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ENGINEERING SUPPORT PROGRAM

WOLT-0077
GARDEZ TO KHOST ROAD, BRIDGE #9
DESIGN ANALYSIS
FINAL DESIGN SUBMITTAL

March 28, 2014

This publication was produced for review by the United States Agency for International Development. It was prepared by Tetra Tech, Inc.

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Design Analysis

Introduction: The Design Analysis provides documentation of the basis for the design on the project. It is intended to describe the project requirements, identify governing codes and criteria being utilized, explain proposed design solutions and document other situations which affect the design. Engineering calculations are also included where appropriate.

The Design Analysis is organized by content and technical design discipline as follows:

Section 1 - Hydraulics

Section 2 - Geotechnical

Section 3 - Civil

Section 4 - Structural

Section 5 - Bill of Quantities

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Section 1
Hydraulics

Design Analysis

Discipline:	Hydraulics	Date:	March 28, 2014

Design Submittal: Final Design Submittal
Site Location: Bridge #09
Prepared By: Tetra Tech

I. General Summary:

The existing Bridge #09, located along the Gardez to Khost Road in Afghanistan, consists of a two-span concrete deck / concrete girder bridge, supported on stone masonry abutments and piers. The existing bridge has partially collapsed, likely due to scour and abutment failure. In addition, based on preliminary hydraulic modeling performed (by others) provided by USAID and on anecdotal evidence, the existing bridge elevation is not sufficient to meet the hydraulic demands of the crossing. Complete bridge replacement is proposed. The proposed bridge abutments will generally be in the same location as the existing abutments, and a second pier will be added. Thus the new bridge does not improve the overall span of the bridge crossing, but is taller than the existing structure to provide increased capacity.

The objective is to design a new bridge crossing to replace the existing bridge crossing. The proposed bridge superstructure and substructure shall be constructed out of reinforced concrete. Approach roadway work will be required to transition from the existing roadway to the bridge.

In order to expedite the schedule, the Final bridge design was performed prior to the completion of a complete hydraulic analysis and without geotechnical information specific to the bridge site, as directed by USAID. In this Design Analysis, any discrepancies between assumed and actual design parameters are noted, and any need for future redesign is identified.

II. Detailed Analysis

Hydraulic Analysis

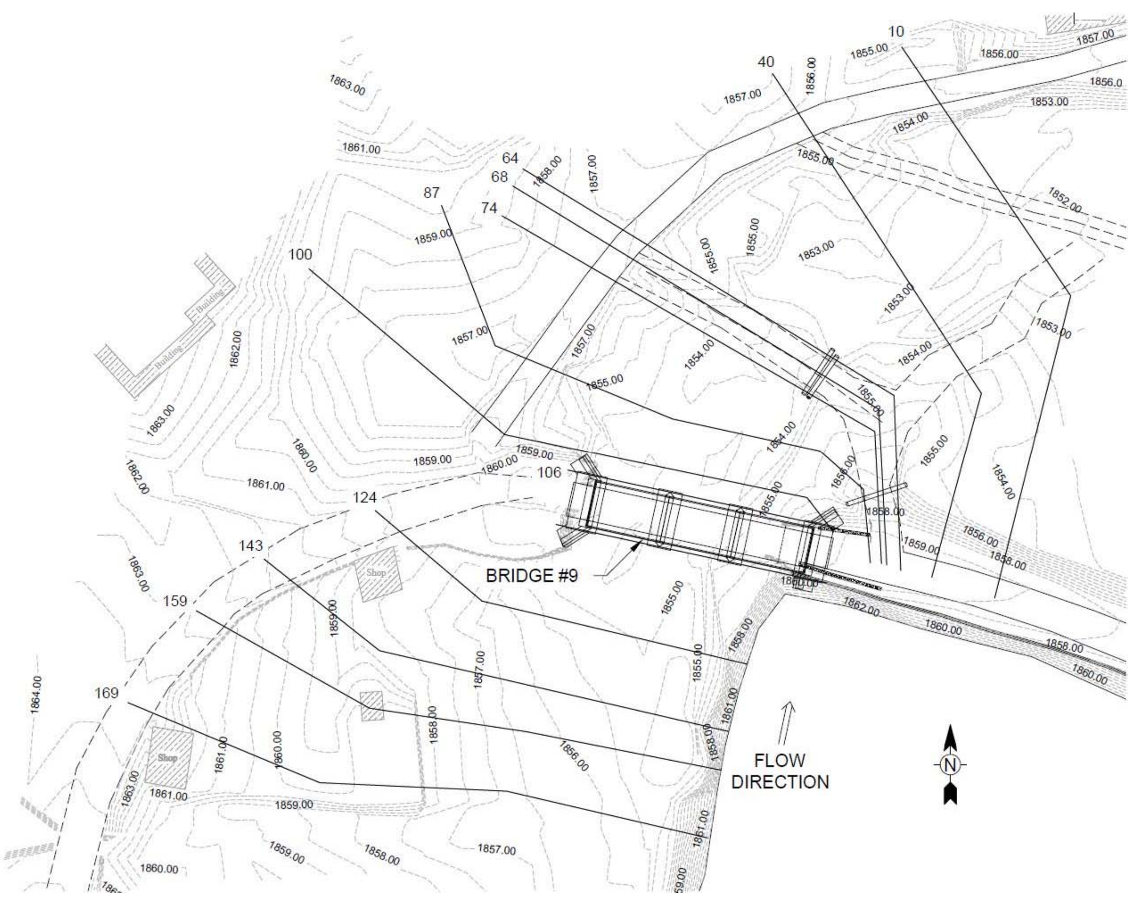
The river is a steep, mountain channel bounded by high valley walls. Small settlements or individual homes are located along each bank. It is expected that the riverbed is mobile and that the size and shape of the channel adjusts in response to significant flows. Geotechnical data shows that the riverbed material is granular and non-plastic.

A previous hydrologic analysis for the 50-year flood was performed by others and supplied to Tetra Tech for use in this analysis. Standards in the industry typically utilize the 100-year event for hydraulic parameters of the bridge and a ‘check design’ procedure based on the 500-year event. Although the hydraulic parameters for design of Bridge #09 are less rigorous than typically used, some estimation of the ‘check design event’ is made for final recommendations of pier scour, as presented in the scour section of this report. The hydraulic capacity of the bridge and scour potential were evaluated using the estimated peak 50-year discharge. The 50-year discharge used for this analysis was 534.7 m^3/s.

There are two tributaries to the main river near Bridge #09; one small creek immediately upstream of the bridge and a second, relatively large river approximately 300 meters downstream of the bridge. Examination of the aerial photography showed that the drainage area of the downstream tributary is substantial and could have an impact on water surfaces within the subject river. No analysis was available to determine if the downstream tributary could potentially affect the hydraulics at Bridge #09.

A hydraulic analysis was conducted using HEC-RAS version 4.1.0. A detailed topographic survey of the river and its vicinity was conducted in January 2014 by Geotechnique. A hydraulic model was encoded using the topographic survey. Thirteen cross sections were encoded at an interval of generally less than 20 meters between cross sections. A Manning's *n* value of 0.045 was selected to represent the rocky, unvegetated conditions in the river as shown in site photographs.

The proposed Bridge #09 replacement is a three-span beam bridge with two piers. Each span is approximately 16.8 meters wide from pier/abutment centerline to pier/abutment centerline providing a total width of 50.4m. The road width of the bridge is approximately 10.95 meters. It was assumed for this analysis that the finished grade of the river bottom under the bridge will be approximately elevation 1854.2 meters. This is slightly lower than the existing channel grade, and is recommended to provide a continuous grade through the bridge. A schematic representation of the bridge and cross sections is presented in the following figure.



The initial recommendations for the new Bridge #09 was to install a slightly taller or higher bridge opening to provide additional capacity. As previously noted, the replacement bridge is approximately the same width and includes an additional pier. Thus the velocities and shear stresses remain relatively high. Hydraulic modeling results show velocities at the bridge approach of 4.2 m/s and shear stresses near 304 N/m^2. Average velocities through the bridge of 3.5 m/s, ranging from 3 to 4.2 m/s across the cross section. Velocities downstream of the bridge remain high, consistent with the existing cross sections. Most cross sections show that flow is within the critical flow regime, however, given the channel roughness and diversity of channel configuration it is unlikely that supercritical flow can be achieved or maintained. The maximum water surface elevation at the upstream face of the bridge crossing is approximately at elevation 1858.32 meters. A summary of HEC-RAS results is presented in Table 1.

Table 1
Summary of HEC-RAS Calculations

Cross Section	Water Surface El. (m)	Avg. Velocity (m/s)
10	1853.99	6.34
40	1854.92	6.78
64	1856.39	4.41
74	1856.58	4.27
87	1856.28	5.22
100	1856.83	4.68
106	1856.78	5.38
113	Bridge	
124	1858.03	3.43
143	1858.13	3.33

Geotechnical Investigation

A subsurface investigation was conducted by KA Construction Materials Testing and Soil Investigation Laboratory in Kabul, Afghanistan in January 2014. A report summarizing their findings was presented to Tetra Tech in February 2014.

Five boreholes were advanced at the proposed locations of the bridge abutments and each of the piers. Gradations were obtained for samples taken at a one-meter depth interval for each of the boreholes. Due to limitations of the sampling method, the obtained samples do not have particle sizes greater than 75 mm (3 inches). Photographs of the project area show that there is a significant amount of material greater than 75 mm in diameter, up to 0.5 meters in diameter. As a result, gradations will be skewed such that the d_{50} of the samples is smaller than actual conditions. This skew will lead to greater scour depth calculations, which will provide an additional factor of safety.

A summary of the d_{50} values for the boreholes is presented in Table 2. The results of the gradation analyses show that average d_{50} for all samples is approximately 23 mm. Boreholes 1 and 2 show smaller d_{50} values nearest the surface. Similar values are interspersed throughout the samples. Smaller values also occur in boreholes 4 and 5. The smaller values were not considered to be representative of the overall stream system and the values were neglected for scour analysis. The selected d_{50} for the analysis was 12 mm. This value was selected because it was considered to be the smallest d_{50} for the soils that would normally aggrade or degrade during flood events.

Table 2
Summary of d_{50} (mm) for all soil samples

Depth (m)	BH1	BH2	BH3	BH4	BH5
1m	12	16	31	30	26
2m	33	23	31	0.85	4.7
3m	27	34	40	32	31
4m	24	8.6	31	30	24
5m	29	24	24	26	35
6m	23	13	19	21	17
7m	24	14	27	26	25
8m	14	21	31	7	13
averages	23	19	29	22	22

Bridge Scour Analysis

Scour potential at structures is a combination of long term scour, contraction scour, and localized scour at the abutments piers. Long term aggradation or degradation is the raising or lowering of the stream bed due to natural stream formation processes. Contraction scour can occur when flow is constricted from a wider floodplain into a narrower area, such as a bridge, and can occur over the entire streambed. Localized scour at abutments and piers is typically a result of vortices in flow. Localized scour is added to the contraction scour and long term scour. Contraction and localized scour analysis was performed using the HEC-RAS program.

Long term aggradation or degradation of the streambed may be considered in a scour analysis, but requires significant monitoring and analysis of the streambed over time in order to develop a long term estimate. No data for this river was available for review, thus long term aggradation and degradation are not accounted for numerically in this analysis Further, the potential for deposition or high sediment loading under high flow conditions is unknown and thus not considered in the overall hydraulic design-based recommendations.

Contraction scour can either be clear water scour or live bed scour. Clear water scour can occur if a stream does not carry any sediment load into the crossing. Because this river is in a natural state, i.e. there are no dams or other factors to reduce sediment within the creek, and because it has high velocities, clear water scour was considered to be unlikely. Live bed scour, where some sediment load is carried into the crossing, was used for this analysis. This assumption is verified in HEC-RAS by the comparison of critical velocity, the velocity required to move the average size material, with the computed velocities. Calculations indicate the computed velocities exceed the critical values, thus supporting the live bed scour approach to this analysis. HEC-RAS utilizes Laursen's live-bed contraction scour analysis.

Pier scour and abutment scour can be calculated using one of several methods available in HEC-RAS. The Colorado State University (CSU) equation was selected for estimating pier scour and the Froehlich Equation was selected for estimating abutment scour. The piers are modeled with a skew of 15 degrees to account for the mobile bed and the overall bend of the river at the bridge location. No debris accumulation was considered in the pier width based on the lack of timber observed in the photos.

A summary of the calculated scour results is presented in Table 3. The top of footing elevation is set approximately at the calculated scour depth, assuming the channel finished bottom elevation is at approximately 1854.2.

Table 3
Recommended Design Scour Depths

	West Abutment and Pier (left)	East Abutment and Pier (right)
Total scour depth	9.2 m	4.0 m
Top of footing elevation for scour protection	1845.0 m	1850.2 m

While HEC-RAS does calculate separate scour values for the piers and abutments, the size of the abutment scour holes and the relative instability and non-plastic nature of the riverbed ultimately controls the depth of the pier footings. For example, the west abutment has a calculated scour depth of 9.2 meters, which is substantially lower than the calculated pier scour. The calculated size of the west abutment scour hole is sufficiently large that it would intersect the calculated scour hole of the pier. The intersection of the scour holes could lead to failure of the soil under the pier footing due to the loss of material on the west side of the pier.

Generally, if the flow velocity in the stream is less than the threshold flow velocity for mobilization of bed material, a riprap blanket around the pier might help reduce scour. However, in the case of Bridge #09 the channel velocities are greater than that required for mobilization so the use of riprap at the piers is discouraged because the loose riprap will break up (dissipate) due to the secondary flow patterns at, and around the piers, and sink down into the streambed offering no protection from scour at the piers.

Scour Protection Design

Several alternatives were considered for protection of the piers and abutments from the calculated scour depths. Alternatives that were evaluated included riprap protection of the structures, deeper spread footing foundation, drilled foundations, concrete armoring of the channel, and armoring the channel with articulated concrete blocks. Evaluations included constructability, cost, availability of skilled labor and equipment, and schedule. Based on these criteria, a concrete apron was selected to armor the channel. The concrete apron should include downward sloping key walls to protect the apron from undermining.

The concrete apron is intended to prevent the formation of scour holes at the pier and abutment. By covering the riverbed soil, scour holes are not able to propagate out from the structure where they form. Some local scour is anticipated at the edges of the apron where flow transitions back to normal river flows. No research has been done for this specific type of application. An estimate for this local scour was adapted from existing methods to determine the approximate depth.

The HEC-RAS model was modified to estimate the local scour at the apron edge. By using a similar cross section of the bridge, but without piers, the contraction scour depth of the abutments was calculated independently. By projecting this contraction scour to the edge of the apron, the estimated depth of scour was approximately 3 meters.

An additional calculation for general scour using *Technical Supplement 14B* of the National Engineering Handbook was used to confirm the above calculated scour depth. The general river scour estimate is noted as equation TS14B-23 in the publication. The equation for general scour is:

$$z_t = KQ_d^a W_f^b d_{50}^c$$

Where:

z_t	maximum scour depth (m)
K	coefficient from table TS14B-8
Q_d	design discharge (m^3/s)
W_f	flow width (m)
d_{50}	median size of bed material (mm)
a,b,c	exponents from table TS14B-8

Coefficients and exponents in the equation are determined by the general geometry of the river. In this location, the "right angle" coefficients and exponents were selected because the river does turn approximately 90 degrees just downstream of the dam. Coefficients also vary based on experimental data by two researchers (Lacey and Blench). For the purposes of this evaluation, both data sets are utilized for calculations. The d_{50} of the material used for this calculation was approximately 23.5 mm, which is the average d_{50} determined from laboratory data.

Using the selected parameters above and data from the HEC-RAS model, the estimated scour depth using the Lacey relations was approximately 1.9 meters. The estimated scour depth using the Blench relations is approximately 3.6 meters.

The calculated scour depths show satisfactory correspondence between the two methods. To provide a factor of safety, the sloped key walls for the apron are recommended to be set to a depth of 4 meters below the edge of apron.

Tetra Tech evaluated the potential for uplift of the concrete mat at varying flow conditions across the mat. Velocities for each flow condition were used to determine the uplift force that the mat would experience. Forces that were calculated to counteract the uplift forces were the weight of the mat itself and the weight of the water above the concrete mat. The typical factor of safety used for uplift resistance is 1.5.

The nominal mat thickness used in the analysis was 0.20 meters (8 inches). The flow analysis showed that in some isolated instances, uplift could occur downstream of the bridge. To counteract the uplift forces, a thicker mat section of 0.30 meters (12 inches) should be provided downstream of the pier nose. The increased thickness provides the desired factor of safety.

III. References

- AASHTO "LRFD Bridge Design Specifications." 6th Edition, 2012
- U.S. Department of Transportation, *Hydraulic Engineering Circular No. 18 - Evaluating Scour at Bridges*, April 2012.
- USBR Report DSO-07-07. *Uplift and Crack Resistance Resulting from High Velocity Discharges Over Open Offset Joints*. Figure 11. December 2007.
- US Department of Agriculture, Natural Resource Conservation Services. *National Engineering Handbook, Part 654, Technical Bulletin 14B – Scour Calculations*. August 2007.

IV. List of Attachments:

Calculations

- Scour Analysis and Gradation Analysis
- HEC-RAS Results
- Scour Analysis from HECRAS
- Riprap Stability Calculations
- General Scour Calculations – With Concrete Apron
- Uplift Resistance Calculations

Calculations

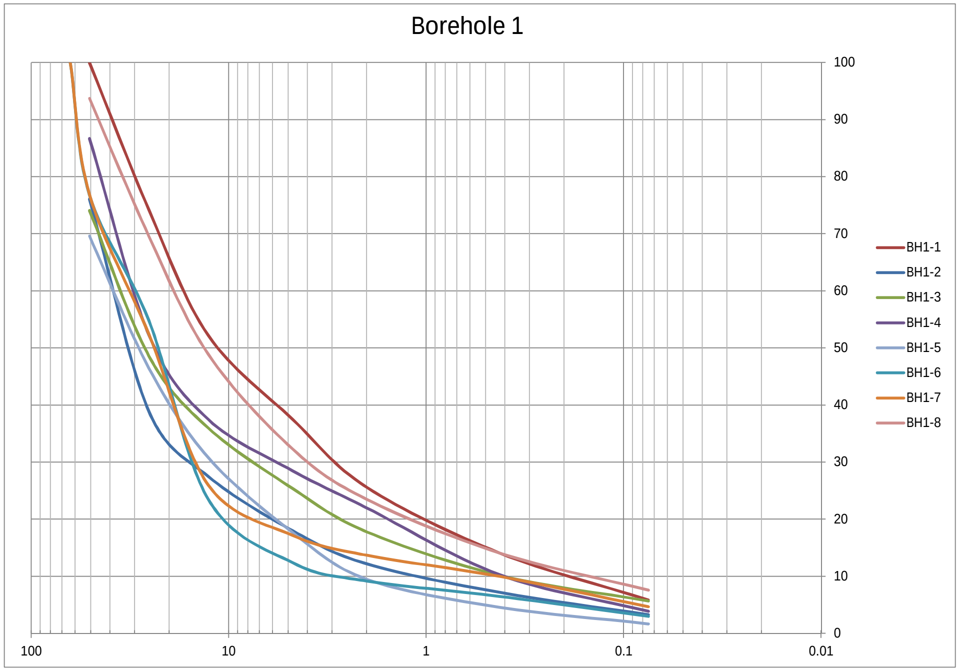
Khost Bridge 9					
Scour Analysis					
Summary of d50 (mm) for Boreholes 1-5					
Depth (m)	BH1	BH2	BH3	BH4	BH5
1m	12	16	31	30	26
2m	33	23	31	0.85	4.7
3m	27	34	40	32	31
4m	24	8.6	31	30	24
5m	29	24	24	26	35
6m	23	13	19	21	17
7m	24	14	27	26	25
8m	14	21	31	7	13
Average	23.05375				

SAMPLE BH 01

Sieve Name	Sieve Size (mm)	1m	2m	3m	4m	5m	6m	7m	8m
		Percent Passing at Specified Depth							
2.5"	63.5						100	100	
2"	50.8	100	76.1	74.1	86.7	69.6	76.8	76.9	93.7
1"	25.4	74.2	38.9	48.6	52.3	46.5	54.8	52.4	69.6
1/2"	12.7	52.2	27.5	36	37.5	30.8	23.5	26	48.9
No. 4	4.75	37.5	18	25.4	28.5	17.7	12.4	17.2	32.3
No. 10	2	25.6	12.2	17.8	22	9.5	9.2	13.7	23.5
No. 40	0.425	14.1	7.2	10.2	10.3	4.6	6.5	10	14.1
No. 200	0.075	5.9	3.3	5.7	3.9	1.7	3	4.7	7.6

D50 for each depth (mm)

Depth	D50 (mm)
1m	12
2m	33
3m	27
4m	24
5m	29
6m	23
7m	24
8m	14

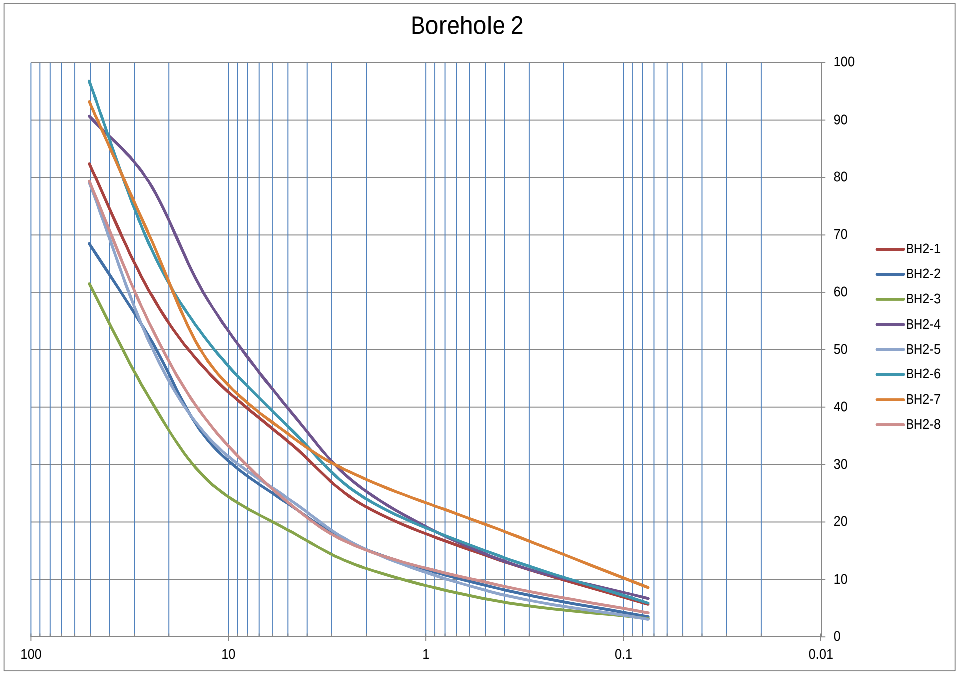


SAMPLE BH 02

Sieve Name	Sieve Size (mm)	1m	2m	3m	4m	5m	6m	7m	8m
		Percent Passing at Specified Depth							
2.5"	63.5								
2"	50.8	82.4	68.5	61.5	90.7	79.2	96.8	93.2	79.4
1"	25.4	60.4	52.4	41.8	79.3	51.6	68.6	70.2	54.9
1/2"	12.7	46.1	34.2	27.2	58.6	34.8	51.4	48	37.4
No. 4	4.75	33.4	22.7	18.2	38.9	23.6	35.9	34.8	22.8
No. 10	2	22.6	15.2	11.9	25.3	15.2	24	27.4	15.1
No. 40	0.425	13.4	8.4	6.2	13.5	7.5	14.1	18.7	9
No. 200	0.075	5.7	3.5	3.2	6.7	3.1	5.9	8.6	4.2

