

12-NOV-09  
16:45:21

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; 115' SPAN; 40' TALL; BRIDGE 17 ; PIER 20

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
MIN.P	MAX.P	CL.SP.	STEEL CLEAR	R MODE	KL COEF	OC	OF	CM	BD1	BD2	IMPACT %	SOIL KCF	WT KSF	ALL.S.P.	MIN PL	MAX SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE I	MIN DEPTH	CL.	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	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	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		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 TRANS.	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* WIND ON APT	FORCE APL	* WIND ON PT	PIER PL		
1121.	2243.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	14.323

GROUP III WIND INTENSITIES

STD. WIND	* FT1	WIND ON FT2	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* WIND ON FT1	WIND ON FT2	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	* LENGTHS OF TRANS.	LL LONGI.	* WIND ON 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	115.0	230.0	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	8.260	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	232.854	270.284	0.000	270.284	0.000	270.284	232.854					
LL 1	1	75.498	45.299	0.000	0.000	0.000	0.000	0.000					
LL 2	2	75.498	90.598	0.000	75.498	0.000	0.000	0.000					
LL 3	3	75.498	90.598	0.000	105.698	0.000	75.498	15.099					
LL 4	1	0.000	0.000	0.000	0.000	0.000	45.299	75.498					
LL 5	2	0.000	0.000	0.000	75.498	0.000	90.598	75.498					
LL 6	3	15.099	75.498	0.000	105.698	0.000	90.598	75.498					
LL 7	1	0.000	22.649	0.000	75.498	0.000	22.649	0.000					
LL 8	2	37.749	98.148	0.000	83.048	0.000	22.649	0.000					
LL 9	3	37.749	98.148	0.000	90.598	0.000	98.148	37.749					
LL10	2	0.000	75.498	0.000	90.598	0.000	75.498	0.000					
LL11	2	75.498	45.299	0.000	0.000	0.000	45.299	75.498					
LL12	3	75.498	90.598	0.000	75.498	0.000	45.299	75.498					

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	1502.910 1747.710	0.000	0.000	0.000	1747.710	6868.974	-6868.974	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	-178.276	-8.260	-459.116	-459.116
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 1	1	0.000	-781.307	61.323	2866.289	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 2	1	0.000	-781.307	61.323	2866.289	0.000	0.000	0.000	85.938	14.323	572.920	572.920
GROUP 2 WIND 2 1	1	0.000	-691.346	54.597	2547.645	0.000	0.000	0.000	-265.939	-27.781	-1210.493	-1210.493
GROUP 2 WIND 2 2	1	0.000	-691.346	54.597	2547.645	0.000	0.000	0.000	265.939	27.781	1210.493	1210.493

