

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
40' CURB-CURB; 6 BEAMS; 137' SPAN; 70' TALL; BRIDGE 25 ; PIER 19

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP				
OPTIONS											EC KSI	ES KSI	STRAIN	FACT	MAIN SIZE	STR TOP	MAX	MAX	MIN	MIN	TOP	MIN	DEPTH	BOT
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	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
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	10.000	2.50	5.00	1.250	0.300	3.000	0.000	0.000	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	21.625	6.000	4.000	6.000	6.000	4.000	15.625	18.000	7.200	4.800					
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		70.000	0.000	12.000	6.000	12.000	6.000	6.000	0.000	12	6	11	12	6	11	34	16	11	34	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	S	14.000	14.000	2.250	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 ON PIER				
WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	APT	APL	APT	APL	APT	APL	APT	APL	
1336.	2672.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	8.876	25.133			

GROUP III WIND INTENSITIES															* WIND ON LL													
STD.	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	STD.	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	LENGTHS	OF LL	* WIND	ON LL	ARMS
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	137.0	274.0	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	9.668	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	260.312	295.303	0.000	590.607	0.000	295.303	260.312					
LL 1	1	79.000	56.429	0.000	0.000	0.000	0.000	0.000					
LL 2	2	79.000	97.810	0.000	94.047	0.000	0.000	0.000					
LL 3	3	79.000	97.810	0.000	188.096	0.000	41.381	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	56.429	79.000					
LL 5	2	0.000	0.000	0.000	94.047	0.000	97.810	79.000					
LL 6	3	0.000	41.381	0.000	188.096	0.000	97.810	79.000					
LL 7	1	0.000	28.214	0.000	107.214	0.000	0.000	0.000					
LL 8	2	54.548	107.215	0.000	109.095	0.000	0.000	0.000					
LL 9	3	54.548	107.215	0.000	189.977	0.000	54.548	0.000					
LL10	2	0.000	41.381	0.000	188.096	0.000	41.381	0.000					
LL11	3	79.000	97.810	0.000	188.096	0.000	41.381	0.000					
LL12	2	79.000	56.429	0.000	0.000	0.000	56.429	79.000					
LL13	3	79.000	97.810	0.000	94.047	0.000	56.429	79.000					

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	70.000	0.000	0.000	0.000	6.000	1.000	70.000	70.000			
DEAD LOAD TOTAL	1	1956.987	0.000	0.000	0.000	2648.187	9096.676	-9096.676	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	-208.664	-9.668	-827.416	-827.416			
WIND ON SUBSTR.	1	0.000	-53.256	8.876	621.320	0.000	0.000	0.000	-150.798	-25.133	-1759.310	-1759.310			
GROUP 2 WIND 1 1	1	0.000	-946.706	75.676	5789.970	0.000	0.000	0.000	-150.798	-25.133	-1759.310	-1759.310			
GROUP 2 WIND 1 2	1	0.000	-946.706	75.676	5789.970	0.000	0.000	0.000	150.798	25.133	1759.310	1759.310			
GROUP 2 WIND 2 1	1	0.000	-839.492	67.660	5169.732	0.000	0.000	0.000	-365.226	-41.165	-2999.786	-2999.786			