D50 for each depth (mm)

Depth	D50 (mm)
1m	16
2m	23
3m	34
4m	8.6
5m	24
6m	13
7m	14
8m	21

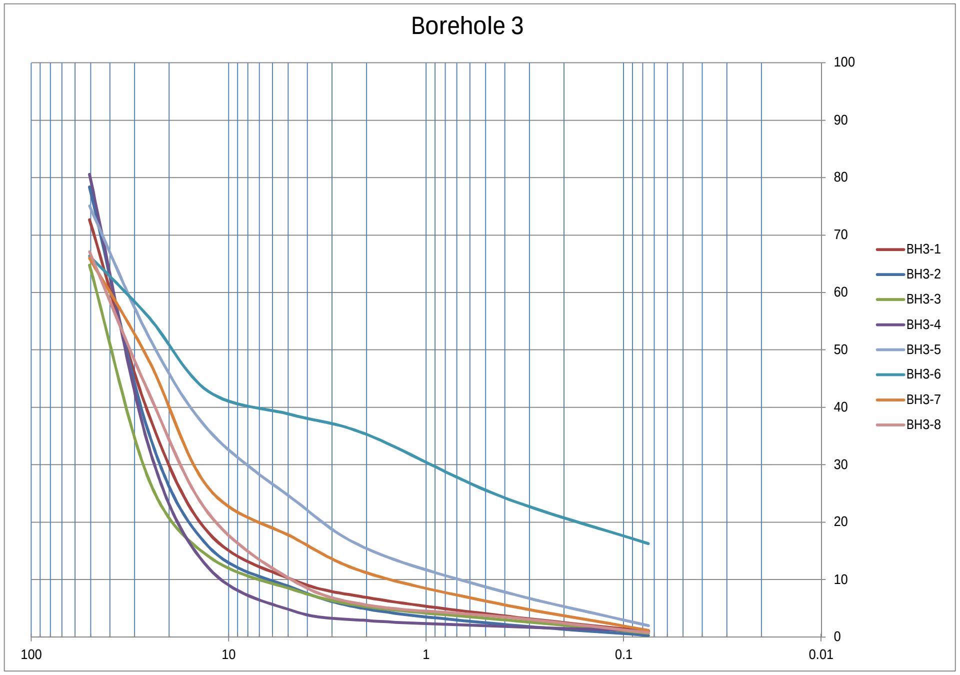


SAMPLE BH 03

Sieve Name	Sieve Size (mm)	Percent Passing at Specified Depth 1m	2m	3m	4m	5m	6m	7m	8m
2.5"	63.5								
2"	50.8	72.7	78.4	64.8	80.6	75.1	66.4	66	67.1
1"	25.4	38.7	35.5	27.4	33.1	52.3	55.7	48.2	42.5
1/2"	12.7	18.2	15.8	14.1	12.1	36.1	42.8	26	21.6
No. 4	4.75	10	8.6	8.3	4.6	24.1	38.7	17.4	9.9
No. 10	2	6.9	4.9	5.3	2.9	15.4	35.3	11.2	5.6
No. 40	0.425	3.8	2.3	3.1	1.9	8.1	24.6	5.8	3.6
No. 200	0.075	1	0.3	0.7	1.1	2	16.3	1.2	0.8

D50 for each depth (mm)

Depth	D50 (mm)
1m	31
2m	31
3m	40
4m	31
5m	24
6m	19
7m	27
8m	31

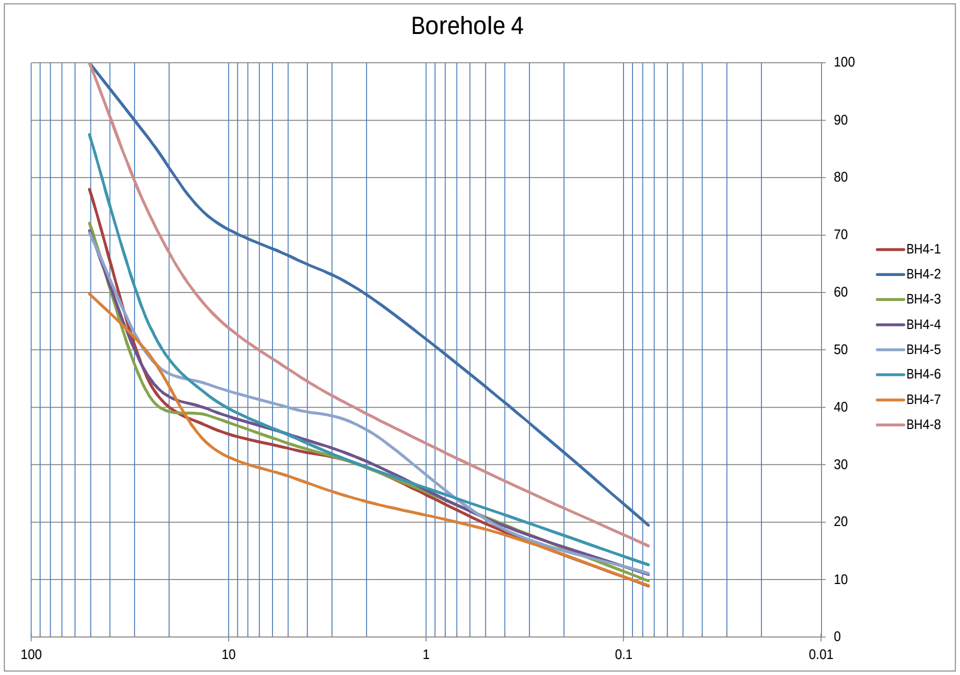


SAMPLE BH 04

Sieve Name	Sieve Size (mm)	Percent Passing at Specified Depth 1m	2m	3m	4m	5m	6m	7m	8m
2.5"	63.5								
2"	50.8	78	100	72.1	70.8	70.4	87.5	59.8	100
1"	25.4	44.6	86.8	42.1	45.3	48.9	54.5	49.3	73.8
1/2"	12.7	36.7	73.3	38.6	39.7	44	42.1	33.6	57.2
No. 4	4.75	32.7	66.1	33.5	35.1	39.8	34.9	27.8	46.2
No. 10	2	29.6	59.6	29.5	30.6	36.1	29.6	23.6	38.9
No. 40	0.425	18.7	41.6	19.9	19.7	19.2	21.6	18.1	27.6
No. 200	0.075	8.9	19.5	9.8	10.9	11.1	12.6	9	15.9

D50 for each depth (mm)

Depth	D50 (mm)
1m	30
2m	0.85
3m	32
4m	30
5m	26
6m	21
7m	26
8m	7

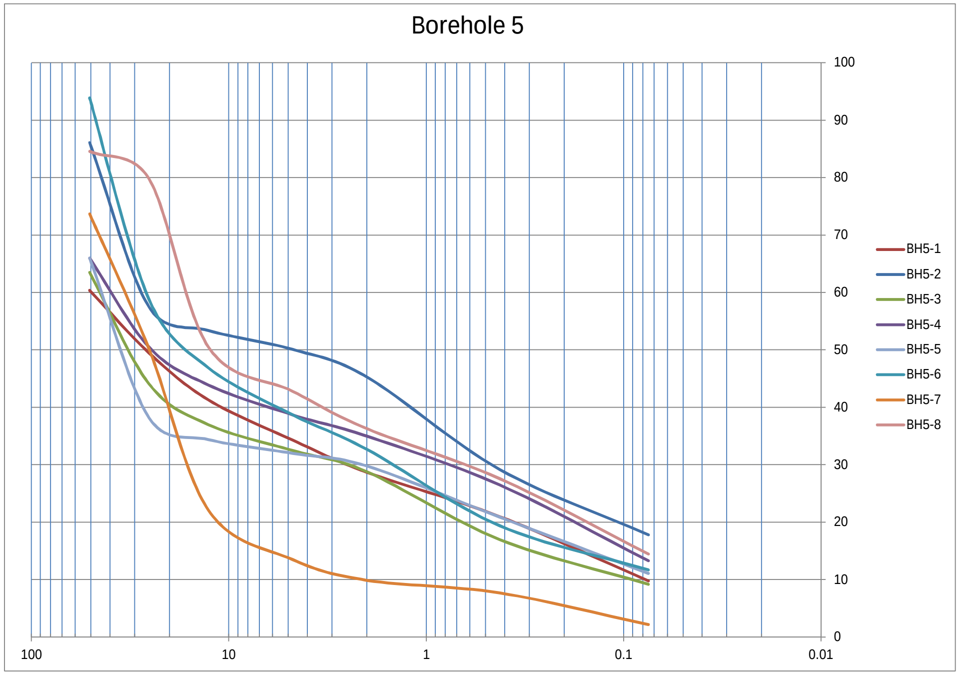


SAMPLE BH 05

Sieve Name	Sieve Size (mm)	Percent Passing at Specified Depth 1m	2m	3m	4m	5m	6m	7m	8m
2.5"	63.5								
2"	50.8	60.4	86.1	63.5	66	66	93.9	73.7	84.6
1"	25.4	49.5	57.5	44.1	50.5	38.2	58.8	50.2	79.8
1/2"	12.7	41.3	53.4	37	43.9	34.4	46.9	22.1	50.5
No. 4	4.75	34.3	50.1	32.5	38.7	32	38.7	13.5	42.8
No. 10	2	28.7	45.3	28.8	35	29.8	32.7	9.9	36.3
No. 40	0.425	21	29.2	17	26.5	20.9	19.4	7.7	27.6
No. 200	0.075	9.8	17.8	9.2	13.3	11.1	11.7	2.2	14.5

D50 for each depth (mm)

Depth	D50 (mm)
1m	26
2m	4.7
3m	31
4m	24
5m	35
6m	17
7m	25
8m	13



HEC-RAS Results										
PROPOSED CONDITIONS HEC-RAS										
River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
	(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
186	534.7	1855.32	1858.53	1858.53	1859.54	0.014594	4.47	122.55	62.44	0.97
169	534.7	1855.04	1858.54	1858.08	1859.16	0.00778	3.51	155.24	69.95	0.72
159	534.7	1854.9	1857.99	1857.99	1859.02	0.01434	4.66	125.41	69.96	0.97
143	534.7	1854.5	1858.13	1857.45	1858.68	0.00562	3.33	165.27	77.04	0.63
124	534.7	1854.3	1858.03	1857.04	1858.59	0.004404	3.43	166.09	50.4	0.58
113	Bridge									
106	534.7	1854.2	1856.78	1857.03	1858.21	0.018855	5.38	103.23	50.4	1.12
100	534.7	1853.96	1856.83	1856.87	1857.94	0.016308	4.68	114.32	59.4	1.02
87	534.7	1853.87	1856.28	1856.58	1857.62	0.023656	5.22	106.37	70.96	1.21
74	534.7	1853.83	1856.58	1856.58	1857.44	0.014206	4.27	134.74	77.87	0.95
64	534.7	1853.79	1856.39	1856.49	1857.28	0.016967	4.41	133.03	88.51	1.02
40	534.7	1852.33	1854.92	1855.43	1856.6	0.038661	6.78	101.24	93.25	1.53
10	534.7	1851.97	1853.99	1854.46	1855.39	0.036639	6.34	106.11	96.98	1.5

Khost-Gardez Road Bridge 9
Scour analysis from HECRAS

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (m):	2.01	2.63	1.79
	Approach Velocity (m/s):	1.93	2.77	1.46
	Br Average Depth (m):	1.99	2.53	0.86
	BR Opening Flow (m3/s):	5.61	527.20	1.90
	BR Top WD (m):	0.87	42.24	1.09
	Grain Size D50 (mm):	12.00	12.00	12.00
	Approach Flow (m3/s):	21.00	504.79	8.91
	Approach Top WD (m):	5.42	53.74	3.42
	K1 Coefficient:		0.640	
Results				
	Scour Depth Ys (m):		0.65	
	Critical Velocity (m/s):		1.66	
	Equation:		Live	

Pier Scour

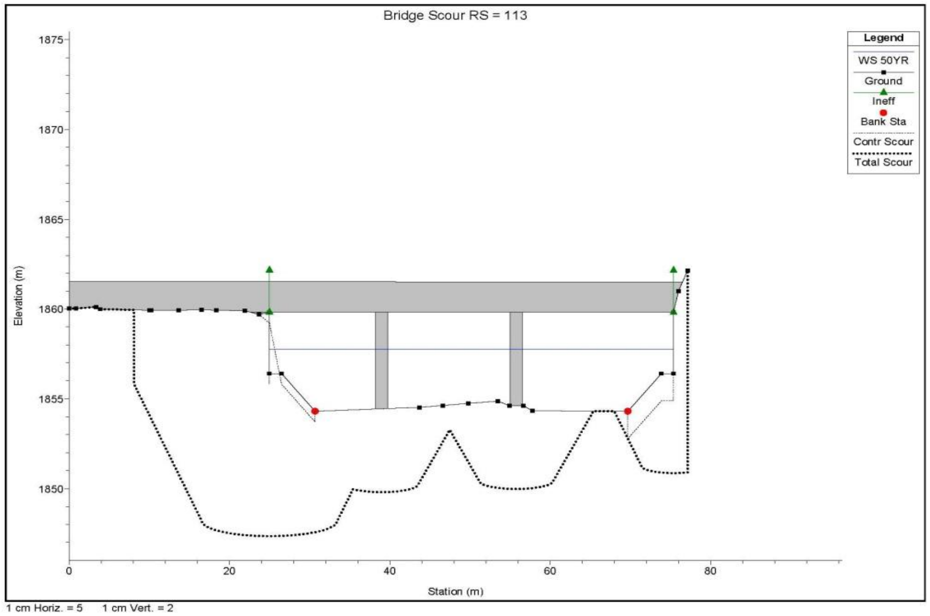
	All piers have the same scour depth	
Input Data		
	Pier Shape:	Sharp nose
	Pier Width (m):	1.50
	Grain Size D50 (mm):	12.00000
	Depth Upstream (m):	3.89
	Velocity Upstream (m/s):	3.71
	K1 Nose Shape:	1.00
	Pier Angle:	15.00
	Pier Length (m):	10.95
	K2 Angle Coef:	1.98
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	60.00000
	K4 Armouring Coef:	0.65
	Set K1 value to 1.0 because angle > 5 degrees	
Results		
	Scour Depth Ys (m):	4.76
	Froude #:	0.60
	Equation:	CSU equation

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (m):	25.00	72.57
	Toe Sta at appr (m):	34.18	90.24
	Abutment Length (m):	5.42	3.42
	Depth at Toe (m):	1.51	1.37
	K1 Shape Coef:	0.82 - Vert. with wing walls	
	Degree of Skew (degrees):	75.00	75.00
	K2 Skew Coef:	0.98	0.98
	Projected Length L' (m):	31.38	3.34
	Avg Depth Obstructed Ya (m):	2.01	1.79
	Flow Obstructed Qe (m3/s):	21.00	8.91
	Area Obstructed Ae (m2):	10.87	6.11
	Froude #:	0.43	0.35
	Equation:	Froehlich	Froehlich

Combined Scour Depths

Pier Scour + Contraction Scour (m):		
	Channel:	5.42
Left abutment scour + contraction scour (m):	9.20	
Right abutment scour + contraction scour (m):	4.03	



left abutment scour depth	9.2 m	elev	1845.0
right abutment scour depth	4.0 m	elev	1850.2
piers	5.4 m		

without blanket use 'check event' to predicted scour

depth*	6	m
channel bed elev	1854.2	m
design scour	1847.9	use 1845

* check event is estimated based on relationships of 500 to 50 year events in the front range of Colorado. Using rivers of similar magnitude such as the Poudre and Big Thompson the average ratio is 3 (Q500=3xQ50). Using HECRAS and a Q500 of 1600 m3/s yields a pier scour depth of 6 m. Design scour depth is 1 foot or 0.3 meters below for a total of 6.3 m. However, the abutment scour depth exceeds this value so will govern.

Riprap stability calculations: 212.8L

Riprap

Reference: FHWA 2011

$$D_{30} = S_f\, C_s\, C_v\, C_t\, d\ [(\gamma_w / (\gamma_s - \gamma_w))^{0.5} *\ V/(K_1 g d)^{0.5}]^{2.5}$$

variable	value	description
D_{30} =	calculate	riprap size of which 30 percent by weight is finer
D_{50} =	$1.26D_{30}$	$D_{50} = D_{30}\,(D_{85}/D_{15})^{1/3;}$ (USACE 1994). Using FWHA gradation D85/D15 is equal to 2; thus a 1.26 conversion is used
S_f =	1.1	minimum safety factor as recommended by FHWA
C_s =	0.3	stability coefficient for incipient failure, when D_{85}/D_{15} fall within the range of 1.7 to 5.2, typical values are 0.3 for angular rock and 0.375 for rounded rock. The riprap material to be used at Bridge 9 is assumed to be angular in nature and therefore use 0.3
C_v =	1.25	vertical velocity distribution coefficient, use 1.25 to account for bendway weirs, see below:
		Typical values are as follows: 1.0 for straight channels, inside of bends 1.283 – 0.2 log (R/W) for outside of bends, 1 for (R/W)>26 1.25 for downstream of concrete channels or at ends of dikes and projections. in this case the site is on a bend and not concrete; thus use the equation with: R = 250 m, radius of curvature measured from aerial W = 50 m, effective channel width, scaled and ck vs effective flow Cv = 1.283 – 0.2 log (R/W) = 1.14 use 1.25
C_t =	1	thickness coefficient, for thickness = 1 D_{100} or 1.5 D_{50}, whichever is greater. Riprap thickness will be at or greater than these values so use 1.
d =	varies	Local depth of flow, see HECRAS
g =	9.81	= force of gravity, m/s^2
γ_w =	981	= unit weight of water, kh/m3
γ_s =	2600	= unit weight of rock material, kg/m^3 (assuming a specific gravity of 2.65)
K_1 =	0.72	= side slope correction factor, see below = 0.72, see below $K_1 = (1 - (\sin^2\theta / \sin^2\Phi))^{0.5}$ θ = 26.57 = angle of side slope with horizontal (26.57 degrees for the 2H:1V) Φ = 40 = angle of repose of riprap material (40 degrees) $K_1 = (1 - (\sin^2\theta / \sin^2\Phi))^{0.5}$ 0.72

Riprap stability calculations: 212.8L

Riprap

V =	Characteristic velocity for design, defined as the depth-averaged velocity at a point 20% upslope from the toe of the revetment					
V =	1.377 V_{avg} local depth-averaged velocity defined as:					
		V =	V_{avg} (1.74-.52log(R/W))			
		V_{avg} =	varies-see below			
		R =	250	ft, radius of curvature		
		W =	50	ft, typical channel width		
		V =	1.377 V_{avg}			

Check upstream approach section

	V_{avg}	3.40 m/s	d=	3.2 m	
	V=	4.68 m/s			
D_{30} =	0.68	m			
D_{50} =	0.9	m	855 mm		

Check section with highest velocity-velocity distribution

	V_{avg}	3.12 m/s	d=	2.2 m	
	V=	4.30 m/s			
D_{30} =	0.60	m			
D_{50} =	0.8	m	760 mm		

Note available riprap is not sufficient to modify or reduce scour

General Scour Calculations					
Bridge 9 Concrete Apron Scour Calculations					
National Engineering Handbook, Part 654, Technical Supplement 14B					
Equation TS14B-23					
	Qd (m3/s)	534.7			
	Wf (m)	53.7			
	d50 (mm)	23.05			
Lacey	K	0.389		Right Angle Bend	
	a	0.333333			
	b	0			
	c	-0.16667			
Blench	K	1.105		Right Angle Bend	
	a	0.666667			
	b	-0.66667			
	c	-0.1092			
General Scour					
Lacey	Z (m)	1.872			
Blench	Z (m)	3.631			

	Bridge 9 Uplift Resistance Calculations										
	Comparison of Uplift Pressure v. Weight of Water+Concrete										
				Unit Weight Water	9.81	kN/m3					
				Unit Weight Concrete	23.6	kN/m3					
				Area	1	m2					
				Concrete Thickness	8	in					
				Concrete Thickness	0.2032	m					
				Weight of Concrete	4.80	kN/m2					
Minimum Desired Factor of Safety for Design Flow and Lower Flows					1.5						
	BRIDGE 113 UPSTREAM										
	Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
50-Yr	537.8	1857.76	1854.2	3.56	34.9	4.35	14.3	4.0	1.2	12.0	3.3
	1500	1859.47	1854.2	5.27	51.7	7.78	25.5	11.0	3.4	32.9	1.7
	1000	1858.36	1854.2	4.16	40.8	6.77	22.2	8.6	2.6	25.7	1.8
	400	1857.3	1854.2	3.1	30.4	3.85	12.6	3.3	1.0	9.8	3.6
	300	1856.9	1854.2	2.7	26.5	3.44	11.3	2.7	0.8	8.1	3.9
	200	1856.37	1854.2	2.17	21.3	3.01	9.9	2.2	0.7	6.5	4.0
	100	1855.72	1854.2	1.52	14.9	2.36	7.7	1.5	0.5	4.5	4.4
	50	1855.3	1854.2	1.1	10.8	1.82	6.0	1.0	0.3	3.0	5.2
	25	1855.01	1854.2	0.81	7.9	1.43	4.7	0.7	0.2	2.1	6.1
	BRIDGE 113 DOWNSTREAM										
	Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
	537.8	1857.16	1854.2	2.96	29.0	5.33	17.5	5.7	1.7	16.9	2.0
	1500	1859.46	1854.2	5.26	51.6	7.37	24.2	10.0	3.0	29.9	1.9
	1000	1858.38	1854.2	4.18	41.0	6.51	21.4	8.0	2.4	24.0	1.9
	400	1856.73	1854.2	2.53	24.8	4.86	15.9	4.8	1.5	14.5	2.0
	300	1856.29	1854.2	2.09	20.5	4.55	14.9	4.3	1.3	12.9	2.0
	200	1856.01	1854.2	1.81	17.8	3.55	11.6	2.9	0.9	8.5	2.6
	100	1855.59	1854.2	1.39	13.6	2.37	7.8	1.5	0.5	4.5	4.1
	50	1855.23	1854.2	1.03	10.1	1.62	5.3	0.8	0.3	2.5	5.9
	25	1854.96	1854.2	0.76	7.5	1.11	3.6	0.5	0.1	1.5	8.4
	SECTION 106										
	Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
	537.8	1856.78	1854.2	2.58	25.3	5.38	17.7	5.8	1.8	17.2	1.7
	1500	1858.79	1854.2	4.59	45.0	7.64	25.1	10.7	3.2	31.9	1.6
	1000	1857.86	1854.2	3.66	35.9	6.62	21.7	8.3	2.5	24.7	1.6
	400	1856.16	1854.2	1.96	19.2	5.55	18.2	Birdg	#VALUE!	#VALUE!	#VALUE!
	300	1855.82	1854.2	1.62	15.9	5.13	16.8	5.3	1.6	15.9	1.3
	200	1856.04	1854.2	1.84	18.1	2.98	9.8	2.2	0.7	6.4	3.6
	100	1855.59	1854.2	1.39	13.6	2.03	6.7	1.2	0.4	3.5	5.2
	50	1855.23	1854.2	1.03	10.1	1.4	4.6	0.7	0.2	2.0	7.3
	25	1854.96	1854.2	0.76	7.5	0.97	3.2	0.4	0.1	1.2	10.2
	SECTION 100										
	Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
	537.8	1856.83	1854.2	2.63	25.8	4.68	15.4	4.5	1.4	13.6	2.3
	1500	1858.25	1854.2	4.05	39.7	7.86	25.8	11.2	3.4	33.5	1.3
	1000	1857.43	1854.2	3.23	31.7	6.82	22.4	8.7	2.7	26.0	1.4
	400	1856.59	1854.2	2.39	23.4	3.94	12.9	3.4	1.0	10.1	2.8
	300	1856.33	1854.2	2.13	20.9	3.43	11.3	2.7	0.8	8.1	3.2
	200	1855.99	1854.2	1.79	17.6	2.86	9.4	2.0	0.6	6.0	3.7
	100	1855.51	1854.2	1.31	12.9	2.14	7.0	1.3	0.4	3.8	4.6
	50	1855.14	1854.2	0.94	9.2	1.68	5.5	0.9	0.3	2.7	5.3
	25	1854.87	1854.2	0.67	6.6	1.37	4.5	0.7	0.2	2.0	5.8

