

29-OCT-09
08:54:54

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 25 ; PIER 31,32,33

PROB. NO. 0001

DESIGN NO.	NO. CAN	NO. COL	NO. LLC	SKEW D	ANG M	F'C S	FC PSI	N	FY PSI	FS PSI	DESIGN DATA		CONC.	Z	* * * CAP			REINFORCING STEEL		* * * CAP					
OPTIONS											EC	ES	STRAIN	FACT	MAIN SIZE	STR SIZ	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	MIN TOP	MIN CL.	MIN S.SP	MIN INCR.	MIN 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	ALL.PILE
MIN.P	MAX.P	CL.SP.	CLEAR	MODE	COEF					%	KCF	KSF	PL SP	PL SP	PL SP	DIST	DEPTH	CLEAR	CAPACITY	UPLIFT	I
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		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	ARM	* WIND ON	PIER
																APT	APL	PT	PL
1365.	2730.	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	* WIND ON LL	LL	ARMS																
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	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	40.000	0.000	0.000	0.000	6.000	1.000	40.000	40.000
DEAD LOAD TOTAL	1	1765.594	0.000	0.000	0.000	2010.394	8089.646	-8089.646	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
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
GROUP 2 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

PIER-36-5-140-40.OUT																
GROUP	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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	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
LIVE LOAD	LL 2	1	1	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

□ 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	371.011	-1113.041	0.000	1113.041	371.011	1978.726	-865.685	0.000	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	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	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	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	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	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	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	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	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	0.000

□ CAP ANALYSIS AND DESIGN DATA

POINT	CAP MOMENTS AND SHEARS								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.	M UNF.		TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				RIGHT STIRRUPS		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	K-FT.	K-FT.	AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
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! ***

□ COLUMN ANALYSIS AND DESIGN OUTPUT

CRITICAL COLUMN LOADS

PIER-36-5-140-40.OUT

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					2891.9	-4773.1	0.0	2891.9	5247.4	2041.3	8630.8	15664.3	6093.6	2.985	72.00	96.00
1	B		3	LL 2	4.1					2970.8	4440.3	-3102.8	2970.8	4843.8	3600.5	7652.5	12417.2	9230.0	2.566	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	3051.	33756.	1.099	1.176	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2812.	33756.	1.091	1.160	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 2	3.1				2241.590	3346.342	29.851-2107.092	-40.565	144.827	51.725	197.651	290.753	111.721	-0.141	46.515		MAX.P1
1	3	LL 2	1.1				2914.067	4759.314	46.874-1648.364	-31.222	154.842	82.093	290.380	363.129	149.630	-0.183	60.470		MAX.MT
1	3	LL 2	3.1				2914.067	4350.244	38.807-2739.219	-52.734	188.275	67.243	256.947	377.979	145.238	-0.183	60.470		MAX.VT
1	3	LL 3	4.1				3019.261	2799.441	31.636-3601.562	-68.878	248.055	88.995	212.195	371.254	133.071	-0.183	62.608		MAX.VP
1	3	LL 3	4.1				3019.261	2799.441	31.636-3601.562	-68.878	248.055	88.995	212.195	371.254	227.679	35.243	62.608		MAX.ML
1	3	LL 3	4.1				3019.261	2799.441	31.636-3601.562	-68.878	248.055	88.995	212.195	371.254	227.679	35.243	62.608		MAX.VL
1	3	LL 2	3.1				2241.590	3346.342	29.851-2107.092	-40.565	144.827	51.725	197.651	290.753	111.721	-0.141	46.515		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
13.750	13.750	4.000	0.990	1.10	20 # 8	@ 8.250	TOP TRAN	155.770	37.522	75.044	31.090	0.000
				1.64	15 #11	@11.000	BOT.LONG	236.369	38.976	77.952	32.295	0.000

NUMBER OF PILES = 14 BP = 1.875 DP = 1.875