

28-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
40' CURB-CURB; 6 BEAMS; 120' SPAN; 50' TALL; BRIDGE 13 ; PIER 17

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 SIZ	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	MIN CL.	MIN S.SP	MIN INCR.	MIN CL.		
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	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	21.625	6.000	4.000	6.000	6.000	4.000	15.625	18.000	7.200	4.800					
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	12.000	6.000	12.000	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	14.000	14.000	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

STANDARD	WIND ON SUPERSTRUCTURE	INTENSITIES	STD.	WIND ON LIVE LOAD	INTENSITIES	LENGTHS OF LL	WIND ON LL	LL ARMS										
TRANS.	LONG.	WIND FT1 FT2 FT3 FT4 FT5	FT1 FT2 FT3 FT4 FT5	WIND FT1 FT2 FT3 FT4 FT5	FT1 FT2 FT3 FT4 FT5	TRANS. LONGI.	APT	APL										
1170.	2340.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	6.475	20.283		

GROUP III WIND

STD.	WIND ON SUPERSTRUCTURE	INTENSITIES	STD.	WIND ON LIVE LOAD	INTENSITIES	LENGTHS OF LL	WIND ON LL	LL ARMS																	
WIND FT1 FT2 FT3 FT4 FT5	FT1 FT2 FT3 FT4 FT5	FT1 FT2 FT3 FT4 FT5	WIND FT1 FT2 FT3 FT4 FT5	FT1 FT2 FT3 FT4 FT5	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	120.0	240.0	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	8.580	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	228.953	260.545	0.000	521.090	0.000	260.545	228.953					
LL 1	1	72.416	51.725	0.000	0.000	0.000	0.000	0.000					
LL 2	2	72.416	89.658	0.000	86.209	0.000	0.000	0.000					
LL 3	3	72.416	89.658	0.000	172.418	0.000	37.932	0.000					
LL 4	1	0.000	0.000	0.000	0.000	0.000	51.725	72.416					
LL 5	2	0.000	0.000	0.000	86.209	0.000	89.658	72.416					
LL 6	3	0.000	37.932	0.000	172.418	0.000	89.658	72.416					
LL 7	1	0.000	25.862	0.000	98.278	0.000	0.000	0.000					
LL 8	2	50.001	98.279	0.000	100.002	0.000	0.000	0.000					
LL 9	3	50.001	98.279	0.000	174.143	0.000	50.001	0.000					
LL10	2	0.000	37.932	0.000	172.418	0.000	37.932	0.000					
LL11	3	72.416	89.658	0.000	172.418	0.000	37.932	0.000					
LL12	2	72.416	51.725	0.000	0.000	0.000	51.725	72.416					
LL13	3	72.416	89.658	0.000	86.209	0.000	51.725	72.416					

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	50.000	0.000	0.000	0.000	6.000	1.000	50.000	50.000	
DEAD LOAD TOTAL	1	1755.236	0.000	0.000	0.000	2230.436	8156.828	-8156.828	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	-185.182	-8.580	-562.702	-562.702	
WIND ON SUBSTR.	1	0.000	-38.850	6.475	323.750	0.000	0.000	0.000	-121.698	-20.283	-1014.150	-1014.150	
GROUP 2 WIND 1 1	1	0.000	-821.287	64.975	3680.188	0.000	0.000	0.000	-121.698	-20.283	-1014.150	-1014.150	
GROUP 2 WIND 1 2	1	0.000	-821.287	64.975	3680.188	0.000	0.000	0.000	121.698	20.283	1014.150	1014.150	
GROUP 2 WIND 2 1	1	0.000	-727.395	57.955	3277.415	0.000	0.000	0.000	-309.483	-34.323	-1819.695	-1819.695	

