

28-OCT-09  
18:25:17

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  
37' CURB-CURB; 6 BEAMS; 140' SPAN; 40' TALL; BRIDGE 19 ; PIER 21

PROB. NO. 0001

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

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	I
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	P
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	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	20.055	4.430	4.000	6.000	6.000	4.000	15.625	16.630	6.652	5.548					
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		40.000	0.000	8.860	6.000	8.860	6.000	6.000	0.000	9	6	11	9	6	11	24	16	11	24	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	10.860	10.860	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

SUPERSTRUCTURE AREA*STD.	TRANS.	LONG.	WIND FT1	FT1	WIND ON SUPERSTRUCTURE INTENSITIES	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* WIND FORCE APT	ARM APL	* WIND ON PIER PL
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	15.078

GROUP III WIND

STD. * WIND ON SUPERSTRUCTURE INTENSITIES	* STD. * WIND ON LIVE LOAD INTENSITIES	* LENGTHS OF LL TRANS.	OF LL LONGI.	* WIND ON LL APT	LL ARMS APL																				
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
6.828	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	255.200	286.511	0.000	429.767	0.000	286.511	255.200					
LL 1	1	71.308	66.103	0.000	0.000	0.000	0.000	0.000					
LL 2	2	71.308	98.163	0.000	105.351	0.000	0.000	0.000					
LL 3	3	71.308	98.163	0.000	175.751	0.000	67.012	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	66.103	71.308					
LL 5	2	0.000	0.000	0.000	105.351	0.000	98.163	71.308					
LL 6	3	0.000	67.012	0.000	175.751	0.000	98.163	71.308					
LL 7	1	0.000	30.985	0.000	106.425	0.000	0.000	0.000					
LL 8	2	69.160	99.237	0.000	106.425	0.000	0.000	0.000					
LL 9	3	69.160	99.237	0.000	174.677	0.000	69.160	0.000					
LL10	2	0.000	48.275	0.000	178.272	0.000	48.275	0.000					
LL11	2	71.308	66.103	0.000	0.000	0.000	66.103	71.308					
LL12	3	71.308	98.163	0.000	105.351	0.000	66.103	71.308					

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	0.000	-6.000	1.000	40.000	0.000	0.000	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	1745.731 2016.847	0.000	0.000	0.000	2016.847	8133.150	-8133.150	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	-548.048	-548.048
CENT. FORCE 1 LN	1	0.000	-147.369	6.828	379.521	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	-90.468	-15.078	-603.120	-603.120
GROUP 2 WIND 1 1	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	-90.468	-15.078	-603.120	-603.120
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	90.468	15.078	603.120	603.120
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	-309.551	-31.458	-1379.123	-1379.123

PIER-37-6-140-40.OUT																
GROUP	WIND	2	2	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	309.551	31.458	1379.123	1379.123	
GROUP 2	WIND	3	1	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	-528.633	-47.838	-2155.125	-2155.125	
GROUP 2	WIND	3	2	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	528.633	47.838	2155.125	2155.125	
GROUP 2	WIND	4	1	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	-674.688	-58.758	-2672.460	-2672.460	
GROUP 2	WIND	4	2	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	674.688	58.758	2672.460	2672.460	
GROUP 2	WIND	5	1	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	-784.229	-66.948	-3060.461	-3060.461	
GROUP 2	WIND	5	2	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	784.229	66.948	3060.461	3060.461	
GROUP 3	WIND	1	1	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	-27.140	-4.523	-180.936	-180.936	
GROUP 3	WIND	1	2	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	27.140	4.523	180.936	180.936	
GROUP 3	WIND	2	1	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	-165.384	-12.797	-600.496	-600.496	
GROUP 3	WIND	2	2	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	165.384	12.797	600.496	600.496	
GROUP 3	WIND	3	1	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	-303.628	-21.071	-1020.055	-1020.055	
GROUP 3	WIND	3	2	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	303.628	21.071	1020.055	1020.055	
GROUP 3	WIND	4	1	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	-395.790	-26.587	-1299.762	-1299.762	
GROUP 3	WIND	4	2	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	395.790	26.587	1299.762	1299.762	
GROUP 3	WIND	5	1	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	-464.912	-30.724	-1509.542	-1509.542	
GROUP 3	WIND	5	2	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	464.912	30.724	1509.542	1509.542	
LIVE LOAD	LL	1	1	1	137.411	-1845.427	0.000	1845.427	137.411	1845.427	0.000	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	LL 2	1	274.822	-2165.322	0.000	2165.322	274.822	2165.322	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 3	1	371.011	-1347.009	0.000	1347.009	371.011	1948.790	-601.781	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 4	1	137.411	1845.428	0.000	-1845.428	137.411	0.000	-1845.428	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 5	1	274.822	2165.322	0.000	-2165.322	274.822	0.000	-2165.322	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 6	1	371.011	1347.009	0.000	-1347.009	371.011	601.781	-1948.790	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 7	1	137.410	-309.168	0.000	309.168	137.410	309.168	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 8	1	274.822	-2140.318	0.000	2140.318	274.822	2140.318	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 9	1	371.011	-1305.215	0.000	1305.215	371.011	1926.286	-621.071	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL10	1	274.822	0.000	0.000	0.000	274.822	481.688	-481.688	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	1845.427	-1845.428	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL12	1	371.010	-287.905	0.000	287.905	371.010	1948.790	-1660.885	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	-29.455	-29.455	-29.455	-29.455	-29.455	-29.455	-29.455	-17.786	-349.546	-17.786	-349.546	-17.786	-504.355
P 2	-2495.567	-2495.567	-3525.361	-2495.567	-2495.567	-2495.567	-3112.210	-394.128	-766.592	-394.128	-766.592	-548.938	-1134.514
P 3	-6875.622	-6875.622	-9946.645	-6875.622	-6875.622	-6875.622	-8714.558	-813.912	-813.912	-813.912	-813.912	-1181.833	-1181.833
C 1L	-10573.095	-10573.095	-15274.009	-10573.095	-10573.095	-10573.095	-13388.014	-855.377		-855.377		-1223.298	
C 1R	-10573.095	-10573.095	-15274.009	-10573.095	-10573.095	-10573.095	-13388.014		855.377		1223.298		855.377
P 5	-6875.622	-6875.622	-9946.644	-6875.622	-6875.622	-6875.622	-8714.558	813.912	813.912	1181.833	1181.833	813.912	813.912
P 6	-2495.567	-2495.567	-3525.361	-2495.567	-2495.567	-2495.567	-3112.210	766.592	394.128	1134.514	548.938	766.592	394.128
P 7	-29.455	-29.455	-29.455	-29.455	-29.455	-29.455	-29.455	349.546	17.786	504.355	17.786	349.546	17.786

