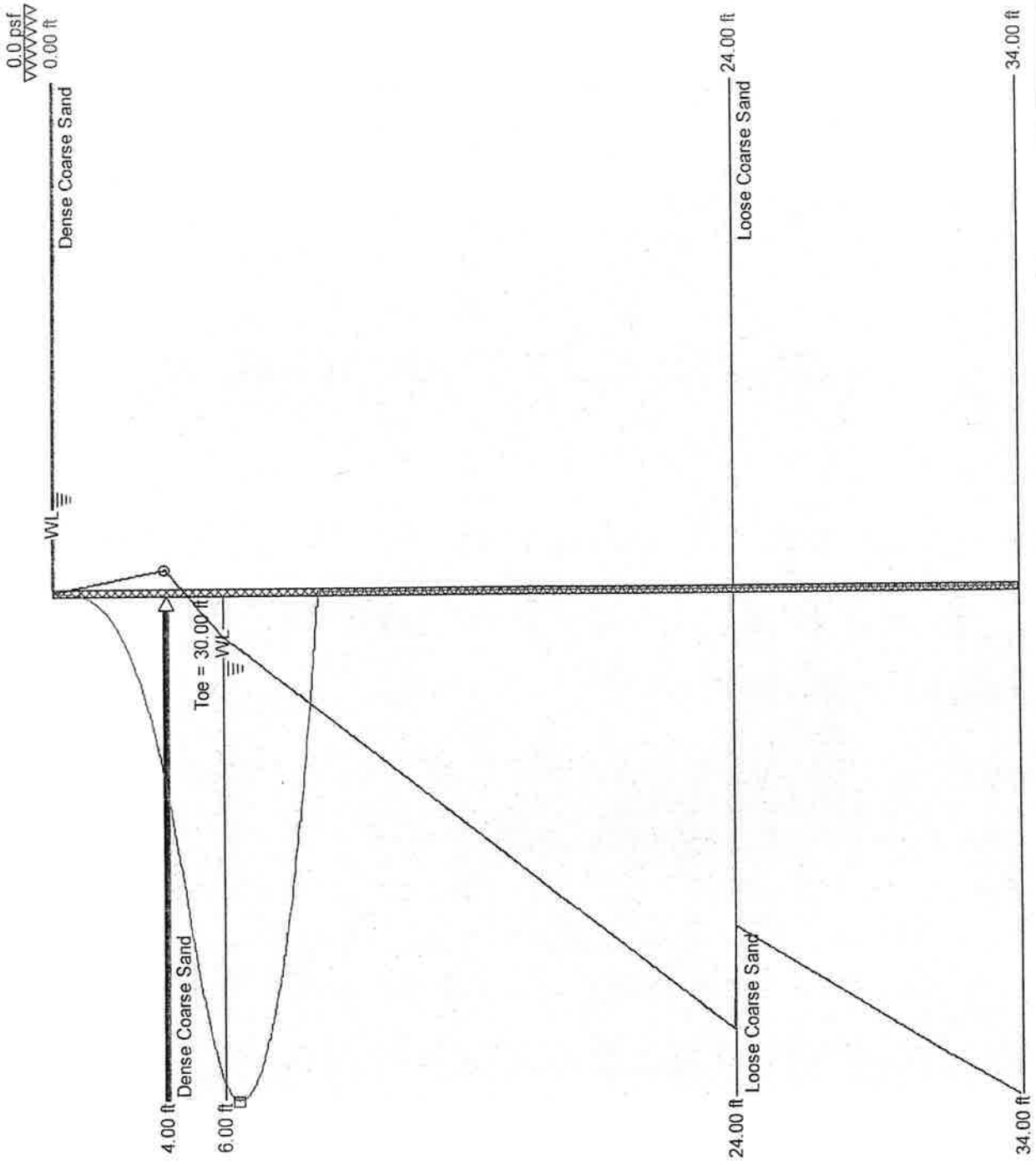


Railroad bridge

Client: Town of Derby	
Title: Levee Certification	
Designer: Glenn Janis	
Ref: 1560-119	
Page: 1	
Date: 11.24.10	
Sheet: MZ-32	
Pressure: Rankine	
Toe: Cantilever	
Maximum	d (ft)
○	310.0 psf
□	2163.7 flb/ft



Client: Town of Derby

Title: Levee Certification

Designer: Glenn Jarvis

Ref: 1560-119

Page: 2

Date: 11.24.10

Sheet: MZ-32

Pressure: Rankine

Toe: Cantilever

Input Data

Depth Of Excavation = 4.00 ft Depth Of Active Water = 0.00 ft Water Density = 62.37 pcf
Surcharge = 0.0 psf Depth Of Passive Water = 6.00 ft Minimum Fluid Density = 31.82 pcf

Soil Profile

Depth (ft)	Soil Name	γ (pcf)	γ' (pcf)	C (psf)	C_a (psf)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Dense Coarse Sand	115.82	68.73	0.0	0.0	40.0	0.0	0.22	0.00	4.60	0.00
24.00	Loose Coarse Sand	106.28	68.73	0.0	0.0	35.0	0.0	0.27	0.00	3.69	0.00

Solution

Sheet

Sheet Name	I (in ⁴ /ft)	E (psi)	Z (in ³ /ft)	f (psi)	Maximum Bending Moment (ftlb/ft)	Upstand (ft)	Toe (ft)	Pile Length (ft)
MZ-32	385.70	3.04E+07	38.30	25000.0	79696.6	0.00	30.00	34.00

Maxima

	Maximum	Depth
Bending Moment	2163.7 ftlb/ft	6.49 ft
Pressure	310.0 psf	4.00 ft
Shear Force	726.0 lb/ft	4.67 ft

