

28-OCT-09
17:30:24

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; 125' SPAN; 40' TALL; BRIDGE 19 ; PIER 23

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. 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	19.625	4.000	4.000	6.000	6.000	4.000	15.625	16.224	8.112	4.112					
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

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 PT
1219.	2438.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	14.323

GROUP III WIND

STD. * WIND ON SUPERSTRUCTURE INTENSITIES	* STD. * WIND ON LIVE LOAD INTENSITIES	* LENGTHS OF LL TRANS.	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	125.0	250.0	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	8.900	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	251.914	294.167	0.000	294.167	0.000	294.167	251.914					
LL 1	1	76.811	50.662	0.000	0.000	0.000	0.000	0.000					
LL 2	2	76.811	97.805	0.000	80.331	0.000	0.000	0.000					
LL 3	3	76.811	97.805	0.000	112.639	0.000	80.331	14.834					
LL 4	1	0.000	0.000	0.000	0.000	0.000	50.662	76.811					
LL 5	2	0.000	0.000	0.000	80.331	0.000	97.805	76.811					
LL 6	3	14.834	80.331	0.000	112.639	0.000	97.805	76.811					
LL 7	1	0.000	23.571	0.000	80.331	0.000	23.571	0.000					
LL 8	2	38.405	103.902	0.000	89.068	0.000	23.571	0.000					
LL 9	3	38.405	103.902	0.000	97.805	0.000	103.902	38.405					
LL10	2	0.000	78.571	0.000	97.805	0.000	78.571	0.000					
LL11	2	76.811	50.662	0.000	0.000	0.000	50.662	76.811					
LL12	3	76.811	97.805	0.000	80.331	0.000	50.662	76.811					

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	1612.679	-0.001	0.000	0.001	1857.479	7454.374	-7454.373	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	-192.089	-8.900	-494.689	-494.689
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	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 1	1	0.000	-846.844	66.223	3098.426	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 2	1	0.000	-846.844	66.223	3098.426	0.000	0.000	0.000	85.938	14.323	572.920	572.920
GROUP 2 WIND 2 1	1	0.000	-749.020	58.909	2751.926	0.000	0.000	0.000	-281.588	-28.951	-1265.922	-1265.922

PIER-36-5-125-40.OUT																
GROUP	WIND	2	2	1	0.000	-749.020	58.909	2751.926	0.000	0.000	0.000	281.588	28.951	1265.922	1265.922	
GROUP 2	WIND	3	1	1	0.000	-700.107	55.252	2578.675	0.000	0.000	0.000	-477.237	-43.579	-1958.923	-1958.923	
GROUP 2	WIND	3	2	1	0.000	-700.107	55.252	2578.675	0.000	0.000	0.000	477.237	43.579	1958.923	1958.923	
GROUP 2	WIND	4	1	1	0.000	-569.674	45.500	2116.674	0.000	0.000	0.000	-607.670	-53.331	-2420.924	-2420.924	
GROUP 2	WIND	4	2	1	0.000	-569.674	45.500	2116.674	0.000	0.000	0.000	607.670	53.331	2420.924	2420.924	
GROUP 2	WIND	5	1	1	0.000	-308.808	25.996	1192.672	0.000	0.000	0.000	-705.495	-60.645	-2767.425	-2767.425	
GROUP 2	WIND	5	2	1	0.000	-308.808	25.996	1192.672	0.000	0.000	0.000	705.495	60.645	2767.425	2767.425	
GROUP 3	WIND	1	1	1	0.000	-523.841	32.367	1624.315	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876	
GROUP 3	WIND	1	2	1	0.000	-523.841	32.367	1624.315	0.000	0.000	0.000	25.781	4.297	171.876	171.876	
GROUP 3	WIND	2	1	1	0.000	-462.119	28.673	1436.991	0.000	0.000	0.000	-149.225	-11.685	-546.525	-546.525	
GROUP 3	WIND	2	2	1	0.000	-462.119	28.673	1436.991	0.000	0.000	0.000	149.225	11.685	546.525	546.525	
GROUP 3	WIND	3	1	1	0.000	-431.258	26.826	1343.328	0.000	0.000	0.000	-272.669	-19.074	-921.175	-921.175	
GROUP 3	WIND	3	2	1	0.000	-431.258	26.826	1343.328	0.000	0.000	0.000	272.669	19.074	921.175	921.175	
GROUP 3	WIND	4	1	1	0.000	-348.962	21.900	1093.562	0.000	0.000	0.000	-354.965	-23.999	-1170.941	-1170.941	
GROUP 3	WIND	4	2	1	0.000	-348.962	21.900	1093.562	0.000	0.000	0.000	354.965	23.999	1170.941	1170.941	
GROUP 3	WIND	5	1	1	0.000	-184.370	12.049	594.029	0.000	0.000	0.000	-416.687	-27.693	-1358.266	-1358.266	
GROUP 3	WIND	5	2	1	0.000	-184.370	12.049	594.029	0.000	0.000	0.000	416.687	27.693	1358.266	1358.266	
LIVE LOAD	LL	1	1	1	127.473	-1657.152	0.000	1657.152	127.473	1657.152	0.000	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	254.947	-2039.576	0.000	2039.576	254.947	2039.576	0.000	0.000	0.000			
LIVE LOAD	LL	3	1	344.178	-1032.538	0.000	1032.538	344.178	1835.618	-803.081	0.000	0.000			
LIVE LOAD	LL	4	1	127.473	1657.152	0.000	-1657.152	127.473	0.000	-1657.152	0.000	0.000			
LIVE LOAD	LL	5	1	254.947	2039.576	0.000	-2039.576	254.947	0.000	-2039.576	0.000	0.000			
LIVE LOAD	LL	6	1	344.178	1032.537	0.000	-1032.537	344.178	803.081	-1835.618	0.000	0.000			
LIVE LOAD	LL	7	1	127.473	0.000	0.000	0.000	127.473	191.208	-191.208	0.000	0.000			
LIVE LOAD	LL	8	1	254.946	-1274.728	0.000	1274.728	254.946	1465.936	-191.208	0.000	0.000			
LIVE LOAD	LL	9	1	344.177	0.000	0.000	0.000	344.177	1319.342	-1319.342	0.000	0.000			
LIVE LOAD	LL	10	1	254.947	0.000	0.000	0.000	254.947	637.368	-637.368	0.000	0.000			
LIVE LOAD	LL	11	1	254.946	0.000	0.000	0.000	254.946	1657.152	-1657.152	0.000	0.000			
LIVE LOAD	LL	12	1	344.178	-344.182	0.000	344.182	344.178	1835.618	-1491.437	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	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	-17.649	-345.137	-17.649	-345.137	-17.649	-511.894
P 2	-3042.929	-3042.929	-4395.659	-3042.929	-3042.929	-3042.929	-3852.947	-401.220	-783.637	-401.220	-783.637	-567.976	-1162.728
P 3	-6337.434	-6337.434	-9248.987	-6337.434	-6337.434	-6337.434	-8080.879	-819.593	-819.593	-819.593	-819.593	-1198.684	-1198.684
C 1L	-9690.686	-9690.686	-14118.604	-9690.686	-9690.686	-9690.686	-12342.134	-857.033		-857.033		-1236.124	
C 1R	-9690.684	-9690.684	-14118.603	-9690.684	-9690.684	-9690.684	-12342.132		857.033		1236.124		857.033
P 5	-6337.433	-6337.433	-9248.985	-6337.433	-6337.433	-6337.433	-8080.878	819.593	819.593	1198.684	1198.684	819.593	819.593
P 6	-3042.928	-3042.928	-4395.659	-3042.928	-3042.928	-3042.928	-3852.947	783.637	401.220	1162.728	567.976	783.637	401.220
P 7	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	345.137	17.649	511.894	17.649	345.137	17.649

