

04-NOV-09
16:08:42

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; 70' TALL; BRIDGE 7 ; PIER 6

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW	ANG	F'C	FC	N	FY	FS	DESIGN DATA		CONC.	Z	* * *	CAP	REINFORCING STEEL			* * *	CAP					
OPTIONS				D	M	PSI	PSI		PSI	PSI	EC	ES	STRAIN	FACT	MAIN	STR	MAX	MAX	MIN	MIN	TOP	MIN	DEPTH	BOT		
D	D	D	L	0	2	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	REINFORCING	STEEL	R	KL	OC	OF	CM	BD1	BD2	IMPACT	SOIL	WT	ALL.S.P.	MIN	MAX	EDGE	PILE	REBAR	ALL.PILE	ALL.PILE			
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF		PL	SP	PL	SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	I
1.00	8.00	2.50	3.750	1	2.00	0.75	0.90	0.00	1.00	0.75	15.38	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	C	28.000	3.000	6.000	6.000		0.000	0.000	3.000	6.333	9.333	6.333				

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	R		70.000	0.000	6.000	0.000	0.000	0.000	3.000	0.000	27	0	11	27	0	11	51	0	11	51	0	11	0.000	0.000	0.000
22	1	2			SAME AS COLUMN 1																						

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	2.000	2.000	3.000	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

32 2 SAME AS FOOTING 1

GROUP II WIND

WIND ON SUPERSTRUCTURE	INTENSITIES	* WIND FORCE	ARM	* WIND ON PIER														
TRANS.	LONG.	WIND	FT1	FT1	FT2	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	APT	APL	PT	PL
1913.	1913.	1	50	0	44	6	41	12	33	16	17	19	9.125	9.125	9.125	40.860		

GROUP III WIND

STD. * WIND ON SUPERSTRUCTURE	INTENSITIES	* STD. * WIND ON LIVE LOAD	INTENSITIES	* LENGTHS OF LL	* WIND ON LL																				
WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	TRANS.	LONGI.	APT	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	18.084	18.084

MISCELLANEOUS FORCES

CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL	
16.232	6.340	18.084	18.084	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	348.577	0.000	407.310	371.380	0.000	239.157						
LL01	1	28.500	0.000	35.230	41.850	0.000	54.970						
LL02	1	75.860	0.000	43.970	30.640	0.000	5.540						
LL03	2	37.860	0.000	60.520	61.160	0.000	60.500						
LL04	2	12.070	0.000	53.930	72.490	0.000	36.750						
LL05	2	90.880	0.000	79.200	50.700	0.000	16.510						
LL06	2	104.350	0.000	70.520	48.440	0.000	17.710						

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	1.203	16.839	0.500	18.161	1.203	0.000	-16.839	1.500	0.500	35.000	35.000
	2	-1.203	16.839	0.500	18.161	-1.203	-16.839	0.000	1.500	0.500	35.000	35.000
EXPANSION OF CAP	1	0.000	65.499	2.092	80.932	0.000	0.000	-65.499	0.000	0.000	0.000	0.000
	2	0.000	-65.499	-2.092	-80.932	0.000	65.499	0.000	0.000	0.000	0.000	0.000
SHRINKAGE OF CAP	1	0.000	-160.110	-5.113	-197.834	0.000	0.000	160.110	0.000	0.000	0.000	0.000
	2	0.000	160.109	5.113	197.834	0.000	-160.109	0.000	0.000	0.000	0.000	0.000
DEAD LOAD TOTAL	1	819.625	890.376	19.049	443.073	1103.782	0.000	-890.376	0.000	0.000	0.000	0.000
	2	1103.782	-887.556	-19.049	-445.893	982.156	887.556	0.000	0.000	0.000	0.000	0.000
		697.999										
		982.156										
TRAC. FORCE 1 LN	1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-66.836	-3.170	-279.226	-279.226
	2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-66.836	-3.170	-279.226	-279.226
CENT. FORCE 1 LN	1	30.007	273.327	8.116	294.793	30.007	0.000	-273.327	0.000	0.000	0.000	0.000
	2	-30.007	273.327	8.116	294.793	-30.007	-273.327	0.000	0.000	0.000	0.000	0.000
WIND ON SUBSTR.	1	10.975	153.654	4.562	165.721	10.975	0.000	-153.654	-61.290	-20.430	-1430.100	-1430.100
	2	-10.975	153.654	4.562	165.721	-10.975	-153.654	0.000	-61.290	-20.430	-1430.100	-1430.100
GROUP 2 WIND 1 1	1	157.192	1764.280	52.388	1902.845	157.192	0.000	-1764.280	-61.290	-20.430	-1430.100	-1430.100
	2	-157.192	1764.280	52.388	1902.845	-157.192	-1764.280	0.000	-61.290	-20.430	-1430.100	-1430.100
GROUP 2 WIND 1 2	1	157.192	1764.280	52.388	1902.845	157.192	0.000	-1764.280	61.290	20.430	1430.100	1430.100