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Client: Town of Derby

Title: Levee Certification

Designer: Glenn Jarvis

Ref: 1560-119

Page: 4

Date: 11.24.10

Sheet: MZ-32

Pressure: Rankine

Toe: Cantilever

depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)	depth (ft)	P (psf)	M (ftlb/ft)	D (in)	F (lb/ft)
0.00	0.0	0.0	0.0	0.0	11.43	-2240.3	0.0	0.0	0.0	22.87	-5886.3	0.0	0.0	0.0
0.30	24.2	0.4	0.0	4.0	11.73	-2334.1	0.0	0.0	0.0	23.17	-5771.6	0.0	0.0	0.0
0.60	48.3	3.1	0.0	15.7	12.04	-2419.4	0.0	0.0	0.0	23.47	-5865.4	0.0	0.0	0.0
0.90	70.3	9.6	0.0	32.8	12.34	-2513.3	0.0	0.0	0.0	23.77	-5950.7	0.0	0.0	0.0
1.20	94.4	23.3	0.0	58.8	12.64	-2607.1	0.0	0.0	0.0	24.07	-6132.2	0.0	0.0	0.0
1.50	118.6	46.1	0.0	92.3	12.94	-2692.4	0.0	0.0	0.0	24.37	-6318.2	0.0	0.0	0.0
1.81	140.5	76.9	0.0	129.3	13.24	-2786.2	0.0	0.0	0.0	24.67	-6493.2	0.0	0.0	0.0
2.11	164.7	123.8	0.0	177.2	13.54	-2871.5	0.0	0.0	0.0	24.97	-6678.8	0.0	0.0	0.0
2.41	186.6	180.2	0.0	227.3	13.84	-2965.3	0.0	0.0	0.0	25.27	-6863.0	0.0	0.0	0.0
2.71	210.8	259.7	0.0	289.6	14.14	-3059.2	0.0	0.0	0.0	25.58	-7047.9	0.0	0.0	0.0
3.01	234.9	359.6	0.0	359.4	14.44	-3144.5	0.0	0.0	0.0	25.88	-7232.8	0.0	0.0	0.0
3.31	256.9	470.2	0.0	429.3	14.74	-3238.3	0.0	0.0	0.0	26.18	-7417.7	0.0	0.0	0.0
3.61	281.0	615.8	0.0	513.5	15.04	-3323.6	0.0	0.0	0.0	26.48	-7602.6	0.0	0.0	0.0
3.91	305.2	788.6	0.0	605.2	15.35	-3417.4	0.0	0.0	0.0	26.78	-7787.5	0.0	0.0	0.0
4.21	209.0	970.5	0.0	680.9	15.65	-3511.2	0.0	0.0	0.0	27.08	-7972.4	0.0	0.0	0.0
4.51	67.1	1189.7	0.0	722.0	15.95	-3596.5	0.0	0.0	0.0	27.38	-8157.3	0.0	0.0	0.0
4.81	-61.9	1395.0	0.0	720.9	16.25	-3690.3	0.0	0.0	0.0	27.68	-8342.2	0.0	0.0	0.0
5.12	-203.8	1614.7	0.0	677.5	16.55	-3784.2	0.0	0.0	0.0	27.98	-8527.1	0.0	0.0	0.0
5.42	-345.7	1814.5	0.0	589.9	16.85	-3869.5	0.0	0.0	0.0	28.28	-8712.0	0.0	0.0	0.0
5.72	-474.7	1967.5	0.0	471.8	17.15	-3963.3	0.0	0.0	0.0	28.58	-8896.9	0.0	0.0	0.0
6.02	-611.2	2091.3	0.0	300.0	17.45	-4048.6	0.0	0.0	0.0	28.88	-9081.8	0.0	0.0	0.0
6.32	-705.0	2156.3	0.0	93.6	17.75	-4142.4	0.0	0.0	0.0	29.19	-9266.7	0.0	0.0	0.0
6.62	-790.3	2161.1	0.0	-48.3	18.05	-4236.2	0.0	0.0	0.0	29.49	-9451.6	0.0	0.0	0.0
6.92	-884.1	2126.1	0.0	-161.3	18.35	-4321.5	0.0	0.0	0.0	29.79	-9636.5	0.0	0.0	0.0
7.22	-969.4	2048.0	0.0	-238.6	18.65	-4415.4	0.0	0.0	0.0	30.09	-9821.4	0.0	0.0	0.0
7.52	-1063.2	1923.1	0.0	-295.8	18.96	-4509.2	0.0	0.0	0.0	30.39	-10006.3	0.0	0.0	0.0
7.82	-1157.1	1747.9	0.0	-323.7	19.26	-4594.5	0.0	0.0	0.0	30.69	-10191.2	0.0	0.0	0.0
8.12	-1242.4	1550.7	0.0	-323.7	19.56	-4688.3	0.0	0.0	0.0	30.99	-10376.1	0.0	0.0	0.0
8.42	-1336.2	1232.8	0.0	-295.8	19.86	-4773.6	0.0	0.0	0.0	31.29	-10561.0	0.0	0.0	0.0
8.73	-1421.5	932.7	0.0	-245.0	20.16	-4867.4	0.0	0.0	0.0	31.59	-10745.9	0.0	0.0	0.0
9.03	-1515.3	529.8	0.0	-161.3	20.46	-4961.2	0.0	0.0	0.0	31.89	-10930.8	0.0	0.0	0.0
9.33	-1609.1	59.5	0.0	-48.3	20.76	-5046.5	0.0	0.0	0.0	32.19	-11115.7	0.0	0.0	0.0
9.63	-1694.4	0.0	0.0	0.0	21.06	-5140.4	0.0	0.0	0.0	32.50	-11300.6	0.0	0.0	0.0
9.93	-1788.3	0.0	0.0	0.0	21.36	-5225.7	0.0	0.0	0.0	32.80	-11485.5	0.0	0.0	0.0
10.23	-1882.1	0.0	0.0	0.0	21.66	-5319.5	0.0	0.0	0.0	33.10	-11670.4	0.0	0.0	0.0
10.53	-1967.4	0.0	0.0	0.0	21.96	-5413.3	0.0	0.0	0.0	33.40	-11855.3	0.0	0.0	0.0
10.83	-2061.2	0.0	0.0	0.0	22.27	-5498.6	0.0	0.0	0.0	33.70	-12040.2	0.0	0.0	0.0
11.13	-2146.5	0.0	0.0	0.0	22.57	-5592.4	0.0	0.0	0.0	34.00	-12225.1	0.0	0.0	0.0

