

02-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
32' CURB-CURB; 5 BEAMS; 140' SPAN; 70' TALL; BRIDGE 7 ; PIER 5

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 TOP	MIN BOT	NO. CL.	S.SP INCR.	CL. I			
D	D	D	L	2	1	8	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	17.625	4.000	4.000	6.000	6.000	4.000	13.625	14.000	7.000	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

STD.	* WIND ON SUPERSTRUCTURE INTENSITIES	* WIND ON LIVE LOAD INTENSITIES	* WIND ON LL ARMS
WIND FT1	FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5	WIND FT1	FL1 FT2 FL2 FT3 FL3 FT4 FL4 FT5 FL5
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

CENTRI.	TRACTION	FORCE	MISCELLANEOUS FORCES
FT	FL	APT	EXPANSION COEFFICIENT
0.000	9.860	15.583	15.583

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	265.598	299.028	0.000	299.028	0.000	299.028	265.598					
LL 1	1	78.521	58.890	0.000	0.000	0.000	0.000	0.000					
LL 2	2	78.521	98.151	0.000	78.521	0.000	19.630	0.000					
LL 3	1	0.000	0.000	0.000	0.000	0.000	58.890	78.521					
LL 4	2	0.000	19.630	0.000	78.521	0.000	98.151	78.521					
LL 5	1	0.000	29.445	0.000	78.521	0.000	29.445	0.000					
LL 6	2	58.890	107.966	0.000	78.521	0.000	29.445	0.000					
LL 7	2	9.815	78.521	0.000	98.151	0.000	78.521	9.815					
LL 8	2	78.521	58.890	0.000	0.000	0.000	58.890	78.521					

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	1633.030	0.000	0.000	0.000	2093.830	6609.005	-6609.005	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	-843.848	-843.848	
WIND ON SUBSTR.	1	0.000	-53.256	8.876	621.320	0.000	0.000	0.000	-109.626	-18.271	-1278.970	-1278.970	
GROUP 2 WIND 1 1	1	0.000	-966.100	77.126	5902.164	0.000	0.000	0.000	-109.626	-18.271	-1278.970	-1278.970	
GROUP 2 WIND 1 2	1	0.000	-966.100	77.126	5902.164	0.000	0.000	0.000	109.626	18.271	1278.970	1278.970	
GROUP 2 WIND 2 1	1	0.000	-856.558	68.936	5268.462	0.000	0.000	0.000	-328.709	-34.651	-2546.373	-2546.373	
GROUP 2 WIND 2 2	1	0.000	-856.558	68.936	5268.462	0.000	0.000	0.000	328.709	34.651	2546.373	2546.373	
GROUP 2 WIND 3 1	1	0.000	-801.788	64.841	4951.612	0.000	0.000	0.000	-547.791	-51.031	-3813.775	-3813.775	
GROUP 2 WIND 3 2	1	0.000	-801.788	64.841	4951.612	0.000	0.000	0.000	547.791	51.031	3813.775	3813.775	
GROUP 2 WIND 4 1	1	0.000	-655.733	53.921	4106.677	0.000	0.000	0.000	-693.846	-61.951	-4658.710	-4658.710	
GROUP 2 WIND 4 2	1	0.000	-655.733	53.921	4106.677	0.000	0.000	0.000	693.846	61.951	4658.710	4658.710	

