ADDITIONS TO 17TH STREET CANAL PUMPING STATION
REVIEW OF P&S
8 AUG 84 LTB

A0006690

## DISCHARGE TUBE MONOLITH

LOAD CASES FOR 3-D PILE ANALYSIS

1. DRY CASE, CULVERTS FULL P.S. & F.S.
2. FLOOD CASE, IMPERVIOUS UPLIFT, CULVERTS FULL } WATER TO TOP OF WALL, NO WAVE
3. FLOOD CASE, PERVIOUS UPLIFT, CULVERTS FULL }

## CONCRETE WEIGHTS

CULVERT

A $(16.5 \times 15) - \left[\frac{\pi (11)^2}{4}\right] = 152.5\ \square'$

B $(15 \times 13.13) - (11 \times 8.63) = 102.0\ \square'$

AVG. CROSS SECTION ① AREA = $127.3\ \square'$

B 102.0

C $(29 \times 8.2) - (25 \times 3.7) = 145.4$

AVG. CROSS SECTION ② AREA = $123.7\ \square'$

C 145.4

D $(29 \times 11.5) - (25 \times 7.0) = 158.5$

AVG. CROSS SECTION ③ AREA = $151.9\ \square'$

① $127.3 \times 12.5 \times .150 = 238.7^K$

② $123.7 \times 27.7 \times .150 = 512.3^K$

③ $151.9 \times 64 \times .150 = 1458.2^K$

FLOODWALL

$3.3 \times 1.25 \times 29 \times .150 = 17.9^K$

VOLUME IN CULVERT

AB $\frac{1}{2}\left[\frac{\pi (11)^2}{4} + 11 \times 8.63\right] = 95.0\ \square' \times 12.5 = 1187.5$ c.f.

BC $\frac{1}{2}[11 \times 8.63 + 25.1 \times 3.7] = 94\ \square' \times 27.7 = 2603.8$ c.f.

CD $\frac{1}{2}[25 \times 3.7 + 25 \times 7.0] = 134\ \square' \times 64 = 8576$ c.f.

ADDITIONS TO 17TH ST. CANAL PUMPING STATION
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3-D PILE ANALYSIS

| ITEM | COMPUTATION | $F_z$ | $F_y$ | ARM | $M_{xx}$ |
|---|---|---|---|---|---|
| CULVERT | | | | | |
| ① | | 238.7 | | 99.0 | -23,631.3 |
| ② | | 512.3 | | 77.9 | -39,908.2 |
| ③ | | 1458.2 | | 26.7 | -38,933.9 |
| FLOODWALL | | 17.9 | | 64.0 | - 1,145.6 |
| SUB-TOTAL - CONC. WT. | | 2227.1 | | | -103,619.0 |
| WATER WT | | | | | |
| 1 | 1187.5 x .064 | 76.0 | | 99.0 | -7524.0 |
| 2 | 2603.8 x .064 | 166.6 | | 77.9 | -12,978.1 |
| 3 | 8576 x .064 | 548.9 | | 26.7 | -14,655.6 |
| CASE 1 TOTAL WATER IN CULVERTS | | 3018.6 | | | - 138,776.7 |
| | FLOOD CASE | | | | |
| SWL TO 36.5 | 3.3x64 x29 x.064 | 392.0 | | 32.0 | - 12,543.6 |
| | ½(12.7 x 64)x29 x.064 | 754.3 | | 21.3 | - 16,066.1 |
| WATER FORCE | ½ (.064 x28)x28 x 29 | | -727.6 | -9.33 | - 6790.9 |
| IMP. UPLIFT | - (.064 x28)x64 x 29 | -3326.0 | | -32.0 | +106,430.5 |
| CASE 2: TOTAL | | 838.9 | -727.6 | | -67,746.8 |
| | FLOOD CASE | | | | |
| SWL TO 36.5 | | 392.0 | | - 32.0 | -12,543.6 |
| | | 754.3 | | - 21.3 | -16,066.1 |
| WATER FORCE | | | -727.6 | -9.33 | -6790.9 |
| PERV. UPLIFT | -½ (.064 x28) x104.7 x $\overline{26}$ | -2439.1 | | -34.67 | +84,555.5 |
| CASE 3. TOTAL | | 1725.8 | -727.6 | | - 89,621.8 |
| | | | | | |

