

29-OCT-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
36' CURB-CURB; 6 BEAMS; 140' SPAN; 50' TALL; BRIDGE 25 ; PIER 17

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		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP				
OPTIONS											EC	ES	STRAIN	FACT	MAIN SIZE	STR SIZ	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	MIN CL.	MIN S.SP	MIN INCR.	MIN CL.
D D D L	2	1	11	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	ALL.PILE
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	I
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	6.400	5.600					
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		50.000	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															* WIND FORCE					* WIND ON PIER					
STANDARD	WIND ON SUPERSTRUCTURE INTENSITIES					* 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	140.0	280.0	15.583	15.583

MISCELLANEOUS FORCES									
CENTRI.	TRACTION	FORCE	AND	ARMS	EXPANSION	SHRINKAGE	STREAM	FLOW	
FT	FL	APT	APL	COEFFICIENT	COEFFICIENT	PT	PL		
8.128	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	252.591	280.106	0.000	420.160	0.000	280.106	252.591					
LL 1	1	73.000	64.411	0.000	0.000	0.000	0.000	0.000					
LL 2	2	73.000	94.470	0.000	107.353	0.000	0.000	0.000					
LL 3	3	73.000	94.470	0.000	167.470	0.000	73.000	4.294					
LL 4	1	0.000	0.000	0.000	0.000	0.000	64.411	73.000					
LL 5	2	0.000	0.000	0.000	107.353	0.000	94.470	73.000					
LL 6	3	4.294	73.000	0.000	167.470	0.000	94.470	73.000					
LL 7	1	0.000	32.205	0.000	105.205	0.000	0.000	0.000					
LL 8	2	0.000	32.205	0.000	167.470	0.000	73.000	2.147					
LL 9	2	0.000	51.529	0.000	171.764	0.000	51.529	0.000					
LL10	2	73.000	64.411	0.000	0.000	0.000	64.411	73.000					
LL11	3	73.000	94.470	0.000	107.353	0.000	64.411	73.000					

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	50.000	0.000	0.000	0.000	6.000	1.000	50.000	50.000		
DEAD LOAD TOTAL	1	1711.904	0.000	0.000	0.000	2028.704	7711.511	-7711.511	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	-646.648	-646.648		
CENT. FORCE 1 LN	1	0.000	-175.427	8.128	533.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
WIND ON SUBSTR.	1	0.000	-38.850	6.475	323.750	0.000	0.000	0.000	-95.796	-15.966	-798.300	-798.300		
GROUP 2 WIND 1 1	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	-95.796	-15.966	-798.300	-798.300		
GROUP 2 WIND 1 2	1	0.000	-951.694	74.725	4239.594	0.000	0.000	0.000	95.796	15.966	798.300	798.300		
GROUP 2 WIND 2 1	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	-314.879	-32.346	-1738.103	-1738.103		
GROUP 2 WIND 2 2	1	0.000	-842.152	66.535	3769.693	0.000	0.000	0.000	314.879	32.346	1738.103	1738.103		

PIER-36-6-140-50.OUT																
GROUP	WIND	3	1	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	-533.961	-48.726	-2677.905	-2677.905	
GROUP 2	WIND	3	2	1	0.000	-787.382	62.440	3534.742	0.000	0.000	0.000	533.961	48.726	2677.905	2677.905	
GROUP 2	WIND	4	1	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	-680.016	-59.646	-3304.440	-3304.440	
GROUP 2	WIND	4	2	1	0.000	-641.327	51.520	2908.207	0.000	0.000	0.000	680.016	59.646	3304.440	3304.440	
GROUP 2	WIND	5	1	1	0.000	-349.217	29.680	1655.137	0.000	0.000	0.000	-789.557	-67.836	-3774.341	-3774.341	
GROUP 2	WIND	5	2	1	0.000	-349.217	29.680	1655.137	0.000	0.000	0.000	789.557	67.836	3774.341	3774.341	
GROUP 3	WIND	1	1	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	-28.739	-4.790	-239.490	-239.490	
GROUP 3	WIND	1	2	1	0.000	-587.670	36.417	2190.040	0.000	0.000	0.000	28.739	4.790	239.490	239.490	
GROUP 3	WIND	2	1	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	-166.982	-13.064	-741.790	-741.790	
GROUP 3	WIND	2	2	1	0.000	-518.548	32.280	1938.890	0.000	0.000	0.000	166.982	13.064	741.790	741.790	
GROUP 3	WIND	3	1	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	-305.226	-21.338	-1244.089	-1244.089	
GROUP 3	WIND	3	2	1	0.000	-483.987	30.212	1813.315	0.000	0.000	0.000	305.226	21.338	1244.089	1244.089	
GROUP 3	WIND	4	1	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	-397.388	-26.854	-1578.956	-1578.956	
GROUP 3	WIND	4	2	1	0.000	-391.825	24.696	1478.449	0.000	0.000	0.000	397.388	26.854	1578.956	1578.956	
GROUP 3	WIND	5	1	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	-466.510	-30.991	-1830.105	-1830.105	
GROUP 3	WIND	5	2	1	0.000	-207.500	13.664	808.716	0.000	0.000	0.000	466.510	30.991	1830.105	1830.105	
LIVE LOAD	LL	1	1	1	137.411	-1786.346	0.000	1786.346	137.411	1786.346	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 2	1	274.823	-2074.912	0.000	2074.912	274.823	2074.912	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 3	1	371.011	-1174.867	0.000	1174.867	371.011	1867.421	-692.554	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	137.411	1786.346	0.000	-1786.346	137.411	0.000	-1786.346	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	274.823	2074.912	0.000	-2074.912	274.823	0.000	-2074.912	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	371.011	1174.867	0.000	-1174.867	371.011	692.554	-1867.421	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	425.984	0.000	-425.984	274.822	309.168	-735.152	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	274.822	0.000	0.000	0.000	274.822	494.678	-494.678	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	1786.346	-1786.346	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	371.011	-259.710	0.000	259.710	371.011	1867.421	-1607.711	0.000	0.000	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	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-18.933	-347.301	-18.933	-347.301	-18.933	-505.784
P 2	-2387.024	-2387.024	-3401.315	-2387.024	-2387.024	-2387.024	-2994.384	-390.336	-754.474	-390.336	-754.474	-548.819	-1118.051
P 3	-6741.310	-6741.310	-9791.634	-6741.310	-6741.310	-6741.310	-8567.852	-802.194	-802.194	-802.194	-802.194	-1165.771	-1165.771
C 1L	-10024.964	-10024.964	-14529.598	-10024.964	-10024.964	-10024.964	-12722.351	-839.634		-839.634		-1203.211	
C 1R	-10024.964	-10024.964	-14529.598	-10024.964	-10024.964	-10024.964	-12722.351		839.634		1203.211		839.634
P 5	-6741.310	-6741.310	-9791.634	-6741.310	-6741.310	-6741.310	-8567.852	802.194	802.194	1165.771	1165.771	802.194	802.194
P 6	-2387.023	-2387.023	-3401.315	-2387.023	-2387.023	-2387.023	-2994.383	754.474	390.336	1118.051	548.819	754.474	390.336
P 7	-33.126	-33.126	-33.127	-33.126	-33.126	-33.126	-33.127	347.301	18.933	505.784	18.933	347.301	18.933

