

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; 30' TALL; BRIDGE 15 ; PIER 2

PROB. NO. 0001

DESIGN DATA												DESIGN DATA														
DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C PSI	FC PSI	N	FY PSI	FS PSI	DESIGN EC KSI	ES KSI	CONC. STRAIN	Z FACT	* MAIN SIZE	* STR SIZE	* CAP MAX TOP	REINFORCING MAX BOT	STEEL MIN SIZE	* MIN NO.	* TOP CL.	* MIN S.SP	* CAP 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		30.000	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 III WIND																									
STD. WIND FT1	* WIND FT1	ON FT2	SUPER FT2	STRUCTURE FT2	INTENSITIES FT3	FT3	FT4	FT4	FT5	FT5	* WIND FT1	ON FT2	SUPER FT2	STRUCTURE FT2	INTENSITIES FT3	FT3									
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	488.001	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	30.000	0.000	0.000	0.000	6.000	1.000	30.000	30.000			
DEAD LOAD TOTAL	1	1928.261 2101.061	0.000	0.000	0.000	2101.061	8089.646	-8089.646	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	-212.808	-9.860	-449.448	-449.448			
WIND ON SUBSTR.	1	0.000	-24.426	4.071	122.130	0.000	0.000	0.000	-75.900	-12.650	-379.500	-379.500			
GROUP 2 WIND 1 1	1	0.000	-937.270	72.321	2672.974	0.000	0.000	0.000	-75.900	-12.650	-379.500	-379.500			
GROUP 2 WIND 1 2	1	0.000	-937.270	72.321	2672.974	0.000	0.000	0.000	75.900	12.650	379.500	379.500			
GROUP 2 WIND 2 1	1	0.000	-827.729	64.131	2366.873	0.000	0.000	0.000	-294.983	-29.030	-991.703	-991.703			
GROUP 2 WIND 2 2	1	0.000	-827.729	64.131	2366.873	0.000	0.000	0.000	294.983	29.030	991.703	991.703			

PIER-36-5-140-30.OUT																
GROUP	WIND	3	1	1	0.000	-772.958	60.036	2213.822	0.000	0.000	0.000	-514.065	-45.410	-1603.905	-1603.905	
GROUP 2	WIND 3	2	1	1	0.000	-772.958	60.036	2213.822	0.000	0.000	0.000	514.065	45.410	1603.905	1603.905	
GROUP 2	WIND 4	1	1	1	0.000	-626.903	49.116	1805.687	0.000	0.000	0.000	-660.120	-56.330	-2012.040	-2012.040	
GROUP 2	WIND 4	2	1	1	0.000	-626.903	49.116	1805.687	0.000	0.000	0.000	660.120	56.330	2012.040	2012.040	
GROUP 2	WIND 5	1	1	1	0.000	-334.793	27.276	989.417	0.000	0.000	0.000	-769.661	-64.520	-2318.141	-2318.141	
GROUP 2	WIND 5	2	1	1	0.000	-334.793	27.276	989.417	0.000	0.000	0.000	769.661	64.520	2318.141	2318.141	
GROUP 3	WIND 1	1	1	1	0.000	-583.343	35.696	1440.054	0.000	0.000	0.000	-22.770	-3.795	-113.850	-113.850	
GROUP 3	WIND 1	2	1	1	0.000	-583.343	35.696	1440.054	0.000	0.000	0.000	22.770	3.795	113.850	113.850	
GROUP 3	WIND 2	1	1	1	0.000	-514.221	31.559	1271.644	0.000	0.000	0.000	-161.014	-12.069	-450.670	-450.670	
GROUP 3	WIND 2	2	1	1	0.000	-514.221	31.559	1271.644	0.000	0.000	0.000	161.014	12.069	450.670	450.670	
GROUP 3	WIND 3	1	1	1	0.000	-479.660	29.491	1187.439	0.000	0.000	0.000	-299.257	-20.343	-787.489	-787.489	
GROUP 3	WIND 3	2	1	1	0.000	-479.660	29.491	1187.439	0.000	0.000	0.000	299.257	20.343	787.489	787.489	
GROUP 3	WIND 4	1	1	1	0.000	-387.498	23.975	962.893	0.000	0.000	0.000	-391.420	-25.859	-1012.036	-1012.036	
GROUP 3	WIND 4	2	1	1	0.000	-387.498	23.975	962.893	0.000	0.000	0.000	391.420	25.859	1012.036	1012.036	
GROUP 3	WIND 5	1	1	1	0.000	-203.173	12.943	513.800	0.000	0.000	0.000	-460.541	-29.996	-1180.445	-1180.445	
GROUP 3	WIND 5	2	1	1	0.000	-203.173	12.943	513.800	0.000	0.000	0.000	460.541	29.996	1180.445	1180.445	
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	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	-33.127	-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.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
			AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.						AV/IN
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-36-5-140-30.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					3103.4	-4773.1	0.0	3103.4	5052.5	2050.2	9228.1	15031.3	6099.3	2.975	72.00	96.00
1	B		1	LL 2	0.0					3328.0	4773.1	0.0	3328.0	5052.5	2198.6	9520.5	14463.0	6293.5	2.862	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	3216.	58150.	1.059	1.101	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	3216.	58150.	1.059	1.101	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				2332.257	3037.010	29.491-1686.386	-40.063	188.972	127.012	231.592	293.552	175.774	37.241	32.327	MAX.P1	
1	3	LL 2	1.1				3031.934	4276.511	46.405-1316.571	-30.569	223.463	175.207	323.270	371.527	232.902	49.326	42.025	MAX.MT	
1	3	LL 2	1.1				3031.934	4276.511	46.405-1316.571	-30.569	223.463	175.207	323.270	371.527	232.902	49.326	42.025	MAX.VT	
1	3	LL 3	4.1				3137.128	2469.018	31.167-2893.210	-68.225	291.466	185.249	271.451	377.669	216.461	45.883	43.535	MAX.VP	
1	3	LL 3	4.1				3137.128	2469.018	31.167-2893.210	-68.225	291.466	185.249	271.451	377.669	296.317	46.027	43.535	MAX.ML	
1	3	LL 3	4.1				3137.128	2469.018	31.167-2893.210	-68.225	291.466	185.249	271.451	377.669	296.317	46.027	43.535	MAX.VL	
1	3	LL 2	3.1				2332.257	3037.010	29.491-1686.386	-40.063	188.972	127.012	231.592	293.552	175.774	37.241	32.327	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
19.900	19.900	5.000	0.999	1.23	25 # 9	@ 9.500	TOP TRAN	237.269	51.927	103.854	43.026	0.000
				1.53	20 #11	@11.875	BOT.LONG	303.218	53.459	106.918	44.295	0.000

NUMBER OF PILES = 13 BP = 4.350 DP = 4.350