

28-OCT-09  
17:26:02

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; 140' SPAN; 40' TALL; BRIDGE 19 ; PIER 22

PROB. NO. 0001

DESIGN NO.												DESIGN DATA														
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 SIZ	* CAP MAX TOP	REINFORCING MAX BOT	STEEL MIN SIZE	* MIN NO.	* TOP CL.	* CAP MIN 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

COLUMN REINFORCING												STEEL											
MIN.P	MAX.P	CL.SP.	CLEAR	R MODE	KL COEF	OC	OF	CM	BD1	BD2	IMPACT %	SOIL WT	ALL.S.P. KSF	MIN PL	MAX SP	EDGE DIST	PILE DEPTH	REBAR CLEAR	ALL.PILE CAPACITY	PILE UPLIFT	ALL.PILE I 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 INTENSITIES

STD. WIND TRANS.	* WIND LONG.	ON SUPERSTRUCTURE FT1	INTENSITIES FT2	* STD. WIND FT3	* WIND ON SUPERSTRUCTURE FT4	INTENSITIES FT5	* STD. WIND FT6	* WIND ON LIVE LOAD INTENSITIES FT7	* WIND ON PIER FT8	LENGTHS OF TRANS.	LL LONGI.	* WIND ON LL APT	LL ARMS APL			
1365.	2730.	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 FT2	ON SUPERSTRUCTURE FT3	INTENSITIES FT4	* STD. WIND FT5	* WIND ON LIVE LOAD INTENSITIES FT6	* WIND ON PIER FT7	LENGTHS OF 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	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	281.105	327.389	0.000	327.389	0.000	327.389	281.105					
LL 1	1	85.882	51.529	0.000	0.000	0.000	0.000	0.000					
LL 2	2	85.882	103.059	0.000	85.882	0.000	0.000	0.000					
LL 3	3	85.882	103.059	0.000	120.235	0.000	85.882	17.176					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.529	85.882					
LL 5	2	0.000	0.000	0.000	85.882	0.000	103.059	85.882					
LL 6	3	17.176	85.882	0.000	120.235	0.000	103.059	85.882					
LL 7	1	0.000	25.764	0.000	85.882	0.000	25.764	0.000					
LL 8	2	42.941	111.647	0.000	94.470	0.000	25.764	0.000					
LL 9	3	42.941	111.647	0.000	103.059	0.000	111.647	42.941					
LL10	2	0.000	85.882	0.000	103.059	0.000	85.882	0.000					
LL11	2	85.882	51.529	0.000	0.000	0.000	51.529	85.882					
LL12	3	85.882	103.059	0.000	85.882	0.000	51.529	85.882					

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

LOAD	COL	TRANSVERSE						LONGITUDINAL					
		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	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	1770.727 2015.527	-0.001	0.000	0.001	2015.527	8197.465	-8197.464	0.000	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	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	-944.482	73.523	3444.264	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920	
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	85.938	14.323	572.920	572.920	
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	-305.021	-30.703	-1348.923	-1348.923	

PIER-36-5-140-40.OUT																
GROUP	WIND	2	2	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	305.021	30.703	1348.923	1348.923	
GROUP 2	WIND	3	1	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	-524.103	-47.083	-2124.925	-2124.925	
GROUP 2	WIND	3	2	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	524.103	47.083	2124.925	2124.925	
GROUP 2	WIND	4	1	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	-670.158	-58.003	-2642.260	-2642.260	
GROUP 2	WIND	4	2	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	670.158	58.003	2642.260	2642.260	
GROUP 2	WIND	5	1	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	-779.699	-66.193	-3030.261	-3030.261	
GROUP 2	WIND	5	2	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	779.699	66.193	3030.261	3030.261	
GROUP 3	WIND	1	1	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876	
GROUP 3	WIND	1	2	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	25.781	4.297	171.876	171.876	
GROUP 3	WIND	2	1	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	-164.025	-12.571	-591.436	-591.436	
GROUP 3	WIND	2	2	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	164.025	12.571	591.436	591.436	
GROUP 3	WIND	3	1	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	-302.269	-20.845	-1010.995	-1010.995	
GROUP 3	WIND	3	2	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	302.269	20.845	1010.995	1010.995	
GROUP 3	WIND	4	1	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	-394.431	-26.361	-1290.702	-1290.702	
GROUP 3	WIND	4	2	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	394.431	26.361	1290.702	1290.702	
GROUP 3	WIND	5	1	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	-463.553	-30.498	-1500.481	-1500.481	
GROUP 3	WIND	5	2	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	463.553	30.498	1500.481	1500.481	
LIVE LOAD	LL	1	1	1	137.411	-1811.353	0.000	1811.353	137.411	1811.353	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	274.823	-2229.364	0.000	2229.364	274.823	2229.364	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 3	1	371.011	-1128.624	0.000	1128.624	371.011	2006.428	-877.804	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 4	1	137.411	1811.353	0.000	-1811.353	137.411	0.000	-1811.353	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 5	1	274.823	2229.364	0.000	-2229.364	274.823	0.000	-2229.364	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 6	1	371.011	1128.623	0.000	-1128.623	371.011	877.804	-2006.428	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 7	1	137.410	0.000	0.000	0.000	137.410	208.998	-208.998	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 8	1	274.822	-1393.358	0.000	1393.358	274.822	1602.355	-208.998	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL 9	1	371.011	0.000	0.000	0.000	371.011	1442.120	-1442.120	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL10	1	274.823	0.000	0.000	0.000	274.823	696.675	-696.675	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	1811.353	-1811.353	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD	LL12	1	371.011	-376.210	0.000	376.210	371.011	2006.428	-1630.217	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	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	-29.030	-17.649	-383.085	-17.649	-383.085	-17.649	-569.535
P 2	-3350.766	-3350.766	-4863.247	-3350.766	-3350.766	-3350.766	-4256.443	-439.168	-864.774	-439.168	-864.774	-625.618	-1274.964
P 3	-6978.905	-6978.905	-10178.091	-6978.905	-6978.905	-6978.905	-8894.586	-900.730	-900.730	-900.730	-900.730	-1310.921	-1310.921
C 1L	-10656.704	-10656.704	-15496.653	-10656.704	-10656.704	-10656.704	-13554.877	-938.170		-938.170		-1348.360	
C 1R	-10656.702	-10656.702	-15496.652	-10656.702	-10656.702	-10656.702	-13554.876		938.170		1348.360		938.170
P 5	-6978.904	-6978.904	-10178.090	-6978.904	-6978.904	-6978.904	-8894.584	900.730	900.730	1310.921	1310.921	900.730	900.730
P 6	-3350.765	-3350.765	-4863.246	-3350.765	-3350.765	-3350.765	-4256.443	864.774	439.168	1274.964	625.618	864.774	439.168
P 7	-29.030	-29.029	-29.030	-29.030	-29.030	-29.030	-29.030	383.085	17.649	569.535	17.649	383.085	17.649

