Prepared By: RBH Date: 4/23/2019

Checked By: TJS Date: 5-9-19

Project: STH 27 Deck Replacement

Structure Number: B-9-127 New Deck Design Check

Structure Component: Span 1

Design Stresses:				Design Data:	
Concrete Slab f'c	**4000**	psi		Girder Size	**45** Inch
Concrete Girder f'c	**6000**	psi		Span Length	**75.0** Feet
n	1.33			Girder Spacing	**8.75** Feet
Girder Ec(Initial)	3500	ksi		Nom. Slab Thickness	**8** Inches
Girder Ec(Final)	5500	ksi		Overhang	**3.75** Feet
Bar Steel Reinforcement f_y	**60,000**	psi		Railing Width	**1.25** Feet
Strand Ult. Tens. Strength f(ult)	**270,000**	psi		Haunch	**2.0** Inches
Diaphragm Type ("Steel" or "Concrete")	**Steel**				

Dead Loads:

Noncomposite	Interior Girder	Exterior Girder	Composite	Interior Girder	Exterior Girder
Girder (plf)	583	583	F.W.S. (plf)	**170**	**170**
Slab (plf)	875	813	Rail/Parapet (plf)	**225.2**	**225.2**
Haunch (plf)	33	82	Other (plf)		
Diaphragm (kips)	0.35	0.17			
Other (plf)	**0**	**0**			

Dead Load Moments:

	Interior Girder		Exterior Girder	
	Noncomp. (k-ft.)	Comp. (k-ft.)	Noncomp. (k-ft.)	Comp. (k-ft.)
0.0 Pt.	0	0	0	0
0.1 Pt.	379	100	375	100
0.2 Pt.	674	178	666	178
0.3 Pt.	885	233	874	233
0.4 Pt.	1012	267	1000	267
0.5 Pt.	1055	278	1042	278
0.6 Pt.	1012	267	1000	267
0.7 Pt.	885	233	874	233
0.8 Pt.	674	178	666	178
0.9 Pt.	379	100	375	100
1.0 Pt.	0	0	0	0

Live Load Moments

nterior Distribution Factor = 1.591

xterior Distribution Factor = 1.371

Impact = 1.250

	Interior Girder		Exterior Girder	
	Positive L+I (k-ft.)	Negative L+I (k-ft.)	Positive L+I (k-ft.)	Negative L+I (k-ft.)
0.0 Pt.	0	0	0	0
0.1 Pt.	385	0	332	0
0.2 Pt.	681	0	587	0
0.3 Pt.	916	0	790	0
0.4 Pt.	1044	0	900	0
0.5 Pt.	1064	0	917	0
0.6 Pt.	1044	0	900	0
0.7 Pt.	916	0	790	0
0.8 Pt.	681	0	587	0
0.9 Pt.	385	0	332	0
1.0 Pt.	0	0	0	0

Standard Permit Vehicle Moment (no impact)	**2200.0** k-ft./Lane
Stand. Permit Vehicle Distribution Factor	1.25 Wh./Grd.
Standard Permit Vehicle Design Moment	1719 k-ft./Grd

Girder Properties:		Both Girders
Noncomposite:	A	560 $in.^2$
	I	125,390 $in.^4$
	S(top)	5,070 $in.^3$
	S(bot.)	6,186 $in.^3$
	y(top)	24.73 in.
	y(bot.)	20.27 in.

Composite:	Interior Girder	Exterior Girder
Effect. Slab Thick.	7.5 Inches	7.5 Inches
Effective Slab Width	97.00 Inches	97.00 Inches
Haunch	2.00 Inches	2.00 Inches
NA (to bot.)	35.31 Inches	35.31 Inches
I(comp.)	384,694 $in.^4$	384,694 $in.^4$
S(top of Slab)	20048.5 $in.^3$	20048.5 $in.^3$
S(top)	39707.7 $in.^3$	39707.7 $in.^3$
S(bot.)	10894.2 $in.^3$	10894.2 $in.^3$

Strand Information:		Interior Girder	Exterior Girder
Strand Pattern (DR or ST)		**DR**	**DR**
Total Number Strands		**34**	**34**
Strand Diameter		**0.5** Inches	**0.5** Inches
Strand Area		**0.1531** $in.^2$	**0.1531** $in.^2$
Number Draped Strands		**8**	**8**
Number Straight Strands		**26**	**26**
e(s)mid.		15.80 Inches	15.80 Inches
e(s)end.		8.98 Inches	8.98 Inches
Temporary Prestress Force		1124.4 Kips	1124.4 Kips
Initial Prestress Force		**983.8** Kips	**983.8** Kips
Final Prestress Force		729.2 Kips	728.4 Kips
Shrinkage Loss		6.0 ksi	6.0 ksi
Elastic Shortening Loss		18.1 ksi	18.1 ksi
Creep of Concrete Loss		23.1 ksi	23.3 ksi
Relaxation of Prestressing Strands Loss		1.7 ksi	1.7 ksi
Total Loss		48.9 ksi	49.1 ksi
Strand Drape Information	A	**34.00** Inches	**34.00** Inches
	B(min)	**12.25** Inches	**12.25** Inches
	B(max)	**15.25** Inches	**15.25** Inches
	C	**5.00** Inches	**5.00** Inches

