

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; 5 BEAMS; 140' SPAN; 70' TALL; BRIDGE 26 ; PIER 2, 5

PROB. NO. 0001

DESIGN NO.												DESIGN DATA											
OPTIONS	CAN	COL	LLC	D	M	S	F'C	FC	N	FY	FS	EC	ES	CONC.	Z	* * *	* CAP	REINFORCING	STEEL	* * *	CAP		
DDDL	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	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	16.000	8.000	4.000					
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		70.000	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

WIND	TRANS.	LONG.	WIND	FT1	FT2	FT3	FT4	FT5	FT1	FT2	FT3	FT4	FT5	WIND	ON	PIER
1365.	2730.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	8.876	19.216

GROUP III WIND INTENSITIES

STD.	WIND	ON	SUPERSTRUCTURE	INTENSITIES	STD.	WIND	ON	LIVE	LOAD	INTENSITIES	LENGTHS	OF	LL	WIND	ON	LL	ARMS								
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	
3.908	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	281.621	325.334	0.000	325.334	0.000	325.334	281.621					
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)

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	70.000	0.000	0.000	0.000	6.000	1.000	70.000	70.000
DEAD LOAD TOTAL	1	1765.594	2226.394	0.000	0.000	0.000	2226.394	8089.646	-8089.646	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	-843.848	-843.848
CENT. FORCE 1 LN	1	0.000	-84.346	3.908	334.458	0.000	0.000	0.000	0.000	0.000	0.000	0.000
WIND ON SUBSTR.	1	0.000	-53.256	8.876	621.320	0.000	0.000	0.000	-115.296	-19.216	-1345.120	-1345.120
GROUP 2 WIND 1 1	1	0.000	-966.100	77.126	5902.164	0.000	0.000	0.000	-115.296	-19.216	-1345.120	-1345.120
GROUP 2 WIND 1 2	1	0.000	-966.100	77.126	5902.164	0.000	0.000	0.000	115.296	19.216	1345.120	1345.120
GROUP 2 WIND 2 1	1	0.000	-856.558	68.936	5268.462	0.000	0.000	0.000	-334.379	-35.596	-2612.522	-2612.522

PIER-36-5-140-70.OUT																
GROUP	WIND	2	2	1	0.000	-856.558	68.936	5268.462	0.000	0.000	0.000	334.379	35.596	2612.522	2612.522	
GROUP 2	WIND	3	1	1	0.000	-801.788	64.841	4951.612	0.000	0.000	0.000	-553.461	-51.976	-3879.925	-3879.925	
GROUP 2	WIND	3	2	1	0.000	-801.788	64.841	4951.612	0.000	0.000	0.000	553.461	51.976	3879.925	3879.925	
GROUP 2	WIND	4	1	1	0.000	-655.733	53.921	4106.677	0.000	0.000	0.000	-699.516	-62.896	-4724.860	-4724.860	
GROUP 2	WIND	4	2	1	0.000	-655.733	53.921	4106.677	0.000	0.000	0.000	699.516	62.896	4724.860	4724.860	
GROUP 2	WIND	5	1	1	0.000	-363.623	32.081	2416.807	0.000	0.000	0.000	-809.057	-71.086	-5358.561	-5358.561	
GROUP 2	WIND	5	2	1	0.000	-363.623	32.081	2416.807	0.000	0.000	0.000	809.057	71.086	5358.561	5358.561	
GROUP 3	WIND	1	1	1	0.000	-591.992	37.138	2968.811	0.000	0.000	0.000	-34.589	-5.765	-403.536	-403.536	
GROUP 3	WIND	1	2	1	0.000	-591.992	37.138	2968.811	0.000	0.000	0.000	34.589	5.765	403.536	403.536	
GROUP 3	WIND	2	1	1	0.000	-522.870	33.001	2634.921	0.000	0.000	0.000	-172.832	-14.039	-1071.316	-1071.316	
GROUP 3	WIND	2	2	1	0.000	-522.870	33.001	2634.921	0.000	0.000	0.000	172.832	14.039	1071.316	1071.316	
GROUP 3	WIND	3	1	1	0.000	-488.309	30.932	2467.976	0.000	0.000	0.000	-311.076	-22.313	-1739.095	-1739.095	
GROUP 3	WIND	3	2	1	0.000	-488.309	30.932	2467.976	0.000	0.000	0.000	311.076	22.313	1739.095	1739.095	
GROUP 3	WIND	4	1	1	0.000	-396.147	25.416	2022.790	0.000	0.000	0.000	-403.238	-27.829	-2184.282	-2184.282	
GROUP 3	WIND	4	2	1	0.000	-396.147	25.416	2022.790	0.000	0.000	0.000	403.238	27.829	2184.282	2184.282	
GROUP 3	WIND	5	1	1	0.000	-211.822	14.384	1132.417	0.000	0.000	0.000	-472.360	-31.966	-2518.171	-2518.171	
GROUP 3	WIND	5	2	1	0.000	-211.822	14.384	1132.417	0.000	0.000	0.000	472.360	31.966	2518.171	2518.171	
LIVE LOAD	LL	1	1	1	137.411	-1786.344	0.000	1786.344	137.411	1786.344	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	-2198.584	0.000	2198.584	274.823	2198.584	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 3	1	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	137.411	1786.344	0.000	-1786.344	137.411	0.000	-1786.344	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	274.823	2198.584	0.000	-2198.584	274.823	0.000	-2198.584	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	371.011	1113.041	0.000	-1113.041	371.011	865.685	-1978.726	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	206.112	-206.112	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	274.822	-1374.120	0.000	1374.120	274.822	1580.232	-206.112	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	1422.209	-1422.209	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	274.823	0.000	0.000	0.000	274.823	687.056	-687.056	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	274.822	0.000	0.000	0.000	274.822	1786.344	-1786.344	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	371.011	-371.016	0.000	371.016	371.011	1978.726	-1607.710	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	-385.040	-18.933	-385.040	-18.933	-571.490			
P 2	-3323.512	-3323.512	-4815.111	-3323.512	-3323.512	-3323.512	-4216.685	-440.751	-863.685	-440.751	-863.685	-627.201	-1273.876			
P 3	-6846.743	-6846.743	-9979.105	-6846.743	-6846.743	-6846.743	-8722.409	-898.729	-898.729	-898.729	-898.729	-1308.920	-1308.920			
C 1L	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699	-936.169		-936.169		-1346.360				
C 1R	-10516.539	-10516.539	-15289.665	-10516.539	-10516.539	-10516.539	-13374.699		936.169		1346.360		936.169			
P 5	-6846.743	-6846.743	-9979.104	-6846.743	-6846.743	-6846.743	-8722.409	898.729	898.729	1308.920	1308.920	898.729	898.729			
P 6	-3323.512	-3323.512	-4815.110	-3323.512	-3323.512	-3323.512	-4216.685	863.685	440.751	1273.876	627.201	863.685	440.751			
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	385.040	18.933	571.490	18.933	385.040	18.933			