PIER-36-5-115-40.OUT																
GROUP	WIND	3	1	1	0.000	-646.366	51.234	2388.323	0.000	0.000	0.000	-445.940	-41.239	-1848.065	-1848.065	
GROUP 2	WIND 3 2	1	1	1	0.000	-646.366	51.234	2388.323	0.000	0.000	0.000	445.940	41.239	1848.065	1848.065	
GROUP 2	WIND 4 1	1	1	1	0.000	-526.419	42.266	1963.463	0.000	0.000	0.000	-565.940	-50.211	-2273.114	-2273.114	
GROUP 2	WIND 4 2	1	1	1	0.000	-526.419	42.266	1963.463	0.000	0.000	0.000	565.940	50.211	2273.114	2273.114	
GROUP 2	WIND 5 1	1	1	1	0.000	-286.525	24.330	1113.745	0.000	0.000	0.000	-655.940	-56.940	-2591.900	-2591.900	
GROUP 2	WIND 5 2	1	1	1	0.000	-286.525	24.330	1113.745	0.000	0.000	0.000	655.940	56.940	2591.900	2591.900	
GROUP 3	WIND 1 1	1	1	1	0.000	-482.597	29.897	1499.091	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876	
GROUP 3	WIND 1 2	1	1	1	0.000	-482.597	29.897	1499.091	0.000	0.000	0.000	25.781	4.297	171.876	171.876	
GROUP 3	WIND 2 1	1	1	1	0.000	-425.824	26.499	1326.793	0.000	0.000	0.000	-139.351	-11.094	-516.557	-516.557	
GROUP 3	WIND 2 2	1	1	1	0.000	-425.824	26.499	1326.793	0.000	0.000	0.000	139.351	11.094	516.557	516.557	
GROUP 3	WIND 3 1	1	1	1	0.000	-397.438	24.800	1240.644	0.000	0.000	0.000	-252.920	-17.892	-861.238	-861.238	
GROUP 3	WIND 3 2	1	1	1	0.000	-397.438	24.800	1240.644	0.000	0.000	0.000	252.920	17.892	861.238	861.238	
GROUP 3	WIND 4 1	1	1	1	0.000	-321.741	20.270	1010.914	0.000	0.000	0.000	-328.633	-22.423	-1091.025	-1091.025	
GROUP 3	WIND 4 2	1	1	1	0.000	-321.741	20.270	1010.914	0.000	0.000	0.000	328.633	22.423	1091.025	1091.025	
GROUP 3	WIND 5 1	1	1	1	0.000	-170.347	11.209	551.453	0.000	0.000	0.000	-385.418	-25.822	-1263.365	-1263.365	
GROUP 3	WIND 5 2	1	1	1	0.000	-170.347	11.209	551.453	0.000	0.000	0.000	385.418	25.822	1263.365	1263.365	
LIVE LOAD	LL 1	1	1	1	120.797	-1570.360	0.000	1570.360	120.797	1570.360	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 2	1	1	1	241.594	-1932.752	0.000	1932.752	241.594	1932.752	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	326.152	-978.466	0.000	978.466	326.152	1739.477	-761.011	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	120.797	1570.360	0.000	-1570.360	120.797	0.000	-1570.360	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	241.594	1932.752	0.000	-1932.752	241.594	0.000	-1932.752	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	326.152	978.466	0.000	-978.466	326.152	761.011	-1739.477	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	120.796	0.000	0.000	0.000	120.796	181.192	-181.192	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	241.594	-1207.976	0.000	1207.976	241.594	1389.168	-181.192	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	326.153	0.000	0.000	0.000	326.153	1250.251	-1250.251	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	241.594	0.000	0.000	0.000	241.594	603.984	-603.984	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	241.594	0.000	0.000	0.000	241.594	1570.360	-1570.360	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	326.152	-326.153	0.000	326.153	326.152	1739.477	-1413.324	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	-321.643	-18.933	-321.643	-18.933	-485.549
P 2	-2816.335	-2816.335	-4127.584	-2816.335	-2816.335	-2816.335	-3601.515	-377.354	-728.723	-377.354	-728.723	-541.260	-1089.317
P 3	-5799.717	-5799.717	-8553.345	-5799.717	-5799.717	-5799.717	-7448.596	-763.767	-763.767	-763.767	-763.767	-1124.361	-1124.361
C 1L	-8929.665	-8929.665	-13125.671	-8929.665	-8929.665	-8929.665	-11442.243	-801.207		-801.207		-1161.801	
C 1R	-8929.665	-8929.665	-13125.671	-8929.665	-8929.665	-8929.665	-11442.243		801.207		1161.801		801.207
P 5	-5799.717	-5799.717	-8553.344	-5799.717	-5799.717	-5799.717	-7448.596	763.767	763.767	1124.361	1124.361	763.767	763.767
P 6	-2816.335	-2816.335	-4127.584	-2816.335	-2816.335	-2816.335	-3601.515	728.723	377.354	1089.317	541.260	728.723	377.354
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	321.643	18.933	485.549	18.933	321.643	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	0.00	#5@ 0.00	24.00	0.060	#5@10.33	59.14	0.08	0.000	0.099
P 2	-2166.412	-2770.396	11.65	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.124	#5@ 5.01	83.71	0.21	0.536	1.206
P 3	-4461.321	-5729.689	21.14	14 # 11	3.12	2 # 11	24.00	0.096	#5@ 6.46	24.00	0.096	#5@ 6.46	96.00	0.35	0.577	1.038
C 1	-6868.974	-8801.726	33.09	22 # 11	3.12	2 # 11	24.00	0.105	#5@ 5.91	24.00	0.105	#5@ 5.91	96.00	0.54	0.571	0.958
P 5	-4461.321	-5729.689	21.14	14 # 11	3.12	2 # 11	24.00	0.096	#5@ 6.46	24.00	0.096	#5@ 6.46	96.00	0.35	0.577	1.038
P 6	-2166.412	-2770.396	11.65	8 # 11	3.12	2 # 11	24.00	0.124	#5@ 5.01	24.00	0.060	#5@10.33	83.71	0.21	0.536	1.206
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-36-5-115-40.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					2478.3	-4196.0	0.0	2478.3	4551.6	1708.5	8620.9	15836.9	5944.5	3.479	72.00	96.00
1	B		3	LL 2	4.1					2586.1	3826.8	-2612.0	2586.1	4123.2	2965.9	7874.0	12554.7	9030.8	3.045	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	2637.	33756.	1.085	1.149	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2427.	33756.	1.077	1.135	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				1950.952	2636.852	20.270	-2009.256	-38.943	173.473	60.515	178.686	291.644	113.532	-0.253	40.938	MAX.P1
1	3	LL 2	1.1				2536.238	4062.537	38.866	-1417.139	-27.062	177.000	97.415	280.806	360.392	155.034	-0.329	53.219	MAX.MT
1	3	LL 2	3.1				2536.238	3726.557	32.240	-2313.310	-44.735	210.103	80.072	247.704	377.734	151.094	-0.329	53.219	MAX.VT
1	3	LL 3	4.1				2628.713	2384.269	26.351	-3029.828	-58.143	267.592	97.380	205.627	375.839	140.101	-0.329	55.115	MAX.VP
1	3	LL 3	4.1				2628.713	2384.269	26.351	-3029.828	-58.143	267.592	97.380	205.627	375.839	180.222	35.125	55.115	MAX.ML
1	3	LL 3	4.1				2628.713	2384.269	26.351	-3029.828	-58.143	267.592	97.380	205.627	375.839	180.222	35.125	55.115	MAX.VL
1	3	LL 2	4.1				1950.952	2636.852	20.270	-2009.256	-38.943	173.473	60.515	178.686	291.644	113.532	-0.253	40.938	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	
14.000	14.000	4.000	0.993	1.13	21 # 8	8.000	TOP TRAN	161.981	37.862	75.724	31.372	0.000	
				1.28	18 # 9	9.250	BOT.LONG	181.414	39.146	78.293	32.436	0.000	

NUMBER OF PILES = 12 BP = 1.917 DP = 5.750