

28-OCT-09
18:21:29

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
40' CURB-CURB; 6 BEAMS; 140' SPAN; 40' TALL; BRIDGE 19 ; PIER 5

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. I P	
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				
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF		PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT				
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	21.660	6.035	4.000	6.000	6.000	4.000	15.625	18.033	7.213	4.785					
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	12.070	6.000	12.070	6.000	6.000	0.000	12	6	11	12	6	11	34	16	11	34	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	14.070	14.070	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 FORCE ARM * WIND ON PIER															
TRANS. LONG. WIND FT1 FL1 WIND FT2 FL2 WIND FT3 FL3 WIND FT4 FL4 WIND FT5 FL5 APT APL PT PL															
1365. 2730. 1 50 0 44 6 41 12 33 16 17 19 7.375 7.375 5.273 17.900															

GROUP III WIND

STD.	* WIND ON SUPERSTRUCTURE INTENSITIES	* STD.	* WIND ON LIVE LOAD INTENSITIES	* LENGTHS OF LL	* WIND ON LL	LL ARMS
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
0.000	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	266.027	301.717	0.000	603.434	0.000	301.717	266.027					
LL 1	1	80.288	57.123	0.000	0.000	0.000	0.000	0.000					
LL 2	2	80.288	99.310	0.000	95.224	0.000	0.000	0.000					
LL 3	3	80.288	99.310	0.000	191.124	0.000	41.511	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	57.132	80.279					
LL 5	2	0.000	0.000	0.000	95.233	0.000	99.310	80.279					
LL 6	3	0.000	41.520	0.000	191.124	0.000	99.310	80.279					
LL 7	1	0.000	28.575	0.000	108.835	0.000	0.000	0.000					
LL 8	2	55.122	108.836	0.000	110.864	0.000	0.000	0.000					
LL 9	3	55.122	108.836	0.000	193.153	0.000	55.122	0.000					
LL10	2	0.000	41.854	0.000	191.124	0.000	41.844	0.000					
LL11	3	79.650	99.615	0.000	191.124	0.000	41.844	0.000					
LL12	2	80.288	57.123	0.000	0.000	0.000	57.132	80.279					
LL13	3	80.288	99.310	0.000	95.224	0.000	57.132	80.279					

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	1994.576	0.000	0.000	0.000	2363.918	9288.101	-9288.101	0.000	0.000	0.000	0.000
		2363.918										
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
WIND ON SUBSTR.	1	0.000	-31.638	5.273	210.920	0.000	0.000	0.000	-107.400	-17.900	-716.000	-716.000
GROUP 2 WIND 1 1	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	-107.400	-17.900	-716.000	-716.000
GROUP 2 WIND 1 2	1	0.000	-944.482	73.523	3444.264	0.000	0.000	0.000	107.400	17.900	716.000	716.000
GROUP 2 WIND 2 1	1	0.000	-834.940	65.333	3056.262	0.000	0.000	0.000	-326.483	-34.280	-1492.003	-1492.003

GROUP	WIND	2	2	1	0.000	-834.940	65.333	3056.262	PIER-40-6-140-40.OUT	0.000	0.000	0.000	326.483	34.280	1492.003	1492.003	
GROUP 2	WIND	3	1	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	-545.565	-50.660	-2268.005	-2268.005		
GROUP 2	WIND	3	2	1	0.000	-780.170	61.238	2862.262	0.000	0.000	0.000	545.565	50.660	2268.005	2268.005		
GROUP 2	WIND	4	1	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	-691.620	-61.580	-2785.340	-2785.340		
GROUP 2	WIND	4	2	1	0.000	-634.115	50.318	2344.927	0.000	0.000	0.000	691.620	61.580	2785.340	2785.340		
GROUP 2	WIND	5	1	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	-801.161	-69.770	-3173.341	-3173.341		
GROUP 2	WIND	5	2	1	0.000	-342.005	28.478	1310.257	0.000	0.000	0.000	801.161	69.770	3173.341	3173.341		
GROUP 3	WIND	1	1	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	-32.220	-5.370	-214.800	-214.800		
GROUP 3	WIND	1	2	1	0.000	-585.507	36.057	1811.441	0.000	0.000	0.000	32.220	5.370	214.800	214.800		
GROUP 3	WIND	2	1	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	-170.464	-13.644	-634.360	-634.360		
GROUP 3	WIND	2	2	1	0.000	-516.385	31.920	1601.661	0.000	0.000	0.000	170.464	13.644	634.360	634.360		
GROUP 3	WIND	3	1	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	-308.707	-21.918	-1053.919	-1053.919		
GROUP 3	WIND	3	2	1	0.000	-481.824	29.851	1496.771	0.000	0.000	0.000	308.707	21.918	1053.919	1053.919		
GROUP 3	WIND	4	1	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	-400.870	-27.434	-1333.626	-1333.626		
GROUP 3	WIND	4	2	1	0.000	-389.661	24.335	1217.065	0.000	0.000	0.000	400.870	27.434	1333.626	1333.626		
GROUP 3	WIND	5	1	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	-469.991	-31.571	-1543.406	-1543.406		
GROUP 3	WIND	5	2	1	0.000	-205.337	13.303	657.652	0.000	0.000	0.000	469.991	31.571	1543.406	1543.406		
LIVE LOAD	LL	1	1	1	137.411	-2065.905	0.000	2065.905	137.411	2065.905	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	2	1	1	274.822	-2522.368	0.000	2522.368	274.822	2522.368	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	371.010	-1865.897	0.000	1865.897	371.010	2270.131	-404.234	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	4	1	137.411	2065.840	0.000	-2065.840	137.411	0.000	-2065.840	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	5	1	274.822	2522.206	0.000	-2522.206	274.822	0.000	-2522.206	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	6	1	371.010	1865.663	0.000	-1865.663	371.010	404.322	-2269.985	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	7	1	137.410	-309.182	0.000	309.182	137.410	309.182	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	8	1	274.822	-2171.621	0.000	2171.621	274.822	2171.621	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	9	1	371.010	-1417.681	0.000	1417.681	371.010	1954.459	-536.778	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	10	1	274.822	-0.108	0.000	0.108	274.822	452.860	-452.752	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	11	1	371.010	-1855.270	0.000	1855.270	371.010	2262.747	-407.477	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	12	1	274.822	-0.065	0.000	0.065	274.822	2065.905	-2065.840	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	13	1	371.010	-410.875	0.000	410.875	371.010	2270.131	-1859.256	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	-33.165	-33.165	-33.165	-33.165	-33.165	-33.165	-33.165	-18.944	-364.780	-18.944	-364.780	-18.944	-539.085
P 2	-2833.058	-2833.058	-4090.321	-2833.058	-2833.058	-2833.058	-3585.910	-414.164	-806.396	-414.164	-806.396	-588.469	-1196.303
P 3	-6787.878	-6787.878	-9910.848	-6787.878	-6787.878	-6787.878	-8657.920	-847.755	-847.755	-847.755	-847.755	-1237.662	-1237.662
C 1L	-12074.530	-12074.530	-17550.592	-12074.530	-12074.530	-12074.530	-15353.608	-904.242		-904.242		-1294.150	
C 1R	-12074.530	-12074.530	-17550.238	-12074.530	-12074.530	-12074.530	-15353.398		904.242		1294.130		904.242
P 5	-6787.878	-6787.878	-9910.614	-6787.878	-6787.878	-6787.878	-8657.780	847.755	847.755	1237.642	1237.642	847.755	847.755
P 6	-2833.058	-2833.058	-4090.180	-2833.058	-2833.058	-2833.058	-3585.826	806.396	414.164	1196.284	588.450	806.396	414.164
P 7	-33.165	-33.165	-33.165	-33.165	-33.165	-33.165	-33.165	364.780	18.944	539.065	18.944	364.780	18.944

