

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; 110' SPAN; 40' TALL; BRIDGE 25 ; PIER 28

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	ES	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	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	19.780	4.155	4.000	6.000	6.000	4.000	15.625	16.156	8.078	3.923					
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	8.310	6.000	8.310	6.000	6.000	0.000	8	6	11	8	6	11	23	16	11	23	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	10.310	10.310	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

WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	WIND	FT1	FL1	FT2	FL2	FT3	FL3	FT4	FL4	FT5	FL5	LENGTHS	OF LL	WIND	ON LL	LL	ARMS
1073.			2145.	1	50	0	44	6	41	12	33	16	17	19	7.375	7.375	5.273	14.595																				

GROUP III WIND

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	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	223.881	260.640	0.000	260.640	0.000	260.640	223.881					
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					

TRANSVERSE

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	1458.264	0.000	0.000	0.000	1712.550	6721.138	-6721.137	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	-87.570	-14.595	-583.800	-583.800
GROUP 2 WIND 1 1	1	0.000	-749.207	58.923	2752.589	0.000	0.000	0.000	-87.570	-14.595	-583.800	-583.800
GROUP 2 WIND 1 2	1	0.000	-749.207	58.923	2752.589	0.000	0.000	0.000	87.570	14.595	583.800	583.800
GROUP 2 WIND 2 1	1	0.000	-663.098	52.485	2447.588	0.000	0.000	0.000	-259.706	-27.465	-1193.516	-1193.516
GROUP 2 WIND 2 2	1	0.000	-663.098	52.485	2447.588	0.000	0.000	0.000	259.706	27.465	1193.516	1193.516

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	-431.842	-40.335	-1803.232	-1803.232
GROUP 2 WIND 3 2	1	0.000	-620.044	49.266	2295.088	0.000	0.000	0.000	431.842	40.335	1803.232	1803.232
GROUP 2 WIND 4 1	1	0.000	-505.233	40.682	1888.421	0.000	0.000	0.000	-546.600	-48.915	-2209.710	-2209.710
GROUP 2 WIND 4 2	1	0.000	-505.233	40.682	1888.421	0.000	0.000	0.000	546.600	48.915	2209.710	2209.710
GROUP 2 WIND 5 1	1	0.000	-275.611	23.514	1075.087	0.000	0.000	0.000	-632.668	-55.350	-2514.568	-2514.568
GROUP 2 WIND 5 2	1	0.000	-275.611	23.514	1075.087	0.000	0.000	0.000	632.668	55.350	2514.568	2514.568
GROUP 3 WIND 1 1	1	0.000	-462.175	28.677	1437.190	0.000	0.000	0.000	-26.271	-4.379	-175.140	-175.140
GROUP 3 WIND 1 2	1	0.000	-462.175	28.677	1437.190	0.000	0.000	0.000	26.271	4.379	175.140	175.140
GROUP 3 WIND 2 1	1	0.000	-407.853	25.426	1272.320	0.000	0.000	0.000	-134.891	-10.880	-504.794	-504.794
GROUP 3 WIND 2 2	1	0.000	-407.853	25.426	1272.320	0.000	0.000	0.000	134.891	10.880	504.794	504.794
GROUP 3 WIND 3 1	1	0.000	-380.692	23.800	1189.885	0.000	0.000	0.000	-243.511	-17.381	-834.448	-834.448
GROUP 3 WIND 3 2	1	0.000	-380.692	23.800	1189.885	0.000	0.000	0.000	243.511	17.381	834.448	834.448
GROUP 3 WIND 4 1	1	0.000	-308.263	19.465	970.059	0.000	0.000	0.000	-315.924	-21.715	-1054.217	-1054.217
GROUP 3 WIND 4 2	1	0.000	-308.263	19.465	970.059	0.000	0.000	0.000	315.924	21.715	1054.217	1054.217
GROUP 3 WIND 5 1	1	0.000	-163.404	10.794	530.407	0.000	0.000	0.000	-370.234	-24.965	-1219.044	-1219.044
GROUP 3 WIND 5 2	1	0.000	-163.404	10.794	530.407	0.000	0.000	0.000	370.234	24.965	1219.044	1219.044
LIVE LOAD LL 1	1	116.909	-1537.938	0.000	1537.938	116.909	1537.938	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 2	1	233.818	-1906.788	0.000	1906.788	233.818	1906.788	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	315.655	-995.894	0.000	995.894	315.655	1716.109	-720.215	0.000	0.000	0.000	0.000
LIVE LOAD LL 4	1	116.909	1537.938	0.000	-1537.938	116.909	0.000	-1537.938	0.000	0.000	0.000	0.000
LIVE LOAD LL 5	1	233.818	1906.788	0.000	-1906.788	233.818	0.000	-1906.788	0.000	0.000	0.000	0.000
LIVE LOAD LL 6	1	315.655	995.894	0.000	-995.894	315.655	720.215	-1716.109	0.000	0.000	0.000	0.000
LIVE LOAD LL 7	1	116.908	0.000	0.000	0.000	116.908	175.357	-175.357	0.000	0.000	0.000	0.000
LIVE LOAD LL 8	1	233.818	-1169.105	0.000	1169.105	233.818	1344.462	-175.357	0.000	0.000	0.000	0.000
LIVE LOAD LL 9	1	315.656	0.000	0.000	0.000	315.656	1210.016	-1210.016	0.000	0.000	0.000	0.000
LIVE LOAD LL10	1	233.819	0.000	0.000	0.000	233.819	584.548	-584.548	0.000	0.000	0.000	0.000
LIVE LOAD LL11	1	233.818	0.000	0.000	0.000	233.818	1537.938	-1537.938	0.000	0.000	0.000	0.000
LIVE LOAD LL12	1	315.654	-331.965	0.000	331.965	315.654	1716.109	-1384.144	0.000	0.000	0.000	0.000

