S = 51.9 \text{ IN}^3$

$I_x = 310 \text{ IN}^4$

$A = 11.8 \text{ IN}^2$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-7-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

TOP GIRDER

$$\Delta = \frac{5 w \ell^4}{384 EI} = \frac{5 \times 146 \times (18.64 \times 12)^4}{384 \times 29 \times 10^6 \times 310 \times 12} = 0.04 \text{ IN}$$

$$\Delta_{ALLOW} = \frac{\ell}{360} = \frac{18.64 \times 12}{360} = 0.62 \text{ IN} > 0.04 \text{ IN}$$

$$f = \frac{M}{S} = \frac{76{,}090}{51.9} = 1{,}470 \text{ PSI}$$

USE W12X40 ⟸

BOTTOM GIRDER

$$M = \frac{w \ell^2}{8} = \frac{418 \times 18.64^2 \times 12}{8} = 217{,}850 \text{ IN.LB}$$

$$S_{REQ'D} = \frac{217{,}850}{20{,}000} = 10.9 \text{ IN}^3$$

TRY W12X40 $S = 51.9 \text{ IN}^3$

$I_x = 310 \text{ IN}^4$

$A = 11.8 \text{ IN}^2$

$$\Delta = \frac{5 \times 418 \times (18.64 \times 12)^4}{384 \times 29 \times 10^6 \times 310 \times 12} = 0.13 \text{ IN}$$

$$\Delta_{ALLOW} = 0.62 \text{ IN} > 0.13 \text{ IN}$$

$$f = \frac{M}{S} = \frac{217{,}850}{51.9} = 4{,}200 \text{ PSI}$$

USE W12X40 ⟸

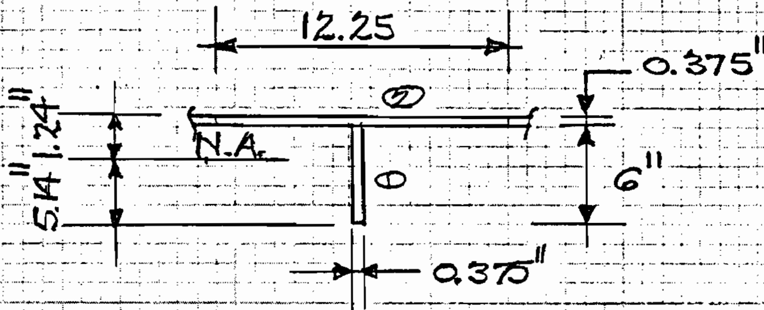
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-7-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

STIFFENER

TRY BAR 6X3/8



USE AISC 1.9.1.2, $\frac{b}{t} = 95.0/\sqrt{F_y} = 95.0/\sqrt{36} = \frac{b}{0.375}$

$\therefore b = 5.94''$

$W = 2b + t_w = 2 \times 5.94 + .375 = 12.25''$

SHEAR LAG CONTROLS DUE TO FLANGE BEING IN TENSION, HOWEVER, ABOVE WIDTH IS CONSERVATIVE.

	A	y	Ay	Ay²	I₀
1	2.25	3.375	7.59	25.6	6.75
2	4.59	.188	0.86	0.2	0.05
	6.84		8.45	25.8	6.80

$\bar{y} = \frac{\Sigma Ay}{\Sigma A} = \frac{8.45}{6.84} = 1.24 \text{ IN}$

$I = I_o + \Sigma Ay^2 - A\bar{y}^2 = 6.80 + 25.8 - 6.84 \times \overline{1.24}^2$
$= 22.1 \text{ IN}^4$

$S_{TOP} = \frac{I}{\bar{y}} = \frac{22.1}{1.24} = 17.82 \text{ IN}^3$

$S_{BOT} = \frac{I}{d - \bar{y}} = \frac{22.1}{6.375 - 1.24} = 4.30 \text{ IN}^3$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB		SHEET Nº	OF
ITEM	WEST SPUR GATE	BY NDL	DATE 12-7-79
JOB Nº	575-79	CHKD. BY	DATE

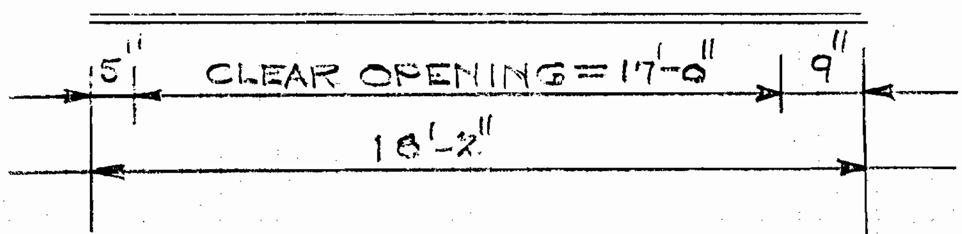
SWING GATE DESIGN

SKIN PLATE

MINIMUM THICKNESS = 5/16" USE 3/8" THICK PLATE

$$S = \frac{bt^2}{6} = \frac{12 \times (0.375)^2}{6} = 0.281\ \text{IN}^3/\text{FT}$$

$$M_{ALLOW} = fS = 20{,}000 \times 0.281 = 5{,}620\ \text{IN·LB}$$



TRY 4 CENTER SPACES AT 3'-1" AND 2 END SPACES AT 2'-11"

EXTERIOR SPAN

$$M = \frac{wl^2}{10} = \frac{211 \times 2.92^2}{10} = 180\ \text{FT·LB/FT}$$

OR 2,160 IN·LB/FT

$$\text{ALLOW. SPAN} = \left[\frac{10 \times M}{w}\right]^{1/2} = \left[\frac{10 \times 5{,}620}{211 \times 12}\right]^{1/2} = 4.71\ \text{FT}$$

INTERIOR SPAN

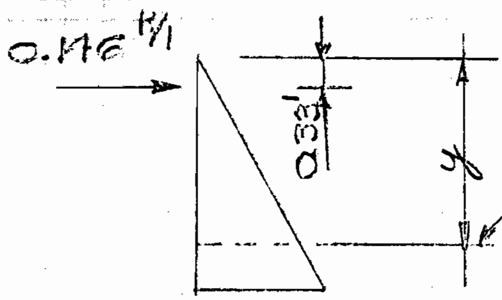
$$\text{ALLOW. SPAN} = \left[\frac{12 \times 5{,}620}{211 \times 12}\right]^{1/2} = 5.16\ \text{FT}$$

N-L ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-7-79
JOB No 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

STIFFENER



$\frac{1}{2}(0.0625)\,y^2 = 0.146^{K/1}$

$y = 2.16$ FT

MOMENT $= 0.146\,(2.16 - 0.33) - \frac{1}{6}(0.0625)(2.16)^3$

$= 0.16$ FT·KIPS/FT

$M/_{STIFF} = 0.16 \times 12 \times 3.08 = 6.0$ IN·KIPS/STIFF

OR 6,000 IN·LB/STIFF

$f_{COMP} = \frac{6{,}000}{4.3} = 1{,}400$ psi

$\frac{b}{t} = \frac{6}{0.375} = 16$ FOR BAR $6 \times 3/8$

$\frac{b}{t_{ALLOW}} = \frac{95.0}{\sqrt{F_y}} = \frac{95.0}{\sqrt{33}} = 16$ O.K.

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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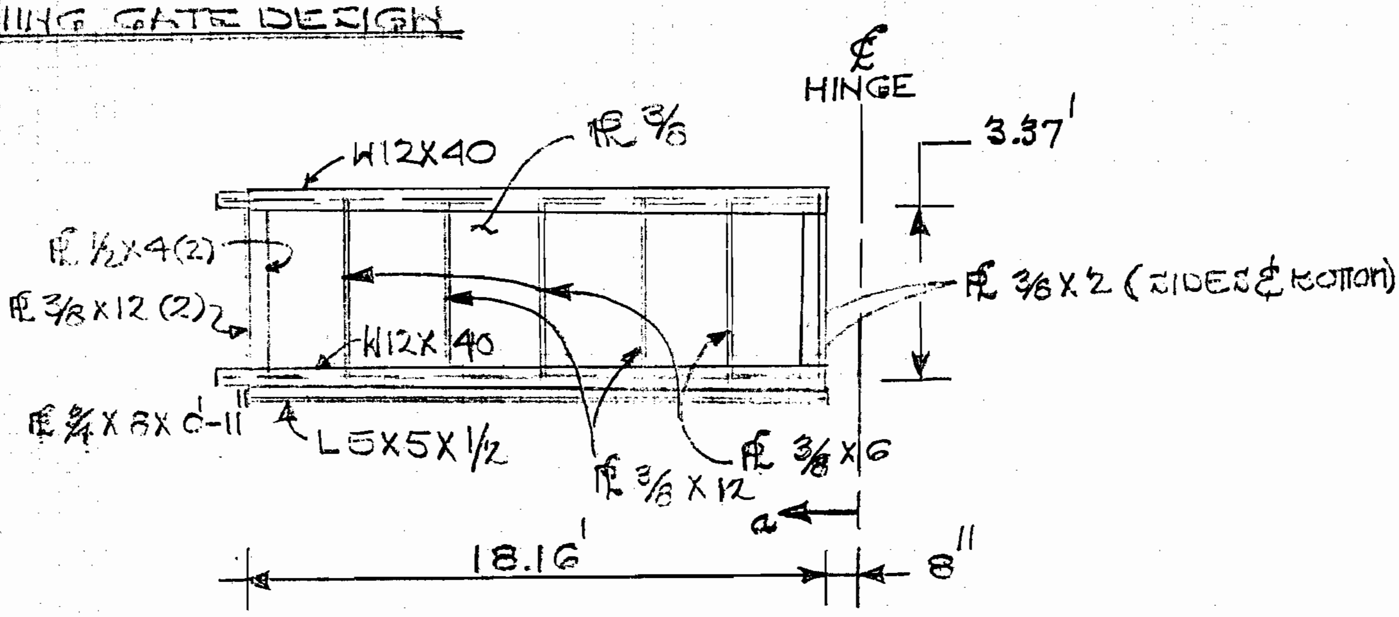
JOB ______ SHEET NO ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-11-79
JOB NO 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN



	WEIGHT		a	Wa
3/8 PL	15.3 X 18.16 X 4.0 =	1,138 LB	9.75 FT	11,099 FT-LB
W12X40	2X40X19.08 =	1,526	10.21	15,585
L5X5X1/2	16.2 X 16.75 =	271	9.79	2,657
PL 3/8X12 (4)	4 X 15.3 X 3.37 =	206	9.75	2,011
PL 1/2X4 (2)	2 X 6.8 X 2.70 =	37	9.75	358
PL 3/8X6 (3)	3 X 7.65 X 3.37 =	77	9.75	754
PL 3/4X8X0'-11"	20.4 X 0.92 =	19	19.41	364
1 1/2" BAR	7.65 X 3.84 =	29	18.65	548
WELD 1/4	0.21 (4X18.16+9X3.37) =	22	9.75	214
SEAL		50	9.75	488
	(USE 3.4")	3,375 LB		34,078 FT-LB

$$d = \frac{34{,}078}{3{,}375} = 10.1 \text{ FT FROM ℄ HINGE}$$

$$\text{HINGE FORCE}_{\text{HORIZ}} = \frac{34{,}078}{3.37} = 10{,}100 \text{ LB}$$

POST & TURNBUCKLE ADDED, NOTES NOT CHANGED
4-11-80

626

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ________ SHEET Nº ____ OF ____

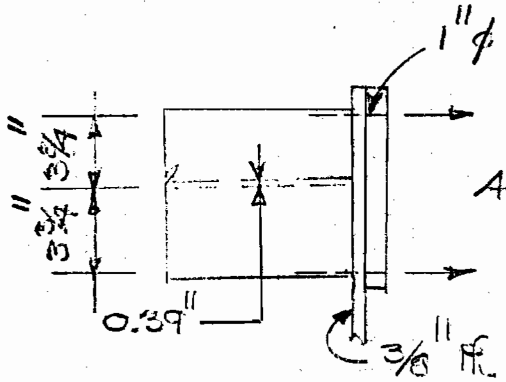
ITEM WEST SPUR GATE BY NDL DATE 12-17-79

JOB Nº 575-79 CHKD. BY ____ DATE ____

SWING GATE DESIGN

UPPER HINGE CONNECTION

ASSUME BATHTUB EFFECT DUE TO DEPTH OF BEAM (12") & BOLT LOCATION



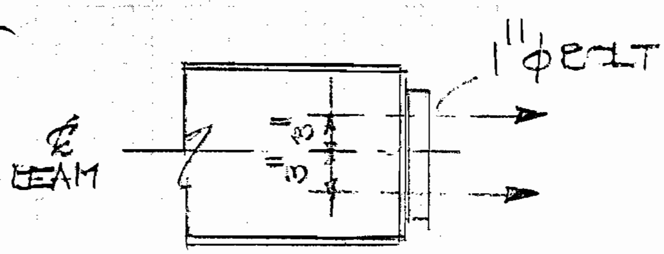
$F = \frac{10,100}{4} = 2,530$ LB

A@ 2,530 LB

$S = \frac{bt^2}{6} = \frac{15 \times 0.375^2}{6} = 0.35 \text{ IN}^3$

$M = 60\%\ Fd = 0.6 \times 2 \times 2,530 \times 3.75$
$= 11,380$ IN·LB

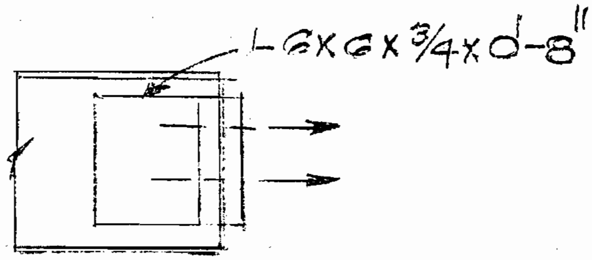
$f = \frac{M}{S} = \frac{11,380}{0.35} = 32,500$ PSI
N.G.



TRY L 6X6X ¾ X 0'-8"

$M = 0.6 \times 2 \times 2,530 \left(3.75 - \frac{0.39}{2} - \frac{0.75}{2}\right)$
$= 9,650$ IN·LB

$S = \frac{bt^2}{6} = \frac{8 \times 0.75^2}{6} = 0.75 \text{ IN}^3$



$f = \frac{M}{S} = \frac{9,650}{0.75} = 12,900$ PSI

USE L 6X6X ¾ ⟸

VOID
CHANGED TO
POST & TURNBUCKLES
4-11-80

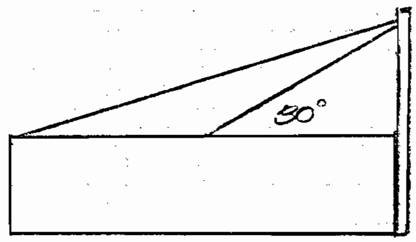
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

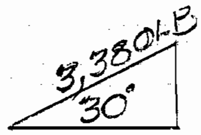
JOB ______ ITEM WEST SPUR GATE JOB No 575-79

SHEET No ______ OF ______ BY NDL DATE 4-3-80 CHKD. BY ______ DATE ______

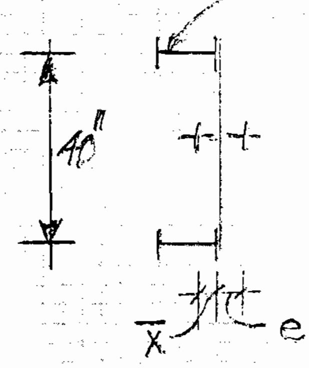
TURNBUCKLES

$W = 3{,}375 \text{ LB}$





$\frac{3375}{2} = 1{,}688 \text{ LB}$ COULD USE 5/8" ROD TURNBUCKLE



$1526 \times 6.44 = 9{,}627$
$271 \times .74 = 200$
$206 \times 6.19 = 1{,}275$
$37 \times 12 = 444$
$77 \times 3 = 231$
$11{,}977 \text{ IN-LB}$

$\bar{X} = \frac{11{,}977}{3375 - 2 \times 5 \times 17.03} = 3.76''$

$W = 3165 \text{ LB}$ (W12X35)

$I = 2 \times 10.3 \times \overline{20}^2 + 0.375 \times \frac{\overline{45}^3}{12} = 11{,}088 \text{ IN}^4$

$A = 2 \times 10.3 + 0.375 \times 45 = 37.48 \text{ IN}^2$

$r = (11{,}088 / 37.48)^{1/2} = 17.2 \text{ IN}$

$e = \frac{3.76}{4}\left(\frac{40}{17.2}\right)^2 = 5.08''$ $T = 3{,}165 \times \frac{18.16}{2} \times 8.84 = 256{,}000$

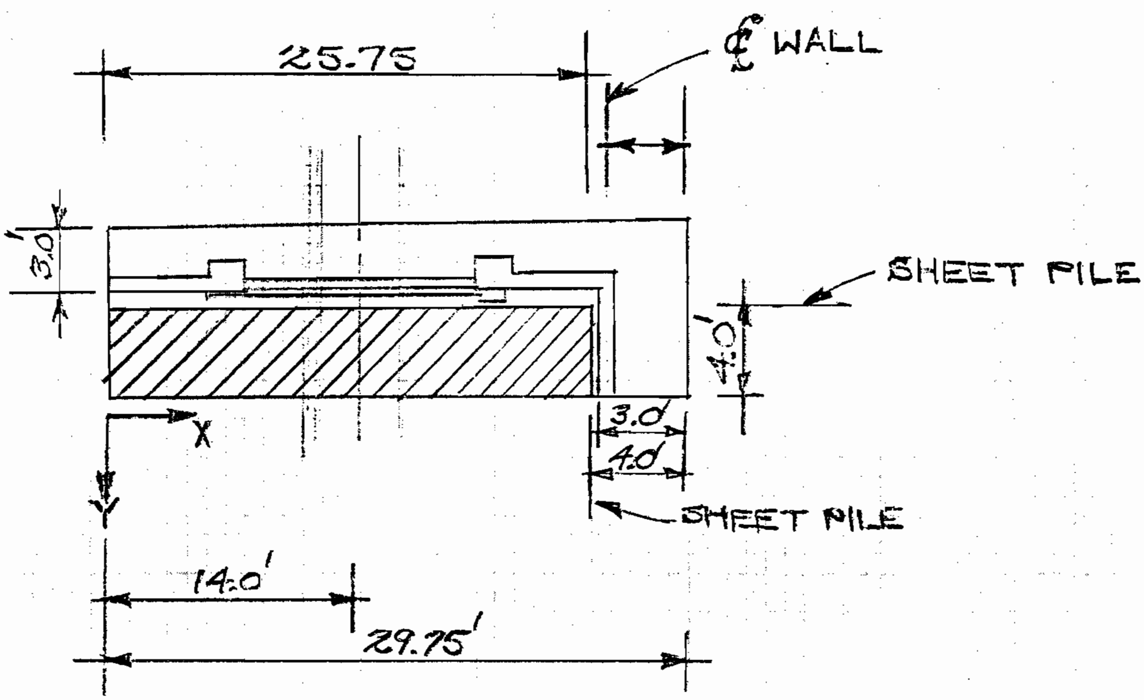
$e + \bar{x} = 5.08 + 3.76 = 8.84''$ $l' = 4.0 + 5.08 = 9.08''$

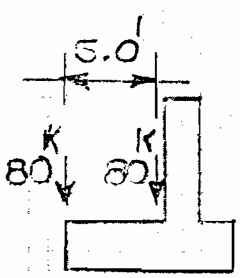
$F = \frac{256{,}000}{18.16 \times 9.08} = 1{,}550 \text{ LB}$

$F/2 = 1{,}550/2 = 780 \text{ LB}$

SWING GATE DESIGN

LOADS ON SUPPORT STRUCTURE

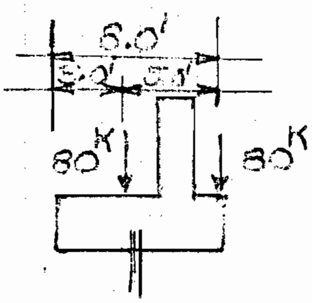




$M_X = 5 \times 80 = -400'^{K}$

$M_Y = 2 \times 80 \times 14 = -2{,}240'^{K}$

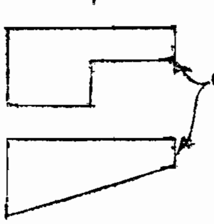
$F_Z = 2 \times 80 = 160^{K}$



$M_X = 80(3.0 + 8.0) = -880'^{K}$

$M_Y = -2{,}240'^{K}$

$F_Z = 160^{K}$



0.16 KSF = 2.5 X 0.0625 9.42 X 0.0625 = 0.59 KSF

$F_{IMPER_Z} = \overset{61}{0.59 \times 25.75 \times 4} + 0.16(\overset{19}{29.75 \times 4} + \overset{3}{4.0 \times 4.0})$

$= -83^{K}$

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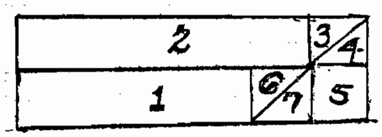
JOB ______ ITEM WEST SPUR GATE JOB No 575-79
SHEET No ______ OF ______ BY NDL DATE 12-10-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

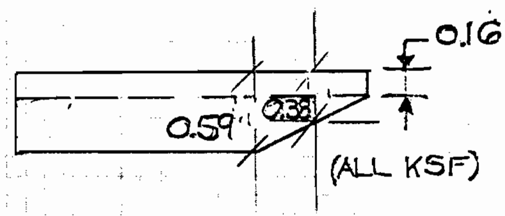
$$M_{IMPER_Y} = 61 \times \overset{785}{\frac{25.75}{2}} + 19 \times \overset{263}{\frac{27.75}{2}} + 3 \times \overset{83}{27.75} = 1{,}151^{1K}$$

$$M_{IMPER_X} = \overset{122}{61 \times 2} + \overset{114}{19 \times 6} + \overset{6}{3 \times 2} = 242^{1K}$$

$$\frac{0.16 + 0.59}{2} = 0.38 \qquad \begin{array}{r} 0.59 \\ -\,0.38 \\ \hline 0.21\ KSF \end{array}$$



$$F_{PERV_Z} = \left(\overset{33}{21.75 \times 4 \times 0.38} + \overset{9}{21.75 \times 4 \times \frac{0.21}{2}}\right) +$$
$$+ \left(\overset{16}{25.75 \times 4 \times 0.16} + \overset{11}{25.75 \times 4 \times \frac{0.22}{2}}\right) +$$
$$+ \left(\overset{1}{4 \times \frac{4}{2} \times 0.16} + \overset{1}{4 \times 4 \times \frac{0.22}{6}}\right) +$$
$$+ \left(\overset{1}{4 \times \frac{4}{2} \times 0.16} + \overset{1}{4 \times 4 \times \frac{0.22}{6}}\right) +$$
$$+ \left(\overset{3}{4 \times 4 \times 0.16} + \overset{2}{4 \times 4 \times \frac{0.22}{2}}\right) +$$
$$+ \left(\overset{3}{4 \times \frac{4}{2} \times 0.38} + \overset{1}{4 \times 4 \times \frac{0.21}{6}}\right) + \left(\overset{3}{4 \times \frac{4}{2} \times 0.38} + \overset{1}{4 \times 4 \times \frac{0.21}{6}}\right) = -86^{K}$$

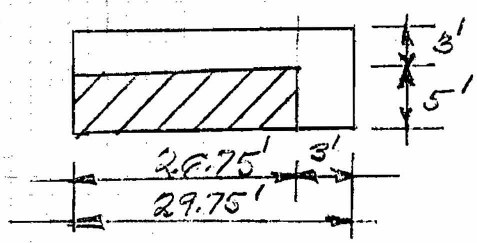


$$M_{PERV_X} = \left(\overset{66}{33 \times 2} + \overset{12}{9 \times \frac{4}{3}}\right) + \left(\overset{96}{16 \times 6} + \overset{59}{11 \times 5.33}\right) + \left(\overset{7}{1 \times 6.67} + \overset{6}{1 \times 6}\right) +$$
$$+ \left(\overset{5}{1 \times 5.33} + \overset{5}{1 \times 5}\right) + \left(\overset{6}{3 \times 2} + \overset{4}{2 \times 2}\right) + \left(\overset{8}{3 \times 2.67} + \overset{2}{1 \times 2}\right) +$$
$$+ \left(\overset{4}{3 \times 1.33} + \overset{1}{1 \times 1}\right) = 281^{1K}$$

$$M_{PERV_Y} = \left(\overset{359}{33 \times \frac{21.75}{2}} + \overset{98}{\frac{9 \times 21.75}{2}}\right) + \left(\overset{206}{16 \times \frac{25.75}{2}} + \overset{142}{11 \times \frac{25.75}{2}}\right) + \left(\overset{27}{1 \times 27.08} + \overset{27}{1 \times 26.75}\right) +$$
$$+ \left(\overset{28}{1 \times 28.42} + \overset{28}{1 \times 27.75}\right) + \left(\overset{83}{3 \times 27.75} + \overset{54}{2 \times 27.08}\right) + \left(\overset{69}{3 \times 23.08} + \overset{23}{1 \times 22.75}\right) +$$
$$+ \left(\overset{73}{3 \times 24.42} + \overset{24}{1 \times 23.75}\right) = 1{,}241^{1K}$$

SWING GATE DESIGN

WATER-VERT



$$F_z = 6.92 \times 5 \times 26.75 \times 0.0625 = 58^K$$

$$M_y = -(58) \times \frac{26.75}{2} = -776^{'K}$$

$$M_x = -(58) \times \frac{5}{2} = -145^{'K}$$

BALLAST

$$\omega_{SATURATED} = 140 \text{ PCF}$$

$$\omega_{SUBMERGED} = 77.5 \text{ PCF}$$

$$F_{z_{SAT}} = 140 \times 8 \times 2 \times 17 = 38^K$$

$$F_{z_{SUB}} = \frac{77.5 \times 38}{140} = 21^K$$

$$M_{y_{SAT}} = -38 \times 14 = -532^{'K} \qquad M_{x_{SAT}} = -38 \times 4 = -152^{'K}$$

$$M_{y_{SUB}} = -21 \times 14 = -294^{'K} \qquad M_{x_{SUB}} = -21 \times 4 = -84^{'K}$$

WATER-HORIZ

$$F_y = -26.75 \times 0.0625 \left(\overset{74}{\frac{9.42^2}{2}} - \overset{5}{\frac{2.5^2}{2}} \right) = -69^K$$

$$M_x = -74 \times \frac{9.42}{3} + 5 \times \frac{2.5}{3} = -228^{'K}$$

$$F_x = \frac{5}{26.75} (\overset{14}{74} - \overset{1}{5}) = 13^K$$

$$M_z = -69 \times \frac{26.75}{2} + 13 \times 2.5 = -890^{'K}$$

$$M_y = -14 \times \frac{9.42}{3} + 1 \times \frac{2.5}{3} = -43^{'K}$$

N-Y ASSOCIATES, INC.
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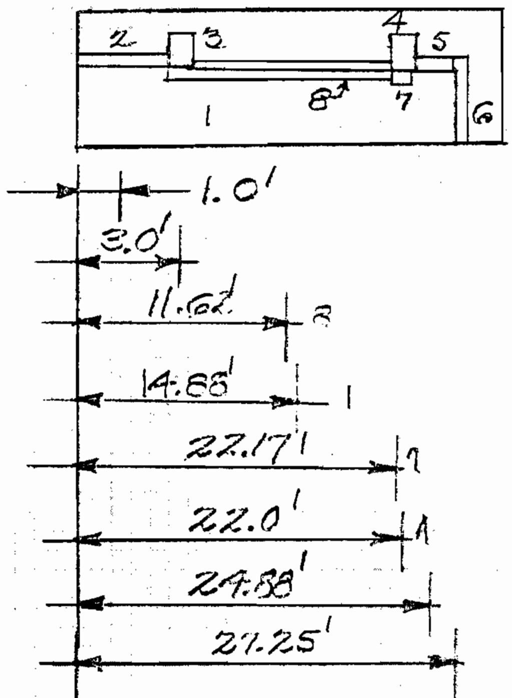
ARCHITECTS & PLANNERS

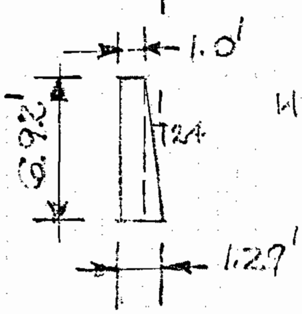
JOB ______ SHEET No ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-11-79
JOB No 575-77 CHKD. BY ______ DATE ______

SWING GATE DESIGN

CONCRETE WEIGHT



	F	X	My	Y	Mx
1	89.25	14.33	1,228	4.0	357
2	2.38	1.0	2	5.5	13
3	4.6	3.0	14	6.0	28
4	7.27	22.0	160	6.0	44
5	4.46	24.88	111	5.5	25
6	7.14	27.25	195	3.0	21
7	1.12	22.17	25	4.17	5
8	11.4	11.62	132	4.75	54
	124^K		−1,967		$-547^{'K}$



$$WT/FT = \frac{(1.0+1.29)}{2} \times 6.92 \times 0.15 = 1.17^{K/'}$$

GATE

GATE CLOSED

$F_z = 3.4^K$

$M_Y = -3.4(22.08 - 10.1) = -41^{'K}$

$M_X = -3.4 \times 4.67 = -16^{'K}$

GATE OPEN

$F_z = 1.7^K$

$M_Y = -1.7 \times 22.08 = -38^{'K}$

$M_X = -1.7 \times 4.22 = -7^{'K}$

N-Y ASSOCIATES, INC.
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JOB ________ SHEET No ____ OF ____
ITEM WEST SPUR GATE BY NDL DATE 12-17-79
JOB No 575-79 CHKD. BY ____ DATE ____

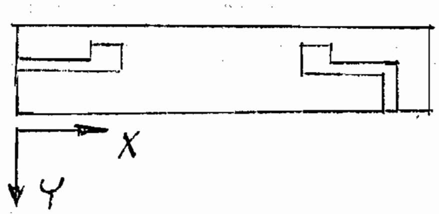
SWING GATE DESIGN

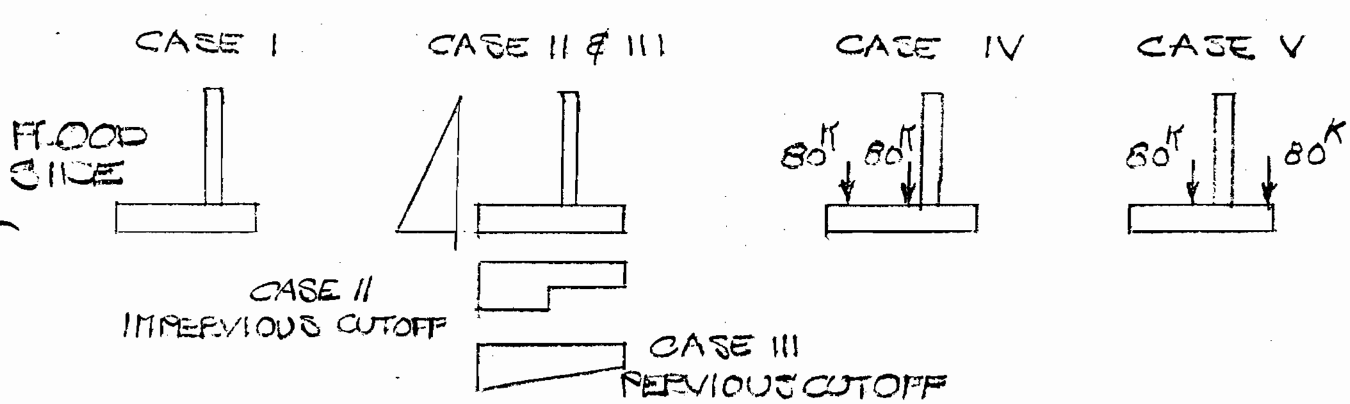
LOAD TABULATION

LOAD NO.	ITEM	F_x K	F_y K	F_z K	M_x 1K	M_y 1K	M_z 1K
1	CONCRETE	0	0	124	-547	-1,967	0
2	GATE-OPEN	0	0	2	-7	-38	0
3	GATE-CLOSED	0	0	4	-16	-41	0
4	BALLAST-SAT.	0	0	38	-152	-532	0
5	BALLAST-SUB.	0	0	21	-84	-294	0
6	WATER-VERT.	0	0	58	-145	-776	0
7	WATER-HORIZ.	13	-69	0	-228	-43	-890
8	UPLIFT-IMP.	0	0	-83	242	1,151	0
9	UPLIFT-PERM.	0	0	-86	281	1,241	0
10	TRAIN-CASE IV	0	0	160	-400	-2,240	0
11	TRAIN-CASE V	0	0	160	-880	-2,240	0

LOAD SUMMATION

CASE	ITEM	F_x K	F_y K	F_z K	M_x 1K	M_y 1K	M_z 1K
I	1+3+4	0	0	166	-715	-2540	0
II	1+3+5+6+7+8	13	-69	124	-778	-1970	-890
III	1+3+5+6+7+9	13	-69	121	-739	-1880	-890
IV	1+2+4+10	0	0	324	-1106	-4777	0
V	1+2+4+11	0	0	324	-1586	-4777	0





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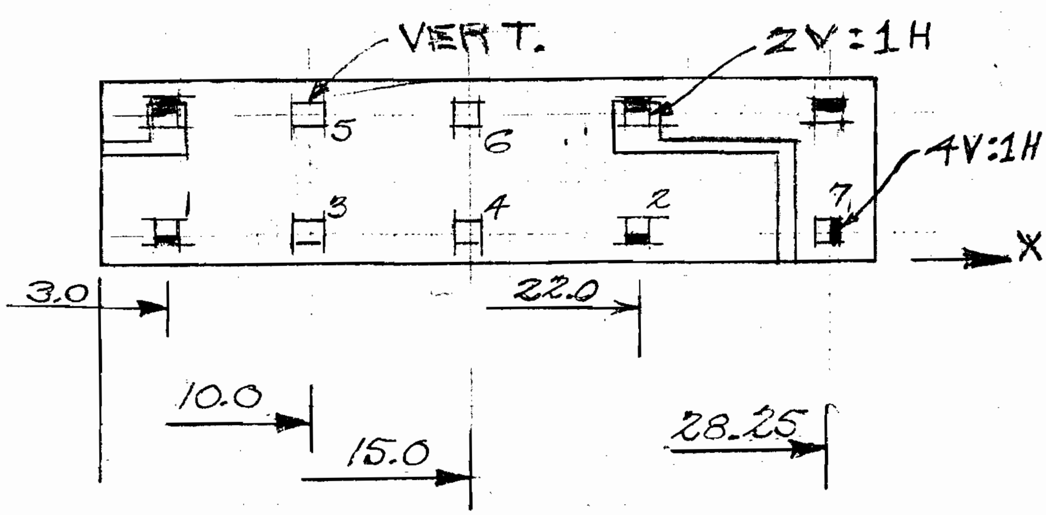
JOB ______ SHEET Nº ______ OF ______
ITEM WEST SPUR GATE BY NDL DATE 12-17-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

BASE DESIGN

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    DOCK BOARD SPUR GATE MONOLITH
30    4, 5
40    2, 0.0, 64
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0, 0
100   2, 70, 2
110   3.0, 22.0
140   2*-1.5
170   2* 0.0
200   0, 90, 4
210   10.0, 15.0, 10.0, 15.0
240   2*-1.5, 2*-6.5
270   4* 0.0
300   4, 0, 1
310   28.25
340   -1.5
370   0.0
400   2, 270, 3
410   3.0, 22.0, 28.25
440   3*-6.5
470   3* 0.0
2000  0, 0, 166, -715, -2540, 0
2010  13, -69, 124, -778, -1970, -870
2020  13, -69, 121, -739, -1880, -870
2030  0, 0, 324, -1106, -4777, 0
2040  0, 0, 324, -1586, -4777, 0
```

	MAX PILE LOAD		ALLOW PILE LOAD		% ALLOW	
	P	q	P	q	P	q
	-276	0.7	-40.	3.49	69.0	20.1
2:1	57.1	0.7	57	1.21	96.8	57.9
VERT	71.8	0.7	74	1.21	97.0	57.9



68A

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03/28/80     13.26


10 FLORIDA AVE WEST 575-79
20 DOCK BOARD SPUR GATE MONOLITH
30 4,5
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 3.0,22.0
140 2*-1.5
170 2*0.0
200 0,90,4
210 10.0,15.0,10.0,15.0
240 2*-1.5,2*-6.5
270 4*0.0
300 4,0,1
310 28.25
340 -1.5
370 0.0
400 2,270,3
410 3.0,22.0,28.25
440 3*-6.5
470 3*0.0
2000 0,0,166,-715,-2540,0
2010 13,-69,124,-778,-1970,-890
2020 13,-69,121,-739,-1880,-890
2030 0,0,324,-1106,-4777,0
2040 0,0,324,-1586,-4777,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/28/80     13.306


    PROG. NO. 713-F3-A2-210     13:19:24   03/28/80     MOD 6B, FEB 80


 FLORIDA AVE WEST 575-79
 DOCK BOARD SPUR GATE MONOLITH


TOTAL NUMBER OF PILES =    10
```

LOAD CONDITION 1 DOCK BOARD SPUR GATE

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	166.0	-715.0	-2540.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	0.2	11.5
2	0.1	0.2	30.4
3	0.1	0.2	12.5
4	0.1	0.2	14.9
5	0.1	0.2	25.6
6	0.1	0.2	28.0
7	-0.2	0.2	8.2
8	-0.1	-0.2	16.6
9	-0.2	-0.2	14.1
10	-0.2	-0.2	13.3

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-0.0	166.0	-715.0	-2540.0	-0.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
13.0	-69.0	124.0	-778.0	-1970.0	-890.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.6	-19.3
2	-0.2	-0.6	-25.8
3	-0.3	-0.6	11.3
4	-0.3	-0.6	6.5
5	-0.3	-0.6	15.2
6	-0.3	-0.6	10.4
7	0.6	-0.2	28.9
8	0.2	0.6	55.0
9	0.2	0.6	28.8
10	0.2	0.6	20.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	13.0	-69.0	124.0	-778.0	-1970.0	-890.0

LOAD CONDITION 3 DOCK BOARD SPUR GATE

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
13.0	-69.0	121.0	-739.0	-1880.0	-890.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	-0.6	-18.2
2	-0.2	-0.6	-27.6
3	-0.3	-0.6	13.8
4	-0.3	-0.6	8.4
5	-0.3	-0.6	12.7
6	-0.3	-0.6	7.3
7	0.6	-0.2	29.1
8	0.3	0.6	55.6
9	0.2	0.6	28.1
10	0.2	0.6	19.0

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	13.0	-69.0	121.0	-739.0	-1880.0	-890.0

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	324.0	-1106.0	-4777.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.6	29.1
2	-0.1	0.6	51.9
4	-0.0	0.6	53.5
5	-0.1	0.5	25.3
6	-0.0	0.5	26..9
7	-0.6	0.1	22.5
8	0.1	-0.5	36.2
9	-0.1	-0.5	24.0
10	-0.1	-0.5	20.0

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	-0.0	-0.0	324.0	-1106.0	-4777.0	-0.0

LOAD CONDITION 5 DOCK BOARD SPUR GATE

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	324.0	-1586.0	-4777.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.2	0.2	24.9
2	0.3	0.2	57.1
3	0.3	0.2	9.4
4	0.3	0.2	13.1
5	0.3	0.2	68.1
6	0.3	0.2	71.8
7	-0.2	0.4	8.5
8	-0.3	-0.2	35.3
9	-0.5	-0.2	28.0
10	-0.5	-0.2	25.6

5 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

5	-0.0	-0.0	324.0	-1586.0	-4777.0	-0.0

0 13:19:40 03/28/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022,15022

0 PROG NO. 713-F3-A2-210 13:19:24 03/28/80 MOD 6B,

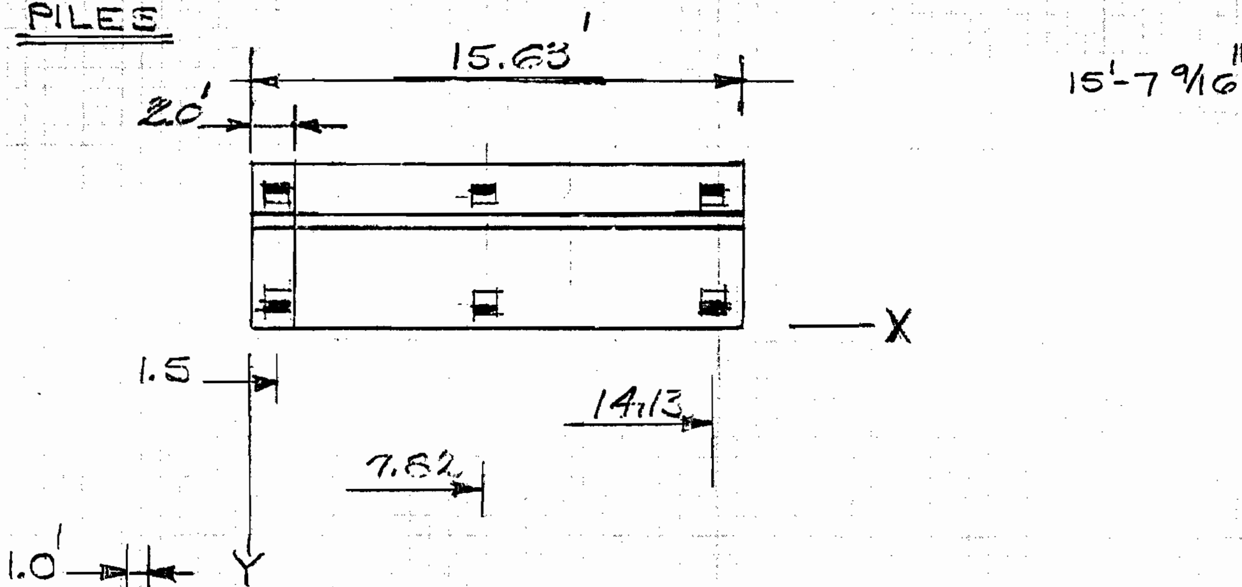
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

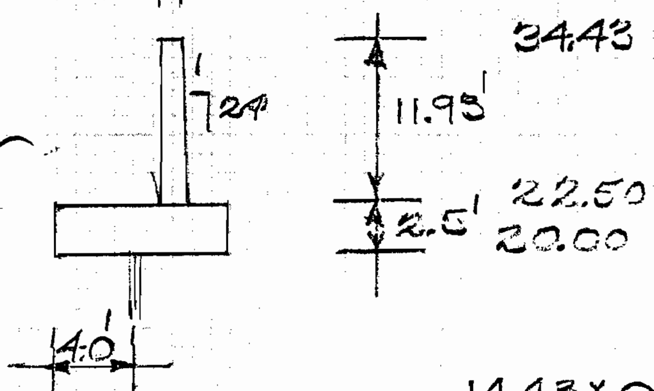
11021	X	Y	Z	RX	RY	RZ
11022	-0.332E-01	0.223E-02	0.235E-02	-0.136E-03	-0.249E-04	0.653E-04
12022	0.888E-01	-0.514E-01	0.123E-01	-0.412E-04	0.499E-04	0.603E-04
13022	0.885E-01	-0.540E-01	0.155E-01	0.113E-04	0.562E-04	0.553E-04
14022	-0.879E-01	-0.253E-01	0.353E-01	0.276E-03	-0.163E-04	0.107E-03
15022	-0.372E-01	0.249E-01	-0.964E-02	-0.608E-03	-0.381E-04	0.121E-03

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

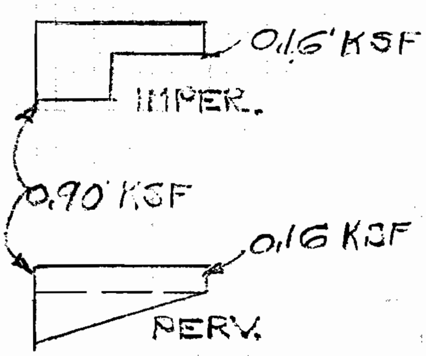
JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 12 BY NDL DATE 1-4-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES





$14.43 \times 0.0625 = 0.90$ KSF



$$F_{IMPER_Z} = \overset{56}{0.90 \times 4 \times 15.63} + \overset{10}{0.16 \times 4 \times 15.63} = -66^K$$

$$M_{IMPER_Y} = 56 \times 7.82 + 10 \times 7.82 = 516^{IK}$$

$$M_{IMPER_X} = 56 \times 2 + 10 \times 6 = 172^{IK}$$

$$F_{PER_Z} = \overset{20}{0.16 \times 8 \times 15.63} + \overset{46}{\frac{(0.90-0.16)}{2} \times 8 \times 15.63} = -66^K$$

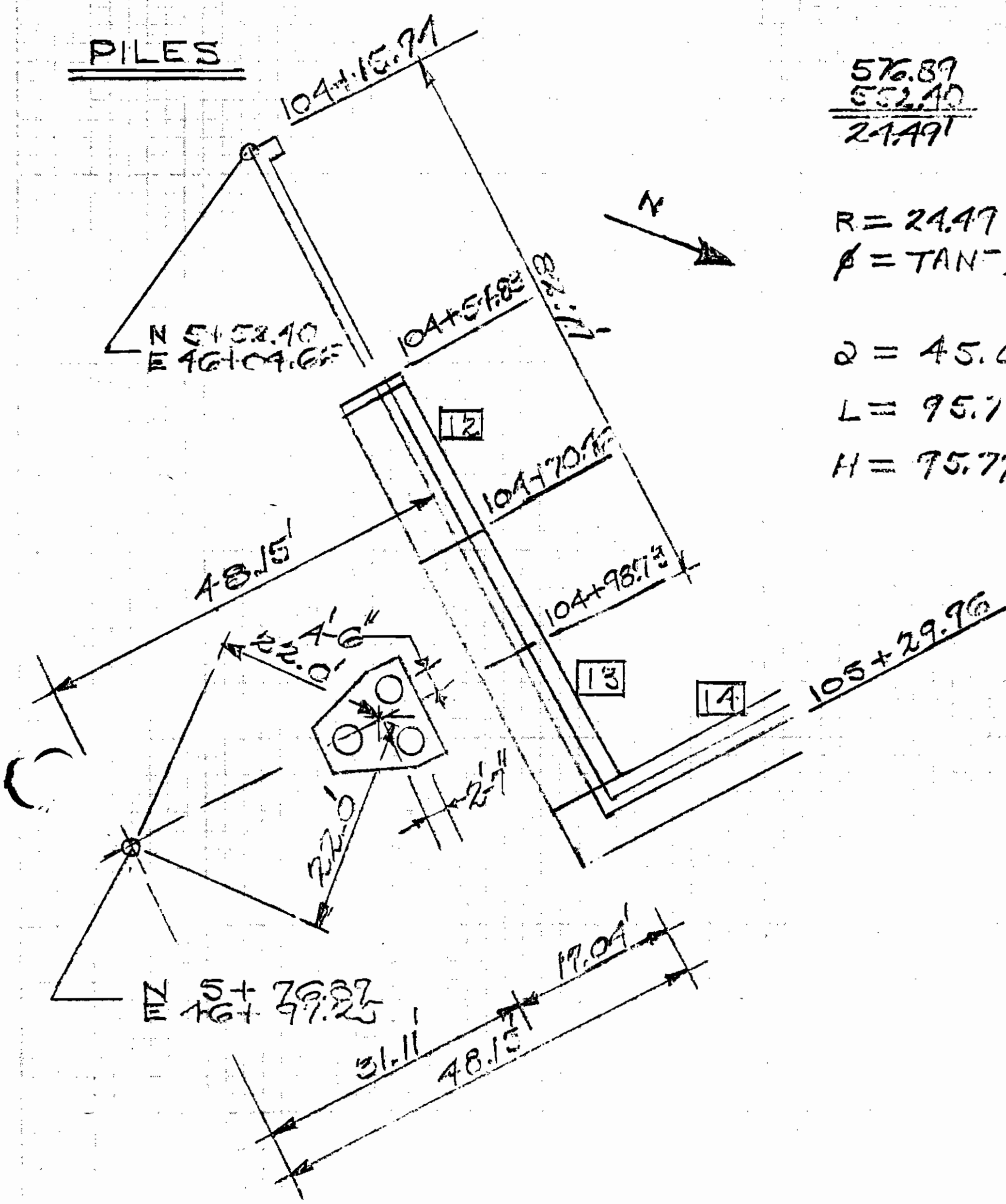
$$M_{PER_Y} = 20 \times 7.82 + 46 \times 7.82 = 516^{IK}$$

$$M_{PER_X} = 20 \times 4 + 46 \times \frac{8}{3} = 203^{IK}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 12 BY NDL DATE 1-28-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES



$$\begin{array}{r} 576.89 \\ \underline{552.40} \\ 24.49' \end{array} \qquad \begin{array}{r} 4697.25 \\ \underline{4604.66} \\ 92.59' \end{array}$$

$R = 24.49 \; 92.57 = 95.77'$

$\phi = TAN^{-1} \dfrac{24.49}{92.57} = 14.82°$

$\alpha = 45.00 - 14.82 = 30.18°$

$L = 95.77 \times SIN\,30.18 = 48.15'$

$H = 95.77 \times COS\,30.18 = 82.77'$

PILES

WATER-VERT

$$F_z = 11.73 \times 5 \times 15.63 \times 0.0625 = 58^K$$

$$M_y = 58 \times 7.82 = -454^{1K}$$

$$M_x = 58 \times 2.5 = -145^{1K}$$

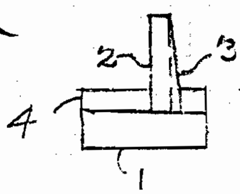
WATER-HORIZ

$$F_y = 15.63 \times 0.0625 \left(\frac{\overset{102}{14.43^2}}{2} - \frac{\overset{-3}{2.5^2}}{2} \right) = -99^K$$

$$M_x = -102 \times \frac{14.43}{3} + 3 \times \frac{2.5}{3} = -488^{1K}$$

$$M_z = -102 \times 7.82 + 3 \times 7.82 = -774^{1K}$$

CONCRETE WEIGHT



$$t = \frac{11.93}{2} + 12 = 17.97''$$

11.93
8.05
3.88'

	F_z	X	M_y	Y	M_x
1	47	7.82	368	4	188
2	28	7.82	219	5.5	154
3	7	7.82	55	6.17	43
4	8	1	8	3.6	29
	90^K		-650^{1K}		-414^{1K}

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	90	-414	-650	0
2	WATER-VERT	0	0	58	-145	-454	0
3	WATER-HORIZ	0	-99	0	-488	0	-774
4	UPLIFT-IMP	0	0	-66	172	516	0
5	UPLIFT-PERV	0	0	-66	203	516	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-99	82	-875	-588	-774
II	1+2+3+5	0	-99	82	-844	-588	-774

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 12 BY NDL DATE 1-7-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    MONOLITH 12
30    2,2
40    2,0.0,64
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,70,3
110   1.5,7.82,14.13
140   3*-1.5
170   3*0.0
200   2,270,3
210   1.5,7.82,14.13
240   3*-6.5
270   3*0.0
2000  0,-99,82,-875,-588,-774
2010  0,-99,82,-844,-588,-774
```

$$Q_{ALLOW} = \frac{750 - 0.006944 \times 57{,}600}{0.1611} = 2{,}173 LB \approx 2.17^K$$

```
03/27/80     14.05


10 FLORIDA AVE WEST 575-79
20 MONOLITH 12
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 1.5,7.82,14.13 | changed to 1.5, 7.75, 14.00 on Drawing
140 3*-1.5
170 3*0.0
200 2,270,3
210 1.5,7.82,14.13 |   "   "   "   "
240 3*-6.5
270 3*0.0
2000 0,-99,82,-875,-588,-774
2010 0,-99,82,-844,-588,-774

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/27/80     14.080


    PROG. NO. 713-F3-A2-210     14:06:06   03/27/80     MOD 6B, FEB 80


 FLORIDA AVE WEST 575-79
 MONOLITH 12


TOTAL NUMBER OF PILES =     6
```

```
LOAD CONDITION   1      MONOLITH 12

   LOADS ON PILE CAP
  X            Y            Z            MX           MY           MZ
  0.         -99.0         82.0       -875.0       -588.0       -774.0

       PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1     1.5    -0.0    -22.4
  2     1.5    -0.0    -24.7
  3     1.5    -0.0    -27.1
  4    -1.6    -0.0     57.6
  5    -1.6    -0.0     55.3
  6    -1.6    -0.0     52.9
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1        -0.0    -99.0     82.0     -875.0     -588.0     -774.0


LOAD CONDITION   2

   LOADS ON PILE CAP
  X            Y            Z            MX           MY           MZ
  0.         -99.0         82.0       -844.0       -588.0       -774.0

       PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1     0.6    -0.0    -20.5
  2     0.6    -0.0    -22.9
  3     0.6    -0.0    -25.2
  4    -0.7    -0.0     55.7
  5    -0.7    -0.0     53.4
  6    -0.7    -0.0     51.1
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         0.0    -99.0     82.0     -844.0     -588.0     -774.0