Bridge 9 Uplift Resistance Calculations

Comparison of Uplift Pressure v. Weight of Water+Concrete

Unit Weight Water	9.81	kN/m3
Unit Weight Concrete	23.6	kN/m3
Area	1	m2
Concrete Thickness	12	in
Concrete Thickness	0.3048	m
Weight of Concrete	7.19	kN/m2
Minimum Desired Factor of Safety for Design Flow and Lower Flows	1.5	

BRIDGE 113 UPSTREAM

	Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
50-Yr	537.8	1857.76	1854.2	3.56	34.9	4.35	14.3	4.0	1.2	12.0	3.5
	1500	1859.47	1854.2	5.27	51.7	7.78	25.5	11.0	3.4	32.9	1.8
	1000	1858.36	1854.2	4.16	40.8	6.77	22.2	8.6	2.6	25.7	1.9
	400	1857.3	1854.2	3.1	30.4	3.85	12.6	3.3	1.0	9.8	3.8
	300	1856.9	1854.2	2.7	26.5	3.44	11.3	2.7	0.8	8.1	4.2
	200	1856.37	1854.2	2.17	21.3	3.01	9.9	2.2	0.7	6.5	4.4
	100	1855.72	1854.2	1.52	14.9	2.36	7.7	1.5	0.5	4.5	5.0
	50	1855.3	1854.2	1.1	10.8	1.82	6.0	1.0	0.3	3.0	6.0
	25	1855.01	1854.2	0.81	7.9	1.43	4.7	0.7	0.2	2.1	7.2

BRIDGE 113 DOWNSTREAM

Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
537.8	1857.16	1854.2	2.96	29.0	5.33	17.5	5.7	1.7	16.9	2.1
1500	1859.46	1854.2	5.26	51.6	7.37	24.2	10.0	3.0	29.9	2.0
1000	1858.38	1854.2	4.18	41.0	6.51	21.4	8.0	2.4	24.0	2.0
400	1856.73	1854.2	2.53	24.8	4.86	15.9	4.8	1.5	14.5	2.2
300	1856.29	1854.2	2.09	20.5	4.55	14.9	4.3	1.3	12.9	2.1
200	1856.01	1854.2	1.81	17.8	3.55	11.6	2.9	0.9	8.5	2.9
100	1855.59	1854.2	1.39	13.6	2.37	7.8	1.5	0.5	4.5	4.6
50	1855.23	1854.2	1.03	10.1	1.62	5.3	0.8	0.3	2.5	6.9
25	1854.96	1854.2	0.76	7.5	1.11	3.6	0.5	0.1	1.5	10.1

SECTION 106

Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
537.8	1856.78	1854.2	2.58	25.3	5.38	17.7	5.8	1.8	17.2	1.9
1500	1858.79	1854.2	4.59	45.0	7.64	25.1	10.7	3.2	31.9	1.6
1000	1857.86	1854.2	3.66	35.9	6.62	21.7	8.3	2.5	24.7	1.7
400	1856.16	1854.2	1.96	19.2	5.55	18.2	6.1	1.9	18.2	1.5
300	1855.82	1854.2	1.62	15.9	5.13	16.8	5.3	1.6	15.9	1.5
200	1856.04	1854.2	1.84	18.1	2.98	9.8	2.2	0.7	6.4	3.9
100	1855.59	1854.2	1.39	13.6	2.03	6.7	1.2	0.4	3.5	5.9
50	1855.23	1854.2	1.03	10.1	1.4	4.6	0.7	0.2	2.0	8.5
25	1854.96	1854.2	0.76	7.5	0.97	3.2	0.4	0.1	1.2	12.2

SECTION 100

Q (m3/2)	WSE	Mat Elev.	Depth of Water (m)	Weight of Water (kN/m2)	Velocity (m/s)	Velocity (ft/s)	Uplift Head (ft)	Uplift Head (m)	Uplift Pressure (kN/m2)	Factor of Safety
537.8	1856.83	1854.2	2.63	25.8	4.68	15.4	4.5	1.4	13.6	2.4
1500	1858.25	1854.2	4.05	39.7	7.86	25.8	11.2	3.4	33.5	1.4
1000	1857.43	1854.2	3.23	31.7	6.82	22.4	8.7	2.7	26.0	1.5
400	1856.59	1854.2	2.39	23.4	3.94	12.9	3.4	1.0	10.1	3.0
300	1856.33	1854.2	2.13	20.9	3.43	11.3	2.7	0.8	8.1	3.5
200	1855.99	1854.2	1.79	17.6	2.86	9.4	2.0	0.6	6.0	4.1
100	1855.51	1854.2	1.31	12.9	2.14	7.0	1.3	0.4	3.8	5.2
50	1855.14	1854.2	0.94	9.2	1.68	5.5	0.9	0.3	2.7	6.2
25	1854.87	1854.2	0.67	6.6	1.37	4.5	0.7	0.2	2.0	7.0

Section 2
Geotechnical

Design Analysis

Discipline:	Geotechnical	Date:	March 28, 2014

Design Submittal: Final Design Submittal
Site Location: Bridge #09
Prepared By: Tetra Tech

I. General Summary:

The existing Bridge #09, located along the Gardez to Khost Road in Afghanistan, consists of a two-span concrete deck / concrete girder bridge, supported on stone masonry abutments and piers. The existing bridge has partially collapsed, likely due to scour and abutment failure. In addition, based on preliminary hydraulic modeling performed (by Others) provided by USAID and on anecdotal evidence, the existing bridge elevation is not sufficient to meet the hydraulic demands of the crossing. Complete bridge replacement is proposed. The proposed bridge abutments will generally be in the same location as the existing abutments, and a second pier will be added. Thus the new bridge does not increase the overall span of the bridge crossing, but is taller than the existing structure to provide increased capacity.

The objective is to design a new bridge crossing to replace the existing bridge crossing. The proposed bridge superstructure and substructure shall be constructed out of reinforced concrete. Approach roadway work will be required to transition from the existing roadway to the bridge.

In order to expedite the schedule, the Final bridge design was performed prior to the completion of a complete hydraulic analysis and without geotechnical information specific to the bridge site, as directed by USAID. In this Design Analysis, any discrepancies between assumed and actual design parameters are noted, and any need for future redesign is identified.

II. Detailed Analysis:

Geotechnical Investigation

A geotechnical field investigation was performed in January 2014 by Construction Material Testing & Soil Investigation Laboratory, as described in their Geotechnical Report, dated February 08, 2014. As noted in their report, their investigation included 9 boreholes drilled to depth of 8 meters below the existing ground surface, 5 boreholes drilled at the footings of the bridge, 2 boreholes drilled at the retaining wall locations and 2 boreholes drilled at a culvert location. Laboratory analyses of the samples were also performed to obtain engineering characteristics of the bridge's subgrade.

The Geotechnical Report recommends supporting the proposed structures on shallow foundations designed for the following design parameters:

- Allowable Soil Bearing Pressure = 1.03 kg/cm^2 (2.11 ksf)
- Angle of Internal Friction = 30.9 degrees
- At Rest Lateral Earth Pressure Coefficient, Ko = 0.49

- Active Lateral Earth Pressure Coefficient, Ka = 0.32
- Passive Lateral Earth Pressure Coefficient, Kp = 3.13
- Coefficient of Friction for Sliding = 0.38 (between soil and concrete)
- Saturated Soil Unit Weight = 20.64 kN/m^3
  based on field density test results
- Cohesion = 7.16 kPa (kN/m^2)
- Young's Modulus of Elasticity of the Soil = 10,000 kN/m^2

Tetra Tech's opinion is that calculations performed by Construction Material Testing & Soil Investigation Laboratory are too conservative and restrictive in the allowable bearing capacity and portray excessive settlement. Tetra Tech performed independent bearing capacity and settlement calculations utilizing soil property values that are typical of those soils encountered in the soil boring logs and gradation analysis of samples obtained at the bridge footing locations.

Review of Geotechnical Report

Tetra Tech performed a review of the geotechnical report, including calculations submitted as part of the report.

Tetra Tech took exception to the bearing capacity calculations in the report, which was based on the Terzaghi equation for a square footing. Tetra Tech has performed updated bearing capacity calculations based on the following:

- Updated calculations using the guidelines for bearing capacity calculations established in AASHTO's LRFD Bridge Design Specifications. This methodology considers the shape of the foundation, depth of embedment, and the shearing resistance of the soil above the foundation.
- Assume bearing soil is fully saturated
- Assume cohesion value is zero since the soils encountered underlying the bridge foundation are granular and non-plastic in nature.
- The surcharge, "q", was revised to portray current site conditions after scour.
- Current footing dimensions and loading directions were utilized to determine effective footing dimensions.

The updated calculations are attached.

Recommendations

Based on the Tetra Tech Review, the following design parameters are recommended for the foundation designs:

- Weight of Soil = 20.6 kN/m^3 (131 pcf)
- Factored Bearing Resistance for Piers= 568.8 kN/m^2 (11.8 ksf)
- Factored Bearing Resistance for Abutments = 478.6 kN/m^2 (10.0 ksf)
- Angle of Internal Friction = 34 degrees
- Ko = 0.44
- Ka = 0.28
- Kp = 3.53

- Coefficient of Friction for Sliding = 0.58

The obtained factored bearing capacity of the soil is greater than the largest anticipated load of 7.46 ksf (Extreme Event I Loading). We used typical soil property values in lieu of values recommended by the geotechnical report to more accurately reflect the soil conditions at the pier footing locations. The values recommended in the geotechnical report were values obtained from laboratory analyses that were run on a soil sample obtained at a location other than the footing locations. The tested sample consisted of silty clay with sand (CL-ML) while the soils encountered at the footing locations consisted of well graded gravel with sand and silt. The bearing capacity and settlement calculations performed in the geotechnical report used the soil property values for the silty clay with sand instead of gravel soil property values.

III. Basis of Design

- Groundwater level at channel grade
- Submerged unit weight of soil
- Weight of Soil = 20.6 kN/m^3 (131 pcf)
- Factored Bearing Resistance for Piers = 568.8 kN/m^2 (11.8 ksf)
- Factored Bearing Resistance for Abutments = 478.6 kN/m^2 (10 ksf)
- Friction Angle = 34 degrees
- Ko = 0.44
- Ka = 0.28
- Kp = 3.53
- Coefficient of Friction for Sliding = 0.58
- Seismic Load: Ss = 0.64g
  S1 = 0.47g
  SPC D
  PGA = 0.29g

IV. Material Properties

See Section III, Basis of Design, for Tetra Tech's recommended soil properties based on the geotechnical investigation.

V. References

- AASHTO "LRFD Bridge Design Specifications" 6th Edition, 2012
- Das, Braja M. "Principles of Foundation Engineering." Sixth Edition, 2007
- Das, Braja M. "Fundamentals of Geotechnical Engineering." Second Edition, 2005.
- Holtz, Kovacs, and Sheahan. "An Introduction to Geotechnical Engineering." Second Edition, 2010.

VI. List of Attachments:

Calculations

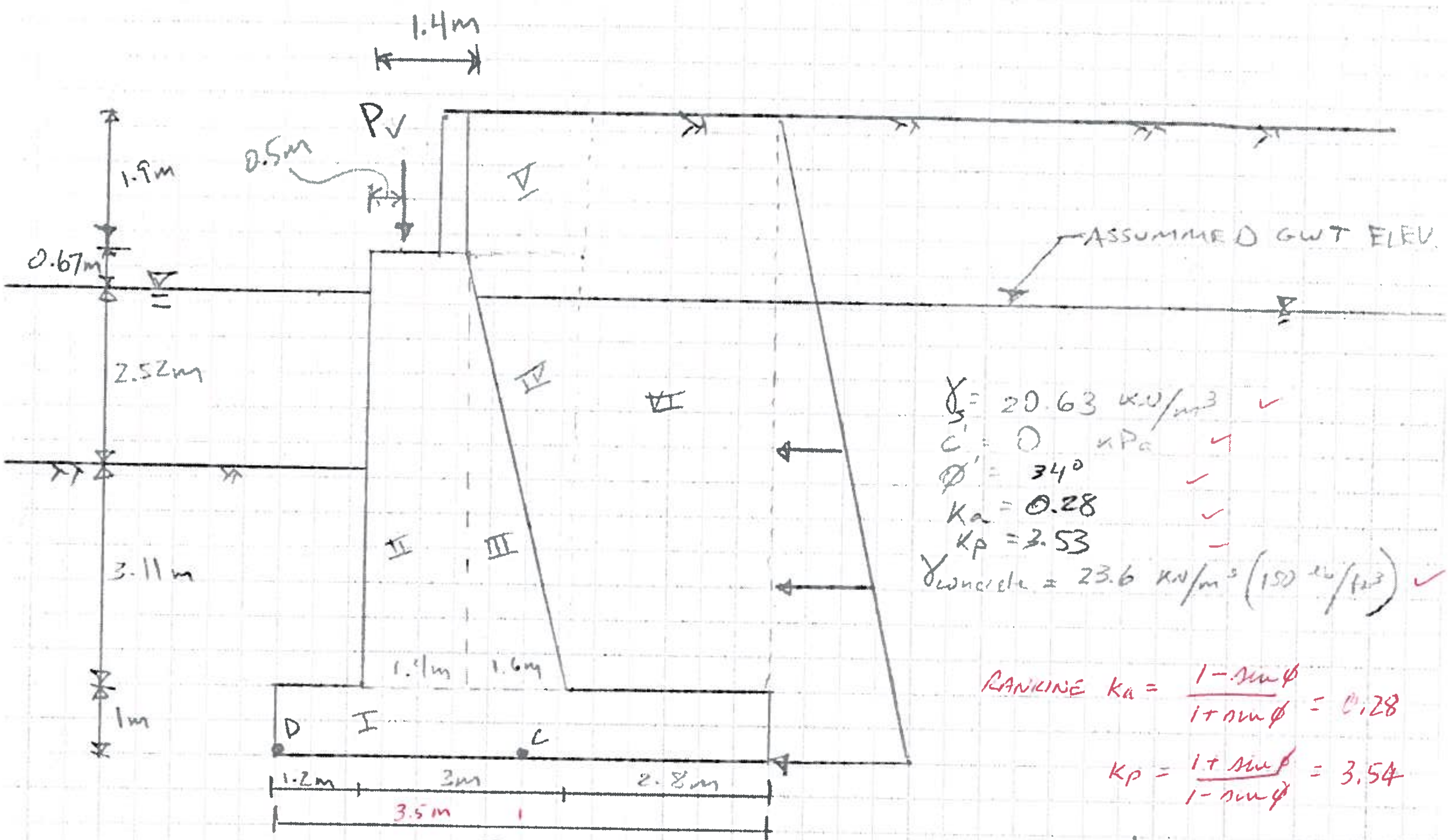
Calculations

TETRA TECH • Professional Engineers •

Client: USAID | Job No.: | Sheet 1 of 6

Description: GK Bridge 9 | Designed By: FJD | Date: 2/17/14

Bearing Capacity - Abutment | Checked By: REV | Date: 2/25/14



γ_s = 20.63 kN/m³ ✓
c' = 0 kPa ✓
ϕ' = 34° ✓
Ka = 0.28 ✓
Kp = 3.53
$\gamma_{concrete}$ = 23.6 kN/m³ (150 lb/ft³) ✓

RANKINE $K_a = \frac{1-\sin\phi}{1+\sin\phi} = 0.28$

$K_p = \frac{1+\sin\phi}{1-\sin\phi} = 3.54$

Abutment length = 13.45 m ✓

Bearing length

P_V = 8998.4 kN

L = 11.25 m

Region	Area (m²)	γ (kN/m³)	W (kN/m)	Mom Arm (m)	M (kN m/m) About pt. C
I	7	23.6	165.2 ✓	0	0
II	8.82 ✓	23.6	208.2 ✓	1.6 ✓	333.1 ✓
III	5.04 ✓	23.6	118.9 ✓	0.37 ✓	44 ✓
IV	5.04 ✓	20.63	104	-0.17 ✓	-17.7 ✓
V	3.04 ✓	20.63	62.7 ✓	0.1 ✓	6.3 ✓
VI	22.96 ✓	20.63	473.7 ✓	-2.1 ✓	-994.8 ✓
P_v	—	—	799.9 ✓	1.5 1.8	~~1200~~ 1440
F_{A1}	—	—	19.1 ✓	7.49 ✓	143.1
F_{A2}	—	—	85.7 ✓	2.21 ✓	189.4 ✓
F_{A3}	—	—	215.6 ✓	2.21 ✓	476.5 ✓
F_{A4}	—	—	98.4 ✓	3.3 ✓	324.8 ✓

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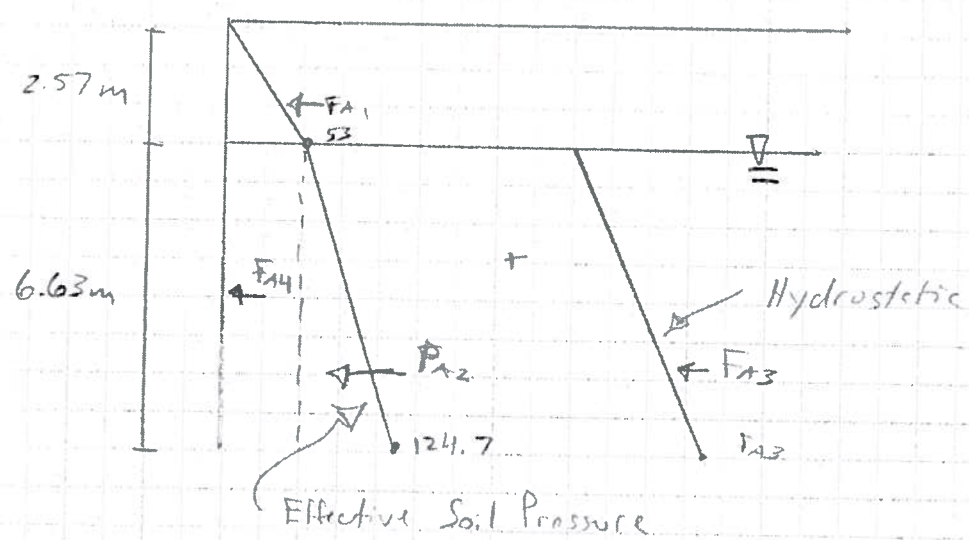
Client: USAID | Job No.: | Sheet 2 of

Description: GK Bridge 9 | Designed By: FJD | Date: 2/18/14

Bearing Capacity - Abutment | Checked By: REV | Date: 2/25/14

Calculation of Active Earth Pressure And Hydrostatic Pressure



$F_A = 0.5(\gamma)(H^2)(K_a)$

$F_{A1} = 0.5(20.63\ kN/m^3)(2.57m)^2(0.26) = 19.1\ kN/m$ ✓

Moment Arm $F_{A1} = 6.63 + 1/3(2.57m) = 7.49\ m$ ✓

$F_{A2} = F_{A1} + 0.5(20.63\ kN/m^3 - 9.81\ kN/m^3)(6.63\ m)^2(0.28)$ 62.4 pcf

$= 85.7\ kN/m$ ✓

Moment Arm $F_{A2} = 1/3(6.63m) = 2.21\ m$ ✓

$F_{A3} = 0.5(9.81\ kN/m^3)(6.63m)^2 = 215.6\ kN/m$

Moment Arm $F_{A3} = F_{A2} = 2.21\ m$

$F_{A4} = (2.57m)(20.63)(6.63m)(0.28) = 98.4\ kN/m$ ✓

Moment Arm $F_{A4} = 1/2(6.63\ m) = 3.3\ m$ ✓

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Client: USAID Job No.: Sheet 3 of

Description: GK Bridge 9 Designed By: FJD Date:

Bearing Capacity - Abutment Checked By: REV Date: 2/25/14

Eccentricity

$$e = \frac{333.1 + 411 - 17.7 + 6.3 - 994.8 + \cancel{1250}\ 1440 + 143.1 + 189.4 + 476.5 + 324.8}{165.2 + 208.2 + 118.9 + 104 + \cancel{54.9}\ 62.1 + 473.7 + 799.7}$$

$$e = \frac{\cancel{1704.7}\ 1944.7 \text{ kN}\cdot\text{m/m}}{\cancel{1924.6}\ 1932.6 \text{ kN/m}} = 1.01^{*} \quad 0.89 \text{ m} \quad 0.882\text{m} \quad \cancel{.8867} \quad .886\text{m}$$

∴ DIFF = .004 m → negligible

0.9 EITHER WAY

The vertical stress can now be measured:

$$\sigma_v = \frac{\Sigma V}{B - 2e} = \frac{\cancel{1924.6}\ 1932.6 \text{ kN/m}}{7\text{m} - 2(0.9\text{m})\ \ 2(1.0)} \approx 370 \text{ kN/m}^2 \quad \cancel{372}\ 387 \ \frac{kN}{m^2}$$

Now we need to determine the soil's bearing capacity

Assumptions:

- cohesionless soil
- effective stress analyses
- drained strength parameters
- groundwater level at ground surface.
- bottom of footing at 0.9 m below scour depth.
- eccentric load = eccentric footing dimensions
- SERVICE I Load combinations.

q_n - nominal bearing resistance

$$q_n = c N_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5 B N_{\gamma m} C_{w\gamma}$$

since cohesion = 0, c = 0

$$q_n = \gamma D_f N_{qm} C_{wq} + 0.5 B N_{\gamma m} C_{w\gamma} \checkmark$$

* FOUND ERROR IN P_V CALC ON PAGE 1. THIS CHANGES e = 1.01 e ≠ 0.89

$N_{qm} = N_q \, s_q \, d_q \, i_q$

$N_{\gamma m} = N_\gamma \, s_\gamma \, i_\gamma$

where

N_q - bearing capacity factor for surcharge (table 10.6.3.1.2a-1)

$\phi' = 34^\circ$

N_q 29.4 ✓

N_γ - bearing capacity factor for soil unit weight (table 10.6.3.1.2a-1)

N_γ 41.1 ✓

γ - total moist soil unit weight = $\gamma = 20.63$ kN/m³

D_f - footing embedment depth = 0.9 m

Eccentricity already determined, $e = 0.9$ m ✓

$B' = B - 2e = 7\,m - 2(0.9\,m)$

$B' = 5.2\,m$ ✓

$L' = L = 13.45\,m$

$A' = L' \, B' = (5.2\,m)(13.45\,m) = 69.9\,m^2$ ✓

$C_{wq} = C_{w\gamma}$ = correction factor for groundwater table elevation

table 10.6.3.1.2a-2 and G.W.T at surface.