PIER-40-6-137-70.OUT															
GROUP	WIND	2	2	1	0.000	-839.492	67.660	5169.732	0.000	0.000	0.000	365.226	41.165	2999.786	2999.786
GROUP 2	WIND	3	1	1	0.000	-785.885	63.652	4859.613	0.000	0.000	0.000	-579.654	-57.197	-4240.262	-4240.262
GROUP 2	WIND	3	2	1	0.000	-785.885	63.652	4859.613	0.000	0.000	0.000	579.654	57.197	4240.262	4240.262
GROUP 2	WIND	4	1	1	0.000	-642.933	52.964	4032.629	0.000	0.000	0.000	-722.606	-67.885	-5067.246	-5067.246
GROUP 2	WIND	4	2	1	0.000	-642.933	52.964	4032.629	0.000	0.000	0.000	722.606	67.885	5067.246	5067.246
GROUP 2	WIND	5	1	1	0.000	-357.029	31.588	2378.661	0.000	0.000	0.000	-829.820	-75.901	-5687.484	-5687.484
GROUP 2	WIND	5	2	1	0.000	-357.029	31.588	2378.661	0.000	0.000	0.000	829.820	75.901	5687.484	5687.484
GROUP 3	WIND	1	1	1	0.000	-579.699	36.403	2909.478	0.000	0.000	0.000	-45.239	-7.540	-527.793	-527.793
GROUP 3	WIND	1	2	1	0.000	-579.699	36.403	2909.478	0.000	0.000	0.000	45.239	7.540	527.793	527.793
GROUP 3	WIND	2	1	1	0.000	-512.052	32.354	2582.708	0.000	0.000	0.000	-180.533	-15.638	-1181.333	-1181.333
GROUP 3	WIND	2	2	1	0.000	-512.052	32.354	2582.708	0.000	0.000	0.000	180.533	15.638	1181.333	1181.333
GROUP 3	WIND	3	1	1	0.000	-478.229	30.330	2419.323	0.000	0.000	0.000	-315.826	-23.735	-1834.872	-1834.872
GROUP 3	WIND	3	2	1	0.000	-478.229	30.330	2419.323	0.000	0.000	0.000	315.826	23.735	1834.872	1834.872
GROUP 3	WIND	4	1	1	0.000	-388.033	24.931	1983.630	0.000	0.000	0.000	-406.022	-29.134	-2270.566	-2270.566
GROUP 3	WIND	4	2	1	0.000	-388.033	24.931	1983.630	0.000	0.000	0.000	406.022	29.134	2270.566	2270.566
GROUP 3	WIND	5	1	1	0.000	-207.642	14.134	1112.244	0.000	0.000	0.000	-473.668	-33.182	-2597.335	-2597.335
GROUP 3	WIND	5	2	1	0.000	-207.642	14.134	1112.244	0.000	0.000	0.000	473.668	33.182	2597.335	2597.335
LIVE LOAD	LL	1	1	1	135.429	-2031.433	0.000	2031.433	135.429	2031.433	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL	2	1	1	270.857	-2478.348	0.000	2478.348	270.857	2478.348	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	365.658	-1828.290	0.000	1828.290	365.658	2230.513	-402.223	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	135.429	2031.433	0.000	-2031.433	135.429	0.000	-2031.433	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	270.857	2478.348	0.000	-2478.348	270.857	0.000	-2478.348	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	365.658	1828.290	0.000	-1828.290	365.658	402.223	-2230.513	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	135.428	-304.711	0.000	304.711	135.428	304.711	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	270.858	-2139.786	0.000	2139.786	270.858	2139.786	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	365.659	-1395.601	0.000	1395.601	365.659	1925.807	-530.207	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	270.858	0.000	0.000	0.000	270.858	446.915	-446.915	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	365.658	-1828.290	0.000	1828.290	365.658	2230.513	-402.223	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	270.858	0.000	0.000	0.000	270.858	2031.433	-2031.433	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL13	1	365.657	-402.223	0.000	402.223	365.657	2230.513	-1828.290	0.000	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	-357.339	-18.933	-357.339	-18.933	-528.848			
P 2	-2774.046	-2774.046	-4008.910	-2774.046	-2774.046	-2774.046	-3513.486	-406.616	-790.509	-406.616	-790.509	-578.125	-1174.364			
P 3	-6665.277	-6665.277	-9742.644	-6665.277	-6665.277	-6665.277	-8508.011	-831.987	-831.987	-831.987	-831.987	-1215.841	-1215.841			
C 1L	-11825.678	-11825.678	-17206.172	-11825.678	-11825.678	-11825.678	-15047.530	-888.147		-888.147		-1272.001				
C 1R	-11825.678	-11825.678	-17206.172	-11825.678	-11825.678	-11825.678	-15047.530		888.147		1272.001		888.147			
P 5	-6665.277	-6665.277	-9742.644	-6665.277	-6665.277	-6665.277	-8508.012	831.987	831.987	1215.841	1215.841	831.987	831.987			
P 6	-2774.046	-2774.046	-4008.911	-2774.046	-2774.046	-2774.046	-3513.486	790.509	406.616	1174.364	578.125	790.509	406.616			
P 7	-33.128	-33.128	-33.128	-33.128	-33.128	-33.128	-33.128	357.339	18.933	528.847	18.933	357.339	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+	M-	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	-2133.881	-2702.681	11.68	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.154	#5@ 4.04	81.25		0.22	0.527	1.214
P 3	-5127.136	-6544.624	24.17	16 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.38	24.00	0.115	#5@ 5.38	96.00		0.40	0.571	0.997
C 1	-9096.676	-11575.023	44.26	29 # 11	3.12	2 # 11	24.00	0.129	#5@ 4.81	24.00	0.129	#5@ 4.81	96.00		0.71	0.571	0.923
P 5	-5127.136	-6544.625	24.17	16 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.38	24.00	0.115	#5@ 5.38	96.00		0.40	0.571	0.997
P 6	-2133.881	-2702.681	11.68	8 # 11	3.12	2 # 11	24.00	0.154	#5@ 4.04	24.00	0.060	#5@10.33	81.25		0.22	0.527	1.214
P 7	-25.483	-25.483	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																					
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				3132.1	-5380.5	0.0	3132.1	5959.4	2912.4	13924.2	26508.8	12955.0	4.448	72.00	144.00
1	B		2		5.1					3442.6	3092.3	-7393.7	3442.6	4496.2	10509.8	6977.4	9099.0	21268.5	2.024	72.00	144.00

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		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3581.	36868.	1.108	1.550	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	2993.	36868.	1.088	1.421	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	2		4.1				2648.187	4032.629	52.964-5067.246	-67.885	7.322	0.835	5.992	12.479	88.906	4.355	32.127	MAX.P1	
1	2		1.1				3442.643	7526.961	98.379-2287.103	-32.673	5.312	2.373	11.996	14.935	129.617	6.417	41.765	MAX.MT	
1	2		1.1				3442.643	7526.961	98.379-2287.103	-32.673	5.312	2.373	11.996	14.935	129.617	6.417	41.765	MAX.VT	
1	3	LL 3	4.1				3842.538	4578.194	32.411-5855.967	-71.808	10.398	2.937	8.641	16.102	120.527	5.862	46.616	MAX.VP	
1	3	LL 3	4.1				3842.538	4578.194	32.411-5855.967	-71.808	10.398	2.937	8.641	16.102	332.924	40.149	46.616	MAX.ML	
1	3	LL 3	4.1				3842.538	4578.194	32.411-5855.967	-71.808	10.398	2.937	8.641	16.102	332.924	40.149	46.616	MAX.VL	
1	2		4.1				2648.187	4032.629	52.964-5067.246	-67.885	6.965	0.662	5.675	11.978	88.214	21.873	45.823	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	
21.500	21.500	4.500	0.998	0.79	39 # 6	@ 6.500	TOP TRAN	174.353	59.397	118.793	49.215	0.000	
				1.51	21 #11	@12.250	BOT.LONG	336.080	60.700	121.400	50.295	0.000	