   0    14:07:04   03/27/80    *** END OF  RUN ***


STOP        EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      14:06:06   03/27/80            MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X           Y           Z           RX           RY           RZ
11022   0.114E-04   0.200E 00 -0.192E 00 -0.427E-02   0.215E-04 -0.239E-06
12022   0.114E-04   0.748E-01 -0.896E-01 -0.213E-02   0.215E-04 -0.239E-06
```

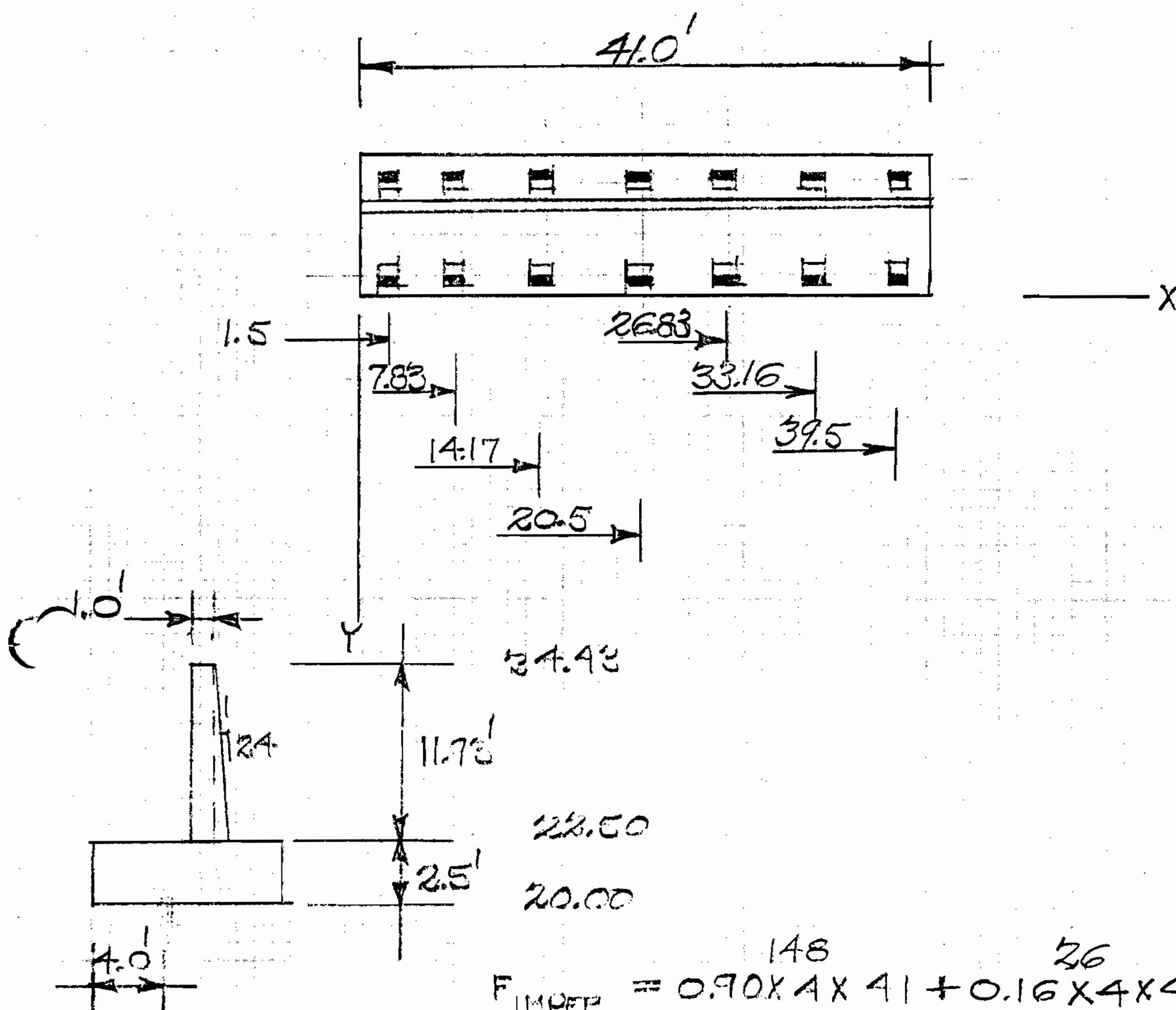
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 16
JOB No 575-79

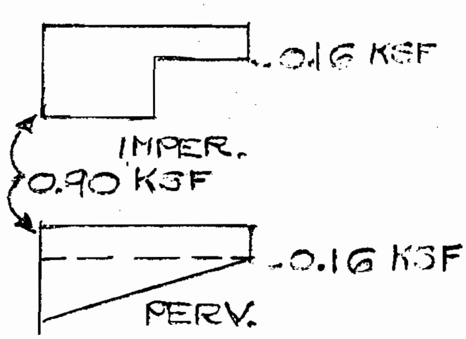
SHEET No ____ OF ____
BY NDL DATE 1-11-80
CHKD. BY ____ DATE ____

ALSO 15 & 17 MONOLITHS

PILES



$$F_{IMPER_Z} = \overset{148}{0.90 \times 4 \times 41} + \overset{26}{0.16 \times 4 \times 41} = -174^{K}$$



$$M_{IMPER_Y} = 148 \times 20.5 + 26 \times 20.5 = 3,567^{1K}$$

$$M_{IMPER_X} = 148 \times 2 + 26 \times 6 = 452^{1K}$$

$$F_{PER_Z} = \overset{52}{0.16 \times 8 \times 41} + \overset{121}{\frac{(0.90-0.16)}{2}} \times 8 \times 41 = -173^{K}$$

$$M_{PER_Y} = 52 \times 20.5 + 121 \times 20.5 = 3,546^{1K}$$

$$M_{PER_X} = 52 \times 4 + 121 \times \frac{8}{3} = 531^{1K}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB		SHEET No	OF
ITEM	WEST MONOLITH 16	BY NDL	DATE 1-11-80
JOB No	575-79	CHKD. BY	DATE

PILES

WATER-VERT

$$F_Z = 11.93 \times 5 \times 41 \times 0.0625 = 153^K$$

$$M_Y = 153 \times 20.5 = -3{,}136^{IK}$$

$$M_X = 153 \times 2.5 = -382^{IK}$$

WATER-HORIZ

$$F_Y = 41 \times 0.0625 \left(\frac{\overset{267}{\overline{14.43^2}}}{2} - \frac{\overset{-8}{\overline{2.5^2}}}{2} \right) = -259^K$$

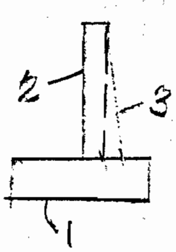
1,284 7

$$M_X = -267 \times \frac{14.43}{3} + 8 \times \frac{2.5}{3} = -1{,}277^{IK}$$

$$M_Z = -267 \times 20.5 + 8 \times 20.5 = -5{,}310^{IK}$$

CONCRETE WEIGHT

$t = 17.97''$



	F_Z	X	M_Y	Y	M_X
1	123	20.5	2,522	4	492
2	73	20.5	1,496	5.5	402
3	18	20.5	369	6.17	111
	214^K		$-4{,}387^{IK}$		$-1{,}005^{IK}$

LOAD TABULATION

LOAD No.	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	214	-1,005	-4,387	0
2	WATER-VERT	0	0	153	-382	-3,136	0
3	WATER-HORIZ	0	-259	0	-1,277	0	-5,310
4	UPLIFT-IMP	0	0	-174	452	3,567	0
5	UPLIFT-PERV	0	0	-173	521	3,546	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	0	-257	193	-2,212	-3,956	-5,310
II	1+2+3+5	0	-257	194	-2,133	-3,977	-5,310

N-L ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ________ SHEET No ____ OF ____
ITEM WEST MONOLITH 16 BY NDL DATE 1-11-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    MONOLITH 16
30    2,2
40    2, 0,0, 64
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0,0
100   2, 70, 7
110   1.5, 7.83, 14.17, 20.5, 26.83, 33.16, 39.5
140   7*-1.5
170   7*0.0
200   2, 270, 7
210   1.5, 7.83, 14.17, 20.5, 26.83, 33.16, 39.5
240   7*-6.5
270   7*0.0
2000  0, -257, 193, -2212, -3956, -5310
2010  0, -257, 194, -2133, -3977, -5310
```

GROUP	MAX. PILE LOAD P	MAX. PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
A	-29.7	1.8	I	I	-40.0	3.47	74.2	51.6
B	60.5	-1.9	I	I	68.0	2.05	89.0	92.7

CALCULATE Q_{ALLOW} CORRESPONDING TO P_{MAX} (p. 56)

$$Q_{ALLOW} = \frac{750 - 0.006944 \times 60{,}500}{0.1611} = 2.05^{K}$$

75 A

```
LISTH D29010

01/15/80     11.86

10 florida ave west 575-79
20 monolith 16
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,7
110 1.5,7.83,14.17,20.5,26.83,33.16,39.5
140 7*-1.5
170 7*0.0
200 2,270,7
210 1.5,7.83,14.17,20.5,26.83,33.16,39.5
240 7*-6.5
270 7*0.0
2000 0,-259,193,-2212,-3956,-5310
2010 0,-259,194,-2133,-3977,-5310
```

TOTAL NUMBER OF PILES =   14

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-259.0	193.0	-2212.0	-3956.0	-5310.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	1.8	-0.0	-29.7
8	-1.9	-0.0	60.5

1   SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-259.0	193.0	-2212.0	-3956.0	-5310.0

LOAD CONDITION 2 MONOLITH 1G

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-259.0	194.0	-2133.0	-3977.0	-5310.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.8	-0.0	-27.5
8	-0.8	-0.0	58.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-259.0	194.0	-2133.0	-3977.0	-5310.0

0 12:01:21 01/15/80 *** END OF RUN ***

ready

*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 12:01:14 01/15/80 MOD 6A,

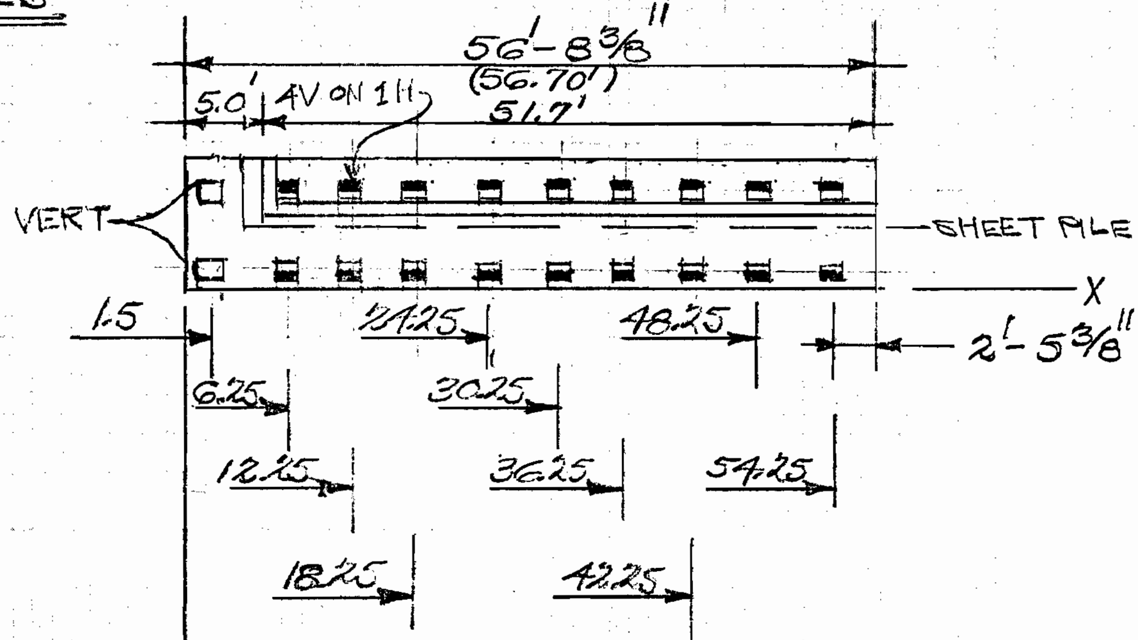
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

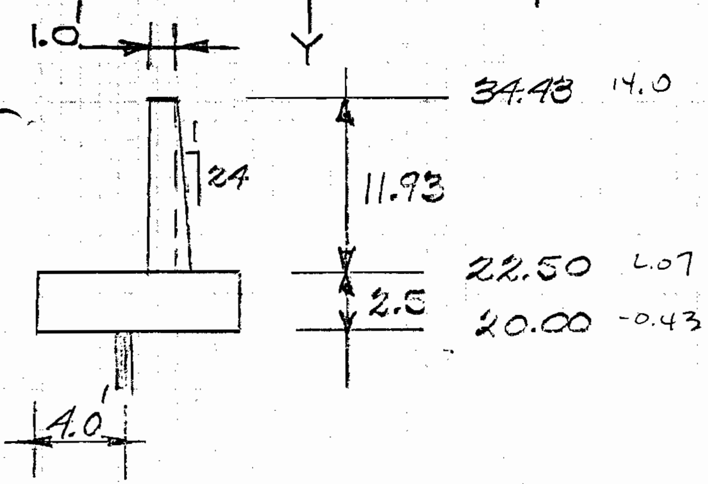
11021	X	Y	Z	RX	RY	RZ
11022	0.471E-05	0.240E 00	-0.232E 00	-0.505E-02	0.652E-08	-0.986E-07
12022	0.471E-05	0.961E-01	-0.114E 00	-0.260E-02	-0.796E-08	-0.987E-07

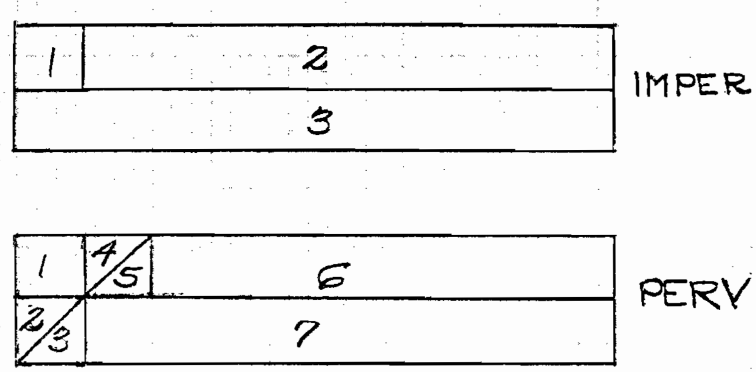
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

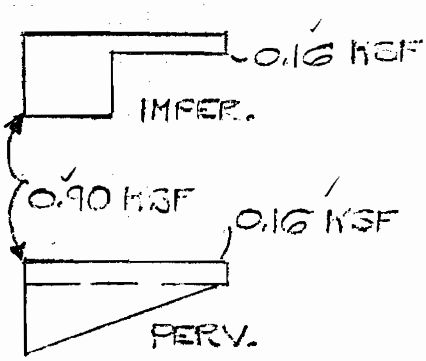
JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 14 BY NDL DATE 1-12-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES





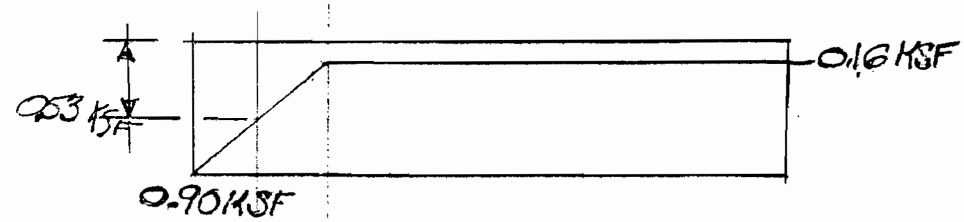




$$F_{IMPER_Z} = \overset{14}{4\times4\times0.9} + \overset{34}{4\times52.7\times0.16} + \overset{204}{4\times56.7\times0.9} = -252^K$$

$$M_{IMPER_Y} = \overset{28}{14\times2} + \overset{1,032}{34\times30.35} + \overset{5,783}{204\times28.35} = 6,843^{IK}$$

$$M_{IMPER_X} = \overset{84}{14\times6} + \overset{204}{34\times6} + \overset{408}{204\times2} = 696^{IK}$$



0.90
0.53
0.37 KSF

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 14 BY NDL DATE 1-12-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

$$F_{PER_Z} = (4 \times 4 \times \overset{8}{0.53} + \overset{3}{\frac{4\times4}{2} \times 0.37}) + (\overset{4}{\frac{4\times4}{2} \times 0.53} + \overset{2}{\frac{4\times4\times0.37}{3}}) +$$

$$+ (4+2) + (\overset{1}{\frac{4\times4}{2}\times 0.16} + \overset{2}{\frac{4\times4\times0.37)}{3}} + (1+2) +$$

$$(\overset{31}{48.7 \times 4 \times 0.16} + \overset{36}{48.7 \times \frac{4}{2} \times 0.37}) + (\overset{112}{52.7 \times 4 \times 0.53} + \overset{39}{52.7 \times \frac{4}{2} \times 0.37}) =$$

$$= -247^{K}$$

$$M_{PER_Y} = (\overset{16}{8\times2} + \overset{4}{3\times\frac{4}{3}}) + (\overset{5}{4\times\frac{4}{3}} + \overset{2}{2\times1}) + (\overset{11}{4\times\frac{2\times4}{3}} + \overset{5}{2\times2.5}) +$$

$$+ (\overset{5}{1\times5.33} + \overset{10}{2\times5}) + (\overset{7}{1\times6.67} + \overset{13}{2\times6.5}) + (\overset{1,003}{31\times32.35} + \overset{1,165}{36\times32.35}) +$$

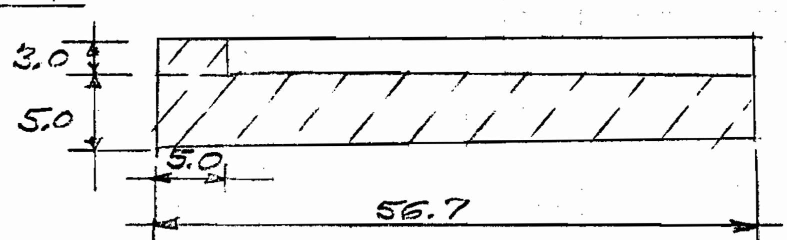
$$+ (\overset{3399}{112\times30.35} + \overset{1,184}{39\times30.35}) = 6,829^{1K}$$

$$M_{PER_X} = (\overset{48}{8\times6} + \overset{18}{3\times6}) + (\overset{11}{4\times2.67} + \overset{5}{2\times2.5}) + (\overset{5}{4\times1.33} + \overset{2}{2\times1}) +$$

$$+ (\overset{7}{1\times6.67} + \overset{12}{2\times6}) + (\overset{5}{1\times5.33} + \overset{10}{2\times5}) + (\overset{186}{31\times6} + \overset{192}{36\times5.33}) +$$

$$+ (\overset{224}{112\times2} + \overset{52}{39\times1.33}) = 777^{1K}$$

WATER-VERT



$$F_Z = 11.93 \times 0.0625\,(\overset{11}{3\times5} + \overset{211}{5\times56.7}) = 222^{K}$$

$$M_Y = -(\overset{28}{11\times2.5} + \overset{5982}{211\times\frac{56.7}{2}}) = -6,010^{1K}$$

$$M_X = -(\overset{72}{11\times6.5} + \overset{528}{211\times2.5}) = -600^{1K}$$

WATER-HORIZ

$$F_{WATER-HORIZ_Y} = 51.7 \times 0.0625\,(\overset{336}{\frac{14.43^2}{2}} - \overset{10}{\frac{2.5^2}{2}}) = -326^{K}$$

$$M_X = -(\overset{1,616}{336 \times \frac{14.43}{3}} - \overset{8}{10 \times \frac{2.5}{3}}) = -1,608^{1K}$$

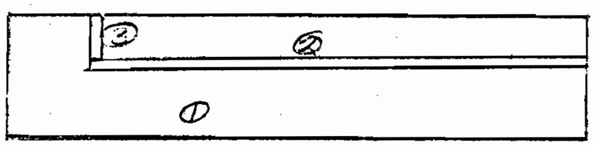
$$F_{WATER-HORIZ_X} = 3 \times 0.0625\,(\overset{20}{\frac{14.43^2}{2}} - \overset{1}{\frac{2.5^2}{2}}) = 19^{K}$$

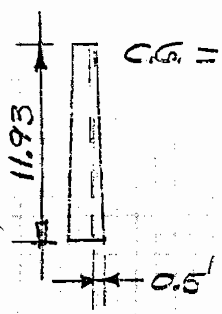
PILES

$$M_z = 19 \times 6.5 - 326 \times 30.85 = -9{,}934^{1K}$$

$$M_y = -(20 \times \frac{14.43}{3} - 1 \times \frac{2.5}{3} = -96^{1K}$$

CONCRETE WEIGHT





$$C.G. = \frac{0.5 \times \overset{1.79}{11.93 \times 1 \times 1 \times 0.15} + \overset{0.45}{11.93 \times \frac{0.5}{2} \times 1 \times 0.15} \times 1.16}{1.79 + 0.45} = 0.63' \qquad WT = 2.24^{K/1}$$

	F	X	M_y	Y	M_x
1	170	28.35	4,820	4	680
2	116	30.85	3,579	5.63	653
3	4	5.63	23	7	28
	290^K		$-8,422^{1K}$		$-1,361^{1K}$

LOAD TABULATION

LOAD NO	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	290	-1,361	-8,422	0
2	WATER-VERT	0	0	222	-600	-6,010	0
3	WATER-HORIZ	19	-326	0	-1,608	-96	-9,934
4	UPLIFT-IMP	0	0	-252	696	6,843	0
5	UPLIFT-PERV	0	0	-247	777	6,829	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	19	-326	260	-2,873	-7,635	-9,934
II	1+2+3+5	19	-326	265	-2,792	-7,699	-9,934

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
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JOB ______ SHEET Nº ______ OF ______
ITEM WEST MONOLITH 14 BY NDL DATE 1-12-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    MONOLITH 14
30    3, 2
40    2, 0.0, 64
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0, 0
100   4, 180, 2
110   2*1.5
140   -1.5, -6.5
170   2*0.0
200   2, 90, 9
210         6.25, 12.25, 18.25, 24.25, 30.25, 36.25, 42.25, 48.25, 54.25
240   9*-1.5
270   9*0.0
300   2, 270, 8
310         6.25,        18.25, 24.25, 30.25, 36.25, 42.25, 48.25, 54.25
340   8*-6.5
370   8*0.0
400   4, 270, 1
410   12.25
440   -6.5
470   0.0
2000  17, -326, 260, -2873, -7685, -9934
2010  14, -326, 265, -2792, -7699, -9934
```

79A

```
03/28/80     14.34


10 FLORIDA AVE WEST 575-79
20 MONOLITH 14
30 4,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 4,180,2
110 2*1.5
140 -1.5,-6.5
170 2*0.0
200 2,90,9
210 6.25,12.25,18.25,24.25,30.25,36.25,42.25,48.25,54.25
240 9*-1.5
270 9*0.0
300 2,270,8
310 6.25,18.25,24.25,30.25,36.25,42.25,48.25,54.25
340 8*-6.5
370 8*0.0
400 4,270,1
410 12.25
440 -6.5
470 0.0
2000 19,-326,260,-2873,-7685,-9934
2010 19,-326,265,-2792,-7699,-9934

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/28/80     14.373


    PROG. NO. 713-F3-A2-210     14:23:26   03/28/80     MOD 6B, FEB 80


  FLORIDA AVE WEST 575-79
  MONOLITH 14


 TOTAL NUMBER OF PILES =    20
```

LOAD CONDITION 1 MONOLITH 14

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
19.0	-326.0	260.0	-2873.0	-7685.0	-9934.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	0.2	-41.1
2	-0.7	0.2	15.9
3	-0.1	-0.6	-20.8
4	-0.1	-0.6	-21.8
5	-0.1	-0.6	-22.7
6	-0.1	-0.6	-23.6
7	-0.1	-0.6	-24.5
8	-0.1	-0.6	-25.4
9	-0.1	-0.6	-26.4
10	-0.1	-0.6	-27.3
11	-0.1	-0.6	-28.2
12	0.0	0.6	66.5
13	0.0	0.6	63.0
14	0.0	0.6	61.3
15	0.0	0.6	59.6
16	0.0	0.6	57.9
17	0.0	0.6	56.2
18	0.0	0.6	54.5
19	0.0	0.6	52.8
20	0.1	0.6	61.1

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	19.0	-326.0	260.0	-2873.0	-7685.0	-9934.0

LOAD CONDITION 2 MONOLITH 14

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
19.0	-326.0	265.0	-2792.0	-7699.0	-9934.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.7	0.3	-24.2
2	-0.7	0.3	1.0
3	-0.3	-0.7	-19.0
4	-0.3	-0.7	-20.2
5	-0.3	-0.7	-21.4
6	-0.3	-0.7	-22.6
7	-0.3	-0.7	-23.8
8	-0.3	-0.7	-25.0
9	-0.2	-0.7	-26.2
10	-0.2	-0.7	-27.4
11	-0.2	-0.7	-28.7
12	0.2	0.7	68.6
13	0.2	0.7	64.4
14	0.2	0.7	62.3
15	0.2	0.7	60.2
16	0.2	0.7	58.1
17	0.2	0.7	56.0
18	0.2	0.7	53.9
19	0.2	0.7	51.8
20	0.2	0.7	54.9

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	19.0	-326.0	265.0	-2792.0	-7699.0	-9934.0

0 14:23:51 03/28/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 14:23:26 03/28/80 MOD 6B,

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

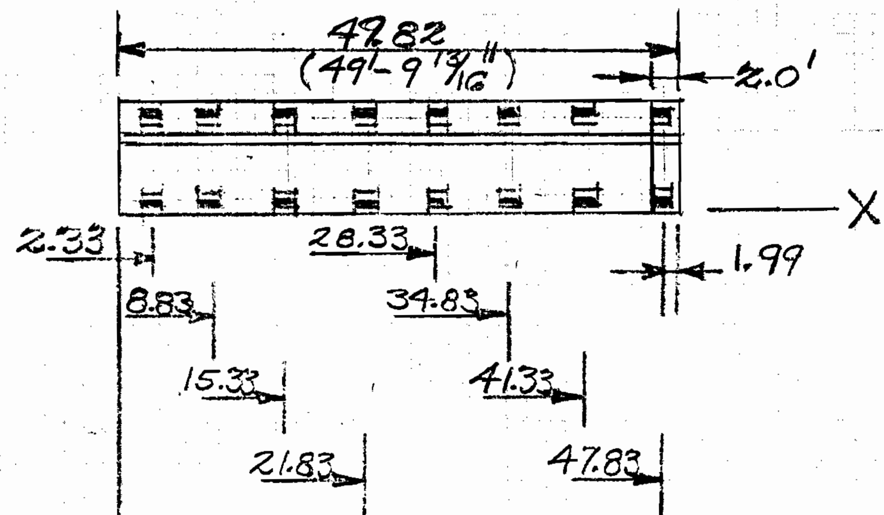
11021	X	Y	Z	RX	RY	RZ
11022	0.982E-01	-0.246E-01	-0.125E-01	-0.611E-03	0.127E-04	0.768E-05
12022	0.102E 00	-0.452E-01	0.542E-02	-0.271E-03	0.159E-04	0.848E-05

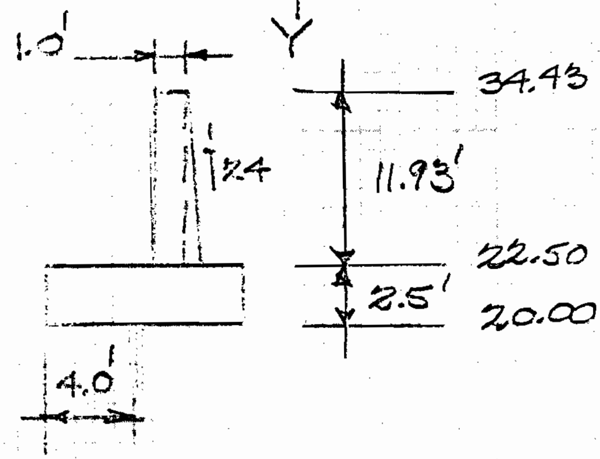
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

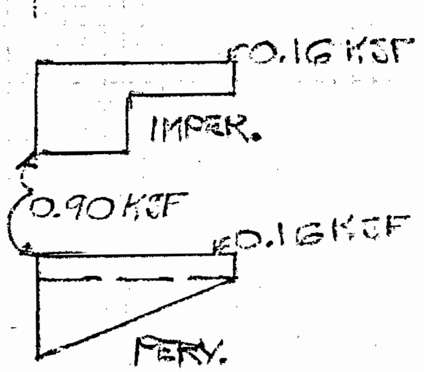
JOB ____ SHEET Nº ____ OF ____
ITEM WEST MONOLITH 18 BY NDL DATE 1-12-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES

$$\begin{array}{r} 54.11 \\ -4.29 \\ \hline 49.82 \end{array}$$







$$F_{IMPER_Z} = 0.90 \times 4 \times 49.82 + 0.16 \times 4 \times 49.82 = -211^K$$
(179, 32)

$$M_{IMPER_Y} = 179 \times 24.91 + 32 \times 24.91 = 5,256^{IK}$$

$$M_{IMPER_X} = 179 \times 2 + 32 \times 6 = 550^{IK}$$

$$F_{PER_Z} = 0.16 \times 8 \times 49.82 + \frac{(0.90-0.16)}{2} \times 8 \times 49.82 = -211^K$$
(64, 147)

$$M_{PER_Y} = 64 \times 24.91 + 147 \times 24.91 = 5,256^{IK}$$

$$M_{PER_X} = 64 \times 4 + 147 \times \frac{8}{3} = 648^{IK}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 18 BY NDL DATE 1-14-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 11.93 \times 5 \times 49.82 \times 0.0625 = 186^{K}$

$M_y = 186 \times 24.91 = -4{,}633^{1K}$

$M_x = 186 \times 2.5 = -465^{1K}$

FORCE OF SOIL & WATER ON MONOLITH DUE TO END WALL IS SMALL HOWEVER, FORCE SHOULD BE CONSIDERED IN END WALL DESIGN.

WATER-HORIZ

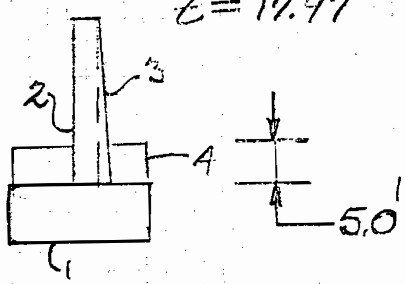
$$F_y = 49.82 \times 0.0625 \left(\overset{324}{\frac{14.43^2}{2}} - \overset{-10}{\frac{2.5^2}{2}} \right) = -314^{K}$$

$$M_x = -324 \times \frac{14.43}{3} + 10 \times \frac{2.5}{3} = -1{,}550^{1K}$$

$$M_z = -324 \times 24.91 + 10 \times 24.91 = -7{,}822^{1K}$$

CONCRETE HEIGHT

$t = 17.97''$



	F_z	X	M_y	Y	M_x
1	149	24.91	3,711	4	596
2	89	24.91	2,217	5.5	490
3	22	24.91	548	6.17	136
4	10	48.82	488	3.8	38
	270^{K}		$6{,}964^{1K}$		$-1{,}260^{1K}$

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	270	-1,260	-6,964	0
2	WATER-VERT	0	0	186	-465	-4,633	0
3	WATER-HORIZ	0	-314	0	-1,550	0	-7,822
4	UPLIFT-IMP	0	0	-211	550	5,256	0
5	UPLIFT-PERV	0	0	-211	648	5,256	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	0	-314	245	-2,725	-6,341	-7,822
II	1+2+3+5	0	-314	245	-2,627	-6,341	-7,822

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 18
JOB Nº 575-79

SHEET Nº OF
BY NDL DATE 1-14-80
CHKD. BY DATE

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-79
20    MONOLITH 18
30    2,2
40    2,0.0,64
50    1,12,12.
60    1,5
70    -1, 8.33
80    0,0,0
100   2,90, 8
110   2.33, 8.83, 15.33, 21.83, 28.33, 34.83, 41.33, 47.83
140   8*-1.5
170   8* 0.0
200   2,270, 8
210   2.33, 8.83, 15.33, 21.83, 28.33, 34.83, 41.33, 47.83
240   8*-6.5
270   8* 0.0
2000  0, -314, 245, -2725, -6341, -7822
2010  0, -314, 245, -2627, -6341, -7822
```

GROUP	MAX. PILE LOAD P	Q	CASE No. P	Q	ALLOW PILE LOAD P	Q	% ALLOW P	Q
A	-32.8	1.9	I	I	-40	3.49	82.0	54.4
B	64.2	-2.0	I	I	68	1.89	94.4	105.8 ▷

$$Q_{ALLOW} = \frac{750-0.006944 \times 64,200}{0.1611} = 1.89$$

▷ EXCEEDS 100%

82A

01/30/80   12.15

```
10 FLORIDA AVE WEST 575-79
20 MONOLITH 18
30 2,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,8
110 2.33,8.83,15.33,21.83,28.33,34.83,41.33,47.83
140 8*-1.5
170 8*0.0
200 2,270,8
210 2.33,8.83,15.33,21.83,28.33,34.83,41.33,47.83
240 8*-6.5
270 8*0.0
2000 0,-314,245,-2725,-6341,-7822
2010 0,-314,245,-2627,-6341,-7822
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

01/30/80   12.169

PROG. NO. 713-F3-A2-210   12:10:31   01/30/80   MOD 6B, JAN 80

FLORIDA AVE WEST 575-79
MONOLITH 18

TOTAL NUMBER OF PILES =   16

LOAD CONDITION 1 MONOLITH 18 WEST

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-314.0	245.0	-2725.0	-6341.0	-7822.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	1.9	0.0	-32.8
2	1.9	0.0	-32.2
3	1.9	0.0	-31.6
4	1.9	0.0	-31.0
5	1.9	0.0	-30.4
6	1.9	0.0	-29.8
7	1.9	0.0	-29.2
8	1.9	0.0	-28.5
9	-2.0	0.0	64.2

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1 -0.0 -314.0 245.0 -2725.0 -6341.0 -7822.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-314.0	245.0	-2627.0	-6441.0	-7822.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.8	0.0	-31.4
2	0.8	0.0	-30.6
3	0.8	0.0	-29.7
4	0.8	0.0	-28.9
5	0.8	0.0	-28.1
6	0.8	0.0	-27.3
7	0.8	0.0	-26.5
8	0.8	0.0	-25.6
9	-0.9	0.0	61.3

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 -0.0 -314.0 245.0 -2627.0 -6441.0 -7822.0

0 12:10:41 01/30/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022 MONOLITH 18 WEST

0 PROG NO. 713-F3-A2-210 12:10:31 01/30/80 MOD 6A, JUN

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

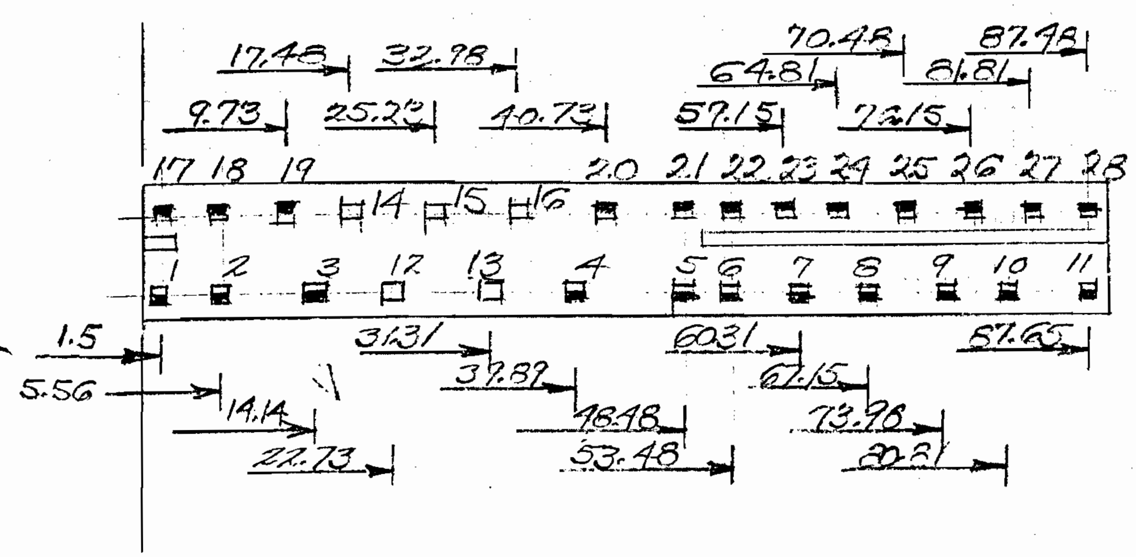
11021	X	Y	Z	RX	RY	RZ
11022	-0.183E-03	0.252E 00	-0.245E 00	-0.533E-02	-0.358E-05	0.382E-05
12022	-0.183E-03	0.104E 00	-0.124E 00	-0.280E-02	-0.541E-05	0.382E-05

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
JOB ______ SHEET Nº ______ OF ______
ITEM WEST HARBOR ROAD GATE BY NDL DATE 1-14-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER INPUT

```
10    FLORIDA AVE WEST 575-77
20    RELOCATED HARBOR ROAD GATE
30    3, 4
40    2, 0.0, 64
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0, 0
100   2, 90, 11
110   1.5, 5.56, 14.14,                39.89, 48.48,
120   53.48, 60.31, 67.15, 73.98, 80.81, 87.65
140   11*-1.5
170   11*0.0
200   0, 90, 6
210   22.73, 31.31, 17.48, 25.23, 32.98
240   2*-1.5, 3*-6.5
270   5*0.0
300   2, 270, 12
310   1.5, 5.58, 7.73, 40.73, 48.48, 53.48, 59.15,
320   64.81, 70.48, 76.15, 81.81, 87.48
340   12*-6.5
370   12*0.0
2000  0, -2772, 423.8, -3084, -21908, -11953
2010  0, -2772, 423.7, -3084, -21908, -11953
2020  0, 0, 556.1, -2318, -26639, 0
2030  0, 0, 556.1, -2830, -26639, 0
```

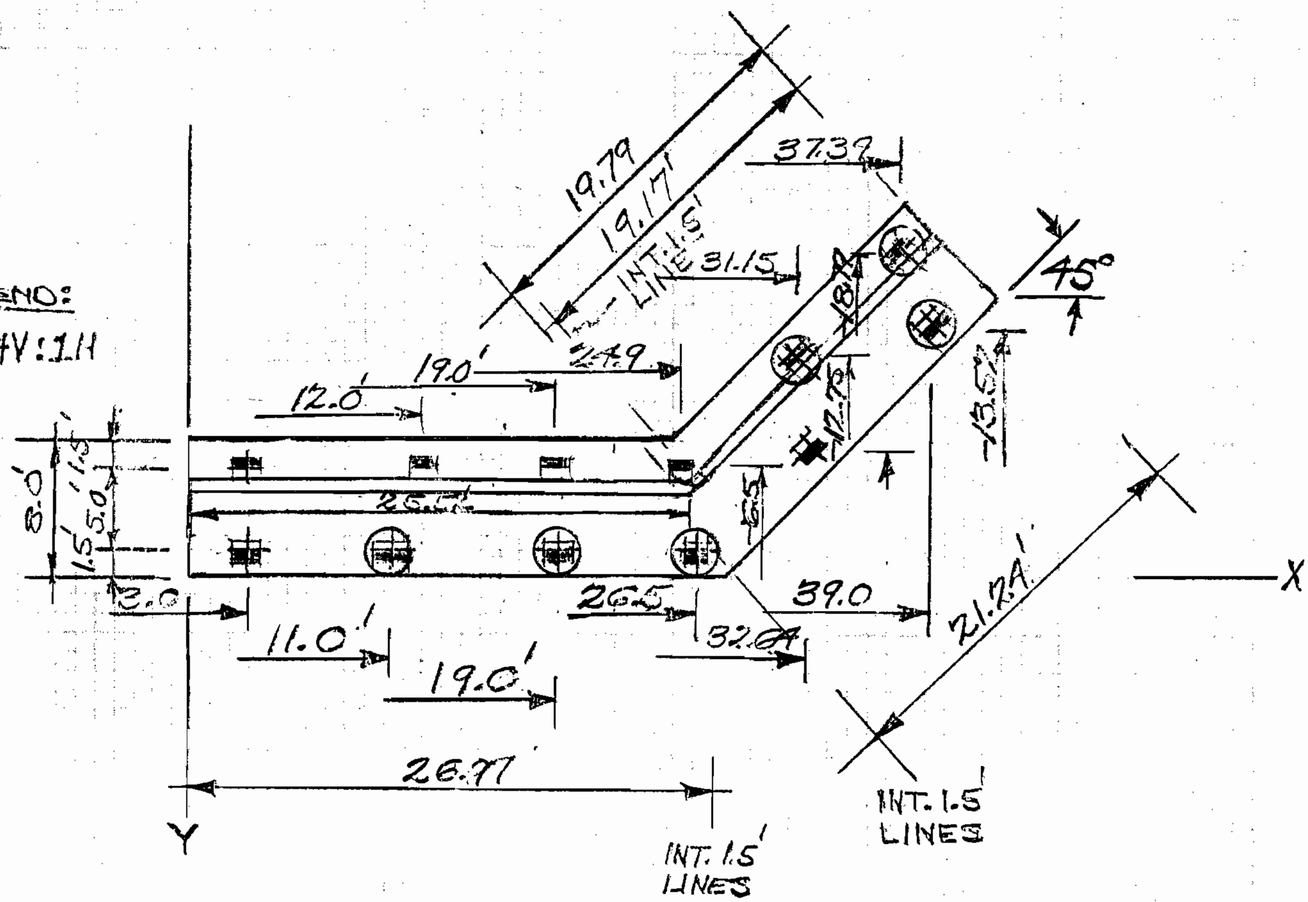


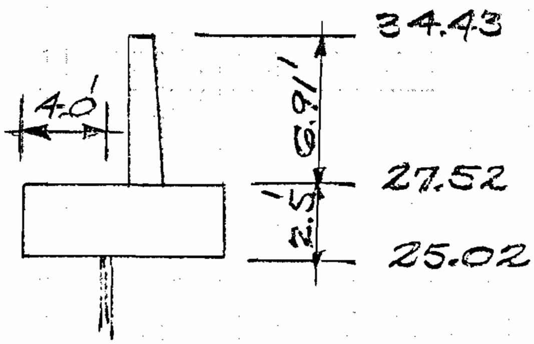
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ________ SHEET Nº ____ OF ____
ITEM WEST MONOLITH 20 BY NDL DATE 1-15-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

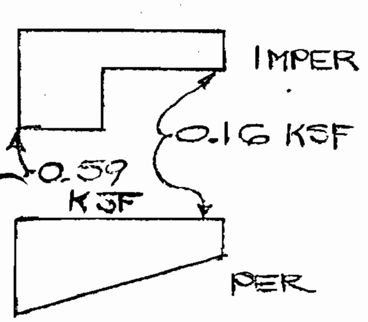
PILES

LEGEND:
○ - 4V:1H





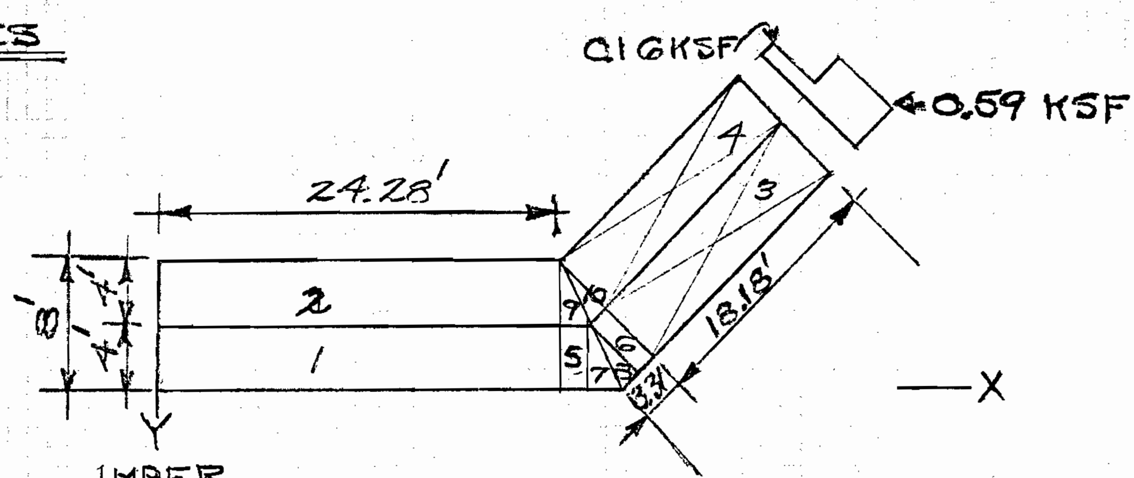
9.41 X 0.0625 = 0.59 KSF



N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 20 BY NDL DATE 1-22-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

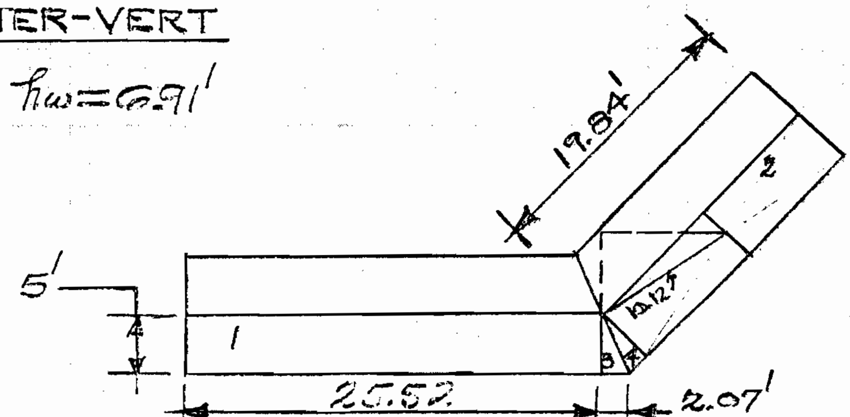


1.66

IMPER	A	F	Y	Mx	X	My
1	97.12	57	2	114	12.14	692
2	97.12	16	6	96	12.14	194
3	72.72	43	13.01	559	32.13	1,382
4	72.72	12	15.84	190	29.30	352
5	6.64	4	2	8	25.11	100
6	6.64	4	3.1	12	27.91	112
7	3.32	2	1.33	3	26.19	53
8	3.32	2	1.7	3	27.41	55
9	3.32	1	5.33	5	24.83	25
10	3.32	1	5.7	6	25.51	26
	366.04 SF	-142^{K}		996^{IK}		$2,991^{IK}$

WATER-VERT

$h_w = 6.91'$



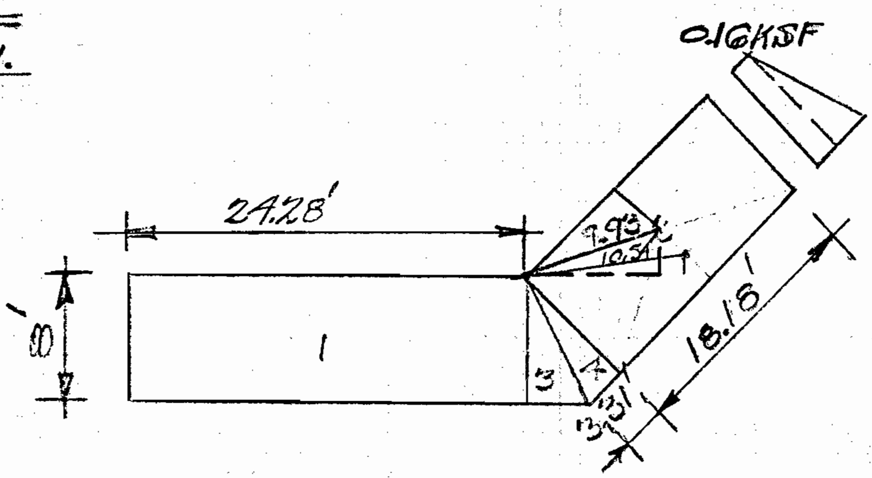
	A	F	Y	Mx	X	My
1	127.6	55	2.5	138	12.76	702
2	99.2	43	10.6	456	33.95	1,460
3	5.18	2	1.67	3	26.2	52
4	5.18	2	2.1	4	27.4	55
		102^{K}		-601^{IK}		$-2,269^{IK}$

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 20 BY NDL DATE 1-23-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

PERV.



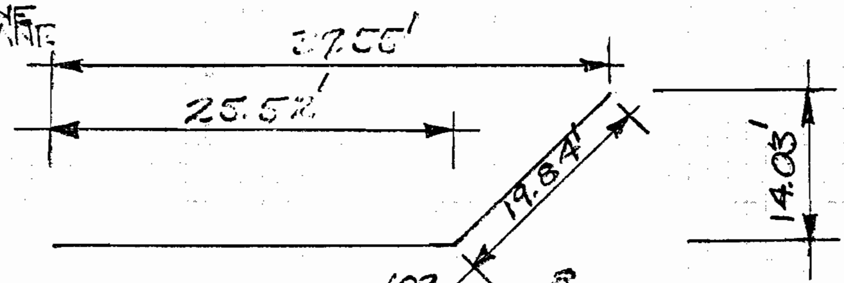
0.59
0.16
0.43KSF

$F_3 = \frac{3.31}{6}\left(\frac{3\times0.43}{2} + \frac{4\times4\times0.43}{2} + \frac{4\times4\times0.43}{4} + 0\right) = 3^K$

	FORCE		Y		M_X	X		M_Y
	UNI	TRI	UNI	TRI		UNI	TRI	
1	31	42	4	2.67	236	12.14		886
2	23	31	11.6	10.66	597	33.53	34.48	1,890
3	2	3	2.67	2	11	25.38	25.5	127
4	2	3	3.5	2.9	16	27.3	27.7	137
	-137^K				860^{1K}			$2,970^{1K}$

WATER-HORIZ

USE WALL LINE AS FORCE PLANE



$h_w = 9.41'$

$F_Y = 37.55 \times 0.0625\left(\frac{9.41^2}{2} - \frac{2.5^2}{2}\right) = -101^K$ (107, 3)

$M_X = 107 \times 9.41/3 - 3\times2.5/3 = -335^{1K}$

$F_X = 14.03\times0.0625\left(\frac{9.41^2}{2} - \frac{2.5^2}{2}\right) = -36^K$ (39, 3)

$M_Y = 39\times9.41/3 - 3\times2.5/3 = 120^{1K}$

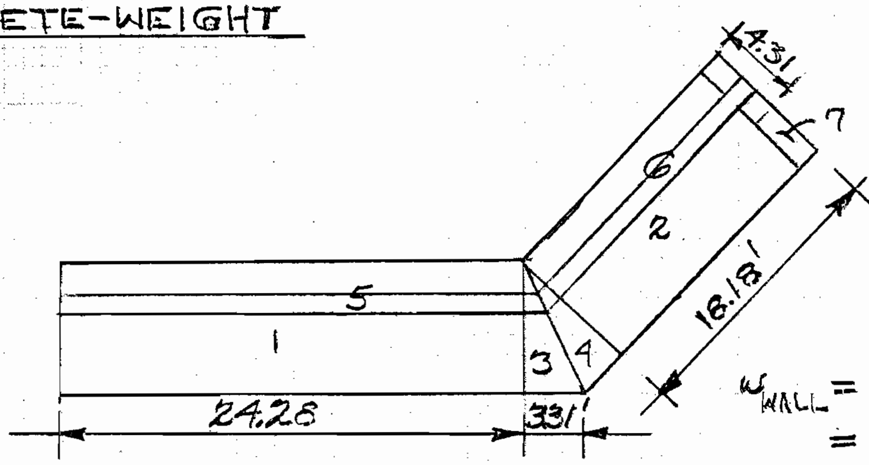
$M_Z = -101 \times \frac{37.55}{2} - 36\times\left(\frac{14.03}{2} + 5\right) = -2,43?^{1K}$

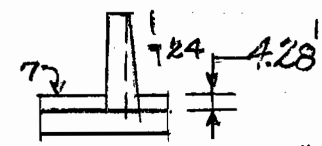
N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITH 20 BY NDL DATE 1-23-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

CONCRETE-WEIGHT





$t = 12 + \frac{6.91}{2} = 15.46''$

$w_{WALL} = 6.91 \times 0.15 \left(1.04 + \frac{3.46}{12 \times 2} \right) = 1.19^{K/'}$

(1.04, 0.15)

$C.G. = \frac{5.5 \times 1.04 + 6.1 \times 0.15}{1.19} = 5.58'$

	F	Y	Mx	X	My
1	73	4	292	12.14	886
2	55	11.6	638	33.53	1,844
3	5	2.67	13	25.38	127
4	5	3.5	18	27.31	137
5	30	5.58	167	12.64	379
6	23	12.38	285	32.06	737
7	9	17.10	160	39.47	355
	200 K		−1,573 'K		−4,465 'K

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	200	−1,573	−4465	0
2	WATER-VERT	0	0	102	−601	−2,269	0
3	WATER-HORIZ	−36	−101	0	−335	120	−2,430
4	UPLIFT-IMP	0	0	−142	776	2,771	0
5	UPLIFT-PERY	0	0	−137	860	2,770	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	−36	−101	160	−1,573	−3,323	−2,430
II	1+2+3+5	−36	−101	165	−1,349	−3,324	−2,430

```
03/28/80     13.45

10 FLORIDA AVE WEST 575-79
20 MONOLITH 20
30 6,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,1
110 3.0
140 -1.5
170 0.0
200 4,90,3
210 11.0,19.0,26.5
240 3*-1.5
270 3*0.0
300 4,45,1
310 39.0
340 -13.52
370 0.0
400 2,270,4
410 3.0,12.0,19.0,24.9
440 4*-6.5
470 4*0.0
500 4,225,2
510 31.15,37.39
540 -12.75,-18.79
570 2*0.0
600 2,45,1
610 32.64
640 -7.16
670 0.0
2000 -36,-101,160,-1513,-3623,-2430
2010 -36,-101,165,-1648,-3624,-2430

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/28/80     13.487
```

PROG. NO. 713-F3-A2-210   13:30:05 03/28/80   MOD 6B, FEB 80

FLORIDA AVE WEST 575-79
MONOLITH 20

TOTAL NUMBER OF PILES = 12

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-36.0	-101.0	160.0	-1513.0	-3623.0	-2430.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.6	-25.5
2	-0.3	0.6	-0.2
3	-0.3	0.6	11.0
4	-0.3	0.6	21.5
5	-0.6	0.2	-19.6
6	0.3	-0.6	19.3
7	0.3	-0.6	32.3
8	0.2	-0.6	42.5
9	0.2	-0.6	51.0
10	0.6	-0.2	44.6
11	0.6	-0.2	34.0
12	-0.6	0.2	-39.8

1   SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-36.0	-101.0	160.0	-1513.0	-3623.0	-2430.0

LOAD CONDITION 2 MONOLITH 20

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-36.0	-101.0	165.0	-1648.0	-3624.0	-2430.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.5	-20.2
2	-0.3	0.5	0.5
3	-0.3	0.5	7.9
4	-0.3	0.5	14.9
5	-0.6	0.2	-16.6
6	0.2	-0.5	25.3
7	0.2	-0.5	33.8
8	0.2	-0.5	40.5
9	0.2	-0.5	46.1
10	0.5	-0.2	45.2
11	0.6	-0.2	38.8
12	-0.6	0.2	-39.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 -36.0 -101.0 165.0 -1648.0 -3624.0 -2430.0

0 13:30:45 03/28/80 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022
```

0 PROG NO. 713-F3-A2-210 13:30:05 03/28/80 MOD 6B,

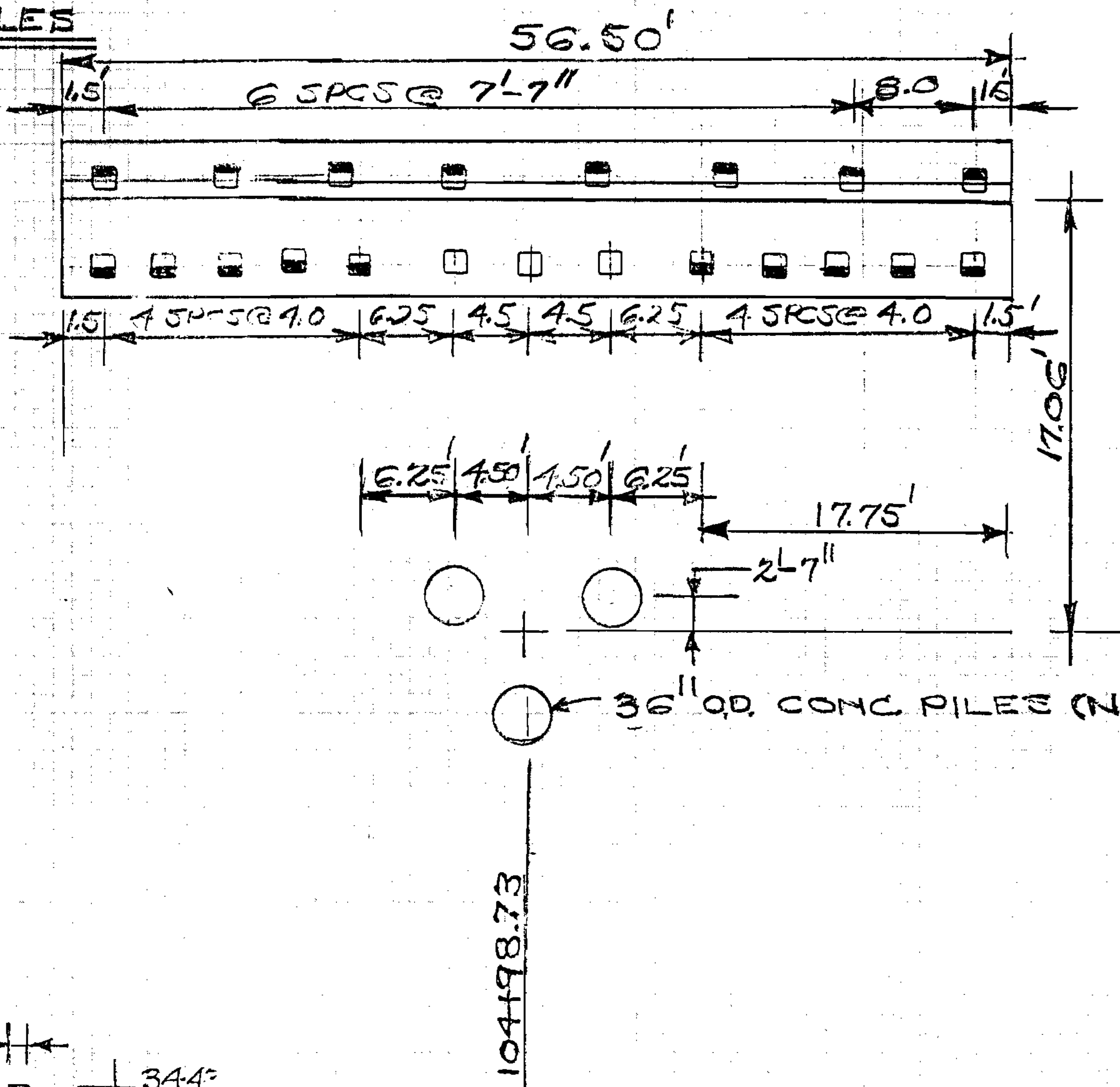
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

11021	X	Y	Z	RX	RY	RZ
11022	-0.839E-01	-0.415E-01	0.362E-02	0.179E-03	-0.778E-04	-0.123E-04
12022	-0.807E-01	-0.382E-01	0.530E-02	0.112E-03	-0.515E-04	-0.691E-05

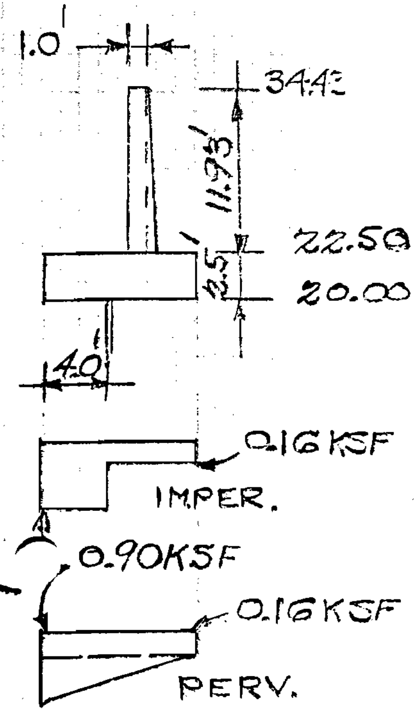
N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM WEST MONOLITH 13 BY NDL DATE 1-28-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES



17.06
3.50
13.56'



$$F_{IMPER_Z} = 0.90 \times 4 \times \overset{203}{56.50} + 0.16 \times 4 \times \overset{36}{56.50} = -239^{K}$$

$$M_{IMPER_Y} = 203 \times 28.25 + 36 \times 28.25 = 6{,}752^{\prime K}$$

$$M_{IMPER_X} = 203 \times 2 + 36 \times 6 = 622^{\prime K}$$

$$F_{PER_Z} = 0.16 \times \overset{72}{8} \times 56.50 + \overset{167}{\frac{(0.90-0.16)}{2}} \times 8 \times 56.5 = -2$$

$$M_{PER_Y} = 72 \times 28.25 + 167 \times 28.25 = 6{,}752^{\prime K}$$

$$M_{PER_X} = 72 \times 4 + 167 \times \frac{8}{3} = 733^{\prime K}$$

PILES

WATER-VERT

$F_Z = 11.73 \times 5 \times 5650 \times 0.0625 = 211^{K}$

$M_Y = 211 \times 28.25 = -5{,}962^{IK}$

$M_X = 211 \times 2.5 = -528^{IK}$

WATER-HORIZ

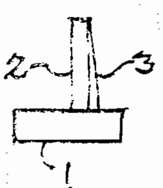
$F_Y = 56.50 \times 0.0625 \left(\dfrac{\overset{367}{14.43^2}}{2} - \dfrac{\overset{11}{2.5^2}}{2} \right) = -356^{K}$

$M_X = -367 \times \dfrac{14.43}{3} + 11 \times \dfrac{2.5}{3} = -1{,}756^{IK}$

$M_Z = -367 \times 28.25 + 11 \times 28.25 = -10{,}057^{IK}$

CONCRETE WEIGHT

$t = 17.97''$



	F_Z	X	M_Y	Y	M_X
1	170	28.25	4,802	4	680
2	101	28.25	2,853	5.5	556
3	25	28.25	706	6.17	154
	296^{K}		$-8{,}361^{IK}$		$-1{,}390^{IK}$

LOAD TABULATION

LOAD NO.	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	296	-1,390	-8,361	0
2	WATER-VERT	0	0	211	-528	-5,962	0
3	WATER-HORIZ	0	-356	0	-1,756	0	-10057
4	UPLIFT-IMP	0	0	-239	622	6,752	0
5	UPLIFT-PERY	0	0	-239	733	6,752	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	0	-356	268	-3,052	-7,571	-10,057
II	1+2+3+5	0	-356	268	-2,941	-7,571	-10,057

Q_{ALLOW} WITH P_{MAX}

$0.006744(47{,}100) + 0.1611\,Q = 840$

$\therefore\ Q_{ALLOW} = 3{,}184\ LB \simeq 3.18^{K}$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST MONOLITH 13
JOB Nº 575-79
SHEET Nº OF
BY NDL DATE 1-28-80
CHKD. BY DATE

PILES

COMPUTER-INPUT

```
10   FLORIDA AVE WEST 575-79
20   MONOLITH 13
30   ,2
40   2,0.0,64
50   1,12,12
60   1,5
70   -1,8.33
80   0,0,0
```

```
04/09/80    10.02


10 FLORIDA AVE WEST 575-79
20 MONOLITH 13
30 3,2
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,10
110 1.5,5.5,9.5,13.5,17.5,39.0,43.0,47.0,51.0,55.0
140 10*-1.5
170 10*0.0
200 0,90,3
210 23.75,28.25,32.75
240 3*-1.5
270 3*0.0
300 4,270,8
310 1.5,9.14,16.79,24.43,32.07,39.72,47.36,55.0
340 8*-6.5
370 8*0.0
2000 0,-356,268,-3052,-7571,-10057
2010 0,-356,268,-2941,-7571,-10057

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        04/09/80    10.053


    PROG. NO. 713-F3-A2-210    10:09:48  04/09/80    MOD 6B, FEB 80

 FLORIDA AVE WEST 575-79
 MONOLITH 13

TOTAL NUMBER OF PILES =   21
```

9/B

```
              LOAD CONDITION   1          MONOLITH 13

            LOADS ON PILE CAP
        X          Y          Z          MX         MY         MZ
        0.       -356.0     268.0     -3052.0    -7571.0   -10057.0

             PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1     -0.8     0.0     -46.3
 11     -0.8     0.0      49.5
 14      0.8     0.0      68.5
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1         -0.0  -356.0   268.0   -3052.0   -7571.0  -10057.0


              LOAD CONDITION   2

            LOADS ON PILE CAP
        X          Y          Z          MX         MY         MZ
        0.       -356.0     268.0     -2941.0    -7571.0   -10057.0

             PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1     -0.9     0.0     -47.1
 11     -0.9     0.0      59.2
 14      0.9     0.0      65.7
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         -0.0  -356.0   268.0   -2941.0   -7571.0  -10057.0


   0    10:13:13   04/09/80    *** END OF  RUN ***


STOP        EOJ

*OLD P29010
*LIST 11020-11022,12022

<53>-LINES IGNORED BY EDIT---
0,0


2010 0,-356,268,-2941,-7571,-10057

READY

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      10:09:48   04/09/80              MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021         X           Y            Z            RX           RY           RZ
11022 -0.813E-06 -0.126E 00  0.363E-01  0.307E-03  0.980E-08  0.196E-07
12022 -0.782E-06 -0.139E 00  0.457E-01  0.493E-03  0.941E-08  0.189E-07
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST MONOLITHS BY NDL DATE 2-6-80
JOB No 575-79 CHKD. BY ______ DATE ______

CRITICAL PILE LOADS

MONOLITH	GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
2	A	-7.3	-1.4	I	II	-40	3.49	18.2	40.1
	B	28.7	1.4	I	II	61	3.48 ▷1	47.0	40.1
3	A	-18.0	-0.6	I	II	-40	3.49	45.0	17.2
	B	44.5	0.5	I	II	65	1.21	68.5	41.3
5	A	-32.6	-0.5	II	II	-40	3.49	81.5	14.3
	B	63.8	0.4	I	II	73	1.21	87.4	33.1
6	A	-28.8	-0.4	II	II	-40	3.49	72.0	11.5
	B	47.4	0.4	I	II	68	1.21	69.7	33.1
7	A	-14.1	-0.4	I	II	-40	3.49	35.2	11.5
	B	35.1	0.4	I	II	65	1.21	54.0	33.1
8	A	-23.1	-0.3	I	II	-40	3.49	57.8	8.6
	B	36.5	0.2	II	II	64	1.21	57.0	16.5
9	A	-9.1	-0.9	I	II	-40	3.49	22.8	25.8
	B	53.5	1.0	II	II	63	1.21	84.9	83.3
12	A	-27.1	1.5	I	I	-40	3.49	67.8	43.0
	B	57.6	-1.6	I	I	68	2.17 ▷1	84.7	73.7
13	A	-47.1	-0.9	II	II	-52 ▷3	3.18 ▷1	90.6	28.3
	B	68.5	0.9	I	II	68	1.21	100.7 ▷2	74.4
14	A	-41.1	0.8	I	II	-52 ▷3	3.49	79.0	22.9
	B	68.6	0.7	II	II	68	1.21	100.9 ▷2	57.9
15, 16 & 17	A	-29.7	1.8	I	I	-40	3.49	74.2	51.6
	B	60.5	-1.9	I	I	68	2.05 ▷1	89.0	92.7
18	A	-32.8	1.9	I	I	-40	3.49	82.0	54.4
	B	64.2	-2.0	I	I	68	1.89 ▷1	94.4	105.8 ▷2
20	A	-39.8	0.6	I	I	-40	3.49	99.5	17.2
	B	51.0	-0.6	I	I	57	1.21	89.5	49.6

▷1 Q_{ALLOW} CORRESPONDING TO P_{MAX}

▷2 EXCEEDS 100%

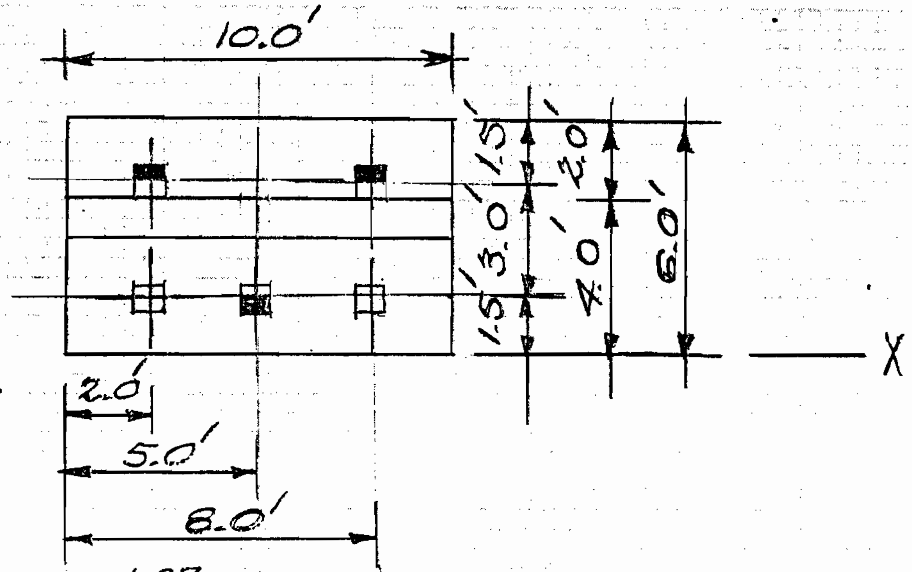
▷3 SOIL CAPACITY OF PILE

NOTE:
ALL T-WALL MONOLITH PILES ARE 12" SQUARE PRESTRESSED CONCRETE PILES.

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO ____ OF ____
ITEM WEST HEADWALL 1 BY NDL DATE 3-15-80
JOB NO 575-77 CHKD. BY ____ DATE ____

PILES



$\gamma_{SAT} = 130$ PCF

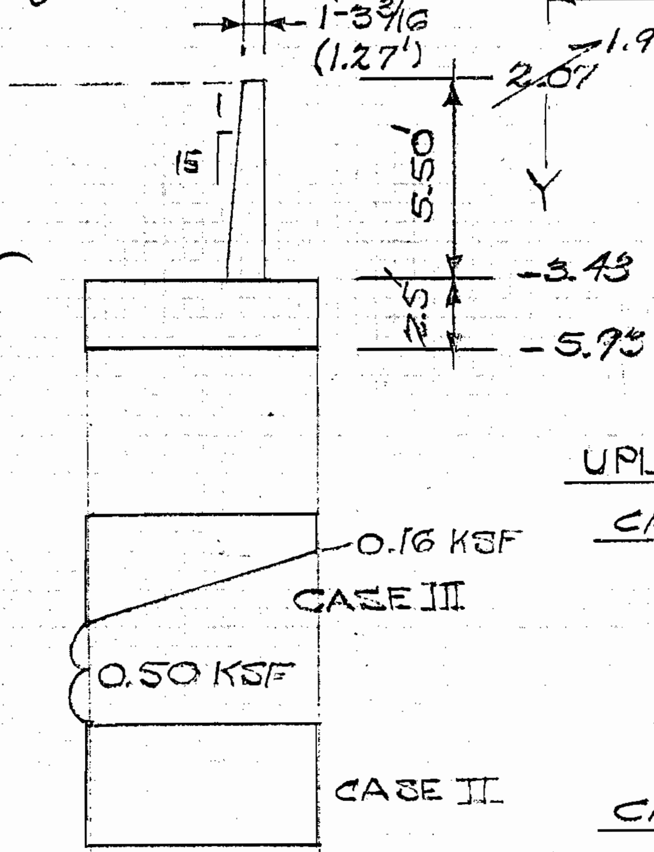
$\gamma_{SUB} = 67.5$ PCF

$P_{EARTH} = 33$ PSF

$P_{EARTH\ (IN\ WATER)} = 20.5$ PSF

K = 0.64 (SATURATED)

1/3 " — THRUST POINT "



CASE I — SOIL SATURATED, WATER LEVEL BELOW SLAB BASE, EAST

CASE II — WATER AT TOP, BOTH SIDES

CASE III — WATER AT TOP, WEST & AT TOP OF BASE, EAST

UPLIFT

CASE II

$F_Z = 0.50 \times 6 \times 10 = -30^K$

$M_Y = 30 \times 5 = 150^{1K}$

$M_X = 30 \times 3 = 90^{1K}$

CASE III

$F_Z = \overset{10}{0.16 \times 6 \times 10} + \overset{10}{\frac{(0.50 - 0.16)}{2}} \times 6 \times 10$

$= -20^K$

$M_Y = 20 \times 5 = 100^{1K}$

$M_X = 10 \times 3 + 10 \times \frac{6}{3} = 50^{1K}$

2.07
5.93
8.00 × 0.0625 = 0.50 KSF

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ ITEM WEST HEADWALL 1 JOB No 575-79

SHEET No ______ OF ______ BY NDL DATE 3-17-80 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_{Z_W} = 2.55 \times 5.5 \times 10 \times 0.0625 = 9^K$

$M_{Y_W} = 9 \times 5 = -45^{IK}$

$M_{X_W} = 9 \times 2.55/2 = -11^{IK}$

$F_{Z_E} = 2 \times 5.5 \times 10 \times 0.0625 = 7^K$

$M_{Y_E} = 7 \times 5 = -35^{IK}$

$M_{X_E} = 7 \times 5 = -35^{IK}$

WATER-HORIZ

$F_Y = 10 \times 0.0625 \left(\frac{\overset{20}{\overline{8.0^2}}}{2} - \frac{\overset{2}{\overline{2.5^2}}}{2} \right) = -18^K$

$M_X = 20 \times \frac{8}{3} - 2 \times \frac{2.5}{3} = -52^{IK}$

$M_Z = 18 \times 5 = -90^{IK}$

EARTH-VERT

$F_{Z_{SAT}} = 2.55 \times 5.5 \times 10 \times 0.13 = 18^K$

$M_{Y_{SAT}} = 18 \times 5 = -90^{IK}$

$M_{X_{SAT}} = 18 \times 2.55/2 = -23^{IK}$

$F_{Z_{SUB}} = 18 \times \frac{0.0675}{0.13} = 9^K$

$M_{Y_{SUB}} = 9 \times 5 = -45^{IK}$

$M_{X_{SUB}} = 9 \times 2.55/2 = -11^{IK}$

EARTH-HORIZ

$F_{Y_{SAT}} = 10 \times 0.083 \times \overline{8.0}^2 / 2 = -27^K$

$M_{X_{SAT}} = 27 \times 8/3 = -72^{IK}$

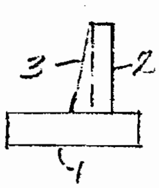
$M_{Z_{SAT}} = 27 \times 5 = -135^{IK}$

$F_{Y_{SUB}} = 27 \times \frac{0.0205}{0.083} = -7^K$

$M_{X_{SUB}} = 7 \times 8/3 = -19^{IK}$

$M_{Z_{SUB}} = 7 \times 5 = -35^{IK}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	22	5	110	3	66
2	10	5	50	3.5	35
3	2	5	10	2.88	6
	34^K		-170^{IK}		-107^{IK}

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO ____ OF ____
ITEM WEST HEADWALL 1 BY NDL DATE 3-17-80
JOB NO 575-79 CHKD. BY ____ DATE ____

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	34	-107	-170	0
2	EARTH-HORIZ-SAT	0	-27	0	-72	0	-135
3	" " -SUB	0	-7	0	-19	0	-35
4	EARTH-VERT-SAT	0	0	18	-23	-90	0
5	" " -SUB	0	0	9	-11	-45	0
6	WATER-HORIZ	0	-18	0	-52	0	-70
7	WATER-VERT-WEST	0	0	9	-11	-45	0
8	" " -EAST	0	0	7	-35	-35	0
9	UPLIFT-CASE III	0	0	-20	50	100	0
10	UPLIFT-CASE II	0	0	-30	90	150	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4	0	-27	52	-202	-260	-135
II	1+3+5+7+8+10	0	-7	29	-93	-145	-35
III	1+3+5+7+6+9	0	-25	32	-150	-160	-125

```
10    FLORIDA AVE WEST 575-79
20    WEST HEADWALL 1
30    3,3
40    2,0.0,64
50    1,12,12
60    1,5
70    -1,8.32
80    0,0,0
100   0,70,2
110   2.0,8.0
140   2*-4.5
170   2*0.0
200   2,70,1
210   8.0
240   -4.5
270   0.0
300   2,270,2
310   2.0,8.0
340   2*-4.5
370   2*0.0
2000  0,-27,52,-202,-260,-135
2010  0,-7,27,-93,-145,-35
2020  0,-25,32,-150,-160,-125
```

```
03/19/80    11.25


10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 1
30 3,3
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 0,90,2
110 2.0,8.0
140 2*-1.5
170 2*0.0
200 2,90,1
210 5.0
240 -1.5
270 0.0
300 2,270,2
310 2.0,8.0
340 2*-4.5
370 2*0.0
2000 0,-27,52,-202,-260,-135
2010 0,-7,29,-93,-145,-35
2020 0,-25,32,-150,-160,-125

READY

*RUN RK29010A

        03/19/80    11.284


    PROG. NO. 713-F3-A2-210    11:17:34  03/19/80    MOD 6B, FEB 80


 FLORIDA AVE WEST 575-79
 WEST HEADWALL 1


TOTAL NUMBER OF PILES =     5
```

95 E

LOAD CONDITION 1 HEADWALL 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-27.0	52.0	-202.0	-260.0	-135.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	10.7
3	-0.2	0.0	-12.0
4	0.2	-0.0	23.2

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-27.0	52.0	-202.0	-260.0	-135.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-7.0	29.0	-93.0	-145.0	-35.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.0	0.0	5.0
3	-0.0	0.0	2.9
4	-0.0	-0.0	9.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-7.0	29.0	-93.0	-145.0	-35.0

95

LOAD CONDITION 3 HEADWALL 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-25.0	32.0	-150.0	-160.0	-125.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	6.0
3	-0.2	0.0	-15.8
4	0.2	-0.0	19.1

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	-0.0	-25.0	32.0	-150.0	-160.0	-125.0

0 11:18:00 03/19/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 11:17:34 03/19/80 MOD 6B,
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

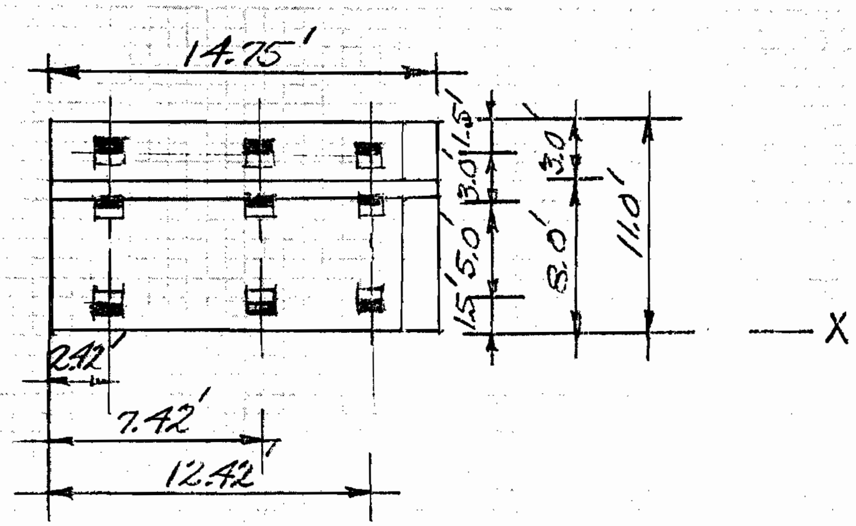
11021	X	Y	Z	RX	RY	RZ
11022	-0.926E-08	-0.300E-01	0.939E-02	0.153E-03	0.191E-10	-0.606E-10
12022	-0.324E-08	-0.215E-02	0.195E-02	-0.627E-04	0.840E-11	-0.192E-10

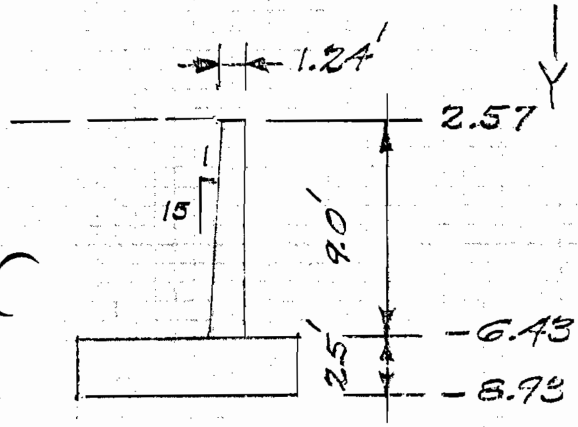
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM WEST HEADWALL-2 JOB No 575-79

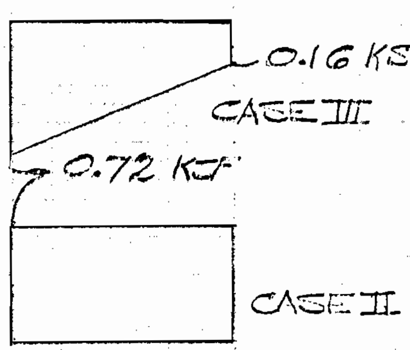
SHEET No ______ OF ______ BY NDL DATE 3-18-80
CHKD. BY ______ DATE ______

PILES





$1.24 + \frac{9}{15} = 1.84'$



2.57
8.93
11.50

$11.50 \times 0.0625 = 0.72\ KSF$

UPLIFT

CASE II

$F_z = 0.72 \times 11 \times 14.75 = -117^K$

$M_y = 117 \times 7.38 = 863^{1K}$

$M_x = 117 \times 5.5 = 644^{1K}$

CASE III

$F_z = \overset{26}{0.16 \times 11 \times 14.75} + \overset{45}{\left(\frac{0.72 - 0.16}{2}\right) \times 11 \times 14.75}$
$= -71^K$

$M_y = 71 \times 7.38 = 524^{1K}$

$M_x = 26 \times 5.5 + 45 \times \frac{11}{3} = 308^{1K}$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM WEST HEADWALL-2 BY NDL DATE 3-18-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILE 2

WATER-VERT

$F_{z_W} = 6.16 \times 9 \times 14.75 \times 0.0625 = 51^K$

$M_{Y_W} = 51 \times 7.38 = -376^{'K}$

$M_{X_W} = 51 \times 6.16/2 = -157^{'K}$

$F_{z_E} = 3 \times 9 \times 14.75 \times 0.0625 = 25^K$

$M_{Y_E} = 25 \times 7.38 = -184^{'K}$

$M_{X_E} = 25 \times 9.5 = -238^{'K}$

WATER-HORIZ

$F_Y = 14.75 \times 0.0625 \left(\overset{61}{\dfrac{\overline{11.5}^2}{2}} - \overset{3}{\dfrac{\overline{2.5}^2}{2}} \right) = -58^K$

$M_X = 61 \times \dfrac{11.5}{3} - 3 \times \dfrac{2.5}{3} = -231^{'K}$

$M_Z = 58 \times 7.38 = -428^{'K}$

EARTH-VERT

$F_{z_{SAT}} = 6.16 \times 9 \times 14.75 \times 0.13 = 106^K$

$M_{Y_{SAT}} = 106 \times 7.38 = -782^{'K}$

$M_{X_{SAT}} = 106 \times 6.16/2 = -326^{'K}$

$F_{z_{SUB}} = 106 \times \dfrac{0.0675}{0.13} = 55^K$

$M_{Y_{SUB}} = 55 \times 7.38 = -406^{'K}$

$M_{X_{SUB}} = 55 \times 6.16/2 = -169^{'K}$

EARTH-HORIZ.

$F_{Y_{SAT}} = 14.75 \times 0.083 \times \overline{11.5}^2/2 = -54^K$

$M_{X_{SAT}} = 54 \times 11.5/3 = -207^{'K}$

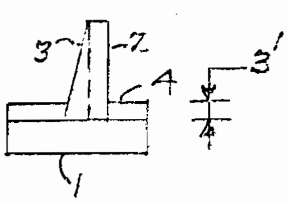
$M_{Z_{SAT}} = 54 \times 7.38 = -399^{'K}$

$F_{Y_{SUB}} = 54 \times \dfrac{0.0205}{0.083} = -13^K$

$M_{X_{SUB}} = 13 \times 11.5/3 = -50^{'K}$

$M_{Z_{SUB}} = 13 \times 7.38 = -96^{'K}$

CONCRETE-WEIGHT



	F_z	X	M_Y	Y	M_X
1	61	7.38	450	5.5	336
2	25	7.38	184	7.38	184
3	6	7.38	44	6.56	39
4	6	14.0	84	5.18	31
	98^K		$-762^{'K}$		$-590^{'K}$

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	98	-590	-762	0
2	EARTH-HORIZ-SAT	0	-54	0	-207	0	-399
3	" " -SUB	0	-13	0	-50	0	-96
4	EARTH-VERT-SAT	0	0	106	-326	-782	0
5	" " -SUB	0	0	55	-169	-406	0
6	WATER-HORIZ	0	-58	0	-281	0	-428
7	WATER-VERT-WEST	0	0	51	-157	-376	0
8	" " -EAST	0	0	25	-238	-184	0
9	UPLIFT-CASE III	0	0	-71	308	524	0
10	UPLIFT-CASE II	0	0	-117	644	863	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4	0	-54	204	-1,123	-1,544	-399
II	1+3+5+7+8+10	0	-13	117	-560	-565	-96
III	1+2+5+7+6+9	0	-71	133	-889	-1,020	-524

```
10    FLORIDA AVE WEST 575-79
20    WEST HEADWALL 2
30    2, 2
40    2, 0.0, 64
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0, 0
100   2, 70, 3
110   2.42, 7.42, 12.42
140   3*-1.5
170   3*0.0
200   2, 270, 6
210   2.42, 7.42, 12.42, 2.42, 7.42, 12.42
240   3*-6.5, 3*-9.5
270   6*0.0
2000  0, -54, 204, -1123, -1544, -399
2010  0, -13, 117, -560, -565, -96
2020  0, -71, 133, -889, -1020, -524
```

```
03/19/80    11.36

10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 2
30 2,3
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 2.42,7.42,12.42
140 3*-1.5
170 3*0.0
200 2,270,6
210 2.42,7.42,12.42,2.42,7.42,12.42
240 3*-6.5,3*-9.5
270 6*0.0
2000 0,-54,204,-1123,-1544,-399
2010 0,-13,117,-560,-865,-96
2020 0,-71,133,-889,-1020,-524

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/19/80    11.389


    PROG. NO. 713-F3-A2-210    11:23:37  03/19/80    MOD 6B, FEB 80

 FLORIDA AVE WEST 575-79
 WEST HEADWALL 2

TOTAL NUMBER OF PILES =    9
```

LOAD CONDITION 1 HEADWALL 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-54.0	204.0	-1123.0	-1544.0	-399.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	0.0	17.5
2	-0.5	0.0	19.4
3	-0.5	0.0	21.3
4	0.4	0.0	48.2
5	0.4	0.0	49.0
6	0.4	0.0	49.8
7	0.5	0.0	7.0
8	0.5	0.0	7.8
9	0.5	0.0	8.6

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-54.0	204.0	-1123.0	-1544.0	-399.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-13.0	117.0	-560.0	-865.0	-96.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.0	17.6
4	0.1	-0.0	21.8
7	0.2	-0.0	4.6

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-13.0	117.0	-560.0	-865.0	-96.0

LOAD CONDITION 3 HEADWALL 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-71.0	133.0	-889.0	-1020.0	-524.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	0.0	-2.0
2	-0.6	0.0	0.1
3	-0.6	0.0	2.2
4	0.5	0.0	44.9
5	0.5	0.0	45.7
6	0.5	0.0	46.5
7	0.6	0.0	3.2
8	0.6	0.0	4.0
9	0.6	0.0	4.8

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3 0.0 -71.0 133.0 -889.0 -1020.0 -524.0

0 11:23:58 03/19/80 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022
```

0 PROG NO. 713-F3-A2-210 11:23:37 03/19/80 MOD 6B,

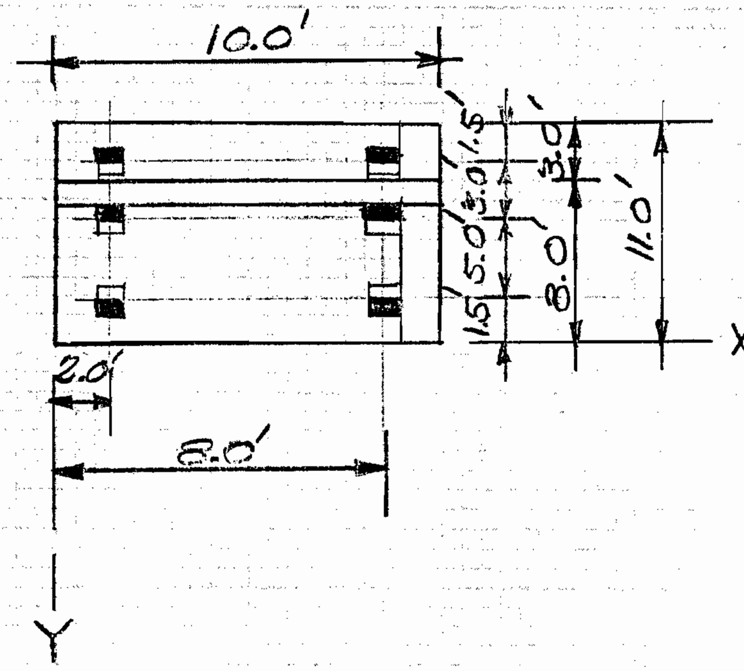
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

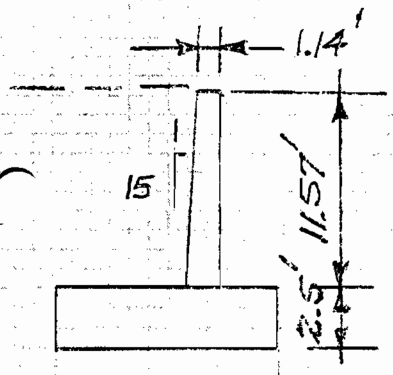
11021	X	Y	Z	RX	RY	RZ
11022	-0.882E-03	-0.694E-01	0.606E-01	0.796E-03	-0.152E-04	0.126E-04
12022	0.797E-05	-0.230E-01	0.298E-01	0.334E-03	0.137E-05	-0.114E-06

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM WEST HEADWALL 3 BY NDL DATE 3-18-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES





3.57

-8.00

-10.50

$1.14 + \frac{11.57}{15} = 1.91'$

$1.14 + \frac{11.57}{2 \times 15} = 1.53'$

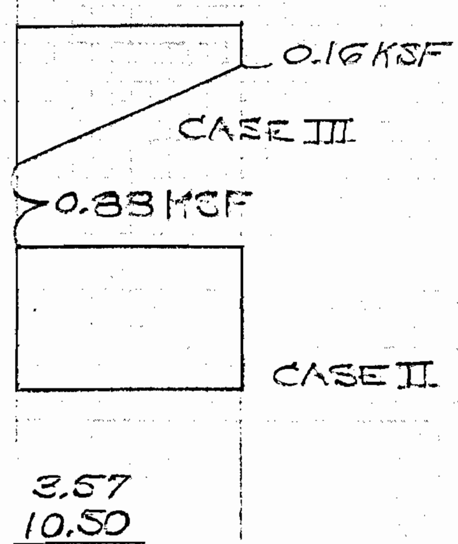
UPLIFT

CASE II

$F_z = 0.88 \times 11 \times 10 = -97^K$

$M_y = 97 \times 5 = 485^{'K}$

$M_x = 97 \times 5.5 = 534^{'K}$



CASE III

$F_z = \overset{18}{0.16 \times 11 \times 10} + \overset{40}{\left(\frac{0.88 - 0.16}{2}\right) \times 11 \times 10}$

$= -58^K$

$M_y = 58 \times 5 = 290^{'K}$

$M_x = 18 \times 5.5 + 40 \times \frac{11}{3} = 246^{'K}$

3.57
10.50
$14.07 \times 0.0625 = 0.88$ KSF

PILES

WATER-VERT

$F_{Z_W} = 6.47 \times 11.57 \times 10 \times 0.0625 = 47^K$

$M_{Y_W} = 47 \times 5 = -235^{1K}$

$M_{X_W} = 47 \times 6.47/2 = -152^{1K}$

$F_{Z_E} = 3 \times 11.57 \times 10 \times 0.0625 = 22^K$

$M_{Y_E} = 22 \times 5 = -110^{1K}$

$M_{X_E} = 22 \times 7.5 = -207^{1K}$

WATER-HORIZ

$F_Y = 10 \times 0.0625\left(\frac{\overset{62}{\overline{14.07}^2}}{2} - \frac{\overset{2}{\overline{2.5}^2}}{2}\right) = -60^K$

$M_X = 62 \times \frac{14.07}{3} - 2 \times \frac{2.5}{3} = -289^{1K}$

$M_Z = 60 \times 5 = -300^{1K}$

EARTH-VERT

$F_{Z_{SAT}} = 6.47 \times 11.57 \times 10 \times 0.13 = 97^K$

$M_{Y_{SAT}} = 97 \times 5 = -485^{1K}$

$M_{X_{SAT}} = 97 \times 6.47/2 = -314^{1K}$

$F_{Z_{SUB}} = 97 \times \frac{0.0675}{0.13} = 50^K$

$M_{Y_{SUB}} = 50 \times 5 = -250^{1K}$

$M_{X_{SUB}} = 50 \times 6.47/2 = -162^{1K}$

EARTH-HORIZ

$F_{Y_{SAT}} = 10 \times 0.083 \times \overline{14.07}^2/2 = -82^K$

$M_{X_{SAT}} = 82 \times 14.07/3 = -385^{1K}$

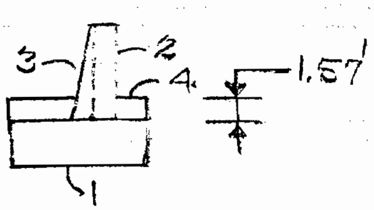
$M_{Z_{SAT}} = 82 \times 5 = -410^{1K}$

$F_{Y_{SUB}} = 82 \times \frac{0.0205}{0.083} = -20^K$

$M_{X_{SUB}} = 20 \times 14.07/3 = -94^{1K}$

$M_{Z_{SAT}} = 20 \times 5 = -100^{1K}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	41	5	205	5.5	226
2	20	5	100	7.48	149
3	7	5	35	6.60	46
4	3	9	27	5.18	16
	71^K		-367^{1K}		-437^{1K}

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO ____ OF ____
ITEM WEST HEADWALL 3 BY NDL DATE 3-18-80
JOB NO 575-77 CHKD. BY ____ DATE ____

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	71	-437	-367	0
2	EARTH-HORIZ-SAT	0	-82	0	-365	0	-410
3	" " -SUB	0	-20	0	-94	0	-100
4	EARTH-VERT-SAT	0	0	97	-314	-485	0
5	" " -SUB	0	0	50	-162	-250	0
6	WATER-HORIZ	0	-60	0	-287	0	-300
7	WATER-VERT-WEST	0	0	47	-152	-235	0
8	" " -EAST	0	0	22	-209	-110	0
9	UPLIFT-CASE III	0	0	-55	246	290	0
10	UPLIFT-CASE II	0	0	-97	534	485	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4	0	-82	168	-1136	-852	-410
II	1+3+5+7+8+10	0	-20	93	-520	-477	-100
III	1+3+5+7+6+9	0	-80	110	-888	-562	-400

10 FLORIDA AVE WEST 575-77
20 WEST HEADWALL 3
30 2,3
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,70,2
110 2.0, 8.0
140 2*-1.5
170 2*0.0
200 2,270,4
210 2.0, 8.0, 2.0 8.0
240 2*-6.5, 2*-7.5
270 4*0.0
2000 0, -82, 168, -1136, -852, -410
2010 0, -20, 93, -520 -477 -100
2020 0, -80, 110, -888 -562, -400

03/19/80 11.55

```
10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 3
30 2,3
40 2,0.0,64
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 2.0,8.0
140 2*-1.5
170 2*0.0
200 2,270,4
210 2.0,8.0,2.0,8.0
240 2*-6.5,2*-9.5
270 4*0.0
2000 0,-82,168,-1136,-852,-410
2010 0,-20,93,-520,-477,-100
2020 0,-80,110,-888,-562,-400
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

03/19/80 11.572

PROG. NO. 713-F3-A2-210 11:34:35 03/19/80 MOD 6B, FEB 80

FLORIDA AVE WEST 575-79
WEST HEADWALL 3

TOTAL NUMBER OF PILES = 6

LOAD CONDITION 1 HEADWALL 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-82.0	168.0	-1136.0	-852.0	-410.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	0.0	2.6
2	-0.9	0.0	4.8
3	0.7	0.0	74.4
4	0.7	0.0	75.6
5	0.8	0.0	15.0
6	0.8	0.0	16.1

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-82.0	168.0	-1136.0	-852.0	-410.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-20.0	93.0	-520.0	-477.0	-100.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	14.3
2	-0.2	0.0	16.5
3	0.1	0.0	25.9
4	0.1	0.0	27.1
5	0.2	0.0	9.6
6	0.2	0.0	10.7

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-20.0	93.0	-520.0	-477.0	-100.0

101 C

LOAD CONDITION 3 HEADWALL 3

~ LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-80.0	110.0	-888.0	-562.0	-400.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.7	0.0	-12.8
2	-0.7	0.0	-10.6
3	0.6	0.0	59.3
4	0.6	0.0	60.4
5	0.7	0.0	13.1
6	0.7	0.0	14.2

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	-80.0	110.0	-888.0	-562.0	-400.0

0 11:34:39 03/19/80 ♦♦♦ END OF RUN ♦♦♦

STOP EOJ

```
♦OLD P29010
READY
♦LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210     11:34:35  03/19/80              MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X            Y             Z            RX           RY           RZ
11022 -0.718E-03 -0.119E 00  0.815E-01  0.115E-02 -0.161E-04  0.103E-04
12022 -0.718E-03 -0.273E-01  0.287E-01  0.315E-03 -0.161E-04  0.103E-04
```

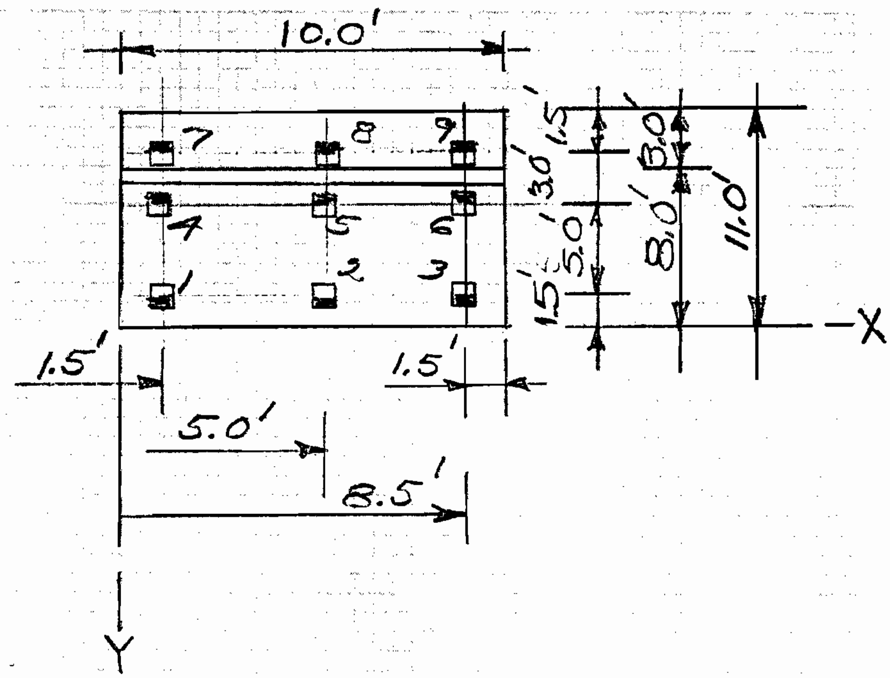
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

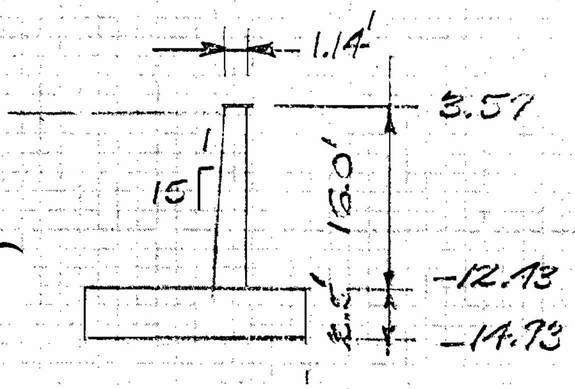
JOB
ITEM WEST HEADWALL 4
JOB No 575-77

SHEET No   OF
BY NDL   DATE 3-22-80
CHKD. BY   DATE

PILES

COMPUTER OUTPUT ON HW 1, HW 2 & HW 3 INDICATE THAT CASE II IS NOT CRITICAL. WILL NOT DO CASE II HEREON





$$1.14 + \frac{16}{15} = 2.21'$$

$$1.14 + \frac{16}{2 \times 15} = 1.67'$$

UPLIFT

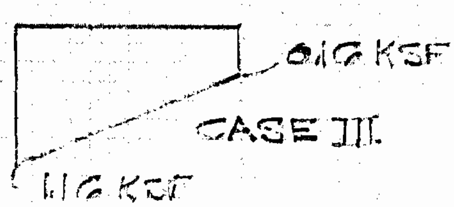
CASE III

$$F_z = \overset{18}{0.16 \times 11 \times 10} + \overset{55}{\frac{(1.16 - 0.16)}{2} \times 11 \times 10}$$

$$= -73^K$$

$$M_Y = 73 \times 5 = 365^{1K}$$

$$M_X = 18 \times 5.5 + 55 \times \frac{11}{3} = 301^{1K}$$



3.57
14.93
18.50' × 0.0625 = 1.16 KSF

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST HEADWALL 4
JOB No 575-79
SHEET No OF
BY NDL DATE 3-22-80
CHKD. BY DATE

PILES

WATER-VERT

$F_{Z_W} = 6.33 \times 16.0 \times 10 \times 0.0625 = 63^{k}$

$M_{Y_W} = 63 \times 5 = -315^{1k}$

$M_{X_W} = 63 \times 6.33/2 = -199^{1k}$

WATER-HORIZ

$$F_Y = 10 \times 0.0625 \left(\overset{107}{\frac{18.5^2}{2}} - \overset{2}{\frac{2.5^2}{2}} \right) = -105^{k}$$

$$M_X = 107 \times \frac{18.5}{3} - 2 \times \frac{2.5}{3} = -658^{1k}$$

$M_Z = 105 \times 5 = -525^{1k}$

EARTH-VERTICAL

$F_{Z_{SAT}} = 6.33 \times 16 \times 10 \times 0.13 = 132^{k}$ $\quad F_{Z_{SUB}} = 132 \times \frac{0.0675}{0.13} = 69^{k}$

$M_{Y_{SAT}} = 132 \times 5 = -660^{1k}$ $\quad M_{Y_{SUB}} = 69 \times 5 = -345^{1k}$

$M_{X_{SAT}} = 132 \times 6.33/2 = -418^{1k}$ $\quad M_{X_{SUB}} = 69 \times 6.33/2 = -218^{1k}$

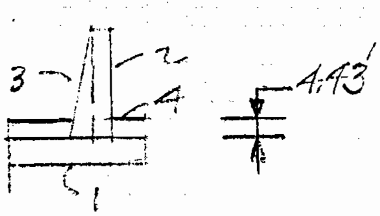
EARTH-HORIZ

$F_{Y_{SAT}} = 10 \times 0.083 \times 18.5^2/2 = -142^{k}$ $\quad F_{Y_{SUB}} = 142 \times \frac{0.0205}{0.083} = -35^{k}$

$M_{X_{SAT}} = 142 \times 18.5/3 = -876^{1k}$ $\quad M_{X_{SUB}} = 35 \times 18.5/3 = -216^{1k}$

$M_{Z_{SAT}} = 142 \times 5 = -710^{1k}$ $\quad M_{Z_{SUB}} = 35 \times 5 = -175^{1k}$

CONCRETE-WEIGHT



	Fz	X	My	Y	Mx
1	41	5	205	5.5	226
2	27	5	135	7.43	201
3	13	5	65	6.5	84
4	9	9.25	83	5.15	46
	90^{k}		-488^{1k}		-557^{1k}

JOB
ITEM WEST HEADWALL 4
JOB No 575-79
SHEET No OF
BY NDL DATE 3-22-80
CHKD. BY DATE

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	90	-557	-488	0
2	EARTH-HORIZ-SAT	0	-142	0	-876	0	-710
3	" " SUB	0	-35	0	-216	0	-175
4	EARTH-VERT-SAT	0	0	132	-418	-660	0
5	" " SUB	0	0	69	-218	-345	0
6	WATER-HORIZ	0	-105	0	-658	0	-525
7	WATER-VERT-WEST	0	0	63	-199	-315	0
9	UPLIFT-CASE III	0	0	-73	301	365	0

LOAD SUMMATION

CASE	ITEM	Fx	FY	Fz	Mx	My	Mz
I	1+2+4	0	-142	222	-1,851	-1,148	-710
III	1+3+5+6+7+9	0	-140	149	-1,547	-783	-700

```
10    FLORIDA AVE WEST 575-79
20    WEST HEADWALL 4
30    2,2
40    2,0.0,60
50    1,12,12
60    1,5
70    -1,3.33
80    0,0,0
100   2,90,2
110   1.5,5.0,8.5
140   6*-1.5
170   6*0.0
200   2,270,6
210   1.5,5.0,8.5,1.5,5.0,8.5
240   3*-6.5,3*-9.5
270   6*0.0
2000  0,-142,222,-1851,-1148,-710
2010  0,-140,149,-1547,-783,-700
```

104A

```
10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 4
30 2,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 1.5,5.0,8.5
140 3*-1.5
170 3*0.0
200 2,270,6
210 1.5,5.0,8.5,1.5,5.0,8.5
240 3*-6.5,3*-9.5
270 6*0.0
2000 0,-142,222,-1851,-1148,-710
2010 0,-140,149,-1547,-783,-700

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/24/80    14.463


    PROG. NO. 713-F3-A2-210    14:28:10  03/24/80    MOD 6B, FEB 80

 FLORIDA AVE WEST 575-79
 WEST HEADWALL 4

TOTAL NUMBER OF PILES =     9
```

LOAD CONDITION 1 HEADWALL 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-142.0	222.0	-1851.0	-1148.0	-710.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	0.0	-13.1
2	-0.5	0.0	-10.1
3	-0.5	0.0	-7.1
4	0.4	0.0	57.0
5	0.4	0.0	58.5
6	0.4	0.0	60.1
7	0.5	0.0	33.0
8	0.5	0.0	34.5
9	0.4	0.0	36.0

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1 -0.0 -142.0 222.0 -1851.0 -1148.0 -710.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-140.0	149.0	-1547.0	-783.0	-700.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	-26.2
2	-0.4	0.0	-23.3
3	-0.4	0.0	-20.3
4	0.3	0.0	43.8
5	0.3	0.0	45.4
6	0.3	0.0	46.9
7	0.4	0.0	32.0
8	0.4	0.0	33.6
9	0.3	0.0	35.1

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 -0.0 -140.0 149.0 -1547.0 -783.0 -700.0

0 14:28:15 03/24/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 14:28:10 03/24/80 MOD 6B,
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

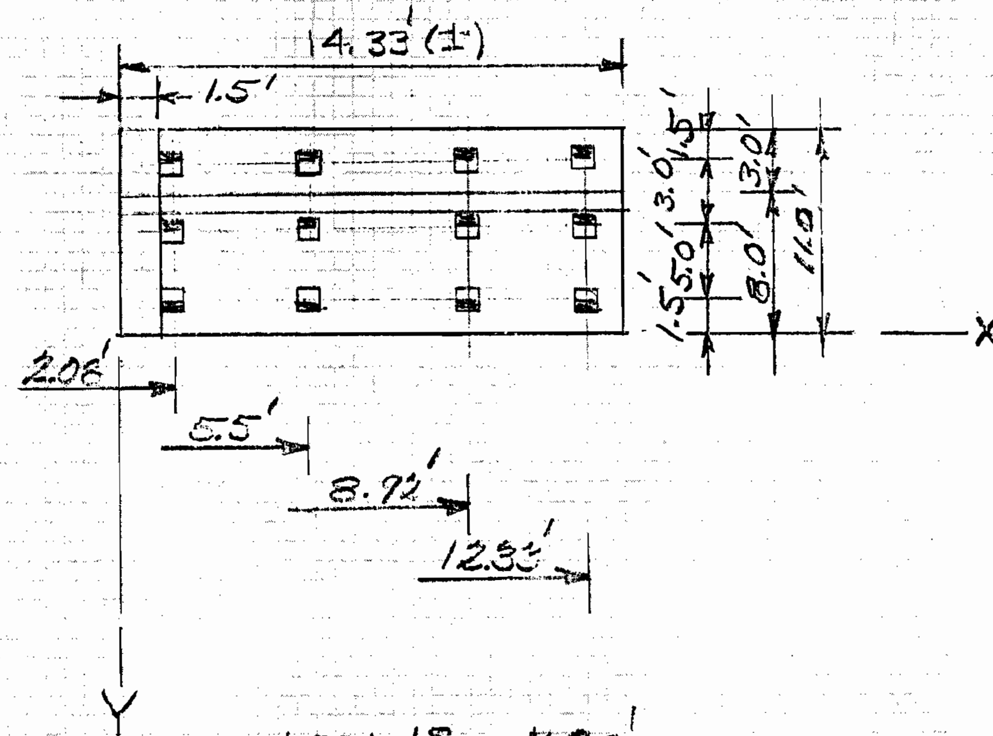
11021	X	Y	Z	RX	RY	RZ
11022	-0.157E-02	-0.722E-01	0.346E-01	0.435E-03	-0.351E-04	0.224E-04
12022	-0.157E-02	-0.589E-01	0.153E-01	0.213E-03	-0.351E-04	0.224E-04

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ ITEM WEST HEADWALL 5 JOB NO 575-79

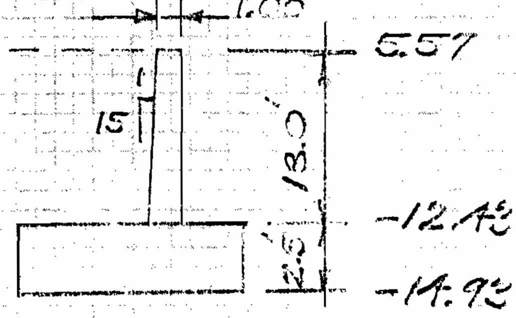
SHEET NO ____ OF ____ BY NDL DATE 3-22-80 CHKD. BY ____ DATE ____

PILES



$$1.00 + \frac{18}{15} = 2.20'$$

$$1.00 + \frac{18}{2 \times 15} = 1.60'$$



UPLIFT

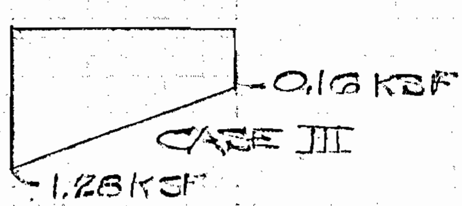
CASE III

$$F_z = 0.16 \times \overbrace{14.33 \times 11}^{25} + \overbrace{\frac{(1.28-0.16)}{2} \times 14.33 \times 11}^{88}$$

$$= -112^{k}$$

$$M_Y = 113 \times 14.33/2 = 810^{'k}$$

$$M_X = 25 \times 5.5 + 88 \times \frac{11}{3} = 460^{'k}$$



5.57
14.93

$20.50' \times 0.0625 = 1.28$ KSF

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST HEADWALL 5
JOB No 575-79
SHEET No   OF
BY NDL   DATE 3-22-80
CHKD. BY   DATE

PILES

WATER-VERT

$F_{Z_W} = 6.4 \times 18 \times 14.33 \times 0.0625 = 103^K$

$M_{Y_W} = 103 \times 14.33/2 = -738^{1K}$

$M_{X_W} = 103 \times 6.4/2 = -330^{1K}$

WATER-HORIZ

$F_Y = 14.33 \times 0.0625 \left(\overset{188}{\frac{\overline{20.5}^2}{2}} - \overset{3}{\frac{\overline{2.5}^2}{2}} \right) = -185^K$

$M_X = 188 \times \frac{20.5}{3} - 3 \times \frac{2.5}{3} = -1,282^{1K}$

$M_Z = 185 \times 14.33/2 = -1,326^{1K}$

EARTH-VERTICAL

$F_{Z_{SAT}} = 6.4 \times 18.0 \times 14.33 \times 0.13 = 215^K$

$M_{Y_{SAT}} = 215 \times 14.33/2 = -1,540^{1K}$

$M_{X_{SAT}} = 215 \times 6.4/2 = -688^{1K}$

$F_{Z_{SUB}} = 215 \times \frac{0.0675}{0.13} = 112^K$

$M_{Y_{SUB}} = 112 \times 14.33/2 = -802^{1K}$

$M_{X_{SUB}} = 112 \times 6.4/2 = -358^{1K}$

EARTH-HORIZ

$F_{Y_{SAT}} = 14.33 \times 0.083 \times \overline{20.5}^2/2 = -250^K$

$M_{X_{SAT}} = 250 \times 20.5/3 = -1,708^{1K}$

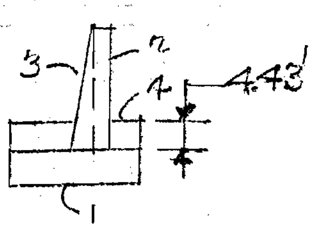
$M_{Z_{SAT}} = 250 \times 14.33/2 = -1,791^{1K}$

$F_{Y_{SUB}} = 250 \times \frac{0.0205}{0.083} = -62^K$

$M_{X_{SUB}} = 62 \times 20.5/3 = -424^{1K}$

$M_{Z_{SUB}} = 62 \times 14.33/2 = -444^{1K}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	59	7.16	422	5.5	324
2	39	7.16	279	7.5	292
3	23	7.16	165	6.6	152
4	9	10.75	7	5.15	46
	130^K		-873^{1K}		-814^{1K}

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ ITEM WEST HEADWALL 5 JOB No 575-79
SHEET No ____ OF ____ BY NDL DATE 3-22-80 CHKD. BY ____ DATE ____

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	130	-614	-873	0
2	EARTH-HORIZ-SAT	0	-250	0	-1,708	0	-1,791
3	" " -SUB	0	+62	0	-424	0	-444
4	EARTH-VERT-SAT	0	0	215	-688	-1,540	0
5	" " -SUB	0	0	112	-358	-802	0
6	WATER-HORIZ	0	-165	0	-1,262	0	-1,326
7	WATER-VERT-WEST	0	0	103	-330	-738	0
9	UPLIFT-CASE III	0	0	-113	460	810	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4	0	-250	345	-3,210	-2,413	-1,791
III	1+3+5+6+7+9	0	-247	232	-2,748	-1,603	-1,770

10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 5
30 2,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,1
110 2.08, 5.5, 8.92, 12.33
140 4*-1.5
170 4*0.0
200 2,270,8
210 2.08, 5.5, 8.92, 12.33, 2.08, 5.5, 8.92, 12.33
240 4*-6.5, 4*-9.5
270 8*0.0
2000 0, -250, 345, -3210, -2413, -1771
2010 0, -247, 232, -2748, -1603, -1770

107A

```
10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 5
30 2,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,4
110 2.08,5.5,8.92,12.33
140 4*-1.5
170 4*0.0
200 2,270,8
210 2.08,5.5,8.92,12.33,2.08,5.5,8.92,12.33
240 4*-6.5,4*-9.5
270 8*0.0
2000 0,-250,345,-3210,-2413,-1791
2010 0,-247,232,-2748,-1603,-1770