$C_{wq} = C_{w\gamma} = 0.5$

S_q - footing shape factor, table 10.6.3.1.2a-3

$$S_q = 1 + \left(\frac{B}{L} \tan\phi\right) = 1 + \left(\frac{5.2m}{13.45m} \tan 34°\right) = 1.26$$ ✓

S_γ - footing shape factor, table 10.6.3.1.2a-3

$$S_\gamma = 1 - 0.4\left(\frac{B}{L}\right) = 1 - 0.4\left(\frac{5.2m}{13.45}\right) = 0.85$$ –

load inclination factors ≈ 1 = i_q and i_γ

d_q - correction factor to account for shearing resistance of soil above footing.

d_q = 1 ⊳ conservative assumption ✓

Now..

$$N_{qm} = N_q\, s_q\, d_q\, i_q = (29.4)(1.26)(1)(1) = 37$$ ✓

$$N_{\gamma m} = N_\gamma\, s_\gamma\, i_\gamma = (41.1)(0.85)(1) = 34.9$$ ✓

Now find q_n

$$q_n = \gamma D_f N_{qm} C_{wq} + 0.5\,\gamma B N_{\gamma m} C_{w\gamma}$$

$$= (20.63\ kN/m^3)(0.9m)(37)(0.5) + 0.5(20.63\ kN/m^3)(\overset{5.2}{4m})(34.9)(0.5)$$

$$= 343.5\ kN/m^2 + \overset{\cancel{720}}{936.0}\ kN/m^2$$

$$q_n = \cancel{1063.5}\ kN/m^2$$

1280 KN/m²

$q_r = \phi\, q_n$ and $\phi = 0.45$ ✓

$$q_r = 0.45\left(\overset{1280}{\cancel{1063.5}}\ kN/m^2\right) = \overset{575.8}{\cancel{478.6}}\ kN/m^2$$

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Client: USAID | Job No: | Sheet 6 of 6

Description: GK Bridge 9 Bearing Capacity - Abutment | Designed By: FJD | Date:

Checked By: REV | Date: 2/25/14

Calculation Commentary:

$q_r > \sigma_v \rightarrow$ OK. ✓

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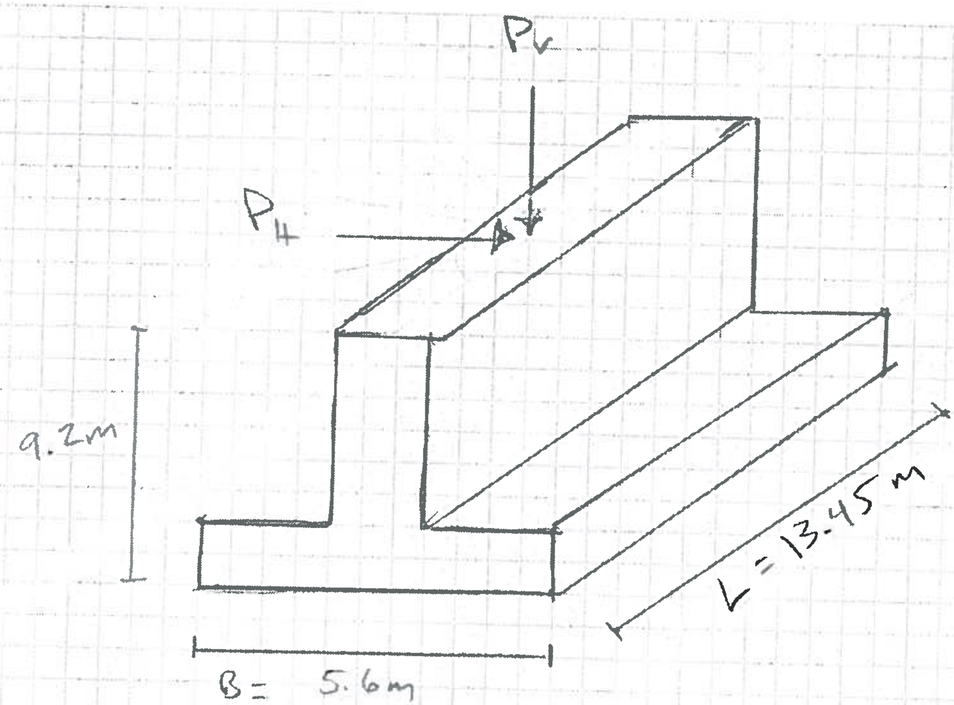
Client: USAID Job No: ______ Sheet 1 of 6

Description: GK Bridge 9 Designed By: FJD Date: 2/13/14

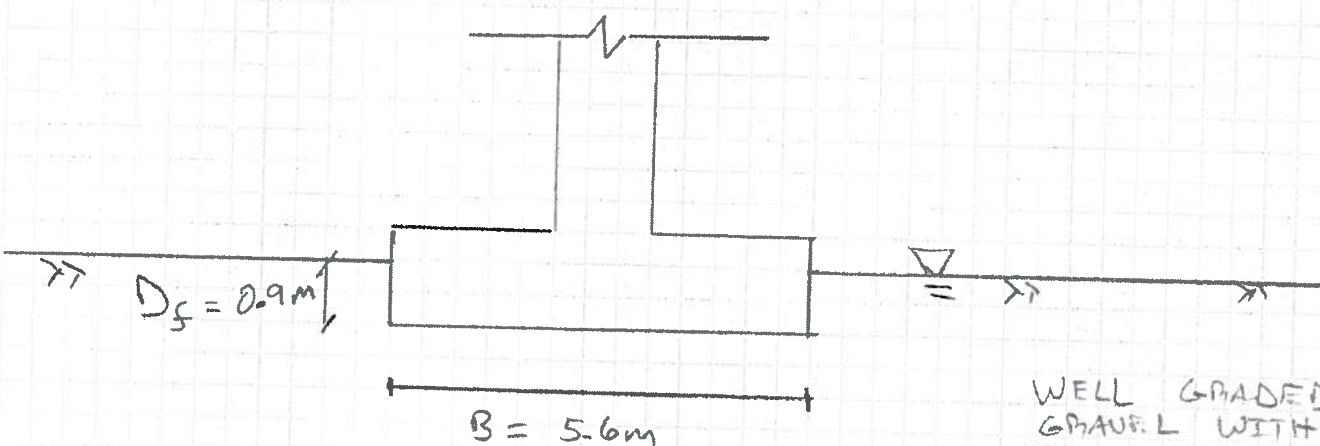
Bearing Capacity - Pier Foundation Checked By: REV Date: 2/25/14

P_V = 13,731.7 kN

P_H = 174.1 kN



PIER SPREAD FOOTING ISOMETRIC VIEW
(NOT TO SCALE)



WELL GRADED GRAVEL WITH SILT AND SAND

$\phi' = 34°$ ✓

$c' = 0$ kPa ✓

$\gamma_s = 20.6$ kN/m³ ✓

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• Professional Engineers •

Client: USAID | Job No: | Sheet 2 of

Description: GK Bridge 9 Bearing Capacity - Pier Foundation | Designed By: FJD | Date: 2/13/14

Checked By: REV | Date: 2/25/14

Calculations performed per 2012 AASHTO LRFD Bridge Design Specifications, section 10.6.3.1.2

✓ Assumptions:
- cohesionless soil
- effective stress analyses
- drained strength parameters
- groundwater table at ground surface
- bottom of footing at 0.9 m below scour depth
- eccentric load = eccentric footing dimensions
- SERVICE I Load Combination Limit State
- Angle of internal friction = 34°, Table 8.1 - Typ. Values of drained angle of friction for sands and silts, Braja Das.

Calculate q_r, factored resistance of soil

$$q_r = \phi_b \, q_n$$

ϕ_b = resistance factor per 10.5.5.2.2-1 (Table) for bearing resistance, theoretical method, in sand, using SPT, $\phi_b = 0.45$

$\phi_b = 0.45$ ✓

q_n - nominal bearing resistance

$$q_n = c N_{cm} + \gamma D_f N_{qm} C_{wq} + 0.5 \gamma B N_{\gamma m} C_{w\gamma}$$ ✓

since cohesion, $c = 0$, q_n takes the following form:

$$q_n = \gamma D_f N_{qm} C_{wq} + 0.5 \gamma B N_{\gamma m} C_{w\gamma}$$ ✓

TETRA TECH RMC

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Client: USAID | Job No: | Sheet 3 of

Description: GK Bridge 9 | Designed By: FJD | Date: 2/13/14

Bearing Capacity - Pier Footing | Checked By: REV | Date: 2/25/14

$$N_{qm} = N_q \, s_q \, d_q \, i_q$$

$$N_{\gamma m} = N_\gamma \, s_\gamma \, i_\gamma$$

where:

N_q - bearing capacity factor for surcharge
from table 10.6.3.1.2a-1 and $\phi' = 34°$
$N_q = 29.4$ ✓

N_γ - bearing capacity factor for soil unit weight
from table 10.6.3.1.2a-1 and $\phi' = 34°$
$N_\gamma = 41.1$ ✓

γ - total moist soil unit weight
from geotech report $\gamma = 20.6 \text{ kN/m}^3$ ✓

D_f - Footing Embedment Depth $= 0.9$ m ✓

Need to determine effective footing dimensions since loading is eccentric

$$B' = B - 2e$$

$$e = \frac{M_{(about\ fdn)}}{P_v} = \frac{(174.1 \text{ kN})(9.2 \text{ m})}{13,731.7 \text{ kN}}$$

$$e = 0.12 \text{ m}$$

$$B' = 5.6\text{m} - 2(0.12\text{m})$$

$$B' = 5.36 \text{ m}$$ ✓

NOTE: THIS IS CONSERVATIVE. INCLINATION FACTOR MAY BE OMITTED (10-49)

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Client: USAID Job No: Sheet 4 of

Description: GK Bridge 9 Designed By: FJD Date: 2/13/14

Bearing Capacity - Pier foundation Checked By: REV Date: 2/25/14

$L' = L = 13.45m$ ✓

$A' = B'L' = (5.36\ m)(13.45m) = 72.1\ m^2$ ✓

$C_{wq} = C_{w\gamma}$ – correction factors for the location of the groundwater table

from table 10.6.3.1.2a-2, and depth to water is zero

$C_{wq} = C_{w\gamma} = 0.5$ ✓

S_q – footing shape factor, table 10.6.3.1.2a-3

$$S_q = 1 + \left(\frac{B}{L}\tan\phi'\right) = 1 + \left(\frac{5.36m}{13.45m}\tan(34)\right) =$$

$S_q = 1.27$ ✓

S_γ – footing shape factor, table 10.6.3.1.2a-3

$$S_\gamma = 1 - 0.4\left(\frac{B}{L}\right) = 1 - 0.4\left(\frac{5.36m}{13.45m}\right) = 0.84$$

$S_\gamma = 0.84$ ✓

i_q – load inclination factor

$$i_q = \left[1 - \frac{P_H}{(P_V + cBL\cot\phi')}\right]^n \quad ; \text{ since } c = 0$$

$$i_q = \left[1 - \frac{P_H}{P_V}\right]^n$$

and $n = \left[(2 + L/B)/(1 + L/B)\right]\cos^2\theta + \left[(2 + B/L)/(1 + B/L)\right]\sin^2\theta$

where θ, is direction of horizontal load, with respect to the alignment of the footing length

$\theta = 90°$

since $\cos^2(90°) = 0$ and $\sin^2(90) = 1$

$$n = [(2 + B/L)/(1 + B/L)]$$

$$n = [(2 + 5.36m/(13.45m))/(1 + 5.36m/(13.45))]$$

$$n = 1.71$$

so,

$$i_q = \left[1 - \frac{174.1 \text{ KN}}{13,731.7 \text{ KN}}\right]^{1.71}$$

$$i_q = 0.98$$ ✓

i_γ - Load inclination factor

$$i_\gamma = \left[1 - \frac{P_H}{P_V + cBL\cot\phi'}\right]^{(n+1)}$$ since $c = 0$

$$i_\gamma = \left[1 - \frac{P_H}{P_V}\right]^{(n+1)} = \left[1 - \frac{174.1 \text{ KN}}{13,731.7 \text{ KN}}\right]^{(1.71+1)}$$

$$i_\gamma = 0.97$$ ✓ USUALLY IGNORED DUE TO CLOSENESS TO 1.0

d_q - correction factor to account for shearing resistance of soil above the bearing elevation

$d_q = 1$ → we are going to assume that the soil above the bearing elevation does not provide shearing resistance.

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Client: USAID | Job No: | Sheet 6 of 6

Description: GK Bridge 9 | Designed By: FJD | Date: 2/13/14

Bearing Capacity - Pier Footing | Checked By: REV | Date: 2/25/14

Now,

$$N_{qm} = N_q \, s_q \, d_q \, i_q = (29.4)(1.27)(1)(0.98)$$

$$N_{qm} = 36.6$$

$$N_{\gamma m} = N_\gamma \, s_\gamma \, i_\gamma = (41.1)(0.84)(0.97)$$

$$N_{\gamma m} = 33.5$$

Now we can find q_n, nominal bearing resistance

$$q_n = \gamma D_f N_{qm} C_{wq} + 0.5 \gamma B N_{\gamma m} C_{w\gamma}$$

$$q_n = (20.6\ kN/m^3)(0.9\ m)(36.6)(0.5) + (0.5)(20.6\ kN/m^3)(5.36\ m)(33.5)(0.5)$$

$$q_n = 339.3\ kN/m^2 + 924.7\ kN/m^2$$

$$q_n = 1{,}264\ kN/m^2$$

and $q_r = \phi_b \, q_n$ (Factored bearing resistance)

$$q_r = (0.45)(1264\ kN/m^2)$$

$$q_r = 568.8\ kN/m^2 \approx \frac{224.8\ \frac{\#}{kN}}{10.76\ \frac{ft^2}{m^2}}(568.8) \approx 11{,}880\ psf$$

Now, check actual conditions

$$q_{actual} = \frac{P_v}{A'} = \frac{13{,}371.7\ KN}{72.1\ m^2} = 185.5\ kN/m^2$$

$q_r > q_{actual} \Rightarrow$ OK.

Calculations performed following guidelines set in The AASHTO LRFD Bridge Design Specifications, 2012

Since the foundation soils are ~~cohesive~~ COHESIONLESS, immediate settlement will be the main form of settlement the structure will experience. Consolidation settlement is not expected or anticipated at this site.

S_e - elastic settlement

$$S_e = \frac{q_o (1 - \nu_o^2)\sqrt{A'}}{E_s \, \beta_z}$$

Where,

- q_o - applied pressure to bearing surface.
- ν - poisson's ratio of soil
- A' - effective footing area
- E_s - Young's Modulus of Elasticity of soil
- β_z - footing shape factor

q_o - from bearing capacity calculation $= 185.5$ kN/m^2 ✓

ν_o - from Article 10.4.6.3 $= 0.2$ ✓

$A' = B'L'$ → From Bearing Capacity Calculation $= 72.1$ m^2 ✓

$E_s = 69{,}000$ kN/m^2 → Braja Das, Principles of Foundation Engineering, 6th Edition Table 5.8 ✓

TETRA TECH RMC

• Professional Engineers •

Client: USAID

Job No: ______ Sheet 2 of 2

Description: GK Bridge 9 Settlement - Pier Footing

Designed By: FJD Date: 2/19/2014

Checked By: REV Date: 2/27/2014

β_z - from table 10.6.2.4.2-1 and $L'/B' = 13.45m/5.36m = 2.5$

$\beta_z = 1.11$ ✓

$$S_e = \frac{(185.5\ kN/m^2)(1-0.2^2)\sqrt{72.1\ m^2}}{(69{,}000\ kN/m^2)(1.11)}$$

$S_e = 0.02\ m = 0.8\ in$ ✓

Section 3
Civil

Design Analysis

Discipline:	Civil	Date:	March 28, 2014

Design Submittal: Final Design Submittal
Site Location: Bridge #09
Prepared By: Tetra Tech

I. General Summary:

The existing Bridge #09, located along the Gardez to Khost Road in Afghanistan, consists of a two-span concrete deck / concrete girder bridge, supported on stone masonry abutments and piers. The existing bridge has partially collapsed, likely due to scour and abutment failure. In addition, based on preliminary hydraulic modeling performed (by Others) provided by USAID and on anecdotal evidence, the existing bridge elevation is not sufficient to meet the hydraulic demands of the crossing. Complete bridge replacement is proposed. The proposed bridge abutments will generally be in the same location as the existing abutments, and a second pier will be added. Thus the new bridge does not increase the overall span of the bridge crossing, but is taller than the existing structure to provide increased capacity.

The objective is to design a new bridge crossing to replace the existing bridge crossing. The proposed bridge superstructure and substructure shall be constructed out of reinforced concrete. Approach roadway work will be required to transition from the existing roadway to the bridge.

In order to expedite the schedule, the Final bridge design was performed prior to the completion of a complete hydraulic analysis and without geotechnical information specific to the bridge site, as directed by USAID. In this Design Analysis, any discrepancies between assumed and actual design parameters are noted, and any need for future redesign is identified.

II. Basis of Design

- The roadway approaches will consist of asphaltic concrete pavement travel lanes and bituminous sealed shoulders. The roadway typical section is comprised of two 3.5 meter lanes with 1.0 meter shoulders with normal crown at the bridge and super elevated sections at the horizontal curves. There will be a transition to the bridge section which includes two 3.5m lanes with 0.5m shoulders and 1.2m sidewalks on each side.

- The horizontal alignment was based on the design alignment taken from the Detailed Engineering Design of Gardez-Khost Road Rehabilitation Project, dated June 2010 and prepared by The Louis Berger Group, Inc. /Black and Veatch Special Projects Corp., Joint Venture (LBG/BV). The road tangent through the proposed bridge was taken directly from the LBG/BV alignment with an identical bearing, location and length. The PT and PC just off either end of the bridge are in the same coordinate location and have the same stationing as the original alignment. The horizontal curve west of the bridge was modified from the LBG/BV alignment through the use of a compound curve. This was done to match into the existing, currently un-rehabilitated roadway west of the proposed bridge. The horizontal curve east of the bridge was also modified by truncating the curve and adding a tangent section. This was done to match into the recently rehabilitated section of road east of the bridge. It is noted that this rehabilitated section of road does not appear to follow the LBG/BV alignment used in the design plans referenced above.

- The vertical alignment was designed for a design speed of 50 km/h (30 mph) to match the existing roadway and meet the necessary proposed bridge deck elevation.

- Embankments adjacent to the river will be protected with rip rap stone.

- Stone masonry guardwalls are provided along the proposed roadway approaches to assist in guiding vehicles to the bridge crossing. The design of the guardwalls is not intended to be for crash attenuation.

- Grouted riprap slopes are used on the roadway embankments in areas where required for stability for embankment slopes in excess of 2:1.

- A paved transition is provided at the side road immediately west of the bridge to provide a smooth transition and minimize future maintenance at the intersection.

- Signage is provided for to alert traffic of the curved roadway. Additional signage has been provided to alert motorists of the side road intersection due to restricted sight distance of motorists crossing the bridge. A stop sign has been provided at the end of the side road for safety.

III. Material Properties

- Approach roadway surface: Asphaltic concrete pavement conforming to specification section 32 12 16 to be obtained and manufactured locally.

- Approach roadway fill: Select fill conforming to specification section 31 20 00 intended to be obtained locally.

- Stone masonry walls conforming to specification section 32 32 40 and Rip Rap conforming to specification section 31 37 00: Stones intended to be obtained locally.

- Soil materials for roadway base courses and embankments conforming to specification section 31 20 00 shall be compacted to 95% maximum dry density as per ASTM D1557.

IV. Code References

- US Army Corps of Engineers Afghanistan Engineer District AED Design Requirements: Vertical Curve Design and Superelevation Road Design March 2009

- AASHTO “A Policy on Geometric Design of Highways and Streets”, 6th Edition, 2011

Section 4
Structural

Design Analysis

Discipline:	Structural	**Date:**	March 28, 2014

Design Submittal: Final Design Submittal
Site Location: Bridge #09
Prepared By: Tetra Tech

I. General Summary:

The existing Bridge #09, located along the Gardez to Khost Road in Afghanistan, consists of a two-span concrete deck / concrete girder bridge, supported on stone masonry abutments and piers. The existing bridge has partially collapsed, likely due to scour and abutment failure. In addition, based on preliminary hydraulic modeling performed (by Others) provided by USAID and on anecdotal evidence, the existing bridge elevation is not sufficient to meet the hydraulic demands of the crossing. Complete bridge replacement is proposed. The proposed bridge abutments will generally be in the same location as the existing abutments, and a second pier will be added. Thus the new bridge does not increase the overall span of the bridge crossing, but is taller than the existing structure to provide increased capacity.

The objective is to design a new bridge crossing to replace the existing bridge crossing. The proposed bridge superstructure and substructure shall be constructed out of reinforced concrete. Approach roadway work will be required to transition from the existing roadway to the bridge.

In order to expedite the schedule, the Final bridge design was performed prior to the completion of a complete hydraulic analysis and without geotechnical information specific to the bridge site, as directed by USAID. In this Design Analysis, any discrepancies between assumed and actual design parameters are noted, and any need for future redesign is identified.

II. Detailed Analysis:

General

The proposed three-span reinforced concrete bridge is comprised of 16.8 meter simple spans, with a total bridge length of 50.4 meters. The superstructure (girder, slab and barriers) and the substructure (abutments, retaining walls and piers) shall be reinforced concrete. The roadway and sidewalks widths on the bridge match those of adjacent Bridge #10 on the same road. As such, the roadway is 4.0m wide in each direction of travel and has two 1.2 m wide sidewalks on each side of the roadway. The bridge is designed for an AASHTO LRFD HL-93 vehicle.

The substructure construction will potentially require dewatering and support-of-excavation in order to construct the proposed foundation.

If a crane is available during the superstructure construction, the beams can be precast offsite or on the approaches and placed using a crane. Using precast beams would accelerate the superstructure construction considerably. Since the reinforced concrete superstructure is heavy, deep girders are required to carry the load.

The superstructure, abutments, and piers have been designed to resist all applied loads as described in AASHTO "LRFD Bridge Design Specifications" 6th Edition, 2012. See the "Basis of Design" for design load information.

For related approach roadway work and limits of work, see the Civil section.

Assumptions

As noted previously, the bridge design was performed concurrently with the topographical survey, geotechnical investigation and hydraulic analysis. The final design parameters are as follows:

- Preliminary hydraulic report (referenced above):
    - River bed elevation of 1854.57m
    - Piers and abutments were sized to insure their footings are below the scour line.
    - The proposed bridge seat elevation has been set 0.49m above the 50-year flood elevation.
    - Hydraulic Data:

        Watershed Area = 237.87 square kilometers.
        Design Flood Event = 50-yr
        Design Discharge = 534.7 m^3/s
        Design Velocity = 3.13 m/s
        Design Groundwater Elevation = 1858.95m
        Scour Depth at Piers = 3.45m
        Scour Depth at Abutments = 2.21m

- Profiles and Plans for Gardez-Khost Rehabilitation Project (by Others)
    - The roadway profile was based on these drawings.
    - Note that sheet GK-PP-072 indicates a river bed elevation of approximately 1857.5m which is about 2.93m higher than that indicated in the hydraulic report. For the purpose of this design, the lower bed elevation (1854.57m) is used.

- Geotechnical Report for Gardez to Khost Bridge No. 9, Afghanistan (by Construction Material Testing & Soil Investigation Laboratory, dated February 08, 2014).

    - *Allowable Soil Bearing Pressure = 3.98 kg/cm^2 (8.15 ksf)
    - Friction Angle = 31 degrees
    - Ko = 0.49
    - Ka = 0.32
    - Kp = 3.13

    * Based on Section 13.4 Geotechnical Recommendations, an allowable bearing capacity of 3.98 kg/cm^2 (8.15 ksf) was used for the design. Upon further review of the report, inconsistencies regarding allowable bearing were noted. The Executive Summary and Section 7 note Qa=1.03 kg/cm^2 (2.11 ksf). Tetra Tech's review of the bearing capacity recommendations are discussed on page 3.

It was assumed that the Factored Bearing Resistance and the Allowable Soil Bearing Pressure were similar, as they are both the result of the Ultimate Bearing Capacity times a factor.

Note that the report did not include a recommended Unit Weight of Soil. Therefore, a Unit Weight of 18.1 kN/m3 (115 pcf) was assumed based on the previous Geotechnical Report for Gardez to Khost Road Rehabilitation/ Reconstruction Project (by Others).