		PIER-32-4-170-70.OUT											
	2	-157.192	1764.280	52.388	1902.845	-157.192	-1764.280	0.000	61.290	20.430	1430.100	1430.100	
GROUP 2 WIND 2 1	1	139.646	1571.004	46.648	1694.391	139.646	0.000	-1571.004	-130.875	-26.169	-1884.198	-1884.198	
	2	-139.646	1571.004	46.648	1694.391	-139.646	-1571.004	0.000	-130.875	-26.169	-1884.198	-1884.198	
GROUP 2 WIND 2 2	1	139.646	1571.004	46.648	1694.391	139.646	0.000	-1571.004	130.875	26.169	1884.198	1884.198	
	2	-139.646	1571.004	46.648	1694.391	-139.646	-1571.004	0.000	130.875	26.169	1884.198	1884.198	
GROUP 2 WIND 3 1	1	130.873	1474.367	43.779	1590.163	130.873	0.000	-1474.367	-200.461	-31.908	-2338.297	-2338.297	
	2	-130.873	1474.367	43.779	1590.163	-130.873	-1474.367	0.000	-200.461	-31.908	-2338.297	-2338.297	
GROUP 2 WIND 3 2	1	130.873	1474.367	43.779	1590.163	130.873	0.000	-1474.367	200.461	31.908	2338.297	2338.297	
	2	-130.873	1474.367	43.779	1590.163	-130.873	-1474.367	0.000	200.461	31.908	2338.297	2338.297	
GROUP 2 WIND 4 1	1	107.478	1216.667	36.127	1312.223	107.478	0.000	-1216.667	-246.851	-35.734	-2641.029	-2641.029	
	2	-107.478	1216.667	36.127	1312.223	-107.478	-1216.667	0.000	-246.851	-35.734	-2641.029	-2641.029	
GROUP 2 WIND 4 2	1	107.478	1216.667	36.127	1312.223	107.478	0.000	-1216.667	246.851	35.734	2641.029	2641.029	
	2	-107.478	1216.667	36.127	1312.223	-107.478	-1216.667	0.000	246.851	35.734	2641.029	2641.029	
GROUP 2 WIND 5 1	1	60.689	701.266	20.823	756.344	60.689	0.000	-701.266	-281.644	-38.604	-2868.078	-2868.078	
	2	-60.689	701.266	20.823	756.344	-60.689	-701.266	0.000	-281.644	-38.604	-2868.078	-2868.078	
GROUP 2 WIND 5 2	1	60.689	701.266	20.823	756.344	60.689	0.000	-701.266	281.644	38.604	2868.078	2868.078	
	2	-60.689	701.266	20.823	756.344	-60.689	-701.266	0.000	281.644	38.604	2868.078	2868.078	