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				RIGHT STIRRUPS		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	BAR&SPAC					
P 1	-25.482	-25.482	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.14		0.08	0.000	0.099
P 2	-1836.172	-2303.372	10.21	7 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.149	#5@ 4.17	78.79		0.19	0.514	1.274
P 3	-5185.623	-6590.655	24.29	16 # 11	3.12	2 # 11	24.00	0.105	#5@ 5.92	24.00	0.105	#5@ 5.92	96.00		0.40	0.570	1.004
C 1	-7711.511	-9786.424	36.88	24 # 11	3.12	2 # 11	24.00	0.114	#5@ 5.44	24.00	0.114	#5@ 5.44	96.00		0.60	0.577	0.967
P 5	-5185.623	-6590.655	24.29	16 # 11	3.12	2 # 11	24.00	0.105	#5@ 5.92	24.00	0.105	#5@ 5.92	96.00		0.40	0.570	1.004
P 6	-1836.172	-2303.372	10.21	7 # 11	3.12	2 # 11	24.00	0.149	#5@ 4.17	24.00	0.060	#5@10.33	78.79		0.19	0.514	1.274
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

CN	T B	GR	LLC	WC	R	E S	C F	S F	PF	CRITICAL COLUMN LOADS						PU	MTU	MLU	PU/PM	B	D
										MTF	MLF	PM	MTM	MLM	Page 2						

PIER-36-6-140-50.OUT

1	T	1	LL	2	0.0	C	2822.1	-4960.7	0.0	2822.1	5751.6	2193.9	7935.3	16173.7	6169.3	2.812	72.00	96.00
1	B	3	LL	3	4.1	C	3119.6	5320.3	-4322.4	3119.6	6131.6	5538.5	5793.6	11421.0	10316.1	1.862	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
			NO.SIZE		NO.SIZE		NO.SIZE		NO.SIZE											
1	T	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	3028.	22021.	1.159	1.296	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2914.	22021.	1.152	1.281	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	4.1	C		2340.819	3906.070	46.642	-3324.906	-53.476	188.115	67.927	171.700	291.889	235.602	31.888	27.278	MAX.P1
1	3	LL	3	1.1	C		3043.064	6002.959	75.872	-2581.073	-40.835	200.455	107.273	267.305	360.487	319.864	43.258	35.461	MAX.MT
1	3	LL	3	1.1	C		3043.064	6002.959	75.872	-2581.073	-40.835	200.455	107.273	267.305	360.487	319.864	43.258	35.461	MAX.VT
1	3	LL	3	3.1	C		3043.064	5513.218	67.805	-3887.052	-62.348	230.755	90.275	237.005	377.485	312.673	42.303	35.461	MAX.VP
1	3	LL	3	5.1	C		3043.064	4207.239	46.292	-4648.873	-74.897	262.286	94.217	205.474	373.543	274.896	48.329	35.461	MAX.ML
1	3	LL	3	5.1	C		3043.064	4207.239	46.292	-4648.873	-74.897	262.286	94.217	205.474	373.543	274.896	48.329	35.461	MAX.VL
1	3	LL	2	4.1	C		2259.900	4290.097	40.952	-2872.252	-46.574	170.146	66.253	178.881	282.773	234.555	31.749	26.294	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	
18.500	18.500	5.250	0.994	1.36	20 #10	@11.000	TOP LONG	276.799	55.462	110.924	45.955	0.000	
				1.55	19 #11	@11.625	BOT.TRAN	331.277	57.079	114.159	47.295	0.000	

NUMBER OF PILES = 15 BP = 4.000 DP = 8.000