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/24/80    13.757


    PROG. NO. 713-F3-A2-210    13:47:48  03/24/80    MOD 6B, FEB 80


 FLORIDA AVE WEST 575-79
 WEST HEADWALL 5


TOTAL NUMBER OF PILES =   12
```

LOAD CONDITION 1 HEADWALLS

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-250.0	345.0	-3210.0	-2413.0	-1791.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	-0.0	-18.1
2	-0.4	-0.0	-19.7
3	-0.4	-0.0	-21.4
4	-0.4	-0.0	-23.1
5	0.3	-0.0	63.2
6	0.3	-0.0	61.6
7	0.3	-0.0	60.1
8	0.3	-0.0	58.5
10	0.3	-0.0	57.1
11	0.3	-0.0	55.5
12	0.3	-0.0	54.0

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-0.0	-250.0	345.0	-3210.0	-2413.0	-1791.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-247.0	232.0	-2748.0	-1603.0	-1770.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	-0.0	-33.6
2	-0.2	-0.0	-35.1
3	-0.2	-0.0	-36.7
4	-0.2	-0.0	-38.3
5	0.2	-0.0	47.1
6	0.2	-0.0	45.7
7	0.2	-0.0	44.2
8	0.2	-0.0	42.7
9	0.2	-0.0	58.1
10	0.2	-0.0	56.7
11	0.2	-0.0	55.2
12	0.2	-0.0	53.7

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-247.0	232.0	-2748.0	-1603.0	-1770.0

0 13:48:46 03/24/80 *** END OF RUN ***

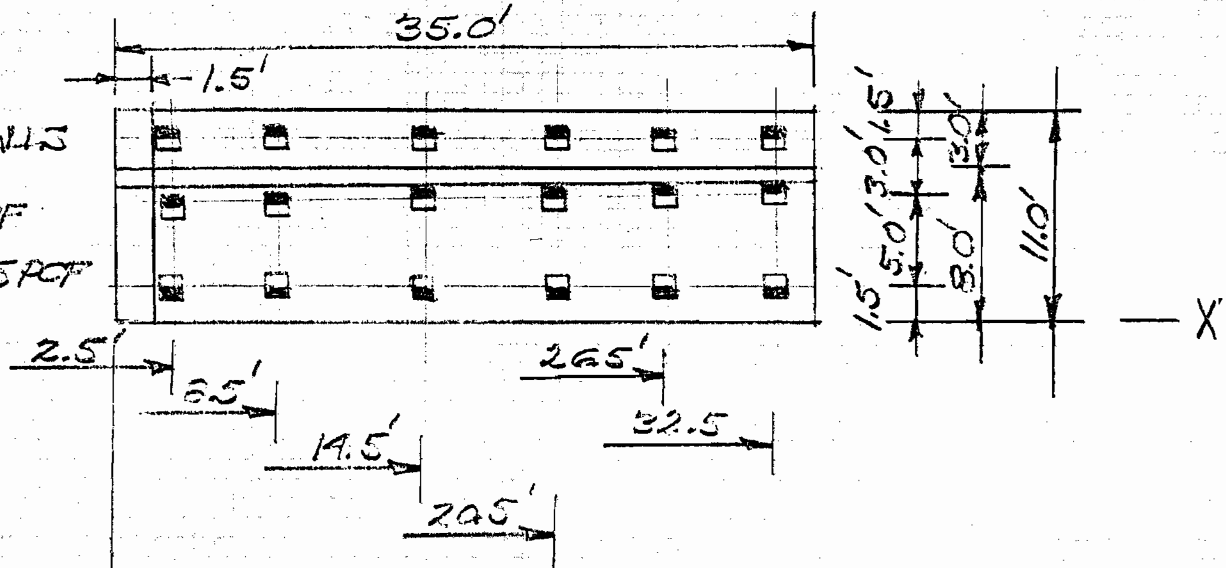
STOP EOJ HEADWALLS

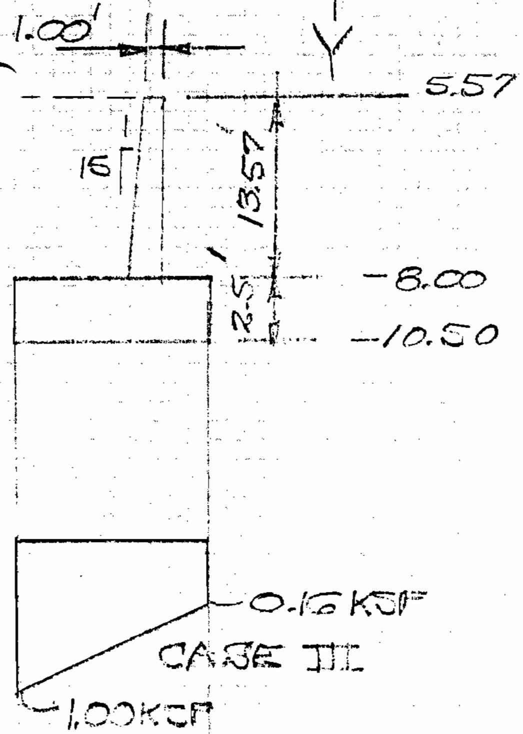
```
*OLD P29010
READY
*LISTH 11020-11022,12022

03/24/80     13.84


0           PROG NO. 713-F3-A2-210     13:47:48  03/24/80          MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X          Y          Z          RX          RY          RZ
11022  0.141E-03 -0.578E-01  0.193E-01  0.820E-04  0.258E-04 -0.201E-05
12022  0.128E-03 -0.406E-01 -0.451E-02 -0.199E-03  0.243E-04 -0.183E-05
```

JOB
ITEM WEST HEADWALL 6
JOB NO 575-79
SHEET NO OF
BY NDL DATE 3-22-80
CHKD. BY DATE

PILES

FOR HEADWALLS 6 & 7;
$\gamma'_{SAT} = 115$ PCF
$\gamma_B = 52.5$ PCF
K = 0.5





$1.00 + \frac{13.57}{15} = 1.90'$

$1.00 + \frac{13.57}{2 \times 15} = 1.45'$

UPLIFT

CASE III

$F_Z = \overset{62}{0.16 \times 11 \times 35} + \overset{162}{\frac{(1.00-0.16)}{2} \times 35 \times 11}$

$= -224^K$

$M_Y = 224 \times 35/2 = 3,920^{IK}$

$M_X = 62 \times 5.5 + 162 \times \frac{11}{3} = 935^{IK}$

5.57
10.50

16.07 x 0.0625 = 1.00 KSF

PILES

WATER-VERT

$F_{Z_W} = 6.55 \times 13.57 \times 35 \times 0.0625 = 194^{K}$

$M_{Y_W} = 194 \times 35/2 = -3{,}395^{'K}$

$M_{X_W} = 194 \times 6.55/2 = -635^{'K}$

WATER-HORIZ

$F_Y = 35 \times 0.0625 \left(\underbrace{\frac{\overline{16.07}^2}{2}}^{262} - \underbrace{\frac{\overline{2.5}^2}{2}}^{7} \right) = -275^{K}$

$M_X = 262 \times \frac{16.07}{3} - 7 \times \frac{2.5}{3} = -1{,}505^{'K}$

$M_Z = 275 \times 35/2 = -4{,}812^{'K}$

EARTH-VERTICAL

$F_{Z_{SAT}} = 6.55 \times 13.57 \times 35 \times 0.115 = 358^{K}$ $\qquad F_{Z_{SUB}} = 358 \times \frac{0.0525}{0.115} = 163^{K}$

$M_{Y_{SAT}} = 358 \times 35/2 = -6{,}265^{'K}$ $\qquad M_{Y_{SUB}} = 163 \times 35/2 = -2{,}852^{'K}$

$M_{X_{SAT}} = 358 \times 6.55/2 = -1{,}172^{'K}$ $\qquad M_{X_{SUB}} = 163 \times 6.55/2 = -534$

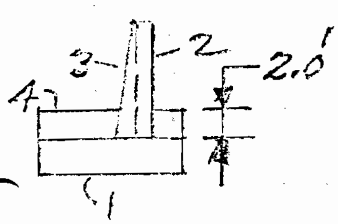
EARTH-HORIZ

$F_{Y_{SAT}} = 35 \times 0.055 \times \overline{16.07}^2/2 = -249^{K}$ $\qquad F_{Y_{SUB}} = 249 \times \frac{0.0262}{0.055} = -119^{K}$

$M_{X_{SAT}} = 249 \times 16.07/3 = -1{,}334^{'K}$ $\qquad M_{X_{SUB}} = 119 \times 16.07/3 = -637^{'K}$

$M_{Z_{SAT}} = 249 \times 35/2 = -4{,}356^{'K}$ $\qquad M_{Z_{SUB}} = 119 \times 35/2 = -2{,}082^{'K}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	144	17.5	2,520	5.5	792
2	71	17.5	1,242	7.5	532
3	32	17.5	560	6.7	214
4	4	0.75	3	5.18	2.1
	251^{K}		$-4{,}325^{'K}$		$-1{,}559^{'K}$

PILES

LOAD TABOLATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	251	-1,559	-4,325	0
2	EARTH-HORIZ-SIIT	0	-249	0	-1,334	0	-4,358
3	" " -SUB	0	-119	0	-637	0	-2,082
4	EARTH-VERT-SIIT	0	0	356	-1,172	-6,265	0
5	" " -SUB	0	0	163	-534	-2,852	0
6	WATER-HORIZ	0	-275	0	-1,505	0	-4,812
7	WATER-VERT-WEST	0	0	194	-635	-3,395	0
9	UPLIFT-CASE III	0	0	-224	735	3920	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4	0	-249	609	-4,065	-10,590	-4,358
III	1+3+5+6+7+9	0	-394	384	-3,935	-6,652	-6,894

10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 6
30 2,2
40 2,20,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,70,6
110 2.5, 8.5, 14.5, 20.5, 26.5, 32.5
140 6*-1.5
170 6*0.0
200 2, 270, 12
210 2.5, 8.5, 14.5, 20.5, 26.5, 32.5,
220 2.5, 8.5, 14.5, 20.5, 26.5, 32.5
240 6*-6.5, 6*-9.5
270 12*0.0
2000 0, -249, 609, -4065, -10590, -4358
2010 0, -394, 384, -3935, -6652, -6894

```
03/26/80    14.30

10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 6
30 2,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,6
110 2.5,8.5,14.5,20.5,26.5,32.5
140 6*-1.5
170 6*0.0
200 2,270,12
210 2.5,8.5,14.5,20.5,26.5,32.5,
220 2.5,8.5,14.5,20.5,26.5,32.5
240 6*-6.5,6*-9.5
270 12*0.0
2000 0,-249,609,-4065,-10590,-4358
2010 0,-394,384,-3935,-6652,-6894

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/26/80    14.326


    PROG. NO. 713-F3-A2-210    14:20:10  03/26/80    MOD 6B, FEB 80
```

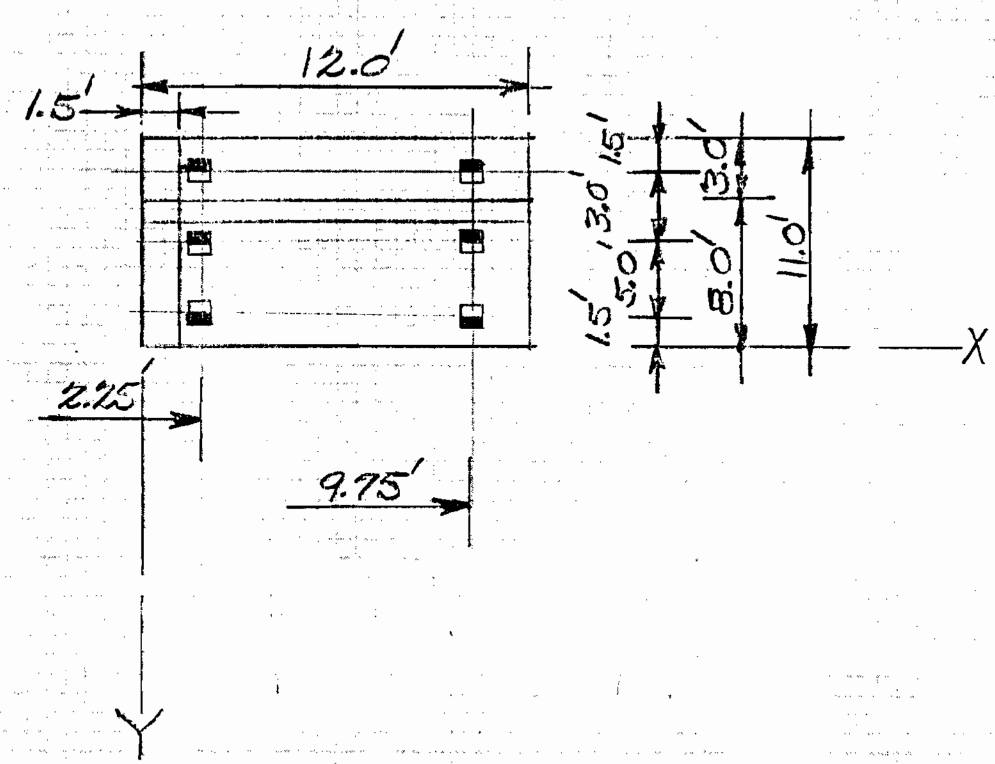
```
FLORIDA AVE WEST 575-79
WEST HEADWALL 6

TOTAL NUMBER OF PILES =    18



           LOAD CONDITION  1

         LOADS ON PILE CAP
     X          Y          Z          MX         MY         MZ
     0.       -249.0      609.0    -4065.0   -10590.0    -4358.0

          PILE LOADS (PILE AXIS)
PILE
 NO.      X      Y        Z
  1    -0.7   -0.0     13.2
  7     0.5   -0.0     74.0
 13     0.6   -0.0     28.3
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1       -0.0  -249.0   609.0   -4065.0  -10590.0   -4358.0

           LOAD CONDITION  2

         LOADS ON PILE CAP
     X          Y          Z          MX         MY         MZ
     0.       -394.0      384.0    -3935.0    -6652.0    -6894.0

          PILE LOADS (PILE AXIS)
PILE
 NO.      X      Y        Z
  1    -0.8   -0.0    -34.2
  7     0.7   -0.0     75.6
 13     0.8   -0.0     32.4
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2       -0.0  -394.0   384.0   -3935.0   -6652.0   -6894.0


   0   14:20:22  03/26/80    *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      14:20:10  03/26/80          MOD 6B, F
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X           Y            Z           RX          RY          RZ
11022   0.116E-03 -0.892E-01   0.682E-01   0.827E-03   0.244E-05 -0.166E-05
12022   0.102E-03 -0.118E 00   0.511E-01   0.782E-03   0.243E-05 -0.146E-05
```

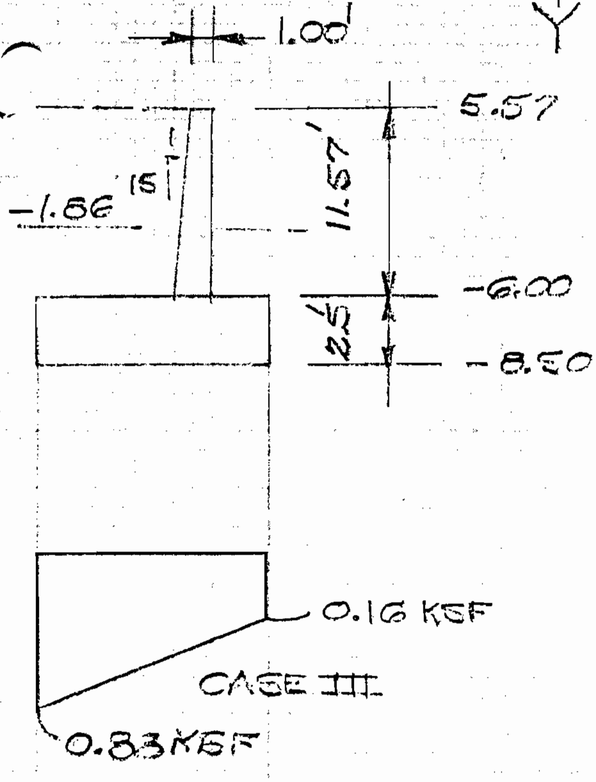
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST HEADWALL 7
JOB No 575-79
SHEET No OF
BY NDL DATE 3-22-80
CHKD. BY DATE

PILES

115
15





$$1.00 + \frac{11.57}{15} = 1.77'$$

$$1.00 + \frac{11.57}{2 \times 15} = 1.39'$$

$$\begin{array}{r} 6.00 \\ 1.86 \\ \hline 4.14' \\ 2.50 \\ \hline 6.64' \end{array}$$

UPLIFT

CASE III

$$F_Z = \overset{21}{0.16 \times 11 \times 12} + \overset{48}{\frac{(0.83-0.16)}{2} \times 11 \times 12}$$

$$= -69^T$$

$$M_Y = 69 \times 6 = 414^{'K}$$

$$M_X = 21 \times 5.5 + 48 \times \frac{11}{3} = 292^{'K}$$

$$\begin{array}{r} 5.57 \\ 8.50 \\ \hline 14.07 \end{array} \times 0.0625 = 0.88 \text{ KSF}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM WEST HEADWALL 7 JOB NO 575-79

SHEET NO ______ OF ______ BY NDL DATE 3-22-80 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_{Z_W} = 6.61 \times 11.57 \times 12 \times 0.0625 = 57^K$

$M_{Y_W} = 57 \times 6 = -342^{\prime K}$

$M_{X_W} = 57 \times 6.61/2 = -188^{\prime K}$

WATER-HORIZ

$F_Y = 12 \times 0.0625 \left(\overset{74}{\frac{14.07^2}{2}} - \overset{2}{\frac{2.5^2}{2}} \right) = -72^K$

$M_X = 74 \times \frac{14.07}{3} - \frac{2 \times 2.5}{3} = -345^{\prime K}$

$M_Z = 72 \times 6 = -432^{\prime K}$

EARTH-VERT

$F_{Z_{SAT}} = 6.61 \times 11.57 \times 12 \times 0.115 = 106^K$

$M_{Y_{SAT}} = 106 \times 6 = -636^{\prime K}$

$M_{X_{SAT}} = 106 \times 6.61/2 = -350^{\prime K}$

$F_{Z_{SUB}} = 106 \times \frac{0.0525}{0.115} = 48^K$

$M_{Y_{SAT}} = 48 \times 6 = -288^{\prime K}$

$M_{X_{SAT}} = 48 \times 6.61/2 = -159^{\prime K}$

$F_{Z_{SAT_E}} = 3 \times 4.14 \times 12 \times 0.115 = 17^K$

$M_{Y_{SAT_E}} = 17 \times 6 = -102^{\prime K}$

$M_{X_{SAT_E}} = 17 \times 9.5 = -162^{\prime K}$

EARTH-HORIZ

$F_{Y_{SAT}} = 12 \times 0.055 \left(\overset{65}{\frac{14.07^2}{2}} - \overset{15}{\frac{6.64^2}{2}} \right) = -50$

$M_{X_{SAT}} = 65 \times 14.07/3 - 15 \times 6.64/3 = -272^{\prime K}$

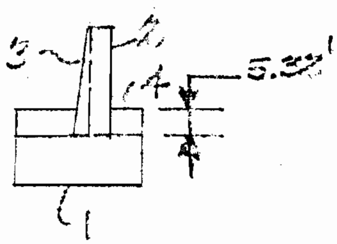
$M_{Z_{SAT}} = 50 \times 6 = -300^{\prime K}$

$F_{Y_{SUB}} = 12 \times 0.0262 \times \frac{14.07^2}{2} = -31^K$

$M_{X_{SUB}} = 31 \times 14.07/3 = -145^{\prime K}$

$M_{Z_{SUB}} = 31 \times 6 = -186^{\prime K}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	50	6	300	5.5	275
2	21	6	126	7.5	158
3	8	6	48	6.79	54
4	7	0.75	5	5.19	36
	96^K		$-479^{\prime K}$		$-523^{\prime K}$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO ____ OF ____
ITEM WEST HEADWALL 7 BY NDL DATE 3-24-80
JOB NO 575-79 CHKD. BY ____ DATE ____

PILES

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	96	-523	-477	0
2	EARTH-HORIZ-SAT	0	-50	0	-272	0	-300
3	" " -SUB	0	-31	0	-145	0	-186
4	EARTH-VERT-SAT	0	0	106	-350	-636	0
5	" " -SUB	0	0	48	-157	-286	0
6	WATER-HORIZ	0	-72	0	-345	0	-432
7	WATER-VERT-WEST	0	0	57	-186	-342	0
9	UPLIFT-CASE III	0	0	-69	272	414	0
11	EARTH-VERT-EAST	0	0	17	-162	-102	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+4+11	0	-50	219	-1,307	-1,217	-300
III	1+3+5+6+7+9	0	-103	132	-1,068	-675	-618

10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 7
30 2, 2
40 2, 0.0, 6.0
50 1, 12, 12
60 1, 5
70 -1, 6.33
80 0, 0, 0
100 2, 10, 2
110 2.25, 9.75
140 2*-1.5
170 2*0.0
200 2, 220, 4
210 2.25, 9.75, 2.25, 9.75
240 2*-6.5, 2*-9.5
270 4*0.0
2000 0, -50, 219, -1307, -1217, -300
2010 0, -103, 132, -1068, -675, -618

$0.008944\,P + 0.1611\,(300) = 750$

$P_{ALLOW} = 89{,}447\ LB \approx 89.4^K$

03/26/80   14.39

```
10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 7
30 2,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 2.25,9.75
140 2*-1.5
170 2*0.0
200 2,270,4
210 2.25,9.75,2.25,9.75
240 2*-6.5,2*-9.5
270 4*0.0
2000 0,-50,219,-1307,-1217,-300
2010 0,-103,132,-1068,-695,-618
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

03/26/80   14.417

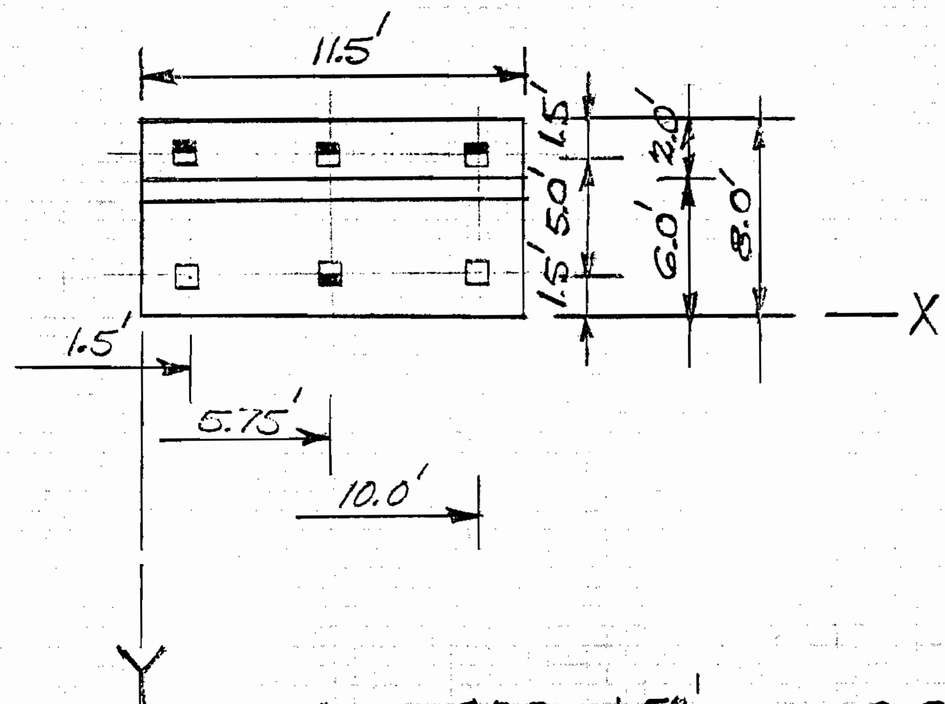
PROG. NO. 713-F3-A2-210   14:26:14   03/26/80   MOD 6B, FEB 80

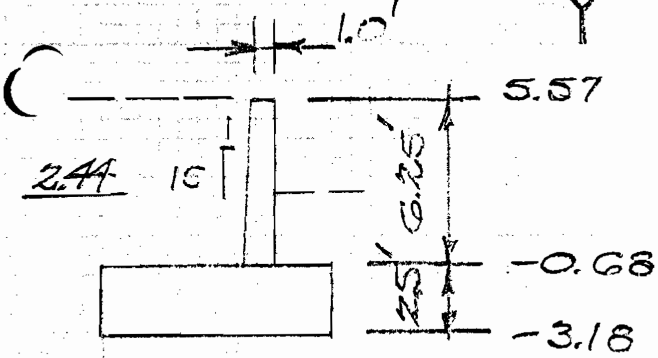
```
FLORIDA AVE WEST 575-79
WEST HEADWALL 7

TOTAL NUMBER OF PILES =     6



           LOAD CONDITION   1

         LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.       -50.0      219.0     -1307.0     -1217.0      -300.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -0.3    -0.0      41.0
  2    -0.3    -0.0      26.7
  3     0.1    -0.0      57.1
  4     0.2    -0.0      49.8
  5     0.1    -0.0      38.7
  6     0.2    -0.0      31.4
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1         0.0   -50.0   219.0   -1307.0   -1217.0    -300.0


           LOAD CONDITION   2

         LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.      -103.0      132.0     -1068.0     -695.0      -618.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -1.0    -0.0     -10.5
  2    -1.0    -0.0     -24.7
  3     0.8    -0.0      84.4
  4     0.9    -0.0      77.1
  5     1.0    -0.0      14.8
  6     1.0    -0.0       7.5
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         0.0  -103.0   132.0   -1068.0    -695.0    -618.0


   0   14:26:23   03/26/80    *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0            PROG NO. 713-F3-A2-210      14:26:14  03/26/80            MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X          Y          Z          RX          RY          RZ
11022   0.353E-02 -0.291E-01  0.501E-01  0.333E-03  0.781E-04 -0.504E-04
12022   0.353E-02 -0.136E 00  0.867E-01  0.126E-02  0.781E-04 -0.504E-04
```

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM WEST HEADWALL 8 JOB No 575-79
SHEET No ______ OF ______
BY NDL DATE 3-25-80
CHKD. BY ______ DATE ______

PILES





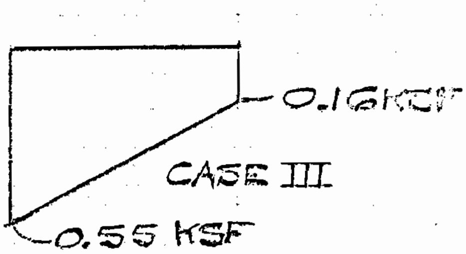
$1.00 + \frac{6.25}{15} = 1.52'$

$1.00 + \frac{6.25}{2 \times 15} = 1.21'$

$$\begin{array}{r} 0.68 \\ 2.44 \\ \hline 3.12 \\ 2.50 \\ \hline 5.62' \end{array}$$

UPLIFT

CASE III



$$F_z = \overset{15}{0.16 \times 8 \times 11.5} + \overset{18}{\left(\frac{0.55 - 0.16}{2}\right) \times 8 \times 11.5}$$
$$= 33^{K}$$

$$M_y = 33 \times 11.5/2 = 190^{\prime K}$$

$$M_x = 15 \times 4 + 18 \times \frac{8}{3} = 108^{\prime K}$$

$$\begin{array}{r} 5.57 \\ 3.18 \\ \hline 8.75 \end{array} \times 0.0625 = 0.55 \text{ KSF}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM WEST HEADWALL 8 BY NDL DATE 3-25-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_{Z_W} = 4.79 \times 6.25 \times 11.5 \times 0.0625 = 22^K$

$M_{Y_W} = 22 \times 11.5/2 = -126^{lK}$

$M_{X_W} = 22 \times 4.79/2 = -53^{lK}$

WATER-HORIZ

$F_Y = 11.5 \times 0.0625 \left(\overset{28}{\frac{8.75^2}{2}} - \overset{2}{\frac{2.5^2}{2}} \right) = -26^K$

$M_X = 28 \times 8.75/3 - 2 \times 2.5/3 = -80^{lK}$

$M_Z = 26 \times 11.5/2 = -150^{lK}$

EARTH-VERT

$F_{Z_{SAT}} = 4.79 \times 6.25 \times 11.5 \times 0.13 = 45^K$

$M_{Y_{SAT}} = 45 \times 11.5/2 = -257^{lK}$

$M_{X_{SAT}} = 45 \times 4.79/2 = -108^{lK}$

$F_{Z_{SUB}} = 45 \times \frac{0.0675}{0.13} = 23^K$

$M_{Y_{SUB}} = 23 \times 11.5/2 = -132^{lK}$

$M_{X_{SUB}} = 23 \times 4.79/2 = -55^{lK}$

$F_{Z_{SITE}} = 2 \times 4.14 \times 11.5 \times 0.13 = 12^K$

$M_{Y_{SITE}} = 12 \times 11.5/2 = -69^{lK}$ $M_{X_{SITE}} = 12 \times 7 = -84^{lK}$

EARTH-HORIZ

$F_{Y_{SAT}} = 11.5 \times 0.083 \left(\overset{37}{\frac{8.75^2}{2}} - \overset{15}{\frac{5.62^2}{2}} \right) = -22^K$

$M_{X_{SAT}} = 37 \times 8.75/3 - 15 \times 5.62/3 = -80^{lK}$

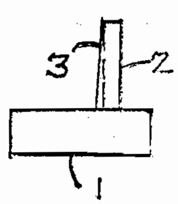
$M_{Z_{SAT}} = 22 \times 11.5/2 = -126^{lK}$

$F_{Y_{SUB}} = 11.5 \times 0.0205 \times \frac{8.75^2}{2} = -9^K$

$M_{X_{SUB}} = 9 \times 8.75/3 = -26^{lK}$

$M_{Z_{SUB}} = 9 \times 11.5/2 = -52^{lK}$

CONCRETE-WEIGHT



	F_Z	X	M_Y	Y	M_X
1	34	5.75	196	4	136
2	11	5.75	63	5.5	60
3	3	5.75	17	4.83	14
	48^K		-276^{lK}		-210^{lK}

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET NO ____ OF ____
ITEM WEST HEADWALL 8 BY NDL DATE 3-25-80
JOB NO 575-79 CHKD. BY ____ DATE ____

PILES

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	48	-210	-276	0
2	EARTH-HORIZ-SAT	0	-22	0	-80	0	-126
3	" " -SUB	0	-9	0	-26	0	-52
4	EARTH-VERT-SAT	0	0	45	-108	-259	0
5	" " -SUB	0	0	23	-55	-132	0
6	WATER-HORIZ	0	-26	0	-80	0	-150
7	WATER-VERT-WEST	0	0	22	-53	-126	0
9	UPLIFT-CASE III	0	0	-33	108	190	0
11	EARTH-VERT-EAST	0	0	12	-84	-69	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+4+11	0	-22	105	-482	-604	-126
III	1+3+5+6+7+9	0	-35	60	-316	-344	-202

```
10    FLORIDA AVE WEST 575-79
20    WEST HEADWALL 8
30    3,2
40    2,0.0,80
50    1,12,12
60    1,5
70    -1,8.83
80    0,0,0
100   0,90,2
110   1.5,10.0
140   2* -1.5
170   2* 0.0
200   2,90,1
210   5.75
240   -1.5
270   0.0
300   2,270,3
310   1.5,5.75,10.0
340   3* -6.5
370   3* 0.0
2000  0,-22,105,-482,-604,-126
2010  0,-35, 60,-316,-344,-202
```

```
03/26/80     14.48


10 FLORIDA AVE WEST 575-79
20 WEST HEADWALL 8
30 3,2
40 2,0.0,60
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 0,90,2
110 1.5,10.0
140 2*-1.5
170 2*0.0
200 2,90,1
210 5.75
240 -1.5
270 0.0
300 2,270,3
310 1.5,5.75,10.0
340 3*-6.5
370 3*0.0
2000 0,-22,105,-482,-604,-126
2010 0,-35,60,-316,-344,-202

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/26/80     14.514


    PROG. NO. 713-F3-A2-210    14:31:57  03/26/80    MOD 6B, FEB 80
```

116B

```
FLORIDA AVE WEST 575-79
WEST HEADWALL 8


TOTAL NUMBER OF PILES =     6




          LOAD CONDITION  1

        LOADS ON PILE CAP
     X          Y          Z          MX         MY         MZ
     0.       -22.0      105.0     -482.0     -604.0     -126.0

         PILE LOADS (PILE AXIS)
PILE
 NO.     X      Y       Z
  1     0.1    0.0     10.3
  3     0.1    0.0     21.5
  4    -0.2    0.0     24.2
   1     SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1       -0.0   -22.0   105.0    -482.0    -604.0    -126.0


          LOAD CONDITION  2

        LOADS ON PILE CAP
     X          Y          Z          MX         MY         MZ
     0.       -35.0       60.0     -316.0     -344.0     -202.0

         PILE LOADS (PILE AXIS)
PILE
 NO.     X      Y       Z
  1    -0.3   -0.0     17.9
  2    -0.3   -0.0     17.4
  3    -0.3   -0.0    -23.0
  4     0.3   -0.0     16.8
   2     SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2       -0.0   -35.0    60.0    -316.0    -344.0    -202.0


   0   14:32:10  03/26/80   *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      14:31:57  03/26/80            MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y          Z          RX          RY          RZ
11022 -0.292E-03  0.155E-01  0.708E-03 -0.293E-03 -0.153E-05  0.609E-05
12022  0.511E-03 -0.499E-01  0.178E-01  0.408E-03  0.310E-05 -0.107E-04
```

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM WEST HEADWALLS
JOB NO 575-79
SHEET NO OF
BY NDL DATE 3-20-80
CHKD. BY DATE

CRITICAL PILE LOADS

MONOLITH	GROUP	MAX PILE LOAD P	MAX PILE LOAD Q	CASE No. P	CASE No. Q	ALLOW PILE LOAD P	ALLOW PILE LOAD Q	% ALLOW P	% ALLOW Q
HEADWALL 1	A	-15.8	-0.2	III	III	-40	3.49	39.5	5.7
	B	23.2	0.2	I	I	80	1.21	29.0	16.5
HEADWALL 2	A	-2.0	-0.6	III	III	-40	3.49	5.0	17.2
	B	49.8	0.6	I	III	80	1.21	62.2	49.6
HEADWALL 3	A	-12.8	-0.7	III	III	-40	3.49	32.0	20.1
	B	75.6	-0.9	I	I	80	1.21	94.5	74.4
HEADWALL 4	A	-26.2	-0.5	III	I	-40	3.49	65.5	14.3
	B	60.1	0.5	I	I	80	1.21	75.1	41.3
HEADWALL 5	A	-38.3	-0.4	III	I	-40	3.49	95.8	11.5
	B	63.2	0.3	I	I	80	1.21	79.0	24.8
HEADWALL 6	A	-34.2	-0.8	III	III	-40	3.49	85.5	22.9
	B	75.6	0.8	III	III	80	1.21	94.5	66.1
HEADWALL 7	A	-24.7	-1.0	III	III	-40	3.49	61.8	28.7
	B	84.4	1.0	III	III	89.4 1P	1.21	94.4	82.6
HEADWALL 8	A	-23.0	-0.3	III	III	-40	3.49	57.5	86.0
	B	24.2	0.3	I	III	80	1.21	30.2	24.8

1P P_{ALLOW} CORRESPONDING TO Q_{MAX}

NOTES:

1. − DENOTES TENSION (LOAD IN KIPS)
   + DENOTES COMPRESSION (LOAD IN KIPS)
2. GROUP A − TENSION PILES
   GROUP B − COMPRESSION PILES
3. ALL PILES ABOVE ARE 12" SQUARE PRESTRESSED PRECAST CONCRETE PILES.
4. ALLOWABLE AXIAL LOAD CALCULATED FOR MAXIMUM TRANSVERSE LOAD, NOT ALLOWABLE TRANSVERSE LOAD.

Q_{ALLOW} WITH P_{MAX}

$$0.006944(84{,}400) + 0.1611\ Q = 750$$

$$\therefore\ Q_{ALLOW} = 1{,}018\ LB \approx 1.02^{K}$$

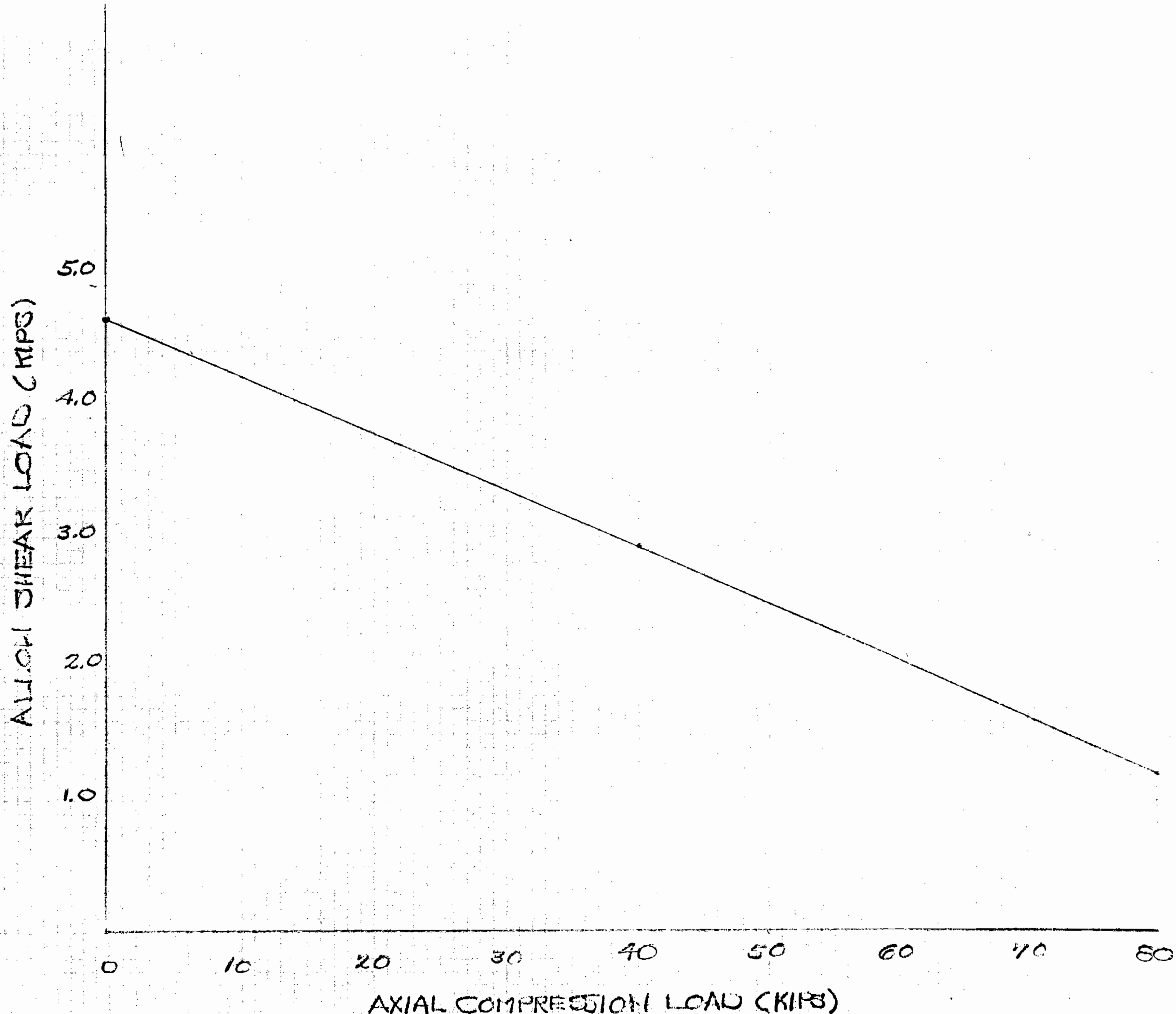
$$\%\ ALLOW = \frac{0.8}{1.02} = 78.4\%\ (\text{vs}\ 82.6\%\ \text{FOR HEADWALL 7})$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM
JOB No 5175-77

118

SHEET No ___ OF ___
BY NDL DATE 3-17-80
CHKD. BY ___ DATE ___



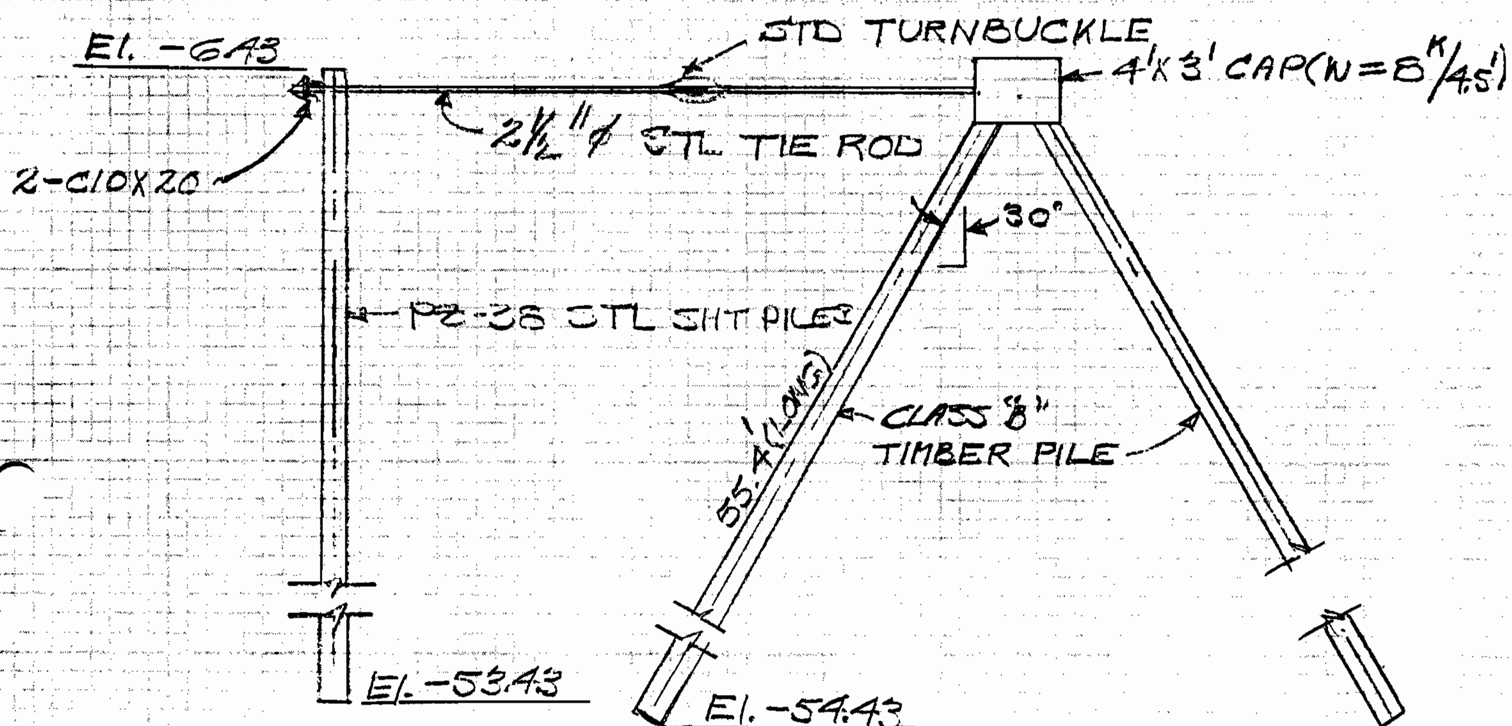
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM WEST BY NDL DATE 4-15-80
JOB NO 575-79 CHKD. BY ______ DATE ______

TIE-BACK SHEET PILE WALL

$F = 6.9^{K/'}$ | EUSTIS
$M = 77^{'K/'}$ | ENGR CO

TIE RODS AT 4'-6''



TIE ROD

$F/_{\text{TIE ROD}} = 6.9 \times 4.5 = 31^K$ w/ 60^K ALLOW (AISC p. 4-127)

TIMBER PILES

$31^K \quad \downarrow 3^K$

C / \ T

$F_C = \dfrac{31/2}{\sin 30^\circ} + \dfrac{8/2}{\cos 30^\circ} = 31 + 5 = 36^K \; (18^T)$ w/ 25^T ALLOW

$F_T = 31 - 5 = 26^K \; (13^T)$ w/ 12^T ALLOW

$\boxed{\text{P}_{\text{ALLOW}} \text{ AT } -4.43 \text{ CUT-OFF}}$

SHEET PILE

$M = 77^{'K/'}$ OR $924^{''K/'}$ PZ 32 OR PZ 38 @ ASTM A328 OR ABOVE A ASTM A572 GRADE 50 WITH PZ27 AT ASTM A572 GRADE 50

WALES

$M = w\ell^2/10 = (6.9/4)(4.5^2)/10 = 3.49^{'K}$ OR 42,000 ''-LB

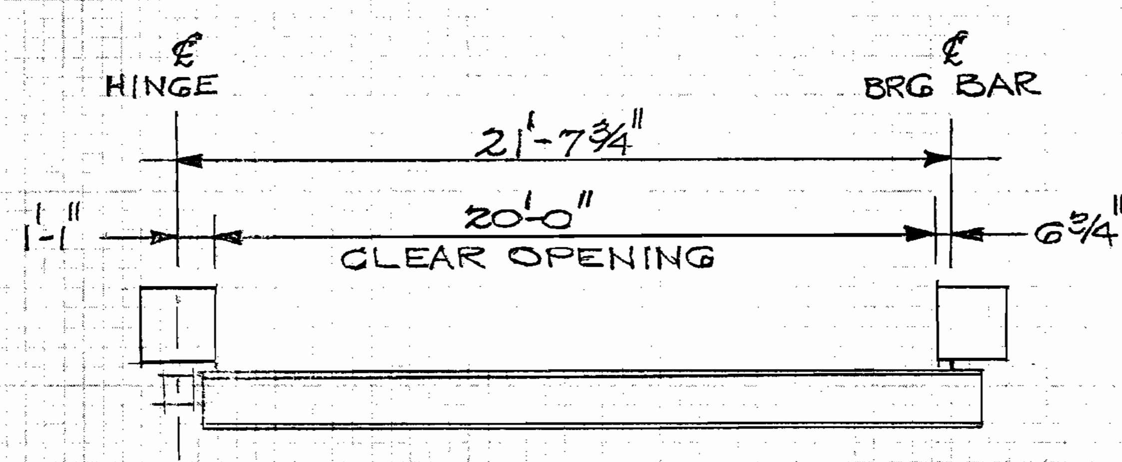
$f_b = 42{,}000 / 2 \times 15.8 = 1{,}300$ PSI

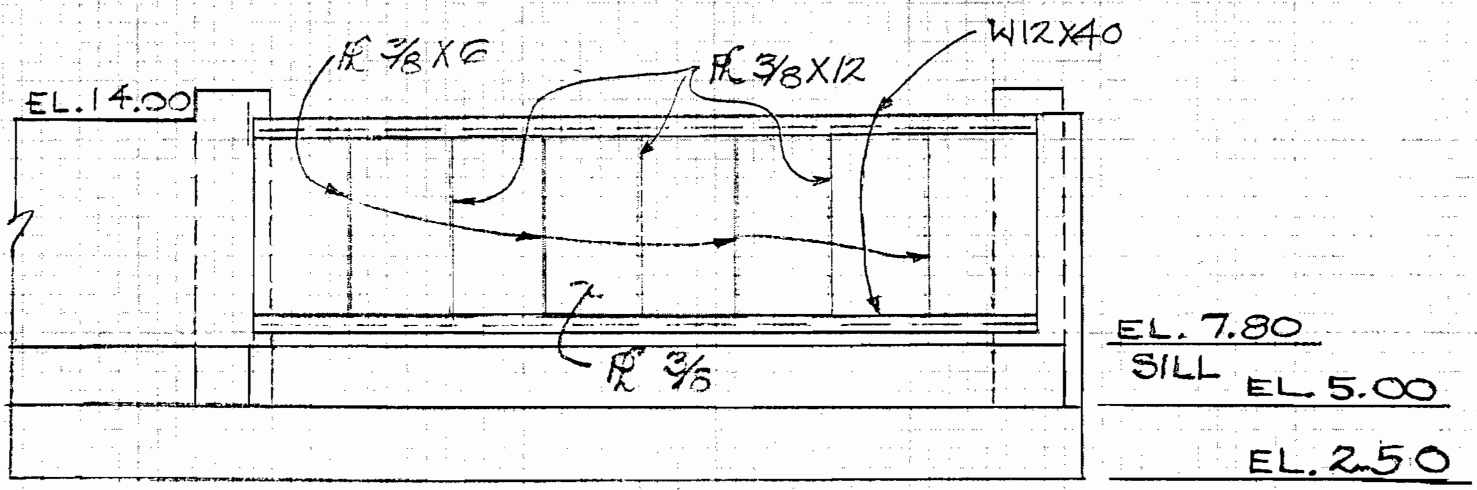
(6)

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB		SHEET No	OF
ITEM	EAST RR GATE	BY NDL	DATE 9-11-79
JOB No	575-79	CHKD. BY	DATE

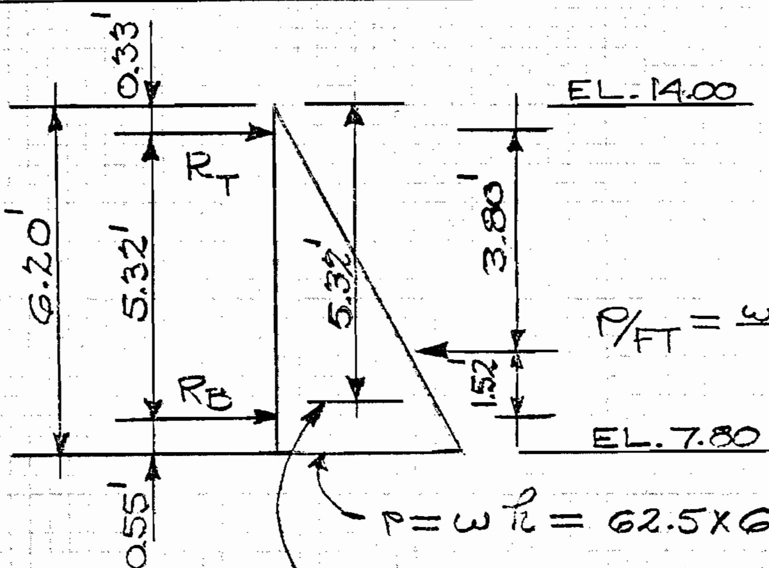
SWING GATE DESIGN





$$\begin{array}{r} 14.00 \\ \underline{7.80} \\ 6.20 \text{ FT} \end{array}$$

SWING GATE DESIGN



$$P/FT = \frac{\omega \bar{h}^2}{2} = \frac{62.5 \times \overline{6.2}^2}{2} = 1{,}201.25 \text{ PLF}$$

$p = \omega h = 62.5 \times 6.2 = 387.5$ PSF

MAX. SKIN STRESS — $\omega = 62.5 \times 5.32 = 332$ PSF

REACTIONS

$$R_T = 1{,}201.25 \times \frac{1.52}{5.32} = 343.21 \text{ PLF}$$

$$R_B = 1{,}201.25 \times \frac{3.8}{5.32} = 858.04 \text{ PLF}$$

GIRDER DESIGN

LENGTH = OPENING + TO THE HINGE ℄ + TO THE BAR ℄

$= 20.0 + 1.08 + 0.56 = 21.64$ FT

TOP GIRDER

$$M = \frac{w l^2}{8} = \frac{343.21 \times \overline{21.64}^2 \times 12}{8} = 241{,}100 \text{ IN·LB}$$

$$S_{REQ'D} = \frac{241{,}100}{20{,}000} = 12.1 \text{ IN}^3$$

TRY W12X40 $S = 51.9 \text{ IN}^3$

$I_x = 310 \text{ IN}^4$

$A = 11.8 \text{ IN}^2$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST RR GATE BY NDL DATE 9-11-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN

TOP GIRDER

$$\Delta = \frac{5 w l^4}{384 EI} = \frac{5 \times 343.71 \times \overline{(21.64 \times 12)}^4}{384 \times 29 \times 10^6 \times 310 \times 12} = 0.19 \text{ IN}$$

$$\Delta_{ALLOW} = \frac{l}{360} = \frac{21.64 \times 12}{360} = 0.72 \text{ IN} > 0.19 \text{ IN}$$

$$f = \frac{M}{S} = \frac{241,100}{51.9} = 4,600 \text{ PSI}$$

USE W12x40 ⟸

BOTTOM GIRDER

$$M = \frac{w l^2}{8} = \frac{858.04 \times \overline{21.64}^2 \times 12}{8} = 602,700 \text{ IN-LB}$$

$$S_{REQ'D} = \frac{602,700}{20,000} = 30.1 \overline{\text{IN}}^3$$

TRY W12x40 $S = 51.9 \overline{\text{IN}}^3$

$I_x = 310 \overline{\text{IN}}^4$

$A = 11.8 \overline{\text{IN}}^2$

$$\Delta = \frac{5 w l^4}{384 EI} = \frac{5 \times 858.04 \times \overline{(21.64 \times 12)}^4}{384 \times 29 \times 10^6 \times 310 \times 12} = 0.47 \text{ IN}$$

$$\Delta_{ALLOW} = 0.72 \text{ IN} > 0.47 \text{ IN}$$

$$f = \frac{M}{S} = \frac{602,700}{51.9} = 11,600 \text{ PSI}$$

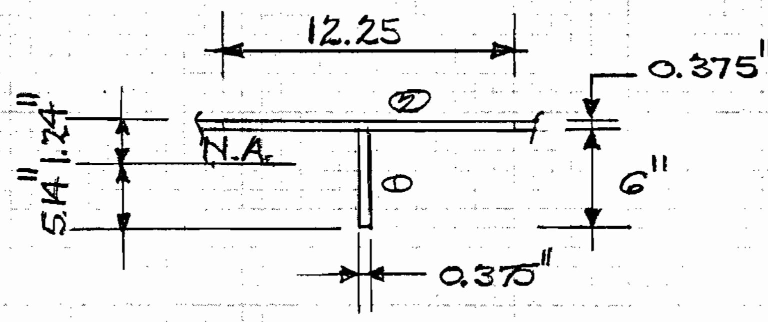
USE W12x40 ⟸

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB		SHEET No		OF	
	ITEM	EAST RR GATE	BY	NDL	DATE	9-6-79
	JOB No	575-79	CHKD. BY		DATE	

SWING GATE DESIGN

STIFFENER

TRY BAR 6 X 3/8



USE AISC 1.9.1.2, $\frac{b}{t} = 95.0/\sqrt{F_y} = 95.0/\sqrt{36} = \frac{b}{0.375}$

$\therefore b = 5.94''$

$W = 2b + t_w = 2 \times 5.94 + .375 = 12.25''$

SHEAR LAG CONTROLS DUE TO FLANGE BEING IN TENSION, HOWEVER, ABOVE WIDTH IS CONSERVATIVE.