PT.	UNF. K-FT.		TOP REINFORCE. AS NO.SIZE		BOT.REINFORCE. AS NO.SIZE		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
	M+	M-	AS	NO.SIZE	AS	NO.SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.						AV/IN
P 1	-22.658	-22.658	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	58.52	0.08	0.000	0.089
P 2	-1919.667	-2394.008	10.57	7 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.152	#5@ 4.07	78.96	0.20	0.536	1.321
P 3	-5288.940	-6703.506	24.69	16 # 11	3.12	2 # 11	24.00	0.108	#5@ 5.74	24.00	0.108	#5@ 5.74	96.00	0.41	0.582	1.021
C 1	-8133.150	-10298.473	38.92	25 # 11	3.12	2 # 11	24.00	0.118	#5@ 5.24	24.00	0.118	#5@ 5.24	96.00	0.63	0.586	0.978
P 5	-5288.940	-6703.506	24.69	16 # 11	3.12	2 # 11	24.00	0.108	#5@ 5.74	24.00	0.108	#5@ 5.74	96.00	0.41	0.582	1.021
P 6	-1919.667	-2394.008	10.57	7 # 11	3.12	2 # 11	24.00	0.152	#5@ 4.07	24.00	0.060	#5@10.33	78.96	0.20	0.536	1.321
P 7	-22.657	-22.658	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	58.52	0.08	0.000	0.089

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

PIER-37-6-140-40.OUT

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	1	LL	2	0.0			C		2866.1	-5084.1	0.0	2866.1	5450.1	1989.5	9835.6	18710.0	6829.8	3.433	72.00	106.32
1	B	3	LL	3	4.1			C		3104.2	4665.4	-3613.3	3104.2	4987.8	4155.8	8424.2	13469.2	11222.4	2.703	72.00	106.32

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	16	# 11	16	# 11	9	# 11	9	# 11	78.00	1.019	1.00	0.000	3042.	45294.	1.072	1.157	1.000	2	0.70
1	B	16	# 11	16	# 11	9	# 11	9	# 11	78.00	1.019	1.00	0.000	2928.	45294.	1.069	1.150	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 3	3.1		C		2328.961	3654.656	48.287-2499.786	-47.693	174.384	93.094	211.359	292.649	177.468	-0.263	43.901		MAX.P1
1	3	LL 2	1.1		C		2922.455	5709.692	64.627-1660.142	-31.516	178.750	124.791	307.687	361.647	236.040	-0.342	55.177		MAX.MT
1	3	LL 2	3.1		C		2922.455	5300.622	56.560-2750.997	-53.029	203.395	113.844	283.043	372.593	230.869	-0.342	55.177		MAX.VT
1	3	LL 3	3.1		C		3027.650	4751.052	62.773-3249.721	-62.001	226.699	121.022	274.766	380.443	230.708	-0.342	57.072		MAX.VP
1	3	LL 3	4.1		C		3027.650	4387.434	55.602-3613.340	-69.172	238.719	121.178	262.746	380.287	302.354	58.974	57.072		MAX.ML
1	3	LL 3	4.1		C		3027.650	4387.434	55.602-3613.340	-69.172	238.719	121.178	262.746	380.287	302.354	58.974	57.072		MAX.VL
1	3	LL 2	3.1		C		2248.042	4077.401	43.507-2116.152	-40.791	156.458	87.573	217.725	286.610	177.591	-0.263	42.444		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
18.250	18.250	5.750	0.996	1.25	23 # 9	@ 9.500	TOP TRAN	290.645	63.130	126.259	52.308	0.000
				1.28	24 # 9	@ 9.125	BOT.LONG	309.684	64.491	128.982	53.436	0.000

NUMBER OF PILES = 14 BP = 2.625 DP = 2.625