													PIER-32-5-140-70.OUT						
GROUP 2 WIND 5 1	1	0.000	-363.623	32.081	2416.807	0.000	0.000	0.000	-803.387	-70.141	-5292.411	-5292.411	0.000	0.000	0.000	803.387	70.141	5292.411	5292.411
GROUP 2 WIND 5 2	1	0.000	-363.623	32.081	2416.807	0.000	0.000	0.000	803.387	70.141	5292.411	5292.411	0.000	0.000	0.000	-803.387	-70.141	-5292.411	-5292.411
GROUP 3 WIND 1 1	1	0.000	-591.992	37.138	2968.811	0.000	0.000	0.000	-32.888	-5.481	-383.691	-383.691	0.000	0.000	0.000	32.888	5.481	383.691	383.691
GROUP 3 WIND 1 2	1	0.000	-591.992	37.138	2968.811	0.000	0.000	0.000	32.888	5.481	383.691	383.691	0.000	0.000	0.000	-32.888	-5.481	-383.691	-383.691
GROUP 3 WIND 2 1	1	0.000	-522.870	33.001	2634.921	0.000	0.000	0.000	-171.131	-13.755	-1051.471	-1051.471	0.000	0.000	0.000	171.131	13.755	1051.471	1051.471
GROUP 3 WIND 2 2	1	0.000	-522.870	33.001	2634.921	0.000	0.000	0.000	171.131	13.755	1051.471	1051.471	0.000	0.000	0.000	-171.131	-13.755	-1051.471	-1051.471
GROUP 3 WIND 3 1	1	0.000	-488.309	30.932	2467.976	0.000	0.000	0.000	-309.375	-22.029	-1719.250	-1719.250	0.000	0.000	0.000	309.375	22.029	1719.250	1719.250
GROUP 3 WIND 3 2	1	0.000	-488.309	30.932	2467.976	0.000	0.000	0.000	309.375	22.029	1719.250	1719.250	0.000	0.000	0.000	-309.375	-22.029	-1719.250	-1719.250
GROUP 3 WIND 4 1	1	0.000	-396.147	25.416	2022.790	0.000	0.000	0.000	-401.537	-27.545	-2164.437	-2164.437	0.000	0.000	0.000	401.537	27.545	2164.437	2164.437
GROUP 3 WIND 4 2	1	0.000	-396.147	25.416	2022.790	0.000	0.000	0.000	401.537	27.545	2164.437	2164.437	0.000	0.000	0.000	-401.537	-27.545	-2164.437	-2164.437
GROUP 3 WIND 5 1	1	0.000	-211.822	14.384	1132.417	0.000	0.000	0.000	-470.659	-31.682	-2498.326	-2498.326	0.000	0.000	0.000	470.659	31.682	2498.326	2498.326
GROUP 3 WIND 5 2	1	0.000	-211.822	14.384	1132.417	0.000	0.000	0.000	470.659	31.682	2498.326	2498.326	0.000	0.000	0.000	-470.659	-31.682	-2498.326	-2498.326
LIVE LOAD LL 1	1	137.411	-1511.524	0.000	1511.524	137.411	1511.524	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
LIVE LOAD LL 2	1	274.823	-1648.941	0.000	1648.941	274.823	1786.351	-137.410	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

□ COLUMN MOMENTS(KIP-FEET), SHEARS(KIPS), REACTIONS(KIPS)

													TRANSVERSE				* LONGITUDINAL		
LOAD	COL	PC	MT	V	MB	RF	ML	MR	MT	V	MB	MF							
LIVE LOAD LL 3	1	137.411	1511.524	0.000	-1511.524	137.411	0.000	-1511.524	0.000	0.000	0.000	0.000							
LIVE LOAD LL 4	1	274.823	1648.941	0.000	-1648.941	274.823	137.410	-1786.351	0.000	0.000	0.000	0.000							
LIVE LOAD LL 5	1	137.411	0.000	0.000	0.000	137.411	206.115	-206.115	0.000	0.000	0.000	0.000							
LIVE LOAD LL 6	1	274.822	-1374.107	0.000	1374.107	274.822	1580.222	-206.115	0.000	0.000	0.000	0.000							
LIVE LOAD LL 7	1	274.823	0.000	0.000	0.000	274.823	687.057	-687.057	0.000	0.000	0.000	0.000							
LIVE LOAD LL 8	1	274.822	0.000	0.000	0.000	274.822	1511.524	-1511.524	0.000	0.000	0.000	0.000							

□ CAP ANALYSIS AND DESIGN DATA

CAP MOMENTS AND SHEARS

													MOMENTS(KIP-FEET)				** SHEARS(KIPS)			
POINT	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	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-33.476	-19.222	-364.499	-19.222	-364.499	-19.222	-534.968							
P 2	-2749.772	-2749.772	-3943.056	-2749.772	-2749.772	-2749.772	-3464.313	-414.391	-803.127	-414.391	-803.127	-584.860	-1186.682							
P 3	-6032.523	-6032.523	-8760.025	-6032.523	-6032.523	-6032.523	-7665.758	-839.021	-839.021	-839.021	-839.021	-1222.576	-1222.576							
C 1L	-8591.707	-8591.707	-12469.875	-8591.707	-8591.707	-8591.707	-10913.963	-867.101		-867.101		-1250.656								
C 1R	-8591.707	-8591.707	-12469.875	-8591.707	-8591.707	-8591.707	-10913.963		867.101		1250.656		867.101							
P 5	-6032.523	-6032.523	-8760.026	-6032.523	-6032.523	-6032.523	-7665.758	839.021	839.021	1222.576	1222.576	839.021	839.021							
P 6	-2749.772	-2749.772	-3943.056	-2749.772	-2749.772	-2749.772	-3464.313	803.127	414.391	1186.682	584.860	803.127	414.391							
P 7	-33.476	-33.476	-33.477	-33.476	-33.476	-33.476	-33.477	364.499	19.222	534.968	19.222	364.499	19.222							