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Client: Town of Derby

Title: Levee Certification

Designer: Glenn Jarvis

Ref: 1560-119

Page: 3

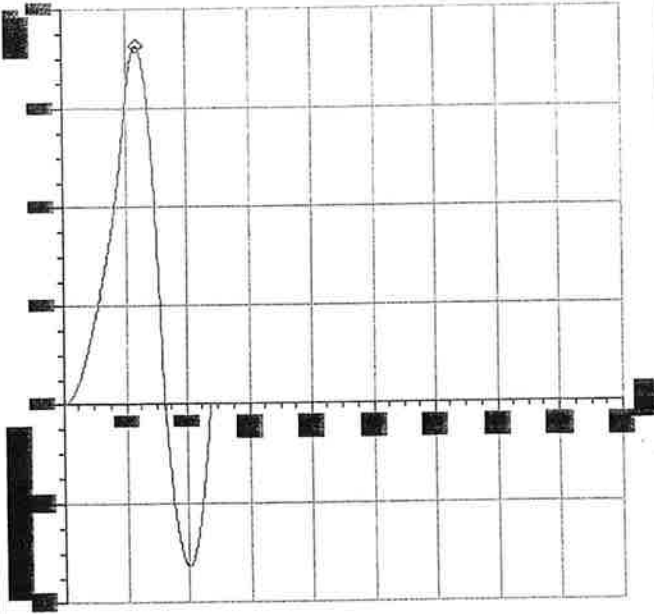
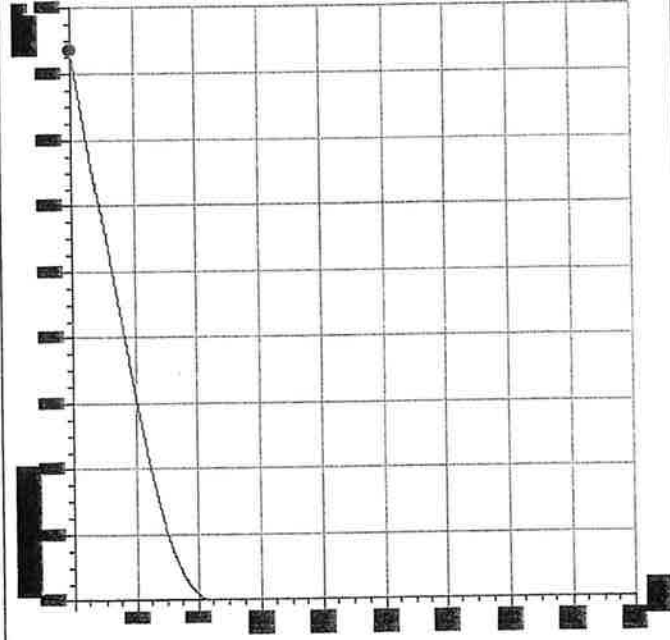
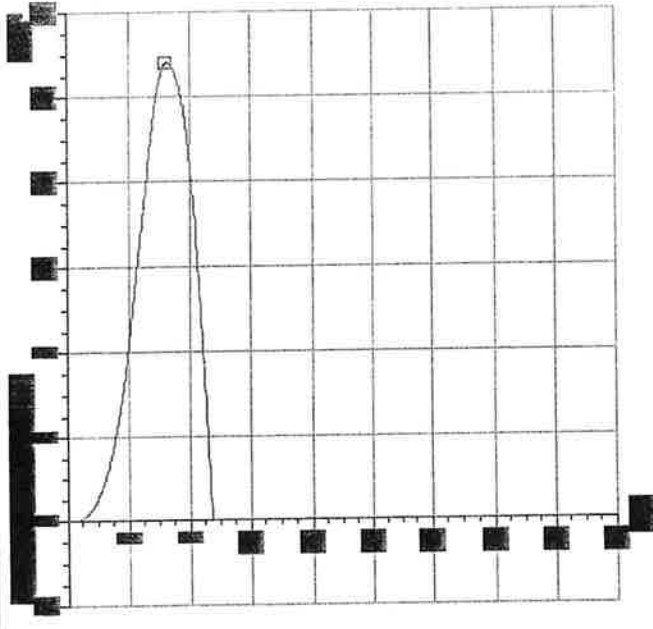
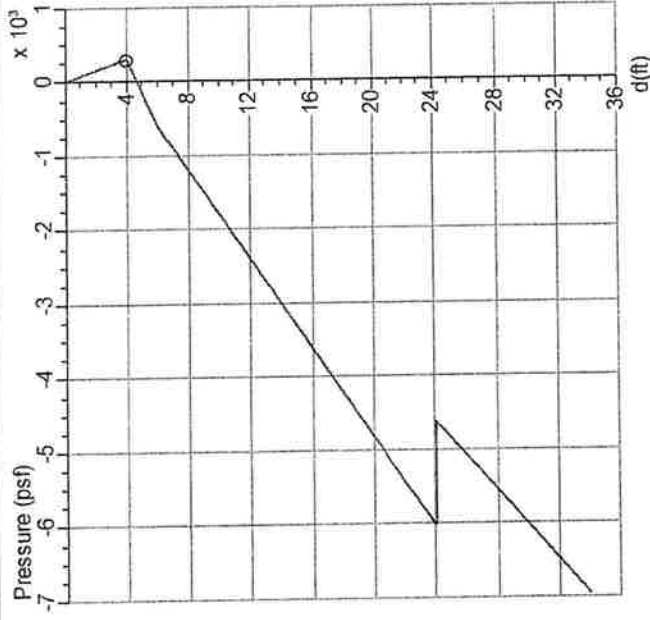
Date: 11.24.10

Sheet: MZ-32

Pressure: Rankine

Toe: Cantilever

	Maximum	d (ft)
○	310.0 psf	4.00
□	2163.7 flb/ft	6.49
◇	726.0 lb/ft	4.67
●	0.0 in	0.00



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page 1

DESIGNER GDJ Derby Levee SHEET NO
 CHECKER T-wall Section D OF
 DATE 11/19/010 JOB 1560-119 Time 16:25:16

 * Retaining Structure *
 * by NECO *

 * INPUT DATA *

1. Retaining Structure Geometry

Struct.Type	Abutment	Struct.Shape	Cantilever
Footing Type	Spread	Stem Sections	2
Wall Height	14.000 ft	Stem Width	1.500 ft
Toe Thickness	2.420 ft	Toe Width	5.670 ft
Heel Thickness	2.420 ft	Heel width	12.000 ft
Front Batt.El.	7.100 ft	Back Batt.El.	0.000 ft
Front Slope	50.000 %	Back Slope	0.000 %
Seat width	0.000 ft	Seat Depth	0.000 ft
Seat Thick	0.000 ft	Front Fill	10.000 ft
Concrete Weight	150 pcf	Concrete, fc	3 ksi
Wind Pressure	0 psf	Concrete Cover	3.000 in
Earthquake	0.000	Ground water	Yes
Es/Ec ratio	8.00	Z, Quantity	145 k/in