Similarly, the Coefficient of Friction for Sliding value in this report was not used since it did not correlate with AASHTO LRFD. Per AASHTO LRFD, a Coefficient of Friction for Sliding value of 0.58 was used.

Results of Hydraulic Analysis

The purpose of the Hydraulic Analysis, performed by Tetra Tech concurrent with design, was to determine how the actual hydraulic conditions compare with those assumed for design. As discussed in Section 1, the hydraulic analysis showed that the scour depths at the piers and abutments are significantly larger than assumed for design. Additional parameters also varied. A comparison of the main design parameters is as follows:

- River bed elevation = 1854.2m (0.37m lower than assumed)
- 50-Year flood elev. = 1858.32 (0.63m lower than assumed)
- Design Velocity = 4.2 m/s (1.07 m/s larger than assumed)
- Scour Depth at West Abut = 9.2m (6.99 larger than assumed)
- Scour Depth at Pier 1 = 9.2m (5.75m larger than assumed)
- Scour Depth at Pier 2 = 4.0m (0.55m larger than assumed)
- Scour Depth at East Abut = 4.0m (1.79 larger than assumed)

Based on these results, scour protection design was required. As discussed in Section 1, there were several alternates considered for scour protection. The recommended scour countermeasure is construction of a concrete scour mattress below the bridge, on the channel embankments and along the channel upstream and downstream of the bridge. The concrete mattress includes downward sloping key walls at the upstream and downstream ends to protect the concrete mattress from undermining.

The concrete mattress is a reinforced concrete slab-on-grade, generally 200mm thick, placed on a compacted subgrade. As discussed in Section 1, the hydraulic flow analysis showed that a 300mm thick slab was required downstream of the pier nose to counteract uplift forces. Due to the use of a thickened slab in this area, soil anchors are not required to resist uplift.

For constructability, the downward sloping key walls at the upstream and downstream ends of the mattress, as well as the upward sloping portions of the mattress along the embankments, are generally sloped at 2H:1V. At the southeast corner of the bridge, using a 2H:1V slope would have resulted in the slopes protruding far into the channel, so 1H:1V slopes are used in this isolated area.

Results of Geotechnical Investigation
As discussed in Section 2, the Geotechnical Report performed by Construction Material Testing & Soil Investigation Laboratory (report dated February 08, 2014) was reviewed by Tetra Tech. Tetra Tech took exception to some of the calculations in the report and provided design parameters in accordance with AASHTO LRFD. A comparison of the main design parameters is as follows:

- Weight of Soil = 20.6 kN/m3 (14% greater than assumed)
- Factored Bearing Resistance
  - Piers 68.8 kg/cm2 (11.8ksf) (45% greater than assumed)
  - Abutments 478.6 kg/cm2 (10.0ksf) (23% greater than assumed)
- Friction Angle = 34 degrees (13% greater than assumed)

Based on these results, Tetra has verified that the abutments, piers and retaining walls will not need to be redesigned due to the updated geotechnical parameters.

III. Basis of Design

- Dead Load: Selfweight of superstructure and substructure components
- Live Load: AASHTO LRFD LH-93 Vehicle
- Longitudinal Force: 5% of Live Load
- Seismic Load: Ss = 0.64g
  S1 = 0.47g
  SDC D
  PGA = 0.29g
- Hydraulic Data: As noted under Part II – Assumptions
- Geotech Data: As noted under Part II – Assumptions
- Load combinations are based on AASHTO "LRFD Bridge Design Specifications" 6th Edition, 2012.

IV. Material Properties

Concrete Properties:
- Concrete mix shall be ASTM C-150 Type 1 or Type 2 Portland Cement.
- f'c = 27.5 MPa (4000 psi)
- Reinforcement: fy = 4218 kg/cm^2 (60 ksi)

Anchor Bolts:
- ASTM F1554, Grade 105 Steel

Soil Properties:

- As noted under Part II - Assumptions
- Compaction shall be 95% maximum dry density as per ASTM D 1557.
- The Contractor shall verify that the actual subsurface conditions meet the assumed geotechnical design parameters.

V. Code References

- AASHTO “LRFD Bridge Design Specifications” 6th Edition, 2012

VI. List of Attachments:

Calculations

Calculations

DESIGN CALCULATIONS
BRIDGE NO. 9
GARDEZ TO KHOST ROAD - PHASE IV

TABLE OF CONTENTS

DESIGN CALCULATIONS

SUPERSTRUCTURE ANALYSIS

SUPERSTRUCTURE ANALYSIS

CONSPAN MODEL, ANALYSIS & RESULTS

PROJECT DATA

Project:	Khost Bridge No 9
Designer:	ALH
Date:	Oct/28/2013
Checked By:	SAM
Date Checked:	Feb/11/2014
User job number:	Projects\1298\127-1298-12001-LT0077\SupportDocs\Calcs\Structural\Conspan
State:	Khost, Afghanistan, State Job #:
State Specification:	None
Design Code:	AASHTO LRFD - [6th Edition, 2012]
Units:	US
Span Type:	Simple Span
Flared Girder:	No
File Name:	P:\1298\127-1298-12001-LT0077\SupportDocs\Calcs\Structural\Final Design\Conspan\KHOST_BRIDGE_9.csl

GEOMETRY DATA
BRIDGE LAYOUT

Overall Width (ft)	35.920
Left curb (ft)	4.670
Right curb (ft)	4.670
Curb-to-curb width (ft)	26.580
Number of spans	1
Number of lanes	2
Lane width (ft)	12.000
Eff Deck thick (in)	8.860
Sacrificial thick (in)	0.000
Haunch thickness (in)	0.000
Haunch width (in)	23.640
Bridge c/s,MI(Ixx) (in4)	5349779.00

SPAN DATA

Precast length,	ft =	55.120
Bearing-to-bearing,	ft =	54.120
Release span,	ft =	55.120

BEAM DATA

No	ID	Loc-prev ft	Area in2	MI(Ixx) in4	Height in	Yb in	B-topg in	B-trib ft
1	600x1500(2x5)	2.790	1395.7	405420.0	59.04	29.52	23.64	5.825
2	600x1500(2x5)	6.070	1395.7	405420.0	59.04	29.52	23.64	6.070
3	600x1500(2x5)	6.070	1395.7	405420.0	59.04	29.52	23.64	6.070
4	600x1500(2x5)	6.070	1395.7	405420.0	59.04	29.52	23.64	6.070
5	600x1500(2x5)	6.070	1395.7	405420.0	59.04	29.52	23.64	6.070
6	600x1500(2x5)	6.070	1395.7	405420.0	59.04	29.52	23.64	5.815

MATERIAL DATA - Project Level

As defined in Material Tab. For beam level properties look at Beam Specific output.

CONCRETE PROPERTIES

	Precast Release	Precast Final	C.I.P
f'c (ksi)	1.000	4.000	4.000
Wc (pcf)	150.000	150.000	150.000
Ec (ksi)	1917.130	3834.250	3600.000
K1	1.000	1.000	1.000
Thermal coeff.(1/°F)	0.00000600		

STRAND AND REBAR PROPERTIES

PRESTRESSED STEEL:

DUMMY, Low relaxation strands

Straight Pattern

Strand Diameter = 0.100 in

Tensile Strength(fpu) = 270.0 ksi

Use transformed strand and rebar: No

REINFORCING STEEL:

Tension/Shear steel: fy = 60.0 ksi Es = 29000 ksi

Bentley		Sheet #	4
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

LOADS DATA

Loads generated using Permanent Load Wizard: NO

DEAD LOADS ON PRECAST - NONE

DIAPHRAGM LOADS - using Wizard

Span	Magnitude (plf)	Location (ft)	Skew (deg)
1	1000.000	0.000	0.000
1	1000.000	27.060	0.000
1	1000.000	54.120	0.000

Span	Beam	Load (kips)	Location (ft)
1	1	2.050	0.000
1	1	2.050	27.060
1	1	2.050	54.120
1	2	4.100	0.000
1	2	4.100	27.060
1	2	4.100	54.120
1	3	4.100	0.000
1	3	4.100	27.060
1	3	4.100	54.120
1	4	4.100	0.000
1	4	4.100	27.060
1	4	4.100	54.120
1	5	4.100	0.000
1	5	4.100	27.060
1	5	4.100	54.120
1	6	2.050	0.000
1	6	2.050	27.060
1	6	2.050	54.120

* SEE BACK-UP FOR DISTRIBUTION FACTORS

DF	LANE	INT	EXT
M	1+	0.759	0.759
	1	0.583	0.617
V	+1	0.814	0.656
	1	0.680	0.617

DEAD LOADS ON COMPOSITE

UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf, Area: ksf, Width: ft)

Span	DC/DW	Type	Mag.1	Loc.1/Width	Mag.2	Loc.2	Description
1	DC	Line	0.510	0.000	0.510	54.120	Left Barrier Weight
1	DC	Line	0.530	0.000	0.530	54.120	Left Sidewalk Weight
1	DC	Line	0.530	0.000	0.530	54.120	Right Sidewalk Weight
1	DC	Line	0.510	0.000	0.510	54.120	Right Barrier Weight
1	DW	Area	0.030	26.570	-	-	Future Wearing Surface

TEMPERATURE LOADS

Temperature Loads (Degrees Fahrenheit)

Load Name	Uniform Rise	Uniform Fall	Gradient Rise Top	Gradient Rise Bottom	Gradient Fall Top	Gradient Fall Bottom
Temp(Khost)	17.4	52.6				

LIVE LOADS

Live load deflection: included.

ID	Type
Design Lane	Design Lane
Design Tandem	Design Tandem
Design Truck	Design Truck

Pedestrian Load

295.50 plf

LRFD Article 3.6.1.6 requires 0.075 ksf applied to all sidewalks greater than 2.0 ft.

LIVE LOADS USED
LIVE LOAD LIBRARY: Default.cs3

1 ID: Design Lane

Description:	Design Lane as in AASHTO-LRFD
Type:	Design Lane

Lane Load:	Intensity = 0.64 klf,	Width = 10.00 ft

2 ID: Design Tandem

Description:	Design Tandem as in AASHTO-LRFD
Type:	Design Tandem

First Axle Magnitude = 25.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	25.00	4.00	4.00	0.00

3 ID: Design Truck

Description:	Design Truck as in AASHTO-LRFD
Type:	Design Truck

First Axle Magnitude = 8.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	14.00	2.00

4 ID: Fatigue Truck

Description:	Fatigue Truck as in AASHTO-LRFD
Type:	Fatigue Truck

First Axle Magnitude = 8.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	30.00	0.00

RATING LOADS

Design Live Load Type,	Weight (tons),	Wheel Spacing(ft)
Design Tandem	25.00	6.00
Design Truck	36.00	6.00
Fatigue Truck	36.00	6.00
HL93 Design Load	-	-

Legal Live Load Type,	Weight (tons),	Wheel Spacing(ft)
3S2 Legal Load	36.00	6.00
3-3 Legal Load	40.00	6.00
3 Legal Load	25.00	6.00

Permit Live Load Type,	Weight (tons),	Wheel Spacing(ft)
PT110	110.00	6.00

RATING LOADS DETAILS
Design Rating Loads:

1 ID: Design Tandem

Description:	Design Tandem as in AASHTO-LRFD
Type:	Design Tandem

First Axle Magnitude = 25.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	25.00	4.00	4.00	0.00

2 ID: Design Truck

Description:	Design Truck as in AASHTO-LRFD
Type:	Design Truck

First Axle Magnitude = 8.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	14.00	2.00

3 ID: Fatigue Truck

Description:	Fatigue Truck as in AASHTO-LRFD
Type:	Design Truck

First Axle Magnitude = 8.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	30.00	0.00

4 ID: Fatigue Truck

Description:	Fatigue Truck as in AASHTO-LRFD
Type:	Fatigue Truck

First Axle Magnitude = 8.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	30.00	0.00

Legal Rating Loads:

1 ID: 3S2 Legal Load

Description:	3S2 Truck as in Manual for Condition Evaluation of Bridges 1994
Type:	Legal Truck

First Axle Magnitude = 10.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	15.50	11.00	11.00	0.00
2	15.50	4.00	4.00	0.00
3	15.50	22.00	22.00	0.00
4	15.50	4.00	4.00	0.00

2 ID: 3-3 Legal Load

Description:	3-3 Truck as in Manual for Condition Evaluation of Bridges 1994
Type:	Legal Truck

First Axle Magnitude = 12.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	12.00	15.00	15.00	0.00
2	12.00	4.00	4.00	0.00
3	16.00	15.00	15.00	0.00
4	14.00	16.00	16.00	0.00
5	14.00	4.00	4.00	0.00

3 ID: 3 Legal Load

Description:	3 Truck as in Manual for Condition Evaluation of Bridges 1994
Type:	Legal Truck

First Axle Magnitude = 16.00 k,	Wheel Spacing = 6.00 ft,	Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	17.00	15.00	15.00	0.00
2	17.00	4.00	4.00	0.00

4 ID: Fatigue Truck

Description:	Fatigue Truck as in AASHTO-LRFD
Type:	Fatigue Truck

First Axle Magnitude = 8.00 k, Wheel Spacing = 6.00 ft, Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	30.00	0.00

Permit Rating Loads:

1 ID: PT110

Description:	Permit Vehicle 110 Tons
Type:	Permit Vehicle

Uniform Load	Intensity, klf	Location, ft	Length, ft
Preceding	0.00	0.00	0.00
Trailing	0.00	0.00	0.00

First Axle Magnitude = 10.00 k, Wheel Spacing = 6.00 ft, Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	18.00	9.00	9.00	0.00
2	18.00	4.00	4.00	0.00
3	23.00	4.00	4.00	0.00
4	23.00	4.00	4.00	0.00
5	23.00	4.00	4.00	0.00
6	21.00	10.00	10.00	0.00
7	21.00	4.00	4.00	0.00
8	21.00	4.00	4.00	0.00
9	21.00	4.00	4.00	0.00
10	21.00	4.00	4.00	0.00

2 ID: Fatigue Truck

Description:	Fatigue Truck as in AASHTO-LRFD
Type:	Fatigue Truck

First Axle Magnitude = 8.00 k, Wheel Spacing = 6.00 ft, Truck Width = 10.00 ft

#	Magnitude, k	Max Spacing, ft	Min Spacing, ft	Increment, ft
1	32.00	14.00	14.00	0.00
2	32.00	30.00	30.00	0.00

ANALYSIS DATA
ANALYSIS PARAMETERS DATA

Truck impact:	1.330
Lane impact:	1.000
Strength II impact:	1.330
Fatigue impact:	1.150

DISTRIBUTION FACTORS (Art. 4.6.2.2):

Include sacrificial deck thick in ts:	NO
Is Span Post-tensioned:	NO
ADTT (Average Daily Truck Traffic) :	5000
Percent of the specified force effect :	1.00
Apply reduction of Moment for skew:	YES

NOTE: Beam specific dead and live load DFs are printed in beam level reports.

LOAD FACTORS: (Table 3.4.1-1 & 3.4.1-2)

	Live	DC(max)	DC(min)	DW(max)	DW(min)	TU(max)	TU(min)	TG/TML(max)	TG/TML(min)
Service I:	1.00	1.00	-	1.00	-	1.20	1.00	0.50	0.50
Service III:	0.80	1.00	-	1.00	-	-	1.00	-	0.50
Strength I:	1.75	1.25	0.90	1.50	0.65	-	0.50	-	0.00
Strength II:	1.35	1.25	0.90	1.50	0.65	-	0.50	-	0.00
Fatigue I:	1.50	-	-	-	-	-	-	-	-

Note: For TU, TG/TML, the Max. load factor is used for deflections and the Min. load factor for forces.
Permit Vehicle Side by Side with Design Loads (Art. 4.6.2.2.5): No

Ductility Factor:	1.00
Redundancy Factor:	1.00
Importance Factor:	1.00

PROJECT DESIGN PARAMETERS
MULTIPLIERS:

Trans len mult:	Bonded	1.00
	Debonded	1.00
Dev len mult:	Bonded	1.60
	Debonded	2.00

Camber & Deflection Multiplier (PCI ref.)

	Erection	Final
Prestress:	1.80	2.20
Self. Wt:	1.85	2.40
Deck + Haunch:		2.30
Diaphragm:		3.00
DL-Prec.:		3.00
DL-Comp.:		3.00

MOMENT AND SHEAR PROVISIONS:

Ultimate Moment Capacity, Mr-prvd computed:	AASHTO equations
Horizontal Shear, Beam and Slab effects in Vu:	INCLUDED

STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		1.00	ksi
Elasticity		1917.1	ksi
Max comp		0.60	ksi
Max tens		-0.09	ksi
Max tens,	w/reinf	-0.24	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	4.00	ksi	4.00	ksi
Elasticity	3834.25	ksi	3600.00	ksi

STRESS LIMITS AT FINAL 1 (P/S + DL + LL):

	PRECAST		DECK	
Max comp	2.40	ksi	2.40	ksi

STRESS LIMITS AT FINAL 2 (P/S + DL):

	PRECAST		DECK	
Max comp	1.80	ksi	1.80	ksi

FATIGUE I STRESS LIMITS AT FINAL 3 (50% P/S + 50% DL + F_LL) (Art. 5.5.3.1):

	PRECAST		DECK	
Max comp	1.60	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.38	ksi	-0.38	ksi

RESISTANCE FACTORS (Art. 5.5.4.2):

Flexure Reinforced	
Compression controlled sections	0.75
Tension controlled sections	0.90
Flexure Prestressed	
Compression controlled sections	0.75
Tension controlled sections	0.90
Shear	0.90

PRESTRESS LOSSES:

Time Dependent Losses, Approximate Method (Art.5.9.5.3)
Days to release = 1.00
Rel. Humid.(RH) = 75.0 %

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 1, SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.8	79.4	148.0	197.0	226.4	236.2
Haunch (Max)	V	17.5	17.5	15.6	14.2	10.7	7.1	3.6	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	63.3	63.3	58.6	55.0	46.4	37.8	27.6	8.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	63.3	63.3	58.6	55.0	46.7	38.7	30.9	23.5
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	386.5	653.3	1205.0	1582.0	1807.1	1868.4
	V	137.5	137.5	124.2	113.9	90.8	67.8	43.1	9.9
Total :	M-	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	137.5	137.5	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	137.5	137.5	124.2	113.9	91.2	68.8	46.6	24.9
	M	0.0	0.0	389.1	653.3	1181.4	1532.0	1708.3	1718.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.4	197.0	148.0	79.4	46.8	0.0	0.0
Haunch (Max)	V	3.6	7.1	10.7	14.2	15.6	17.5	17.5
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	27.6	37.8	46.4	55.0	58.6	63.3	63.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.9	38.7	46.7	55.0	58.6	63.3	63.3
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1807.1	1582.0	1205.0	653.3	386.5	0.0	0.0
	V	43.1	67.8	90.8	113.9	124.2	137.5	137.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	137.5	137.5
Total :	Vmx	46.6	68.8	91.2	113.9	124.2	137.5	137.5
	M	1709.5	1533.1	1180.3	653.0	388.9	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	17.5	17.5
Diaphragm	3.1	3.1
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	. 0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

Bentley		Sheet #	17
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	34.3	46.9	57.5	68.2	72.7	78.6	78.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	38.4	48.0	57.9	68.2	72.7	78.6	78.6
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1838.7	1606.8	1222.1	661.8	391.4	0.0	0.0
	V	50.9	78.2	103.5	128.8	140.9	156.6	156.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	55.3	79.4	103.9	128.8	140.9	156.6	156.6
	M	1741.2	1557.8	1197.4	661.4	393.8	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	18.2	18.2
Diaphragm	6.2	6.2
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 3, SERVICE I
Shears: kips, Moments: kft

Bentley		Sheet #	19
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	34.3	46.9	57.5	68.2	72.7	78.6	78.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	38.4	48.0	57.9	68.2	72.7	78.6	78.6
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1838.7	1606.8	1222.1	661.8	391.4	0.0	0.0
	V	50.9	78.2	103.5	128.8	140.9	156.6	156.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	55.3	79.4	103.9	128.8	140.9	156.6	156.6
	M	1741.2	1557.8	1197.4	661.4	393.8	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	18.2	18.2
Diaphragm	6.2	6.2
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 4, SERVICE I
Shears: kips, Moments: kft

Bentley		Sheet #	22
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	34.3	46.9	57.5	68.2	72.7	78.6	78.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	38.4	48.0	57.9	68.2	72.7	78.6	78.6
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1838.7	1606.8	1222.1	661.8	391.4	0.0	0.0
	V	50.9	78.2	103.5	128.8	140.9	156.6	156.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	55.3	79.4	103.9	128.8	140.9	156.6	156.6
	M	1741.2	1557.8	1197.4	661.4	393.8	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	18.2	18.2
Diaphragm	6.2	6.2
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 5, SERVICE I
Shears: kips, Moments: kft

Bentley		Sheet #	25
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

Bentley		Sheet #	26
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	34.3	46.9	57.5	68.2	72.7	78.6	78.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	38.4	48.0	57.9	68.2	72.7	78.6	78.6
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1838.7	1606.8	1222.1	661.8	391.4	0.0	0.0
	V	50.9	78.2	103.5	128.8	140.9	156.6	156.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	55.3	79.4	103.9	128.8	140.9	156.6	156.6
	M	1741.2	1557.8	1197.4	661.4	393.8	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	18.2	18.2
Diaphragm	6.2	6.2
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 6, SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.7	79.3	147.7	196.7	226.0	235.8
Haunch (Max)	V	17.4	17.4	15.6	14.2	10.6	7.1	3.5	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	63.3	63.3	58.6	55.0	46.4	37.8	27.6	8.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	63.3	63.3	58.6	55.0	46.7	38.7	30.9	23.5
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	386.5	653.2	1204.8	1581.7	1806.7	1868.0
	V	137.5	137.5	124.2	113.9	90.8	67.7	43.1	9.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	137.5	137.5	124.2	113.9	91.2	68.8	46.6	24.9
	M	0.0	0.0	389.0	653.2	1181.2	1531.6	1707.9	1718.0

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.0	196.7	147.7	79.3	46.7	0.0	0.0
Haunch (Max)	V	3.5	7.1	10.6	14.2	15.6	17.4	17.4
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	862.9	763.2	591.4	324.8	193.0	0.0	0.0
	V	27.6	37.8	46.4	55.0	58.6	63.3	63.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.9	38.7	46.7	55.0	58.6	63.3	63.3
	M	771.6	718.2	568.5	324.8	195.4	0.0	0.0
Pedestrian:	M+	17.3	15.0	11.3	6.1	3.6	0.0	0.0
	V	0.3	0.5	0.8	1.1	1.2	1.3	1.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.6	1.3	1.3
Pedestrian:	Vmx	0.5	0.6	0.9	1.1	1.2	1.3	1.3
	M	11.0	11.1	9.5	5.7	3.5	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1806.7	1581.7	1204.8	653.2	386.5	0.0	0.0
	V	43.1	67.7	90.8	113.9	124.2	137.5	137.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	46.6	68.8	91.2	113.9	124.2	137.5	137.5
	M	1709.2	1532.7	1180.1	652.8	388.8	0.0	0.0

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	39.3	39.3
Deck+Haunch	17.4	17.4
Diaphragm	3.1	3.1
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	56.3	56.3
DL-Comp.(DW)	21.6	21.6
Live	76.9	76.9
Pedestrian	8.0	8.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 1, SERVICE III
Shears: kips, Moments: kft

