

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
32' CURB-CURB; 4 BEAMS; 170' SPAN; 40' TALL; BRIDGE 2A ; PIER 3

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN DATA EC KSI	ES KSI	CONC. STRAIN	Z FACT	* MAIN SIZE	* STR TOP	* CAP MAX	REINFORCING MAX	STEEL MIN	* MIN TOP	* * CL. S.SP	* * CAP MIN DEPTH	* * CAP BOT CL.	
D D D L	2	1	6	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 MIN.	1.00	8.00	2.50	3.750	2	2.00	0.70	0.90	1.00	1.00	0.75	16.95	0.120	0.000	3.00	9.00	1.250	1.000	3.000	235.000				-9.999

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	17.625	4.000	4.000	6.000	6.000	4.000	13.625	14.000	9.333	0.667					
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 ND	NB SZ	SLOPE	EP	AP						
21	0	C	T		40.000	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 * WIND FORCE ARM * WIND ON PIER															
SUPERSTRUCTURE AREA*STD. TRANS. LONG. WIND FT1 FL1 WIND ON SUPERSTRUCTURE INTENSITIES FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5 WIND ON LIVE LOAD INTENSITIES FT1 FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5 LENGTHS OF LL * WIND ON LL ARMS TRANS. LONGI. APT APL															
1629. 1629. 1 50 0 44 6 41 12 33 16 17 19 7.292 7.292 5.273 13.389															

STD. WIND FT1	* WIND FT1	ON FL1	SUPERSTRUCTURE FT2	INTENSITIES FL2	FT3	FL3	FT4	FL4	FT5	FL5	STD. WIND FT1	* WIND FT1	ON FL1	SUPERSTRUCTURE FT2	INTENSITIES FL2	FT3	FL3	FT4	FL4	FT5	FL5	LENGTHS OF LL TRANS.	* WIND ON LL ARMS LONGI. APT	LL APL	
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	170.0	170.0	15.417	15.417

CENTRI. FT	TRACTION FL	FORCE APT	MISCELLANEOUS FORCES AND ARMS APL	EXPANSION COEFFICIENT	SHRINKAGE COEFFICIENT	STREAM PT	FLOW PL
16.592	6.340	15.417	15.417	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	386.350	354.110	0.000	0.000	419.750	331.580						
LL01	1	29.200	60.100	0.000	0.000	93.190	109.400						
LL02	1	127.530	66.880	0.000	0.000	65.620	25.710						
LL03	2	44.630	105.800	0.000	0.000	152.250	134.740						
LL04	2	42.550	108.500	0.000	0.000	158.810	111.760						
LL05	2	135.750	126.990	0.000	0.000	106.520	34.120						
LL06	2	156.730	110.460	0.000	0.000	97.970	32.540						

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

LOAD	COL	TRANSVERSE							* LONGITUDINAL					
		PC	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	1696.540 1941.340	-460.438	0.000	460.438	1941.340	7858.969	-7398.530	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	-135.784	-6.340	-351.344	-351.344		
CENT. FORCE 1 LN	1	0.000	-355.351	16.592	919.479	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-80.334	-13.389	-535.560	-535.560		
GROUP 2 WIND 1 1	1	0.000	-1114.271	86.723	4062.854	0.000	0.000	0.000	-80.334	-13.389	-535.560	-535.560		
GROUP 2 WIND 1 2	1	0.000	-1114.271	86.723	4062.854	0.000	0.000	0.000	80.334	13.389	535.560	535.560		
GROUP 2 WIND 2 1	1	0.000	-984.355	76.949	3600.621	0.000	0.000	0.000	-210.250	-23.163	-997.792	-997.792		
GROUP 2 WIND 2 2	1	0.000	-984.355	76.949	3600.621	0.000	0.000	0.000	210.250	23.163	997.792	997.792		
GROUP 2 WIND 3 1	1	0.000	-919.397	72.062	3369.505	0.000	0.000	0.000	-340.166	-32.937	-1460.024	-1460.024		
GROUP 2 WIND 3 2	1	0.000	-919.397	72.062	3369.505	0.000	0.000	0.000	340.166	32.937	1460.024	1460.024		
GROUP 2 WIND 4 1	1	0.000	-746.176	59.030	2753.196	0.000	0.000	0.000	-426.777	-39.453	-1768.179	-1768.179		
GROUP 2 WIND 4 2	1	0.000	-746.176	59.030	2753.196	0.000	0.000	0.000	426.777	39.453	1768.179	1768.179		
GROUP 2 WIND 5 1	1	0.000	-399.733	32.966	1520.577	0.000	0.000	0.000	-491.735	-44.340	-1999.295	-1999.295		

