

27-OCT-09
17:01:30

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; 110' SPAN; 40' TALL; BRIDGE 25 ; PIER 35

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 SIZE	MAX TOP	MAX BOT	MIN SIZE	MIN NO.	TOP CL.	MIN S.SP	DEPTH INCR.	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	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	21.28	0.120	10.000	2.50	5.00	1.250	0.300	3.000	0.000	0.000	

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	S	10.000	10.000	2.250	0.500	0.500	0.250	1.000	1.000	2.500	4	3	0.000	0.000	0.000

GROUP II WIND

SUPERSTRUCTURE	TRANS.	LONG.	WIND	FT1	FT1	WIND ON SUPERSTRUCTURE	INTENSITIES	FT2	FT2	FT3	FT3	FT4	FT4	FT5	FT5	* WIND FORCE	ARM	* WIND ON	PIER
																APT	APL	PT	PL
1073.	2145.	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	APL																
WIND	FT1	FT1	FT2	FT2	FT3	FT3	FT4	FT4	FT5	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	110.0	220.0	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	7.940	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	223.100	259.274	0.000	259.274	0.000	259.274	223.100					
LL 1	1	73.477	43.432	0.000	0.000	0.000	0.000	0.000					
LL 2	2	73.477	89.093	0.000	71.248	0.000	0.000	0.000					
LL 3	3	73.477	89.093	0.000	101.880	0.000	73.492	12.786					
LL 4	1	0.000	0.000	0.000	0.000	0.000	43.432	73.477					
LL 5	2	0.000	0.000	0.000	71.248	0.000	89.093	73.477					
LL 6	3	12.786	73.492	0.000	101.880	0.000	89.093	73.477					
LL 7	1	0.000	21.708	0.000	73.492	0.000	21.708	0.000					
LL 8	2	35.617	95.201	0.000	81.292	0.000	21.708	0.000					
LL 9	3	35.617	95.201	0.000	89.093	0.000	95.201	35.617					
LL10	2	0.000	72.363	0.000	89.093	0.000	72.363	0.000					
LL11	2	73.477	43.432	0.000	0.000	0.000	43.432	73.477					
LL12	3	73.477	89.093	0.000	71.248	0.000	43.432	73.477					

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	1450.372	0.000	0.000	0.000	1695.172	6624.830	-6624.830	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	-171.369	-7.940	-441.329	-441.329
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	-749.207	58.923	2752.589	0.000	0.000	0.000	-85.938	-14.323	-572.920	-572.920
GROUP 2 WIND 1 2	1	0.000	-749.207	58.923	2752.589	0.000	0.000	0.000	85.938	14.323	572.920	572.920
GROUP 2 WIND 2 1	1	0.000	-663.098	52.485	2447.588	0.000	0.000	0.000	-258.074	-27.193	-1182.636	-1182.636
GROUP 2 WIND 2 2	1	0.000	-663.098	52.485	2447.588	0.000	0.000	0.000	258.074	27.193	1182.636	1182.636

PIER-36-5-110-40.OUT												
GROUP 2 WIND 3 1	1	0.000	-620.044	49.266	2295.088	0.000	0.000	0.000	-430.211	-40.063	-1792.353	-1792.353
GROUP 2 WIND 3 2	1	0.000	-620.044	49.266	2295.088	0.000	0.000	0.000	430.211	40.063	1792.353	1792.353
GROUP 2 WIND 4 1	1	0.000	-505.233	40.682	1888.421	0.000	0.000	0.000	-544.968	-48.643	-2198.830	-2198.830
GROUP 2 WIND 4 2	1	0.000	-505.233	40.682	1888.421	0.000	0.000	0.000	544.968	48.643	2198.830	2198.830
GROUP 2 WIND 5 1	1	0.000	-275.611	23.514	1075.087	0.000	0.000	0.000	-631.036	-55.078	-2503.688	-2503.688
GROUP 2 WIND 5 2	1	0.000	-275.611	23.514	1075.087	0.000	0.000	0.000	631.036	55.078	2503.688	2503.688
GROUP 3 WIND 1 1	1	0.000	-462.175	28.677	1437.190	0.000	0.000	0.000	-25.781	-4.297	-171.876	-171.876
GROUP 3 WIND 1 2	1	0.000	-462.175	28.677	1437.190	0.000	0.000	0.000	25.781	4.297	171.876	171.876
GROUP 3 WIND 2 1	1	0.000	-407.853	25.426	1272.320	0.000	0.000	0.000	-134.401	-10.798	-501.530	-501.530
GROUP 3 WIND 2 2	1	0.000	-407.853	25.426	1272.320	0.000	0.000	0.000	134.401	10.798	501.530	501.530
GROUP 3 WIND 3 1	1	0.000	-380.692	23.800	1189.885	0.000	0.000	0.000	-243.021	-17.299	-831.184	-831.184
GROUP 3 WIND 3 2	1	0.000	-380.692	23.800	1189.885	0.000	0.000	0.000	243.021	17.299	831.184	831.184
GROUP 3 WIND 4 1	1	0.000	-308.263	19.465	970.059	0.000	0.000	0.000	-315.435	-21.633	-1050.953	-1050.953
GROUP 3 WIND 4 2	1	0.000	-308.263	19.465	970.059	0.000	0.000	0.000	315.435	21.633	1050.953	1050.953
GROUP 3 WIND 5 1	1	0.000	-163.404	10.794	530.407	0.000	0.000	0.000	-369.745	-24.883	-1215.780	-1215.780
GROUP 3 WIND 5 2	1	0.000	-163.404	10.794	530.407	0.000	0.000	0.000	369.745	24.883	1215.780	1215.780
LIVE LOAD LL 1	1	116.909	-1523.088	0.000	1523.088	116.909	1523.088	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 2	1	233.818	-1888.376	0.000	1888.376	233.818	1888.376	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	315.655	-986.278	0.000	986.278	315.655	1699.538	-713.261	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	116.909	1523.088	0.000	-1523.088	116.909	0.000	-1523.088	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	233.818	1888.376	0.000	-1888.376	233.818	0.000	-1888.376	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	315.655	986.278	0.000	-986.278	315.655	713.261	-1699.538	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	116.908	0.000	0.000	0.000	116.908	173.664	-173.664	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	233.818	-1157.816	0.000	1157.816	233.818	1331.480	-173.664	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	315.656	0.000	0.000	0.000	315.656	1198.332	-1198.332	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	233.819	0.000	0.000	0.000	233.819	578.904	-578.904	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	233.818	0.000	0.000	0.000	233.818	1523.088	-1523.088	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	315.654	-328.759	0.000	328.759	315.654	1699.538	-1370.779	0.000	0.000	0.000	0.000