Bentley		Sheet #	31
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.8	79.4	148.0	197.0	226.4	236.2
Haunch (Max)	V	17.5	17.5	15.6	14.2	10.7	7.1	3.6	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	50.7	50.7	46.9	44.0	37.1	30.2	22.1	7.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	50.7	50.7	46.9	44.0	37.4	31.0	24.8	18.8
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	347.2	587.2	1084.5	1426.4	1631.1	1689.1
	V	124.6	124.6	112.2	102.7	81.4	60.1	37.5	8.2
Total :	M-	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	124.6	124.6	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	124.6	124.6	112.2	102.7	81.7	60.9	40.4	20.1
	M	0.0	0.0	349.2	587.2	1065.6	1386.3	1552.0	1569.1

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.4	197.0	148.0	79.4	46.8	0.0	0.0
Haunch (Max)	V	3.6	7.1	10.7	14.2	15.6	17.5	17.5
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	22.1	30.2	37.1	44.0	46.9	50.7	50.7
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	24.8	31.0	37.4	44.0	46.9	50.7	50.7
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1631.1	1426.4	1084.5	587.2	347.2	0.0	0.0
	V	37.5	60.1	81.4	102.7	112.2	124.6	124.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	124.6	124.6
Total :	Vmx	40.4	60.9	81.7	102.7	112.2	124.6	124.6
	M	1553.0	1387.2	1064.7	586.9	349.1	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	62.9	62.9	58.2	54.6	46.0	37.5	27.4	8.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	62.9	62.9	58.2	54.6	46.4	38.4	30.7	23.4
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	352.1	595.6	1101.5	1451.1	1662.7	1726.7
	V	140.6	140.6	126.1	114.9	91.8	68.7	44.0	10.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	140.6	140.6	126.1	114.9	92.2	69.7	47.5	25.7
	M	0.0	0.0	354.1	595.6	1082.6	1411.1	1583.6	1606.7

Bentley		Sheet #	34
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	27.4	37.5	46.0	54.6	58.2	62.9	62.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.7	38.4	46.4	54.6	58.2	62.9	62.9
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1662.7	1451.1	1101.5	595.6	352.1	0.0	0.0
	V	44.0	68.7	91.8	114.9	126.1	140.6	140.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	47.5	69.7	92.2	114.9	126.1	140.6	140.6
	M	1584.6	1411.9	1081.7	595.3	354.0	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 3, SERVICE III
Shears: kips, Moments: kft

Sheet #	35
Job #	Projects\1298\127-1298-

Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	62.9	62.9	58.2	54.6	46.0	37.5	27.4	8.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	62.9	62.9	58.2	54.6	46.4	38.4	30.7	23.4
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	352.1	595.6	1101.5	1451.1	1662.7	1726.7
	V	140.6	140.6	126.1	114.9	91.8	68.7	44.0	10.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	140.6	140.6	126.1	114.9	92.2	69.7	47.5	25.7
	M	0.0	0.0	354.1	595.6	1082.6	1411.1	1583.6	1606.7

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	27.4	37.5	46.0	54.6	58.2	62.9	62.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.7	38.4	46.4	54.6	58.2	62.9	62.9
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1662.7	1451.1	1101.5	595.6	352.1	0.0	0.0
	V	44.0	68.7	91.8	114.9	126.1	140.6	140.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	47.5	69.7	92.2	114.9	126.1	140.6	140.6
	M	1584.6	1411.9	1081.7	595.3	354.0	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 4, SERVICE III
Shears: kips, Moments: kft

Bentley		Sheet #	37
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	62.9	62.9	58.2	54.6	46.0	37.5	27.4	8.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	62.9	62.9	58.2	54.6	46.4	38.4	30.7	23.4
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	352.1	595.6	1101.5	1451.1	1662.7	1726.7
	V	140.6	140.6	126.1	114.9	91.8	68.7	44.0	10.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	140.6	140.6	126.1	114.9	92.2	69.7	47.5	25.7
	M	0.0	0.0	354.1	595.6	1082.6	1411.1	1583.6	1606.7

Bentley		Sheet #	38
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	27.4	37.5	46.0	54.6	58.2	62.9	62.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.7	38.4	46.4	54.6	58.2	62.9	62.9
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1662.7	1451.1	1101.5	595.6	352.1	0.0	0.0
	V	44.0	68.7	91.8	114.9	126.1	140.6	140.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	47.5	69.7	92.2	114.9	126.1	140.6	140.6
	M	1584.6	1411.9	1081.7	595.3	354.0	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 5, SERVICE III
Shears: kips, Moments: kft

Bentley		Sheet #	39
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68		Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	62.9	62.9	58.2	54.6	46.0	37.5	27.4	8.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	62.9	62.9	58.2	54.6	46.4	38.4	30.7	23.4
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	352.1	595.6	1101.5	1451.1	1662.7	1726.7
	V	140.6	140.6	126.1	114.9	91.8	68.7	44.0	10.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	140.6	140.6	126.1	114.9	92.2	69.7	47.5	25.7
	M	0.0	0.0	354.1	595.6	1082.6	1411.1	1583.6	1606.7

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	27.4	37.5	46.0	54.6	58.2	62.9	62.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	30.7	38.4	46.4	54.6	58.2	62.9	62.9
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1662.7	1451.1	1101.5	595.6	352.1	0.0	0.0
	V	44.0	68.7	91.8	114.9	126.1	140.6	140.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	47.5	69.7	92.2	114.9	126.1	140.6	140.6
	M	1584.6	1411.9	1081.7	595.3	354.0	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 6, SERVICE III
Shears: kips, Moments: kft

Bentley		Sheet #	41
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.7	79.3	147.7	196.7	226.0	235.8
Haunch (Max)	V	17.4	17.4	15.6	14.2	10.6	7.1	3.5	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	154.4	259.8	473.2	610.6	690.3	702.9
	V	50.7	50.7	46.9	44.0	37.1	30.2	22.1	7.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	50.7	50.7	46.9	44.0	37.4	31.0	24.8	18.8
	M	0.0	0.0	156.3	259.8	454.8	574.5	617.3	589.5
Pedestrian:	M+	0.0	0.0	2.9	4.8	9.0	12.0	13.8	14.4
	V	1.1	1.1	1.0	0.9	0.7	0.4	0.2	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.1	1.1	1.0	0.9	0.7	0.5	0.4	0.2
	M	-0.0	-0.0	2.9	4.8	8.5	8.0	7.8	7.7
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	347.2	587.0	1084.2	1426.0	1630.7	1688.7
	V	124.6	124.6	112.2	102.7	81.4	60.1	37.5	8.2
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	124.6	124.6	112.2	102.7	81.7	60.9	40.4	20.1
	M	0.0	0.0	349.2	587.0	1065.3	1386.0	1551.6	1568.6

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.0	196.7	147.7	79.3	46.7	0.0	0.0
Haunch (Max)	V	3.5	7.1	10.6	14.2	15.6	17.4	17.4
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
LL + I :	M+	690.3	610.6	473.2	259.8	154.4	0.0	0.0
	V	22.1	30.2	37.1	44.0	46.9	50.7	50.7
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	24.8	31.0	37.4	44.0	46.9	50.7	50.7
	M	617.3	574.5	454.8	259.8	156.3	0.0	0.0
Pedestrian:	M+	13.8	12.0	9.0	4.8	2.9	0.0	0.0
	V	0.2	0.4	0.7	0.9	1.0	1.1	1.1
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.5	1.1	1.1
Pedestrian:	Vmx	0.4	0.5	0.7	0.9	1.0	1.1	1.1
	M	8.8	8.9	7.6	4.6	2.8	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1630.7	1426.0	1084.2	587.0	347.2	0.0	0.0
	V	37.5	60.1	81.4	102.7	112.2	124.6	124.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	40.4	60.9	81.7	102.7	112.2	124.6	124.6
	M	1552.6	1386.9	1064.5	586.7	349.0	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 1, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	43
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	58.5	99.2	185.0	246.2	283.0	295.2
Haunch (Max)	V	21.8	21.8	19.5	17.8	13.3	8.9	4.4	0.0
Deck + :	M	0.0	0.0	42.1	71.5	133.2	177.3	203.8	212.6
Haunch (Min)	V	15.7	15.7	14.1	12.8	9.6	6.4	3.2	0.0
Diaphragm :	M	0.0	0.0	3.6	6.4	13.5	20.5	27.6	34.7
(Max)	V	3.8	3.8	2.4	1.3	1.3	1.3	1.3	1.3
Diaphragm :	M	0.0	0.0	2.6	4.6	9.7	14.8	19.9	25.0
(Min)	V	2.8	2.8	1.7	0.9	0.9	0.9	0.9	0.9
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	110.9	110.9	102.6	96.2	81.1	66.1	48.3	15.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	110.9	110.9	102.6	96.2	81.7	67.7	54.2	41.2
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	583.9	986.2	1815.3	2376.8	2710.6	2796.0
	V	205.1	205.1	186.0	171.2	137.7	104.2	68.0	16.9
Total :	M-	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	177.9	177.9	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	205.1	205.1	186.0	171.2	138.3	106.0	74.2	43.0
	M	0.0	0.0	588.3	986.2	1774.0	2289.2	2537.7	2533.4

Bentley		Sheet #	44
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	283.0	246.2	185.0	99.2	58.5	0.0	0.0
Haunch (Max)	V	4.4	8.9	13.3	17.8	19.5	21.8	21.8
Deck + :	M	203.8	177.3	133.2	71.5	42.1	0.0	0.0
Haunch (Min)	V	3.2	6.4	9.6	12.8	14.1	15.7	15.7
Diaphragm :	M	27.6	20.5	13.5	6.4	3.6	0.0	0.0
(Max)	V	1.3	1.3	1.3	1.3	2.4	3.8	3.8
Diaphragm :	M	19.9	14.8	9.7	4.6	2.6	0.0	0.0
(Min)	V	0.9	0.9	0.9	0.9	1.7	2.8	2.8
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	48.3	66.1	81.1	96.2	102.6	110.9	110.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	54.2	67.7	81.7	96.2	102.6	110.9	110.9
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2710.6	2376.8	1815.3	986.2	583.9	0.0	0.0
	V	68.0	104.2	137.7	171.2	186.0	205.1	205.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	177.9	177.9
Total :	Vmx	74.2	106.0	138.3	171.2	186.0	205.1	205.1
	M	2539.9	2291.1	1772.1	985.6	588.0	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	21.8	21.8
Diaphragm	3.8	3.8
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	46
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	137.6	137.6	127.3	119.3	100.7	82.0	60.0	19.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	137.6	137.6	127.3	119.3	101.4	84.1	67.2	51.1
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	590.0	996.8	1836.6	2407.7	2750.1	2843.0
	V	236.6	236.6	213.9	196.4	159.1	121.8	81.1	21.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	236.6	236.6	213.9	196.4	159.8	124.0	88.7	54.2
	M	0.0	0.0	594.4	996.8	1795.2	2320.1	2577.2	2580.5

Bentley		Sheet #	47
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	60.0	82.0	100.7	119.3	127.3	137.6	137.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	67.2	84.1	101.4	119.3	127.3	137.6	137.6
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2750.1	2407.7	1836.6	996.8	590.0	0.0	0.0
	V	81.1	121.8	159.1	196.4	213.9	236.6	236.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	88.7	124.0	159.9	196.4	213.9	236.6	236.6
	M	2579.4	2322.0	1793.3	996.2	594.1	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	22.7	22.7
Diaphragm	7.7	7.7
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 3, STRENGTH I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	137.6	137.6	127.3	119.3	100.7	82.0	60.0	19.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	137.6	137.6	127.3	119.3	101.4	84.1	67.2	51.1
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	590.0	996.8	1836.6	2407.7	2750.1	2843.0
	V	236.6	236.6	213.9	196.4	159.1	121.8	81.1	21.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	236.6	236.6	213.9	196.4	159.8	124.0	88.7	54.2
	M	0.0	0.0	594.4	996.8	1795.2	2320.1	2577.2	2580.5

Sheet #	50
Job #	Projects\1298\127-1298-

Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name:	KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	60.0	82.0	100.7	119.3	127.3	137.6	137.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	67.2	84.1	101.4	119.3	127.3	137.6	137.6
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2750.1	2407.7	1836.6	996.8	590.0	0.0	0.0
	V	81.1	121.8	159.1	196.4	213.9	236.6	236.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	88.7	124.0	159.9	196.4	213.9	236.6	236.6
	M	2579.4	2322.0	1793.3	996.2	594.1	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	22.7	22.7
Diaphragm	7.7	7.7
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 4, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	52
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	137.6	137.6	127.3	119.3	100.7	82.0	60.0	19.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	137.6	137.6	127.3	119.3	101.4	84.1	67.2	51.1
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	590.0	996.8	1836.6	2407.7	2750.1	2843.0
	V	236.6	236.6	213.9	196.4	159.1	121.8	81.1	21.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	236.6	236.6	213.9	196.4	159.8	124.0	88.7	54.2
	M	0.0	0.0	594.4	996.8	1795.2	2320.1	2577.2	2580.5

Bentley		Sheet #	53
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	60.0	82.0	100.7	119.3	127.3	137.6	137.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	67.2	84.1	101.4	119.3	127.3	137.6	137.6
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2750.1	2407.7	1836.6	996.8	590.0	0.0	0.0
	V	81.1	121.8	159.1	196.4	213.9	236.6	236.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	88.7	124.0	159.9	196.4	213.9	236.6	236.6
	M	2579.4	2322.0	1793.3	996.2	594.1	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	22.7	22.7
Diaphragm	7.7	7.7
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 5, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	55
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	137.6	137.6	127.3	119.3	100.7	82.0	60.0	19.3
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	137.6	137.6	127.3	119.3	101.4	84.1	67.2	51.1
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	590.0	996.8	1836.6	2407.7	2750.1	2843.0
	V	236.6	236.6	213.9	196.4	159.1	121.8	81.1	21.9
Total :	M-	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	236.6	236.6	213.9	196.4	159.8	124.0	88.7	54.2
	M	0.0	0.0	594.4	996.8	1795.2	2320.1	2577.2	2580.5

Bentley		Sheet #	56
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	60.0	82.0	100.7	119.3	127.3	137.6	137.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	67.2	84.1	101.4	119.3	127.3	137.6	137.6
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2750.1	2407.7	1836.6	996.8	590.0	0.0	0.0
	V	81.1	121.8	159.1	196.4	213.9	236.6	236.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	88.7	124.0	159.9	196.4	213.9	236.6	236.6
	M	2579.4	2322.0	1793.3	996.2	594.1	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	22.7	22.7
Diaphragm	7.7	7.7
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 6, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	58
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	58.4	99.1	184.7	245.8	282.5	294.7
Haunch (Max)	V	21.8	21.8	19.5	17.7	13.3	8.9	4.4	0.0
Deck + :	M	0.0	0.0	42.1	71.3	133.0	177.0	203.4	212.2
Haunch (Min)	V	15.7	15.7	14.0	12.8	9.6	6.4	3.2	0.0
Diaphragm :	M	0.0	0.0	3.6	6.4	13.5	20.5	27.6	34.7
(Max)	V	3.8	3.8	2.4	1.3	1.3	1.3	1.3	1.3
Diaphragm :	M	0.0	0.0	2.6	4.6	9.7	14.8	19.9	25.0
(Min)	V	2.8	2.8	1.7	0.9	0.9	0.9	0.9	0.9
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	337.7	568.4	1035.0	1335.6	1510.0	1537.5
	V	110.9	110.9	102.6	96.2	81.1	66.1	48.3	15.6
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	110.9	110.9	102.6	96.2	81.7	67.7	54.2	41.2
	M	0.0	0.0	342.0	568.4	995.0	1256.8	1350.2	1289.6
Pedestrian:	M+	0.0	0.0	6.3	10.6	19.8	26.3	30.2	31.6
	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	2.3	2.3	1.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	2.3	2.3	2.1	1.9	1.5	1.1	0.8	0.5
	M	-0.0	-0.0	6.4	10.6	18.5	17.6	17.1	16.9
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	583.8	986.0	1815.0	2376.4	2710.1	2795.4
	V	205.1	205.1	185.9	171.1	137.7	104.2	68.0	16.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	205.1	205.1	185.9	171.1	138.3	106.0	74.2	43.0
	M	0.0	0.0	588.2	986.0	1773.6	2288.8	2537.2	2532.9

Bentley		Sheet #	59
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	282.5	245.8	184.7	99.1	58.4	0.0	0.0
Haunch (Max)	V	4.4	8.9	13.3	17.7	19.5	21.8	21.8
Deck + :	M	203.4	177.0	133.0	71.3	42.1	0.0	0.0
Haunch (Min)	V	3.2	6.4	9.6	12.8	14.0	15.7	15.7
Diaphragm :	M	27.6	20.5	13.5	6.4	3.6	0.0	0.0
(Max)	V	1.3	1.3	1.3	1.3	2.4	3.8	3.8
Diaphragm :	M	19.9	14.8	9.7	4.6	2.6	0.0	0.0
(Min)	V	0.9	0.9	0.9	0.9	1.7	2.8	2.8
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1510.0	1335.6	1035.0	568.4	337.7	0.0	0.0
	V	48.3	66.1	81.1	96.2	102.6	110.9	110.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	54.2	67.7	81.7	96.2	102.6	110.9	110.9
	M	1350.2	1256.8	995.0	568.4	342.0	0.0	0.0
Pedestrian:	M+	30.2	26.3	19.8	10.6	6.3	0.0	0.0
	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	1.0	2.3	2.3
Pedestrian:	Vmx	0.8	1.1	1.5	1.9	2.1	2.3	2.3
	M	19.3	19.5	16.6	10.0	6.1	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2710.1	2376.4	1815.0	986.0	583.8	0.0	0.0
	V	68.0	104.2	137.7	171.1	185.9	205.1	205.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	74.2	106.0	138.3	171.1	185.9	205.1	205.1
	M	2539.4	2290.7	1771.7	985.4	587.9	0.0	0.0

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	49.2	49.2
Deck+Haunch	21.8	21.8
Diaphragm	3.8	3.8
DL-Prec.(DC)	0.0	0.0
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	70.4	70.4
DL-Comp.(DW)	32.4	32.4
Live	134.6	134.6
Pedestrian	14.0	14.0

Upward reactions are positive.
Live Load reactions are per lane with no distribution factor and no impact.
Reactions are not multiplied by Load Modifiers (ductility, redundancy and operational importance).
Non-composite load types are per beam.
Composite and Pedestrian load types are per total bridge width.

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 1, STRENGTH II
Shears: kips, Moments: kft

Bentley			Sheet #	61
			Job #	Projects\1298\127-1298-
Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	58.5	99.2	185.0	246.2	283.0	295.2
Haunch (Max)	V	21.8	21.8	19.5	17.8	13.3	8.9	4.4	0.0
Deck + :	M	0.0	0.0	42.1	71.5	133.2	177.3	203.8	212.6
Haunch (Min)	V	15.7	15.7	14.1	12.8	9.6	6.4	3.2	0.0
Diaphragm :	M	0.0	0.0	3.6	6.4	13.5	20.5	27.6	34.7
(Max)	V	3.8	3.8	2.4	1.3	1.3	1.3	1.3	1.3
Diaphragm :	M	0.0	0.0	2.6	4.6	9.7	14.8	19.9	25.0
(Min)	V	2.8	2.8	1.7	0.9	0.9	0.9	0.9	0.9
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	85.5	85.5	79.1	74.2	62.6	51.0	37.3	12.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	85.5	85.5	79.1	74.2	63.0	52.3	41.8	31.8
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	505.3	853.8	1574.2	2065.5	2358.5	2437.3
	V	179.3	179.3	162.0	148.7	118.8	88.9	56.9	13.3
Total :	M-	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	152.0	152.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	179.3	179.3	162.0	148.7	119.3	90.3	61.6	33.5
	M	0.0	0.0	508.6	853.8	1542.3	1997.9	2225.2	2234.8

Bentley		Sheet #	62
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	283.0	246.2	185.0	99.2	58.5	0.0	0.0
Haunch (Max)	V	4.4	8.9	13.3	17.8	19.5	21.8	21.8
Deck + :	M	203.8	177.3	133.2	71.5	42.1	0.0	0.0
Haunch (Min)	V	3.2	6.4	9.6	12.8	14.1	15.7	15.7
Diaphragm :	M	27.6	20.5	13.5	6.4	3.6	0.0	0.0
(Max)	V	1.3	1.3	1.3	1.3	2.4	3.8	3.8
Diaphragm :	M	19.9	14.8	9.7	4.6	2.6	0.0	0.0
(Min)	V	0.9	0.9	0.9	0.9	1.7	2.8	2.8
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	37.3	51.0	62.6	74.2	79.1	85.5	85.5
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	41.8	52.3	63.0	74.2	79.1	85.5	85.5
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2358.5	2065.5	1574.2	853.8	505.3	0.0	0.0
	V	56.9	88.9	118.8	148.7	162.0	179.3	179.3
Total :	M-	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	152.0	152.0
Total :	Vmx	61.6	90.3	119.3	148.7	162.0	179.3	179.3
	M	2226.8	1999.4	1540.8	853.3	508.4	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, STRENGTH II
Shears: kips, Moments: kft

Bentley		Sheet #	64
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	106.1	106.1	98.2	92.1	77.7	63.3	46.2	14.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	106.1	106.1	98.2	92.1	78.2	64.8	51.8	39.4
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	511.3	864.4	1595.5	2096.4	2398.1	2484.4
	V	204.6	204.6	184.3	168.6	135.7	102.8	67.3	17.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	204.6	204.6	184.3	168.6	136.3	104.5	73.2	42.4
	M	0.0	0.0	514.7	864.4	1563.6	2028.8	2264.7	2281.9

Bentley		Sheet #	65
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	46.2	63.3	77.7	92.1	98.2	106.1	106.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	51.8	64.8	78.2	92.1	98.2	106.1	106.1
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2398.1	2096.4	1595.5	864.4	511.3	0.0	0.0
	V	67.3	102.8	135.7	168.6	184.3	204.6	204.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	73.2	104.5	136.3	168.6	184.3	204.6	204.6
	M	2266.4	2030.3	1562.1	863.9	514.5	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 3, STRENGTH II
Shears: kips, Moments: kft

Bentley		Sheet #	67
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	106.1	106.1	98.2	92.1	77.7	63.3	46.2	14.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	106.1	106.1	98.2	92.1	78.2	64.8	51.8	39.4
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	511.3	864.4	1595.5	2096.4	2398.1	2484.4
	V	204.6	204.6	184.3	168.6	135.7	102.8	67.3	17.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	204.6	204.6	184.3	168.6	136.3	104.5	73.2	42.4
	M	0.0	0.0	514.7	864.4	1563.6	2028.8	2264.7	2281.9

Bentley		Sheet #	68
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	46.2	63.3	77.7	92.1	98.2	106.1	106.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	51.8	64.8	78.2	92.1	98.2	106.1	106.1
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2398.1	2096.4	1595.5	864.4	511.3	0.0	0.0
	V	67.3	102.8	135.7	168.6	184.3	204.6	204.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	73.2	104.5	136.3	168.6	184.3	204.6	204.6
	M	2266.4	2030.3	1562.1	863.9	514.5	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 4, STRENGTH II
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	106.1	106.1	98.2	92.1	77.7	63.3	46.2	14.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	106.1	106.1	98.2	92.1	78.2	64.8	51.8	39.4
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	511.3	864.4	1595.5	2096.4	2398.1	2484.4
	V	204.6	204.6	184.3	168.6	135.7	102.8	67.3	17.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	204.6	204.6	184.3	168.6	136.3	104.5	73.2	42.4
	M	0.0	0.0	514.7	864.4	1563.6	2028.8	2264.7	2281.9

Bentley		Sheet #	71
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	46.2	63.3	77.7	92.1	98.2	106.1	106.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	51.8	64.8	78.2	92.1	98.2	106.1	106.1
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2398.1	2096.4	1595.5	864.4	511.3	0.0	0.0
	V	67.3	102.8	135.7	168.6	184.3	204.6	204.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	73.2	104.5	136.3	168.6	184.3	204.6	204.6
	M	2266.4	2030.3	1562.1	863.9	514.5	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 5, STRENGTH II
Shears: kips, Moments: kft

