

29-OCT-09  
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GEORGIA DEPARTMENT OF TRANSPORTATION  
PRECONSTRUCTION DIVISION - OFFICE OF BRIDGE & STRUCTURAL DESIGN  
THE ANALYSIS AND DESIGN OF PIERS FOR BRIDGES - V 4.2.07 - AASHTO SPECS 1984 INTERIM  
REVISED: JUNE 30, 2008  
36' CURB-CURB; 5 BEAMS; 125' SPAN; 40' TALL; BRIDGE 25 ; PIER 34

PROB. NO. 0001

DESIGN DATA												DESIGN DATA																	
DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW	ANG	F'C	FC	N	FY	FS	DESIGN DATA	DESIGN DATA	CONC.	Z	* * *	CAP	REINFORCING	STEEL	* * *	CAP									
OPTIONS	D	D	D	L	L	L	L	L	L	L	EC	ES	STRAIN	FACT	MAIN	STR	MAX	MAX	MIN	MIN	TOP								
				D	M	S	PSI	PSI		PSI	PSI	PSI	PSI		SIZE	SIZE	TOP	TOP	MIN	MIN	CL.								
D	D	D	D	L	L	L	2	1	12	0-00-00	3500.	1400.	8.	60000.	24000.	3409.	29000.	0.0030	170.	11	5	16	16	11	2	2.00	4.00	3.00	2.00
COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE									
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT									
1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	18.87	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000	-9.999									

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.000	8.000	4.000					
12	2	SAME AS CANTILEVER 1														

COLUMN DATA

CN	P	I	T	S	HT	A	DT	BT	DB	BB	DL	FLEX	ND	NB	SZ	ND	NB	SZ	ND	NB	SZ	SLOPE	EP	AP			
21	1	C	T		40.000	0.000	8.000	6.000	8.000	6.000	6.000	0.000	8	6	11	8	6	11	22	16	11	22	16	11	0.000	0.000	0.000

FOOTING DATA

CN	S/P	B	D	T	DEL.B	DEL.D	DEL.T	R.B/D	R.D/B	S.HT.	NP	SYM.	BP	DP	SET.
31	P	10.000	10.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND INTENSITIES

WIND	TRANS.	LONG.	WIND	FT1	FT2	FT3	FT4	FT5	FT1	FT2	FT3	FT4	FT5	WIND	ON	PIER
1219.	2438.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	14.323

GROUP III WIND INTENSITIES

STD.	WIND	ON	SUPERSTRUCTURE	INTENSITIES	STD.	WIND	ON	LIVE	LOAD	INTENSITIES	LENGTHS	OF	LL	WIND	ON	LL	ARMS								
WIND	FT1	FT2	FT3	FT4	FT5	WIND	FT1	FT2	FT3	FT4	FT5	TRANS.	LONGI.	APT	APT	APT	APT								
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	125.0	250.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL	
0.000	8.900	15.583	15.583	0.00018000	0.00044000	0.000	0.000	

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES

I.D.	NL	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
D.L.	0	252.360	292.304	0.000	292.304	0.000	292.304	252.360					
LL 1	1	79.671	47.802	0.000	0.000	0.000	0.000	0.000					
LL 2	2	79.671	95.605	0.000	79.671	0.000	0.000	0.000					
LL 3	3	79.671	95.605	0.000	111.539	0.000	79.671	15.934					
LL 4	1	0.000	0.000	0.000	0.000	0.000	47.802	79.671					
LL 5	2	0.000	0.000	0.000	79.671	0.000	95.605	79.671					
LL 6	3	15.934	79.671	0.000	111.539	0.000	95.605	79.671					
LL 7	1	0.000	23.901	0.000	79.671	0.000	23.901	0.000					
LL 8	2	39.835	103.572	0.000	87.638	0.000	23.901	0.000					
LL 9	3	39.835	103.572	0.000	95.605	0.000	103.572	39.835					
LL10	2	0.000	79.671	0.000	95.605	0.000	79.671	0.000					
LL11	2	79.671	47.802	0.000	0.000	0.000	47.802	79.671					
LL12	3	79.671	95.605	0.000	79.671	0.000	47.802	79.671					

COLUMN MOMENTS(KIP- FEET), SHEARS(KIPS), REACTIONS(KIPS)

TRANSVERSE

\* LONGITUDINAL

LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF
UNIT F.AT CL.CAP	1	0.000	-6.000	1.000	40.000	0.000	0.000	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	1607.982	1852.782	0.000	0.000	0.000	1852.782	7357.229	-7357.229	0.000	0.000	0.000
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-192.089	-8.900	-494.689	-494.689
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 1	1	0.000	-846.844	66.223	3098.426	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 2	1	0.000	-846.844	66.223	3098.426	0.000	0.000	0.000	85.938	14.323	572.920	572.920
GROUP 2 WIND 2 1	1	0.000	-749.020	58.909	2751.926	0.000	0.000	0.000	-281.588	-28.951	-1265.922	-1265.922
GROUP 2 WIND 2 2	1	0.000	-749.020	58.909	2751.926	0.000	0.000	0.000	281.588	28.951	1265.922	1265.922