	A	y	Ay	Ay^2	I_o
1	2.25	3.375	7.59	25.6	6.75
2	4.59	.188	0.86	0.2	0.05
	6.84		8.45	25.8	6.80

$\bar{y} = \frac{\Sigma Ay}{\Sigma A} = \frac{8.45}{6.84} = 1.24 \text{ IN}$

$I = I_o + \Sigma Ay^2 - A\bar{y}^2 = 6.80 + 25.8 - 6.84 \times \overline{1.24}^2$
$= 22.1 \text{ IN}^4$

$S_{TOP} = \frac{I}{\bar{y}} = \frac{22.1}{1.24} = 17.82 \text{ IN}^3$

$S_{BOT} = \frac{I}{d - \bar{y}} = \frac{22.1}{6.375 - 1.24} = 4.30 \text{ IN}^3$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST RR GATE BY NDL DATE 9-11-79
JOB No 575-79 CHKD. BY ______ DATE ______

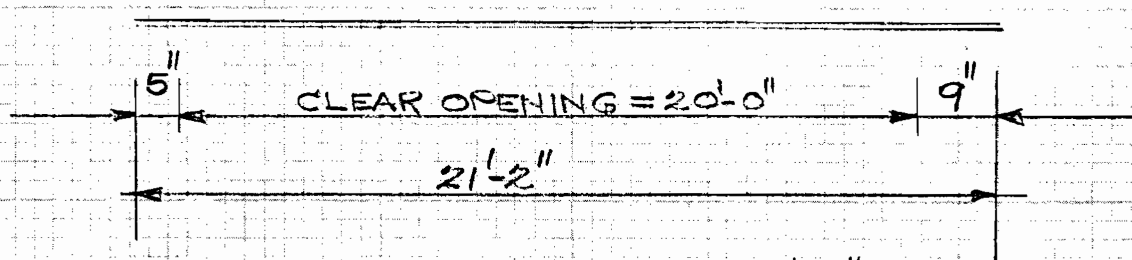
SWING GATE DESIGN

SKIN PLATE

MINIMUM THICKNESS = 5/16" USE 3/8" THICK PLATE

$$S = \frac{bt^2}{6} = \frac{12 \times (0.375)^2}{6} = 0.281\ \text{IN}^3/\text{FT}$$

$$M_{ALLOW} = fS = 20{,}000 \times 0.281 = 5{,}620\ \text{IN-LB}$$



TRY 6 CENTER SPACES AT 2'-8" AND 2 END SPACES AT 2'-7"

LENGTH = 6 X (2'-8") + 2X (2'-7") = 21'-2"

EXTERIOR SPAN

$$M = \frac{wl^2}{10} = \frac{332 \times 3.42^2}{10} = 388\ \text{FT-LB/FT}$$

OR 4,660 IN-LB/FT

$$\text{ALLOW. SPAN} = \left[\frac{10 \times M}{w}\right]^{1/2} = \left[\frac{10 \times 5620}{332 \times 12}\right]^{1/2} = 3.75\ \text{FT}$$

INTERIOR SPAN

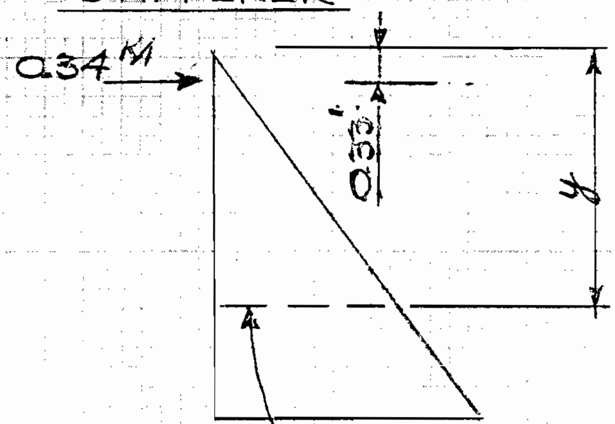
$$\text{ALLOW. SPAN} = \left[\frac{12 \times 5{,}620}{332 \times 12}\right]^{1/2} = 4.11\ \text{FT}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET Nº ____ OF ____
ITEM EAST RR GATE BY NDL DATE 9-26-79
JOB Nº 575-79 CHKD. BY ____ DATE ____

SWING GATE DESIGN

STIFFENER



POINT OF ZERO SHEAR = POINT OF MAXIMUM MOMENT

$\frac{1}{2}(0.0625)y^2 = 0.34^{K/I}$

$y = 3.30$ FT

MOMENT $= 0.34(3.30-0.33) - \frac{1}{6}(0.0625)\overline{(3.30)}^3$

$= 0.63$ FT·KIPS/FT

M/STIFF $= 0.63 \times 12 \times 2.67 = 20.2$ IN·KIPS/STIFF

OR 20,200 IN·LB/STIFF

$f_{COMP} = \frac{20{,}200}{4.30} = 4{,}700$ PSI

$\frac{b}{t} = \frac{6}{0.375} = 16$ FOR BAR 6X3/8

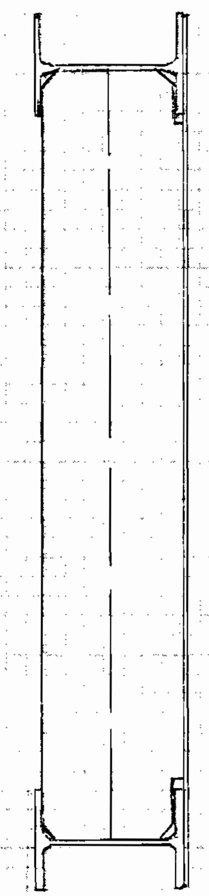
$\frac{b}{t_{ALLOW}} = \frac{95.0}{\sqrt{F_y}} = \frac{95.0}{\sqrt{33}} = 16$ O.K.

1-7 Reb

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST RR GATE BY NDL DATE 9-26-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

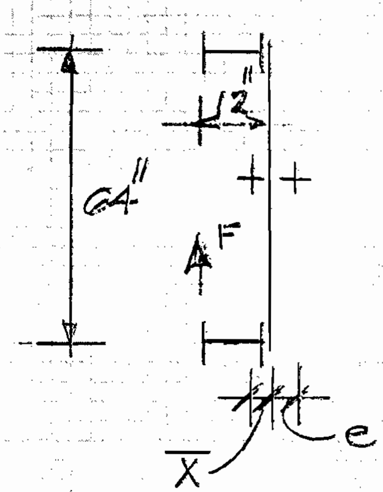
SWING GATE DESIGN



n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM EAST RR GATE BY NDF DATE 4-3-80
JOB NO 575-79 CHKD. BY ______ DATE ______

TURNBUCKLES



$2 \times 40 \times 6.16 \times 22.08 = 10,880$
$.74 \times 320 = 240$
$6.16 \times 407 = 2,510$
$12 \times 63 = 760$
$3 \times 163 = 490$
$14,880$ IN·LB

$$\bar{X} = \frac{14,880}{4,824} = 3.1''$$

$$I_X = \frac{0.375 \times \overline{71}^3}{12} + 2 \times 11.8 \times \overline{32}^2 = 35,350 \; IN^4$$

$$A = 0.375 \times 71 + 2 \times 11.8 = 50.2 \; IN^2$$

$$r = \left(\frac{35,350}{50.2}\right)^{1/2} = 26.5 \; IN$$

I▷

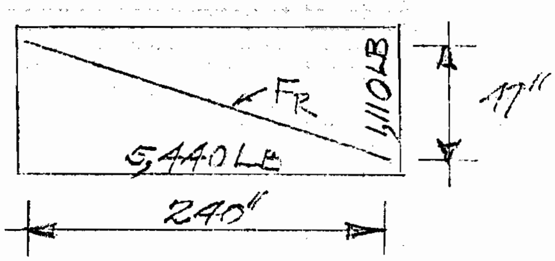
$$e = \frac{\bar{X}}{4}\left(\frac{d}{r_X}\right)^2 = \frac{3.1}{4}\left(\frac{64}{26.5}\right)^2 = 4.5''$$

$$\ell = \bar{X} + e = 3.1 + 4.5 = 7.6''$$

$$T = 4,824 \times \frac{21.16}{2} \times 7.6 = 388,000$$

$$\ell' = 12 + 4.5 = 16.5''$$

$$F = \frac{388,000}{21.16 \times 16.5} = 1,110 \text{ LB}$$



$$F_H = 1,110 \times \frac{240}{49} = 5,440 \text{LB}$$

$$F_R = 5,440 \not+ 1,110 = 5,550 \text{LB}$$

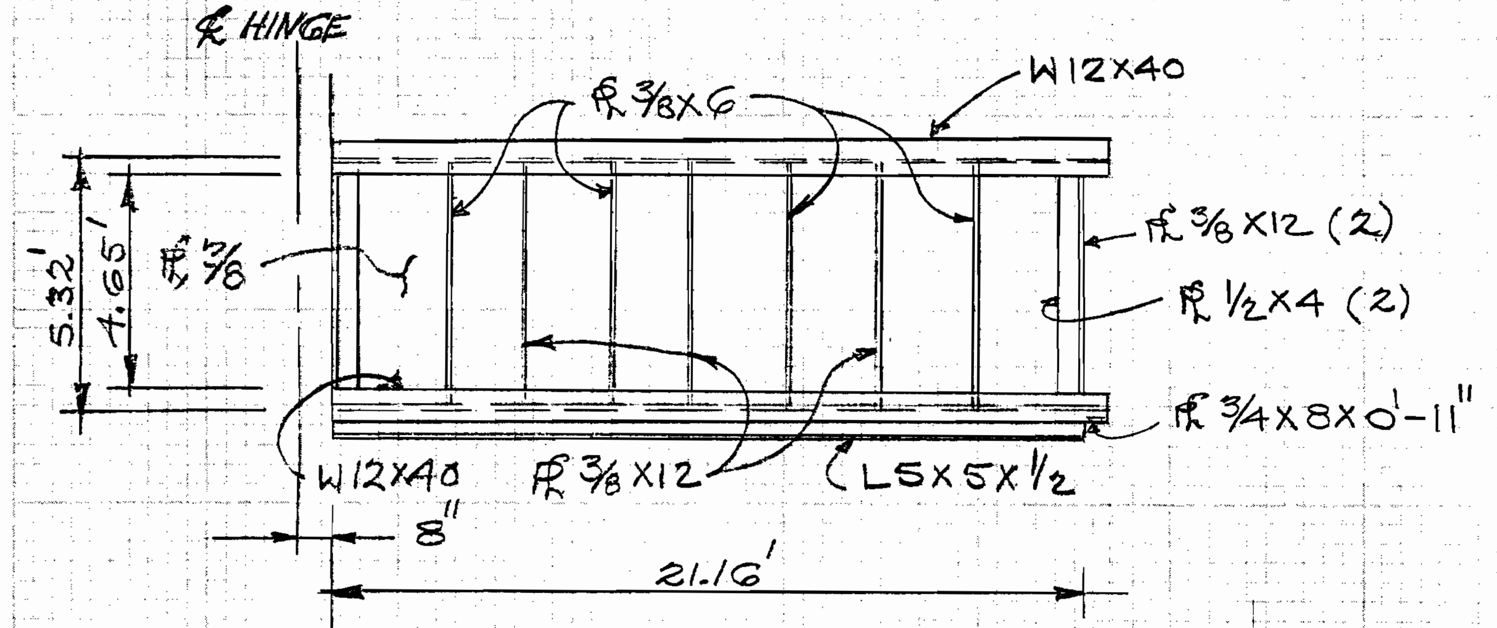
Try 3/4" Std. Turnbuckles

I▷ P. A-3 STRUCTURAL ENGRNG HNDBK - GAYLORD[2]

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST RR GATE BY NDL DATE 12-24-79
JOB Nº 575-79 CHKD. BY ______ DATE ______

SWING GATE DESIGN



	WEIGHT		x	Wx
3/8 PL	15.3X 21.16X 6.0=	1,942 LB	11.25 FT	21,848 FT·LB
W12X40	2X40X 22.08 =	1,766	11.71	20,680
L5X5X 1/2	16.2X 19.75 =	320	11.30	3,615
PL 3/8X12 (5)	5 X 15.3 X 5.32 =	407	11.25	4,579
PL 1/2X4 (2)	2 X 6.8 X 4.65 =	63	11.25	709
PL 3/8X6 (4)	4 X 7.65 X 5.32 =	163	11.25	1,834
PL 3/4 X 8 X 0'-11"	20.4 X 0.92 =	19	22.42	426
1 1/2" Φ BAR	7.65 X 5.79 =	44	21.67	960
WELD 1/4 / 1/4	0.21(4X21.16+11X 5.32)=	30	11.25	338
SEAL		70	11.25	788
		4,824 LB		55,777 FT·LB

$$d = \frac{55{,}777}{4{,}824} = 11.56 \text{ FT FROM ℄ HINGE}$$

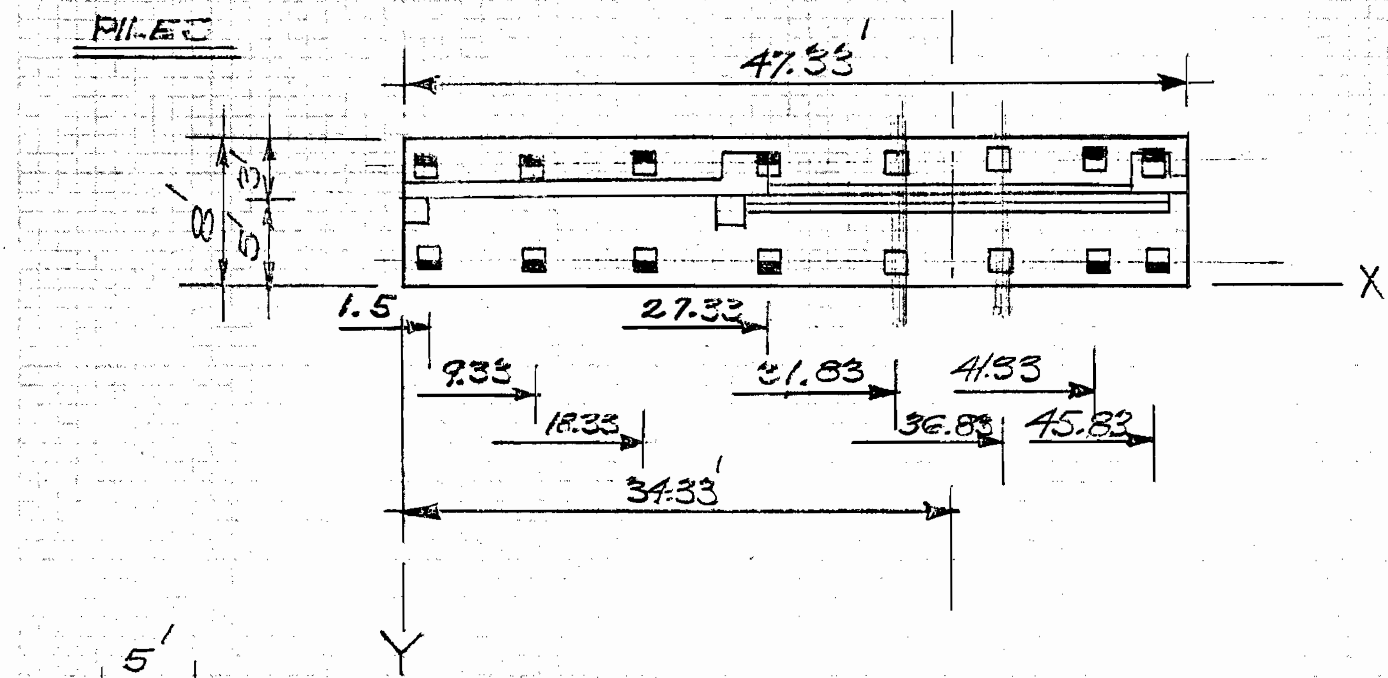
$$\text{HINGE FORCE}_{HORIZ} = \frac{55{,}777}{5.32} = 10{,}500 \text{ LB}$$

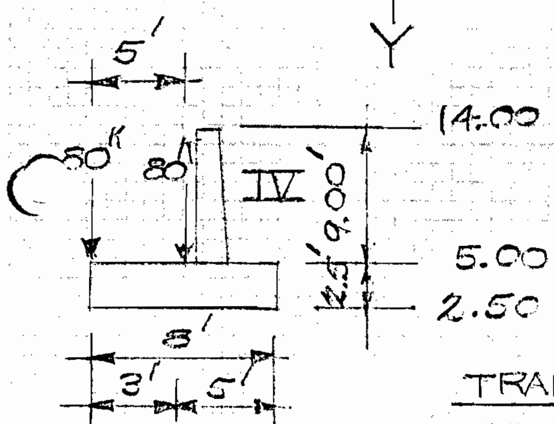
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______
ITEM EAST RR GATE
JOB NO 575-79

SHEET NO ______ OF ______
BY NDL DATE 3-13-80
CHKD. BY ______ DATE ______

PILES

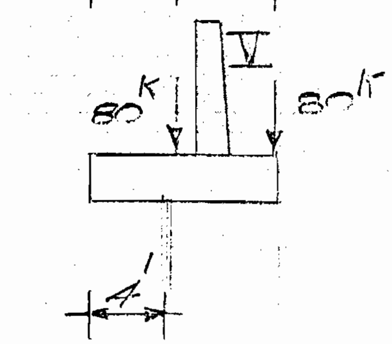




$$\begin{array}{r} 14.00 \\ 2.50 \\ \hline 11.50 \end{array} \times 0.0625 = 0.72\ KSF$$

TRAIN

IV



$M_x = 5 \times 80 = -400^{'K}$

$M_y = 2 \times 80 \times 34.33 = -5{,}493^{'K}$

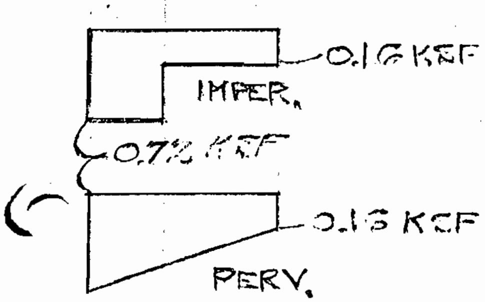
$F_z = 2 \times 80 = 160^K$

V

$M_x = 80 \times 3 + 80 \times 8 = -880^{'K}$

$M_y = -5{,}493^{'K}$

$F_z = 160^K$



PILES

$$F_{IMPER_Z} = \overset{136}{0.72 \times 4 \times 47.33} + \overset{30}{0.16 \times 4 \times 47.33} = -166^K$$

$$M_{IMPER_Y} = 136 \times 23.67 + 30 \times 23.67 = 3{,}929^{\prime K}$$

$$M_{IMPER_X} = 136 \times 2 + 30 \times 6 = 452^{\prime K}$$

$$F_{PERV_Z} = \overset{61}{0.16 \times 8 \times 47.33} + \overset{106}{\left(\frac{0.72-0.16}{2}\right) \times 8 \times 47.33} = -167^K$$

$$M_{PERV_Y} = 61 \times 23.67 + 106 \times 23.67 = 3{,}953^{\prime K}$$

$$M_{PERV_X} = 61 \times 4 + 106 \times \frac{5}{3} = 527^{\prime K}$$

WATER–VERT

$$F_Z = 9.00 \times 5 \times 47.33 \times 0.0625 = 133^K$$

$$M_Y = 133 \times 23.67 = -3{,}148^{\prime K}$$

$$M_X = 133 \times 2.5 = -332^{\prime K}$$

$$WT = 9.00 \times .15 + \frac{9.00^2}{2 \times 2 \times 12} \times .15$$

$$= 1.6^{K/\prime}$$

$$C.G. = 0.6^{\prime}$$

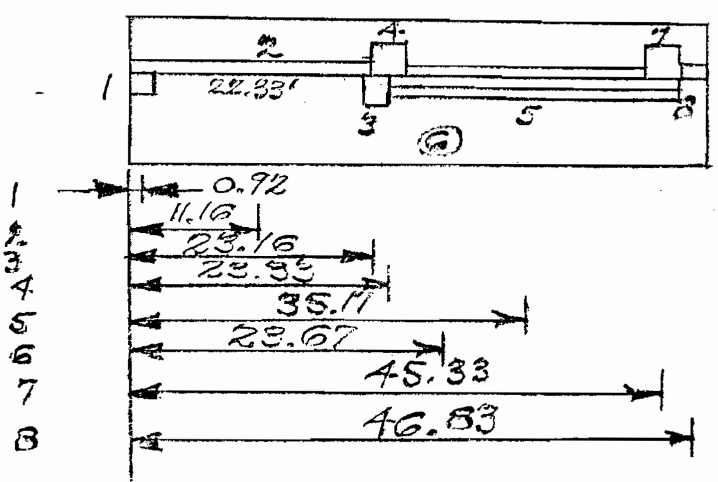
WATER–HORIZ:

$$F_Y = 47.33 \times 0.0625\left(\overset{196}{\frac{11.50^2}{2}} - \overset{9}{\frac{2.5^2}{2}}\right) = -187^K$$

$$M_X = -196 \times \frac{11.36}{3} + 9 \times \frac{2.5}{3} = -735^{\prime K}$$

$$M_Z = -196 \times 23.67 + 9 \times 23.67 = -4{,}426^{\prime K}$$

CONCRETE–WEIGHT



	F_Z	X	M_Y	Y	M_X
1	1	0.92	1	4.17	4
2	36	11.16	402	5.6	202
3	1	23.16	23	4.17	4
4	6	23.33	140	6.0	36
5	13	35.17	457	4.75	62
6	142	23.67	3,361	4.0	568
7	6	45.33	272	6.0	36
8	2	46.83	94	5.6	11
	207^K		$-4{,}750^{\prime K}$		$-923^{\prime K}$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST RR GATE
JOB No 575-79
SHEET No
BY NDL
CHKD. BY
OF
DATE 3-14-80
DATE

PILES

BALLAST

$w_{SATURATED} = 140$ PCF $\quad w_{SUBMERGED} = 77.5$ PCF

$F_{Z\,SAT} = 140 \times 8 \times 2 \times 20 = 45^K \qquad F_{Z\,SUB} = \frac{77.5}{140} \times 45 = 25^K$

$M_{Y\,SAT} = 45 \times 34.33 = -1{,}545^{1K} \qquad M_{Y\,SUB} = 25 \times 34.33 = -858^{1K}$

$M_{X\,SAT} = 45 \times 4 = -180^{1K} \qquad M_{X\,SUB} = 25 \times 4 = -100^{1K}$

GATE

GATE CLOSED

$F_Z = 5^K$

$M_Y = 5 \times 34.81 = -174^{1K}$

$M_X = 5 \times 4.58 = -23^{1K}$

GATE OPEN

$F_Z = 5^K$

$M_Y = 5 \times 11.69 = -58^{1K}$

$M_X = 5 \times 4.08 = -20^{1K}$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST RR GATE
JOB No 575-79

SHEET No OF
BY NDL DATE 3-15-80
CHKD. BY DATE

PILES

LOAD TABULATION							
LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	207	-923	-4,750	0
2	GATE-OPEN	0	0	5	-20	-58	0
3	GATE-CLOSED	0	0	5	-23	-174	0
4	BALLAST-SAT.	0	0	45	-180	-1,545	0
5	BALLAST-SUB.	0	0	25	-100	-858	0
6	WATER-VERT.	0	0	133	-332	-3,148	0
7	WATER-HORIZ.	0	-187	0	-735	0	-4,426
8	UPLIFT-IMP.	0	0	-166	452	3,929	0
9	UPLIFT-PERM.	0	0	-167	527	3,953	0
10	TRAIN-CASE IV	0	0	160	-400	-5,493	0
11	TRAIN-CASE V	0	0	160	-880	-5,493	0

LOAD SUMMATION							
CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+4	0	0	257	-1,126	-6,469	0
II	1+3+5+6+7+8	0	-187	204	-1,661	-5,001	-4,426
III	1+3+5+6+7+9	0	-187	203	-1,586	-4,977	-4,426
IV	1+2+4+10	0	0	417	-1,523	-11,846	0
V	1+2+4+11	0	0	417	-2,003	-11,846	0

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST RR GATE
JOB Nº 575-79
SHEET Nº   OF
BY NDL   DATE 3-15-80
CHKD. BY   DATE

PILES

COMPUTER-INPUT

```
10    FLORIDA AVE EAST  575-79
20    EAST RR GATE
30    ,5
40    2,0.0,70
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,90,6
110   1.5,9.33,18.33,27.33,41.33,45.83
140   6*-1.5
170   6*0.0
200   0,707
210   2*31.83, 2*36.83
240   -1.5,-6.5,-1.5,-6.5
270   4*0.0
300   1.5,7.33,18.33,27.33,41.33,45.83
340   6*-6.5
370   6*0.0
2000  0,0,257,-1126,-6167,0
2010  0,-187,204,-1666,-5001,-4426
2020  0,-187,203,-1586,-4977,-4426
2030  0,0,417,-1523,-11846,0
2040  0,0,417,-2003,-11846,0
```

GROUP	MAX PILE LOAD P	MAX PILE LOAD Φ	CASE No. P	CASE No. Φ	ALLOW PILE LOAD P	ALLOW PILE LOAD Φ	% ALLOW P	% ALLOW Φ
A	-22.4	0.5	2	3	40	3.49	56.0	14.3
VERT PILE B	62.7	0.4	5	3	72	1.21	86.5	33.1

8F

```
03/19/80    11.94

10 FLORIDA AVE EAST 575-79
20 EAST RR GATE
30 3,5
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,6
110 1.5,9.33,18.33,27.33,41.33,45.83
140 6*-1.5
170 6*0.0
200 0,90,4
210 2*31.83,2*36.83
240 -1.5,-6.5,-1.5,-6.5
270 4*0.0
300 2,270,6
310 1.5,9.33,18.33,27.33,41.33,45.83
340 6*-6.5
370 6*0.0
2000 0,0,257,-1126,-6469,0
2010 0,-187,204,-1661,-5001,-4426
2020 0,-187,203,-1586,-4977,-4426
2030 0,0,417,-1523,-11846,0
2040 0,0,417,-2003,-11846,0

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/19/80    11.976


    PROG. NO. 713-F3-A2-210    11:58:51   03/19/80    MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 EAST RR GATE


TOTAL NUMBER OF PILES =    16
```

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	257.0	-1126.0	-6469.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.0	-0.0	20.5
2	0.0	-0.0	19.3
3	0.0	-0.0	18.0
4	0.1	-0.0	16.6
5	0.1	-0.0	14.5
6	0.1	-0.0	13.8
7	0.1	-0.0	9.0
8	0.1	0.0	27.1
9	0.1	-0.0	8.2
10	0.1	0.0	26.3
11	-0.1	-0.0	20.9
12	-0.1	-0.0	19.7
13	-0.1	-0.0	18.4
14	-0.1	-0.0	17.1
15	-0.1	-0.0	15.0
16	-0.1	-0.0	14.4

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-0.0	257.0	-1126.0	-6469.0	-0.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-187.0	204.0	-1661.0	-5001.0	-4426.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	-17.4
2	-0.4	0.0	-18.3
3	-0.4	0.0	-19.3
4	-0.4	0.0	-20.3
5	-0.4	0.0	-21.9
6	-0.4	0.0	-22.4
7	-0.4	0.0	19.9
8	-0.4	-0.0	8.3
9	-0.4	0.0	19.0
10	-0.4	-0.0	7.4
11	0.3	0.0	52.4
12	0.3	0.0	50.8
13	0.3	0.0	48.9
14	0.3	0.0	47.0
15	0.3	0.0	44.1
16	0.3	0.0	43.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-187.0	204.0	-1661.0	-5001.0	-4426.0

LOAD CONDITION 3

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-187.0	203.0	-1586.0	-4977.0	-4426.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	0.0	-17.3
2	-0.5	0.0	-18.2
3	-0.5	0.0	-19.2
4	-0.5	0.0	-20.2
5	-0.4	0.0	-21.8
6	-0.4	0.0	-22.3
7	-0.4	0.0	26.4
8	-0.4	-0.0	1.7
9	-0.4	0.0	25.5
10	-0.4	-0.0	0.8
11	0.4	0.0	52.2
12	0.4	0.0	50.6
13	0.4	0.0	48.7
14	0.4	0.0	46.8
15	0.4	0.0	43.8
16	0.4	0.0	42.9

3 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

3	0.0	-187.0	203.0	-1586.0	-4977.0	-4426.0

LOAD CONDITION 4

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	417.0	-1523.0	-11846.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	22.9
2	-0.2	0.0	24.4
3	-0.2	0.0	26.1
4	-0.2	0.0	27.8
5	-0.2	0.0	30.5
6	-0.2	0.0	31.4
7	-0.1	0.0	45.0
8	-0.1	-0.0	18.3
9	-0.1	0.0	46.1
10	-0.1	-0.0	19.3
11	0.1	0.0	22.3
12	0.1	0.0	23.8
13	0.1	0.0	25.4
14	0.1	0.0	27.1
15	0.1	0.0	29.7
16	0.1	0.0	30.5

4 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

4	0.0	-0.0	417.0	-1523.0	-11846.0	-0.0

LOAD CONDITION 5

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	0.	417.0	-2003.0	-11846.0	0.

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.3	-0.0	22.0
2	0.2	-0.0	23.4
3	0.2	-0.0	25.0
4	0.2	-0.0	26.6
5	0.2	-0.0	29.2
6	0.2	-0.0	30.0
7	0.3	-0.0	0.7
8	0.3	0.0	62.6
9	0.3	-0.0	1.8
10	0.3	0.0	63.7
11	-0.4	-0.0	23.2
12	-0.4	-0.0	24.8
13	-0.4	-0.0	26.5
14	-0.4	-0.0	28.3
15	-0.4	-0.0	31.0
16	-0.4	-0.0	31.9

5 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

5 0.0 -0.0 417.0 -2003.0 -11846.0 -0.0

0 12:01:49 03/19/80 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022,13022,14022,15022
```

0 PROG NO. 713-F3-A2-210 11:58:51 03/19/80 MOD 6B,

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

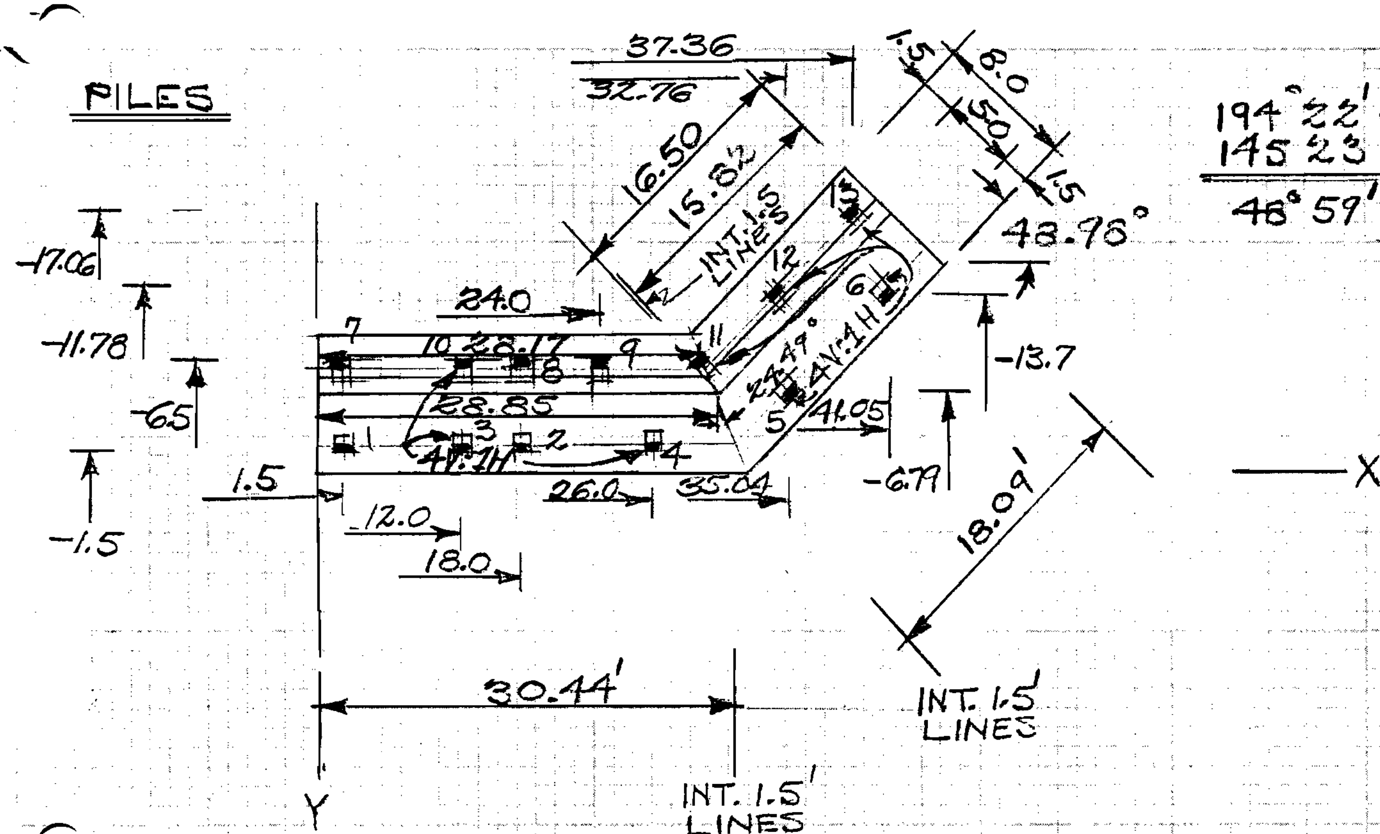
11021	X	Y	Z	RX	RY	RZ
11022	0.141E-04	0.120E-01	0.607E-02	-0.205E-03	0.949E-05	-0.293E-06
12022	-0.291E-03	-0.611E-01	0.198E-01	0.132E-03	0.102E-04	0.605E-05
13022	-0.301E-03	-0.699E-01	0.269E-01	0.281E-03	0.102E-04	0.627E-05
14022	-0.208E-04	-0.178E-01	0.316E-01	0.304E-03	-0.119E-04	0.434E-06
15022	0.481E-04	0.412E-01	-0.167E-01	-0.702E-03	-0.119E-04	-0.100E-05

READY

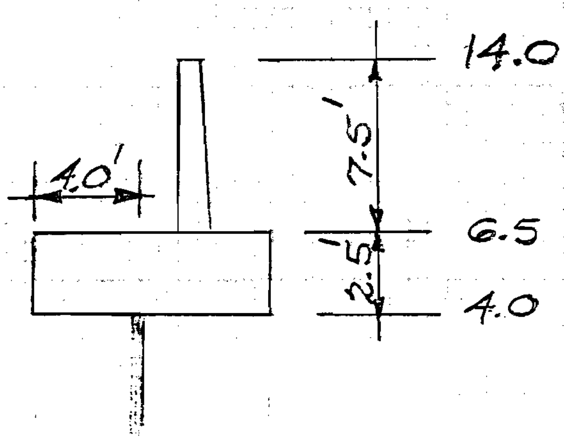
*

N-Y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS		
JOB	SHEET No	OF
ITEM EAST MONOLITH 6	BY NDL	DATE 2-12-80
JOB No 575-79	CHKD. BY	DATE

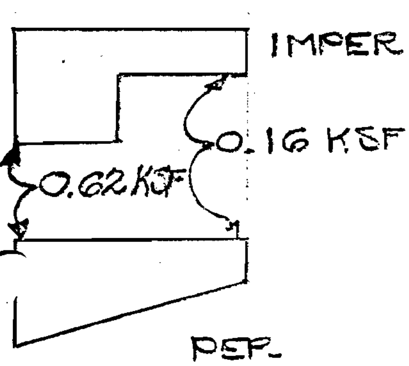
PILES



$$\begin{array}{r} 194^\circ 22' 09'' \\ 145\ 23\ 09 \\ \hline 48^\circ 59' 00'' \end{array}$$



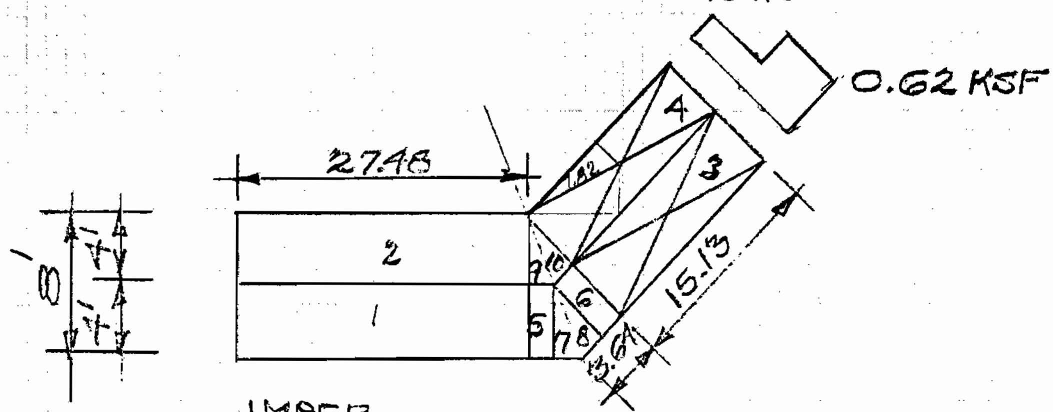
$$\begin{array}{r} 14.0 \\ 4.0 \\ \hline 10.0 \end{array} \times 0.0625 = 0.62 \text{ KSF}$$



N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM EAST MONOLITH G BY NDL DATE 2-15-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

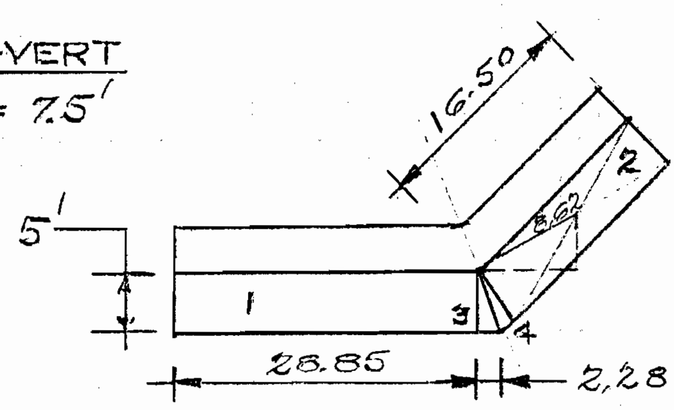


48.98
14.34°
34.64°

IMPER

	A	F	Y	Mx	X	My
1	109.92	68	2	136	13.74	934
2	109.92	18	6	108	13.74	247
3	60.52	38	9.82	373	36.93	1,403
4	60.52	10	12.45	124	33.91	339
5	7.28	5	2	10	28.39	142
6	7.28	5	3.2	16	31.2	156
7	3.64	2	1.33	3	29.91	60
8	3.64	2	1.6	3	30.6	61
9	3.64	1	5.33	5	28.09	28
10	3.64	1	5.7	6	29.0	29
	370 FT²	150^K		784^{1K}		3,399^{1K}

WATER-VERT
$h_w = 7.5'$



48.98
16.86
32.12°

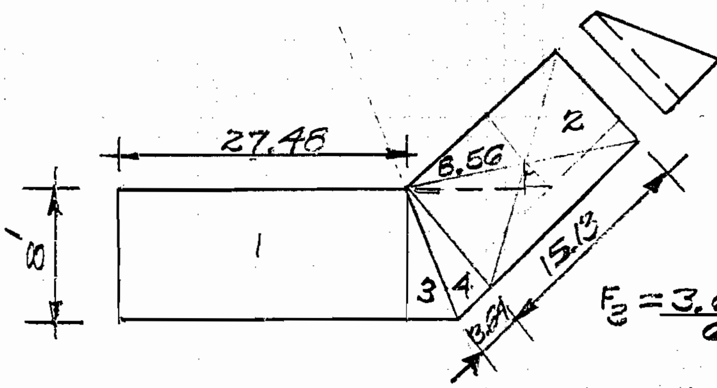
	A	F	Y	Mx	X	My
1	144.25	68	2.5	170	14.42	981
2	82.5	39	9.58	374	36.15	1,401
3	5.7	3	1.67	5	29.61	89
4	5.7	3	2.2	7	30.5	92
	238 FT²	113^K		-556^{1K}		-2,563^{1K}

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST MONOLITH 6 BY NDL DATE 2-15-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

PERV.



0.62
0.16
0.46 KSF

48.98
27.87
21.11°

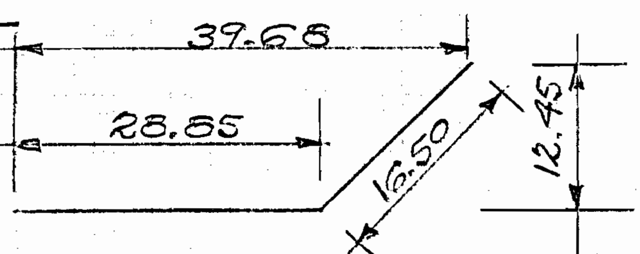
$$F_z = \frac{3.64}{6}\left(\frac{8 \times 0.46}{2} + \frac{4 \times 4 \times 0.46}{2} + \frac{4 \times 4 \times 0.46}{4} + 0\right) = 4^K$$

(USED 5^K)

	FORCE UNI	FORCE TRI	Y UNI	Y TRI	M_X	X UNI	X TRI	M_Y
1	35	51	4	2.67	276	13.74		1,182
2	19	29	11.08	10.21	507	35.47	36.47	1,732
3	2	3	2.67	2	11	28.69	28.84	201
4	2	3	3.4	2.9	16	30.5	30.7	153
	-144^K				810^{1K}			$3,268^{1K}$

WATER-HORIZ

USE WALL LINE AS FORCE PLANE



$h_w = 10.0'$

$$F_Y = 39.68 \times 0.0625\left(\overset{124}{\frac{10.0^2}{2}} - \overset{8}{\frac{2.5^2}{2}}\right) = -116^K$$

$$M_X = 124 \times 10.0/3 - 8 \times 2.5/3 = -407^{1K}$$

$$F_X = 12.45 \times 0.0625\left(\overset{39}{\frac{10.0^2}{2}} - \overset{2}{\frac{2.5^2}{2}}\right) = -37^K$$

$$M_Y = 39 \times 10.0/3 - 2 \times 2.5/3 = 128^{1K}$$

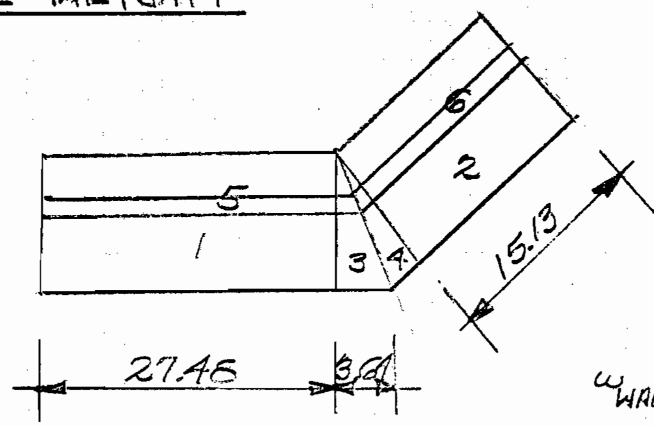
$$M_Z = -116 \times \frac{39.68}{2} - 37 \times \left(\frac{12.45}{2} + 5\right) = -2,717^{1K}$$

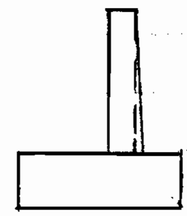
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM EAST MONOLITH 6 BY NDL DATE 2-16-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

CONCRETE-WEIGHT





$t = 12 + \frac{7.5}{2} = 15.75''$

$w_{WALL} = 7.5 \times 0.15 (1.0 + \frac{3.75}{12 \times 2}) =$

$= 1.30^{K/l}$

$C.G. = \frac{5.5 \times 1.12 + 6.1 \times 0.18}{1.30} = 5.56'$

	F	Y	Mx	X	My
1	82	4	328	13.74	1,127
2	45	11.08	499	35.47	1,596
3	5	2.67	13	28.67	143
4	5	3.4	17	30.5	152
5	37	5.56	206	14.29	529
6	21	11.5	242	34.3	720
	195^K		$-1,305^{IK}$		$-4,267^{IK}$

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	195	-1,305	-4,267	0
2	WATER-VERT	0	0	113	-556	-2,563	0
3	WATER-HORIZ	-37	-116	0	-407	128	-2,717
4	UPLIFT-IMP	0	0	-150	784	3,399	0
5	UPLIFT-PERV	0	0	-144	810	3,268	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	-37	-116	158	-1,484	-3,303	-2,717
II	1+2+3+5	-37	-116	164	-1,458	-3,434	-2,717

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB		SHEET Nº	OF
ITEM	EAST MONOLITH 6	BY NDL	DATE 2-16-80
JOB Nº	575-79	CHKD. BY	DATE

PILES

COMPUTER-INPUT

```
10    FLORIDA AVE EAST 575-79
20    MONOLITH 6
30    6,2
40    2,0.0,70
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,90,2
110   1.5, 16.0
140   2*-1.5
170   2*0.0
200   4,90,2
210   12.0, 26.0
240   2*-1.5
270   2*0.0
300   4,41.02,2
310   35.04, 41.05
340   -6.79, -13.7
370   2*0.0
400   2,270,3
410   1.5, 18.0, 24.0
440   3*-6.5
470   3*0.0
500   4,270,1
510   12.0
540   -6.5
570   0.0
600   4,221.02,3
610   28.17, 32.76, 37.35
640   -6.5, -11.78, -17.06
670   3*0.0
2000  -37, -116, 158, -1434, -3303, -2717
2010  -37, -116, 164, -1458, -3434, -2717
```

14A

```
03/11/80     14.82


10 FLORIDA AVE EAST 575-79
20 MONOLITH 6
30 6,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 1.5,18.0
140 2*-1.5
170 2*0.0
200 4,90,2
210 12.0,26.0
240 2*-1.5
270 2*0.0
300 4,41.02,2
310 35.04,41.05
340 -6.79,-13.7
370 2*0.0
400 2,270,3
410 1.5,18.0,24.0
440 3*-6.5
470 3*0.0
500 4,270,1
510 12.0
540 -6.5
570 0.0
600 4,221.02,3
610 28.17,32.76,37.36
640 -6.5,-11.78,-17.06
670 3*0.0
2000 -37,-116,158,-1484,-3303,-2717
2010 -37,-116,164,-1458,-3434,-2717

READY

*RUN RK29010A

        03/11/80     14.849
```

14B

TOTAL NUMBER OF PILES = 13

LOAD CONDITION 1 MONOLITH 6

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-37.0	-116.0	158.0	-1484.0	-3303.0	-2717.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.4	-18.8
2	-0.4	0.4	-22.0
3	-0.4	0.4	-3.0
4	-0.5	0.4	-1.1
5	-0.6	-0.1	-20.0
6	-0.7	-0.1	-36.5
7	0.3	-0.4	29.1
8	0.3	-0.4	47.2
9	0.4	-0.4	53.8
10	0.3	-0.4	24.5
11	0.6	0.1	46.6
12	0.6	0.1	38.9
13	0.7	0.1	31.2

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-37.0	-116.0	158.0	-1484.0	-3303.0	-2717.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-37.0	-116.0	164.0	-1458.0	-3434.0	-2717.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.4	-19.8
2	-0.4	0.4	-20.8
3	H "`	`4	-1.8
4	-0.5	0.4	2.3
5	-0.7	-0.1	-18.4
6	-0.7	-0.1	-38.8
7	0.3	-0.4	27.8
8	0.4	-0.4	48.7
9	0.4	-0.4	56.3
10	0.4	-0.4	24.2
11	0.6	0.1	48.9
12	0.7	0.1	38.7
13	0.7	0.1	28.5

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-37.0	-116.0	164.0	-1458.0	-3434.0	-2717.0

0 14:51:31 03/11/80 *** END OF RUN ***

STOP EOJ

14 C

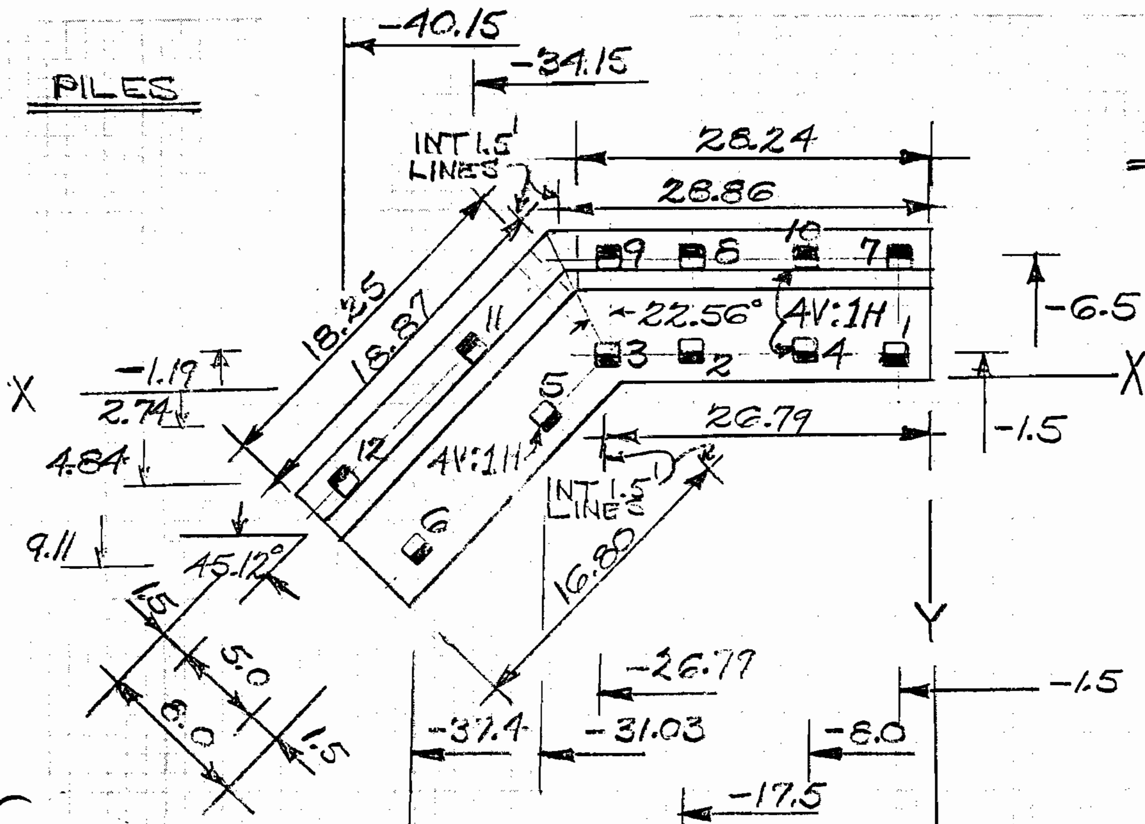
```
*OLD P29010
READY
*LIST 11020-11022,12022
```

MONOLITH 6

```
0          PROG NO. 713-F3-A2-210     14:51:18  03/11/80          MOD 6B, FE
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y          Z          RX          RY          RZ
11022 -0.575E-01 -0.432E-01  0.100E-01  0.137E-03 -0.286E-04 -0.822E-04
12022 -0.580E-01 -0.451E-01  0.107E-01  0.174E-03 -0.381E-04 -0.842E-04
```

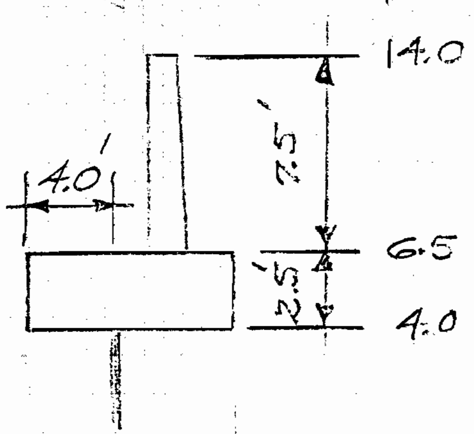
N-H ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS	JOB	SHEET Nº	OF
	ITEM EAST MONOLITH 7	BY NDL	DATE 2-16-80
	JOB Nº 575-79	CHKD. BY	DATE

PILES

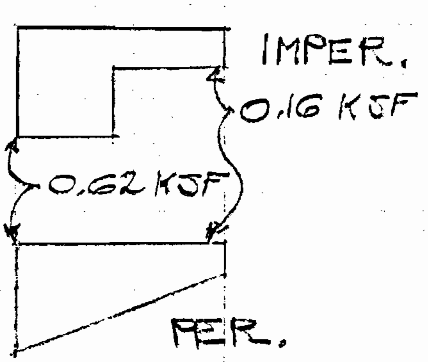


194°22'09"
149 14 36
45° 7' 33"
45.12° (22.56°)

324.74
296.50
28.24'



14.0
4.0
10.0 X 0.0625 = 0.62 KSF

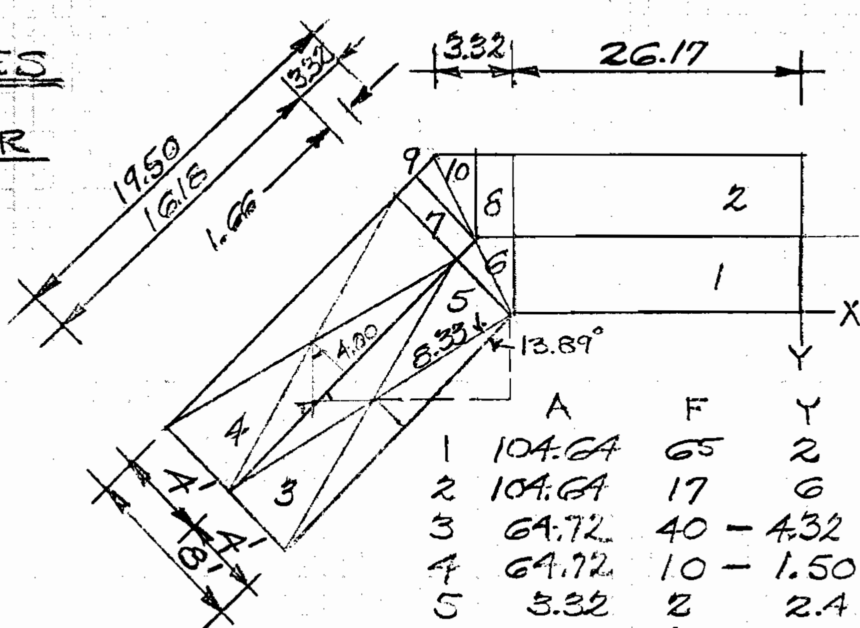


N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

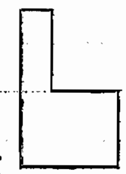
JOB ____ SHEET No ____ OF ____
ITEM EAST MONOLITH 7 BY NDL DATE 2-16-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

IMPER



0.16 KSF



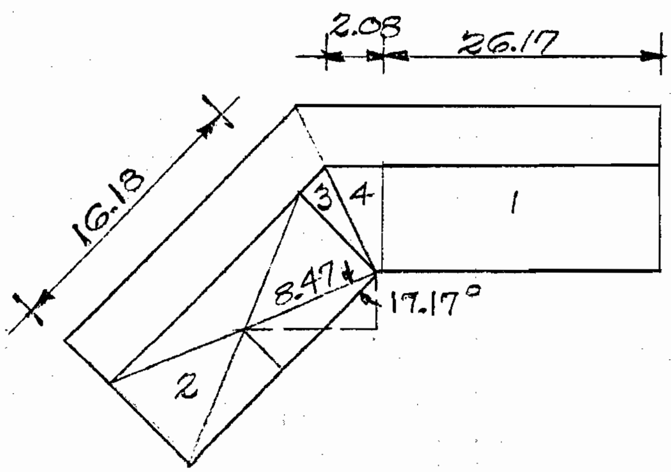
0.62 KSF

45.12
13.89
31.23
90.00
58.77

	A	F	Y	Mx	X	My
1	104.64	65	2	130	13.08	850
2	104.64	17	6	102	13.08	222
3	64.72	40	− 4.32	− 173	33.29	1,332
4	64.72	10	− 1.50	− 15	36.12	361
5	3.32	2	2.4	5	28.0	58
6	3.32	2	2.67	5	26.72	53
7	6.64	1	4.8	5	30.0	30
8	6.64	1	6.0	6	27.00	27
9	3.32	1	6.2	6	29.4	29
10	3.32	1	6.67	7	28.38	28
	365.28 FT²	−140^K		78^1K		−2,990^1K

WATER-VERT

$h_w = 7.5'$



45.12
17.17
27.95
90.00
62.05°

	F	Y	Mx	X	My
1	61	2.5	152	13.08	798
2	38	− 3.97	− 151	33.65	1,279
3	2	2.7	5	28.2	56
4	2	3.33	7	26.36	54
	103^K		−13^1K		2,187^1K

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

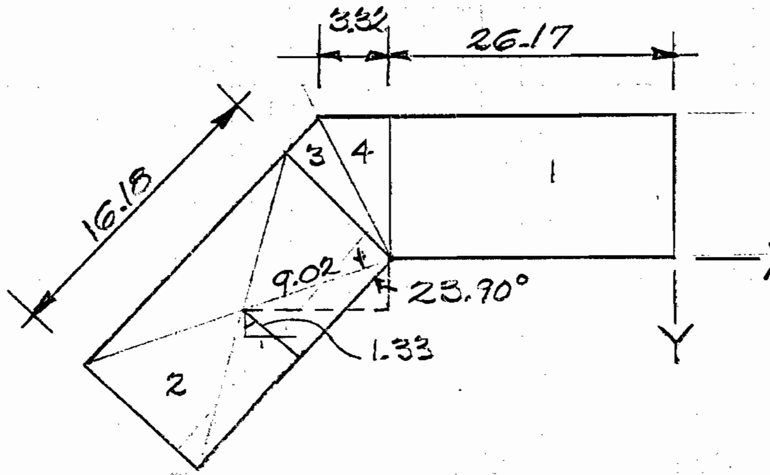
JOB ____ SHEET No ____ OF ____

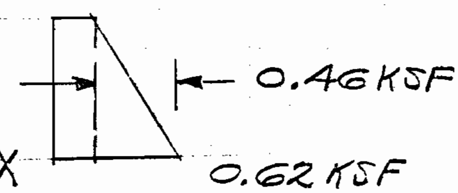
ITEM EAST MONOLITH 7 BY NDL DATE 2-16-80

JOB No 575-79 CHKD. BY ____ DATE ____

PILES

PERV.



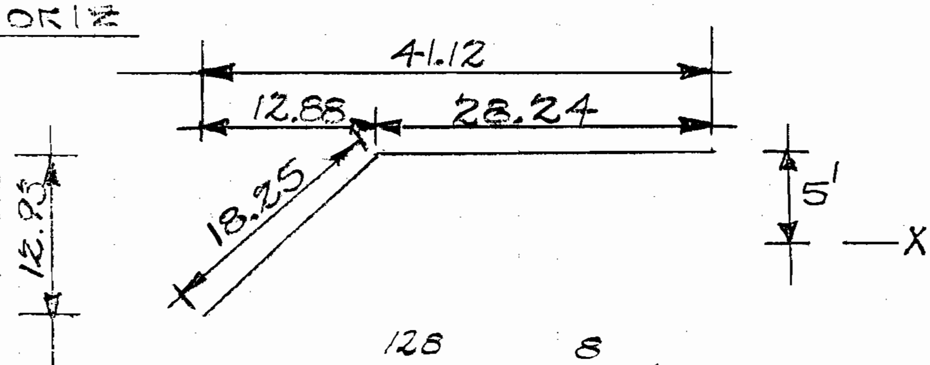


45.12
23.90
21.22
90.00
68.78°

	FORCE UNI	FORCE TRI	Y UNI	Y TRI	M_X	X UNI	X TRI	M_Y
1	33	48	4	2.67	260	13.08		1,059
2	21	30	-3.26	-4.20	-194	34.58	33.64	1,735
3	2	3	4.4	3.5	19	29.3	28.6	144
4	2	3	5.33	4.00	23	27.28	27.00	136
	-142^K				108^{1K}			$-3,074^{1K}$

WATER-HORIZ

$h_w = 10.0$



$$F_Y = 41.12 \times 0.0625 \left(\overset{128}{\frac{10.0^2}{2}} - \overset{8}{\frac{2.5^2}{2}} \right) = -120^K$$

$$M_X = 128 \times 10.0/3 - 8 \times 2.5/3 = -420^{1K}$$

$$F_X = 12.93 \times 0.0625 \left(\overset{40}{\frac{10.0^2}{2}} - \overset{3}{\frac{2.5^2}{2}} \right) = -37^K$$

$$M_Y = 40 \times 10.0/3 - 3 \times 2.5/3 = 131^{1K}$$

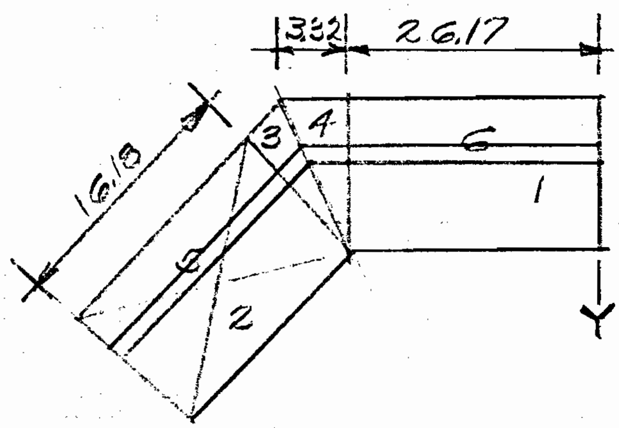
$$M_Z = 120 \times 41.12/2 + 37 \times (12.93/2 - 5.0) = 2,521^{1K}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST MONOLITH 7 BY NDL DATE 2-16-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILE 3

CONCRETE-WEIGHT



$\omega_{WALL} = 1.30^{k/'}$

$C.G. = 5.58'$

	F	Y	Mx	X	My
1	79	4	−316	13.08	1,033
2	49	3.26	160	34.58	1,694
3	5	4.4	−22	27.3	146
4	5	5.33	−27	27.26	136
5	24	0.7	17	35.1	842
6	37	5.58	−206	13.08	484
	199^{k}		$-394^{'k}$		$4,335^{'k}$

LOAD TABULATION

LOAD NO	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	199	−394	4,335	0
2	WATER-VERT	0	0	103	−13	2,187	0
3	WATER-HORIZ	−37	−120	0	−420	131	2,521
4	UPLIFT-IMP	0	0	−140	78	−2,990	0
5	UPLIFT-PERV	0	0	−142	108	−3,074	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	−37	−120	162	−749	3,663	2,521
II	1+2+3+5	−37	−120	160	−719	3,579	2,521

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST MONOLITH 7 BY NDL DATE 2-16-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER-INPUT