Bentley		Sheet #	73
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	61.0	103.4	192.8	256.6	294.9	307.7
Haunch (Max)	V	22.7	22.7	20.4	18.5	13.9	9.3	4.6	0.0
Deck + :	M	0.0	0.0	43.9	74.5	138.8	184.7	212.3	221.5
Haunch (Min)	V	16.4	16.4	14.7	13.3	10.0	6.7	3.3	0.0
Diaphragm :	M	0.0	0.0	7.2	12.8	27.0	41.1	55.2	69.3
(Max)	V	7.7	7.7	4.8	2.6	2.6	2.6	2.6	2.6
Diaphragm :	M	0.0	0.0	5.2	9.2	19.4	29.6	39.8	49.9
(Min)	V	5.5	5.5	3.5	1.8	1.8	1.8	1.8	1.8
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	106.1	106.1	98.2	92.1	77.7	63.3	46.2	14.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	106.1	106.1	98.2	92.1	78.2	64.8	51.8	39.4
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	511.3	864.4	1595.5	2096.4	2398.1	2484.4
	V	204.6	204.6	184.3	168.6	135.7	102.8	67.3	17.5
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	204.6	204.6	184.3	168.6	136.3	104.5	73.2	42.4
	M	0.0	0.0	514.7	864.4	1563.6	2028.8	2264.7	2281.9

Bentley		Sheet #	74
		Job #.	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	294.9	256.6	192.8	103.4	61.0	0.0	0.0
Haunch (Max)	V	4.6	9.3	13.9	18.5	20.4	22.7	22.7
Deck + :	M	212.3	184.7	138.8	74.5	43.9	0.0	0.0
Haunch (Min)	V	3.3	6.7	10.0	13.3	14.7	16.4	16.4
Diaphragm :	M	55.2	41.1	27.0	12.8	7.2	0.0	0.0
(Max)	V	2.6	2.6	2.6	2.6	4.8	7.7	7.7
Diaphragm :	M	39.8	29.6	19.4	9.2	5.2	0.0	0.0
(Min)	V	1.8	1.8	1.8	1.8	3.5	5.5	5.5
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	46.2	63.3	77.7	92.1	98.2	106.1	106.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	51.8	64.8	78.2	92.1	98.2	106.1	106.1
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2398.1	2096.4	1595.5	864.4	511.3	0.0	0.0
	V	67.3	102.8	135.7	168.6	184.3	204.6	204.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	73.2	104.5	136.3	168.6	184.3	204.6	204.6
	M	2266.4	2030.3	1562.1	863.9	514.5	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 6, STRENGTH II
Shears: kips, Moments: kft

Bentley		Sheet #	76
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	131.9	223.6	416.9	554.9	637.8	665.4
(Max)	V	49.2	49.2	44.0	40.1	30.1	20.0	10.0	0.0
Self wt. :	M	0.0	0.0	94.9	161.0	300.2	399.6	459.2	479.1
(Min)	V	35.4	35.4	31.7	28.8	21.6	14.4	7.2	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	58.4	99.1	184.7	245.8	282.5	294.7
Haunch (Max)	V	21.8	21.8	19.5	17.7	13.3	8.9	4.4	0.0
Deck + :	M	0.0	0.0	42.1	71.3	133.0	177.0	203.4	212.2
Haunch (Min)	V	15.7	15.7	14.0	12.8	9.6	6.4	3.2	0.0
Diaphragm :	M	0.0	0.0	3.6	6.4	13.5	20.5	27.6	34.7
(Max)	V	3.8	3.8	2.4	1.3	1.3	1.3	1.3	1.3
Diaphragm :	M	0.0	0.0	2.6	4.6	9.7	14.8	19.9	25.0
(Min)	V	2.8	2.8	1.7	0.9	0.9	0.9	0.9	0.9
DL-Comp :	M	0.0	0.0	31.4	53.3	99.4	132.3	152.1	158.7
DC(Max)	V	11.7	11.7	10.5	9.6	7.2	4.8	2.4	0.0
DL-Comp :	M	0.0	0.0	22.6	38.4	71.6	95.3	109.5	114.2
DC(Min)	V	8.4	8.4	7.6	6.9	5.2	3.4	1.7	0.0
DL-Comp :	M	0.0	0.0	14.5	24.5	45.7	60.9	69.9	73.0
DW(Max)	V	5.4	5.4	4.8	4.4	3.3	2.2	1.1	0.0
DL-Comp :	M	0.0	0.0	6.3	10.6	19.8	26.4	30.3	31.6
DW(Min)	V	2.3	2.3	2.1	1.9	1.4	1.0	0.5	0.0
LL + I :	M+	0.0	0.0	260.5	438.5	798.5	1030.3	1164.9	1186.1
	V	85.5	85.5	79.1	74.2	62.6	51.0	37.3	12.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	85.5	85.5	79.1	74.2	63.0	52.3	41.8	31.8
	M	0.0	0.0	263.8	438.5	767.5	969.5	1041.6	994.8
Pedestrian:	M+	0.0	0.0	4.8	8.2	15.3	20.3	23.3	24.3
	V	1.8	1.8	1.6	1.5	1.1	0.7	0.4	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.8	1.8	0.8	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.8	1.8	1.6	1.5	1.1	0.8	0.6	0.4
	M	-0.0	-0.0	4.9	8.2	14.3	13.5	13.2	13.1
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	505.2	853.7	1573.9	2065.1	2358.1	2436.8
	V	179.2	179.2	162.0	148.7	118.8	88.9	56.9	13.3
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	179.2	179.2	162.0	148.7	119.3	90.3	61.6	33.5
	M	0.0	0.0	508.5	853.7	1542.0	1997.5	2224.7	2234.3

Bentley		Sheet #	77
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	637.8	554.9	416.9	223.6	131.9	0.0	0.0
(Max)	V	10.0	20.0	30.1	40.1	44.0	49.2	49.2
Self wt. :	M	459.2	399.6	300.2	161.0	94.9	0.0	0.0
(Min)	V	7.2	14.4	21.6	28.8	31.7	35.4	35.4
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	282.5	245.8	184.7	99.1	58.4	0.0	0.0
Haunch (Max)	V	4.4	8.9	13.3	17.7	19.5	21.8	21.8
Deck + :	M	203.4	177.0	133.0	71.3	42.1	0.0	0.0
Haunch (Min)	V	3.2	6.4	9.6	12.8	14.0	15.7	15.7
Diaphragm :	M	27.6	20.5	13.5	6.4	3.6	0.0	0.0
(Max)	V	1.3	1.3	1.3	1.3	2.4	3.8	3.8
Diaphragm :	M	19.9	14.8	9.7	4.6	2.6	0.0	0.0
(Min)	V	0.9	0.9	0.9	0.9	1.7	2.8	2.8
DL-Comp :	M	152.1	132.3	99.4	53.3	31.4	0.0	0.0
DC(Max)	V	2.4	4.8	7.2	9.6	10.5	11.7	11.7
DL-Comp :	M	109.5	95.3	71.6	38.4	22.6	0.0	0.0
DC(Min)	V	1.7	3.4	5.2	6.9	7.6	8.4	8.4
DL-Comp :	M	69.9	60.9	45.7	24.5	14.5	0.0	0.0
DW(Max)	V	1.1	2.2	3.3	4.4	4.8	5.4	5.4
DL-Comp :	M	30.3	26.4	19.8	10.6	6.3	0.0	0.0
DW(Min)	V	0.5	1.0	1.4	1.9	2.1	2.3	2.3
LL + I :	M+	1164.9	1030.3	798.5	438.5	260.5	0.0	0.0
	V	37.3	51.0	62.6	74.2	79.1	85.5	85.5
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	41.8	52.3	63.0	74.2	79.1	85.5	85.5
	M	1041.6	969.5	767.5	438.5	263.8	0.0	0.0
Pedestrian:	M+	23.3	20.3	15.3	8.2	4.8	0.0	0.0
	V	0.4	0.7	1.1	1.5	1.6	1.8	1.8
Pedestrian:	M-	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.8	1.8	1.8
Pedestrian:	Vmx	0.6	0.9	1.2	1.5	1.6	1.8	1.8
	M	14.9	15.0	12.8	7.7	4.7	-0.0	-0.0
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	2358.1	2065.1	1573.9	853.7	505.1	0.0	0.0
	V	56.9	88.9	118.8	148.7	162.0	179.2	179.2
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	61.6	90.3	119.3	148.7	162.0	179.2	179.2
	M	2226.4	1999.0	1540.5	853.2	508.3	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 1, FATIGUE I
Shears: kips, Moments: kft

Bentley		Sheet #	79
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.8	79.4	148.0	197.0	226.4	236.2
Haunch (Max)	V	17.5	17.5	15.6	14.2	10.7	7.1	3.6	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	130.6	216.4	374.8	475.3	513.0	516.4
	V	50.8	50.8	46.5	43.2	35.6	28.5	20.8	19.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	50.8	50.8	46.5	43.2	35.6	28.8	23.3	19.1
	M	0.0	0.0	130.6	216.4	374.8	461.9	503.0	516.4
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	320.6	538.8	977.1	1279.1	1440.0	1488.2
	V	123.7	123.7	110.9	101.0	79.3	57.9	36.0	20.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	123.7	123.7	110.9	101.0	79.3	58.3	38.6	20.1
	M	0.0	0.0	320.6	538.8	977.1	1265.7	1429.9	1488.2

Bentley		Sheet #	80
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.4	197.0	148.0	79.4	46.8	0.0	0.0
Haunch (Max)	V	3.6	7.1	10.7	14.2	15.6	17.5	17.5
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	513.0	475.3	374.8	216.3	130.6	0.0	0.0
	V	20.8	28.5	35.6	43.2	46.5	50.8	50.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	23.3	28.8	35.6	43.2	46.5	50.8	50.8
	M	503.0	461.9	374.8	216.3	130.6	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1440.0	1279.1	977.1	538.8	320.6	0.0	0.0
	V	36.0	57.9	79.3	101.0	110.9	123.7	123.7
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	38.6	58.3	79.3	101.0	110.9	123.7	123.7
	M	1429.9	1265.7	977.1	538.8	320.6	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, FATIGUE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	123.4	204.4	354.1	449.1	484.8	488.0
	V	56.0	56.0	51.3	47.6	39.3	31.4	22.9	21.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	56.0	56.0	51.3	47.6	39.3	31.7	25.7	21.0
	M	0.0	0.0	123.4	204.4	354.1	436.4	475.2	488.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	318.2	535.4	973.5	1277.6	1443.3	1497.4
	V	132.7	132.7	118.2	107.1	84.4	62.1	39.3	23.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	132.7	132.7	118.2	107.1	84.4	62.5	42.1	23.1
	M	0.0	0.0	318.2	535.4	973.5	1264.9	1433.8	1497.4

Bentley		Sheet #	82
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	484.8	449.1	354.1	204.4	123.4	0.0	0.0
	V	22.9	31.4	39.3	47.6	51.3	56.0	56.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	25.7	31.7	39.3	47.6	51.3	56.0	56.0
	M	475.2	436.4	354.1	204.4	123.4	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1443.3	1277.6	973.5	535.4	318.2	0.0	0.0
	V	39.3	62.1	84.4	107.1	118.2	132.7	132.7
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	42.1	62.5	84.4	107.1	118.2	132.7	132.7
	M	1433.8	1264.9	973.5	535.4	318.2	0.0	0.0

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 3, FATIGUE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	123.4	204.4	354.1	449.1	484.8	488.0
	V	56.0	56.0	51.3	47.6	39.3	31.4	22.9	21.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	56.0	56.0	51.3	47.6	39.3	31.7	25.7	21.0
	M	0.0	0.0	123.4	204.4	354.1	436.4	475.2	488.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	318.2	535.4	973.5	1277.6	1443.3	1497.4
	V	132.7	132.7	118.2	107.1	84.4	62.1	39.3	23.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	132.7	132.7	118.2	107.1	84.4	62.5	42.1	23.1
	M	0.0	0.0	318.2	535.4	973.5	1264.9	1433.8	1497.4

Bentley		Sheet #	84
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	484.8	449.1	354.1	204.4	123.4	0.0	0.0
	V	22.9	31.4	39.3	47.6	51.3	56.0	56.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	25.7	31.7	39.3	47.6	51.3	56.0	56.0
	M	475.2	436.4	354.1	204.4	123.4	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1443.3	1277.6	973.5	535.4	318.2	0.0	0.0
	V	39.3	62.1	84.4	107.1	118.2	132.7	132.7
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	42.1	62.5	84.4	107.1	118.2	132.7	132.7
	M	1433.8	1264.9	973.5	535.4	318.2	0.0	0.0

Bentley			Sheet #	85
			Job #	Projects\1298\127-1298-
Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 4, FATIGUE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	123.4	204.4	354.1	449.1	484.8	488.0
	V	56.0	56.0	51.3	47.6	39.3	31.4	22.9	21.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	56.0	56.0	51.3	47.6	39.3	31.7	25.7	21.0
	M	0.0	0.0	123.4	204.4	354.1	436.4	475.2	488.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	318.2	535.4	973.5	1277.6	1443.3	1497.4
	V	132.7	132.7	118.2	107.1	84.4	62.1	39.3	23.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	132.7	132.7	118.2	107.1	84.4	62.5	42.1	23.1
	M	0.0	0.0	318.2	535.4	973.5	1264.9	1433.8	1497.4

Bentley		Sheet #	86
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	484.8	449.1	354.1	204.4	123.4	0.0	0.0
	V	22.9	31.4	39.3	47.6	51.3	56.0	56.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	25.7	31.7	39.3	47.6	51.3	56.0	56.0
	M	475.2	436.4	354.1	204.4	123.4	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1443.3	1277.6	973.5	535.4	318.2	0.0	0.0
	V	39.3	62.1	84.4	107.1	118.2	132.7	132.7
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	42.1	62.5	84.4	107.1	118.2	132.7	132.7
	M	1433.8	1264.9	973.5	535.4	318.2	0.0	0.0

Bentley		Sheet #	87
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 5, FATIGUE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	123.4	204.4	354.1	449.1	484.8	488.0
	V	56.0	56.0	51.3	47.6	39.3	31.4	22.9	21.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	56.0	56.0	51.3	47.6	39.3	31.7	25.7	21.0
	M	0.0	0.0	123.4	204.4	354.1	436.4	475.2	488.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	318.2	535.4	973.5	1277.6	1443.3	1497.4
	V	132.7	132.7	118.2	107.1	84.4	62.1	39.3	23.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	132.7	132.7	118.2	107.1	84.4	62.5	42.1	23.1
	M	0.0	0.0	318.2	535.4	973.5	1264.9	1433.8	1497.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	235.9	205.3	154.2	82.7	48.8	0.0	0.0
Haunch (Max)	V	3.7	7.4	11.1	14.8	16.3	18.2	18.2
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	44.2	32.9	21.6	10.3	5.8	0.0	0.0
(Max)	V	2.1	2.1	2.1	2.1	3.8	6.2	6.2
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	484.8	449.1	354.1	204.4	123.4	0.0	0.0
	V	22.9	31.4	39.3	47.6	51.3	56.0	56.0
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	25.7	31.7	39.3	47.6	51.3	56.0	56.0
	M	475.2	436.4	354.1	204.4	123.4	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1443.3	1277.6	973.5	535.4	318.2	0.0	0.0
	V	39.3	62.1	84.4	107.1	118.2	132.7	132.7
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	42.1	62.5	84.4	107.1	118.2	132.7	132.7
	M	1433.8	1264.9	973.5	535.4	318.2	0.0	0.0

Bentley		Sheet #	89
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 6, FATIGUE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.7	79.3	147.7	196.7	226.0	235.8
Haunch (Max)	V	17.4	17.4	15.6	14.2	10.6	7.1	3.5	0.0
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	0.0	0.0	130.6	216.4	374.8	475.3	513.0	516.4
	V	50.8	50.8	46.5	43.2	35.6	28.5	20.8	19.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	50.8	50.8	46.5	43.2	35.6	28.8	23.3	19.1
	M	0.0	0.0	130.6	216.4	374.8	461.9	503.0	516.4
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	320.5	538.7	976.8	1278.7	1439.6	1487.8
	V	123.6	123.6	110.9	101.0	79.3	57.9	36.0	20.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	123.6	123.6	110.9	101.0	79.3	58.2	38.6	20.1
	M	0.0	0.0	320.5	538.7	976.8	1265.3	1429.5	1487.8

Bentley		Sheet #	90
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	32.57	38.08	43.60	49.11	51.29	54.12	54.12
Self wt. :	M	510.2	443.9	333.5	178.9	105.5	0.0	0.0
(Max)	V	8.0	16.0	24.0	32.1	35.2	39.3	39.3
Self wt. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	226.0	196.7	147.7	79.3	46.7	0.0	0.0
Haunch (Max)	V	3.5	7.1	10.6	14.2	15.6	17.4	17.4
Deck + :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	22.1	16.4	10.8	5.1	2.9	0.0	0.0
(Max)	V	1.0	1.0	1.0	1.0	1.9	3.1	3.1
Diaphragm :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	121.7	105.9	79.5	42.7	25.2	0.0	0.0
DC(Max)	V	1.9	3.8	5.7	7.6	8.4	9.4	9.4
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Comp :	M	46.6	40.6	30.5	16.3	9.6	0.0	0.0
DW(Max)	V	0.7	1.5	2.2	2.9	3.2	3.6	3.6
DL-Comp :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Min)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	M+	513.0	475.3	374.8	216.3	130.6	0.0	0.0
	V	20.8	28.5	35.6	43.2	46.5	50.8	50.8
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	23.3	28.8	35.6	43.2	46.5	50.8	50.8
	M	503.0	461.9	374.8	216.3	130.6	0.0	0.0
Pedestrian:	M+	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	1439.6	1278.7	976.8	538.7	320.5	0.0	0.0
	V	36.0	57.9	79.3	101.0	110.9	123.6	123.6
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	38.6	58.2	79.3	101.0	110.9	123.6	123.6
	M	1429.5	1265.3	976.8	538.7	320.5	0.0	0.0

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 1, STRENGTH I

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	131
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Transfer :	0.50									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Critical :	5.86									
168.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.08
1049.3	3.20	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.165	0.010
0.1L :	5.51									
171.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.11
986.2	3.20	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.136	0.010
0.2L :	11.02									
138.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.82
1774.0	3.20	64.30	189.0	0.025	214.3	2.23	24.00	0.299	2.643	0.010
0.3L :	16.54									
106.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.20
2289.2	3.20	64.30	189.0	0.019	214.3	2.23	24.00	0.299	3.448	0.010
0.4L :	22.05									
74.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.66
2537.7	3.20	64.30	189.0	0.014	214.3	2.23	24.00	0.299	4.928	0.010
0.5L :	27.56									
43.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.25
2533.4	3.20	64.30	189.0	0.008	214.3	2.23	24.00	0.299	8.499	0.010
0.6L :	33.07									
74.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.67
2539.9	3.20	64.30	189.0	0.014	214.3	2.23	24.00	0.299	4.926	0.010
0.7L :	38.58									
106.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.21
2291.1	3.20	64.30	189.0	0.019	214.3	2.23	24.00	0.299	3.447	0.010
0.8L :	44.10									
138.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.82
1772.1	3.20	64.30	189.0	0.025	214.3	2.23	24.00	0.299	2.642	0.010

Location(ft) / Vu (kips) / Mcor (kft)	bv (in) / a (in)	de (in) / dv (in)	Aps (in2) / fpo (ksi)	Vp (kips) / vu/fc	eps_x / Vc-com (kips)	Theta / Beta	Vs-reqd (kips) / Max.spc. (in)	Av/s (in2/ft) / min.Av/s (in2/ft)	Av-prvd (in2/ft) / pVn/Vu	Al_reqd (in2) / Aps* (in2)
	49.61									
171.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.51
985.6	3.20	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.136	0.010
Critical :	49.26									
168.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.70
1048.6	3.20	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.165	0.010
Transfer :	54.62									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Bearing :	54.62									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 1

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 1
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley		Sheet #	133
		Job #	Projects\1298\127-1298-

Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA		Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013		Date	Oct/28/2013
		www.bentley.com	Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**			Date	Feb/11/2014

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 205.1	0.00 3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Transfer : 205.1	0.00 3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Critical : 168.8	5.36 2.92	65.90	3.20	64.30	24.00	0.236	0.381	0.000	**0.000***
0.1L : 171.2	5.01 2.96	65.90	3.20	64.30	24.00	0.236	0.395	0.000	**0.000***
0.2L : 138.3	10.52 2.39	65.90	3.20	64.30	24.00	0.236	0.206	0.000	**0.000***
0.3L : 106.0	16.04 1.83	65.90	3.20	64.30	24.00	0.236	0.020	0.000	**0.000***
0.4L : 74.2	21.55 1.28	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.5L : 43.0	27.06 0.74	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.6L : 74.2	32.57 1.28	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.7L : 106.0	38.08 1.83	65.90	3.20	64.30	24.00	0.236	0.020	0.000	**0.000***
0.8L : 138.3	43.60 2.39	65.90	3.20	64.30	24.00	0.236	0.206	0.000	**0.000***
0.9L : 171.2	49.11 2.96	65.90	3.20	64.30	24.00	0.236	0.395	0.000	**0.000***
Critical : 168.8	48.76 2.92	65.90	3.20	64.30	24.00	0.236	0.381	0.000	**0.000***
Transfer : 205.1	54.12 3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Bearing : 205.1	54.12 3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 2, STRENGTH I

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	135
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location(ft) / Vu (kips) / Mcor (kft)	bv (in) / a (in)	de (in) / dv (in)	Aps (in2) / fpo (ksi)	Vp (kips) / vu/fc	eps_x / Vc-com (kips)	Theta / Beta	Vs-reqd (kips) / Max.spc. (in)	Av/s (in2/ft) / min.Av/s (in2/ft)	Av-prvd (in2/ft) / pVn/Vu	Al_reqd (in2) / Aps* (in2)
Bearing :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Transfer :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Critical :	5.86									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	2.65
1061.6	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
0.1L :	5.51									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	2.72
996.8	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.864	0.010
0.2L :	11.02									
159.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1795.2	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.290	0.010
0.3L :	16.54									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.52
2320.1	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.4L :	22.05									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.97
2577.2	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.126	0.010
0.5L :	27.56									
54.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.55
2580.5	3.07	64.36	189.0	0.010	214.5	2.23	24.00	0.299	6.749	0.010
0.6L :	33.07									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.98
2579.4	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.125	0.010
0.7L :	38.58									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.53
2322.0	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.8L :	44.10									
159.9	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1793.3	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.289	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	6.16
996.2	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.863	0.010
Critical :	49.26									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	6.31
1060.9	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
Transfer :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Bearing :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 2

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 2
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 0.00 236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Transfer : 0.00 236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Critical : 5.36 193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
0.1L : 5.01 196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
0.2L : 10.52 159.8	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.3L : 16.04 124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.122	0.000	**0.000***
0.4L : 21.55 88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L : 27.06 54.2	0.94	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L : 32.57 88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L : 38.08 124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.123	0.000	**0.000***
0.8L : 43.60 159.9	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.9L : 49.11 196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
Critical : 48.76 193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
Transfer : 54.12 236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Bearing : 54.12 236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 3, STRENGTH I

