

04-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  
36' CURB-CURB; 5 BEAMS; 140' SPAN; 50' TALL; BRIDGE 15 ; PIER 8-10,18

PROB. NO. 0001

DESIGN DATA												DESIGN DATA														
DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN EC	ES	CONC. STRAIN	Z	* MAIN SIZE	* STR SIZ	* CAP MAX TOP	REINFORCING MAX BOT	STEEL MIN SIZE	* MIN NO.	* TOP CL.	* CAP MIN INCR.	* CAP BOT CL.			
D	D	D	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

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		50.000	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																			
STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE LONG.	WIND ON SUPERSTRUCTURE FT1	INTENSITIES FT2	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT3	INTENSITIES FT4	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT5	INTENSITIES FT6	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT7	INTENSITIES FT8	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT9	INTENSITIES FT10	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT11	INTENSITIES FT12	
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	6.475	15.966			

GROUP III WIND INTENSITIES																									
STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE LONG.	WIND ON SUPERSTRUCTURE FT1	INTENSITIES FT2	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT3	INTENSITIES FT4	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT5	INTENSITIES FT6	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT7	INTENSITIES FT8	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT9	INTENSITIES FT10	* STD. WIND TRANS.	* WIND ON SUPERSTRUCTURE FT11	INTENSITIES FT12							
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI. FT	TRACTION FL	FORCE APT	AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW 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	281.621	325.334	0.000	325.334	0.000	325.334	281.621					
LL 1	1	85.882	51.529	0.000	0.000	0.000	0.000	0.000					
LL 2	2	85.882	103.059	0.000	85.882	0.000	0.000	0.000					
LL 3	3	85.882	103.059	0.000	120.235	0.000	85.882	17.176					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.529	85.882					
LL 5	2	0.000	0.000	0.000	85.882	0.000	103.059	85.882					
LL 6	3	17.176	85.882	0.000	120.235	0.000	103.059	85.882					
LL 7	1	0.000	25.764	0.000	85.882	0.000	25.764	0.000					
LL 8	2	42.941	111.647	0.000	94.470	0.000	25.764	0.000					
LL 9	3	42.941	111.647	0.000	103.059	0.000	111.647	42.941					
LL10	2	0.000	85.882	0.000	103.059	0.000	85.882	0.000					
LL11	2	85.882	51.529	0.000	0.000	0.000	51.529	85.882					
LL12	3	85.882	103.059	0.000	85.882	0.000	51.529	85.882					

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	50.000	0.000	0.000	0.000	6.000	1.000	50.000	50.000			
DEAD LOAD TOTAL	1	1765.594	2082.394	0.000	0.000	0.000	2082.394	8089.646	-8089.646	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	-212.808	-9.860	-646.648	-646.648			
WIND ON SUBSTR.	1	0.000	-38.850	6.475	323.750	0.000	0.000	0.000	-95.796	-15.966	-798.300	-798.300			
GROUP 2 WIND 1 1	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	-95.796	-15.966	-798.300	-798.300			
GROUP 2 WIND 1 2	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	95.796	15.966	798.300	798.300			
GROUP 2 WIND 2 1	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	-314.879	-32.346	-1738.103	-1738.103			
GROUP 2 WIND 2 2	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	314.879	32.346	1738.103	1738.103			