2. Soil Characteristics

Soil Weight	125 pcf	Surcharge	0.000 ft
Friction Angle	32.000 deg	Back Fill slope	0.000 %
Front Water El.	4.000 ft	Back water El.	14.000 ft
Overturn Coef.	2.000	Sliding Coef.	1.500
Friction Coef.	0.600		

3. Superstructure Load System (per LF)

Distance, X	7.25 ft	Distance, Y	14.00 ft
Dead Load	1.80 kip	Live Load	0.00 kip
Centrifug.Load	0.00 kip	Wind Load	0.00 kip
Wind on LL	0.00 kip	Longitud.Load	0.00 kip
Termal Load	0.00 kip	Earthquake	0.00 kip

4. Stem Sections

Section	Elevation
1	0.00 ft
2	0.00 ft

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page 2

DESIGNER GDJ Derby Levee SHEET NO
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5. Footing Section Properties (per LF)

width	21.510 ft
Area	21.510 ft ²
Moment of Inertia	829.354 ft ⁴
Section Modulus	77.113 ft ³

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Derby Levee
 T-wall Section D
 JOB 1560-119

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 Time 16:25:16

 * OUTPUT DATA *

1. FOOTING LOAD SYSTEM
 1.1 From Superstructure

Load	Intens. kip V	H	Moment, kft Pos	Neg
DL	1.80	0.00	27.47	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
EQ	0.00	-0.00	0.00	-0.00

1.2 From Substructure
 1.2.1 Dead Load

Load	Intens. kip V	H	Load Arm, ft x	y	Moment, kft Pos	Neg
Concrete						
C 1	2.06	0.00	2.84	0.00	5.8	0.00
C 2	3.15	0.00	8.76	0.00	27.6	0.00
C 3	4.36	0.00	15.51	0.00	67.6	0.00
C 4	0.85	0.00	6.84	0.00	5.8	0.00
C 5	0.82	0.00	7.23	0.00	5.9	0.00
C 6	0.00	0.00	0.00	0.00	0.0	0.00
C 7	0.00	0.00	0.00	0.00	0.0	0.00
C 8	0.00	0.00	0.00	0.00	0.0	0.00
Earth						
E 1	7.09	0.00	2.84	0.00	20.1	0.00
E 2	17.37	0.00	15.51	0.00	269.4	0.00
E 3	2.24	0.00	6.72	0.00	15.1	0.00
E 4	0.00	0.00	0.00	0.00	0.0	0.00
E 5	0.00	0.00	0.00	0.00	0.0	0.00
TOT	37.93	0.00			417.3	0.0

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Derby Levee
 T-wall Section D
 JOB 1560-119

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1.2.2 Surcharge Load

TW-RG-2A.OUT

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
Sc1	0.00	0.00	0.00	0.00	0.0	0.00
Sc2	0.00	0.00	0.00	0.00	0.0	0.00
Sc3	0.00	0.00	0.00	0.00	0.00	0.0
TOT	0.00	0.00			0.0	0.0

1.2.3 Earth Pressure

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
Ep1	0.00	-0.00	21.51	14.00	0.0	-0.0
Ep2	0.00	-1.88	21.51	4.67	0.0	-8.8
TOT	0.00	-1.88			0.0	-8.8

1.2.4 Buoyancy Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
B1	0.00	-5.62	0.00	4.96	0.00	-27.9
B2	-12.09	0.00	12.75	0.00	0.00	-154.1
B3	0.00	0.00	0.00	0.00	0.00	0.0
TOT	-12.09	-5.62			0.0	-181.9

1.2.5 Wind Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
w1	0.00	-0.00	0.00	13.21	0.00	-0.0
TOT	0.00	-0.00			0.0	-0.0

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Derby Levee
 T-Wall Section D
 JOB 1560-119

SHEET NO
 OF
 Time 16:25:16

1.2.6 Earthquake Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
S 1	0.00	-0.00	0.00	1.21	0.00	-0.0
S 2	0.00	-0.00	0.00	7.00	0.00	-0.0
S 3	0.00	-0.00	0.00	1.21	0.00	-0.0
S 4	0.00	-0.00	0.00	1.21	0.00	-0.0
S 5	0.00	-0.00	0.00	3.98	0.00	-0.0
S 6	0.00	-0.00	0.00	0.00	0.00	-0.0
S 7	0.00	-0.00	0.00	0.00	0.00	-0.0
S 8	0.00	-0.00	0.00	0.00	0.00	-0.0
S 9	0.00	-0.00	0.00	12.75	-0.0	0.00
S10	0.00	-0.00	0.00	7.42	0.00	-0.0
S11	0.00	-0.00	0.00	8.21	0.00	-0.0

				TW-RG-2A.OUT		
S12	0.00	-0.00	0.00	8.47	0.00	-0.0
S13	0.00	-0.00	0.00	0.00	0.00	-0.0
S14	0.00	-0.00	0.00	0.00	0.00	-0.0
SE1	0.00	0.00	0.00	14.00	0.00	0.0
SE2	0.00	0.00	0.00	4.67	0.00	0.0
TOT	0.00	0.00			0.0	0.0

1.2.7 Total Substructure Loads

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
DL	37.93	0.00	417.30	0.00
LL	0.00	0.00	0.00	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
W	0.00	-0.00	0.00	-0.00
EQ	0.00	0.00	0.00	0.00

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DESIGNER GDJ	Derby Levee	SHEET NO
CHECKER	T-Wall Section D	OF
DATE 11/19/010	JOB 1560-119	Time 16:25:16

2. SERVICE LOADS

2.1 Load Combinations

2.1.1 GROUP I

DL+LL+CF+E+B

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
LL	0.00	0.00	0.00	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
TOT	27.65	-7.50	444.77	-190.73

2.1.2 GROUP II

DL+E+B+W

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Substructure:				
DL	37.93	0.00	417.30	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
W	0.00	-0.00	0.00	-0.00
TOT	25.85	-7.50	417.30	-190.73

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Derby Levee
 T-Wall Section D
 JOB 1560-119

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2.1.3 GROUP III
 DL+LL+CF+E+B+0.3*W+WL+LF

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
LL	0.00	0.00	0.00	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
W	0.00	-0.00	0.00	-0.00
TOT	27.65	-7.50	444.77	-190.73

2.1.4 GROUP IV
 DL+LL+CF+E+B+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
LL	0.00	0.00	0.00	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
TOT	27.65	-7.50	444.77	-190.73

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 JOB 1560-119

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 Time 16:25:16

2.1.5 GROUP V
 DL+E+B+W+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
W	0.00	-0.00	0.00	-0.00

TW-RG-2A. OUT				
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
W	0.00	-0.00	0.00	-0.00
TOT	27.65	-7.50	444.77	-190.73

2.1.6 GROUP VI
DL+LL+CF+E+B+0.3*W+WL+LF+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
LL	0.00	0.00	0.00	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
W	0.00	-0.00	0.00	-0.00
TOT	27.65	-7.50	444.77	-190.73

Milone & Macbroom, Inc.