PIER-36-5-125-40.OUT											
GROUP 2 WIND 3 1 1	0.000	-700.107	55.252	2578.675	0.000	0.000	0.000	-477.237	-43.579	-1958.923	-1958.923
GROUP 2 WIND 3 2 1	0.000	-700.107	55.252	2578.675	0.000	0.000	0.000	477.237	43.579	1958.923	1958.923
GROUP 2 WIND 4 1 1	0.000	-569.674	45.500	2116.674	0.000	0.000	0.000	-607.670	-53.331	-2420.924	-2420.924
GROUP 2 WIND 4 2 1	0.000	-569.674	45.500	2116.674	0.000	0.000	0.000	607.670	53.331	2420.924	2420.924
GROUP 2 WIND 5 1 1	0.000	-308.808	25.996	1192.672	0.000	0.000	0.000	-705.495	-60.645	-2767.425	-2767.425
GROUP 2 WIND 5 2 1	0.000	-308.808	25.996	1192.672	0.000	0.000	0.000	705.495	60.645	2767.425	2767.425
GROUP 3 WIND 1 1 1	0.000	-523.841	32.367	1624.315	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876
GROUP 3 WIND 1 2 1	0.000	-523.841	32.367	1624.315	0.000	0.000	0.000	25.781	4.297	171.876	171.876
GROUP 3 WIND 2 1 1	0.000	-462.119	28.673	1436.991	0.000	0.000	0.000	-149.225	-11.685	-546.525	-546.525
GROUP 3 WIND 2 2 1	0.000	-462.119	28.673	1436.991	0.000	0.000	0.000	149.225	11.685	546.525	546.525
GROUP 3 WIND 3 1 1	0.000	-431.258	26.826	1343.328	0.000	0.000	0.000	-272.669	-19.074	-921.175	-921.175
GROUP 3 WIND 3 2 1	0.000	-431.258	26.826	1343.328	0.000	0.000	0.000	272.669	19.074	921.175	921.175
GROUP 3 WIND 4 1 1	0.000	-348.962	21.900	1093.562	0.000	0.000	0.000	-354.965	-23.999	-1170.941	-1170.941
GROUP 3 WIND 4 2 1	0.000	-348.962	21.900	1093.562	0.000	0.000	0.000	354.965	23.999	1170.941	1170.941
GROUP 3 WIND 5 1 1	0.000	-184.370	12.049	594.029	0.000	0.000	0.000	-416.687	-27.693	-1358.266	-1358.266
GROUP 3 WIND 5 2 1	0.000	-184.370	12.049	594.029	0.000	0.000	0.000	416.687	27.693	1358.266	1358.266
LIVE LOAD LL 1	127.473	-1657.152	0.000	1657.152	127.473	1657.152	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 2	254.947	-2039.576	0.000	2039.576	254.947	2039.576	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

LOAD	COL	PC	MT	TRANSVERSE						LONGITUDINAL		
				V	MB	RF	ML	MR	MT	V	MB	MF
LIVE LOAD LL 3	1	344.178	-1032.538	0.000	1032.538	344.178	1835.618	-803.081	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	127.473	1657.152	0.000	-1657.152	127.473	0.000	-1657.152	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	254.947	2039.576	0.000	-2039.576	254.947	0.000	-2039.576	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	344.178	1032.538	0.000	-1032.538	344.178	803.081	-1835.618	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	127.473	0.000	0.000	0.000	127.473	191.208	-191.208	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	254.946	-1274.728	0.000	1274.728	254.946	1465.936	-191.208	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	344.177	0.000	0.000	0.000	344.177	1319.342	-1319.342	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	254.947	0.000	0.000	0.000	254.947	637.368	-637.368	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	254.946	0.000	0.000	0.000	254.946	1657.152	-1657.152	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	344.178	-344.182	0.000	344.182	344.178	1835.618	-1491.437	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	MOMENTS(KIP-FEET)							SHEARS(KIPS)						
	D.L.TOT.	G1 MAX.+	G1 MAX.-	G2 MAX.+	G2 MAX.-	G3 MAX.+	G3 MAX.-	DL T.LT	DL T.RT	G1 + LT	G1 + RT	G1 - LT	G1 - RT	
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-347.001	-18.933	-347.001	-18.933	-519.967	
P 2	-3019.198	-3019.198	-4402.924	-3019.198	-3019.198	-3019.198	-3847.776	-402.712	-782.707	-402.712	-782.707	-575.677	-1163.231	
P 3	-6218.516	-6218.516	-9124.338	-6218.516	-6218.516	-6218.516	-7958.529	-817.751	-817.751	-817.751	-817.751	-1198.275	-1198.275	
C 1L	-9564.398	-9564.398	-13992.317	-9564.398	-9564.398	-9564.398	-12215.847	-855.191		-855.191		-1235.715		
C 1R	-9564.398	-9564.398	-13992.317	-9564.398	-9564.398	-9564.398	-12215.847		855.191		1235.715		855.191	
P 5	-6218.516	-6218.516	-9124.338	-6218.516	-6218.516	-6218.516	-7958.529	817.751	817.751	1198.275	1198.275	817.751	817.751	
P 6	-3019.198	-3019.198	-4402.924	-3019.198	-3019.198	-3019.198	-3847.776	782.707	402.712	1163.231	575.677	782.707	402.712	
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	347.001	18.933	519.967	18.933	347.001	18.933	