GROUP	WIND	2	2	1	0.000	-727.395	57.955	3277.415	PIER-40-6-120-50.OUT	0.000	0.000	0.000	309.483	34.323	1819.695	1819.695	
GROUP 2	WIND	3	1	1	0.000	-680.449	54.445	3076.029	0.000	0.000	0.000	-497.268	-48.363	-2625.240	-2625.240		
GROUP 2	WIND	3	2	1	0.000	-680.449	54.445	3076.029	0.000	0.000	0.000	497.268	48.363	2625.240	2625.240		
GROUP 2	WIND	4	1	1	0.000	-555.259	45.085	2538.999	0.000	0.000	0.000	-622.458	-57.723	-3162.270	-3162.270		
GROUP 2	WIND	4	2	1	0.000	-555.259	45.085	2538.999	0.000	0.000	0.000	622.458	57.723	3162.270	3162.270		
GROUP 2	WIND	5	1	1	0.000	-304.879	26.365	1464.939	0.000	0.000	0.000	-716.350	-64.743	-3565.042	-3565.042		
GROUP 2	WIND	5	2	1	0.000	-304.879	26.365	1464.939	0.000	0.000	0.000	716.350	64.743	3565.042	3565.042		
GROUP 3	WIND	1	1	1	0.000	-505.382	31.492	1891.052	0.000	0.000	0.000	-36.509	-6.085	-304.245	-304.245		
GROUP 3	WIND	1	2	1	0.000	-505.382	31.492	1891.052	0.000	0.000	0.000	36.509	6.085	304.245	304.245		
GROUP 3	WIND	2	1	1	0.000	-446.135	27.946	1675.781	0.000	0.000	0.000	-155.004	-13.177	-734.788	-734.788		
GROUP 3	WIND	2	2	1	0.000	-446.135	27.946	1675.781	0.000	0.000	0.000	155.004	13.177	734.788	734.788		
GROUP 3	WIND	3	1	1	0.000	-416.511	26.173	1568.145	0.000	0.000	0.000	-273.498	-20.269	-1165.330	-1165.330		
GROUP 3	WIND	3	2	1	0.000	-416.511	26.173	1568.145	0.000	0.000	0.000	273.498	20.269	1165.330	1165.330		
GROUP 3	WIND	4	1	1	0.000	-337.515	21.445	1281.117	0.000	0.000	0.000	-352.495	-24.997	-1452.359	-1452.359		
GROUP 3	WIND	4	2	1	0.000	-337.515	21.445	1281.117	0.000	0.000	0.000	352.495	24.997	1452.359	1452.359		
GROUP 3	WIND	5	1	1	0.000	-179.522	11.990	707.060	0.000	0.000	0.000	-411.742	-28.543	-1667.630	-1667.630		
GROUP 3	WIND	5	2	1	0.000	-179.522	11.990	707.060	0.000	0.000	0.000	411.742	28.543	1667.630	1667.630		
LIVE LOAD	LL	1	1	1	124.141	-1862.118	0.000	1862.118	124.141	1862.118	0.000	0.000	0.000	0.000	0.000	0.000	
LIVE LOAD	LL	2	1	1	248.283	-2271.794	0.000	2271.794	248.283	2271.794	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 3	1	335.182	-1675.916	0.000	1675.916	335.182	2044.615	-368.699	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	124.141	1862.118	0.000	-1862.118	124.141	0.000	-1862.118	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	248.283	2271.794	0.000	-2271.794	248.283	0.000	-2271.794	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	335.182	1675.916	0.000	-1675.916	335.182	368.699	-2044.615	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	124.140	-279.310	0.000	279.310	124.140	279.310	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	248.282	-1961.431	0.000	1961.431	248.282	1961.431	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	335.182	-1279.278	0.000	1279.278	335.182	1765.288	-486.010	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	248.282	0.000	0.000	0.000	248.282	409.666	-409.666	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	335.182	-1675.916	0.000	1675.916	335.182	2044.615	-368.699	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	248.282	0.000	0.000	0.000	248.282	1862.118	-1862.118	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL13	1	335.182	-368.709	0.000	368.709	335.182	2044.615	-1675.906	0.000	0.000	0.000	0.000	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	MOMENTS(KIP-FEET)								SHEARS(KIPS)							
	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	-316.572	-18.933	-316.572	-18.933	-473.787			
P 2	-2480.525	-2480.525	-3612.474	-2480.525	-2480.525	-2480.525	-3158.339	-365.849	-704.557	-365.849	-704.557	-523.064	-1056.420			
P 3	-5959.186	-5959.186	-8780.075	-5959.186	-5959.186	-5959.186	-7648.341	-746.035	-746.035	-746.035	-746.035	-1097.898	-1097.898			
C 1L	-10603.876	-10603.876	-15535.941	-10603.876	-10603.876	-10603.876	-13557.209	-802.195		-802.195		-1154.057				
C 1R	-10603.876	-10603.876	-15535.941	-10603.876	-10603.876	-10603.876	-13557.208		802.195		1154.057		802.195			
P 5	-5959.186	-5959.186	-8780.075	-5959.186	-5959.186	-5959.186	-7648.341	746.035	746.035	1097.898	1097.898	746.035	746.035			
P 6	-2480.525	-2480.525	-3612.474	-2480.525	-2480.525	-2480.525	-3158.339	704.557	365.849	1056.420	523.064	704.557	365.849			
P 7	-33.127	-33.126	-33.127	-33.127	-33.127	-33.127	-33.127	316.572	18.933	473.787	18.933	316.572	18.933			

