

06-NOV-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  
44' CURB-CURB; 6 BEAMS; 140' SPAN; 40' TALL; BRIDGE 2A ; PIER 10

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW	ANG	F'C	FC	N	FY	FS	DESIGN DATA		CONC.	Z	CAP			REINFORCING			STEEL			* * * CAP		
OPTIONS				D	M	S	PSI	PSI	PSI	PSI	EC	ES	STRAIN	FACT	MAIN	STR	MAX	MAX	MIN	MIN	MIN	TOP	MIN	TOP	MIN	TOP
D	D	D	L	2	1	13	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	ALL.PILE	ALL.PILE	ALL.PILE	ALL.PILE	ALL.PILE	ALL.PILE
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF																					
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							

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	23.825	8.200	4.000	6.000	6.000	4.000	15.625	20.170	8.068	3.902					
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	16.400	6.000	16.400	6.000	6.000	0.000	16	6	11	16	6	11	47	16	11	47	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	18.400	18.400	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

STD.	* WIND ON SUPERSTRUCTURE INTENSITIES	* WIND ON LIVE LOAD INTENSITIES	* WIND ON LL ARMS
WIND FT1	FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5	WIND FT1	FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5
1	50 0 44 6 41 12 33 16 17 19	1	100 0 88 12 82 24 66 32 34 38

CENTRI.	TRACTION	FORCE	MISCELLANEOUS FORCES	SHRINKAGE	STREAM	FLOW
FT	FL	APT	AND ARMS APL	COEFFICIENT	PT	PL
0.000	9.860	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	279.464	323.594	0.000	808.984	0.000	323.594	279.464					
LL 1	1	86.572	50.839	0.000	0.000	0.000	0.000	0.000					
LL 2	2	86.572	104.762	0.000	83.489	0.000	0.000	0.000					
LL 3	3	86.572	104.762	0.000	205.861	0.000	15.039	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	50.839	86.572					
LL 5	2	0.000	0.000	0.000	83.489	0.000	104.762	86.572					
LL 6	3	0.000	15.039	0.000	205.861	0.000	104.762	86.572					
LL 7	1	0.000	25.547	0.000	111.863	0.000	0.000	0.000					
LL 8	2	42.000	111.864	0.000	120.958	0.000	0.000	0.000					
LL 9	3	42.000	111.864	0.000	216.370	0.000	42.000	0.000					
LL10	2	0.000	33.773	0.000	207.276	0.000	33.773	0.000					
LL11	3	50.226	120.090	0.000	208.144	0.000	33.773	0.000					
LL12	2	86.572	50.839	0.000	0.000	0.000	50.839	86.572					
LL13	3	86.572	104.762	0.000	83.489	0.000	50.839	86.572					

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

LOAD	COL	PC	TRANSVERSE							LONGITUDINAL			
			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	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	2301.930 2803.770	0.002	0.000	-0.002	2803.770	11072.799-11072.801	0.000	0.000	0.000	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	0.000	-212.808	-9.860	-548.048	-548.048
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	0.000	-130.230	-21.705	-868.200	-868.200
GROUP 2 WIND 1 1	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	0.000	-130.230	-21.705	-868.200	-868.200
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	0.000	130.230	21.705	868.200	868.200
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	0.000	-349.312	-38.085	-1644.203	-1644.203