```
10    FLORIDA AVE EAST 575-79
20    MONOLITH 7
30    7 ,2
40    2, 0.0, 70
50    1, 12, 12
60    1, 5
70    -1, 8.33
80    0, 0, 0
100   2, 70, 3
110   -1.5, -17.5, -26.79
140   3* -1.5
170   3*0.0
200   4, 70, 1
210   -8.0
240   -1.5
270   0.0
300   4, 44.58, 1
310   -31.03
340   2.74
370   0.0
400   2, 44.85, 1
410   -374
440   9.11
470   0.0
500   2, 270, 3
510   -1.5, -17.5, -26.79
540   3* -6.5
570   3* 0.0
600   4, 270, 1
610   -6.0
640   -6.5
670   0.0
700   -34.15, -40.15
740   -1.19, 4.84
770   2* 0.0
2000  -37, -120, 162, -749, 3563, 2521
2010  -37, -120, 160, -719, 3577, 2521
```

19 A

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 7
30 7,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 -1.5,-17.5,-26.79
140 3*-1.5
170 3*0.0
200 4,90,1
210 -8.0
240 -1.5
270 0.0
300 4,44.88,1
310 -31.03
340 2.74
370 0.0
400 2,44.88,1
410 -37.4
440 9.11
470 0.0
500 2,270,3
510 -1.5,-17.5,-26.79
540 3*-6.5
570 3*0.0
600 4,270,1
610 -8.0
640 -6.5
670 0.0
700 2,224.88,2
710 -34.15,-40.15
740 -1.19,4.84
770 2*0.0
2000 -37,-120,162,-749,3663,2521
2010 -37,-120,160,-719,3579,2521

READY

*RUN RK29010A

        03/11/80     15.024


    PROG. NO. 713-F3-A2-210     15:02:06   03/11/80     MOD 6B, FEB 80


 FLORIDA AVE EAST 575-79
 MONOLITH 7


TOTAL NUMBER OF PILES =    12
```

LOAD CONDITION 1 MONOLITH 7 19B

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-37.0	-120.0	162.0	-749.0	3663.0	2521.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.3	-17.1
4	-0.3	0.3	0.0
5	-0.4	-0.0	-2.9
6	-0.3	-0.0	-11.4
7	0.3	-0.3	48.6
8	0.3	-0.3	38.3
9	0.2	-0.3	32.3
10	0.3	-0.3	29.8
11	0.3	-0.0	45.6
12	0.3	-0.0	48.8

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-37.0	-120.0	162.0	-749.0	3663.0	2521.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-37.0	-120.0	160.0	-719.0	3579.0	2521.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.3	-16.0
2	-0.3	0.3	-17.9
3	-0.3	0.3	-19.0
4	-0.4	0.3	1.0
5	-0.4	-0.0	-3.3
6	-0.4	-0.0	-10.3
7	0.3	-0.3	50.0
8	0.3	-0.3	37.3
9	0.3	-0.3	30.0
11	0.3	-0.0	44.9
12	0.3	-0.0	50.1

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-37.0	-120.0	160.0	-719.0	3579.0	2521.0

0 15:02:40 03/11/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 15:02:06 03/11/80 MOD 6B, F

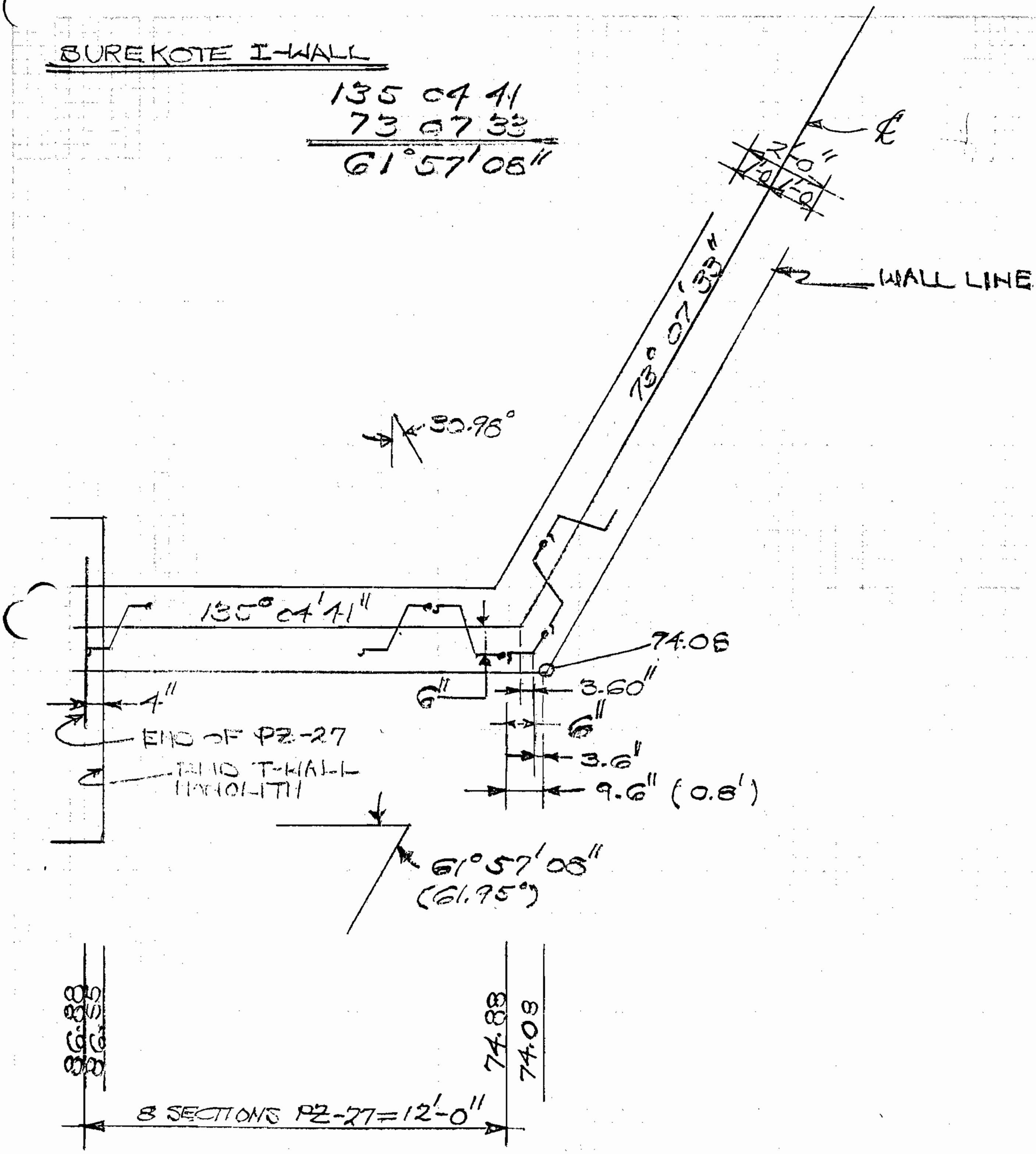
11020	DEFLECTION OF PILE CAP (INCHES & RADIANS)					
11021	X	Y	Z	RX	RY	RZ
11022	-0.391E-01	-0.557E-01	0.163E-01	0.828E-04	-0.198E-04	-0.421E-04
12022	-0.402E-01	-0.578E-01	0.189E-01	0.114E-03	-0.289E-04	-0.427E-04

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST AT SUREKOTE BY NDL DATE 2-18-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

SUREKOTE I-WALL

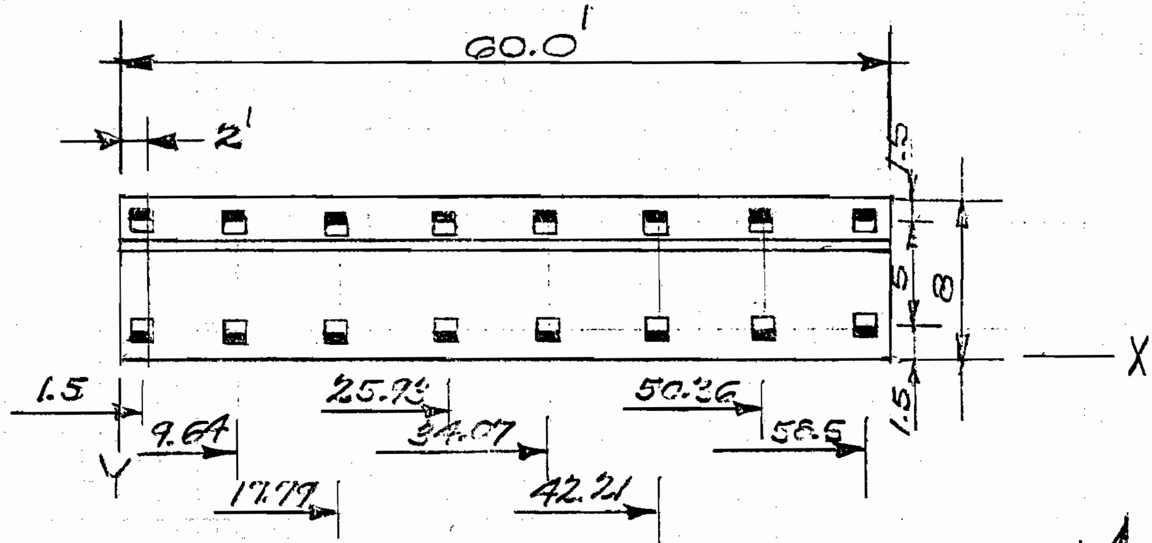
```
 135 04 41
  73 07 33
 ---------
 61°57'08"
```

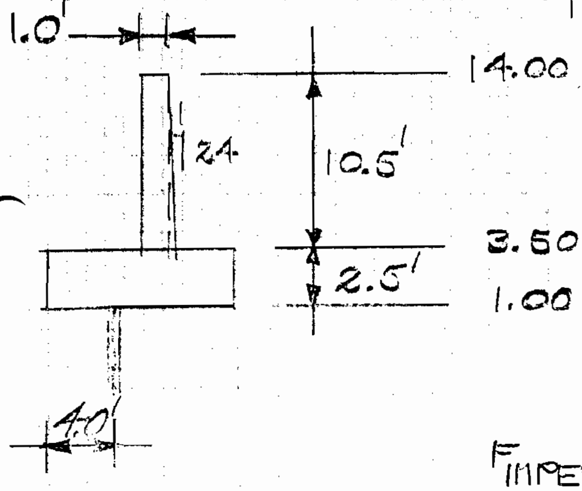


N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET Nº ____ OF ____
ITEM EAST MONOLITH 2 BY NDL DATE 2-18-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

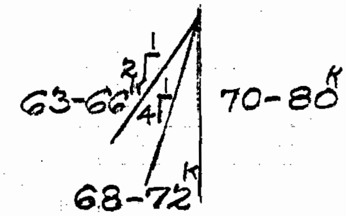
PILES

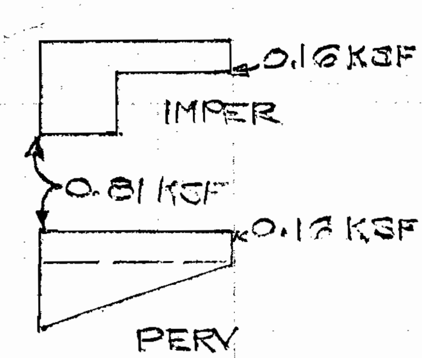




$$\begin{array}{r} 14.0 \\ 1.0 \\ \hline \end{array}$$

$13.0 \times 0.0625 = 0.81$ KSF





$$F_{IMPER_Z} = \overset{194}{0.81 \times 4 \times 60.0} + \overset{38}{0.16 \times 4 \times 60.0} = -232^K$$

$$M_{IMPER_Y} = 194 \times 30.0 + 38 \times 30.0 = 6{,}960^{IK}$$

$$M_{IMPER_X} = 194 \times 2 + 38 \times 6 = 616^{IK}$$

$$F_{PER_Z} = \overset{77}{0.16 \times 8 \times 60.0} + \overset{156}{\frac{(0.81-0.16)}{2} \times 8 \times 60.0} =$$
$$= -233^K$$

$$M_{PER_Y} = 77 \times 30.0 + 156 \times 30.0 = 6{,}990^{IK}$$

$$M_{PER_X} = 77 \times 4 + 156 \times \frac{8}{3} = 724^{IK}$$

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST MONOLITH 2 BY NDL DATE 2-20-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 10.5 \times 5 \times 60 \times 0.0625 = 197^K$

$M_y = 197 \times 30 = -5{,}910^{'K}$

$M_x = 197 \times 2.5 = -492^{'K}$

WATER-HORIZ

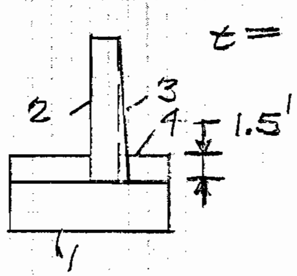
$F_y = 60 \times 0.0625 \left(\underbrace{\frac{13.0^2}{2}}_{317} - \underbrace{\frac{2.5^2}{2}}_{-12} \right) = -305^K$

$M_x = -317 \times \frac{13.0}{3} + 12 \times \frac{2.5}{3} = -1{,}364^{'K}$

$M_z = -317 \times 30.0 + 12 \times 30.0 = -9{,}150^{'K}$

CONCRETE-WEIGHT

$t = 17.25''$



	F_z	X	M_y	Y	M_x
1	180	30	5,400	4	720
2	94	30	2,820	5.5	517
3	21	30	630	6.15	129
4	3	1	3	3.6	11
	298^K		$-8{,}853^{'K}$		$-1{,}377^{'K}$

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	298	-1,377	-8,853	0
2	WATER-VERT	0	0	197	-492	-5,910	0
3	WATER-HORIZ	0	-305	0	-1,364	0	-9,150
4	UPLIFT-IMP	0	0	-232	616	6,960	0
5	UPLIFT-PERV	0	0	-233	724	6,990	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	0	-305	263	-2,617	-7,803	-9,150
II	1+2+3+5	0	-305	262	-2,509	-7,773	-9,150

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET Nº ____ OF ____
ITEM EAST MONOLITH 2 BY NDL DATE 2-20-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES

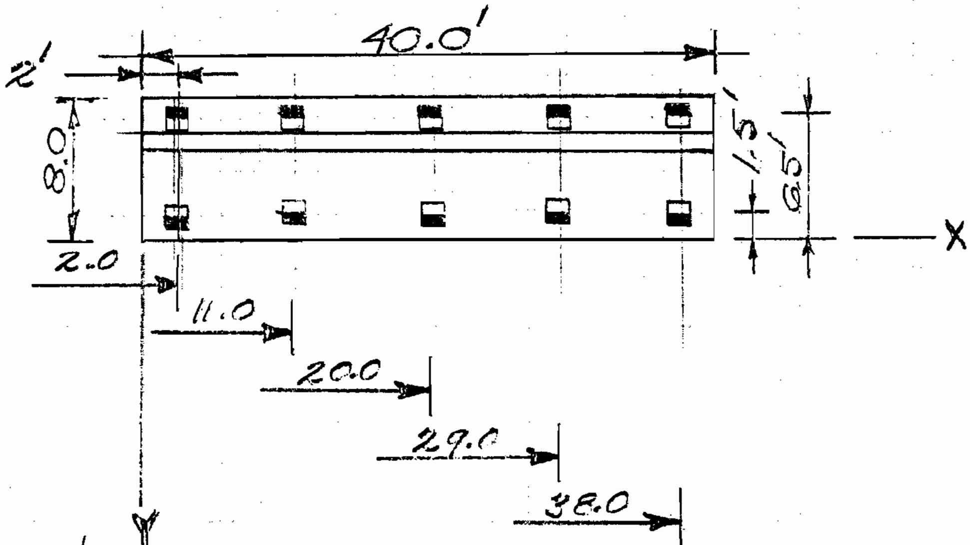
COMPUTER-INPUT

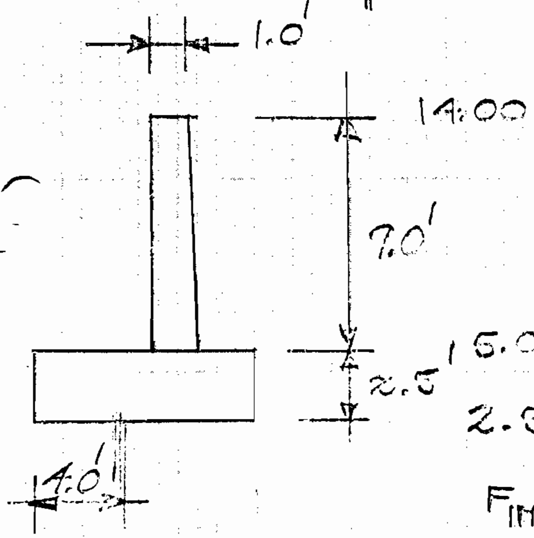
```
10   FLORIDA AVE EAST 575-79
20   MONOLITH 2
30   2,2
40   2,0,0,70
50   1,12,12
60   1,5
70   -1,5.33
80   0,0,0
100  2,90,8
110  1.5, 9.64, 17.79, 25.93, 34.07, 42.21, 50.36, 58.5
140  8*-1.5
170  8*0.0
200  2,270,8
210  1.5, 9.64, 17.79, 25.93, 34.07, 42.21, 50.36, 58.5
240  8*-6.5
270  8*0.0
2000 0, -305, 253, -2617, -7803, -7150
2010 0, -305, 268, -2507, -7803, -7150
```

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 2
30 2,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,8
110 1.5,9.64,17.79,25.93,34.07,42.21,50.36,58.5
140 8*-1.5
170 8*0.0
200 2,270,8
210 1.5,9.64,17.79,25.93,34.07,42.21,50.36,58.5
240 8*-6.5
270 8*0.0
2000 0,-305,263,-2617,-7803,-9150
2010 0,-305,262,-2509,-7803,-9150

READY

*RUN RK29010A

        02/26/80    12.952


    PROG. NO. 713-F3-A2-210    12:57:23  02/26/80    MOD 6B, FEB 80
```

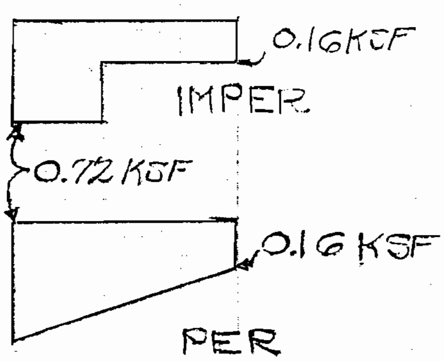
```
FLORIDA AVE EAST 575-79
MONOLITH 2

TOTAL NUMBER OF PILES =    16



             LOAD CONDITION   1

           LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.       -305.0      263.0    -2617.0    -7803.0    -9150.0

            PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1      0.4     0.0     -24.7
  9     -0.5    -0.0      62.4
   1       SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1         -0.0  -305.0   263.0   -2617.0   -7803.0   -9150.0


             LOAD CONDITION   2

           LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.       -305.0      262.0    -2509.0    -7803.0    -9150.0

            PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1     -0.8     0.0     -22.6
  9      0.7    -0.0      59.8
   2       SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         -0.0  -305.0   262.0   -2509.0   -7803.0   -9150.0


   0   12:57:28   02/26/80    *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      12:57:23  02/26/80           MOD 6B, FEB
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y          Z          RX          RY          RZ
11022 -0.246E-07  0.478E-01 -0.768E-01 -0.190E-02  0.111E-05 -0.371E-11
12022 -0.239E-07 -0.110E 00  0.521E-01  0.791E-03  0.724E-06  0.357E-11
```

PILES





$$\begin{array}{r} 14.00 \\ 2.50 \\ \hline 11.50' \end{array} \times 0.0625 = 0.72\ KSF$$



$$F_{IMPER_Z} = \overset{115}{0.72 \times 4 \times 40.0} + \overset{26}{0.16 \times 4 \times 40.0} = -141^K$$

$$M_{IMPER_Y} = 115 \times 20.0 + 2.6 \times 20.0 = 2{,}820^{'K}$$

$$M_{IMPER_X} = 115 \times 2 + 26 \times 6 = 386^{'K}$$

$$F_{PER_Z} = \overset{51}{0.16 \times 8 \times 40.0} + \overset{90}{\frac{(0.72 - 0.16)}{2} \times 8 \times 40.0}$$
$$= -141^K$$

$$M_{PER_Y} = 51 \times 20.0 + 90 \times 20.0 = 2{,}820^{'K}$$

$$M_{PER_X} = 51 \times 4 + 90 \times \frac{8}{3} = 444^{'K}$$

N-L ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST MONOLITH 3 BY NDL DATE 2-23-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$$F_z = 9.0 \times 5 \times 40.0 \times 0.0625 = 112^K$$

$$M_y = 112 \times 20.0 = -2{,}240^{1K}$$

$$M_x = 112 \times 2.5 = -280^{1K}$$

WATER-HORIZ

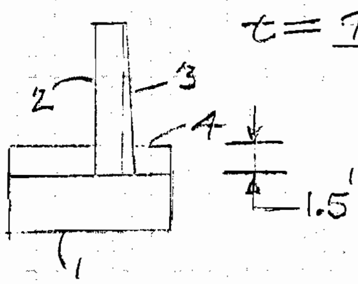
$$F_y = 40.0 \times 0.0625 \left(\overset{165}{\frac{11.5^2}{2}} - \overset{8}{\frac{2.5^2}{2}} \right) = -157^K$$

$$M_x = -165 \times \frac{11.5}{3} + 8 \times \frac{2.5}{3} = -626^{1K}$$

$$M_z = -165 \times 20.0 + 8 \times 20.0 = -3{,}140^{1K}$$

CONCRETE-WEIGHT

$$t = \frac{7.0}{2} + 12 = 16.5''$$



	F_z	X	M_y	Y	M_x
1	120	20	2,400	4	480
2	54	20	1,080	5.5	297
3	10	20	200	6.12	61
4	3	1	3	3.65	11
	187^K		$-3{,}683^{1K}$		-849^{1K}

LOAD TABULATION

LOAD NO	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	187	-849	-3,683	0
2	WATER-VERT	0	0	112	-280	-2,240	0
3	WATER-HORIZ	0	-157	0	-626	0	-3,140
4	UPLIFT-IMP	0	0	-141	386	2,820	0
5	UPLIFT-PERV	0	0	-141	444	2,820	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-157	158	-1,369	-3,103	-3,140
II	1+2+3+5	0	-157	158	-1,311	-3,103	-3,140

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No ____ OF ____
ITEM EAST MONOLITH 3 BY NDL DATE 2-23-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

COMPUTER-INPUT

```
10      FLORIDA AVE EAST 575-79
20      MONOLITH 3
30      2,2
40      2,0.0,70
50      1,12,12
60      1,5
70      -1,5.33
80      0,0,0
100     2,70,5
110     2,11,20,27,35
140     5*-1.5
170     5*0.0
200     2,270,5
210     2,11,20,27,35
240     5*-6.5
270     5*0.0
2000    0,-157,156,-1267,-3103,-3140
2010    0,-157,156,-1311,-3103,-3140
```

$0.006944 \times 51{,}700 + 0.1611\,P = 750$

$P = 2{,}427$ LB = 2.43^{k}

26A

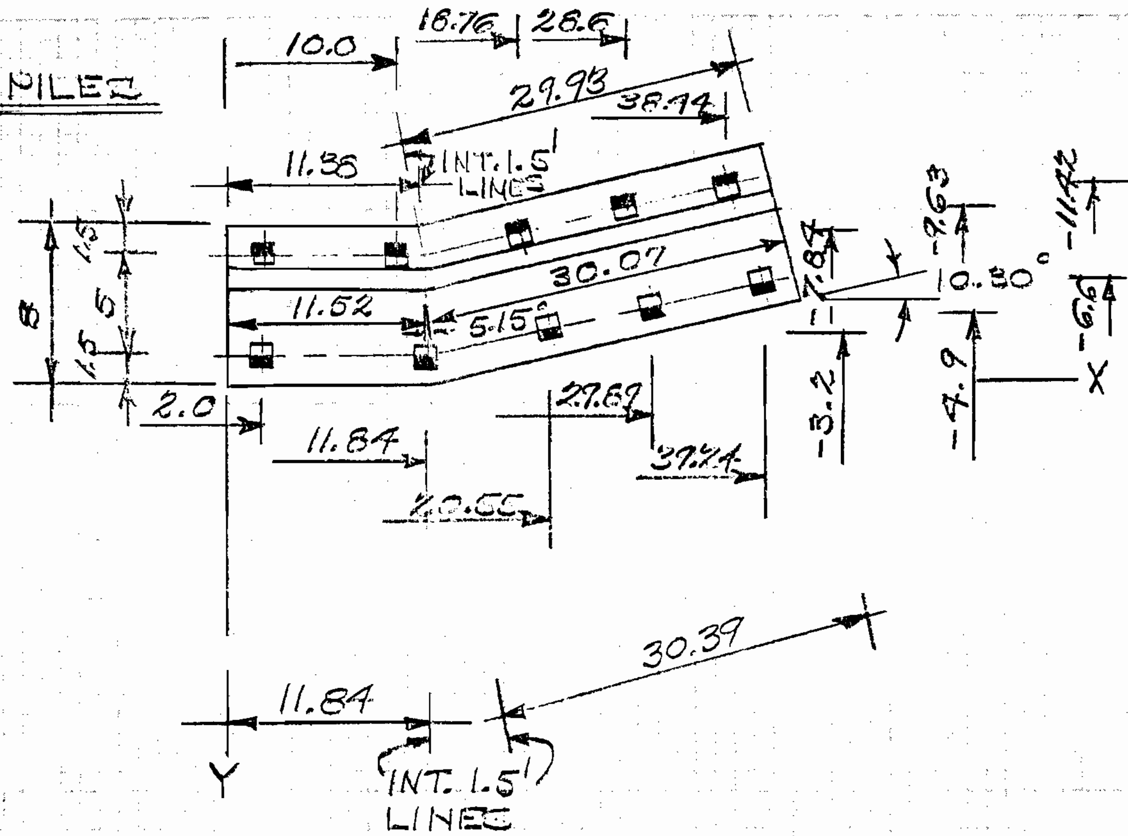
```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 3
30 2,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,5
110 2,11,20,29,38
140 5*-1.5
170 5*0.0
200 2,270,5
210 2,11,20,29,38
240 5*-6.5
270 5*0.0
2000 0,-157,158,-1369,-3103,-3140
2010 0,-157,158,-1311,-3103,-3140

READY

*RUN RK29010A

        02/26/80    12.174


    PROG. NO. 713-F3-A2-210    12:10:57  02/26/80    MOD 6B, FEB 80
```

```
FLORIDA AVE EAST 575-79
MONOLITH 3


TOTAL NUMBER OF PILES =    10



           LOAD CONDITION   1

         LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.      -157.0      158.0    -1369.0    -3103.0    -3140.0

          PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -0.9     0.0     -15.0
  6     0.8    -0.0      51.7
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1        -0.0  -157.0   158.0   -1369.0   -3103.0   -3140.0


           LOAD CONDITION   2

         LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.      -157.0      158.0    -1311.0    -3103.0    -3140.0

          PILE LOADS (PILE AXIS)
PILE
 NO.      X       Y        Z
  1    -1.9     0.0     -13.0
  6     1.9    -0.0      49.7
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2        -0.0  -157.0   158.0   -1311.0   -3103.0   -3140.0


   0   12:11:02   02/26/80    *** END OF   RUN ***


STOP        EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210     12:10:57  02/26/80          MOD 6B, F
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y          Z          RX          RY          RZ
11022 -0.198E-07 -0.127E 00   0.752E-01   0.127E-02   0.249E-05 -0.132E-10
12022 -0.179E-07 -0.268E 00   0.190E 00   0.368E-02   0.249E-05 -0.423E-10
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

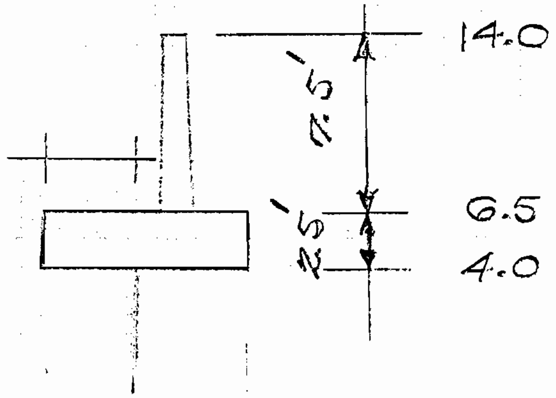
JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH 4 BY NDL DATE 2-25-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

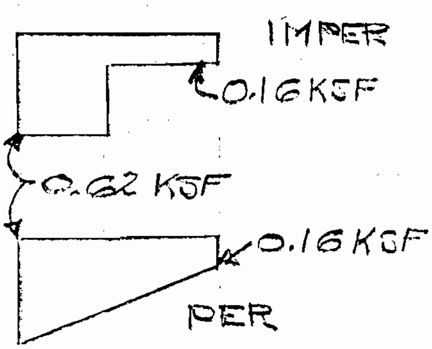


$$
\begin{array}{r}
145^\circ\ 23'\ 09'' \\
\underline{135\ \ 04\ \ 41} \\
10^\circ\ 18'\ 28''
\end{array}
$$

10.30°



$$
\begin{array}{r}
14.0 \\
\underline{4.0} \\
10.0
\end{array}
\times 0.0625 = 0.62\ KSF
$$

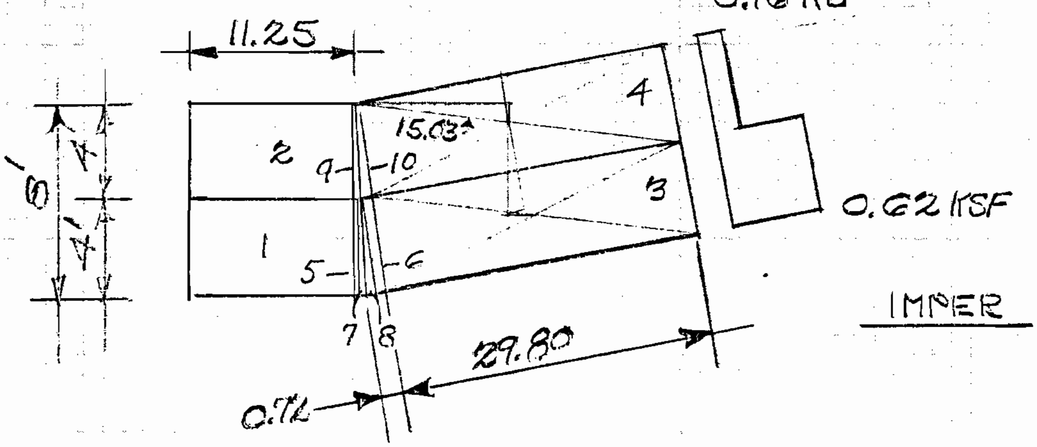


N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST MONOLITH 4 BY NDL DATE 2-23-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES

10.30
7.65
2.65°

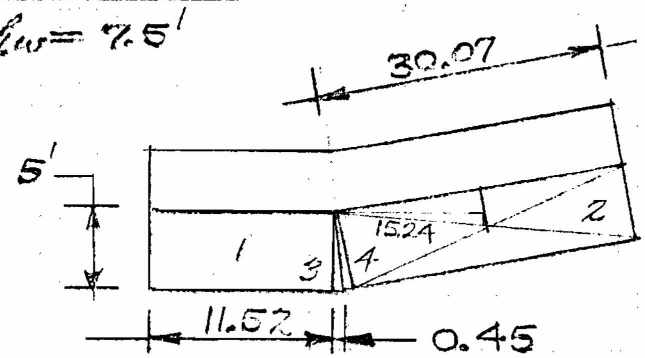


	A	F	Y	Mx	X	My
1	45.00	28	2	56	5.62	157
2	45.00	7	6	42	5.62	39
3	119.20	74	4.75	352	25.54	1,890
4	119.20	19	8.67	165	26.26	499
5	1.44	1	2	2	11.43	11
6	1.44	1	2.5	2	12.9	13
7	0.72	—		—		—
8	0.72	—		—		—
9	0.72	—		—		—
10	0.72	—		—		—
	334.16 ft²	-130^K		619^IK		2,609^IK

WATER-VERT

$h_w = 7.5'$

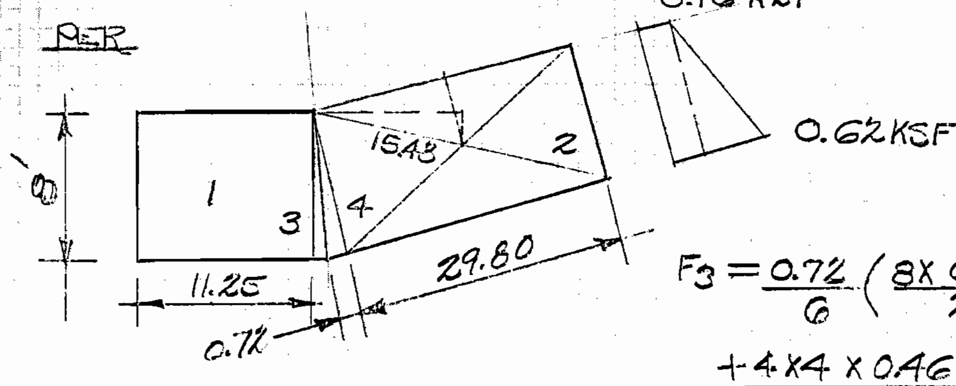
10.30
9.44
0.86°



	A	F	Y	Mx	X	My
1	57.60	27	2.5	68	5.76	156
2	150.35	70	5.23	366	26.76	1,873
3	1.12	1	1.67	2	11.67	12
4	1.12	1	1.7	2	12	12
	210.19 ft²	99^K		-438^IK		-2,053^IK

PILES

PER

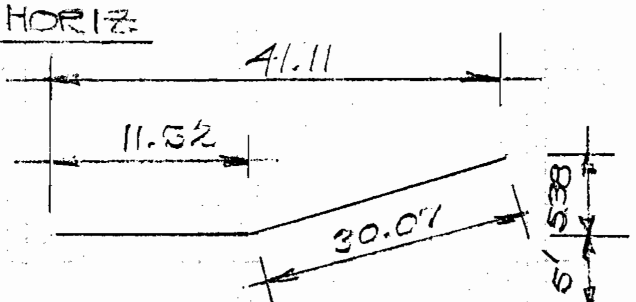


$$\begin{array}{r} 15.03 \\ 10.30 \\ \hline 4.73^\circ \end{array}$$

$$F_3 = \frac{0.72}{6}\left(\frac{8 \times 0.46}{2} + \frac{4 \times 4 \times 0.46}{2} + \frac{4 \times 4 \times 0.46}{4} + 0\right) = 0.88^{K}$$

	FORCE		Y		M_X	X		M_Y
	UNI	TRI	UNI	TRI		UNI	TRI	
1	14	21	4	2.67	112	5.62		197
2	38	55	6.73	5.42	554	26.63	26.87	2,490
3, 4	1	2	2.7	2	7	12		36
	-131^{K}				673^{IK}			$2,723^{IK}$

WATER – HORIZ.



$h_w = 7.5'$

$$F_Y = 41.11 \times 0.0625 \left(\overset{128}{\frac{10.0^2}{2}} - \overset{8}{\frac{2.5^2}{2}}\right) = -120^{K}$$

$$M_X = 128 \times \frac{10.0}{3} - \frac{8 \times 2.5}{3} = -420^{IK}$$

$$F_X = 5.38 \times 0.0625 \left(\overset{17}{\frac{10.0^2}{2}} - \overset{1}{\frac{2.5^2}{2}}\right) = -16^{K}$$

$$M_Y = 17 \times \frac{10.0}{3} - 1 \times \frac{2.5}{3} = 56^{IK}$$

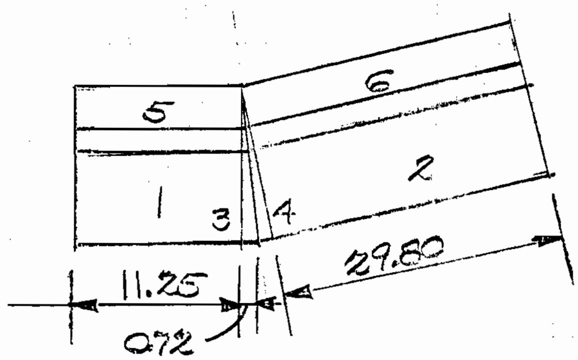
$$M_Z = -120 \times \frac{41.11}{2} - 16 \times \left(\frac{5.38}{2} + 5\right) = -2,590^{IK}$$

N-H ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST MONOLITH 4
JOB No 575-79
SHEET No OF
BY NDL DATE 2-23-80
CHKD. BY DATE

PILES

CONCRETE-WEIGHT



$\omega_{WALL} = 1.3^{K/'}$

$C.G. = 5.58'$

	F	Y	Mx	X	My
1	34	4	136	5.62	191
2	89	6.73	599	26.63	2,370
3	1	2.7	5	12	24
4	1				
5	15	5.58	84	5.73	86
6	39	7.7	300	26.1	1,018
	179^{K}		$-1,124^{'K}$		$-3,687^{'K}$

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	177	-1,124	-3,689	0
2	WATER-VERT	0	0	99	-438	-2,053	0
3	WATER-HORIZ	-16	-120	0	-420	56	-2,590
4	UPLIFT-IMP	0	0	-130	619	2,609	0
5	UPLIFT-PERV	0	0	-131	673	2,723	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	-16	-120	148	-1,363	-3,077	-2,590
II	1+2+3+5	-16	-120	147	-1,309	-2,963	-2,590

PILES

COMPUTER-INPUT

```
10    FLORIDA EAST 575-79
20    MONOLITH 4
30    4,2
40    2,0.0,70
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,90,2
110   2.0,11.89
140   2*-1.5
170   2*0.0
200   2,77.7,3
210   20.55,27.89,39.24
240   -3.2,-4.7,-6.6
270   3*0.0
300   2,270,2
310   2,10.0
340   2*-6.5
370   2*0.0
400   2,259.7,3
410   15.76,28.6,38.44
440   -2.37,-9.65,-11.42
470   3*0.0
2000  -16,-120,145,-1363,-3077,-2570
2010  -16,-120,141,-1309,-2963,-2570
```

$0.006944 \times 60,300 + 0.1611\, P = 750$

$P = 2,035\ LB \approx 2.03^{K}$

```
03/11/80    14.60

10 FLORIDA AVE EAST 575-79
20 MONOLITH 4
30 4,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 2.0,11.84
140 2*-1.5
170 2*0.0
200 2,79.7,3
210 20.55,29.89,39.24
240 -3.2,-4.9,-6.6
270 3*0.0
300 2,270,2
310 2,10.0
340 2*-6.5
370 2*0.0
400 2,259.7,3
410 18.76,28.6,38.44
440 -7.84,-9.63,-11.42
470 3*0.0
2000 -16,-120,148,-1363,-3077,-2590
2010 -16,-120,147,-1309,-2963,-2590

READY

*RUN RK29010A

        03/11/80    14.633


    PROG. NO. 713-F3-A2-210    14:38:31   03/11/80    MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 MONOLITH 4

TOTAL NUMBER OF PILES =    10
```

MONOLITH 4

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-16.0	-120.0	148.0	-1363.0	-3077.0	-2590.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.2	0.3	-33.7
2	-1.3	0.3	19.3
3	-1.3	0.1	1.8
4	-1.3	0.1	-8.9
5	-1.2	0.1	-19.4
6	1.2	-0.3	13.5
7	1.1	-0.3	55.8
8	1.2	-0.1	57.7
9	1.2	-0.1	45.6
10	1.2	-0.1	33.5

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-16.0	-120.0	148.0	-1363.0	-3077.0	-2590.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-16.0	-120.0	147.0	-1309.0	-2963.0	-2590.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.4	0.3	-38.9
2	-1.6	0.3	27.5
3	-1.6	0.1	5.3
4	-1.5	0.1	-9.1
5	-1.5	0.1	-23.6
6	1.5	-0.3	7.7
7	1.4	-0.3	60.8
8	1.4	-0.1	61.2
9	1.5	-0.1	44.8
10	1.5	-0.1	28.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-16.0	-120.0	147.0	-1309.0	-2963.0	-2590.0

```
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      14:38:31  03/11/80          MOD 6B, F
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X            Y           Z           RX           RY           RZ
11022 -0.461E-01  -0.172E 00  0.933E-01  0.227E-02  -0.339E-03  0.597E-05
12022 -0.482E-01  -0.209E 00  0.117E 00  0.289E-02  -0.424E-03  0.736E-05
```

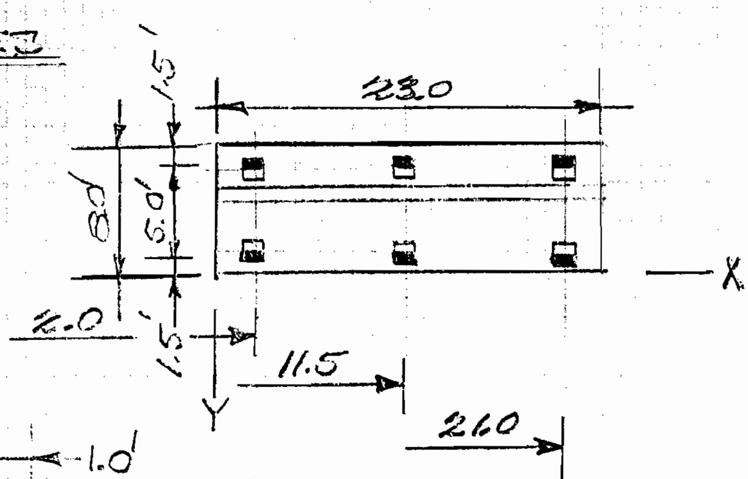
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

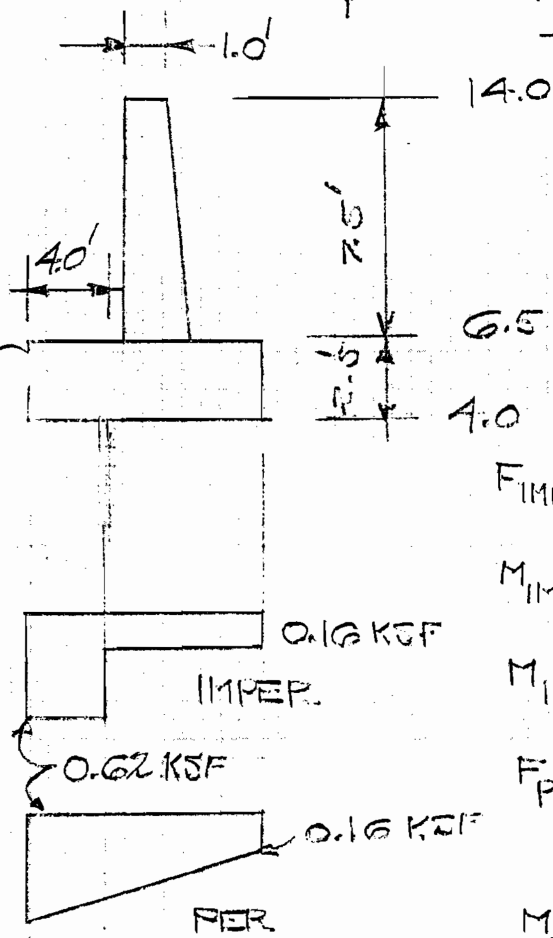
JOB ________ SHEET Nº ____ OF ____

ITEM EAST MONOLITH 5 BY NDL DATE 2-23-80

JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES





14.0
4.0
10.0 X 0.0625 = 0.62 KSF

$$F_{IMPER_Z} = \overset{57}{0.62 \times 4 \times 23.0} + \overset{15}{0.16 \times 4 \times 23.0} = -72^{K}$$

$$M_{IMPER_Y} = 57 \times 11.5 + 15 \times 11.5 = 828^{IK}$$

$$M_{IMPER_X} = 57 \times 2 + 15 \times 6 = 204^{IK}$$

$$F_{PER_Z} = \overset{29}{0.16 \times 8 \times 23.0} + \overset{42}{\frac{(0.62-0.16)}{2} \times 8 \times 23.0}$$
$$= -71^{K}$$

$$M_{PER_Y} = 29 \times 11.5 + 42 \times 11.5 = 816^{IK}$$

$$M_{PER_X} = 29 \times 4 + 42 \times \frac{8}{3} = 228^{IK}$$

PILES

WATER-VERT

$F_z = 7.5 \times 0.0625 \times 23.0 \times 5 = 54^K$

$M_Y = 54 \times 11.5 = -621^{1K}$

$M_X = 54 \times 2.5 = -135^{1K}$

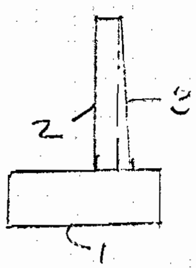
WATER-HORIZ

$F_Y = 23.0 \times 0.0625 \left(\frac{\overset{72}{10.0^2}}{2} - \frac{\overset{4}{2.5^2}}{2} \right) = -68^K$

$M_X = -72 \times \frac{10.0}{3} + 4 \times \frac{2.5}{3} = -237^{1K}$

$M_Z = -72 \times 11.5 + 4 \times 11.5 = -782^{1K}$

CONCRETE-WEIGHT



$t = \frac{7.5}{2} + 12 = 15.75$

	F	Y	Mx	X	My
1	69	4	276	11.5	794
2	26	5.5	143	11.5	299
3	4	6.1	24	11.5	46
	99^K		-443^{1K}		$-1,139^{1K}$

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	99	-443	-1,139	0
2	WATER-VERT	0	0	54	-135	-621	0
3	WATER-HORIZ	0	-68	0	-237	0	-782
4	UPLIFT-IMP	0	0	-72	204	828	0
5	UPLIFT-PERV	0	0	-71	228	816	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	0	-68	81	-611	-932	-782
II	1+2+3+5	0	-68	82	-587	-944	-782

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH 5 BY NDL DATE 2-23-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER-INPUT

```
10    FLORIDA AVE EAST 575-79
20    MONOLITH 5
30    2,2
40    2,0.0,70
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,90,3
110   2.0,11.5,21.0
140   3*-1.5
170   3*0.0
200   2,270,3
210   2.0,11.5,21.0
240   3*-6.5
270   3*0.0
2000  0,-68,81,-611,-732,-782
2010  0,-68,82,-581,-744,-782
```

$0.006711 \times 35{,}700 + 0.1611\,\varphi = 750$

$\varphi = 3{,}117\ LB \approx 3.12^{k}$

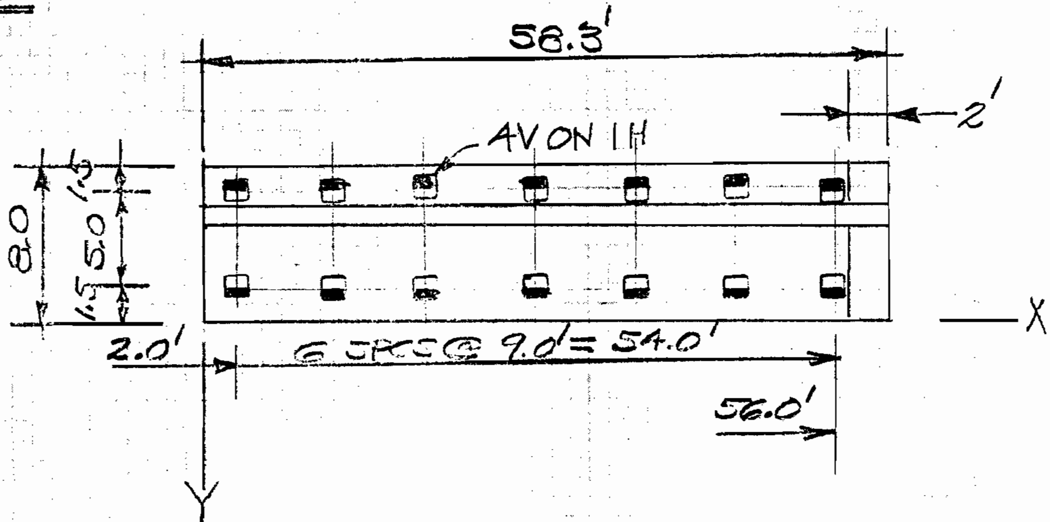
34 A

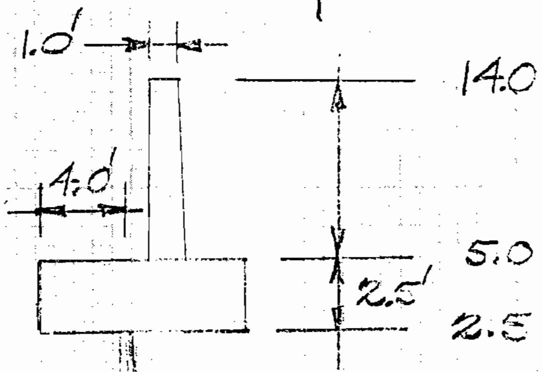
```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 5
30 2,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 2.0,11.5,21.0
140 3*-1.5
170 3*0.0
200 2,270,3
210 2.0,11.5,21.0
240 3*-6.5
270 3*0.0
2000 0,-68,81,-611,-932,-782
2010 0,-68,82,-587,-944,-782

READY

*RUN RK29010A

        02/26/80    12.431


    PROG. NO. 713-F3-A2-210    12:26:15  02/26/80    MOD 6B, FEB 80
```

```
FLORIDA AVE EAST 575-79
MONOLITH 5

TOTAL NUMBER OF PILES =     6


           LOAD CONDITION   1

         LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.       -68.0       81.0      -611.0     -932.0     -782.0

           PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1     -1.6     0.0     -7.1
  4      1.5    -0.0     37.2
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1        -0.0    -68.0     81.0    -611.0    -932.0    -782.0


           LOAD CONDITION   2

         LOADS ON PILE CAP
      X          Y          Z          MX         MY         MZ
      0.       -68.0       82.0      -587.0     -944.0     -782.0

           PILE LOADS (PILE AXIS)
PILE
 NO.       X       Y        Z
  1     -2.4     0.0     -5.3
  4      2.4    -0.0     35.7
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2         0.0    -68.0     82.0    -587.0    -944.0    -782.0


   0    12:26:19   02/26/80   *** END OF  RUN ***


STOP        EOJ

*OLD P29010
READY
*LIST 11021-11022,12022

0           PROG NO. 713-F3-A2-210      12:26:15   02/26/80          MOD 6B, FE
11021         X          Y          Z          RX          RY          RZ
11022 -0.164E-07 -0.222E 00  0.162E 00  0.314E-02 -0.981E-07  0.316E-10
12022 -0.167E-07 -0.336E 00  0.255E 00  0.507E-02 -0.196E-06  0.607E-10
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
JOB
ITEM EAST MONOLITH 8
JOB NO 575-79
SHEET NO OF
BY NDL DATE 2-25-80
CHKD. BY DATE

PILES





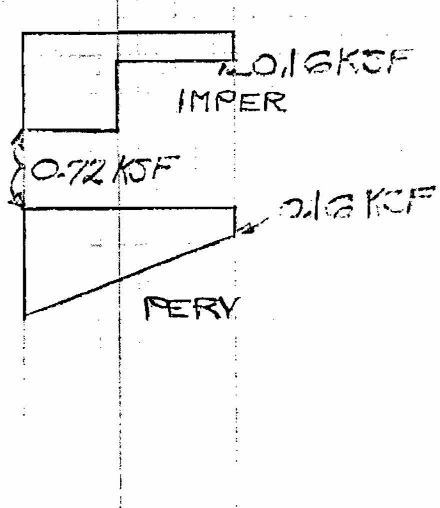
$$\begin{array}{r} 14.0 \\ 2.5 \\ \hline \end{array}$$

$$11.5 \times 0.0625 = 0.72\ KSF$$

$$F_{IMPER_Z} = \overset{168}{0.72 \times 4 \times 58.3} + \overset{37}{0.16 \times 4 \times 58.3} = -205^{K}$$

$$M_{IMPER_Y} = 168 \times 29.15 + 37 \times 29.15 = 5{,}976^{'K}$$

$$M_{IMPER_X} = 168 \times 2 + 37 \times 6 = 558^{'K}$$



$$F_{PER_Z} = \overset{75}{0.16 \times 8 \times 58.3} + \overset{131}{\frac{(0.72-0.16)}{2} \times 8 \times 58.3} =$$
$$= -206^{K}$$

$$M_{PER_Y} = 75 \times 29.15 + 131 \times 29.15 = 6{,}005^{'K}$$

$$M_{PER_X} = 75 \times 4 + 131 \times \frac{8}{3} = 649^{'K}$$

PILES

WATER-VERT

$F_Z = 9 \times 5 \times 58.3 \times 0.0625 = 164^K$

$M_Y = 164 \times 29.15 = -4,781\ ^{'K}$

$M_X = 164 \times 2.5 = -410\ ^{'K}$

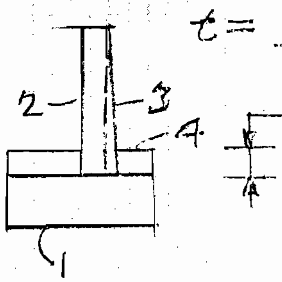
WATER-HORIZ

$F_Y = 58.3 \times 0.0625 \left(\overset{241}{\frac{11.5^2}{2}} - \overset{11}{\frac{2.5^2}{2}} \right) = -230^K$

$M_X = -241 \times \frac{11.5}{3} + 11 \times \frac{2.5}{3} = -915\ ^{'K}$

$M_Z = -241 \times 29.15 + 11 \times 29.15 = -6,705\ ^{'K}$

CONCRETE-WEIGHT



$t = \frac{9}{2} + 12 = 16.5''$

	F_Z	X	M_Y	Y	M_X
1	175	29.15	5,101	4	700
2	79	29.15	2,303	5.5	434
3	15	29.15	437	6.12	92
4	3	57.3	172	3.65	11
	272 K		-8,013 'K		-1,237 'K

LOAD TABULATION

LOAD NO	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	272	-1,237	-8,013	0
2	WATER-VERT	0	0	164	-410	-4,781	0
3	WATER-HORIZ	0	-230	0	-915	0	-6,705
4	UPLIFT-IMP	0	0	-205	558	5,976	0
5	UPLIFT-PERV	0	0	-206	649	6,005	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	0	-230	231	-2,004	-6,818	-6,705
II	1+2+3+5	0	-230	230	-1,913	-6,789	-6,705

$0.006944 \times (65,300) + 0.1611\varphi = 750$

$\varphi = 1,841\ LB \approx 1.84^K$

03/28/80   13.72

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 8
30 3,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,7
110 2.0,11.0,20.0,29.0,38.0,47.0,56.0
140 7*-1.5
170 7*0.0
200 2,270,6
210 2.0,11.0,29.0,38.0,47.0,56.0
240 6*-6.5
270 6*0.0
300 3,270,1
310 20.0
340 -6.5
370 0.0
2000 0,-230,231,-2004,-6818,-6705
2010 0,-230,230,-1913,-6789,-6705
```