ADDITIONS TO 17TH ST CANAL PUMPING STATION

REVIEW OF P & S

R.R. SWING GATE

MOMENTS ABOUT X-X AXIS

| ITEM | COMPUTATION | $F_z$ | $F_y$ | ARM | $M_{xx}$ |
|---|---|---|---|---|---|
| BASE SLAB | 13 x 31 x 2.5 x .150 | 151.1 | | - 6.5 | - 982.2 |
| SILL | 24 x 1.5 x 2.6 x .150 | 14.0 | | - 9.25 | - 129.5 |
| COLS | (2' x 2' x 7.58 x .150) 2 | 9.0 | | - 11.0 | - 99.0 |
| WALLS | 2(2.5 x 1.5 x 7.6) x .150 | 8.6 | | - 10.75 | - 92.5 |
| HINGE PEDESTAL | 1.67 x 1.67 x 2.27 x .150 | 0.9 | | - 9.17 | - 8.3 |
| SUB-TOTAL CONCRETE ONLY | | 183.6 | | | - 1311.5 |
| WATER WT | 10' x 7.58 x 31 x .064 | 150.4 | | - 5.0 | - 751.9 |
| WATER FORCE | ½ (.064 x 10.1) 10.1 x 31 | | - 101.2 | - 3.36 | - 340.0 |
| IMP. UPLIFT. | NONE | 0 | | 0 | 0 |
| GATE WT. | CLOSED | 6.7 | | - 9.17 | - 61.4 |
| CASE I - TOTALS | | 340.7 | - 101.2 | | - 2464.8 |
| WATER WT | | 150.4 | | - 5.0 | - 751.9 |
| WATER FORCE | | | - 101.2 | - 3.36 | - 340.0 |
| PERV. UPLIFT | ½ (.064 x 10.1) 13 x 31 | - 130.3 | | - 4.33 | + 564.2 |
| GATE WT. | CLOSED | 6.7 | | - 9.17 | - 61.4 |
| CASE II TOTALS | | 210.4 | - 101.2 | | - 1900.6 |
| TRAIN: 1ST AXLE | COOPER 80 (P/S) | 80 | | - 13.0 | - 1040.0 |
| 2ND AXLE | | 80 | | - 8.0 | - 640.0 |
| GATE WT | OPENED | 3.4 | | - 9.17 | - 30.7 |
| CASE III TOTALS | | 347.0 | | | - 3022.2 |
| TRAIN: 1ST AXLE | COOPER 80 (F/S) | 80 | | 0 | 0 |
| 2ND AXLE | | 80 | | - 5.0 | - 400 |
| GATE WT | | 3.4 | | - 9.17 | - 30.7 |
| CASE IV TOTALS | | 347.0 | | | - 1742.2 |

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MOMENTS ABOUT Y-Y' AXIS

| ITEM | COMPUTATIONS | $F_z$ | $F_x$ | ARM | $M_{yy}$ |
|---|---|---|---|---|---|
| BASE SLAB | | 151.1 | | 15.5 | -2342.1 |
| SILL | | 14.0 | | 15.0 | - 210.0 |
| $COL_1$ | | 4.5 | | 3.5 | - 15.8 |
| $COL_2$ | | 4.5 | | 27.5 | - 123.8 |
| $WALL_1$ | | 4.3 | | 1.0 | - 4.3 |
| $WALL_2$ | | 4.3 | | 30.0 | - 129.0 |
| HINGE PEDESTAL | | 0.9 | | 27.5 | - 24.8 |
| SUB-TOTAL: CONCRETE ONLY | | 183.6 | | | -2849.8 |
| WATER WT | | 150.4 | | 15.5 | -2331.2 |
| IMP. UPLIFT | | 0 | | 0 | 0 |
| GATE WT | | 6.7 | | 15.5 | - 103.9 |
| CASE I TOTALS | | 340.7 | | | - 5284.9 |
| WATER WT | | 150.4 | | 15.5 | -2331.2 |
| PERV. UPLIFT | | -130.3 | | 15.5 | +2019.7 |
| GATE WT | | 6.7 | | 15.5 | - 103.9 |
| CASE II TOTALS | | 210.4 | | | -3265.2 |
| TRAIN: 1ST AXLE | | 80 | | 15.5 | -1240.0 |
| 2ND AXLE | | 80 | | 15.5 | -1240.0 |
| GATE WT. | | 3.4 | | 27.5 | - 93.5 |
| CASES III & IV TOTALS | | | | | - 5423.3 |

MOMENTS ABOUT ZZ-AXIS

| ITEM | COMPUTATIONS | $F_y$ | $F_x$ | ARM | $M_{zz}$ |
|---|---|---|---|---|---|
| WATER FORCE | | -101.2 | | 15.5 | -1568.6 |
| CASES I & II | | -101.2 | | | -1568.6 |

| CASE | $F_x$ | $F_y$ | $F_z$ | $M_{xx}$ | $M_{yy}$ | $M_{zz}$ |
|---|---|---|---|---|---|---|
| I | 0 | -101.2 | 340.7 | -2464.8 | - 5284.9 | -1568.6 |
| II | 0 | -101.2 | 210.4 | -1900.6 | - 3265.2 | -1568.6 |
| III | 0 | 0 | 347.0 | -3022.2 | - 5423.3 | 0 |
| IV | 0 | 0 | 347.0 | -1742.2 | - 5423.3 | 0 |