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		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	LEFT STIRRUPS	RIGHT STIRRUPS						
P 1	-22.331	-22.331	3.12	2 # 11	3.12	2 # 11	0.00	0.00	#5@ 0.00	24.00	0.061	#5@10.23	58.45	0.08	0.000	0.088
P 2	-2577.512	-3274.187	13.83	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.170	#5@ 7.28	83.36	0.26	0.578	1.227
P 3	-5368.389	-6841.989	25.31	17 # 11	3.12	2 # 11	24.00	0.136	#5@ 4.57	24.00	0.136	#5@ 4.57	96.00	0.42	0.556	0.980
C 1	-8197.464	-10426.829	39.53	26 # 11	3.12	2 # 11	24.00	0.145	#5@ 4.28	24.00	0.145	#5@ 4.28	96.00	0.64	0.569	0.942
P 5	-5368.388	-6841.988	25.31	17 # 11	3.12	2 # 11	24.00	0.136	#5@ 4.57	24.00	0.136	#5@ 4.57	96.00	0.42	0.556	0.980
P 6	-2577.512	-3274.187	13.83	9 # 11	3.12	2 # 11	24.00	0.170	#5@ 7.28	24.00	0.060	#5@10.33	83.36	0.26	0.578	1.227
P 7	-22.330	-22.331	3.12	2 # 11	3.12	2 # 11	24.00	0.061	#5@10.23	0.00	0.000	#5@ 0.00	58.45	0.08	0.000	0.088

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

PIER-36-5-140-40.OUT

CRITICAL COLUMN LOADS																				
CN	T	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		2898.6	-5223.1	0.0	2898.6	5743.4	2046.8	8235.8	16320.9	5816.5	2.842	72.00	96.00
1	B	3	LL 2	4.1			C		2977.5	5467.1	-3102.8	2977.5	5965.2	3601.9	6950.0	13951.7	8424.3	2.338	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	3058.	33756.	1.100	1.177	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2818.	33756.	1.091	1.161	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		2327.642	3470.939	48.287-2490.726	-47.467	169.494	80.752	204.556	293.299	175.359	-0.442	47.155		MAX.P1
1	3	LL 2	1.1		C		2920.740	5779.731	64.627-1648.364	-31.222	163.266	104.569	307.971	366.669	238.201	-0.574	59.247		MAX.MT
1	3	LL 2	3.1		C		2920.740	5370.661	56.560-2739.219	-52.734	190.264	92.577	280.974	378.661	232.602	-0.574	59.247		MAX.VT
1	3	LL 3	3.1		C		3025.934	4512.220	62.773-3237.943	-61.707	220.343	104.977	265.923	381.288	227.967	-0.574	61.302		MAX.VP
1	3	LL 3	5.1		C		3025.934	3421.365	41.261-3874.275	-74.256	251.722	113.613	234.543	372.652	287.106	46.937	61.302		MAX.ML
1	3	LL 3	5.1		C		3025.934	3421.365	41.261-3874.275	-74.256	251.722	113.613	234.543	372.652	287.106	46.937	61.302		MAX.VL
1	3	LL 2	3.1		C		2246.723	4131.278	43.507-2107.092	-40.565	146.357	71.213	216.134	291.277	178.925	-0.442	45.575		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
16.750	16.750	5.250	0.998	1.17	25 # 8	@ 8.000	TOP TRAN	240.038	55.794	111.588	46.230	0.000
				1.38	19 #10	@10.500	BOT.LONG	299.205	57.164	114.328	47.365	0.000

NUMBER OF PILES = 14 BP = 2.375 DP = 2.375