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

		TRANSVERSE								* LONGITUDINAL				
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF		
GROUP 3 WIND 1 1	1	78.584	815.542	24.216	879.595	78.584	0.000	-815.542	-18.387	-6.129	-429.030	-429.030		
	2	-78.584	815.542	24.216	879.595	-78.584	-815.542	0.000	-18.387	-6.129	-429.030	-429.030		
GROUP 3 WIND 1 2	1	78.584	815.542	24.216	879.595	78.584	0.000	-815.542	18.387	6.129	429.030	429.030		
	2	-78.584	815.542	24.216	879.595	-78.584	-815.542	0.000	18.387	6.129	429.030	429.030		
GROUP 3 WIND 2 1	1	69.549	723.209	21.475	780.010	69.549	0.000	-723.209	-60.768	-8.871	-655.105	-655.105		
	2	-69.549	723.209	21.475	780.010	-69.549	-723.209	0.000	-60.768	-8.871	-655.105	-655.105		
GROUP 3 WIND 2 2	1	69.549	723.209	21.475	780.010	69.549	0.000	-723.209	60.768	8.871	655.105	655.105		
	2	-69.549	723.209	21.475	780.010	-69.549	-723.209	0.000	60.768	8.871	655.105	655.105		
GROUP 3 WIND 3 1	1	65.032	677.042	20.104	730.217	65.032	0.000	-677.042	-103.150	-11.612	-881.180	-881.180		
	2	-65.032	677.042	20.104	730.217	-65.032	-677.042	0.000	-103.150	-11.612	-881.180	-881.180		
GROUP 3 WIND 3 2	1	65.032	677.042	20.104	730.217	65.032	0.000	-677.042	103.150	11.612	881.180	881.180		
	2	-65.032	677.042	20.104	730.217	-65.032	-677.042	0.000	103.150	11.612	881.180	881.180		
GROUP 3 WIND 4 1	1	52.985	553.931	16.448	597.436	52.985	0.000	-553.931	-131.404	-13.440	-1031.897	-1031.897		
	2	-52.985	553.931	16.448	597.436	-52.985	-553.931	0.000	-131.404	-13.440	-1031.897	-1031.897		
GROUP 3 WIND 4 2	1	52.985	553.931	16.448	597.436	52.985	0.000	-553.931	131.404	13.440	1031.897	1031.897		
	2	-52.985	553.931	16.448	597.436	-52.985	-553.931	0.000	131.404	13.440	1031.897	1031.897		
GROUP 3 WIND 5 1	1	28.892	307.708	9.137	331.875	28.892	0.000	-307.708	-152.594	-14.811	-1144.935	-1144.935		
	2	-28.892	307.708	9.137	331.875	-28.892	-307.708	0.000	-152.594	-14.811	-1144.935	-1144.935		
GROUP 3 WIND 5 2	1	28.892	307.708	9.137	331.875	28.892	0.000	-307.708	152.594	14.811	1144.935	1144.935		
	2	-28.892	307.708	9.137	331.875	-28.892	-307.708	0.000	152.594	14.811	1144.935	1144.935		
LIVE LOAD LL01	1	65.920	76.551	1.646	38.664	65.920	0.000	-76.551	0.000	0.000	0.000	0.000		
	2	94.630	-77.070	-1.646	-38.146	94.630	77.070	0.000	0.000	0.000	0.000	0.000		
LIVE LOAD LL02	1	115.425	74.871	1.593	36.652	115.425	0.000	-74.871	0.000	0.000	0.000	0.000		
	2	40.585	-73.826	-1.593	-37.697	40.585	73.826	0.000	0.000	0.000	0.000	0.000		
LIVE LOAD LL03	1	98.594	121.229	2.598	60.652	98.594	0.000	-121.229	0.000	0.000	0.000	0.000		
	2	121.446	-121.279	-2.598	-60.602	121.446	121.279	0.000	0.000	0.000	0.000	0.000		
LIVE LOAD LL04	1	72.137	125.251	2.700	63.716	72.137	0.000	-125.251	0.000	0.000	0.000	0.000		
	2	103.103	-126.705	-2.700	-62.262	103.103	126.705	0.000	0.000	0.000	0.000	0.000		
LIVE LOAD LL05	1	160.662	130.562	2.774	63.605	160.662	0.000	-130.562	0.000	0.000	0.000	0.000		
	2	76.628	-128.327	-2.774	-65.839	76.628	128.327	0.000	0.000	0.000	0.000	0.000		
LIVE LOAD LL06	1	167.574	119.409	2.540	58.406	167.574	0.000	-119.409	0.000	0.000	0.000	0.000		
	2	73.446	-117.677	-2.540	-60.137	73.446	117.677	0.000	0.000	0.000	0.000	0.000		

□ CAP ANALYSIS AND DESIGN DATA

		CAP MOMENTS AND SHEARS								** SHEARS(KIPS)					
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		
C 1R	-1157.489	-1157.489	-2151.587	1136.074	-3451.052	-194.616	-3098.073		612.362		814.619		612.362		
P 2	648.007	819.047	208.937	2450.093	-1154.078	1583.445	-671.943	591.302	591.302	793.559	793.559	591.302	591.302		
P 3	4251.948	5382.416	4251.948	5016.523	3487.372	5282.302	4134.562	546.844	17.341	749.102	81.426	546.844	-3.105		
P 4	4108.057	5414.412	4108.057	4872.469	3343.645	5338.680	4083.972	-48.176	-530.970	15.908	-530.970	-68.623	-675.022		
P 5	604.647	1320.187	604.647	2406.569	-1197.274	2090.052	-187.549	-575.428	-575.428	-575.428	-575.428	-719.480	-719.480		
C 2L	-1153.822	-698.651	-1432.421	1139.741	-3447.386	464.051	-2380.853	-596.495		-596.495		-740.547			
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
C 1	0.000	-1567.591	11.44 8 # 11	4.94 4 # 11	0.00	0.00	#5@ 0.00	24.00	0.091	#5@ 6.84	72.00		0.25	1.958	0.000
P 2	577.251	123.904	5.02 4 # 11	9.10 6 # 11	24.00	0.085	#5@ 7.33	24.00	0.085	#5@ 7.33	72.00		0.18	0.368	0.430