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DESIGNER GDJ	Derby Levee	SHEET NO
CHECKER	T-Wall Section D	OF
DATE 11/19/010	JOB 1560-119	Time 16:25:16

2.1.7 GROUP VII
DL+E+B+EQ

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	1.80	0.00	27.47	0.00
EQ	0.00	-0.00	0.00	-0.00
Substructure:				
DL	37.93	0.00	417.30	0.00
E	0.00	-1.88	0.00	-8.79
B	-12.09	-5.62	0.00	-181.94
EQ	0.00	0.00	0.00	0.00
TOT	27.65	-7.50	444.77	-190.73

2.2 Total Service Loads

Group	Intens. kip		Moment, kft	
	V	H	Pos	Neg

TW-RG-2A.OUT				
I	27.65	-7.50	444.77	-190.73
II	25.85	-7.50	417.30	-190.73
III	27.65	-7.50	444.77	-190.73
IV	27.65	-7.50	444.77	-190.73
V	27.65	-7.50	444.77	-190.73
VI	27.65	-7.50	444.77	-190.73
VII	27.65	-7.50	444.77	-190.73

2.5 Moments (kft) and shears (kip), per LF

Group	Toe		Heel	
	V	M	V	M
I	-9.46	-17.37	0.88	8.64
	-9.46	-17.37	0.88	8.64
II	-7.54	-22.32	10.84	73.99
	-6.03	-17.85	8.68	59.19
III	-9.46	-17.37	0.88	8.64
	-7.57	-13.90	0.71	6.91
IV	-9.46	-17.37	0.88	8.64
	-7.57	-13.90	0.71	6.91
V	-7.57	-22.27	9.28	63.21
	-5.41	-15.91	6.63	45.15
VI	-9.46	-17.37	0.88	8.64
	-6.76	-12.41	0.63	6.17
VII	-7.57	-22.27	9.28	63.21
	-5.70	-16.74	6.98	47.53

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DESIGNER	GDJ	Derby Levee	SHEET NO	
CHECKER		T-Wall Section D	OF	
DATE	11/19/010	JOB	1560-119	Time 16:25:16

2.3 Sliding & Overturning Safety Factors

Group	Coef.	Sliding		Overturning	
		Allow	Service	Allow	Service
I	1.000	1.500	2.211	2.000	2.332
II	1.250	1.200	2.067	1.600	2.188
III	1.250	1.200	2.211	1.600	2.332
IV	1.250	1.200	2.211	1.600	2.332
V	1.400	1.071	2.211	1.429	2.332
VI	1.400	1.071	2.211	1.429	2.332
VII	1.330	1.128	2.211	1.504	2.332

2.4 Foundation Pressures, TSF

Group	Coef.	Maxim	Minim	Active Zone	
				Pres.	Width, ft
I	1.000	0.923	0.362		
		0.923	0.362		
II	1.250	0.934	0.267		
		0.747	0.214		
III	1.250	0.923	0.362		
		0.739	0.289		
IV	1.250	0.923	0.362		
		0.739	0.289		
V	1.400	0.923	0.362		
		0.660	0.258		
VI	1.400	0.923	0.362		

VII 1.330 0.660 TW-RG-2A.OUT
 0.923 0.258
 0.694 0.362
 0.272

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DESIGNER	GDJ	Derby Levee	SHEET NO	
CHECKER		T-wall Section D	OF	
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3. REINFORCEMENT (LFD)

3.1 Sections Data

	Cover in	Depth in	Ms kft	Mu kft
Toe	3.000	29.040	17.37	29.60
Heel	3.000	29.040	8.64	98.20
Stem:				
0.00'	3.000	46.080	4.98	8.41
0.00'	3.000	46.080	4.98	8.41

3.2 Rebar Spacing, in

		#4	#5	#6	#7	#8	#9	#10
Toe:	Flexure	9.24	14.44	20.79	28.30	36.96	46.78	57.75
	Crack	9.04	12.42	16.05	19.90	23.93	28.11	32.43
Heel:	Flexure	2.72	4.25	6.12	8.33	10.88	13.77	17.00
	Crack	15.36	21.10	27.28	33.84	40.70	47.84	55.20
Stem:								
0.00'	Flexure	54.27	84.79	99.99	99.99	99.99	99.99	99.99
	Crack	34.33	47.24	61.17	75.95	91.47	99.99	99.99
0.00'	Flexure	54.27	84.79	99.99	99.99	99.99	99.99	99.99
	Crack	34.33	47.24	61.17	75.95	91.47	99.99	99.99

NOTE: See AASHTO 8.21 for rebar spacing limits

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4. QUANTITIES, per LF

Item	Unit	Quantity
Concrete	CY	2.77
Backfill	CY	5.15
Gravel	CY	1.89
Dampproofing	SY	1.56

March 3, 2004
Naugatuck River Valley
1560-88-4
Flood Wall Analysis

The flood wall section was taken from As-Built-Drawings dated March 1970; title "Housatonic River Flood Control". The critical section along the flood wall was analyzed using the AASHTO Load Factor Design method. The additional fill against the existing flood wall will not be an overburden; the wall shall remain structurally sound.