PIER-44-6-140-40.OUT													
GROUP 2 WIND 2 2 1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	0.000	349.312	38.085	1644.203	1644.203	
GROUP 2 WIND 3 1 1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	0.000	-568.395	-54.465	-2420.205	-2420.205	
GROUP 2 WIND 3 2 1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	0.000	568.395	54.465	2420.205	2420.205	
GROUP 2 WIND 4 1 1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	0.000	-714.450	-65.385	-2937.540	-2937.540	
GROUP 2 WIND 4 2 1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	0.000	714.450	65.385	2937.540	2937.540	
GROUP 2 WIND 5 1 1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	0.000	-823.991	-73.575	-3325.541	-3325.541	
GROUP 2 WIND 5 2 1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	0.000	823.991	73.575	3325.541	3325.541	
GROUP 3 WIND 1 1 1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	0.000	-39.069	-6.512	-260.460	-260.460	
GROUP 3 WIND 1 2 1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	0.000	39.069	6.512	260.460	260.460	
GROUP 3 WIND 2 1 1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	0.000	-177.313	-14.786	-680.020	-680.020	
GROUP 3 WIND 2 2 1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	0.000	177.313	14.786	680.020	680.020	
GROUP 3 WIND 3 1 1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	0.000	-315.556	-23.060	-1099.579	-1099.579	
GROUP 3 WIND 3 2 1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	0.000	315.556	23.060	1099.579	1099.579	
GROUP 3 WIND 4 1 1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	0.000	-407.719	-28.576	-1379.286	-1379.286	
GROUP 3 WIND 4 2 1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	0.000	407.719	28.576	1379.286	1379.286	
GROUP 3 WIND 5 1 1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	0.000	-476.840	-32.713	-1589.065	-1589.065	
GROUP 3 WIND 5 2 1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	0.000	476.840	32.713	1589.065	1589.065	
LIVE LOAD LL 1	137.411	-2361.411	0.000	2361.411	137.411	2361.411	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD LL 2	274.823	-3013.987	0.000	3013.987	274.823	3013.987	0.000	0.000	0.000	0.000	0.000	0.000	

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

LOAD	COL	TRANSVERSE								LONGITUDINAL			
		PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF	
LIVE LOAD LL 3	1	371.011	-2548.786	0.000	2548.786	371.011	2712.588	-163.802	0.000	0.000	0.000	0.000	
LIVE LOAD LL 4	1	137.411	2361.411	0.000	-2361.411	137.411	0.000	-2361.411	0.000	0.000	0.000	0.000	
LIVE LOAD LL 5	1	274.823	3013.987	0.000	-3013.987	274.823	0.000	-3013.987	0.000	0.000	0.000	0.000	
LIVE LOAD LL 6	1	371.011	2548.787	0.000	-2548.787	371.011	163.802	-2712.588	0.000	0.000	0.000	0.000	
LIVE LOAD LL 7	1	137.410	-309.170	0.000	309.170	137.410	309.170	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD LL 8	1	274.822	-2200.918	0.000	2200.918	274.822	2200.918	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD LL 9	1	371.011	-1523.371	0.000	1523.371	371.011	1980.826	-457.456	0.000	0.000	0.000	0.000	
LIVE LOAD LL10	1	274.822	0.000	0.000	0.000	274.822	408.721	-408.721	0.000	0.000	0.000	0.000	
LIVE LOAD LL11	1	371.010	-1851.900	0.000	1851.900	371.010	2219.749	-367.849	0.000	0.000	0.000	0.000	
LIVE LOAD LL12	1	274.822	0.000	0.000	0.000	274.822	2361.411	-2361.411	0.000	0.000	0.000	0.000	
LIVE LOAD LL13	1	371.011	-587.318	0.000	587.318	371.011	2712.588	-2125.270	0.000	0.000	0.000	0.000	

CAP MOMENTS AND SHEARS

POINT	D.L.TOT.	MOMENTS(KIP- FEET)						SHEARS(KIPS)					
		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	-33.698	-33.698	-33.698	-33.698	-33.698	-33.698	-33.698	-19.106	-382.409	-19.106	-382.409	-19.106	-570.357
P 2	-3333.138	-3333.138	-4849.500	-3333.138	-3333.138	-3333.138	-4241.140	-438.748	-859.420	-438.748	-859.420	-626.696	-1274.806
P 3	-6751.920	-6751.920	-9889.119	-6751.920	-6751.920	-6751.920	-8630.482	-893.663	-893.663	-893.663	-893.663	-1309.049	-1309.049
C 1L	-14394.638	-14394.638	-20938.004	-14394.638	-14394.638	-14394.638	-18312.822	-970.415		-970.415		-1385.801	
C 1R	-14394.641	-14394.641	-20938.008	-14394.641	-14394.641	-14394.641	-18312.824		970.415		1385.801		970.415
P 5	-6751.921	-6751.921	-9889.121	-6751.921	-6751.921	-6751.921	-8630.483	893.663	893.663	1309.049	1309.049	893.663	893.663
P 6	-3333.138	-3333.138	-4849.501	-3333.138	-3333.138	-3333.138	-4241.140	859.420	438.748	1274.806	626.696	859.420	438.748
P 7	-33.697	-33.697	-33.698	-33.697	-33.697	-33.697	-33.698	382.409	19.106	570.357	19.106	382.409	19.106