PT.	UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
	M+ K-FT.	M- K-FT.	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	LEFT STIRRUPS	RIGHT STIRRUPS						
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	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.169D#5@ 7.35	83.71		0.25	0.563	1.210
P 3	-5266.726	-6709.546	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
C 1	-8089.646	-10288.230	38.97	25 # 11	3.12	2 # 11	24.00	0.145	#5@ 4.29	24.00	0.145	#5@ 4.29	96.00	0.63	0.593	0.977
P 5	-5266.726	-6709.545	24.80	16 # 11	3.12	2 # 11	24.00	0.135	#5@ 4.59	24.00	0.135	#5@ 4.59	96.00	0.41	0.593	1.040
P 6	-2556.548	-3243.604	13.63	9 # 11	3.12	2 # 11	24.00	0.169D#5@ 7.35	24.00	0.060	#5@10.33	83.71		0.25	0.563	1.210
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! ***

PIER-36-5-140-70.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		2891.9	-4992.4	0.0	2891.9	6913.2	3219.6	6552.1	15618.4	7273.8	2.260	72.00	96.00
1	B	3	LL	3	5.1			C		3376.6	4093.0	-6235.5	3376.6	5590.8	11226.2	3680.1	6095.3	12239.3	1.090	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	3191.	11486.	1.385	1.856	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	3077.	11486.	1.366	1.800	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		2538.509	3862.179	35.968	-4462.672	-54.451	199.890	89.994	183.686	293.582	221.919	40.259	42.282	MAX.P1
1	3	LL 2	1.1		C		3194.867	7133.487	58.440	-2718.602	-33.130	190.203	123.261	295.297	362.239	307.881	55.708	53.209	MAX.MT
1	3	LL 2	1.1		C		3194.867	7133.487	58.440	-2718.602	-33.130	190.203	123.261	295.297	362.239	307.881	55.708	53.209	MAX.VT
1	3	LL 3	4.1		C		3300.061	5020.833	46.758	-5801.473	-70.786	259.857	116.992	238.792	381.657	288.494	52.337	54.967	MAX.VP
1	3	LL 3	4.1		C		3300.061	5020.833	46.758	-5801.473	-70.786	259.857	116.992	238.792	381.657	359.271	52.789	54.967	MAX.ML
1	3	LL 3	4.1		C		3300.061	5020.833	46.758	-5801.473	-70.786	259.857	116.992	238.792	381.657	359.271	52.789	54.967	MAX.VL
1	2		3.1				2226.394	4951.612	64.841	-3879.925	-51.976	159.099	62.965	185.463	281.597	216.582	39.331	37.066	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
22.000	22.000	5.500	0.999	1.43	25 #10	@10.500	TOP TRAN	310.053	59.083	118.166	48.955	0.000
				1.63	24 #11	@11.000	BOT.LONG	374.216	60.700	121.400	50.295	0.000

NUMBER OF PILES = 16 BP = 3.250 DP = 3.250