

30-OCT-09  
14:26:08

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  
44' CURB-CURB; 6 BEAMS; 142' SPAN; 40' TALL; BRIDGE 26 ; PIER 15

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 TOP	MAX TOP	MAX BOT	MIN TOP	MIN BOT	NO. CL.	S.SP INCR.	CL. CAP	
D D D L	2	1	13	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	17.24	0.120	20.000	2.50	5.00	1.250	0.300	3.000	0.000	0.000	

CAP DATA

CN	C	L	A	DE	BC	BE	DH	LH	XB1	XB2	XB3	XB4	XB5	XB6	XB7	XB8
11	L	23.625	8.000	4.000	6.000	6.000	4.000	15.625	20.000	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	16.000	6.000	16.000	6.000	6.000	0.000	16	6	11	16	6	11	46	16	11	46	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	s	18.000	18.000	2.250	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND	WIND ON SUPERSTRUCTURE INTENSITIES										* WIND FORCE ARM				* WIND ON PIER	
STANDARD	WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	APT	APT	APT	APT	PT	PL
1385.	2769.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	21.354

GROUP III WIND	WIND ON SUPERSTRUCTURE INTENSITIES										* WIND ON LIVE LOAD INTENSITIES				* LENGTHS OF LL		* WIND ON LL								
STANDARD	WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	WIND FT1	WIND FT2	WIND FT3	WIND FT4	WIND FT5	APT	APT	APT	APT	TRANS.	LONGI.	APT	APT							
1	50	0	44	6	41	12	33	16	17	19	1	100	0	88	12	82	24	66	32	34	38	142.0	284.0	15.583	15.583

MISCELLANEOUS FORCES

CENTRI.	TRACTION	FORCE	AND	EXPANSION	SHRINKAGE	STREAM	FLOW
FT	FL	APT	ARMS	COEFFICIENT	COEFFICIENT	PT	PL
10.584	9.988	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	282.209	326.425	0.000	652.850	0.000	326.425	282.209					
LL 1	1	86.946	52.167	0.000	0.000	0.000	0.000	0.000					
LL 2	2	86.946	104.335	0.000	86.946	0.000	0.000	0.000					
LL 3	3	86.946	104.335	0.000	208.670	0.000	17.389	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	52.167	86.946					
LL 5	2	0.000	0.000	0.000	86.946	0.000	104.335	86.946					
LL 6	3	0.000	17.389	0.000	208.670	0.000	104.335	86.946					
LL 7	1	0.000	26.083	0.000	113.029	0.000	0.000	0.000					
LL 8	2	43.473	113.030	0.000	121.723	0.000	0.000	0.000					
LL 9	3	43.473	113.030	0.000	217.365	0.000	43.473	0.000					
LL10	2	0.000	34.778	0.000	208.670	0.000	34.778	0.000					
LL11	3	52.167	121.724	0.000	208.670	0.000	34.778	0.000					
LL12	2	86.946	52.167	0.000	0.000	0.000	52.167	86.946					
LL13	3	86.946	104.335	0.000	86.946	0.000	52.167	86.946					

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	2154.068	0.000	0.000	0.000	2643.668	11052.618	-11052.618	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	-215.571	-9.988	-555.163	-555.163	
CENT. FORCE 1 LN	1	0.000	-228.434	10.584	588.290	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	-128.124	-21.354	-854.160	-854.160	
GROUP 2 WIND 1 1	1	0.000	-957.857	74.523	3491.639	0.000	0.000	0.000	-128.124	-21.354	-854.160	-854.160	
GROUP 2 WIND 1 2	1	0.000	-957.857	74.523	3491.639	0.000	0.000	0.000	128.124	21.354	854.160	854.160	