READY

```
*CLEAR
AFT CLEARED

*RUN RK29010A
```

03/28/80   13.736

PROG. NO. 713-F3-A2-210   13:44:41   03/28/80   MOD 6B, FEB 80

FLORIDA AVE EAST 575-79
MONOLITH 8

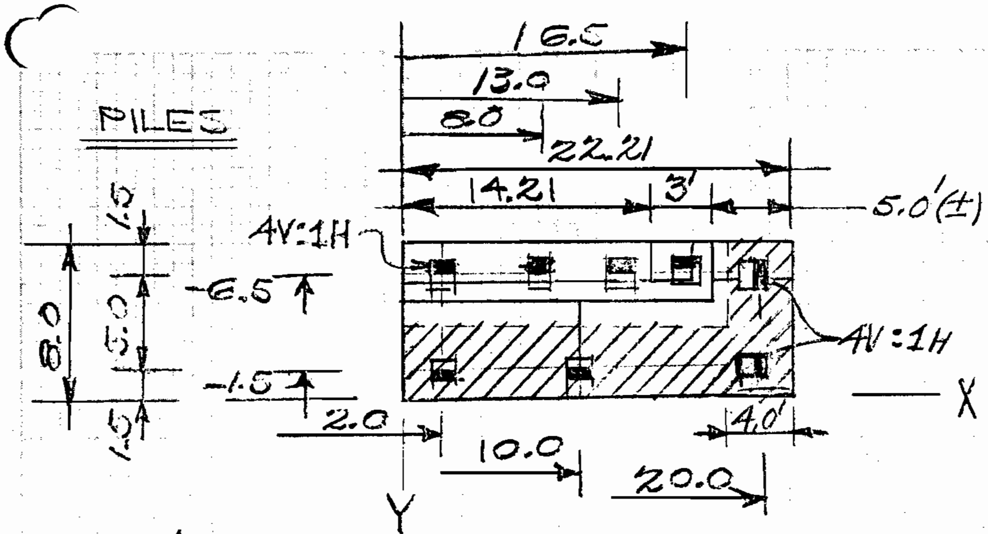
TOTAL NUMBER OF PILES =   14

```
            LOAD CONDITION   1      MONOLITH 8

          LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.      -230.0      231.0     -2004.0     -6818.0     -6705.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X        Y        Z
  1     -1.2      0.0     -17.4
  8      1.1      0.0      61.1
  9      1.1      0.0      60.1
 10      1.1      0.0      58.3
 11      1.1      0.0      57.4
 12      1.1      0.0      56.5
 13      1.1      0.0      55.5
 14      1.1      0.0      24.0
   1      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   1        0.0   -230.0    231.0    -2004.0    -6818.0    -6705.0


            LOAD CONDITION   2

          LOADS ON PILE CAP
      X          Y          Z          MX          MY          MZ
      0.      -230.0      230.0     -1913.0     -6789.0     -6705.0

           PILE LOADS (PILE AXIS)
PILE
 NO.      X        Y        Z
  1     -2.1      0.0     -14.6
  8      2.0      0.0      65.3
  9      2.0      0.0      63.5
 10      1.9      0.0      60.0
 11      1.9      0.0      58.2
 12      1.9      0.0      56.4
 13      1.9      0.0      54.6
 14      2.0      0.0      -0.8
   2      SUMMATION OF PILE LOADS (STRUCTURE AXIS)


   2        0.0   -230.0    230.0    -1913.0    -6789.0    -6705.0


   0   13:44:52   03/28/80    *** END OF  RUN ***


STOP       EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      13:44:41   03/28/80          MOD 6B, F
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021      X           Y            Z           RX          RY          RZ
11022 -0.396E-03 -0.169E 00   0.104E 00   0.182E-02   0.237E-05   0.825E-05
12022 -0.632E-03 -0.288E 00   0.201E 00   0.379E-02   0.597E-05   0.132E-04
```

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

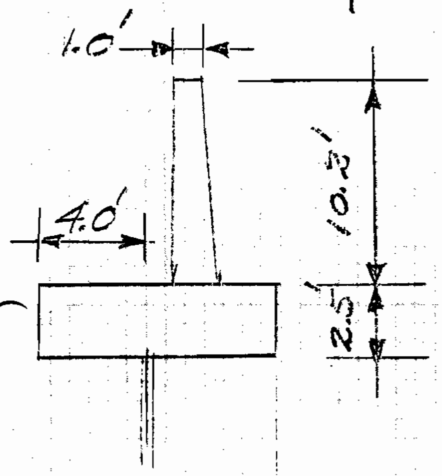
JOB ______ SHEET Nº ______ OF ______
ITEM: EAST MONOLITH 9 BY: NDL DATE: 2-25-80
JOB Nº: 575-79 CHKD. BY ______ DATE ______

PILES

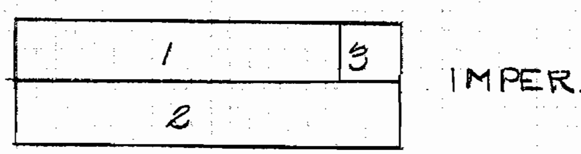


242° 10' 17"
149 14 36
92° 55' 41"
2° 55' 41" = 2.93°

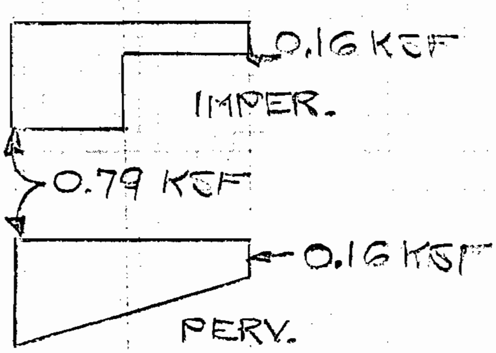
4+04.28 4+21.49
5.00 3+99.28
3+99.28 22.21'



14.0
1.3
12.7 × 0.0625 = 0.79 KSF

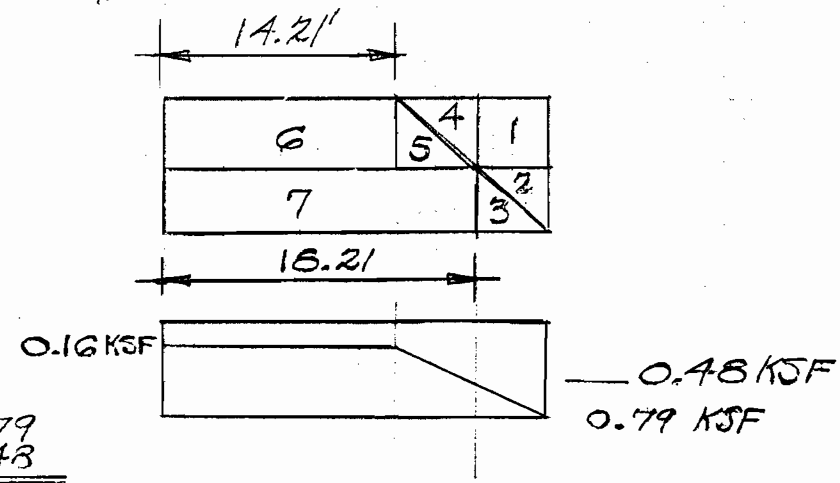


$F_{IMPER_z} = \overset{12}{0.16 \times 4 \times 18.21} + \overset{70}{0.79 \times 22.21 \times 4} + \overset{13}{0.79 \times 4 \times 4} = -95^K$



$M_{IMPER_y} = \overset{109}{12 \times 18.21/2} + \overset{777}{70 \times 22.21/2} + \overset{263}{13 \times 20.21} = 1{,}149^{\,1K}$

$M_{IMPER_x} = 12 \times 6 + 70 \times 2 + 13 \times 6 = 290^{\,1K}$



0.79
0.48
0.31 KSF

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET Nº ____ OF ____
ITEM EAST MONOLITH 9 BY NDL DATE 2-25-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES

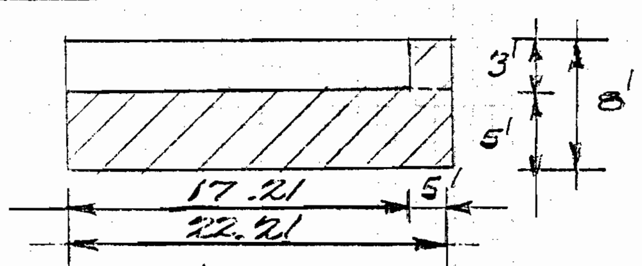
$$F_{PER_Z} = (\overset{8}{4\times4\times0.48} + \overset{2}{4\times\tfrac{4}{2}\times0.31}) + (\overset{4}{4\times\tfrac{4}{2}\times0.48} + \overset{2}{4\times\tfrac{4}{3}\times0.31}) +$$
$$+ (4+2) + (\overset{1}{4\times\tfrac{4}{2}\times0.16} + \overset{2}{4\times\tfrac{1}{3}\times0.31}) + (1+2) +$$
$$+ (\overset{9}{14.21\times4\times0.16} + \overset{9}{14.21\times\tfrac{4}{2}\times0.31}) + (\overset{35}{18.21\times4\times0.48} + \overset{11}{18.21\times\tfrac{4}{2}\times0.31})$$
$$= -92^{K}$$

$$M_{PER_Y} = (\overset{162}{8\times20.21} + \overset{42}{2\times20.88}) + (\overset{84}{4\times20.88} + \overset{42}{2\times21.21}) + (\overset{78}{4\times19.54} + \overset{39}{2\times19.71}) +$$
$$+ (\overset{17}{1\times16.88} + \overset{34}{2\times17.21}) + (\overset{16}{1\times15.54} + \overset{31}{2\times15.71}) + (\overset{64}{9\times7.10} +$$
$$+ \overset{64}{9\times7.1}) + (\overset{318}{35\times9.1} + \overset{100}{11\times9.1}) = 1{,}091^{IK}$$

$$M_{PER_X} = (\overset{48}{8\times6} + \overset{12}{2\times6}) + (\overset{11}{4\times2.67} + \overset{5}{2\times2.5}) + (\overset{5}{4\times1.33} + \overset{2}{2\times1}) +$$
$$+ (\overset{7}{1\times6.67} + \overset{12}{2\times6}) + (\overset{5}{1\times5.33} + \overset{10}{2\times5}) + (\overset{54}{9\times6} + \overset{48}{9\times5.33}) +$$
$$+ (\overset{70}{35\times2} + \overset{15}{11\times1.33}) = 304^{IK}$$

WATER-VERT

$h_w = 10.2'$



$$F_Z = \overset{71}{22.21\times5\times10.2\times0.0625} + \overset{10}{5\times3\times10.2\times0.0625} = 81^{K}$$

$$M_Y = \overset{788}{71\times22.21/2} + \overset{197}{10\times19.71} = -985^{IK}$$

$$M_X = 71\times2.5 + 10\times6.5 = -242^{IK}$$

WATER-HORIZ

$$F_Y = 17.21\times0.0625\times\left(\overset{87}{\frac{12.7^2}{2}} - \overset{3}{\frac{2.5^2}{2}}\right) = -84^{K}$$

$$M_X = 87\times12.7/3 - 3\times2.5/3 = -366^{IK}$$

$$F_X = 3\times0.0625\times\left(\overset{15}{\frac{12.7^2}{2}} - \overset{1}{\frac{2.5^2}{2}}\right) = -14^{K}$$

$$M_Z = -(14\times6.5 + 84\times8.60) = -813^{IK}$$

$$M_Y = 15\times12.7/3 - 1\times2.5/3 = 63^{IK}$$

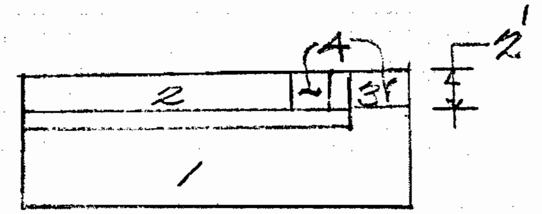
N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

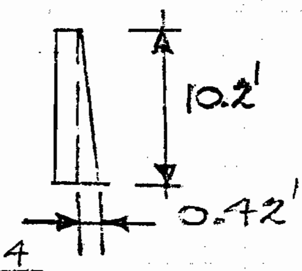
JOB ____ SHEET Nº ____ OF ____
ITEM EAST MONOLITH 9 BY NDL DATE 2-25-80
JOB Nº 575-79 CHKD. BY ____ DATE ____

PILES

CONCRETE-WEIGHT

$t_4 = 1.2'$





$$C.G. = \frac{\overset{1.53}{0.5 \times 10.2 \times 1 \times 0.15} + \overset{0.32}{0.42/2 \times 10.2 \times 1 \times 0.15} \times 1.14}{1.53 + 0.32}$$

$= 0.61'$ WT $= 1.85^{k/1}$

	F	X	M_Y	Y	M_X
1	67	11.10	744	4	268
2	32	8.60	275	5.61	180
3	4	16.65	67	7.1	28
4	2	18.58	37	7	14
	105^k		$-1{,}123^{1k}$		-490^{1k}

LOAD TABULATION

LOAD Nº	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	105	-490	-1,123	0
2	WATER-VERT	0	0	81	-242	-785	0
3	WATER-HORIZ	-14	-84	0	-366	63	-813
4	UPLIFT-IMP	0	0	-95	290	1,149	0
5	UPLIFT-PERV	0	0	-92	304	1,091	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	-14	-84	91	-808	-696	-813
II	1+2+3+5	-14	-84	94	-794	-954	-813

```
03/28/80    15.41

10 FLORIDA AVE EAST 575-79
20 MONOLITH 9
30 4,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 2.0,10.0
140 2*-1.5
170 2*0.0
200 4,0,2
210 2*20.0
240 -1.5,-6.5
270 2*0.0
300 4,270,1
310 2.0
340 -6.5
370 0.0
400 2,270,3
410 8.0,13.0,16.5
440 3*-6.5
470 3*0.0
2000 -14,-84,91,-808,-896,-813
2010 -14,-84,94,-794,-954,-813

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/28/80    15.433


    PROG. NO. 713-F3-A2-210    15:27:19  03/28/80    MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 MONOLITH 9

TOTAL NUMBER OF PILES =     8
```

41A

LOAD CONDITION 1 MONOLITH 9

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-14.0	-84.0	91.0	-808.0	-896.0	-813.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	1.1	-36.8
2	-0.3	1.1	-0.4
3	-1.1	0.0	-11.0
4	-0.9	0.0	-14.5
5	0.5	-0.9	34.8
6	0.3	-0.9	49.6
7	0.1	-0.9	42.0
8	0.0	-0.9	36.7

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-14.0	-84.0	91.0	-808.0	-896.0	-813.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-14.0	-84.0	94.0	-794.0	-954.0	-813.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	1.1	-38.1
2	-0.4	1.1	2.3
3	-1.2	0.0	-5.4
4	-1.0	0.0	-18.5
5	0.6	-1.0	33.9
6	0.3	-1.0	50.9
7	0.2	-1.0	42.3
8	0.0	-1.0	36.2

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-14.0	-84.0	94.0	-794.0	-954.0	-813.0

0 15:27:24 03/28/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

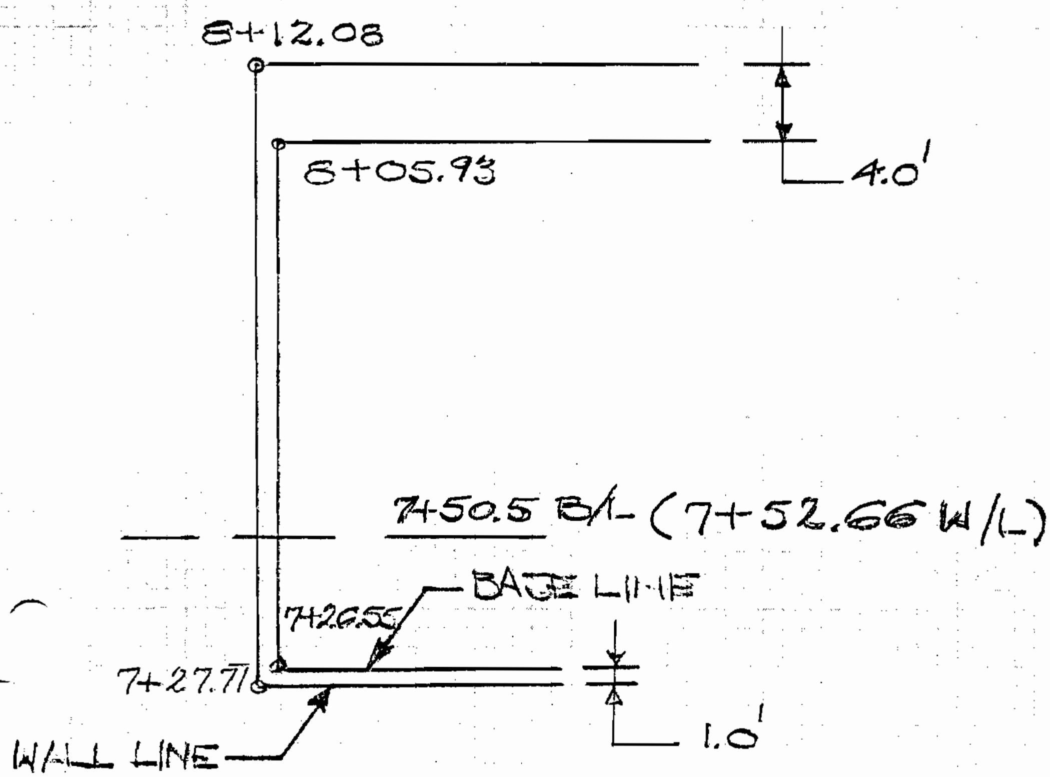
0 PROG NO. 713-F3-A2-210 15:27:19 03/28/80 MOD 6B,
11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

	X	Y	Z	RX	RY	RZ
11021						
11022	-0.171E 00	-0.901E-01	0.126E-01	0.137E-03	-0.960E-04	0.385E-03
12022	-0.180E 00	-0.102E 00	0.188E-01	0.260E-03	-0.105E-03	0.429E-03

N-Y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM ______ BY NDL DATE 3-3-80
JOB No 575-79 CHKD. BY ______ DATE ______

EAST R.R. WALL LINE AT ℄



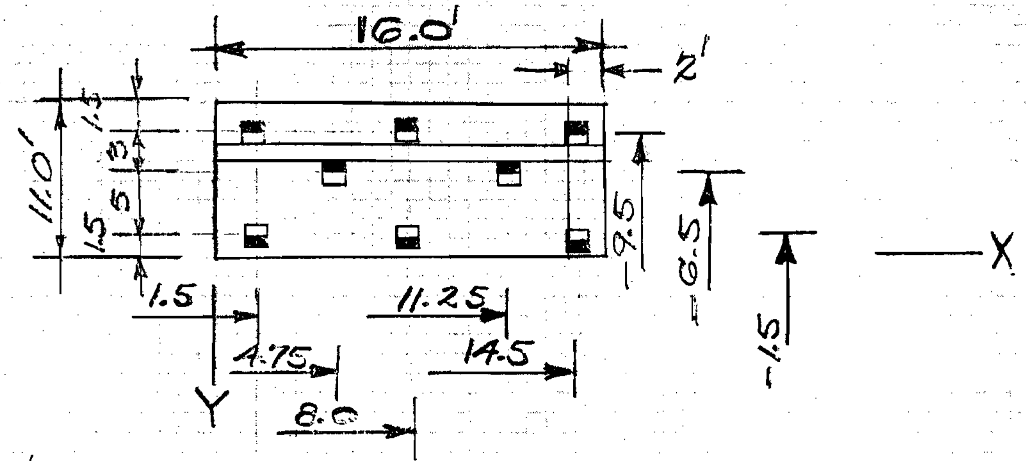
805.93
726.55
79.38'
5.00
84.38'

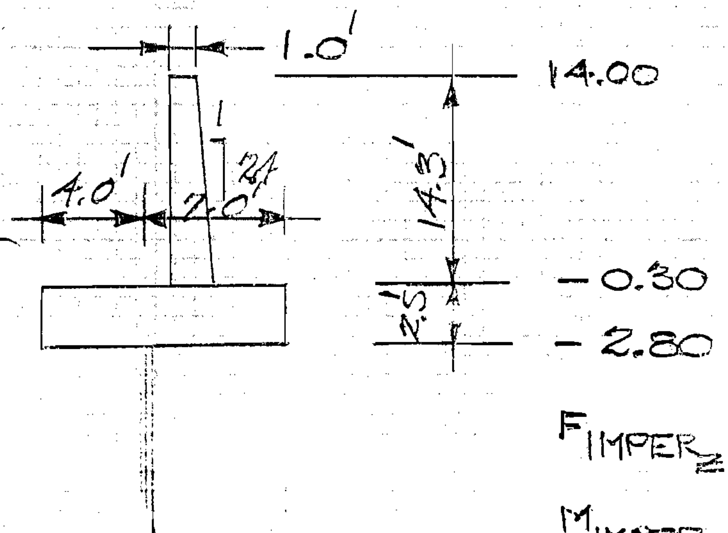
812.08
727.71
84.37'

726.55

750.50
726.55
23.95
1.00
24.95
727.71
752.66
7+52.66

PILES





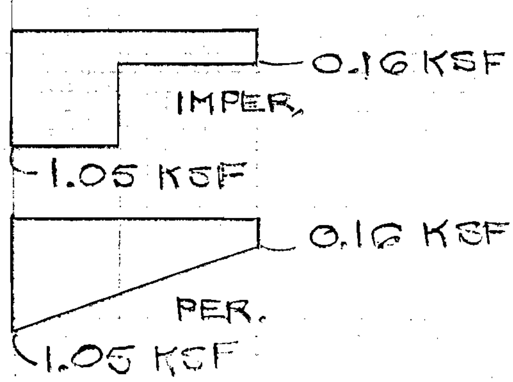
$$\begin{array}{r} 14.0 \\ -\ 2.8 \\ \hline \end{array}$$

$16.8 \times 0.0625 = 1.05\ KSF$

$2.5 \times 0.0625 = 0.16\ KSF$

$$F_{IMPER_Z} = \overset{67}{1.05 \times 4 \times 16} + \overset{18}{0.16 \times 7 \times 16} = -85^{K}$$

$$M_{IMPER_Y} = 67 \times 8 + 18 \times 8 = 680'^{K}$$



$$M_{IMPER_X} = 67 \times 2 + 18 \times 7.5 = 269'^{K}$$

$$F_{PER_Z} = \overset{28}{0.16 \times 11 \times 16} + \overset{78}{\frac{(1.05-0.16)}{2} \times 11 \times 16}$$

$$= -106^{K}$$

$$M_{PER_Y} = 28 \times 8 + 78 \times 8 = 848'^{K}$$

$$M_{PER_X} = 28 \times 5.5 + 78 \times \frac{11}{3} = 440'^{K}$$

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ____ ITEM EAST MONOLITH II JOB No 575-79

SHEET No ____ OF ____ BY NDL DATE 3-8-80 CHKD. BY ____ DATE ____

PILES

WATER-VERT

$F_z = 14.3 \times 7 \times 16 \times 0.0625 = 100^K$

$M_y = 100 \times 8 = -800^{1K}$

$M_x = 100 \times 3.5 = -350^{1K}$

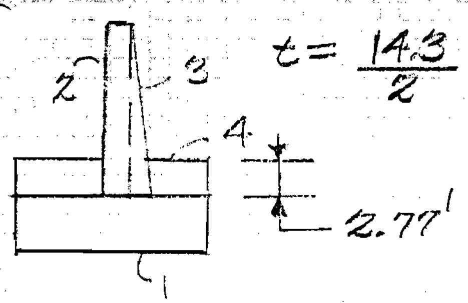
WATER-HORIZ

$F_y = 16 \times 0.0625 \left(\overset{141}{\frac{16.8^2}{2}} - \overset{3}{\frac{2.5^2}{2}} \right) = -138^K$

$M_x = -141 \times \frac{16.8}{3} + 3 \times \frac{2.5}{3} = -787^{1K}$

$M_z = -141 \times 8 + 3 \times 8 = -1{,}104^{1K}$

CONCRETE WEIGHT



$t = \frac{14.3}{2} + 12 = 19.15''$

	F_z	X	M_y	Y	M_x
1	66	8	528	5.5	363
2	34	8	272	7.5	255
3	10	8	80	8.2	82
4	9	15	135	5.4	49
	119^K		$-1{,}015^{1K}$		-749^{1K}

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	119	-749	-1,015	0
2	WATER-VERT	0	0	100	-350	-800	0
3	WATER-HORIZ	0	-138	0	-787	0	-1,104
4	UPLIFT-IMP	0	0	-85	269	680	0
5	UPLIFT-PERV	0	0	-106	440	848	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
I	1+2+3+4	0	-138	134	-1,617	-1,135	-1,104
II	1+2+3+5	0	-138	113	-1,446	-967	-1,104

JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH II BY NDL DATE 3-8-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER-INPUT

```
10     FLORIDA AVE EAST 575-77
20     MONOLITH II
30     2,2
40     2,0.0, 70
50     1,12,12
60     1,5
70     -1, 8.33
80     0,0,0
100    2,90,3
110    1.5, 8.0, 14.5
140    3*-1.5
170    3*0.0
200    2,2.70,5
210    4.75, 11.25, 1.5, 8.0, 14.5
240    2*-6.5, 3*-9.5
270    5*0.0
2000   0,-138, 134, -1617, -1135, -1104
2010   0,-136, 113, -1446, -967, -1104
```

45A

```
03/11/80    13.73


10 FLORIDA AVE EAST 575-79
20 MONOLITH 11
30 2,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,3
110 1.5,8.0,14.5
140 3*-1.5
170 3*0.0
200 2,270,5
210 4.75,11.25,1.5,8.0,14.5
240 2*-6.5,3*-9.5
270 5*0.0
2000 0,-138,134,-1617,-1135,-1104
2010 0,-138,113,-1446,-967,-1104

READY

*RUN RK29010A

        03/11/80    13.751


    PROG. NO. 713-F3-A2-210    13:45:21  03/11/80    MOD 6B, FEB 80


 FLORIDA AVE EAST 575-79
 MONOLITH 11

TOTAL NUMBER OF PILES =     8
```

458

LOAD CONDITION 1 MONOLITH II

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-138.0	134.0	-1617.0	-1135.0	-1104.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	0.0	-28.6
2	-0.2	0.0	-26.0
3	-0.2	0.0	-23.3
4	0.2	0.0	38.3
5	0.2	0.0	40.5
6	0.2	0.0	47.5
7	0.2	0.0	49.7
8	0.2	0.0	51.8

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-138.0	134.0	-1617.0	-1135.0	-1104.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-138.0	113.0	-1446.0	-967.0	-1104.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.0	-31.9
2	-0.4	0.0	-29.2
3	-0.4	0.0	-26.5
4	0.4	0.0	45.8
5	0.4	0.0	48.0
6	0.4	0.0	38.0
7	0.4	0.0	40.2
8	0.4	0.0	42.4

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-0.0	-138.0	113.0	-1446.0	-967.0	-1104.0

0 13:45:27 03/11/80 +++ END OF RUN +++

STOP EOJ

+OLD P29010
READY
+LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 13:45:21 03/11/80 MOD 6B, FE

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

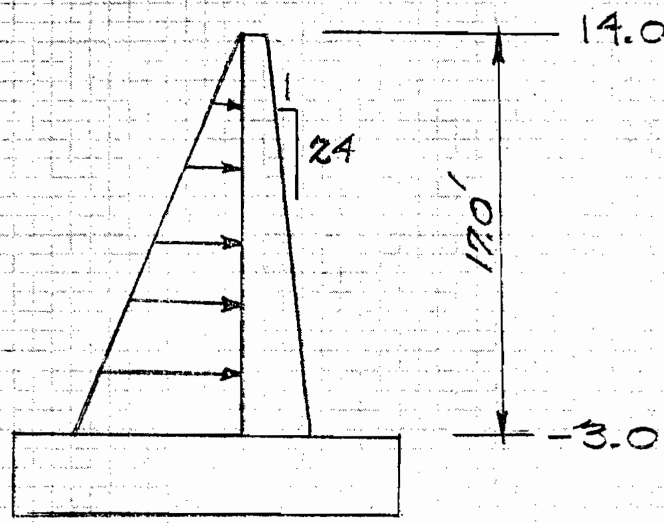
11021	X	Y	Z	RX	RY	RZ
11022	-0.352E-03	-0.371E-01	-0.761E-02	-0.217E-03	-0.237E-04	0.510E-05
12022	-0.352E-03	-0.669E-01	0.112E-01	0.142E-03	-0.237E-04	0.510E-05

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ___ ITEM EAST MONOLITH 14 JOB No 575-79

SHEET No ___ OF ___ BY NDL DATE 3-8-80 CHKD. BY ___ DATE ___

STEM THICKNESS



$F_{/FT} = 17 \times 0.0625 \times \frac{17}{2} = 9.03^{K/1}$

$M = 9.03 \times \frac{17}{3} = 51.18^{1K/1}$ OR 614,000 IN.LB

$f'_c = 3{,}000$ PSI

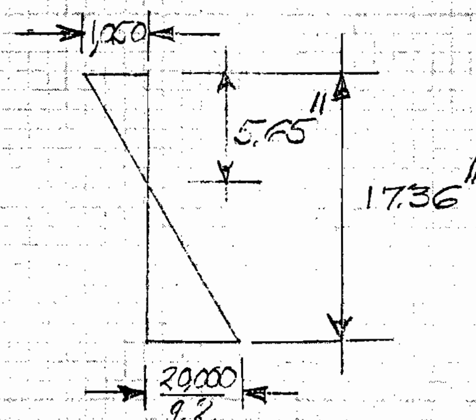
$f_c = 0.35 \times 3{,}000 = 1{,}050$ PSI

$n = 9.2$, $K = 152$, $k = 0.326$

$j = 0.891$, $p = 0.0085$

$f_s = 20{,}000$ PSI, $a = 1.44$

$d = (12 + \frac{17}{2}) - 2.5 - 0.64 = 17.36''$ (20.5; #10)



$2{,}174 + 1{,}050 = 3{,}224$

$\frac{Kd}{17.36} = \frac{1{,}050}{3{,}224}$ ∴ $Kd = 5.65''$

$jd = \frac{5.65}{3} - 17.36 = 15.48''$

$C_1 = T_1 = \frac{1{,}050}{2} \times 12 \times 5.65 = 35{,}780$ LB

$A_{S_1} = \frac{35{,}780}{20{,}000} = 1.79\ IN^2/FT$

$M = 35{,}780 \times 15.48 / 12{,}000 = 46.16^{1K}$

$d' = 2.5 + 0.38 = 2.88''$ (#6)

$M_2 = 51.18 - 46.16 = 5.02^{1K}$

$A_{S_2} = \frac{5.02 \times 12{,}000}{20{,}000 \times (17.36 - 2.88)} = 0.21\ IN^2/FT$

$v = \frac{9{,}030}{12 \times 17.36} = 43$ PSI < 60 PSI

$A_{STENSION} = 0.21 + 1.79 = 2.0\ IN^2/FT$

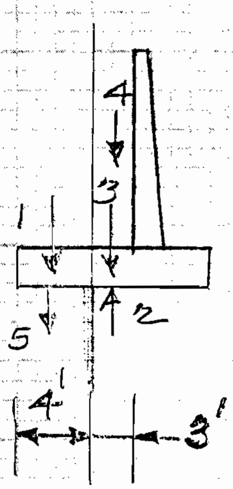
$(9.2 - 1.0)(A'_S)(5.65 - 2.88) = 9.2 \times 0.21 \times (17.36 - 5.65)$

$A'_{S\ COMP} = 1.0\ IN^2/FT$

$H_{STEM\ NO\ COMP\ STEEL} = \left(\frac{46.16}{51.18}\right)^{1/3} \times 17 = 16.4'$

BASE THICKNESS

TRY 2.5' BASE d= 1.5'



$F_1 = 2.5 X 4 X 1 X (150-62.5) = 875$ LB/FT

$F_2 = -160 X (3.0-1.5) = -240$ LB/FT

$F_3 = 2.5 X (3.0-1.5) X 1 X 150 = 560$ LB/FT

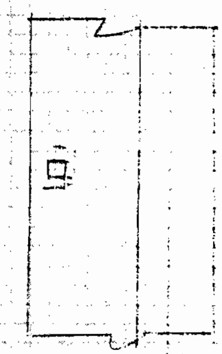
$F_4 = 17.0 X (3.0-1.5) X 1 X 62.5 = 1,590$ LB/FT

$\Sigma F = 875-240+560+1,590 = 2,785$ LB/FT

▷ $F_5 = \frac{32.6}{6.75} X \left(\frac{17.0}{13.43}\right)^2 = 7,730$ LB/FT (

$V = 2,785 + 7,730 = 10,515$ LB

$v = 60$ PSI $= \frac{10,515}{12 X d}$ ∴ $d = 15''$



PILE SHEAR

$L = \frac{1}{2}(4+12+8 X d) = 24+4d$

$v = \frac{40,000}{d(24+4d)} = 60$ ∴ $d = 11$

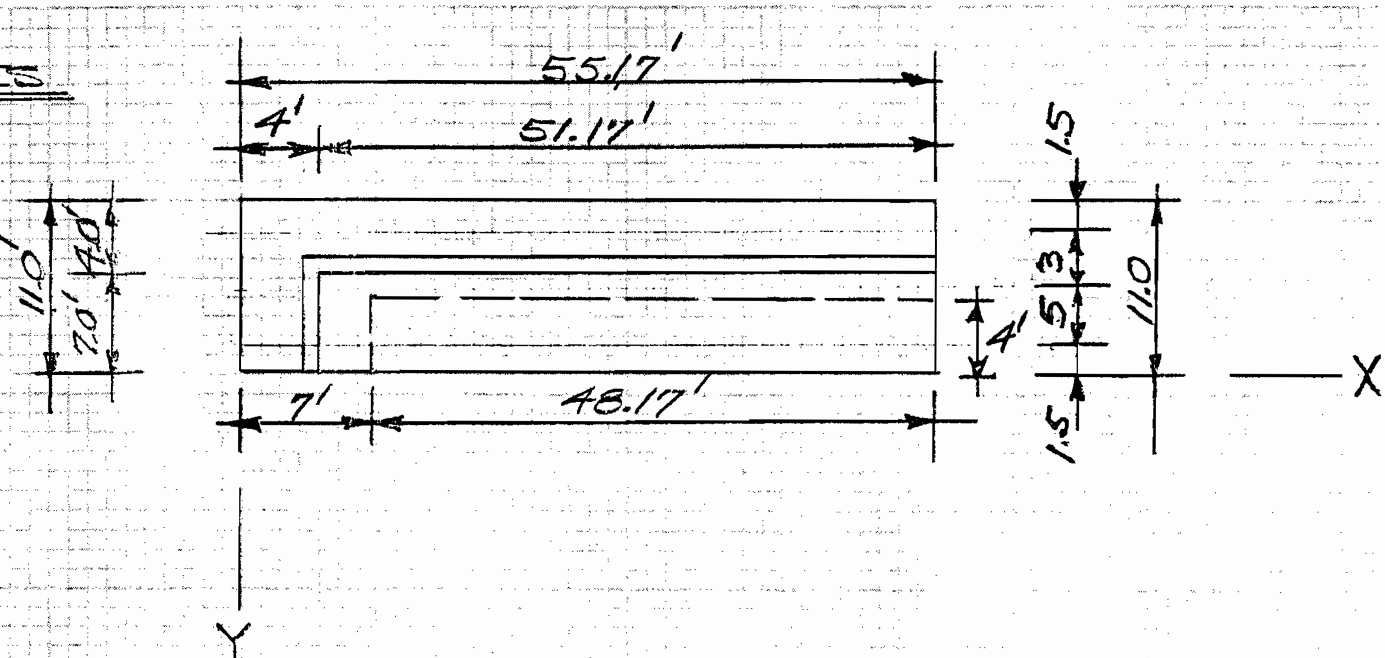
TRY 2'-6" THICK BASE

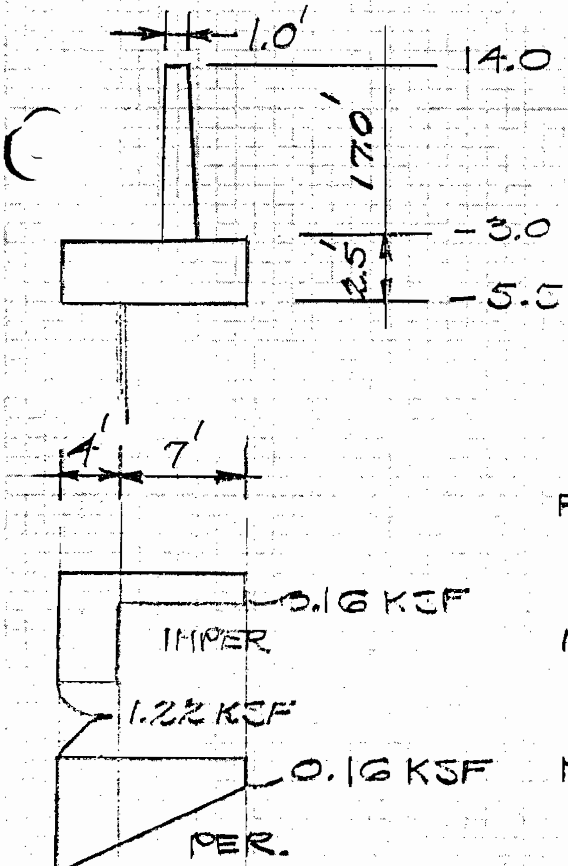
▷ MONOLITH 5 WEST - USE TO ESTIMATE PILE LOAD

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST MONOLITH 14
JOB No 575-79
SHEET No OF
BY NDL DATE 3-8-80
CHKD. BY DATE

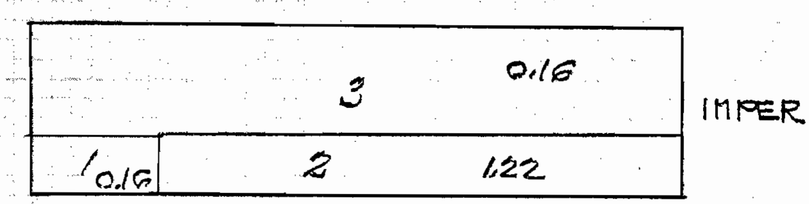
PILES





$$\begin{array}{r} 14.0 \\ -\ 5.5 \\ \hline \end{array}$$

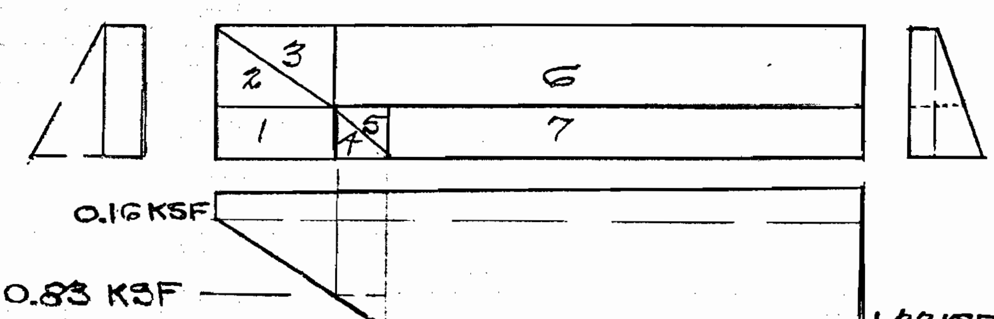
$$19.5 \times 0.0625 = 1.22\ KSF$$



$$F_{IMPER_Z} = \overset{4}{7 \times 4 \times 0.16} + \overset{235}{48.17 \times 4 \times 1.22} + \overset{62}{55.17 \times 7 \times 0.16} = -301^{K}$$

$$M_{IMPER_Y} = \overset{14}{4 \times 3.5} + \overset{7303}{235 \times 31.08} + \overset{1,710}{62 \times 27.58} = 9,027^{'K}$$

$$M_{IMPER_X} = \overset{8}{4 \times 2} + \overset{470}{235 \times 2} + \overset{465}{62 \times 7.5} = 943^{'K}$$



$$\begin{array}{r} 1.22 \\ 0.83 \\ \hline 0.39\ KSF \end{array} \qquad \begin{array}{r} 0.83 \\ 0.16 \\ \hline 0.67\ KSF \end{array}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS
JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH 14 BY NDL DATE 3-8-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

$$F_{PER_Z} = \overset{4}{(7\times4\times0.16} + \overset{9}{7\times\tfrac{4}{2}\times0.67)} + \overset{4}{(7\times\tfrac{7}{2}\times0.16} + \overset{5}{7\times7\times\tfrac{0.67}{6})} + (4+5) +$$

$$+ \overset{7}{(4\times\tfrac{4}{2}\times0.83} + \overset{1}{4\times\tfrac{4}{6}\times0.59)} + (7+1) + \overset{54}{(48.17\times7\times0.16} +$$

$$+ \overset{113}{48.17\times\tfrac{7}{2}\times0.67)} + \overset{147}{(44.17\times4\times0.83} + \overset{34}{44.17\times\tfrac{4}{2}\times0.39)} = -395^{K}$$

$$M_{PER_Y} = (\overset{14}{4\times3.5} + \overset{42}{9\times4.67}) + (\overset{9}{4\times2.33} + \overset{18}{5\times3.5}) + (\overset{19}{4\times4.67} + \overset{26}{5\times5.25}) +$$

$$+ (\overset{58}{7\times8.33} + \overset{9}{1\times9}) + (\overset{68}{7\times9.67} + \overset{10}{1\times10}) + (\overset{1,678}{54\times31.08} + \overset{3,512}{113\times31.08}) +$$

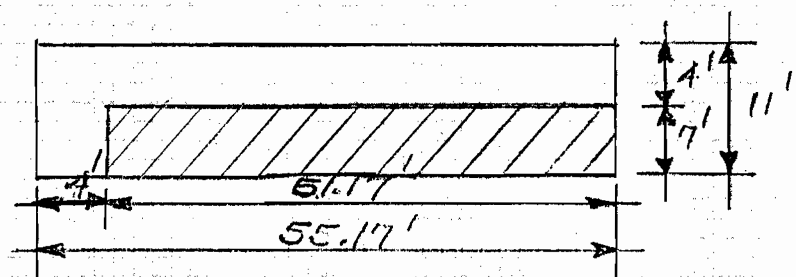
$$+ (\overset{4,863}{147\times33.08} + \overset{1,125}{34\times33.08}) = 11,451^{1K}$$

$$M_{PER_X} = (\overset{8}{4\times2} + \overset{18}{9\times2}) + (\overset{25}{4\times6.33} + \overset{29}{5\times5.75}) + (\overset{35}{4\times8.67} + \overset{38}{5\times7.5}) +$$

$$+ (\overset{9}{7\times1.33} + \overset{1}{1\times1}) + (\overset{19}{7\times2.67} + \overset{2}{1\times2}) + (\overset{405}{54\times7.5} + \overset{715}{113\times6.33}) +$$

$$+ (\overset{294}{147\times2} + \overset{45}{34\times1.33}) = 1,643^{1K}$$

WATER-VERT



$$F_Z = 51.17\times7\times17\times0.0625 = 380^{K}$$

$$M_Y = 380\times29.58 = -11,210^{1K}$$

$$M_X = 380\times3.5 = -1,330^{1K}$$

WATER-HORIZ

$$F_Y = 51.17\times0.0625\times\left(\overset{608}{\frac{19.5^2}{2}} - \overset{10}{\frac{2.5^2}{2}}\right) = -598^{K}$$

$$M_X = -608\times19.5/3 + 10\times2.5/3 = -3,944^{1K}$$

$$F_X = 7\times0.0625\times\left(\overset{83}{\frac{19.5^2}{2}} - \overset{1}{\frac{2.5^2}{2}}\right) = -82$$

$$M_Z = -598\times29.58 - 82\times3.5 = -17,976^{1K}$$

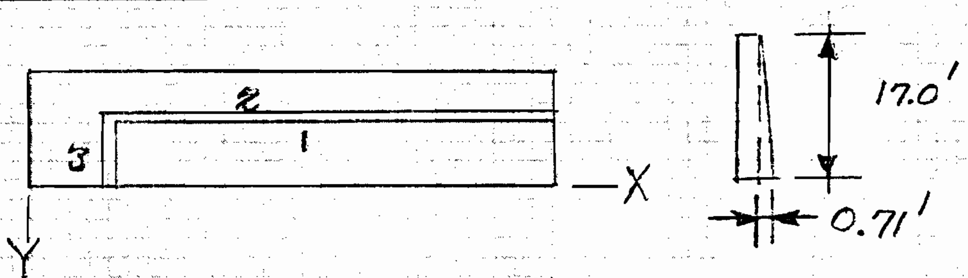
$$M_Y = 83\times19.5/3 - 1\times2.5/3 = 539^{1K}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH M BY NDL DATE 3-10-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILES

CONCRETE-WEIGHT



$$C.G. = \frac{\overset{2.55}{0.5 \times 17 \times 1 \times 0.15} + \overset{0.91}{0.71/2 \times 17 \times 1 \times 0.15 \times 1.24}}{2.55 + 0.91} = 0.69'$$

$WT = 3.46^{K/'}$

	F	X	M_Y	Y	M_X
1	226	27.58	6,288	5.5	1,254
2	181	29.08	5,263	7.69	1,392
3	24	3.31	79	3.5	84
	433^K		$-11,630^{'K}$		$-2,730^{'K}$

LOAD TABULATION

LOAD NO	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
1	CONCRETE	0	0	433	-2,730	-11,630	0
2	WATER-VERT	0	0	380	-1,330	-11,240	0
3	WATER-HORIZ	-62	-576	0	-2,744	539	-17,976
4	UPLIFT-LIN	0	0	-301	943	9,027	0
5	UPLIFT-PERV	0	0	-275	1,643	11,451	0

LOAD SUMMATION

CASE	ITEM	F_X	F_Y	F_Z	M_X	M_Y	M_Z
I	1+2+3+4	-62	-576	512	-7,061	-13,304	-17,976
II	1+2+3+5	-62	-576	416	-6,361	-10,880	-17,976

n-y ASSOCIATES, INC. CONSULTING ENGINEERS ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST MONOLITH 14 BY NDL DATE 3-10-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

COMPUTER-INPUT

```
10    FLORIDA AVE EAST 575-79
20    MONOLITH 14
30    4,2
40    2,0.0,70
50    1,12,12
60    1,5
70    -1,8.33
80    0,0,0
100   2,180,3
110   1.5,4.67,11.42
140   3*-6.5
170   3*0.0
200   2,90,15
210   5.22,9.14,12.96,16.78,20.6,24.42,28.24,32.06,
220   1.5,35.88,39.7,43.52,47.34,51.16,54.98
240   15*-1.5
270   15*0.0
300   2,270,6
310   17.92,24.42,30.92,37.42,43.92,50.42
340   6*-6.5
370   6*0.0
400   2,270,10
410   1.5,4.67,11.67,16.67,25.67,31.27,36.87,42.47,48.07,53.67
440   10*-9.5
470   10*0.0
2000  -82,-576,512,-7061,-13304,-17976
2010  -82,-578,418,-6361,-10680,-17976
```

07/03/80   13.04

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 14
30 7,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,180,3
110 2*1.5,4.67
140 -6.5,-9.5,-6.5
170 3*0.0
200 4,90,10
210 16.17,27.17,30.83,34.5,37.56,40.61,43.67,46.72,49.78,52.83
240 10*-1.5
270 10*0.0
300 2.25,270,11
310 9.12,13.57,18.02,22.47,26.92,31.37,35.82,40.27,44.72,49.17,53.62
340 11*-6.5
370 11*0.0
400 2.25,270,12
410 4.67,9.12,13.57,18.02,22.47,26.92,31.37,35.82,40.27,44.72,49.17,53.62
440 12*-9.5
470 12*0.0
500 2,90,4
510 1.5,5.17,8.83,12.5
540 4*-1.5
570 4*0.0
600 2.5,90,1
610 19.83
640 -1.5
670 0.0
700 3.5,90,1
710 23.5
740 -1.5
770 0.0
2000 -82,-598,512,-7061,-13304,-17976
2010 -82,-598,418,-6361,-10880,-17976
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

07/03/80   13.062

51A

PROG. NO. 713-F3-A2-210 13:04:08 07/03/80 MOD 6B, FEB 80

FLORIDA AVE EAST 575-79
MONOLITH 14

TOTAL NUMBER OF PILES = 42

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-82.0	-598.0	512.0	-7061.0	-13304.0	-17976.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.5	0.6	50.3
2	0.5	0.6	34.5
3	0.5	0.6	49.0
4	-0.7	0.5	-15.2
5	-0.7	0.5	-23.6
6	-0.7	0.5	-26.4
7	-0.8	0.5	-29.2
8	-0.8	0.5	-31.6
9	-0.8	0.5	-33.9
10	-0.8	0.5	-36.3
11	-0.8	0.5	-38.6
12	-0.8	0.5	-40.9
13	-0.9	0.5	-43.3
14	0.6	-0.5	50.1
25	0.6	-0.6	31.6
37	-0.6	0.5	-32.9
38	-0.6	0.5	-36.6
39	-0.6	0.5	-40.2
40	-0.6	0.5	-43.9
41	-0.7	0.5	-38.8
42	-0.7	0.5	-26.1

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-82.0	-598.0	512.0	-7061.0	-13304.0	-17976.0

LOAD CONDITION 2 MONOLITH 14

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-82.0	-598.0	418.0	-6361.0	-10880.0	-17976.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	0.6	0.7	51.2
2	0.7	0.7	24.6
3	0.6	0.7	49.6
4	-0.8	0.6	-13.6
5	-0.9	0.6	-23.9
6	-0.9	0.6	-27.4
7	-0.9	0.6	-30.8
8	-1.0	0.6	-33.7
9	-1.0	0.6	-36.6
10	-1.0	0.6	-39.5
11	-1.0	0.6	-42.3
12	-1.0	0.6	-45.2
13	-1.1	0.6	-48.1
14	0.7	-0.6	53.4
15	0.8	-0.6	54.0
16	0.8	-0.6	54.6
17	0.8	-0.6	55.2
18	0.9	-0.6	55.7
19	0.9	-0.6	56.3
20	0.9	-0.6	56.9
21	1.0	-0.6	57.4
22	1.0	-0.6	58.0
23	1.0	-0.6	58.6
24	1.1	-0.6	59.1
25	0.8	-0.7	23.5
26	0.8	-0.7	24.1
27	0.8	-0.7	24.7
28	0.9	-0.7	25.2
29	0.9	-0.7	25.8
30	0.9	-0.7	26.4
31	1.0	-0.7	27.0
32	1.0	-0.7	27.5
33	1.0	-0.7	28.1
34	1.1	-0.7	28.7
35	1.1	-0.7	29.2
36	1.1	-0.7	29.8
37	-0.7	0.6	-35.4
38	-0.7	0.6	-39.9
39	-0.8	0.6	-44.4
40	-0.8	0.6	-48.9
41	-0.8	0.6	-42.6
42	-0.9	0.6	-27.0

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-82.0	-598.0	418.0	-6361.0	-10880.0	-17976.0

0 13:04:31 07/03/80 ◆◆◆ END OF RUN ◆◆◆

5/C

```
STOP        EOJ
```

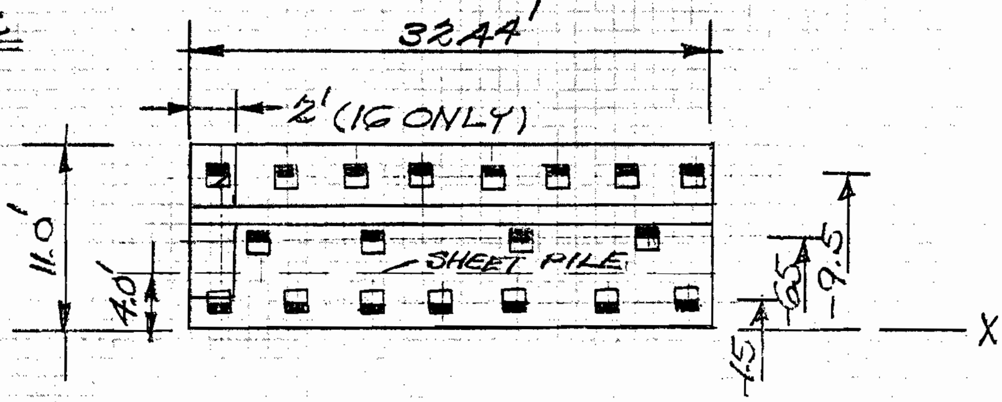
MONOLITH 14

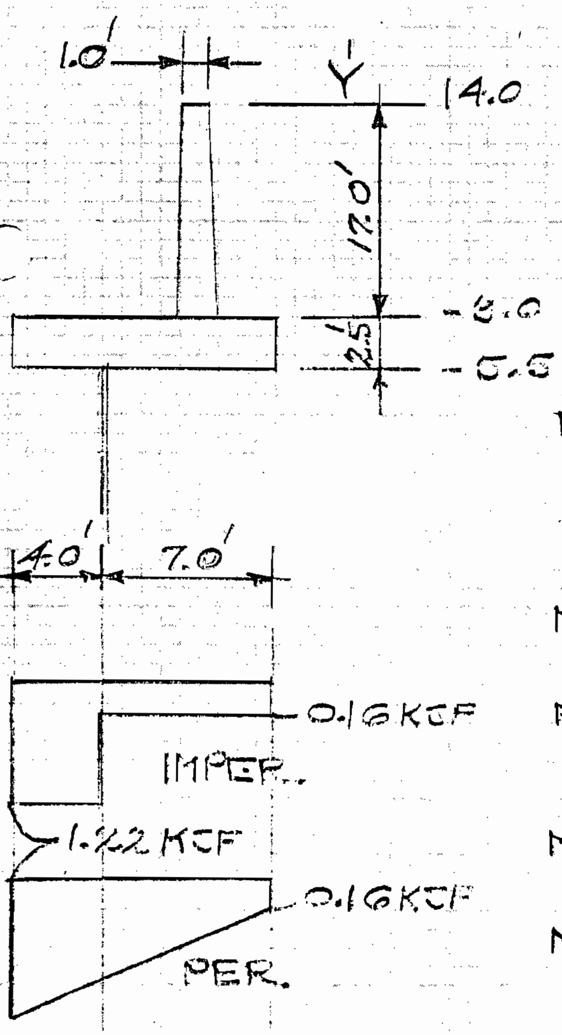
```
*OLD P29010
READY
*LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210     13:04:08  07/03/80          MOD 6B, FEI
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X           Y           Z           RX          RY          RZ
11022 -0.765E-01 -0.876E-01  0.266E-01  0.372E-03  0.262E-04 -0.742E-04
12022 -0.891E-01 -0.107E 00  0.388E-01  0.607E-03  0.323E-04 -0.907E-04
```