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+ K-FT.	M- K-FT.	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14		0.08	0.000	0.099
P 2	-2322.460	-2959.828	12.44	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.142	#5@ 4.37	83.71		0.23	0.593	1.288
P 3	-4783.474	-6121.945	22.59	15 # 11	3.12	2 # 11	24.00	0.112	#5@ 5.56	24.00	0.112	#5@ 5.56	96.00		0.37	0.571	1.014
C 1	-7357.229	-9396.806	35.42	23 # 11	3.12	2 # 11	24.00	0.121	#5@ 5.14	24.00	0.121	#5@ 5.14	96.00		0.58	0.588	0.974
P 5	-4783.474	-6121.945	22.59	15 # 11	3.12	2 # 11	24.00	0.112	#5@ 5.56	24.00	0.112	#5@ 5.56	96.00		0.37	0.571	1.014
P 6	-2322.460	-2959.828	12.44	8 # 11	3.12	2 # 11	24.00	0.142	#5@ 4.37	24.00	0.060	#5@10.33	83.71		0.23	0.593	1.288
P 7	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.14		0.08	0.000	0.099

NOTE: \*\*\* FS/FZ RATIO EXCEEDS 1.0! \*\*\*

□ COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS

PIER-36-5-125-40.OUT

CN	T	B	GR	LLC	WC	R	E	C	S	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T		1	LL	2	0.0				2643.9	-4427.9	0.0	2643.9	4828.9	1839.8	8628.3	15763.0	6005.8	3.264	72.00	96.00
1	B		3	LL	2	4.1				2740.0	4073.1	-2808.4	2740.0	4410.3	3216.5	7767.6	12502.8	9118.6	2.835	72.00	96.00

COLUMN DESIGN DATA

CN	T	B	FACE 1	B	FACE 2	D	FACE 3	D	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2803.	33756.	1.091	1.160	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2581.	33756.	1.083	1.145	1.000	2	0.70

FOOTING 1 DESIGN LOADS

F	G	LLID	WC	ES	C	S	P	MT	VT	ML	VL	P4	P3	P2	P1	MTF	VBF	VPF	LOAD
1	3	LL 2	4.1				2067.258	2809.366	21.900-2160.319	-41.799	198.201	106.485	200.642	292.358	192.292	27.755	41.367	MAX.P1	
1	3	LL 2	1.1				2687.435	4342.154	42.077-1509.629	-28.726	217.818	153.821	300.677	364.675	260.167	37.525	53.777	MAX.MT	
1	3	LL 2	1.1				2687.435	4342.154	42.077-1509.629	-28.726	217.818	153.821	300.677	364.675	260.167	37.525	53.777	MAX.VT	
1	3	LL 3	4.1				2785.021	2550.846	28.470-3258.581	-62.438	293.053	154.830	241.707	379.930	241.953	34.945	55.674	MAX.VP	
1	3	LL 3	4.1				2785.021	2550.846	28.470-3258.581	-62.438	293.053	154.830	241.707	379.930	241.819	52.968	55.674	MAX.ML	
1	3	LL 3	4.1				2785.021	2550.846	28.470-3258.581	-62.438	293.053	154.830	241.707	379.930	241.819	52.968	55.674	MAX.VL	
1	3	LL 2	4.1				2067.258	2809.366	21.900-2160.319	-41.799	198.201	106.485	200.642	292.358	192.292	27.755	41.367	MAX.P3	

FOOTING 1 ANALYSIS/DESIGN RESULTS

FOOTING SIZE				* BAR REINFORCEMENT STEEL *					SECTION CAPACITIES *			
B	D	T	P1/PA	AS	NO.SIZE	SPAC.	PLACEMENT	MT.	VB	VP	DS	FC
18.000	18.000	5.000	0.995	1.28	23 # 9	@ 9.375	TOP LONG	242.030	52.096	104.192	43.166	0.000
				1.34	19 #10	@11.250	BOT.TRAN	260.836	53.543	107.086	44.365	0.000

NUMBER OF PILES = 12 BP = 2.583 DP = 7.750