□ CAP MOMENTS AND SHEARS

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	-33.108	-33.108	-33.108	-33.108	-33.108	-33.108	-33.108	-18.927	-309.972	-18.927	-309.972	-18.927	-469.491
P 2	-2751.490	-2751.490	-4040.081	-2751.490	-2751.490	-2751.490	-3523.101	-366.318	-705.150	-366.318	-705.150	-525.837	-1058.090
P 3	-5583.792	-5583.792	-8256.964	-5583.792	-5583.792	-5583.792	-7184.494	-739.565	-739.565	-739.565	-739.565	-1092.504	-1092.504
C 1L	-8737.479	-8737.479	-12877.114	-8737.479	-8737.479	-8737.479	-11216.303	-778.456		-778.456		-1131.395	
C 1R	-8737.479	-8737.479	-12877.114	-8737.479	-8737.479	-8737.479	-11216.302		778.456		1131.395		778.456
P 5	-5583.791	-5583.791	-8256.964	-5583.791	-5583.791	-5583.791	-7184.493	739.565	739.565	1092.504	1092.504	739.565	739.565
P 6	-2751.489	-2751.489	-4040.080	-2751.489	-2751.489	-2751.489	-3523.101	705.150	366.318	1058.090	525.837	705.150	366.318
P 7	-33.108	-33.108	-33.108	-33.108	-33.108	-33.108	-33.108	309.972	18.927	469.491	18.927	309.972	18.927

PT.	M+ UNF. K-FT.	M- UNF. K-FT.	TOP REINFORCE.		BOT. REINFORCE.		CAP DESIGN DATA				D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO	
			AS	NO. SIZE	AS	NO. SIZE	M.SP.	AV/IN	LEFT STIRRUPS BAR&SPAC	RIGHT STIRRUPS BAR&SPAC						
P 1	-25.468	-25.468	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	-2116.531	-2710.078	11.36	8 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.115	#5@ 5.37	83.95	0.20	0.517	1.176
P 3	-4295.225	-5526.534	20.38	14 # 11	3.12	2 # 11	24.00	0.089	#5@ 6.95	24.00	0.089	#5@ 6.95	96.00	0.34	0.547	1.001
C 1	-6721.137	-8627.926	32.41	21 # 11	3.12	2 # 11	24.00	0.098	#5@ 6.31	24.00	0.098	#5@ 6.31	96.00	0.53	0.598	0.988
P 5	-4295.224	-5526.533	20.38	14 # 11	3.12	2 # 11	24.00	0.089	#5@ 6.95	24.00	0.089	#5@ 6.95	96.00	0.34	0.547	1.001
P 6	-2116.530	-2710.078	11.36	8 # 11	3.12	2 # 11	24.00	0.115	#5@ 5.37	24.00	0.060	#5@10.33	83.95	0.20	0.517	1.176
P 7	-25.468	-25.468	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					2403.4	-4139.6	0.0	2403.4	4443.9	1644.3	9141.7	16908.4	6256.4	3.805	72.00	99.72
1	B		3	LL 2	4.1					2530.3	3739.9	-2517.9	2530.3	3991.5	2839.6	8425.2	13291.8	9455.9	3.330	72.00	99.72

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		8 # 11		8 # 11	74.88	1.043	1.00	0.000	2569.	37514.	1.074	1.140	1.000	2	0.70
1	B		16 # 11		16 # 11		8 # 11		8 # 11	74.88	1.043	1.00	0.000	2365.	37514.	1.067	1.128	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	4.1				1905.342	2542.279	19.465	-1936.875	-37.595	195.256	97.994	195.577	292.839	150.946	-0.381	42.544	MAX.P1
1	3	LL 2	1.1				2476.944	3912.232	37.280	-1375.137	-26.336	212.802	143.826	295.282	364.258	204.208	-0.495	55.307	MAX.MT
1	3	LL 2	3.1				2476.944	3590.737	30.940	-2232.238	-43.239	240.862	128.788	267.221	379.296	199.984	-0.495	55.307	MAX.VT
1	3	LL 3	4.1				2564.666	2328.576	25.304	-2919.547	-56.098	289.911	143.427	234.122	380.606	189.673	-0.495	57.183	MAX.VP
1	3	LL 3	4.1				2564.666	2328.576	25.304	-2919.547	-56.098	289.911	143.427	234.122	380.606	219.275	47.095	57.183	MAX.ML
1	3	LL 3	4.1				2564.666	2328.576	25.304	-2919.547	-56.098	289.911	143.427	234.122	380.606	219.275	47.095	57.183	MAX.VL
1	3	LL 2	4.1				1905.342	2542.279	19.465	-1936.875	-37.595	195.256	97.994	195.577	292.839	150.946	-0.381	42.544	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	
16.000	16.000	4.750	0.997	1.15	24 # 8	8.000	TOP TRAN	209.974	48.724	97.448	40.372	0.000	
				1.21	20 # 9	9.500	BOT.LONG	227.169	50.008	100.017	41.436	0.000	

NUMBER OF PILES = 11 BP = 2.250 DP = 6.750