PIER-44-6-142-40.OUT															
GROUP	WIND	2	1	1	0.000	-846.711	66.213	3097.952	0.000	0.000	0.000	-350.336	-37.968	-1641.248	-1641.248
GROUP 2	WIND 2	2	1	1	0.000	-846.711	66.213	3097.952	0.000	0.000	0.000	350.336	37.968	1641.248	1641.248
GROUP 2	WIND 3	1	1	1	0.000	-791.137	62.058	2901.109	0.000	0.000	0.000	-572.548	-54.582	-2428.336	-2428.336
GROUP 2	WIND 3	2	1	1	0.000	-791.137	62.058	2901.109	0.000	0.000	0.000	572.548	54.582	2428.336	2428.336
GROUP 2	WIND 4	1	1	1	0.000	-642.942	50.978	2376.194	0.000	0.000	0.000	-720.690	-65.658	-2953.062	-2953.062
GROUP 2	WIND 4	2	1	1	0.000	-642.942	50.978	2376.194	0.000	0.000	0.000	720.690	65.658	2953.062	2953.062
GROUP 2	WIND 5	1	1	1	0.000	-346.552	28.818	1326.365	0.000	0.000	0.000	-831.796	-73.965	-3346.606	-3346.606
GROUP 2	WIND 5	2	1	1	0.000	-346.552	28.818	1326.365	0.000	0.000	0.000	831.796	73.965	3346.606	3346.606
GROUP 3	WIND 1	1	1	1	0.000	-593.836	36.557	1836.770	0.000	0.000	0.000	-38.437	-6.406	-256.248	-256.248
GROUP 3	WIND 1	2	1	1	0.000	-593.836	36.557	1836.770	0.000	0.000	0.000	38.437	6.406	256.248	256.248
GROUP 3	WIND 2	1	1	1	0.000	-523.714	32.360	1623.951	0.000	0.000	0.000	-178.656	-14.798	-681.801	-681.801
GROUP 3	WIND 2	2	1	1	0.000	-523.714	32.360	1623.951	0.000	0.000	0.000	178.656	14.798	681.801	681.801
GROUP 3	WIND 3	1	1	1	0.000	-488.654	30.261	1517.541	0.000	0.000	0.000	-318.874	-23.191	-1107.355	-1107.355
GROUP 3	WIND 3	2	1	1	0.000	-488.654	30.261	1517.541	0.000	0.000	0.000	318.874	23.191	1107.355	1107.355
GROUP 3	WIND 4	1	1	1	0.000	-395.159	24.665	1233.782	0.000	0.000	0.000	-412.353	-28.785	-1391.057	-1391.057
GROUP 3	WIND 4	2	1	1	0.000	-395.159	24.665	1233.782	0.000	0.000	0.000	412.353	28.785	1391.057	1391.057
GROUP 3	WIND 5	1	1	1	0.000	-208.168	13.473	666.264	0.000	0.000	0.000	-482.463	-32.981	-1603.834	-1603.834
GROUP 3	WIND 5	2	1	1	0.000	-208.168	13.473	666.264	0.000	0.000	0.000	482.463	32.981	1603.834	1603.834
LIVE LOAD LL	1	1	1	1	139.113	-2364.924	0.000	2364.924	139.113	2364.924	0.000	0.000	0.000	0.000	0.000

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

TRANSVERSE														* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF				
LIVE LOAD LL 2	1	278.227	-2990.940	0.000	2990.940	278.227	2990.940	0.000	0.000	0.000	0.000	0.000				
LIVE LOAD LL 3	1	375.606	-2504.045	0.000	2504.045	375.606	2691.846	-187.801	0.000	0.000	0.000	0.000				
LIVE LOAD LL 4	1	139.113	2364.924	0.000	-2364.924	139.113	0.000	-2364.924	0.000	0.000	0.000	0.000				
LIVE LOAD LL 5	1	278.227	2990.940	0.000	-2990.940	278.227	0.000	-2990.940	0.000	0.000	0.000	0.000				
LIVE LOAD LL 6	1	375.606	2504.045	0.000	-2504.045	375.606	187.801	-2691.846	0.000	0.000	0.000	0.000				
LIVE LOAD LL 7	1	139.112	-312.996	0.000	312.996	139.112	312.996	0.000	0.000	0.000	0.000	0.000				
LIVE LOAD LL 8	1	278.226	-2225.820	0.000	2225.820	278.226	2225.820	0.000	0.000	0.000	0.000	0.000				
LIVE LOAD LL 9	1	375.607	-1533.729	0.000	1533.729	375.607	2003.238	-469.508	0.000	0.000	0.000	0.000				
LIVE LOAD LL10	1	278.226	0.000	0.000	0.000	278.226	417.336	-417.336	0.000	0.000	0.000	0.000				
LIVE LOAD LL11	1	375.605	-1878.023	0.000	1878.023	375.605	2253.625	-375.602	0.000	0.000	0.000	0.000				
LIVE LOAD LL12	1	278.226	0.000	0.000	0.000	278.226	2364.924	-2364.924	0.000	0.000	0.000	0.000				
LIVE LOAD LL13	1	375.606	-563.415	0.000	563.415	375.606	2691.846	-2128.431	0.000	0.000	0.000	0.000				