PIER-36-5-140-50.OUT																
GROUP	WIND	3	1	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	-533.961	-48.726	-2677.905	-2677.905	
GROUP 2	WIND 3	2	1	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	533.961	48.726	2677.905	2677.905	
GROUP 2	WIND 4	1	1	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	-680.016	-59.646	-3304.440	-3304.440	
GROUP 2	WIND 4	2	1	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	680.016	59.646	3304.440	3304.440	
GROUP 2	WIND 5	1	1	1	0.000	-349.217	29.680	1655.137	0.000	0.000	0.000	-789.557	-67.836	-3774.341	-3774.341	
GROUP 2	WIND 5	2	1	1	0.000	-349.217	29.680	1655.137	0.000	0.000	0.000	789.557	67.836	3774.341	3774.341	
GROUP 3	WIND 1	1	1	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	-28.739	-4.790	-239.490	-239.490	
GROUP 3	WIND 1	2	1	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	28.739	4.790	239.490	239.490	
GROUP 3	WIND 2	1	1	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	-166.982	-13.064	-741.790	-741.790	
GROUP 3	WIND 2	2	1	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	166.982	13.064	741.790	741.790	
GROUP 3	WIND 3	1	1	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	-305.226	-21.338	-1244.089	-1244.089	
GROUP 3	WIND 3	2	1	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	305.226	21.338	1244.089	1244.089	
GROUP 3	WIND 4	1	1	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	-397.388	-26.854	-1578.956	-1578.956	
GROUP 3	WIND 4	2	1	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	397.388	26.854	1578.956	1578.956	
GROUP 3	WIND 5	1	1	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	-466.510	-30.991	-1830.105	-1830.105	
GROUP 3	WIND 5	2	1	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	466.510	30.991	1830.105	1830.105	
LIVE LOAD	LL 1	1	1	1	137.411	-1786.344	0.000	1786.344	137.411	1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 2	1	1	1	274.823	-2198.584	0.000	2198.584	274.823	2198.584	0.000	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	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	137.411	1786.344	0.000	-1786.344	137.411	0.000	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	274.823	2198.584	0.000	-2198.584	274.823	0.000	-2198.584	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	371.011	1113.041	0.000	-1113.041	371.011	865.685	-1978.726	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	137.410	0.000	0.000	0.000	137.410	206.112	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	274.822	-1374.120	0.000	1374.120	274.822	1580.232	-206.112	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	371.011	0.000	0.000	0.000	371.011	1422.209	-1422.209	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	274.823	0.000	0.000	0.000	274.823	687.056	-687.056	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	274.822	0.000	0.000	0.000	274.822	1786.344	-1786.344	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	371.011	-371.016	0.000	371.016	371.011	1978.726	-1607.710	0.000	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	CAP MOMENTS AND SHEARS								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	-385.040	-18.933	-385.040	-18.933	-571.490
P 2	-3323.512	-3323.512	-4815.111	-3323.512	-3323.512	-3323.512	-4216.685	-440.751	-863.685	-440.751	-863.685	-627.201	-1273.876
P 3	-6846.743	-6846.743	-9979.105	-6846.743	-6846.743	-6846.743	-8722.409	-898.729	-898.729	-898.729	-898.729	-1308.920	-1308.920
C 1L	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699	-936.169		-936.169		-1346.360	
C 1R	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699		936.169		1346.360		936.169
P 5	-6846.743	-6846.743	-9979.104	-6846.743	-6846.743	-6846.743	-8722.409	898.729	898.729	1308.920	1308.920	898.729	898.729
P 6	-3323.512	-3323.512	-4815.110	-3323.512	-3323.512	-3323.512	-4216.685	863.685	440.751	1273.876	627.201	863.685	440.751
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	385.040	18.933	571.490	18.933	385.040	18.933

PT.	CAP DESIGN DATA		LEFT STIRRUPS		RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE. AS NO.SIZE	BOT.REINFORCE. 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	-2556.548	-3243.604	13.63 9 # 11	3.12 2 # 11	24.00 0.060 #5@10.33	24.00 0.169D#5@ 7.35	83.71		0.25	0.563	1.210
P 3	-5266.726	-6709.546	24.80 16 # 11	3.12 2 # 11	24.00 0.135 #5@ 4.59	24.00 0.135 #5@ 4.59	96.00		0.41	0.593	1.040
C 1	-8089.646	-10288.230	38.97 25 # 11	3.12 2 # 11	24.00 0.145 #5@ 4.29	24.00 0.145 #5@ 4.29	96.00		0.63	0.593	0.977
P 5	-5266.726	-6709.545	24.80 16 # 11	3.12 2 # 11	24.00 0.135 #5@ 4.59	24.00 0.135 #5@ 4.59	96.00		0.41	0.593	1.040
P 6	-2556.548	-3243.604	13.63 9 # 11	3.12 2 # 11	24.00 0.169D#5@ 7.35	24.00 0.060 #5@10.33	83.71		0.25	0.563	1.210
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-36-5-140-50.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					2891.9	-4773.1	0.0	2891.9	5554.5	2263.6	8181.0	15714.9	6404.1	2.829	72.00	96.00
1	B		3	LL 2	4.1					3064.4	4780.1	-3733.9	3064.4	5493.2	4759.1	6522.7	11654.3	10096.8	2.123	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	3098.	22021.	1.164	1.305	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2858.	22021.	1.149	1.275	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	3.1				2313.590	3662.885	30.212-2537.386	-41.058	170.889	85.868	206.785	291.807	186.745	-0.598	45.949	MAX.P1	
1	3	LL 2	1.1				3007.667	5251.493	47.343-1992.623	-31.863	191.811	125.107	299.166	365.870	249.516	-0.777	59.734	MAX.MT	
1	3	LL 2	3.1				3007.667	4761.751	39.276-3298.602	-53.375	222.156	111.628	268.821	379.349	242.769	-0.777	59.734	MAX.VT	
1	3	LL 2	3.1				3007.667	4761.751	39.276-3298.602	-53.375	222.156	111.628	268.821	379.349	242.769	-0.777	59.734	MAX.VP	
1	3	LL 2	4.1				3007.667	4326.425	32.105-3733.928	-60.546	236.957	111.820	254.020	379.157	292.681	52.771	59.734	MAX.ML	
1	3	LL 2	4.1				3007.667	4326.425	32.105-3733.928	-60.546	236.957	111.820	254.020	379.157	292.681	52.771	59.734	MAX.VL	
1	2		3.1				2082.394	3534.742	62.440-2677.905	-48.726	156.411	65.768	188.236	278.879	174.155	-0.598	41.533	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
17.500	17.500	5.500	0.993	1.19	21 # 9	@10.000	TOP TRAN	260.051	59.337	118.675	49.166	0.000
				1.32	19 #10	@11.000	BOT.LONG	305.318	60.785	121.569	50.365	0.000

NUMBER OF PILES = 14 BP = 2.500 DP = 2.500