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	-25.511	-25.511	3.12	2 # 11	3.12	2 # 11	0.00	0.000	#5@ 0.00	24.00	0.060	#5@10.33	59.15	0.08	0.000	0.099
P 2	-2179.275	-2758.393	11.91	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.159D#5@ 7.81	81.30		0.22	0.544	1.239
P 3	-5221.445	-6659.939	24.60	16 # 11	3.12	2 # 11	24.00	0.120	#5@ 5.17	24.00	0.120	#5@ 5.17	96.00	0.41	0.587	1.014
C 1	-9288.101	-11810.469	45.22	29 # 11	3.12	2 # 11	24.00	0.134	#5@ 4.63	24.00	0.134	#5@ 4.63	96.00	0.73	0.590	0.946
P 5	-5221.445	-6659.831	24.60	16 # 11	3.12	2 # 11	24.00	0.120	#5@ 5.17	24.00	0.120	#5@ 5.17	96.00	0.41	0.587	1.014
P 6	-2179.275	-2758.328	11.91	8 # 11	3.12	2 # 11	24.00	0.159D#5@ 7.81		24.00	0.060	#5@10.33	81.30	0.22	0.544	1.239
P 7	-25.512	-25.512	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	59.15	0.08	0.000	0.099

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

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 2	0.0					3189.6	-5476.1	0.0	3189.6	5652.1	2162.7	15653.5	27799.4	10637.3	4.916	72.00	144.84
1	B		3	LL 3	5.1					3555.4	3280.6-3930.1		3555.4	4424.6	4422.2	13838.7	17232.0	17222.8	3.894	72.00	144.84

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		18 # 11		18 # 11	106.08	1.017	1.00	0.000	3430.	110122.	1.032	1.130	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.017	1.00	0.000	3315.	110122.	1.031	1.125	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				2676.032	2786.760	24.335-2813.356	-54.056	214.432	104.792	182.350	291.991	95.403	0.000	21.010	MAX.P1	
1	3	LL 2	1.1				3373.648	5113.415	46.874-1704.166	-32.617	212.787	146.396	289.004	355.395	129.833	0.000	26.459	MAX.MT	
1	3	LL 2	3.1				3373.648	4704.344	38.807-2795.021	-54.129	240.085	131.083	261.707	370.708	127.325	0.000	26.459	MAX.VT	
1	3	LL 3	3.1				3478.842	3986.407	38.807-3293.745	-63.102	266.334	138.005	249.483	377.812	126.253	0.000	27.313	MAX.VP	
1	3	LL 3	4.1				3478.842	3622.788	31.636-3657.363	-70.273	278.762	136.229	237.055	379.588	269.111	53.657	27.313	MAX.ML	
1	3	LL 3	4.1				3478.842	3622.788	31.636-3657.363	-70.273	278.762	136.229	237.055	379.588	269.111	53.657	27.313	MAX.VL	
1	3	LL 2	4.1				2595.114	3339.020	24.335-2429.722	-47.154	194.241	99.468	191.753	286.526	96.227	0.000	20.353	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	
17.500	17.500	5.000	0.994	0.90	27 # 7	@ 7.750	TOP TRAN	177.104	52.249	104.498	43.292	0.000	
				1.38	20 #10	@10.500	BOT.LONG	281.801	53.543	107.086	44.365	0.000	

NUMBER OF PILES = 15 BP = 3.750 DP = 7.500