PT.	UNF. K-FT.		TOP REINFORCE.		BOT.REINFORCE.		CAP DESIGN DATA LEFT STIRRUPS		RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
	M+	M-	AS	NO.SIZE	AS	NO.SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.						AV/IN
P 1	-25.921	-25.921	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.23	0.08	0.000	0.101
P 2	-2563.952	-3262.415	13.68	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.168	D#5@ 7.39	84.01	0.25	0.570	1.213
P 3	-5193.785	-6638.833	24.54	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.40	0.587	1.011
C 1-11072.799-14086.788			49.15	32 # 11	3.12	2 # 11	24.00	0.127	#5@ 4.88	24.00	0.127	#5@ 4.88	105.00M	0.72	0.576	0.909
P 5	-5193.786	-6638.834	24.54	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.40	0.587	1.011
P 6	-2563.953	-3262.416	13.68	9 # 11	3.12	2 # 11	24.00	0.168	D#5@ 7.39	24.00	0.060	#5@10.33	84.01	0.25	0.570	1.213
P 7	-25.921	-25.921	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.23	0.08	0.000	0.101

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

NOTE: \*\*\* CAP DEPTH HAD TO BE INCREMENTED FOR DESIGN! REVIEW REBAR CONSTRAINTS! RE-ANALYZE IF NEW DEPTH IS USED!  
 COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS

CN	T B	GR	LLC	WC	R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL 3	0.0					3798.0	-5533.4	0.0	3798.0	6228.7	2543.0	23627.2	38758.8	15824.3	6.222	72.00	196.80
1	B	3	LL 3	5.1					4127.2	4168.4-3989.4	4127.2	6768.6	4412.0	20361.3	33439.8	21796.8	4.939	72.00	196.80	

COLUMN DESIGN DATA

CN	T B	B NO.SIZE	FACE 1 NO.SIZE	B NO.SIZE	FACE 2 NO.SIZE	D NO.SIZE	FACE 3 NO.SIZE	D NO.SIZE	FACE 4	AS	PS	BD12	BD	SUMPU	SUMPC	DEL.T	DEL.L	CM	R	PHIC
1	T	16 #	11	16 #	11	30 #	11	30 #	11	143.52	1.013	1.00	0.000	4124.	267502.	1.000	1.116	1.000	2	0.70
1	B	16 #	11	16 #	11	30 #	11	30 #	11	143.52	1.013	1.00	0.000	3801.	267502.	1.000	1.106	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 6	3.1R				3115.885-3640.953	-29.851	2579.310	49.681	200.532	131.218	223.459	292.772	50.615	0.000	22.854	MAX.P1	
1	3	LL 3	2.1				4050.650	4869.591	41.496-2807.675	-53.830	251.509	176.093	299.679	375.095	66.183	0.000	29.710	MAX.MT	
1	3	LL 2	3.1				3945.456	5241.992	38.807-2854.379	-55.613	241.693	164.899	297.120	373.914	65.793	0.000	28.920	MAX.VT	
1	3	LL 3	3.1				4050.650	4733.233	38.807-3353.103	-64.586	260.692	170.584	290.496	380.604	65.800	0.000	29.710	MAX.VP	
1	3	LL 3	4.1				4050.650	4369.616	31.636-3716.721	-71.757	270.487	170.584	280.701	380.604	351.271	57.058	29.710	MAX.ML	
1	3	LL 3	4.1				4050.650	4369.616	31.636-3716.721	-71.757	270.487	170.584	280.701	380.604	351.271	57.058	29.710	MAX.VL	
1	3	LL 5	3.1R				3034.966-4032.306	-29.851	2195.676	42.780	185.917	126.845	228.553	287.626	50.610	0.000	22.246	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
21.100	21.100	5.750	0.997	0.38	40 # 4	@ 6.250	TOP TRAN	88.996	63.337	126.674	52.480	0.000
				1.50	25 #10	@10.125	BOT.LONG	352.790	64.405	128.810	53.365	0.000

NUMBER OF PILES = 17 BP = 3.100 DP = 3.100