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST MONOLITH 15¢/16 BY NDL DATE 3-10-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILES





$$F_{IMPER_Z} = \overset{158}{1.22 \times 4 \times 32.44} + \overset{36}{0.16 \times 7 \times 32.44} = -194^{K}$$

$$M_{IMPER_Y} = 158 \times 16.22 + 36 \times 16.22 = 3{,}147^{'K}$$

$$M_{IMPER_X} = 158 \times 2 + 36 \times 7.5 = 586^{'K}$$

$$F_{PER} = \overset{57}{0.16 \times 11 \times 32.44} + \overset{189}{\frac{(1.22-0.16)}{2} \times 11 \times 32.44}$$
$$= -246^{K}$$

$$M_{PER_Y} = 57 \times 16.22 + 189 \times 16.22 = 3{,}990^{'K}$$

$$M_{PER_X} = 57 \times 5.5 + 189 \times \frac{11}{3} = 1{,}006^{'K}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ____ SHEET No. ____ OF ____
ITEM EAST MONOLITH 15/16 BY NDL DATE 3-10-80
JOB No 575-79 CHKD. BY ____ DATE ____

PILES

WATER-VERT

$F_z = 17 \times 7 \times 32.44 \times 0.0625 = 241^K$

$M_y = 241 \times 16.22 = -3{,}909^{1K}$

$M_x = 241 \times 3.5 = -844^{1K}$

WATER-HORIZ

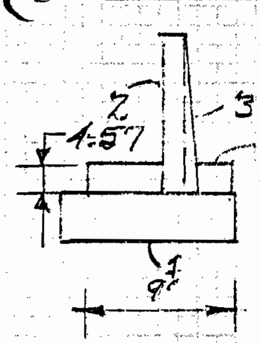
$F_y = 32.44 \times 0.0625 \left(\overset{385}{\frac{19.5^2}{2}} - \overset{6}{\frac{2.5^2}{2}} \right) = -379^K$

$M_x = -385 \times \frac{19.5}{3} + 6 \times \frac{2.5}{3} = -2{,}498^{1K}$

$M_z = -385 \times 16.22 + 6 \times 16.22 = -6{,}147^{1K}$

CONCRETE-WEIGHT

$t = \frac{17}{2} + 12 = 20.5''$



	F_z	X	M_y	Y	M_x
1	134	16.22	2,173	5.5	737
2	83	16.22	1,346	7.5	622
3	59	16.22	957	8.24	486
MONOLITH 15 →	276^K		$-4{,}476^{1K}$		$-1{,}845^{1K}$
4	10	1	10	5.55	56
MONOLITH 16	286^K		$-4{,}486^{1K}$		$-1{,}901^{1K}$

LOAD TABULATION

LOAD NO.	ITEM	F_x	F_y	F_z	M_x	M_y	M_z
1	CONCRETE	0	0	276	-1,845	-4,476	0
2	WATER-VERT	0	0	241	-844	-3,909	0
3	WATER-HORIZ	0	-379	0	-2,498	0	-6,147
4	UPLIFT-IMP	0	0	-194	586	3,147	0
5	UPLIFT-PERV	0	0	-246	1,006	3,970	0

LOAD SUMMATION

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z	
I	1+2+3+4	0	-379	323	-4,601	-5,238	-6,147	MONO-15
II	1+2+3+5	0	-377	271	-4,181	-4,375	-6,147	

CASE	ITEM	F_x	F_y	F_z	M_x	M_y	M_z	
I	1+2+3+4	0	-379	333	-4,657	-5,248	-6,147	MONO.16
II	1+2+3+5	0	-379	281	-4,237	-4,405	-6,147	

PILES

PILE INTERACTION

$P_{TENSION} = 45{,}600$ LB $\quad Q = 1{,}200$ LB

FIND P_{ALLOW} WITH $Q = 1{,}200$ LB

$$0.006944\,(P_{ALLOW}) + 0.1611\,(1{,}200) = 840$$

$$P_{ALLOW} = 93{,}128 \text{ LB} \approx 93.1^{K}$$

FIND Q_{ALLOW} WITH $P = 45{,}600$ LB

$$0.006944\,(45600) + 0.1611\,Q = 840$$

$$Q = 3{,}249 \text{ LB} \approx 3.25^{K}$$

```
07/01/80     13.94


10 FLORIDA AVE EAST 575-79
20 MONOLITH 15
30 4,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 4.5,90,3
110 1.5,5.83,10.16
140 3*-1.5
170 3*0.0
200 2,270,5
210 3.92,9.96,16.0,22.04,28.08
240 5*-6.5
270 5*0.0
300 2,270,8
310 1.5,5.67,9.83,14.0,18.17,22.33,26.5,30.67
340 8*-9.5
370 8*0.0
400 4,90,4
410 14.44,20.83,24.94,30.94
440 4*-1.5
470 4*0.0
2000 0,-379,323,-4601,-5238,-6147
2010 0,-379,271,-4181,-4395,-6147

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        07/01/80     13.980


    PROG. NO. 713-F3-A2-210     14:01:58   07/01/80     MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 MONOLITH 15

TOTAL NUMBER OF PILES =    20
```

LOAD CONDITION 1 MONOLITH 15

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-379.0	323.0	-4601.0	-5238.0	-6147.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.6	-0.0	-37.6
4	0.5	-0.0	51.0
9	0.5	-0.0	51.2
17	-0.6	-0.0	-42.3
18	-0.6	-0.0	-42.9
20	-0.6	-0.0	-44.0

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-379.0	323.0	-4601.0	-5238.0	-6147.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-379.0	271.0	-4181.0	-4395.0	-6147.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	-0.0	-41.1
4	0.9	-0.0	60.7
9	0.9	-0.0	41.6
17	-0.9	-0.0	-46.9

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	0.0	-379.0	271.0	-4181.0	-4395.0	-6147.0

0 14:06:15 07/01/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LISTH 11020-11022,12022

07/01/80 14.14

0 PROG NO. 713-F3-A2-210 14:01:58 07/01/80 MOD 6B, FE

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

	X	Y	Z	RX	RY	RZ
11022	0.958E-03	-0.890E-01	-0.647E-02	-0.750E-05	0.276E-05	-0.134E-04
12022	0.675E-03	-0.136E 00	0.894E-02	0.400E-03	0.754E-06	-0.945E-05

```
07/07/80    10.33

10 FLORIDA AVE EAST 575-79
20 MONOLITH 16
30 4,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 4.5,90,7
110 1.5,6.33,11.17,16.0,20.83,25.67,30.5
140 7*-1.5
170 7*0.0
200 2,270,4
210 11.97,15.5,20.03,28.08
240 4*-6.5
270 4*0.0
300 2,270,7
310 1.5,9.58,14.0,18.17,22.33,26.5,30.67
340 7*-9.5
370 7*0.0
400 4,270,3
410 3.92,5.67,7.0
440 -6.5,-9.5,-6.5
470 3*0.0
2000 0,-379,333,-4657,-5248,-6147
2010 0,-379,281,-4237,-4405,-6147

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        07/07/80    10.355


    PROG. NO. 713-F3-A2-210    10:23:23  07/07/80    MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 MONOLITH 16

TOTAL NUMBER OF PILES =   21
```

LOAD CONDITION 1

MONOLITH 16

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-379.0	333.0	-4657.0	-5248.0	-6147.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.9	0.0	-44.7
2	-0.9	0.0	-44.2
3	-0.9	0.0	-43.6
4	-0.8	0.0	-43.1
5	-0.8	0.0	-42.5
6	-0.8	0.0	-42.0
7	-0.8	0.0	-41.5
8	0.8	0.0	69.1
9	0.8	0.0	66.3
10	0.8	0.0	62.7
11	0.8	0.0	56.3
12	0.9	0.0	65.3
13	0.9	0.0	58.9
14	0.9	0.0	55.4
15	0.8	0.0	52.1
16	0.8	0.0	48.8
17	0.8	0.0	45.5
18	0.8	0.0	42.1
19	0.9	0.0	30.7
20	0.9	0.0	16.6
21	0.9	0.0	29.1

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	0.0	-379.0	333.0	-4657.0	-5248.0	-6147.0

LOAD CONDITION 2 MONOLITH 16

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-379.0	281.0	-4237.0	-4405.0	-6147.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-1.2	0.0	-45.6
8	1.1	0.0	79.7
9	1.1	0.0	76.0
10	1.1	0.0	71.2
11	1.0	0.0	62.8
12	1.2	0.0	62.8
13	1.2	0.0	54.4
14	1.2	0.0	49.7
15	1.1	0.0	45.4
16	1.1	0.0	41.0
17	1.1	0.0	36.7
18	1.1	0.0	32.3
19	1.2	0.0	29.4
20	1.2	0.0	-2.1
21	1.2	0.0	27.0

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 0.0 -379.0 281.0 -4237.0 -4405.0 -6147.0

0 10:24:24 07/07/80 *** END OF RUN ***

STOP EOJ

*OLD P29010
READY
*LIST 11020-11022,12022

0 PROG NO. 713-F3-A2-210 10:23:23 07/07/80 MOD 6B, FEI

11020 DEFLECTION OF PILE CAP (INCHES & RADIANS)

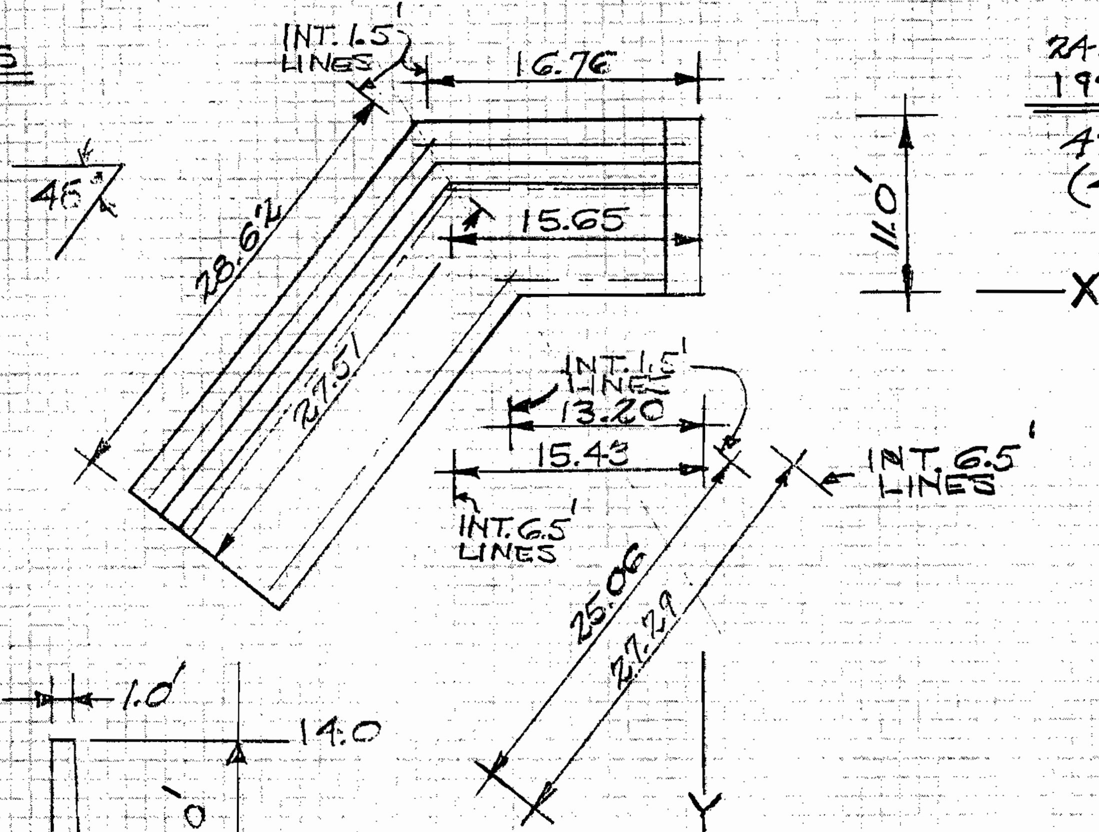
11021	X	Y	Z	RX	RY	RZ
11022	-0.564E-02	-0.147E 00	0.613E-02	0.257E-03	0.110E-04	0.786E-04
12022	-0.641E-02	-0.190E 00	0.210E-01	0.587E-03	0.215E-04	0.894E-04

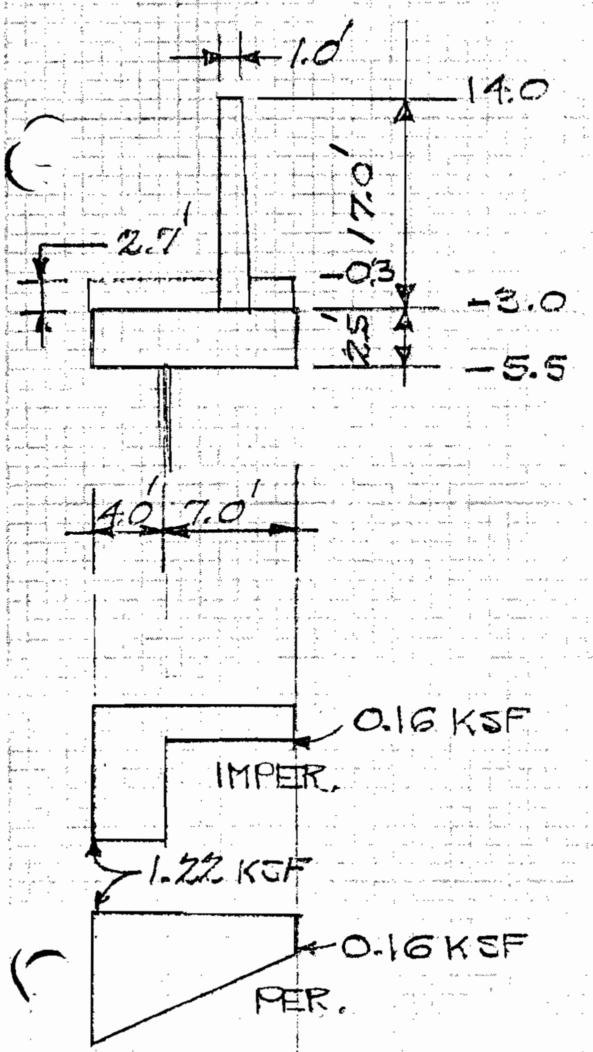
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET Nº ______ OF ______
ITEM EAST MONOLITH 12 BY NDL DATE 3-10-80
JOB Nº 575-79 CHKD. BY ______ DATE ______

PILES

$242°10'17''$
$194°10'28''$
$47°59'49''$
$(48.0°)$



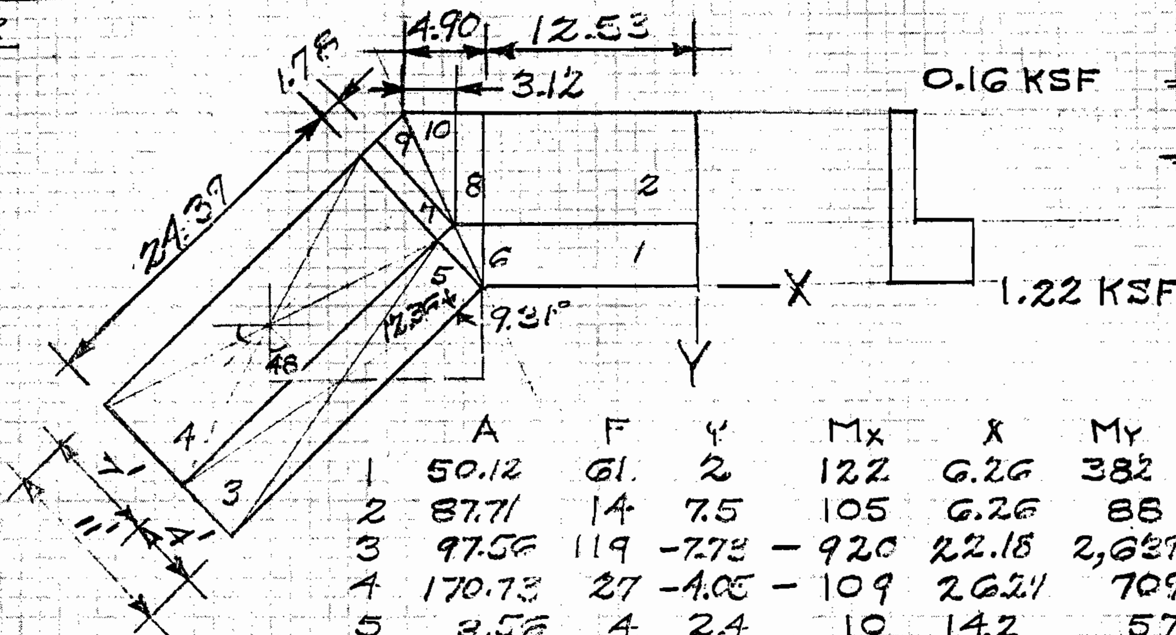


n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH 12 BY NDL DATE 3-10-80
JOB NO 576-79 CHKD. BY ______ DATE ______

PILES

IMPER

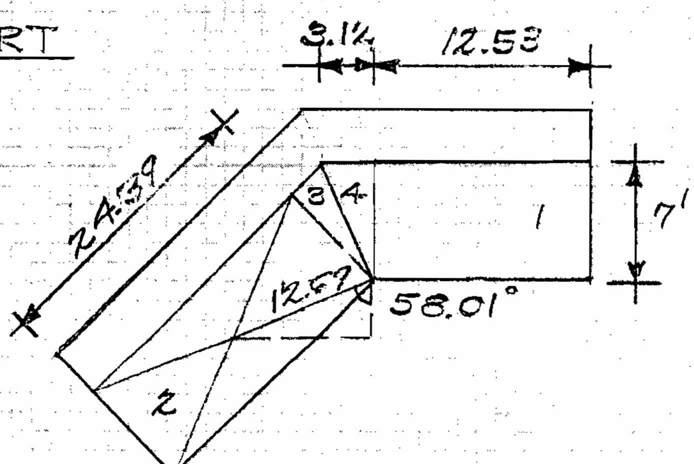


90
48
42
9.31
51.31

	A	F	Y	Mx	X	My
1	50.12	61.	2	122	6.26	382
2	87.71	14	7.5	105	6.26	88
3	97.56	119	-7.73	-920	22.18	2,637
4	170.73	27	-4.05	-109	26.21	709
5	3.56	4	2.4	10	14.2	57
6	3.56	4	2.67	11	13.12	52
7	12.46	2	5.7	11	17.3	35
8	12.46	2	7.50	15	13.42	27
9	10.92	2	8.1	16	16.9	34
10	10.92	2	8.67	17	15.36	31
	460.00 SF	-237 K		-722 IK		-4,054 IK

WATER-VERT

$h_{w} = 17'$

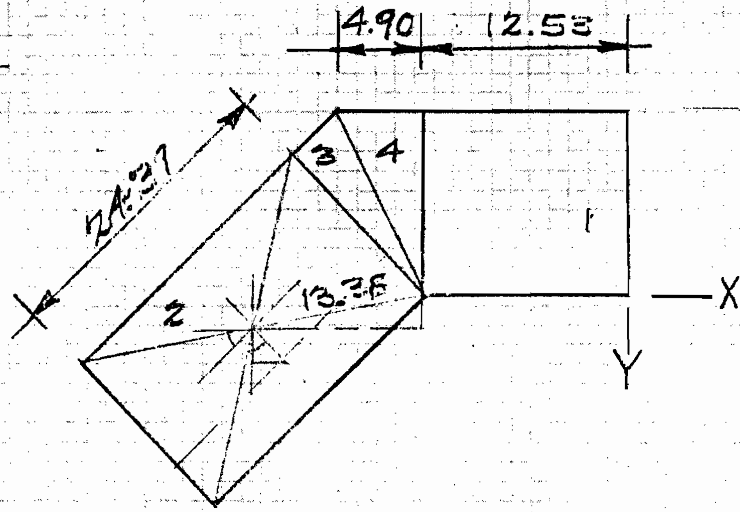


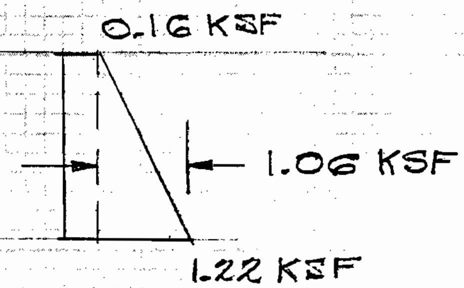
16.01
42
58.01°

	F	Y	Mx	X	My
1	93	3.5	-326	6.26	582
2	181	6.72	1,216	23.29	4,215
3	12	3.8	-46	15.2	182
4	12	4.67	-56	13.57	163
	298 K		738 IK		5,142 IK

PILES

PERV.

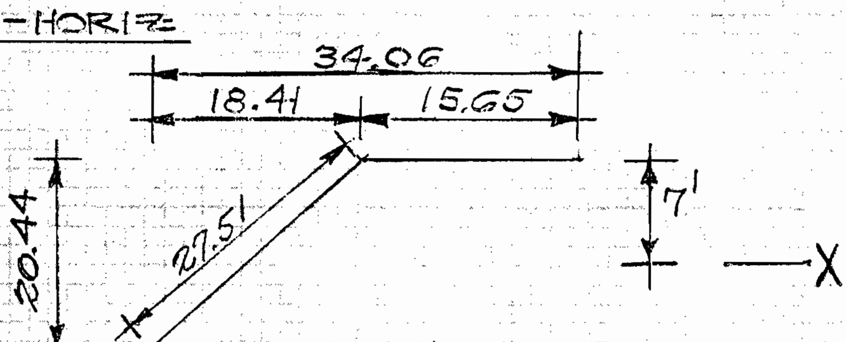




24.27
42
66.27

	FORCE UNI	FORCE TRI	Y UNI	Y TRI	M_X	X UNI	X TRI	M_Y
1	22	72	5.5	3.67	389	6.26		595
2	43	142	5.38	9.6	−1,169	24.78	23.42	4,391
3	4	10	6.3	4.7	72	16.9	15.9	227
4	4	10	7.33	5.5	84	14.16	13.76	191
	−308^K				−624^{1K}			−5,407^{1K}

WATER-HORIZ



$h_w = 19.5'$

$$F_Y = 34.06 \times 0.0625 \left(\overset{405}{\frac{19.5^2}{2}} - \overset{7}{\frac{2.5^2}{2}} \right) = -376^K$$

$$M_X = 405 \times 19.5/3 - 7 \times 2.5/3 = -2,627^{1K}$$

$$F_X = 20.44 \times 0.0625 \left(\overset{243}{\frac{19.5^2}{2}} - \overset{4}{\frac{2.5^2}{2}} \right) = -237^K$$

$$M_Y = 243 \times 19.5/3 - 4 \times 2.5/3 = 1,575^{1K}$$

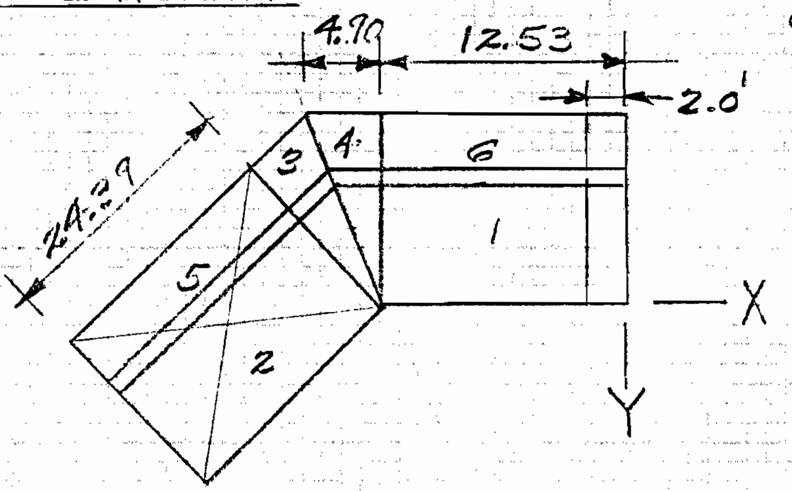
$$M_Z = 405 \overset{6897}{\times} 34.06/2 + 237\,(20.44/2 - 7) = 7,667^{1K}$$

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM EAST MONOLITH 12 JOB NO 575-79
SHEET NO ____ OF ____ BY NDL DATE 3-10-80
CHKD. BY ____ DATE ____

PILES

CONCRETE-WEIGHT



C.G. = 0.69'
WT = 3.46 K/'

	F	Y	Mx	X	My
1	52	5.5	-286	6.3	328
2	101	5.38	543	24.78	2,503
3	10	63	- 63	16.9	169
4	10	7.33	- 73	14.16	142
5	96	2.4	230	25.6	2,458
6	55	7.69	-423	7.98	439
7	8	5.07	- 41	1.0	8
	332 K		-113 1K		6047 1K

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	332	-113	6,047	0
2	WATER-VERT	0	0	276	783	5,142	0
3	WATER-HORIZ	-237	-398	0	-2,627	1,576	7,667
4	UPLIFT-IMP	0	0	-237	-722	-4,054	0
5	UPLIFT-PERV	0	0	-308	-624	-5,407	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	-237	-398	393	-2,674	8,711	7,667
II	1+2+3+5	-237	-398	322	-2,576	7,358	7,667

P_{ALLOW} WITH P_{MAX}

$$0.006944 \times 45{,}500 + 0.1611\,P = 840$$

$$P_{ALLOW} = 3{,}253 \text{ LB} \approx 3.25^{K}$$

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 12
30 8,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,4
110 -1.5,-4.5,-7.5,-10.5
140 4*-1.5
170 4*0.0
200 4,90,1
210 -13.5
240 -0.94
270 0.0
300 2,42,4
310 -22.94,-24.95,-26.96,-28.97
340 9.32,11.55,13.78,16.01
370 4*0.0
400 2,270,2
410 -4.5,-10.5
440 2*-6.5
470 2*0.0
500 2,222,4
510 -18.78,-23.12,-27.47,-31.82
540 -2.78,2.05,6.88,11.71
570 4*0.0
600 2,270,3
610 -1.5,-8.5,-16.5
640 3*-9.5
670 3*0.0
700 2,222,5
710 -18.77,-23.01,-27.25,-31.48,-34.83
740 -7.27,-2.56,2.15,6.86,10.58
770 5*0.0
800 4,42,2
810 -18.26,-20.94
840 4.12,7.09
870 2*0.0
2000 -239,-398,393,-2674,8711,7667
2010 -239,-398,322,-2576,7358,7667

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/27/80    14.713


    PROG. NO. 713-F3-A2-210    14:43:01   03/27/80     MOD 6B, FEB 80
```

FLORIDA AVE EAST 575-79
MONOLITH 12

TOTAL NUMBER OF PILES = 25

LOAD CONDITION 1

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-239.0	-398.0	393.0	-2674.0	8711.0	7667.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.4	0.5	-42.0
2	-0.4	0.5	-38.1
3	-0.4	0.5	-34.2
4	-0.4	0.5	-30.4
5	-0.4	0.5	-9.7
6	-0.4	0.0	-39.8
7	-0.4	0.0	-37.8
8	-0.4	0.0	-35.9
9	-0.3	0.0	-34.0
10	0.4	-0.5	53.8
11	0.3	-0.5	50.4
12	0.5	-0.1	68.0
13	0.4	-0.1	60.1
14	0.4	-0.1	52.2
15	0.3	-0.1	44.4
16	0.4	-0.5	57.6
17	0.3	-0.5	53.7
18	0.3	-0.5	49.2
19	0.5	-0.1	74.3
20	0.4	-0.1	66.6
21	0.4	-0.1	58.9
22	0.3	-0.1	51.3
23	0.3	-0.1	45.2
24	-0.5	0.0	-20.2
25	-0.5	0.0	-19.4

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-239.0	-398.0	393.0	-2674.0	8711.0	7667.0

LOAD CONDITION 2 MONOLITH 12

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-239.0	-398.0	322.0	-2576.0	7358.0	7667.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.5	0.6	-40.5
2	-0.5	0.6	-39.7
3	-0.5	0.6	-38.9
4	-0.4	0.6	-38.0
5	-0.4	0.5	-16.9
6	-0.5	0.1	-45.5
7	-0.5	0.1	-41.6
8	-0.4	0.1	-37.7
9	-0.4	0.1	-33.7
10	0.4	-0.6	59.2
11	0.4	-0.6	47.6
12	0.6	-0.1	65.9
13	0.5	-0.1	60.1
14	0.5	-0.1	54.3
15	0.4	-0.1	48.5
16	0.5	-0.6	61.9
17	0.4	-0.6	48.4
18	0.4	-0.6	33.0
19	0.6	-0.1	64.9
20	0.6	-0.1	59.3
21	0.5	-0.1	53.6
22	0.4	-0.1	48.0
23	0.4	-0.1	43.5
24	-0.6	0.1	-26.0
25	-0.6	0.1	-22.7

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-239.0	-398.0	322.0	-2576.0	7358.0	7667.0

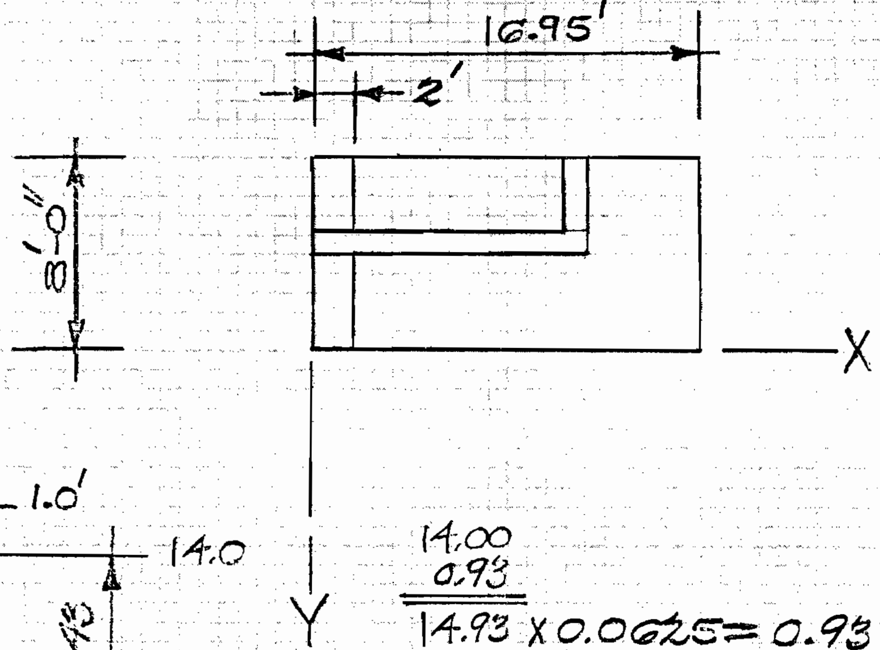
```
*OLD P29010
READY
*LIST 11020-11022,12022

0         PROG NO. 713-F3-A2-210      14:50:15  03/27/80                MOD 6B,
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X             Y            Z            RX            RY           RZ
11022 -0.704E-01 -0.738E-01  0.162E-02 -0.563E-04  0.288E-04 -0.129E-03
12022 -0.843E-01 -0.869E-01  0.126E-01  0.559E-04 -0.481E-04 -0.150E-03
```

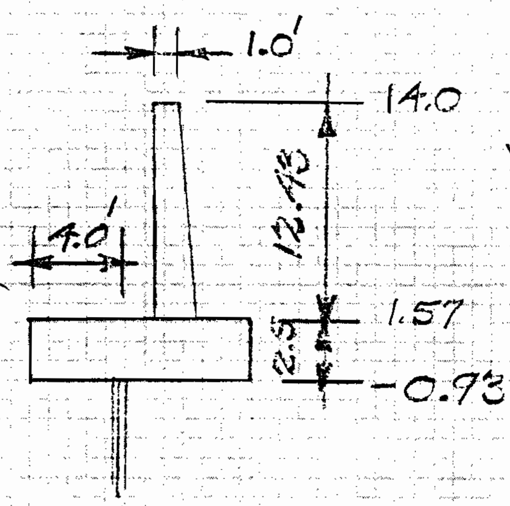
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST MONOLITH 17
JOB No 575-79

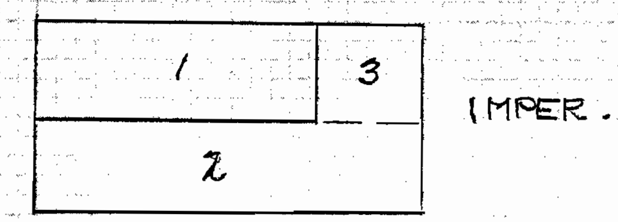
SHEET No ____ OF ____
BY NDL DATE 3-12-80
CHKD. BY ____ DATE ____

PILES

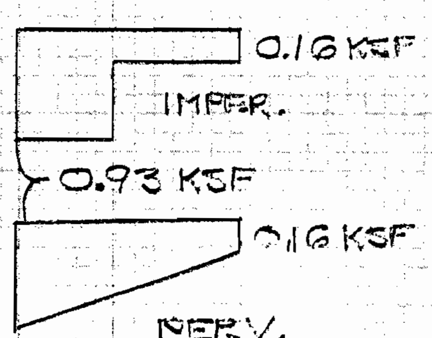




14.00
0.93
14.93 X 0.0625 = 0.93 KSF

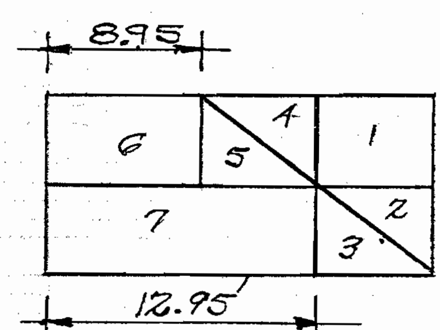


$$F_{IMPER_{V}} = \overset{8}{0.16 \times 12.95 \times 4} + \overset{63}{0.93 \times 16.95 \times 4} + 0.93 \times 4 \times 4 = -86^{K}$$

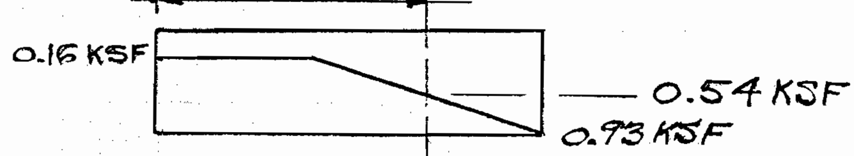


$$M_{IMPER_{Y}} = \overset{52}{8 \times 6.48} + \overset{534}{63 \times 8.48} + \overset{224}{15 \times 14.95} = 810^{IK}$$

$$M_{IMPER_{X}} = \overset{48}{8 \times 6} + \overset{126}{63 \times 2} + \overset{90}{15 \times 6} = 264^{IK}$$



0.93
0.54
0.39 KSF



n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM EAST MONOLITH 17 JOB No 575-79

SHEET No ____ OF ____ BY NDL DATE 3-12-80 CHKD. BY ____ DATE ____

PILES

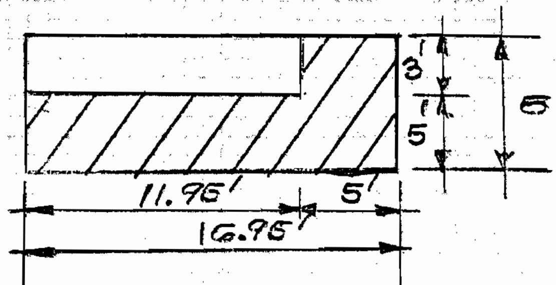
$$F_{PER_Z} = (\overset{9}{4\times4\times0.54} + \overset{3}{4\times\tfrac{4}{2}\times0.39}) + (\overset{4}{4\times\tfrac{4}{2}\times0.54} + \overset{2}{4\times\tfrac{4}{3}\times0.39}) +$$
$$+ (4+2) + (\overset{1}{4\times\tfrac{4}{2}\times0.16} + \overset{2}{4\times\tfrac{4}{3}\times0.39}) + (1+2) +$$
$$+ (\overset{6}{8.95\times4\times0.16} + \overset{7}{8.95\times\tfrac{4}{2}\times0.39}) + (\overset{28}{12.95\times4\times0.54} + \overset{10}{12.95\times\tfrac{4}{2}\times0.39})$$
$$= -81^{K}$$

$$M_{PER_Y} = (\overset{135}{9\times14.95} + \overset{47}{3\times15.62}) + (\overset{62}{4\times15.62} + \overset{32}{2\times15.95}) + (\overset{57}{4\times14.28} + \overset{29}{2\times14.45}) +$$
$$+ (\overset{12}{1\times11.62} + \overset{24}{2\times11.95}) + (\overset{10}{1\times10.28} + \overset{21}{2\times10.45}) + (\overset{27}{6\times4.48} +$$
$$+ \overset{31}{7\times4.45}) + (\overset{181}{28\times6.48} + \overset{65}{10\times6.48}) = 733^{1K}$$

$$M_{PER_X} = (\overset{54}{9\times6} + \overset{16}{3\times6}) + (\overset{11}{4\times2.67} + \overset{5}{2\times2.5}) + (\overset{5}{4\times1.33} + \overset{2}{2\times1}) +$$
$$+ (\overset{7}{1\times6.67} + \overset{12}{2\times6}) + (\overset{5}{1\times5.33} + \overset{10}{2\times5}) + (\overset{36}{6\times6} + \overset{37}{7\times5.33}) +$$
$$+ (\overset{56}{28\times2} + \overset{13}{10\times1.33}) = 271^{1K}$$

WATER-VERT

$h_w = 12.43'$



$$F_Z = \overset{66}{16.95\times5\times12.43\times0.0625} + \overset{12}{5\times3\times12.43\times0.0625} = 78^{K}$$

$$M_Y = \overset{559}{66\times16.95/2} + \overset{173}{12\times14.45} = -732^{1K}$$

$$M_X = 66\times2.5 + 12\times6.5 = -243^{1K}$$

WATER-HORIZ

$$F_Y = 11.95\times0.0625\times\left(\overset{83}{\frac{14.93^2}{2}} - \overset{2}{\frac{2.5^2}{2}}\right) = -81^{K}$$

$$M_X = 83\times14.93/3 - 2\times2.5/3 = -411^{1K}$$

$$F_X = 3\times0.0625\times\left(\overset{21}{\frac{14.93^2}{2}} - \overset{1}{\frac{2.5^2}{2}}\right) = -20^{K}$$

$$M_Z = -(20\times6.5 + 81\times5.98) = -614^{1K}$$

$$M_Y = 21\times14.93/3 - 1\times2.5/3 = 104^{1K}$$

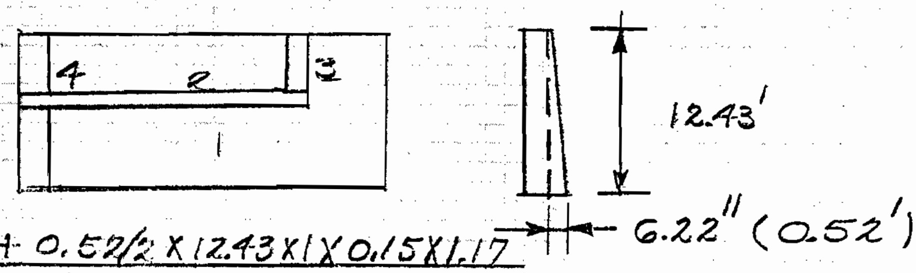
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB
ITEM EAST MONOLITH 17
JOB № 575-79
SHEET №
OF
BY NDL
DATE 3-12-80
CHKD. BY
DATE

PILES

CONCRETE-WEIGHT

$t_4 = 3.57'$



$$C.G. = \frac{0.5 \times 12.43 \times 1 \times 1 \times 0.1 \cdot 5 + 0.52/2 \times 12.43 \times 1 \times 0.15 \times 1.17}{1.86 + 0.48}$$

$= 0.64'$ $WT = 2.34^{K/1}$

	F	X	My	Y	Mx
1	51	8.48	432	4	204
2	28	5.96	167	5.64	158
3	5	11.31	57	7	37
4	7	1.0	7	3.59	25
	91^K		-663^{1K}		-424^{1K}

LOAD TABULATION

LOAD NO	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	91	-424	-663	0
2	WATER-VERT	0	0	78	-243	-732	0
3	WATER-HORIZ	-20	-81	0	-411	104	-614
4	UPLIFT-IMP	0	0	-86	264	810	0
5	UPLIFT-PERV	0	0	-81	271	733	0

LOAD SUMMATION

CASE	ITEM	FX	Fy	Fz	Mx	My	Mz
I	1+2+3+4	-20	-81	83	-814	-481	-614
II	1+2+3+5	-20	-81	88	-807	-558	-614

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET No ______ OF ______
ITEM EAST MONOLITH 17 BY NDL DATE 3-12-80
JOB No 575-79 CHKD. BY ______ DATE ______

PILE3

COMPUTER-INPUT

```
10   FLORIDA AVE EAST 675-77
20   MONOLITH 17
30   3, 2
40   2, 0.0, 70
50   1, 12, 12
60   1, 5
70   -1, 8.23
80   0, 0, 0
100  2, 90, 2
110  1.5, 8.23
140  2*-1.5
170  2*0.0
200  2, 270, 3
210  2.5, 7.0, 11.0
240  3*-6.5
270  3*0.0
300  2*15.25
310  2*15.25
340  -1.5, -8.5
370  2*0.0
2000 -23, -31, 82, -819, -131, -917
2010 -23, -31, 88, -807, -558, -614
```

$0.006944 \times (67{,}700) + 0.1611\,\phi = 750$

$\phi = 1{,}729\ LB \approx 1.73^{K}$

07/03/80 13.36

```
10 FLORIDA AVE EAST 575-79
20 MONOLITH 17
30 3,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 2,90,2
110 1.5,8.33
140 2*-1.5
170 2*0.0
200 2,270,3
210 2.5,7.0,11.0
240 3*-6.5
270 3*0.0
300 4.5,0,2
310 2*15.25
340 -1.5,-6.5
370 2*0.0
2000 -20,-81,83,-814,-481,-614
2010 -20,-81,88,-807,-558,-614
```

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

07/03/80 13.387

PROG. NO. 713-F3-A2-210 13:23:37 07/03/80 MOD 6B, FEB 80

FLORIDA AVE EAST 575-79
MONOLITH 17

TOTAL NUMBER OF PILES = 7

LOAD CONDITION 1 MONOLITH 17

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-20.0	-81.0	83.0	-814.0	-481.0	-614.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.1	1.7	-24.9
2	-0.1	1.7	2.4
3	0.1	-1.6	37.9
4	0.0	-1.6	53.0
5	-0.0	-1.6	66.4
6	-1.7	-0.1	-36.0
7	-1.7	-0.1	-3.2

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1	-20.0	-81.0	83.0	-814.0	-481.0	-614.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
-20.0	-81.0	88.0	-807.0	-558.0	-614.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.2	1.8	-27.1
2	-0.2	1.8	6.0
3	0.1	-1.7	37.7
4	0.1	-1.7	53.3
5	0.0	-1.7	67.2
6	-1.8	-0.1	-29.4
7	-1.8	-0.1	-7.0

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2	-20.0	-81.0	88.0	-807.0	-558.0	-614.0

0 13:23:49 07/03/80 ◆◆◆ END OF RUN ◆◆◆

STOP EOJ

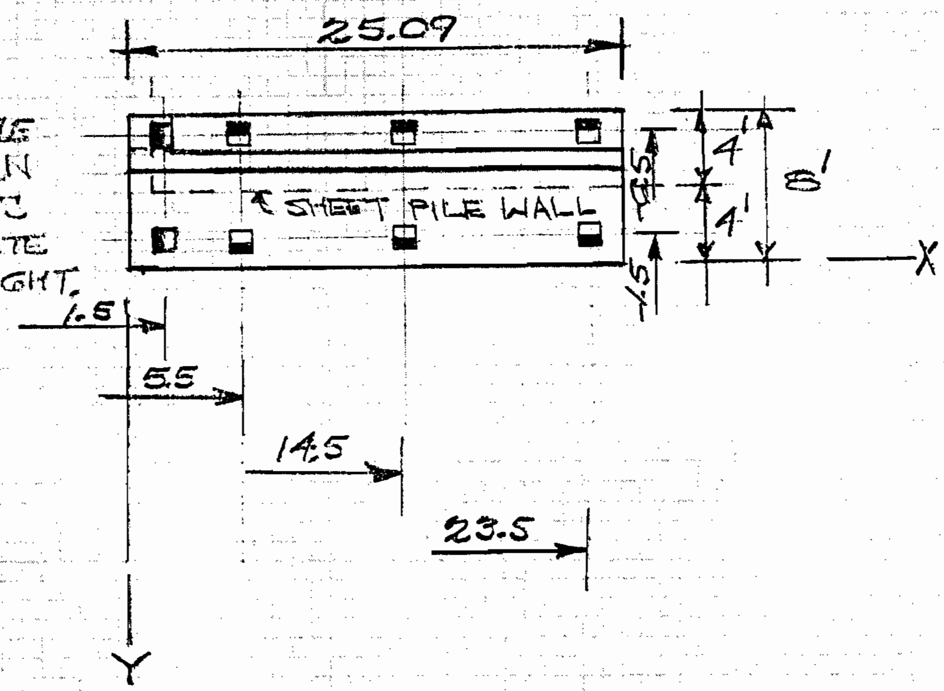
```
◆OLD P29010
READY
◆LIST 11020-11022,12022

0          PROG NO. 713-F3-A2-210      13:23:37   07/03/80          MOD 6B, FE
11020   DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021        X           Y           Z           RX          RY           RZ
11022 -0.253E 00 -0.237E-01 -0.184E-01 -0.372E-03 -0.233E-03  0.409E-04
12022 -0.269E 00 -0.338E-01 -0.135E-01 -0.241E-03 -0.263E-03  0.864E-04
```

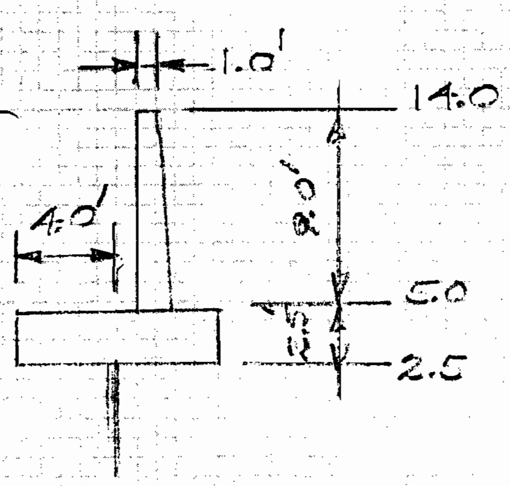
n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ SHEET NO ______ OF ______
ITEM EAST MONOLITH 19 BY NDL DATE 3-15-80
JOB NO 575-79 CHKD. BY ______ DATE ______

PILE 3

ASSUME SHEET PILE WALL DOESN'T TURN AND UPLIFT FORCE IS OFFSET BY CONCRETE "TURN OF WALL" WEIGHT.





$$F_{IMPER_Z} = 0.72 \times 4 \times 25.09 + 0.16 \times 4 \times 25.09 = -88^{K}$$
(72 above the first term, 16 above the second)

$$M_{IMPER_Y} = 72 \times 12.54 + 16 \times 12.54 = 1{,}104^{IK}$$

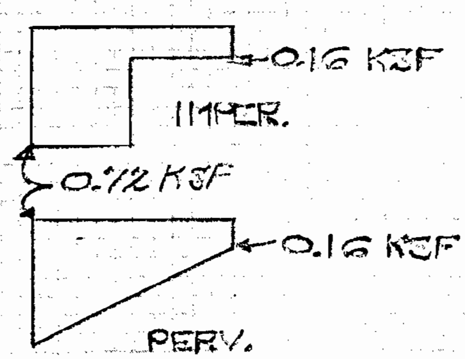
$$M_{IMPER_X} = 72 \times 2 + 16 \times 6 = 240^{IK}$$

$$F_{PER_Z} = 0.16 \times 8 \times 25.09 + \frac{(0.72 - 0.16)}{2} \times 8 \times 25.09$$
(32 above the first term, 56 above the second)

$$= -88^{K}$$

$$M_{PER_Y} = 32 \times 12.54 + 56 \times 12.54 = 1{,}104^{IK}$$

$$M_{PER_X} = 32 \times 4 + 56 \times \frac{8}{3} = 277^{IK}$$



n-y ASSOCIATES, INC.
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JOB ______ ITEM EAST MONOLITH 19 JOB NO 575-79
SHEET NO ______ OF ______ BY NDL DATE 3-15-80 CHKD. BY ______ DATE ______

PILES

WATER-VERT

$F_z = 9.0 \times 5 \times 25.09 \times 0.0625 = 71^K$

$M_y = 71 \times 12.54 = -890^{IK}$

$M_x = 71 \times 2.5 = -178^{IK}$

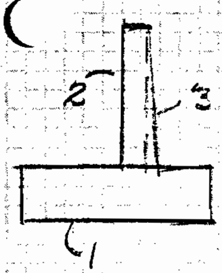
WATER-HORIZ

$F_y = 25.09 \times 0.0625 \left(\overset{104}{\overline{\frac{11.5}{2}^2}} - \overset{5}{\overline{\frac{2.5}{2}^2}} \right) = -99^K$

$M_x = -104 \times \frac{11.5}{3} + 5 \times \frac{2.5}{3} = -394^{IK}$

$M_z = -104 \times 12.54 + 5 \times 12.54 = -1{,}241^{IK}$

CONCRETE-WEIGHT



$t = 12 + \frac{9}{2} = 16.5''$

	F	X	My	Y	Mx
1	75	12.54	940	4	300
2	34	12.54	426	5.5	187
3	6	12.54	75	6.12	37
	115^K		$-1{,}441^{IK}$		-524^{IK}

LOAD TABULATION

LOAD NO.	ITEM	Fx	Fy	Fz	Mx	My	Mz
1	CONCRETE	0	0	115	-524	-1,441	0
2	WATER-VERT	0	0	71	-178	-890	0
3	WATER-HORIZ	0	-99	0	-394	0	-1,241
4	UPLIFT-IMP	0	0	-88	240	1,104	0
5	UPLIFT-PERV	0	0	-88	277	1,104	0

LOAD SUMMATION

CASE	ITEM	Fx	Fy	Fz	Mx	My	Mz
I	1+2+3+4	0	-99	98	-856	-1,227	-1,241
II	1+2+3+5	0	-99	98	-819	-1,227	-1,241

n-y ASSOCIATES, INC.
CONSULTING ENGINEERS
ARCHITECTS & PLANNERS

JOB ______ ITEM EAST MONOLITH 19 JOB No 575-79
SHEET No ______ OF ______ BY NDL DATE 3-15-80
CHKD. BY ______ DATE ______

PILES

COMPUTER-INPUT

10	FLORIDA AVE EAST 575-79
20	MONOLITH 19
30	3, 2
40	2, 0.0, 70
50	1, 12, 12
60	1, 5
70	-1, 8.33
80	0, 0, 0
100	4, 180, 2
110	2* 1.5
140	-1.5, -6.5
170	2* 0.0
200	2, 90, 3
210	5.5, 14.5, 23.5
240	3* -1.5
270	3* 0.0
300	2, 270, 3
310	5.5, 14.5, 23.5
340	3* -6.5
370	3* 0.0
2000	0, -97, 96, -856, -1227, -1241
2010	0, -97, 96, -819, -1227, -1241

66A

```
03/19/80     11.65

10 FLORIDA AVE EAST 575-79
20 MONOLITH 19
30 3,2
40 2,0.0,70
50 1,12,12
60 1,5
70 -1,8.33
80 0,0,0
100 4,180,2
110 2*1.5
140 -1.5,-6.5
170 2*0.0
200 2,90,3
210 5.5,14.5,23.5
240 3*-1.5
270 3*0.0
300 2,270,3
310 5.5,14.5,23.5
340 3*-6.5
370 3*0.0
2000 0,-99,98,-856,-1227,-1241
2010 0,-99,98,-819,-1227,-1241

READY

*CLEAR
AFT CLEARED

*RUN RK29010A

        03/19/80     11.674


    PROG. NO. 713-F3-A2-210    11:40:40   03/19/80     MOD 6B, FEB 80

 FLORIDA AVE EAST 575-79
 MONOLITH 19

TOTAL NUMBER OF PILES =     8
```

66 E

LOAD CONDITION 1 MONOLITH 19

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-99.0	98.0	-856.0	-1227.0	-1241.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.5	7.9
2	-0.3	0.5	1.9
3	-0.5	-0.3	-28.1
4	-0.4	-0.3	-19.4
5	-0.3	-0.3	-10.7
6	0.4	0.3	65.1
7	0.3	0.3	52.3
8	0.2	0.3	39.4

1 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

1 0.0 -99.0 98.0 -856.0 -1227.0 -1241.0

LOAD CONDITION 2

LOADS ON PILE CAP

X	Y	Z	MX	MY	MZ
0.	-99.0	98.0	-819.0	-1227.0	-1241.0

PILE LOADS (PILE AXIS)

PILE NO.	X	Y	Z
1	-0.3	0.6	15.0
2	-0.3	0.6	-5.1
3	-0.5	-0.3	-27.3
4	-0.4	-0.3	-19.2
5	-0.3	-0.3	-11.1
6	0.5	0.3	64.4
7	0.4	0.3	52.1
8	0.3	0.3	39.8

2 SUMMATION OF PILE LOADS (STRUCTURE AXIS)

2 0.0 -99.0 98.0 -819.0 -1227.0 -1241.0

0 11:41:05 03/19/80 *** END OF RUN ***

STOP EOJ

```
*OLD P29010
READY
*LIST 11020-11022,12022

0        PROG NO. 713-F3-A2-210      11:40:40  03/19/80          MOD 6B,
11020  DEFLECTION OF PILE CAP (INCHES & RADIANS)
11021       X          Y            Z           RX          RY          RZ
11022  0.381E-01 -0.829E-01  0.166E-01  0.323E-04  0.148E-04  0.152E-03
12022  0.385E-01 -0.911E-01  0.246E-01  0.198E-03  0.148E-04  0.143E-03
```

CRITICAL PILE LOADS

MONOLITH	GROUP	MAX PILE LOAD P	MAX PILE LOAD Φ	CASE No. P	CASE No. Φ	ALLOW PILE LOAD P	ALLOW PILE LOAD Φ	% ALLOW P	% ALLOW Φ
2	A	-24.7	-0.8	I	II	-40	3.49	61.8	22.9
	B	62.4	0.7	I	II	63	1.21	99.0	57.9
3	A	-15.0	-1.9	I	II	-40	3.49	37.5	54.4
	B	51.7	1.9	I	II	62	2.43 ▷1	83.4	78.2
4	A	-38.9	1.5	I	II	-40	3.49	97.2	43.0
	B	61.2	-1.4 ▷2	I	II	61	2.03 ▷1	100.3 ▷3	69.0
5	A	-7.1	-2.4	I	II	-40	3.49	17.8	68.8
	B	37.2	2.4	I	II	61	3.12 ▷1	61.0	76.9
6	A	-38.8	-0.1	II	II	-40	3.49	97.0	20.1
	B	56.3	0.1	II	II	61	1.21	92.3	57.9
7	A	-19.0	0.5	II	II	-40	3.49	47.5	14.3
	B	50.1	0.5	II	II	61	1.21	82.1	41.3
8	A	-17.4	-2.1	I	II	-40	3.49	43.5	60.2
	B	65.2	2.0	II	II	62	1.84 ▷1	105.3 ▷3	108.7 ▷3
9	A	-38.1	1.3	II	II	-40	3.49	95.2	37.2
	B	50.9	1.2	II	II	63	1.21	80.8	99.2
11	A	-31.9	-0.4	II	II	-40	3.49	79.8	11.5
	B	51.5	0.4	I	II	68	1.21	76.2	32.2
12	A	-45.5	-0.8	II	II	-61 ▷4	3.49	74.6	22.9
	B	74.3	0.7	I	II	72	1.21	103.2 ▷3	57.9
14	A	-36.8	0.5	II	II	-40	3.49	92.0	14.3
	B	68.5	0.5	I	II	72	1.21	95.1	41.3
15	A	-51.2	-1.1	II	II	-61 ▷4	3.01 ▷1	83.9	36.5
	B	75.4	1.2	I	II	72	1.21	104.7 ▷3	99.2
16	A	-42.3	-0.3	II	II	-61 ▷4	3.39 ▷1	69.3	8.5
	B	65.5	0.4	I	II	72	1.21	90.1	33.1
17	A	-36.5	1.6	I	II	-40	3.49	91.2	45.7
	B	67.9	-1.6	II	II	66	1.73 ▷1	102.9 ▷3	92.5
19	A	-28.1	0.6	I	I	-40	3.49	40.1	17.2
	B	65.1	0.7	I	II	62	1.21	105.0 ▷3	57.9

▷1 P_{ALLOW} CORRESPONDING TO P_{MAX}

▷2 NOT GREATEST SHEAR — BUT MOST CRITICAL

▷3 EXCEEDS 100 %

▷4 SOIL CAPACITY OF PILE