GROUP	WIND	5	2	1	0.000	-399.733	32.966	1520.577	0.000	PIER-32-4-170-40.OUT	0.000	0.000	491.735	44.340	1999.295	1999.295
GROUP 3	WIND 1	1	1	1	0.000	-698.370	43.017	2160.945	0.000	0.000	0.000	0.000	-24.100	-4.017	-160.668	-160.668
GROUP 3	WIND 1	2	1	1	0.000	-698.370	43.017	2160.945	0.000	0.000	0.000	0.000	24.100	4.017	160.668	160.668
GROUP 3	WIND 2	1	1	1	0.000	-615.705	38.045	1909.225	0.000	0.000	0.000	0.000	-106.766	-8.989	-412.388	-412.388
GROUP 3	WIND 2	2	1	1	0.000	-615.705	38.045	1909.225	0.000	0.000	0.000	0.000	106.766	8.989	412.388	412.388
GROUP 3	WIND 3	1	1	1	0.000	-574.372	35.559	1783.365	0.000	0.000	0.000	0.000	-189.431	-13.961	-664.109	-664.109
GROUP 3	WIND 3	2	1	1	0.000	-574.372	35.559	1783.365	0.000	0.000	0.000	0.000	189.431	13.961	664.109	664.109
GROUP 3	WIND 4	1	1	1	0.000	-464.152	28.929	1447.738	0.000	0.000	0.000	0.000	-244.542	-17.276	-831.922	-831.922
GROUP 3	WIND 4	2	1	1	0.000	-464.152	28.929	1447.738	0.000	0.000	0.000	0.000	244.542	17.276	831.922	831.922
GROUP 3	WIND 5	1	1	1	0.000	-243.710	15.670	776.484	0.000	0.000	0.000	0.000	-285.874	-19.762	-957.782	-957.782
GROUP 3	WIND 5	2	1	1	0.000	-243.710	15.670	776.484	0.000	0.000	0.000	0.000	285.874	19.762	957.782	957.782
LIVE LOAD	LL01		1	1	291.890	1277.231	0.000	-1277.231	291.890	689.287	-1966.518	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 LL02	1	285.740	-1431.360	0.000	1431.360	285.740	2097.549	-666.189	0.000	0.000	0.000	0.000	
LIVE LOAD LL03	1	437.420	1478.322	0.000	-1478.322	437.420	1118.589	-2596.911	0.000	0.000	0.000	0.000	
LIVE LOAD LL04	1	421.620	1203.737	0.000	-1203.737	421.620	1102.069	-2305.806	0.000	0.000	0.000	0.000	
LIVE LOAD LL05	1	403.380	-1518.354	0.000	1518.354	403.380	2493.162	-974.809	0.000	0.000	0.000	0.000	
LIVE LOAD LL06	1	397.700	-1796.951	0.000	1796.951	397.700	2709.737	-912.786	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	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-19.222	-521.477	-19.222	-521.477	-19.222	-861.738
P 2	-5205.013	-5205.013	-8380.667	-5205.013	-5205.013	-5205.013	-7106.602	-591.736	-1052.079	-591.736	-1052.079	-931.997	-1632.148		
P 3	-5908.797	-5908.797	-9471.357	-5908.797	-5908.797	-5908.797	-8042.067	-1058.245	-1058.245	-1058.245	-1058.245	-1638.315	-1638.315		
C 1L	-10216.659	-10216.659	-16099.496	-10216.659	-10216.659	-10216.659	-13739.316	-1095.685		-1095.685		-1675.755			
C 1R	-9618.089	-9618.089	-15255.981	-9618.089	-9618.089	-9618.089	-12994.073		1109.816		1732.872		1109.816		
P 4	-5253.704	-5253.704	-8399.376	-5253.704	-5253.704	-5253.704	-7137.340	1072.376	1072.376	1695.432	1695.432	1072.376	1072.376		
P 5	-4540.494	-4540.494	-7270.588	-4540.494	-4540.494	-4540.494	-6175.281	1066.210	520.535	1689.265	813.055	1066.210	520.535		
P 6	-33.476	-33.476	-33.477	-33.476	-33.476	-33.476	-33.477	450.276	19.222	742.796	19.222	450.276	19.222		