PIER-32-4-170-70.OUT																
P 3	3791.442	3270.729	3.12	2 # 11	18.05	12 # 11	24.00	0.072	#5@ 8.62	0.00	0.000	#5@ 0.00	72.00	0.40	0.420	1.144
P 4	3834.868	3160.044	3.12	2 # 11	18.16	12 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	72.00	0.40	0.529	1.157
P 5	967.007	465.113	5.21	4 # 11	9.10	6 # 11	24.00	0.063	#5@ 9.77	24.00	0.063	#5@ 9.77	72.00	0.18	0.373	0.720
C 2	0.000	-1015.883	11.42	8 # 11	4.96	4 # 11	24.00	0.069	#5@ 8.92	0.00	0.000	#5@ 0.00	72.00	0.25	1.269	0.000

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

NOTE: *** FS/FF 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	2		1.1						1269.9	3451.1	-79.7	1269.9	3876.7	638.1	2462.1	7503.5	1235.1	1.936	72.00	72.00
1	B	2		5.1						1513.8	1559.2-3728.5	1513.8	1779.8	5901.6	1705.6	2003.6	6643.8	1.126	72.00	72.00	
2	T	2		1.1	R					1111.7	-3447.4	79.7	1111.7	3872.6	520.5	2075.2	7229.9	971.7	1.867	72.00	72.00
2	B	2		5.1	R					1355.7	-1562.9	3728.5	1355.7	1784.2	5519.0	1593.8	2097.5	6488.2	1.176	72.00	72.00

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	27	# 11	0	# 0	0	# 0	0	# 0	42.12	1.035	1.00	0.262	2342.	21333.	1.123	1.675	1.000	1	0.75
1	B	27	# 11	0	# 0	0	# 0	0	# 0	42.12	1.035	1.00	0.464	2342.	18900.	1.141	1.583	1.000	1	0.75
2	T	27	# 11	0	# 0	0	# 0	0	# 0	42.12	1.035	1.00	0.262	2342.	21332.	1.123	1.560	1.000	1	0.75
2	B	27	# 11	0	# 0	0	# 0	0	# 0	42.12	1.035	1.00	0.465	2342.	18886.	1.142	1.480	1.000	1	0.75

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		3.1				1234.654	2033.236	62.828-2338.297	-31.908	163.627	25.745	154.409	292.292	144.127	27.431	33.335	MAX.P1	
1	2		1.1				1639.265	3049.693	92.868-1859.130	-26.559	169.166	59.241	251.885	361.810	198.767	37.785	44.226	MAX.MT	
1	2		1.1				1639.265	3049.693	92.868-1859.130	-26.559	169.166	59.241	251.885	361.810	198.767	37.785	44.226	MAX.VT	
1	2		1.1				1639.265	3049.693	92.868-1859.130	-26.559	169.166	59.241	251.885	361.810	198.767	37.785	44.226	MAX.VP	
1	2		5.1				1513.812	1559.241	51.834-3728.501	-50.185	256.637	36.952	136.535	356.220	198.477	37.731	40.960	MAX.ML	
1	2		5.1				1513.812	1559.241	51.834-3728.501	-50.185	256.637	36.952	136.535	356.220	198.477	37.731	40.960	MAX.VL	
2	5		4.1R	E			1089.634-1839.049	-57.268	2641.029	35.734	162.491	6.833	123.320	278.977	128.779	24.571	29.559	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
14.500	14.500	4.500	0.995	1.22	18 # 9	@ 9.625	TOP LONG	202.583	45.026	90.053	37.308	0.000
				1.18	18 # 9	@ 9.625	BOT.TRAN	208.884	46.388	92.775	38.436	0.000

NUMBER OF PILES = 9 BP = 6.000 DP = 6.000

FOOTING 2 DESIGN SAME AS FOOTING 1