□ CAP ANALYSIS AND DESIGN DATA

CAP MOMENTS AND SHEARS													
MOMENTS(KIP-FEET)								** 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
P 1	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-385.805	-18.933	-385.805	-18.933	-574.564
P 2	-3329.627	-3329.627	-4839.706	-3329.627	-3329.627	-3329.627	-4233.866	-441.515	-865.868	-441.515	-865.868	-630.275	-1281.139
P 3	-6861.589	-6861.589	-10032.751	-6861.589	-6861.589	-6861.589	-8760.488	-900.912	-900.912	-900.912	-900.912	-1316.183	-1316.183
C 1L	-14368.403	-14368.403	-20861.734	-14368.403	-14368.403	-14368.403	-18256.625	-975.792		-975.792		-1391.063	
C 1R	-14368.403	-14368.403	-20861.734	-14368.403	-14368.403	-14368.403	-18256.625		975.792		1391.063		975.792
P 5	-6861.589	-6861.589	-10032.751	-6861.589	-6861.589	-6861.589	-8760.488	900.912	900.912	1316.183	1316.183	900.912	900.912
P 6	-3329.627	-3329.627	-4839.705	-3329.627	-3329.627	-3329.627	-4233.866	865.868	441.515	1281.139	630.275	865.868	441.515
P 7	-33.126	-33.126	-33.126	-33.126	-33.126	-33.126	-33.126	385.805	18.933	574.564	18.933	385.805	18.933

CAP DESIGN DATA																	
PT.	M+ UNF. K-FT.		M- UNF. K-FT.		TOP REINFORCE. AS NO. SIZE.		BOT. REINFORCE. AS NO. SIZE.		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
	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					
P 2	-2561.252	-3256.820	13.70	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.171D#5@ 7.27	83.71		0.25	0.571	1.215	
P 3	-5278.146	-6738.837	24.93	16 # 11	3.12	2 # 11	24.00	0.137	#5@ 4.53	24.00	0.137	#5@ 4.53	96.00		0.41	0.601	1.044
C 1-11052.618-14043.559			48.96	32 # 11	3.12	2 # 11	24.00	0.128	#5@ 4.84	24.00	0.128	#5@ 4.84	105.00M		0.72	0.571	0.906
P 5	-5278.146	-6738.837	24.93	16 # 11	3.12	2 # 11	24.00	0.137	#5@ 4.53	24.00	0.137	#5@ 4.53	96.00		0.41	0.601	1.044
P 6	-2561.252	-3256.820	13.70	9 # 11	3.12	2 # 11	24.00	0.171D#5@ 7.27	24.00	0.060	#5@10.33	83.71		0.25	0.571	1.215	

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

PIER-44-6-142-40.OUT

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

NOTE: \*\*\* CAP DEPTH HAD TO BE INCREMENTED FOR DESIGN! REVIEW REBAR CONSTRAINTS! RE-ANALYZE IF NEW DEPTH IS USED!  
 □ 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	1	LL	3	0.0			C		3615.7	-6238.1	0.0	3615.7	6238.1	2412.8	22702.9	39176.6	15153.1	6.280	72.00	192.00
1	B	3	LL	3	5.1			C		3925.1	6186.3-4033.6		3925.1	6280.1	4444.7	19391.4	31060.6	21982.9	4.945	72.00	192.00

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	16	# 11	16	# 11	29	# 11	29	# 11	140.40	1.016	1.00	0.000	3934.	249585.	1.000	1.112	1.000	2	0.70
1	B	16	# 11	16	# 11	29	# 11	29	# 11	140.40	1.016	1.00	0.000	3607.	249585.	1.000	1.102	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	2964.042	5241.753	58.838-2606.295	-50.158	7.283	1.456	12.786	18.613	7.257	0.000	0.000	MAX.P1	
1	3	LL	3	1.1		C	3853.254	7229.276	84.674-2281.744	-43.386	7.764	2.667	18.326	23.423	9.658	0.000	0.000	MAX.MT	
1	3	LL	3	3.1		C	3853.254	6814.279	76.490-3388.183	-65.206	9.468	1.892	16.622	24.197	9.435	0.000	0.000	MAX.VT	
1	3	LL	3	3.1		C	3853.254	6814.279	76.490-3388.183	-65.206	9.468	1.892	16.622	24.197	9.435	0.000	0.000	MAX.VP	
1	3	LL	3	5.1		C	3853.254	5707.619	54.665-4033.606	-77.934	11.430	2.409	14.659	23.680	275.138	28.218	0.000	MAX.ML	
1	3	LL	3	5.1		C	3853.254	5707.619	54.665-4033.606	-77.934	11.430	2.409	14.659	23.680	275.138	28.218	0.000	MAX.VL	
1	3	LL	3	3.1		C	2964.042	5241.753	58.838-2606.295	-50.158	6.965	1.370	12.428	18.023	7.192	0.000	31.887	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
18.000	18.000	4.500	0.745	0.06	12 # 4	@18.000	TOP TRAN	29.706	59.888	119.776	49.622	0.000
				1.24	23 # 9	@ 9.375	BOT.LONG	283.833	60.870	121.740	50.436	0.000