EXISTING FLOOD CONTROL WALL
STRUCTURAL CALCULATIONS

NAUGATUCK RIVER GREENWAY

Derby, Connecticut

State Project No. 36-178
Federal Aid Project No. TEA-PEDS(50)
MMI Project No. 1560-88-4

March 3, 2004

Prepared by:

Milone & MacBroom, Inc.
716 South Main Street
Cheshire, Connecticut 06410

(203) 271-1773



MILONE & MACBROOM

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Cheshire, Connecticut 06410
(203) 271-1773 Fax (203) 272-9733

Engineering,
Landscape Architecture
and Environmental Science

JOB 1560-88

SHEET NO. 1

OF

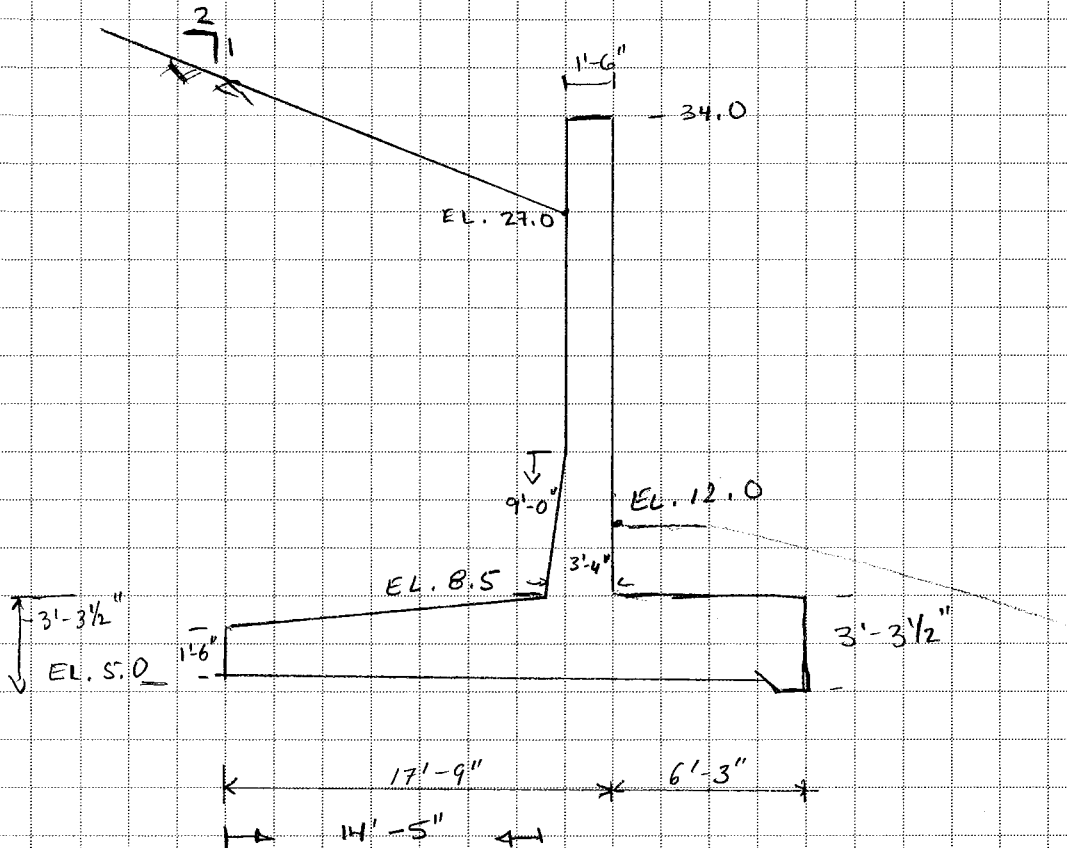
CALCULATED BY KP

DATE 3/01/04

CHECKED BY

DATE

SCALE



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DESIGNER  KP/RFL          EX. WALL ANALYSIS          SHEET NO .....
CHECKER    NAUGATUCK RIVER          OF .....
DATE      3/ 3/04         JOB      1560-88          Time 10:46:21
=====
```

```
*****
*   Retaining Structure   *
*         by NECO         *
*****
```

```
*****
*   INPUT DATA          *
*****
```

1. Retaining Structure Geometry

```
-----
Struct.Type  Ret.Wall      Struct.Shape  Cantilever 1
Footing Type Spread      Stem Sections 1
Wall Height  29.000 ft      Stem Width    3.250 ft
Toe Thickness 3.250 ft      Toe Width     6.250 ft
Heel Thickness 2.000 ft      Heel Width    16.250 ft
Front Batt.El. 0.000 ft      Back Batt.El. 0.000 ft
Front Slope    0.000 %      Back Slope     0.000 %
Seat Width     0.000 ft      Seat Depth     0.000 ft
Seat Thick     0.000 ft      Front Fill     4.000 ft
Concrete Weight 150 pcf      Concrete, fc    3 ksi
Wind Pressure  0 psf       Concrete Cover  2.000 in
Earthquake     0.140      Ground Water    No
Es/Ec ratio    8.00      Z, Quantity     145 k/in
-----
```

2. Soil Characteristics

```
-----
Soil Weight    120 pcf      Surcharge      2.000 ft
Friction Angle 25.000 deg    Back Fill Slope 0.000 %
Overturn Coef. 2.000      Sliding Coef.  1.500
Friction Coef. 0.600
-----
```

3. External Load System (per LF)

```
-----
Distance, X    0.00 ft      Distance, Y     0.00 ft
Dead Load     0.00 kip      Live Load       0.00 kip
-----
```

4. Stem Sections

```
-----
Section      Elevation
-----
1            0.00 ft
-----
```

```
=====
DESIGNER  KP/RFL          EX. WALL ANALYSIS          SHEET NO .....
CHECKER    NAUGATUCK RIVER      OF .....
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5. Footing Section Properties (per LF)

```
-----
Width                25.750 ft
Area                 25.750 ft^2
Moment of Inertia    1422.822 ft^4
Section Modulus      110.510 ft^3
-----
```

```
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DESIGNER  KP/RFL          EX. WALL ANALYSIS          SHEET NO .....
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```