√PTB 5-9-19

Final Stresses - PS+DL+LL+I	Top of Int. Girder (ksi)	Top of Ext. Girder (ksi)	Allowable (ksi)	Status	Bot. of Int. Gird. (ksi)	Bot. of Ext. Gird. (ksi)	Allowable (ksi)	Status
0.0 Pt.	0.011	0.011	3.600	O.K.	2.360	2.358	3.600	O.K.
0.1 Pt.	0.760	0.734	3.600	O.K.	1.333	1.397	3.600	O.K.
0.2 Pt.	1.276	1.230	3.600	O.K.	0.590	0.706	3.600	O.K.
0.3 Pt.	1.569	1.801	3.600	O.K.	0.102	0.258	3.600	O.K.
0.4 Pt.	1.821	1.749	3.600	O.K.	-0.242	-0.063	-0.465	O.K.
0.5 Pt.	1.933	1.858	3.600	O.K.	-0.360	-0.176	-0.465	O.K.
0.6 Pt.	1.821	1.749	3.600	O.K.	-0.242	-0.063	-0.465	O.K.
0.7 Pt.	1.569	1.801	3.600	O.K.	0.102	0.258	3.600	O.K.
0.8 Pt.	1.276	1.230	3.600	O.K.	0.590	0.706	3.600	O.K.
0.9 Pt.	0.760	0.734	3.600	O.K.	1.333	1.397	3.600	O.K.
1.0 Pt.	0.011	0.011	3.600	O.K.	2.360	2.358	3.600	O.K.

Final Stresses - PS+DL	Top of Int. Girder (ksi)	Top of Ext. Girder (ksi)	Allowable (ksi)	Status	Bot. of Int. Gird. (ksi)	Bot. of Ext. Gird. (ksi)	Allowable (ksi)	Status
0.0 Pt.	0.011	0.011	2.400	O.K.	2.360	2.358	3.600	O.K.
0.1 Pt.	0.643	0.634	2.400	O.K.	1.757	1.762	3.600	O.K.
0.2 Pt.	1.071	1.053	2.400	O.K.	1.340	1.352	3.600	O.K.
0.3 Pt.	1.292	1.563	2.400	O.K.	1.111	1.128	3.600	O.K.
0.4 Pt.	1.505	1.477	2.400	O.K.	0.908	0.928	3.600	O.K.
0.5 Pt.	1.611	1.580	2.400	O.K.	0.812	0.834	3.600	O.K.
0.6 Pt.	1.505	1.477	2.400	O.K.	0.908	0.928	3.600	O.K.
0.7 Pt.	1.292	1.563	2.400	O.K.	1.111	1.128	3.600	O.K.
0.8 Pt.	1.071	1.053	2.400	O.K.	1.340	1.352	3.600	O.K.
0.9 Pt.	0.643	0.634	2.400	O.K.	1.757	1.762	3.600	O.K.
1.0 Pt.	0.011	0.011	2.400	O.K.	2.360	2.358	3.600	O.K.

Initial Stresses - PS+GDL	Top of Int. Girder (ksi)	Top of Ext. Girder (ksi)	Bot. of Int. Gird. (ksi)	Bot.of Ext. Gird. (ksi)
0.0 Pt.	0.015	0.015	3.107	3.107
0.1 Pt.	0.004	0.004	2.888	2.888
0.2 Pt.	-0.084	-0.084	2.960	2.960
0.3 Pt.	-0.249	-0.249	3.095	3.095
Hold Down Pt.	-0.322	-0.321	3.155	3.154
0.4 Pt.	-0.253	-0.252	3.098	3.098
0.5 Pt.	-0.214	-0.214	3.066	3.066
0.6 Pt.	-0.253	-0.252	3.098	3.098
Hold Down Pt.	-0.322	-0.321	3.155	3.154
0.7 Pt.	-0.249	-0.249	3.095	3.095
0.8 Pt.	-0.084	-0.084	2.960	2.960
0.9 Pt.	0.004	0.004	2.888	2.888
1.0 Pt.	0.015	0.015	3.107	3.107
Full Develop. Pt	0.019	0.019	2.876	2.875
		Length of Debond =	**0**	
		No. of Debonded Strands =	**0**	
		Point of Development =	0.033	
		Transfer Stress Required	**5300** psi	O.K.

JTB 5-9-19

Non-Prestressed Reinforcement:	Interior Girder	Exterior Girder
As(req'd)	0.45 in.^2	0.45 in.^2
Bar Size Required	**Use 2 - #5 Bars**	**Use 2 - #5 Bars**

Ultimate Flexural Capacity:	Interior Girder	Exterior Girder
Mu(req'd)	4038 k-ft.	3703 k-ft.
fMn	5140 k-ft.	5140 k-ft.
	Ultimate Capacities O.K.	
Cracking Moment	2597 k-ft.	2604 k-ft.
Moment Ratio	1.98	1.97
	Ratios > 1.2 O.K.	

Girder Camber and Deflection Data:	Interior Girder	Exterior Girder
0.1 Pt. Deadload Deflection (D)	**0.30** inches	**0.29** inches
0.2 Pt. Deadload Deflection (E)	**0.56** inches	**0.55** inches
0.3 Pt. Deadload Deflection (F)	**0.76** inches	**0.75** inches
0.4 Pt. Deadload Deflection (G)	**0.89** inches	**0.88** inches
0.5 Pt. Deadload Deflection (H)	**0.95** inches	**0.93** inches
Total Girder Camber (I)	**2.33** inches	**2.33** inches
Residual Deflection (J)	**1.38** inches	**1.40** inches

Girder Ratings:	Interior Girder	Exterior Girder
Inventory Rating	HS **24**	HS **28**
Operating Rating	HS **51**	HS **60**
Maximum Permit Vehicle	**250** kips	

PKB 5-9-19