PT.	M+ UNF. K-FT.		M- UNF. K-FT.		TOP REINFORCE. AS NO.SIZE		BOT.REINFORCE. AS NO.SIZE		CAP DESIGN DATA LEFT STIRRUPS M.SP. AV/IN BAR&SPAC				RIGHT STIRRUPS M.SP. AV/IN BAR&SPAC		D IN.	FC PSI	PS %	FS/FF RATIO	FS/FZ RATIO
	M+	UNF.	M-	UNF.	AS	NO.SIZE	AS	NO.SIZE	M.SP.	AV/IN	BAR&SPAC	M.SP.	AV/IN	BAR&SPAC					
P 1	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	0.00	0.00	#5@ 0.00	24.00	0.060	#5@10.33	60.77			0.08	0.000	0.098	
P 2	-2115.209	-2664.856	10.88	7 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	24.00	0.141	#5@ 4.38	85.43			0.19	0.577	1.351	
P 3	-4640.402	-5896.737	21.66	14 # 11	3.12	2 # 11	24.00	0.117	#5@ 5.31	24.00	0.117	#5@ 5.31	96.00			0.36	0.588	1.068	
C 1	-6609.005	-8395.356	31.34	21 # 11	3.12	2 # 11	24.00	0.124	#5@ 5.02	24.00	0.124	#5@ 5.02	96.00			0.52	0.554	0.961	
P 5	-4640.402	-5896.737	21.66	14 # 11	3.12	2 # 11	24.00	0.117	#5@ 5.31	24.00	0.117	#5@ 5.31	96.00			0.36	0.588	1.068	
P 6	-2115.209	-2664.856	10.88	7 # 11	3.12	2 # 11	24.00	0.141	#5@ 4.38	24.00	0.060	#5@10.33	85.43			0.19	0.577	1.351	
P 7	-25.751	-25.751	3.12	2 # 11	3.12	2 # 11	24.00	0.060	#5@10.33	0.00	0.000	#5@ 0.00	60.77			0.08	0.000	0.098	

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	F	PF	MTF	MLF	PM	MTM	MLM	PU	MTU	MLU	PU/PM	B	D
1	T	1	LL	2	0.0						2719.6	-3579.9	0.0	2719.6	4856.3	2894.1	7724.8	13794.3	8220.7	2.841	72.00	96.00
1	B	2		5.1							2722.0	3141.8	-6880.1	2722.0	3981.5	10584.5	3157.5	4628.0	12303.1	1.162	72.00	96.00

COLUMN DESIGN DATA																				
CN	T	B	FACE 1 NO.SIZE	B	FACE 2 NO.SIZE	D	FACE 3 NO.SIZE	D	FACE 4 NO.SIZE	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	3019.	11486.	1.357	1.774	1.000	2	0.70
1	B	15	# 11	15	# 11	8	# 11	8	# 11	71.76	1.038	1.00	0.000	2422.	11486.	1.267	1.538	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 2	3.1				2093.830	4951.612	64.841-3813.775	-51.031	133.291	10.457	169.704	292.538	172.206	-0.598	35.965		MAX.P1
1 2	1.1				2721.979	7672.812	100.264-1662.661	-23.752	100.482	46.683	293.411	347.210	239.750	-0.777	46.754		MAX.MT
1 2	3.1				2721.979	6437.095	84.293-4957.908	-66.340	173.278	13.595	220.616	380.299	223.867	-0.777	46.754		MAX.VT
1 2	3.1				2721.979	6437.095	84.293-4957.908	-66.340	173.278	13.595	220.616	380.299	223.867	-0.777	46.754		MAX.VP
1 2	5.1				2721.979	3141.849	41.705-6880.134	-91.183	257.103	35.654	136.791	358.240	292.285	52.702	46.754		MAX.ML
1 2	5.1				2721.979	3141.849	41.705-6880.134	-91.183	257.103	35.654	136.791	358.240	292.285	52.702	46.754		MAX.VL
1 5	3.1	E			2093.830	4951.612	64.841-3813.775	-51.031	133.291	10.457	169.704	292.538	172.206	-0.598	35.965		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	5.500	0.996	1.19	21	# 9	@10.000	TOP TRAN	260.051	59.337	118.675	49.166	0.000
				1.32	19	#10	@11.000	BOT.LONG	305.318	60.785	121.569	50.365	0.000

NUMBER OF PILES = 16 BP = 2.500 DP = 2.500