PT.	M+ UNF. K-FT.		M- UNF. K-FT.		TOP REINFORCE. AS NO.SIZE		BOT.REINFORCE. AS NO.SIZE		CAP DESIGN DATA LEFT STIRRUPS M.SP. AV/IN BAR&SPAC		RIGHT STIRRUPS M.SP. AV/IN BAR&SPAC		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+	UNF.	M-	UNF.	AS	NO.SIZE	AS	NO.SIZE	M.SP.	AV/IN	M.SP.	AV/IN					
P 1	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	0.00	0.000 #5@ 0.00	24.00	0.152 #5@ 4.07	60.77		0.08	0.000	0.098		
P 2	-4003.856	-5466.617	21.27	14 # 11	3.12	2 # 11	24.00	0.060 #5@10.27	24.00	0.212D#5@ 5.84	93.65		0.36	0.649	1.017		
P 3	-4545.229	-6186.206	23.47	16 # 11	3.12	2 # 11	24.00	0.205D#5@ 6.06	24.00	0.205D#5@ 6.06	96.00		0.39	0.613	0.942		
C 1	-7398.530	-10568.705	41.18	27 # 11	3.12	2 # 11	24.00	0.215D#5@ 5.77	24.00	0.227D#5@ 5.46	96.00		0.67	0.716	0.914		
P 4	-4041.311	-5490.262	20.75	14 # 11	3.12	2 # 11	24.00	0.217D#5@ 5.72	24.00	0.217D#5@ 5.72	96.00		0.34	0.620	0.995		
P 5	-3492.688	-4750.216	18.38	12 # 11	3.12	2 # 11	24.00	0.225D#5@ 5.52	24.00	0.060 #5@10.33	93.65		0.31	0.653	1.080		
P 6	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	24.00	0.112 #5@ 5.56	0.00	0.000 #5@ 0.00	60.77		0.08	0.000	0.098		

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

COLUMN ANALYSIS AND DESIGN OUTPUT

CN	T B	CRITICAL COLUMN LOADS														B	D		
		GR	LLC	WC	R	E S	C F	S F	PF	MTF	MLF	PM	MTM	MLM	PU			MTU	MLU
1	T	1	LL06	0.0			C	3068.9	-5423.7	0.0	3068.9	6060.4	2188.7	8233.8	16261.7	5872.8	2.683	72.00	96.00
1	B	3	LL06	1.1			C	3040.8	8134.5	-1122.4	3040.8	8977.1	2125.6	6351.1	18818.6	4455.8	2.096	72.00	96.00

CN	T B	COLUMN DESIGN DATA														
		B FACE 1 NO.SIZE	B FACE 2 NO.SIZE	D FACE 3 NO.SIZE	D FACE 4 NO.SIZE	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	0.099	3228.	30726.	1.117	1.189	1.000	2	0.70
1	B	15 # 11	15 # 11	8 # 11	8 # 11	71.76	1.038	1.00	0.100	2882.	30699.	1.104	1.165	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
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PIER-32-4-170-40.OUT																	
1	3	LL06	3.1	C	2281.400	5619.272	68.743-1366.796	-26.641	102.187	39.039	228.205	291.352	189.092	-0.498	30.166	MAX.P1	
1	3	LL06	1.1	C	2965.820	7795.908	99.061-1122.362	-21.706	109.196	57.372	320.314	372.137	252.204	-0.647	39.215	MAX.MT	
1	3	LL06	1.1	C	2965.820	7795.908	99.061-1122.362	-21.706	109.196	57.372	320.314	372.137	252.204	-0.647	39.215	MAX.VT	
1	1	LL05	0.0	C	3272.556	5807.809	43.139	0.000	0.000	139.345	139.345	331.062	331.062	240.832	-0.647	43.318	MAX.VP
1	3	LL05	5.1	C	2972.134	5686.424	63.510-2158.611	-42.175	169.748	70.000	260.603	360.351	165.945	39.548	39.300	MAX.ML	
1	3	LL05	5.1	C	2972.134	5686.424	63.510-2158.611	-42.175	169.748	70.000	260.603	360.351	165.945	39.548	39.300	MAX.VL	
1	3	LL06	3.1	C	2281.400	5619.272	68.743-1366.796	-26.641	102.187	39.039	228.205	291.352	189.092	-0.498	30.166	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
15.000	15.000	4.250	0.992	1.11	22 # 8	@ 8.125	TOP LONG	172.669	41.143	82.285	34.090	0.000
				1.65	16 #11	@11.250	BOT.TRAN	253.818	42.597	85.194	35.295	0.000

NUMBER OF PILES = 15 BP = 3.125 DP = 6.250