```
*****
*      OUTPUT DATA      *
*****
```

1. FOOTING LOAD SYSTEM
1.1 From Superstructure

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
EQ	0.00	-0.00	0.00	-0.00

1.2 From Substructure
1.2.1 Dead Load

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
Concrete						
C 1	3.05	0.00	3.12	0.00	9.5	0.00
C 2	14.14	0.00	7.88	0.00	111.3	0.00
C 3	4.88	0.00	17.62	0.00	85.9	0.00
C 4	0.00	0.00	0.00	0.00	0.0	0.00
C 5	0.00	0.00	0.00	0.00	0.0	0.00
C 6	0.00	0.00	0.00	0.00	0.0	0.00
C 7	0.00	0.00	0.00	0.00	0.0	0.00
C 8	0.00	0.00	0.00	0.00	0.0	0.00
Earth						
E 1	3.00	0.00	3.12	0.00	9.4	0.00
E 2	52.65	0.00	17.62	0.00	928.0	0.00
E 3	-0.00	0.00	0.00	0.00	-0.0	0.00
E 4	0.00	0.00	0.00	0.00	0.0	0.00
E 5	0.00	0.00	0.00	0.00	0.0	0.00
TOT	77.71	0.00			1144.1	0.0

DESIGNER	KP/RFL	EX. WALL ANALYSIS	SHEET NO	
CHECKER		NAUGATUCK RIVER	OF	
DATE	3/ 3/04	JOB	1560-88	Time 10:46:21

1.2.2 Surge Load

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
Sc1	3.90	0.00	17.62	0.00	68.7	0.00
Sc2	0.00	0.00	0.00	0.00	0.0	0.00
Sc3	0.00	-2.83	0.00	14.50	0.00	-41.0
TOT	3.90	-2.83			68.7	-41.0

1.2.3 Earth Pressure

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
Ep1	0.00	-20.48	25.75	9.67	0.0	-198.0
Ep2	0.00	-0.00	25.75	0.00	0.0	-0.0
TOT	0.00	-20.48			0.0	-198.0

1.2.4 Buoyancy Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
B1	0.00	0.00	0.00	0.00	0.00	0.0
B2	0.00	0.00	0.00	0.00	0.00	0.0
B3	0.00	0.00	0.00	0.00	0.00	0.0
TOT	0.00	0.00			0.0	0.0

1.2.5 Wind Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
W1	0.00	-0.00	0.00	18.12	0.00	-0.0
TOT	0.00	-0.00			0.0	-0.0

DESIGNER KP/RFL

EX. WALL ANALYSIS

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NAUGATUCK RIVER

OF

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1.2.6 Earthquake Forces

Load	Intens.kip		Load Arm, ft		Moment, kft	
	V	H	x	y	Pos	Neg
S 1	0.00	-0.43	0.00	1.62	0.00	-0.7
S 2	0.00	-1.98	0.00	14.50	0.00	-28.7
S 3	0.00	-0.68	0.00	1.00	0.00	-0.7
S 4	0.00	-0.00	0.00	0.00	0.00	-0.0
S 5	0.00	-0.00	0.00	0.00	0.00	-0.0
S 6	0.00	-0.00	0.00	0.00	0.00	-0.0
S 7	0.00	-0.00	0.00	0.00	0.00	-0.0
S 8	0.00	-0.00	0.00	0.00	0.00	-0.0
S 9	0.00	-0.00	0.00	0.00	-0.0	0.00
S10	0.00	-0.42	0.00	5.25	0.00	-2.2
S11	0.00	-7.37	0.00	15.50	0.00	-114.3
S12	0.00	0.00	0.00	0.00	0.00	0.0
S13	0.00	-0.00	0.00	0.00	0.00	-0.0
S14	0.00	-0.00	0.00	0.00	0.00	-0.0
SE1	0.00	-2.69	0.00	9.67	0.00	-26.0
SE2	0.00	-0.00	0.00	0.00	0.00	-0.0
TOT	0.00	-13.57			0.0	-198.6

1.2.7 Total Substructure Loads

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
DL	77.71	0.00	1144.11	0.00
LL	3.90	-2.83	68.74	-40.97
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
EQ	0.00	-13.57	0.00	-198.62

DESIGNER KP/RFL

EX. WALL ANALYSIS

SHEET NO

CHECKER

NAUGATUCK RIVER

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2. SERVICE LOADS

2.1 Load Combinations

2.1.1 GROUP I

DL+LL+CF+E+B

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
LL	3.90	-2.83	68.74	-40.97
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
TOT	81.61	-23.31	1212.84	-238.97

2.1.2 GROUP II

DL+E+B+W

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Substructure:				
DL	77.71	0.00	1144.11	0.00
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	77.71	-20.48	1144.11	-198.00

DESIGNER KP/RFL
 CHECKER
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EX. WALL ANALYSIS
 NAUGATUCK RIVER
 JOB 1560-88

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2.1.3 GROUP III
 DL+LL+CF+E+B+0.3*W+WL+LF

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
LL	3.90	-2.83	68.74	-40.97
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	81.61	-23.31	1212.84	-238.97

2.1.4 GROUP IV
 DL+LL+CF+E+B+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
LL	3.90	-2.83	68.74	-40.97
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
TOT	81.61	-23.31	1212.84	-238.97

DESIGNER KP/RFL
 CHECKER
 DATE 3/ 3/04

EX. WALL ANALYSIS
 NAUGATUCK RIVER
 JOB 1560-88

SHEET NO
 OF
 Time 10:46:21

2.1.5 GROUP V
 DL+E+B+W+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	77.71	-20.48	1144.11	-198.00

2.1.6 GROUP VI
 DL+LL+CF+E+B+0.3*W+WL+LF+T

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
LL	3.90	-2.83	68.74	-40.97
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	81.61	-23.31	1212.84	-238.97

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 CHECKER
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EX. WALL ANALYSIS
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2.1.7 GROUP VII
 DL+E+B+EQ

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
EQ	0.00	-0.00	0.00	-0.00
Substructure:				
DL	77.71	0.00	1144.11	0.00
E	0.00	-20.48	0.00	-198.00
B	0.00	0.00	0.00	0.00
EQ	0.00	-13.57	0.00	-198.62
TOT	77.71	-34.06	1144.11	-396.62

2.2 Total Service Loads

Group	Intens. kip		Moment, kft	
	V	H	Pos	Neg
I	81.61	-23.31	1212.84	-238.97
II	77.71	-20.48	1144.11	-198.00
III	81.61	-23.31	1212.84	-238.97
IV	81.61	-23.31	1212.84	-238.97
V	77.71	-20.48	1144.11	-198.00
VI	81.61	-23.31	1212.84	-238.97
VII	77.71	-34.06	1144.11	-396.62

2.5 Moments (kft) and Shears (kip), per LF

Group	Toe		Heel	
	V	M	V	M
I	-20.05	-63.76	10.19	102.13
	-20.05	-63.76	10.19	102.13
II	-18.14	-57.48	11.44	106.59
	-14.52	-45.98	9.15	85.28
III	-20.05	-63.76	10.19	102.13
	-16.04	-51.01	8.15	81.70
IV	-20.05	-63.76	10.19	102.13
	-16.04	-51.01	8.15	81.70
V	-18.14	-57.48	11.44	106.59
	-12.96	-41.06	8.17	76.14
VI	-20.05	-63.76	10.19	102.13

	-14.32	-45.54	7.28	72.95
VII	-26.65	-86.90	22.21	358.31
	-20.04	-65.34	16.70	269.40

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2.3 Sliding & Overturning Safety Factors

Group	Coef.	Sliding		Overturning	
		Allow	Service	Allow	Service
I	1.000	1.500	2.101	2.000	5.075
II	1.250	1.200	2.276	1.600	5.778
III	1.250	1.200	2.101	1.600	5.075
IV	1.250	1.200	2.101	1.600	5.075
V	1.400	1.071	2.276	1.429	5.778
VI	1.400	1.071	2.101	1.429	5.075
VII	1.330	1.128	1.369	1.504	2.885

2.4 Foundation Pressures, TSF

Group	Coef.	Maxim	Minim	Active Zone	
				Pres.	Width, ft
I	1.000	1.932	1.237		
		1.932	1.237		
II	1.250	1.755	1.263		
		1.404	1.010		
III	1.250	1.932	1.237		
		1.546	0.990		
IV	1.250	1.932	1.237		
		1.546	0.990		
V	1.400	1.755	1.263		
		1.254	0.902		
VI	1.400	1.932	1.237		
		1.380	0.884		
VII	1.330	2.654	0.364		
		1.995	0.274		

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3. ULTIMATE LOADS

3.1 Load Combinations

3.1.1 GROUP I

$$1.3*(DL+1.67*LL+CF+1.3*E+B)$$

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	101.02	0.00	1487.34	0.00
LL	8.47	-6.13	149.23	-88.94
E	0.00	-34.62	0.00	-334.63
B	0.00	0.00	0.00	0.00
TOT	109.49	-40.75	1636.57	-423.56

3.1.2 GROUP II

$$1.3*(DL+1.3*E+B+W)$$

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Substructure:				
DL	101.02	0.00	1487.34	0.00
E	0.00	-34.62	0.00	-334.63
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	101.02	-34.62	1487.34	-334.63

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3.1.3 GROUP III

$$1.3*(DL+LL+CF+1.3*E+B+0.3*W+WL+LF)$$

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
Substructure:				
DL	101.02	0.00	1487.34	0.00
LL	5.07	-3.67	89.36	-53.26
E	0.00	-34.62	0.00	-334.63
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	106.09	-38.29	1576.70	-387.88

3.1.4 GROUP IV

$$1.3*(DL+LL+CF+1.3*E+B+T)$$

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	101.02	0.00	1487.34	0.00
LL	5.07	-3.67	89.36	-53.26
E	0.00	-34.62	0.00	-334.63
B	0.00	0.00	0.00	0.00
TOT	106.09	-38.29	1576.70	-387.88

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3.1.5 GROUP V

1.25*(DL+1.3*E+B+W+T)

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	97.14	0.00	1430.13	0.00
E	0.00	-33.29	0.00	-321.76
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	97.14	-33.29	1430.13	-321.76

3.1.6 GROUP VI

1.25*(DL+LL+CF+1.3*E+B+0.3*W+WL+LF+T)

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
LL	0.00	0.00	0.00	0.00
CF	0.00	-0.00	0.00	-0.00
W	0.00	-0.00	0.00	-0.00
WL	0.00	-0.00	0.00	-0.00
LF	0.00	-0.00	0.00	-0.00
T	0.00	-0.00	0.00	-0.00
Substructure:				
DL	97.14	0.00	1430.13	0.00
LL	4.87	-3.53	85.92	-51.21
E	0.00	-33.29	0.00	-321.76
B	0.00	0.00	0.00	0.00
W	0.00	-0.00	0.00	-0.00
TOT	102.01	-36.82	1516.06	-372.96

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3.1.7 GROUP VII
1.3*(DL+1.3*E+B+EQ)

Load	Intens. kip		Moment, kft	
	V	H	Pos	Neg
Superstructure:				
DL	0.00	0.00	0.00	0.00
EQ	0.00	-0.00	0.00	-0.00
Substructure:				
DL	101.02	0.00	1487.34	0.00
E	0.00	-34.62	0.00	-334.63
B	0.00	0.00	0.00	0.00
EQ	0.00	-17.65	0.00	-258.20
TOT	101.02	-52.26	1487.34	-592.83

3.2 Total Ultimate Loads

Group	Intens. kip		Moment, kft	
	V	H	Pos	Neg
I	109.49	-40.75	1636.57	-423.56
II	101.02	-34.62	1487.34	-334.63
III	106.09	-38.29	1576.70	-387.88
IV	106.09	-38.29	1576.70	-387.88
V	97.14	-33.29	1430.13	-321.76
VI	102.01	-36.82	1516.06	-372.96
VII	101.02	-52.26	1487.34	-592.83

3.3 Moments (kft) and Shears (kip), per LF

Group	Toe		Heel	
	V	M	V	M
I	-31.04	-99.80	16.36	182.32
II	-26.90	-86.16	19.06	192.02
III	-29.38	-94.33	17.44	186.21
IV	-29.38	-94.33	17.44	186.21
V	-25.86	-82.85	18.32	184.63
VI	-28.25	-90.70	16.77	179.05
VII	-37.95	-124.41	33.06	519.24

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3.4 Sliding & Overturning Factors

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-----
Group      Slide      Overturn
-----
I           1.612       3.864
II          1.751       4.445
III         1.662       4.065
IV          1.662       4.065
V           1.751       4.445
VI          1.662       4.065
VII         1.160       2.509
-----
```