CAP DESIGN DATA																	
PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE.		BOT. REINFORCE.		LEFT STIRRUPS			RIGHT STIRRUPS			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	BAR&SPAC					
P 1	-22.331	-22.331	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	58.45		0.08	0.000	0.088
P 2	-2340.715	-2963.806	12.48	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.143	#5@ 4.34	83.36		0.23	0.588	1.296
P 3	-4874.949	-6216.061	22.91	15 # 11	3.12	2 # 11	24.00	0.112	#5@ 5.55	24.00	0.112	#5@ 5.55	96.00		0.38	0.580	1.030
C 1	-7454.373	-9493.949	35.76	23 # 11	3.12	2 # 11	24.00	0.121	#5@ 5.13	24.00	0.121	#5@ 5.13	96.00		0.59	0.594	0.984
P 5	-4874.948	-6216.060	22.91	15 # 11	3.12	2 # 11	24.00	0.112	#5@ 5.55	24.00	0.112	#5@ 5.55	96.00		0.38	0.580	1.030
P 6	-2340.714	-2963.805	12.48	8 # 11	3.12	2 # 11	24.00	0.143	#5@ 4.34	24.00	0.060	#5@10.33	83.36		0.23	0.588	1.296
P 7	-22.331	-22.331	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	58.45		0.08	0.000	0.088

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

PIER-36-5-125-40.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		2650.0	-4811.1	0.0	2650.0	5247.8	1844.7	8263.0	16365.8	5753.0	3.119	72.00	96.00
1	B	3	LL	2	4.1			C		2746.2	5059.8	-2808.4	2746.2	5479.8	3217.6	7040.6	14104.5	8281.9	2.572	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	2809.	33756.	1.091	1.160	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2587.	33756.	1.083	1.146	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		2147.021	2986.897	40.336	-2506.601	-48.029	188.778	98.573	203.288	293.493	165.226	35.103	29.669	MAX.P1
1	3	LL 2	1.1		C		2693.541	5328.910	59.830	-1509.629	-28.726	182.069	127.775	312.604	366.898	226.892	48.173	37.169	MAX.MT
1	3	LL 2	1.1		C		2693.541	5328.910	59.830	-1509.629	-28.726	182.069	127.775	312.604	366.898	226.892	48.173	37.169	MAX.VT
1	3	LL 3	3.1		C		2791.126	4207.662	58.840	-2933.885	-56.035	233.697	128.145	275.989	381.541	219.046	46.517	38.569	MAX.VP
1	3	LL 3	5.1		C		2791.126	3233.573	39.630	-3502.103	-67.241	261.519	135.467	248.167	374.220	279.030	43.509	38.569	MAX.ML
1	3	LL 3	5.1		C		2791.126	3233.573	39.630	-3502.103	-67.241	261.519	135.467	248.167	374.220	279.030	43.509	38.569	MAX.VL
1	3	LL 2	3.1		C		2071.955	3818.174	40.482	-1910.552	-36.874	158.639	89.840	221.879	290.678	170.852	36.292	28.591	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	
19.900	19.900	5.000	0.999	1.20	24 # 9	@ 9.875	TOP TRAN	228.767	52.096	104.192	43.166	0.000	
				1.44	23 #10	@10.375	BOT.LONG	284.896	53.543	107.086	44.365	0.000	

NUMBER OF PILES = 13 BP = 4.350 DP = 4.350