

20-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; 30' TALL; BRIDGE 19C ; 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 TOP	* CAP MAX	REINFORCING MAX	STEEL MIN	* MIN	* TOP	* CAP MIN	* CAP DEPTH	* CAP BOT		
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

COLUMN DATA										COLUMN DATA																
COLUMN	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	PILE	ALL.PILE	PILE	MIN	DEPTH	INCR.	CL.	
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	234.000	-9.999						

CAP DATA										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										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										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										GROUP III WIND															
STD.	* WIND ON SUPERSTRUCTURE	INTENSITIES	* STD.	* WIND ON LIVE LOAD	INTENSITIES	* LENGTHS OF LL	* WIND ON LL	LL ARMS																	
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										MISCELLANEOUS FORCES									
CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW											
0.000	8.900	15.583	15.583	0.00018000	0.00044000	0.000	0.000												

DEAD LOAD SUPERSTRUCTURE AND LIVE LOAD CASES										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											

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	1607.982	1780.782	0.000	0.000	0.000	1780.782	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	-405.689	-405.689							
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	-839.632	65.021	2400.136	0.000	0.000	0.000	-75.900	-12.650	-379.500	-379.500							
GROUP 2 WIND 1 2	1	0.000	-839.632	65.021	2400.136	0.000	0.000	0.000	75.900	12.650	379.500	379.500							
GROUP 2 WIND 2 1	1	0.000	-741.808	57.707	2126.775	0.000	0.000	0.000	-271.549	-27.278	-926.221	-926.221							
GROUP 2 WIND 2 2	1	0.000	-741.808	57.707	2126.775	0.000	0.000	0.000	271.549	27.278	926.221	926.221							

GROUP 2 WIND 3 1	1	0.000	-692.895	54.050	1990.095	PIER-36-5-125-30.OUT	0.000	0.000	0.000	-467.199	-41.906	-1472.943	-1472.943
GROUP 2 WIND 3 2	1	0.000	-692.895	54.050	1990.095		0.000	0.000	0.000	467.199	41.906	1472.943	1472.943
GROUP 2 WIND 4 1	1	0.000	-562.462	44.298	1625.614		0.000	0.000	0.000	-597.632	-51.658	-1837.424	-1837.424
GROUP 2 WIND 4 2	1	0.000	-562.462	44.298	1625.614		0.000	0.000	0.000	597.632	51.658	1837.424	1837.424
GROUP 2 WIND 5 1	1	0.000	-301.596	24.794	896.652		0.000	0.000	0.000	-695.457	-58.972	-2110.785	-2110.785
GROUP 2 WIND 5 2	1	0.000	-301.596	24.794	896.652		0.000	0.000	0.000	695.457	58.972	2110.785	2110.785
GROUP 3 WIND 1 1	1	0.000	-521.677	32.006	1289.828		0.000	0.000	0.000	-22.770	-3.795	-113.850	-113.850
GROUP 3 WIND 1 2	1	0.000	-521.677	32.006	1289.828		0.000	0.000	0.000	22.770	3.795	113.850	113.850
GROUP 3 WIND 2 1	1	0.000	-459.955	28.312	1139.446		0.000	0.000	0.000	-146.214	-11.183	-414.615	-414.615
GROUP 3 WIND 2 2	1	0.000	-459.955	28.312	1139.446		0.000	0.000	0.000	146.214	11.183	414.615	414.615
GROUP 3 WIND 3 1	1	0.000	-429.094	26.465	1064.254		0.000	0.000	0.000	-269.658	-18.572	-715.381	-715.381
GROUP 3 WIND 3 2	1	0.000	-429.094	26.465	1064.254		0.000	0.000	0.000	269.658	18.572	715.381	715.381
GROUP 3 WIND 4 1	1	0.000	-346.798	21.539	863.744		0.000	0.000	0.000	-351.954	-23.497	-915.891	-915.891
GROUP 3 WIND 4 2	1	0.000	-346.798	21.539	863.744		0.000	0.000	0.000	351.954	23.497	915.891	915.891
GROUP 3 WIND 5 1	1	0.000	-182.207	11.688	462.723		0.000	0.000	0.000	-413.676	-27.192	-1066.274	-1066.274
GROUP 3 WIND 5 2	1	0.000	-182.207	11.688	462.723		0.000	0.000	0.000	413.676	27.192	1066.274	1066.274
LIVE LOAD LL 1	1	127.473	-1657.152	0.000	1657.152	127.473	1657.152	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 2	1	254.947	-2039.576	0.000	2039.576	254.947	2039.576	0.000	0.000	0.000	0.000	0.000	0.000

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

	LOAD	COL	PC	MT	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	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	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	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	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	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	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	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	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	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	0.000

CAP ANALYSIS AND DESIGN DATA

POINT	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.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE. AS NO. SIZE.	BOT. REINFORCE. AS NO. SIZE.	CAP DESIGN DATA				RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
					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-36-5-125-30.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					2643.9	-4427.9	0.0	2643.9	4648.2	1721.7	8918.2	15685.2	5809.9	3.374	72.00	96.00
1	B		1	LL 2	0.0					2868.5	4427.9	0.0	2868.5	4648.2	1868.0	9274.9	15038.4	6043.6	3.235	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	2756.	58150.	1.050	1.085	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2756.	58150.	1.050	1.085	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				1995.257	2579.548	21.539-1727.269	-41.297	208.267	133.251	217.227	292.244	205.841	41.422	44.028	MAX.P1	
1	3	LL 2	1.1				2593.835	3907.322	41.608-1202.796	-28.073	238.322	186.216	314.821	366.927	275.999	55.490	57.236	MAX.MT	
1	3	LL 2	1.1				2593.835	3907.322	41.608-1202.796	-28.073	238.322	186.216	314.821	366.927	275.999	55.490	57.236	MAX.VT	
1	3	LL 3	4.1				2691.420	2252.083	28.001-2614.626	-61.786	304.773	191.360	266.112	379.526	260.384	52.440	59.305	MAX.VP	
1	3	LL 3	4.1				2691.420	2252.083	28.001-2614.626	-61.786	304.773	191.360	266.112	379.526	250.759	52.029	59.305	MAX.ML	
1	3	LL 3	4.1				2691.420	2252.083	28.001-2614.626	-61.786	304.773	191.360	266.112	379.526	250.759	52.029	59.305	MAX.VL	
1	3	LL 2	4.1				1995.257	2579.548	21.539-1727.269	-41.297	208.267	133.251	217.227	292.244	205.841	41.422	44.028	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	
18.500	18.500	5.000	0.999	1.33	20 #10	@11.000	TOP LONG	259.129	52.011	104.021	43.095	0.000	
				1.42	21 #10	@10.500	BOT.TRAN	279.950	53.543	107.086	44.365	0.000	

NUMBER OF PILES = 11 BP = 2.667 DP = 8.000