□ CAP MOMENTS AND SHEARS

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	-308.963	-18.933	-308.963	-18.933	-468.482	
P 2	-2714.894	-2714.894	-3991.042	-2714.894	-2714.894	-2714.894	-3479.054	-364.674	-701.730	-364.674	-701.730	-524.192	-1054.669	
P 3	-5590.303	-5590.303	-8278.209	-5590.303	-5590.303	-5590.303	-7199.828	-736.774	-736.774	-736.774	-736.774	-1089.713	-1089.713	
C 1L	-8612.278	-8612.278	-12711.943	-8612.278	-8612.278	-8612.278	-11067.166	-774.214		-774.214		-1127.153		
C 1R	-8612.278	-8612.278	-12711.943	-8612.278	-8612.278	-8612.278	-11067.166		774.214		1127.153		774.214	
P 5	-5590.303	-5590.303	-8278.209	-5590.303	-5590.303	-5590.303	-7199.828	736.774	736.774	1089.713	1089.713	736.774	736.774	
P 6	-2714.894	-2714.894	-3991.042	-2714.894	-2714.894	-2714.894	-3479.054	701.730	364.674	1054.669	524.192	701.730	364.674	
P 7	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	-33.127	308.963	18.933	468.482	18.933	308.963	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 BAR&SPAC	RIGHT STIRRUPS 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	-2088.380	-2676.196	11.25	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.115	#5@ 5.38	83.71	0.20	0.510	1.165
P 3	-4300.233	-5538.329	20.44	14 # 11	3.12	2 # 11	24.00	0.089	#5@ 7.00	24.00	0.089	#5@ 7.00	96.00	0.34	0.550	1.003
C 1	-6624.830	-8513.205	31.98	21 # 11	3.12	2 # 11	24.00	0.097	#5@ 6.37	24.00	0.097	#5@ 6.37	96.00	0.53	0.586	0.975
P 5	-4300.233	-5538.329	20.44	14 # 11	3.12	2 # 11	24.00	0.089	#5@ 7.00	24.00	0.089	#5@ 7.00	96.00	0.34	0.550	1.003
P 6	-2088.380	-2676.196	11.25	8 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.38	24.00	0.060	#5@10.33	83.71	0.20	0.510	1.165
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-36-5-110-40.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					2393.1	-4099.7	0.0	2393.1	4435.0	1641.9	8589.1	15921.4	5894.2	3.590	72.00	96.00
1	B		3	LL 2	4.1					2507.7	3716.0	-2513.7	2507.7	3993.8	2841.8	7916.6	12608.8	8971.8	3.157	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	2552.	33756.	1.082	1.143	1.000	2	0.70
1	B		15 # 11		15 # 11		8 # 11		8 # 11	71.76	1.038	1.00	0.000	2349.	33756.	1.075	1.131	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				1887.964	2746.924	23.800-1713.842	-33.179	5.743	1.682	7.993	12.053	98.170	18.092	33.745	MAX.P1	
1	3	LL 2	1.1				2454.353	3892.496	37.280-1370.894	-26.230	6.068	2.822	11.788	15.034	131.143	24.204	43.869	MAX.MT	
1	3	LL 2	1.1				2454.353	3892.496	37.280-1370.894	-26.230	6.068	2.822	11.788	15.034	131.143	24.204	43.869	MAX.VT	
1	3	LL 3	4.1				2542.074	2318.267	25.304-2915.304	-55.992	9.986	3.082	8.443	15.347	117.718	21.549	45.437	MAX.VP	
1	3	LL 3	4.1				2542.074	2318.267	25.304-2915.304	-55.992	9.986	3.082	8.443	15.347	180.773	33.627	45.437	MAX.ML	
1	3	LL 3	4.1				2542.074	2318.267	25.304-2915.304	-55.992	9.986	3.082	8.443	15.347	180.773	33.627	45.437	MAX.VL	
1	3	LL 2	3.1				1887.964	2746.924	23.800-1713.842	-33.179	5.622	1.618	7.888	11.893	97.985	24.349	38.975	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	3.000	0.964	0.95	28 # 7 @	7.500	TOP TRAN	132.312	37.938	75.875	31.434	0.000
				1.28	23 # 9 @	9.125	BOT.LONG	185.304	39.146	78.293	32.436	0.000