PT.	CAP DESIGN DATA				RIGHT STIRRUPS				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	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	M.SP. AV/IN BAR&SPAC	D	FC					
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	-1908.096	-2429.491	10.50 7 # 11	3.12 2 # 11	24.00 0.060 #5@10.33	24.00 0.124 #5@ 5.01	81.25			0.19	0.557	1.300	
P 3	-4583.989	-5883.340	21.71 14 # 11	3.12 2 # 11	24.00 0.090 #5@ 6.86	24.00 0.090 #5@ 6.86	96.00			0.36	0.603	1.066	
C 1	-8156.828	-10428.623	39.63 26 # 11	3.12 2 # 11	24.00 0.104 #5@ 5.98	24.00 0.104 #5@ 5.98	96.00			0.64	0.578	0.942	
P 5	-4583.989	-5883.340	21.71 14 # 11	3.12 2 # 11	24.00 0.090 #5@ 6.86	24.00 0.090 #5@ 6.86	96.00			0.36	0.603	1.066	
P 6	-1908.096	-2429.491	10.50 7 # 11	3.12 2 # 11	24.00 0.124 #5@ 5.01	24.00 0.060 #5@10.33	81.25			0.19	0.557	1.300	
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

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				2820.8	-4932.1	0.0	2820.8	5160.6	2019.0	15194.0	27843.5	10893.1	5.394	72.00	144.00
1	B		2		5.1					2899.6	1904.4	-4634.6	2899.6	3611.9	5350.7	10892.7	13569.1	20101.8	3.757	72.00	144.00

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		18 # 11		18 # 11	106.08	1.023	1.00	0.000	3130.	70682.	1.046	1.193	1.000	2	0.70
1	B		16 # 11		16 # 11		18 # 11		18 # 11	106.08	1.023	1.00	0.000	2591.	70682.	1.038	1.155	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			2512.409	2978.019	26.173-2684.626	-43.435	210.445	134.926	217.428	292.947	138.540	0.000	41.512		MAX.P1
1	3	LL	2	1.1			3171.097	4942.875	40.940-1858.544	-30.218	229.211	176.907	313.447	365.751	184.701	0.000	52.481		MAX.MT
1	3	LL	2	3.1			3171.097	4523.096	34.026-2977.955	-48.658	251.050	167.207	291.608	375.452	181.148	0.000	52.481		MAX.VT
1	3	LL	3	3.1			3266.132	3871.424	34.026-3490.013	-56.465	273.578	175.404	282.656	380.831	180.102	0.000	53.966		MAX.VP
1	3	LL	3	4.1			3266.132	3498.287	27.879-3863.150	-62.612	284.230	175.542	272.004	380.692	348.224	60.922	53.966		MAX.ML
1	3	LL	3	4.1			3266.132	3498.287	27.879-3863.150	-62.612	284.230	175.542	272.004	380.692	348.224	60.922	53.966		MAX.VL
1	3	LL	2	3.1			2439.305	3479.304	26.173-2290.734	-37.429	193.116	128.620	224.314	288.809	139.345	0.000	40.370		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	
20.500	20.500	6.000	0.997	1.00	35 # 7	@ 7.000	TOP TRAN	250.917	66.731	133.463	55.292	0.000	
				1.40	23 #10	@10.625	BOT.LONG	353.732	68.026	136.052	56.365	0.000	

NUMBER OF PILES = 14 BP = 3.000 DP = 3.000