3.5 Foundation Pressures, TSF

```
-----
Group      Maxim      Minim      Active Zone
              Pres.      Width, ft
-----
I           3.016       1.236
II          2.631       1.292
III         2.861       1.259
IV          2.861       1.259
V           2.530       1.243
VI          2.751       1.210
VII         3.799       0.124
-----
```

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4. REINFORCEMENT (LFD)

4.1 Sections Data

	Cover in	Depth in	Ms kft	Mu kft
Toe	2.000	39.000	63.76	124.41
Heel	2.000	24.000	102.13	519.24
Stem:				
0.00'	2.000	39.000	159.80	270.95

4.2 Rebar Spacing, in

		#4	#5	#6	#7	#8	#9	#10
Toe:	Flexure	3.09	4.83	6.95	9.46	12.36	15.64	19.31
	Crack	4.43	6.08	7.86	9.75	11.72	13.78	15.90
Heel:	Flexure	0.28	0.44	0.63	0.86	1.13	1.43	1.76
	Crack	2.04	2.80	3.61	4.46	5.36	6.28	7.24
Stem:								
0.00'	Flexure	1.38	2.16	3.11	4.24	5.53	7.00	8.64
	Crack	2.20	3.01	3.89	4.82	5.80	6.81	7.85

NOTE: See AASHTO 8.21 for rebar spacing limits