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	139
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Transfer :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Critical :	5.86									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	2.65
1061.6	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
0.1L :	5.51									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	2.72
996.8	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.864	0.010
0.2L :	11.02									
159.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1795.2	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.290	0.010
0.3L :	16.54									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.52
2320.1	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.4L :	22.05									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.97
2577.2	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.126	0.010
0.5L :	27.56									
54.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.55
2580.5	3.07	64.36	189.0	0.010	214.5	2.23	24.00	0.299	6.749	0.010
0.6L :	33.07									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.98
2579.4	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.125	0.010
0.7L :	38.58									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.53
2322.0	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.8L :	44.10									
159.9	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1793.3	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.289	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	6.16
996.2	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.863	0.010
Critical :	49.26									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	6.31
1060.9	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
Transfer :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Bearing :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 3

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 3
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley		Sheet #	141
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 236.6	0.00 4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Transfer : 236.6	0.00 4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Critical : 193.5	5.36 3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
0.1L : 196.4	5.01 3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
0.2L : 159.8	10.52 2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.3L : 124.0	16.04 2.14	65.90	3.07	64.36	24.00	0.236	0.122	0.000	**0.000***
0.4L : 88.7	21.55 1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L : 54.2	27.06 0.94	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L : 88.7	32.57 1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L : 124.0	38.08 2.14	65.90	3.07	64.36	24.00	0.236	0.123	0.000	**0.000***
0.8L : 159.9	43.60 2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.9L : 196.4	49.11 3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
Critical : 193.5	48.76 3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
Transfer : 236.6	54.12 4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Bearing : 236.6	54.12 4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 4, STRENGTH I

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	143
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	 bv (in) a (in)	 de (in) dv (in)	 Aps (in2) fpo (ksi)	 Vp (kips) vu/fc	 eps_x Vc-com (kips)	 Theta Beta	 Vs-reqd (kips) Max.spc. (in)	 Av/s (in2/ft) min.Av/s (in2/ft)	 Av-prvd (in2/ft) pVn/Vu	 Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Transfer :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Critical :	5.86									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	2.65
1061.6	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
0.1L :	5.51									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	2.72
996.8	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.864	0.010
0.2L :	11.02									
159.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1795.2	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.290	0.010
0.3L :	16.54									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.52
2320.1	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.4L :	22.05									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.97
2577.2	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.126	0.010
0.5L :	27.56									
54.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.55
2580.5	3.07	64.36	189.0	0.010	214.5	2.23	24.00	0.299	6.749	0.010
0.6L :	33.07									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.98
2579.4	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.125	0.010
0.7L :	38.58									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.53
2322.0	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.8L :	44.10									
159.9	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1793.3	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.289	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	6.16
996.2	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.863	0.010
Critical :	49.26									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	6.31
1060.9	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
Transfer :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Bearing :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 4

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 4
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley		Sheet #	145
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft) / Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing :	0.00								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Transfer :	0.00								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Critical :	5.36								
193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
0.1L :	5.01								
196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
0.2L :	10.52								
159.8	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.3L :	16.04								
124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.122	0.000	**0.000***
0.4L :	21.55								
88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L :	27.06								
54.2	0.94	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L :	32.57								
88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L :	38.08								
124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.123	0.000	**0.000***
0.8L :	43.60								
159.9	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.9L :	49.11								
196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
Critical :	48.76								
193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
Transfer :	54.12								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Bearing :	54.12								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 5, STRENGTH I
Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	147
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Transfer :	0.50									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Critical :	5.86									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	2.65
1061.6	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
0.1L :	5.51									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	2.72
996.8	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.864	0.010
0.2L :	11.02									
159.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1795.2	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.290	0.010
0.3L :	16.54									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.52
2320.1	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.4L :	22.05									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.97
2577.2	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.126	0.010
0.5L :	27.56									
54.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.55
2580.5	3.07	64.36	189.0	0.010	214.5	2.23	24.00	0.299	6.749	0.010
0.6L :	33.07									
88.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.98
2579.4	3.07	64.36	189.0	0.016	214.5	2.23	24.00	0.299	4.125	0.010
0.7L :	38.58									
124.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.53
2322.0	3.07	64.36	189.0	0.023	214.5	2.23	24.00	0.299	2.951	0.010
0.8L :	44.10									
159.9	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.16
1793.3	3.07	64.36	189.0	0.029	214.5	2.23	24.00	0.299	2.289	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
196.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	3.7	0.299	0.440	6.16
996.2	3.07	64.36	189.0	0.036	214.5	2.23	24.00	0.299	1.863	0.010
Critical :	49.26									
193.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.5	0.299	0.440	6.31
1060.9	3.07	64.36	189.0	0.035	214.5	2.23	24.00	0.299	1.891	0.010
Transfer :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007
Bearing :	54.62									
236.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	48.4	0.299	0.440	3.74
0.0	3.07	64.37	189.0	0.043	214.5	2.23	24.00	0.299	1.547	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 5

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 5
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing :	0.00								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Transfer :	0.00								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Critical :	5.36								
193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
0.1L :	5.01								
196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
0.2L :	10.52								
159.8	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.3L :	16.04								
124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.122	0.000	**0.000***
0.4L :	21.55								
88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L :	27.06								
54.2	0.94	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L :	32.57								
88.7	1.53	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L :	38.08								
124.0	2.14	65.90	3.07	64.36	24.00	0.236	0.123	0.000	**0.000***
0.8L :	43.60								
159.9	2.76	65.90	3.07	64.36	24.00	0.236	0.329	0.000	**0.000***
0.9L :	49.11								
196.4	3.39	65.90	3.07	64.36	24.00	0.236	0.539	0.000	**0.000***
Critical :	48.76								
193.5	3.34	65.90	3.07	64.36	24.00	0.236	0.523	0.000	**0.000***
Transfer :	54.12								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***
Bearing :	54.12								
236.6	4.08	65.90	3.07	64.37	24.00	0.236	0.771	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 6, STRENGTH I

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	151
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone:, 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location(ft) / Vu (kips) / Mcor (kft)	bv (in) / a (in)	de (in) / dv (in)	Aps (in2) / fpo (ksi)	Vp (kips) / vu/fc	eps_x / Vc-com (kips)	Theta / Beta	Vs-reqd (kips) / Max.spc. (in)	Av/s (in2/ft) / min.Av/s (in2/ft)	Av-prvd (in2/ft) / pVn/Vu	Al_reqd (in2) / Aps* (in2)
Bearing :	0.50									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Transfer :	0.50									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Critical :	5.86									
168.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.08
1049.1	3.21	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.166	0.010
0.1L :	5.51									
171.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.10
986.0	3.21	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.136	0.010
0.2L :	11.02									
138.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.82
1773.6	3.21	64.30	189.0	0.025	214.3	2.23	24.00	0.299	2.644	0.010
0.3L :	16.54									
106.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.20
2288.8	3.21	64.30	189.0	0.019	214.3	2.23	24.00	0.299	3.449	0.010
0.4L :	22.05									
74.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.66
2537.2	3.21	64.30	189.0	0.014	214.3	2.23	24.00	0.299	4.928	0.010
0.5L :	27.56									
43.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.25
2532.9	3.21	64.30	189.0	0.008	214.3	2.23	24.00	0.299	8.498	0.010
0.6L :	33.07									
74.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.66
2539.4	3.21	64.30	189.0	0.014	214.3	2.23	24.00	0.299	4.927	0.010
0.7L :	38.58									
106.0	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	9.20
2290.7	3.21	64.30	189.0	0.019	214.3	2.23	24.00	0.299	3.447	0.010
0.8L :	44.10									
138.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.82
1771.7	3.21	64.30	189.0	0.025	214.3	2.23	24.00	0.299	2.643	0.010

Location(ft)										
Vu (kips)	bv (in)	de (in)	Aps (in2)	Vp (kips)	eps_x	Theta	Vs-reqd (kips)	Av/s (in2/ft)	Av-prvd (in2/ft)	Al_reqd (in2)
Mcor (kft)	a (in)	dv (in)	fpo (ksi)	vu/fc	Vc-com (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
	49.61									
171.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.51
985.4	3.21	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.136	0.010
Critical :	49.26									
168.8	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.70
1048.4	3.21	64.30	189.0	0.031	214.3	2.23	24.00	0.299	2.166	0.010
Transfer :	54.62									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007
Bearing :	54.62									
205.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	13.6	0.299	0.440	2.95
0.0	3.20	64.30	189.0	0.037	214.3	2.23	24.00	0.299	1.782	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 6

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 6
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 0.00									
205.1	3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Transfer : 0.00									
205.1	3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Critical : 5.36									
168.8	2.92	65.90	3.21	64.30	24.00	0.236	0.381	0.000	**0.000***
0.1L : 5.01									
171.1	2.96	65.90	3.21	64.30	24.00	0.236	0.395	0.000	**0.000***
0.2L : 10.52									
138.3	2.39	65.90	3.21	64.30	24.00	0.236	0.206	0.000	**0.000***
0.3L : 16.04									
106.0	1.83	65.90	3.21	64.30	24.00	0.236	0.020	0.000	**0.000***
0.4L : 21.55									
74.2	1.28	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.5L : 27.06									
43.0	0.74	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.6L : 32.57									
74.2	1.28	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.7L : 38.08									
106.0	1.83	65.90	3.21	64.30	24.00	0.236	0.020	0.000	**0.000***
0.8L : 43.60									
138.3	2.39	65.90	3.21	64.30	24.00	0.236	0.206	0.000	**0.000***
0.9L : 49.11									
171.1	2.96	65.90	3.21	64.30	24.00	0.236	0.395	0.000	**0.000***
Critical : 48.76									
168.8	2.92	65.90	3.21	64.30	24.00	0.236	0.381	0.000	**0.000***
Transfer : 54.12									
205.1	3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***
Bearing : 54.12									
205.1	3.54	65.90	3.20	64.30	24.00	0.236	0.591	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 1, STRENGTH II

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Location(ft)										
Vu (kips)	bv (in)	de (in)	Aps (in2)	Vp (kips)	eps_x	Theta	Vs-reqd (kips)	Av/s (in2/ft)	Av-prvd (in2/ft)	Al_reqd (in2)
Mcor (kft)	a (in)	dv (in)	fpo (ksi)	vu/fc	Vc-com (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
Bearing :	0.50									
179.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Transfer :	0.50									
179.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Critical :	5.86									
146.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	1.80
908.6	3.20	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.493	0.010
0.1L :	5.51									
148.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	1.82
853.8	3.20	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.458	0.010
0.2L :	11.02									
119.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	6.78
1542.3	3.20	64.30	189.0	0.022	214.3	2.23	24.00	0.299	3.064	0.010
0.3L :	16.54									
90.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.99
1997.9	3.20	64.30	189.0	0.016	214.3	2.23	24.00	0.299	4.049	0.010
0.4L :	22.05									
61.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.42
2225.2	3.20	64.30	189.0	0.011	214.3	2.23	24.00	0.299	5.932	0.010
0.5L :	27.56									
33.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.10
2234.8	3.20	64.30	189.0	0.006	214.3	2.23	24.00	0.299	10.920	0.010
0.6L :	33.07									
61.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.43
2226.8	3.20	64.30	189.0	0.011	214.3	2.23	24.00	0.299	5.931	0.010
0.7L :	38.58									
90.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.00
1999.4	3.20	64.30	189.0	0.017	214.3	2.23	24.00	0.299	4.048	0.010
0.8L :	44.10									
119.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	6.78
1540.8	3.20	64.30	189.0	0.022	214.3	2.23	24.00	0.299	3.064	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
148.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	4.77
853.3	3.20	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.457	0.010
Critical :	49.26									
146.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	4.94
908.1	3.20	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.493	0.010
Transfer :	54.62									
179.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Bearing :	54.62									
179.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 1

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 1
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing :	0.00								
179.3	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Transfer :	0.00								
179.3	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Critical :	5.36								
146.6	2.53	65.90	3.20	64.30	24.00	0.236	0.254	0.000	**0.000***
0.1L :	5.01								
148.7	2.57	65.90	3.20	64.30	24.00	0.236	0.266	0.000	**0.000***
0.2L :	10.52								
119.3	2.06	65.90	3.20	64.30	24.00	0.236	0.096	0.000	**0.000***
0.3L :	16.04								
90.3	1.56	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.4L :	21.55								
61.6	1.06	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.5L :	27.06								
33.5	0.58	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.6L :	32.57								
61.6	1.07	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.7L :	38.08								
90.3	1.56	65.90	3.20	64.30	24.00	0.236	0.000	0.000	0.000
0.8L :	43.60								
119.3	2.06	65.90	3.20	64.30	24.00	0.236	0.096	0.000	**0.000***
0.9L :	49.11								
148.7	2.57	65.90	3.20	64.30	24.00	0.236	0.266	0.000	**0.000***
Critical :	48.76								
146.6	2.53	65.90	3.20	64.30	24.00	0.236	0.254	0.000	**0.000***
Transfer :	54.12								
179.3	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Bearing :	54.12								
179.3	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 2, STRENGTH II

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	159
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Transfer :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Critical :	5.86									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.04
920.8	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
0.1L :	5.51									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.07
864.4	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
0.2L :	11.02									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.07
1563.6	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010
0.3L :	16.54									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.27
2028.8	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.501	0.010
0.4L :	22.05									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.69
2264.7	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.002	0.010
0.5L :	27.56									
42.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.37
2281.9	3.07	64.36	189.0	0.008	214.5	2.23	24.00	0.299	8.628	0.010
0.6L :	33.07									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.70
2266.4	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.001	0.010
0.7L :	38.58									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.28
2030.3	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.500	0.010
0.8L :	44.10									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.06
1562.1	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.06
863.9	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
Critical :	49.26									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.22
920.2	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
Transfer :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Bearing :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 2

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 2
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley		Sheet #	161
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft)	Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 0.00	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Transfer : 0.00	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Critical : 5.36	166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
0.1L : 5.01	168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.379	0.000	**0.000***
0.2L : 10.52	136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.193	0.000	**0.000***
0.3L : 16.04	104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.010	0.000	**0.000***
0.4L : 21.55	73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L : 27.06	42.4	0.73	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L : 32.57	73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L : 38.08	104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.011	0.000	**0.000***
0.8L : 43.60	136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.194	0.000	**0.000***
0.9L : 49.11	168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.380	0.000	**0.000***
Critical : 48.76	166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
Transfer : 54.12	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Bearing : 54.12	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 3, STRENGTH II
Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	163
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Transfer :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Critical :	5.86									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.04
920.8	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
0.1L :	5.51									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.07
864.4	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
0.2L :	11.02									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.07
1563.6	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010
0.3L :	16.54									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.27
2028.8	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.501	0.010
0.4L :	22.05									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.69
2264.7	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.002	0.010
0.5L :	27.56									
42.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.37
2281.9	3.07	64.36	189.0	0.008	214.5	2.23	24.00	0.299	8.628	0.010
0.6L :	33.07									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.70
2266.4	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.001	0.010
0.7L :	38.58									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.28
2030.3	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.500	0.010
0.8L :	44.10									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.06
1562.1	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010

Bentley		Sheet #	164
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.06
863.9	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
Critical :	49.26									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.22
920.2	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
Transfer :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Bearing :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 3

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 3
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley			Sheet #	165
			Job #	Projects\1298\127-1298-
Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft)		Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing :	0.00	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Transfer :	0.00	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Critical :	5.36	166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
0.1L :	5.01	168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.379	0.000	**0.000***
0.2L :	10.52	136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.193	0.000	**0.000***
0.3L :	16.04	104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.010	0.000	**0.000***
0.4L :	21.55	73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L :	27.06	42.4	0.73	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L :	32.57	73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L :	38.08	104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.011	0.000	**0.000***
0.8L :	43.60	136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.194	0.000	**0.000***
0.9L :	49.11	168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.380	0.000	**0.000***
Critical :	48.76	166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
Transfer :	54.12	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Bearing :	54.12	204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 4, STRENGTH II

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	167
		Job #	Projects\1298\127-1298-

Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA		Designed	ALH
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013		Date	Oct/28/2013
		www.bentley.com	Phone: 1-800-778-4277	Checked	SAM
File Name:	**KHOST_BRIDGE_9.csl**			Date	Feb/11/2014

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Transfer :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Critical :	5.86									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.04
920.8	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
0.1L :	5.51									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.07
864.4	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
0.2L :	11.02									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.07
1563.6	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010
0.3L :	16.54									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.27
2028.8	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.501	0.010
0.4L :	22.05									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.69
2264.7	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.002	0.010
0.5L :	27.56									
42.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.37
2281.9	3.07	64.36	189.0	0.008	214.5	2.23	24.00	0.299	8.628	0.010
0.6L :	33.07									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.70
2266.4	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.001	0.010
0.7L :	38.58									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.28
2030.3	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.500	0.010
0.8L :	44.10									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.06
1562.1	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
	49.61									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.06
863.9	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
Critical :	49.26									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.22
920.2	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
Transfer :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Bearing :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 4

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 4
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Bentley		Sheet #	169
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 204.6	0.00 3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Transfer : 204.6	0.00 3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Critical : 166.1	5.36 2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
0.1L : 168.6	5.01 2.91	65.90	3.07	64.36	24.00	0.236	0.379	0.000	**0.000***
0.2L : 136.3	10.52 2.35	65.90	3.07	64.36	24.00	0.236	0.193	0.000	**0.000***
0.3L : 104.5	16.04 1.80	65.90	3.07	64.36	24.00	0.236	0.010	0.000	**0.000***
0.4L : 73.2	21.55 1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L : 42.4	27.06 0.73	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L : 73.2	32.57 1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L : 104.5	38.08 1.80	65.90	3.07	64.36	24.00	0.236	0.011	0.000	**0.000***
0.8L : 136.3	43.60 2.35	65.90	3.07	64.36	24.00	0.236	0.194	0.000	**0.000***
0.9L : 168.6	49.11 2.91	65.90	3.07	64.36	24.00	0.236	0.380	0.000	**0.000***
Critical : 166.1	48.76 2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
Transfer : 204.6	54.12 3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Bearing : 204.6	54.12 3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 5, STRENGTH II
Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
Bearing :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Transfer :	0.50									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Critical :	5.86									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.04
920.8	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
0.1L :	5.51									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.07
864.4	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
0.2L :	11.02									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.07
1563.6	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010
0.3L :	16.54									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.27
2028.8	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.501	0.010
0.4L :	22.05									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.69
2264.7	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.002	0.010
0.5L :	27.56									
42.4	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.37
2281.9	3.07	64.36	189.0	0.008	214.5	2.23	24.00	0.299	8.628	0.010
0.6L :	33.07									
73.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.70
2266.4	3.07	64.36	189.0	0.013	214.5	2.23	24.00	0.299	5.001	0.010
0.7L :	38.58									
104.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.28
2030.3	3.07	64.36	189.0	0.019	214.5	2.23	24.00	0.299	3.500	0.010
0.8L :	44.10									
136.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.06
1562.1	3.07	64.36	189.0	0.025	214.5	2.23	24.00	0.299	2.684	0.010

Location(ft)										
Vu (kips)	bv (in)	de (in)	Aps (in2)	Vp (kips)	eps_x	Theta	Vs-reqd (kips)	Av/s (in2/ft)	Av-prvd (in2/ft)	Al_reqd (in2)
Mcor (kft)	a (in)	dv (in)	fpo (ksi)	vu/fc	Vc-com (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
	49.61									
168.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.06
863.9	3.07	64.36	189.0	0.031	214.5	2.23	24.00	0.299	2.170	0.010
Critical :	49.26									
166.1	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	5.22
920.2	3.07	64.36	189.0	0.030	214.5	2.23	24.00	0.299	2.203	0.010
Transfer :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007
Bearing :	54.62									
204.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	12.9	0.299	0.440	2.94
0.0	3.07	64.37	189.0	0.037	214.5	2.23	24.00	0.299	1.788	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 5

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 5
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) / Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 0.00									
204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Transfer : 0.00									
204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Critical : 5.36									
166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
0.1L : 5.01									
168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.379	0.000	**0.000***
0.2L : 10.52									
136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.193	0.000	**0.000***
0.3L : 16.04									
104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.010	0.000	**0.000***
0.4L : 21.55									
73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.5L : 27.06									
42.4	0.73	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.6L : 32.57									
73.2	1.26	65.90	3.07	64.36	24.00	0.236	0.000	0.000	0.000
0.7L : 38.08									
104.5	1.80	65.90	3.07	64.36	24.00	0.236	0.011	0.000	**0.000***
0.8L : 43.60									
136.3	2.35	65.90	3.07	64.36	24.00	0.236	0.194	0.000	**0.000***
0.9L : 49.11									
168.6	2.91	65.90	3.07	64.36	24.00	0.236	0.380	0.000	**0.000***
Critical : 48.76									
166.1	2.87	65.90	3.07	64.36	24.00	0.236	0.365	0.000	**0.000***
Transfer : 54.12									
204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***
Bearing : 54.12									
204.6	3.53	65.90	3.07	64.37	24.00	0.236	0.587	0.000	**0.000***

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 6, STRENGTH II

Using General Beta Theta Tables procedure - Art.5.8.3.4.2

Bentley		Sheet #	175
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location(ft) / Vu (kips) / Mcor (kft)	bv (in) / a (in)	de (in) / dv (in)	Aps (in2) / fpo (ksi)	Vp (kips) / vu/fc	eps_x / Vc-com (kips)	Theta / Beta	Vs-reqd (kips) / Max.spc. (in)	Av/s (in2/ft) / min.Av/s (in2/ft)	Av-prvd (in2/ft) / pVn/Vu	Al_reqd (in2) / Aps* (in2)
Bearing :	0.50									
179.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Transfer :	0.50									
179.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Critical :	5.86									
146.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	1.80
908.4	3.21	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.493	0.010
0.1L :	5.51									
148.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	1.82
853.7	3.21	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.458	0.010
0.2L :	11.02									
119.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	6.78
1542.0	3.21	64.30	189.0	0.022	214.3	2.23	24.00	0.299	3.065	0.010
0.3L :	16.54									
90.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	7.99
1997.5	3.21	64.30	189.0	0.016	214.3	2.23	24.00	0.299	4.050	0.010
0.4L :	22.05									
61.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.42
2224.7	3.21	64.30	189.0	0.011	214.3	2.23	24.00	0.299	5.933	0.010
0.5L :	27.56									
33.5	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.10
2234.3	3.21	64.30	189.0	0.006	214.3	2.23	24.00	0.299	10.920	0.010
0.6L :	33.07									
61.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.42
2226.4	3.21	64.30	189.0	0.011	214.3	2.23	24.00	0.299	5.931	0.010
0.7L :	38.58									
90.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	8.00
1999.0	3.21	64.30	189.0	0.017	214.3	2.23	24.00	0.299	4.048	0.010
0.8L :	44.10									
119.3	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	6.78
1540.5	3.21	64.30	189.0	0.022	214.3	2.23	24.00	0.299	3.064	0.010

Location(ft) Vu (kips) Mcor (kft)	bv (in) a (in)	de (in) dv (in)	Aps (in2) fpo (ksi)	Vp (kips) vu/fc	eps_x Vc-com (kips)	Theta Beta	Vs-reqd (kips) Max.spc. (in)	Av/s (in2/ft) min.Av/s (in2/ft)	Av-prvd (in2/ft) pVn/Vu	Al_reqd (in2) Aps* (in2)
49.61										
148.7	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	4.77
853.2	3.21	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.458	0.010
Critical :	49.26									
146.6	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	4.93
907.8	3.21	64.30	189.0	0.027	214.3	2.23	24.00	0.299	2.493	0.010
Transfer :	54.62									
179.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007
Bearing :	54.62									
179.2	23.64	65.90	0.010	0.0	1.00e-3	36.4	0.0	0.299	0.440	2.30
0.0	3.20	64.30	189.0	0.033	214.3	2.23	24.00	0.299	2.039	0.007

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 1, Beam : 6

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
2.02	20.00	5.91	0.00

HORIZONTAL SHEAR (Art. 5.8.4) - Span : 1, Beam : 6
(Beam and Slab effects are INCLUDED in Vu).
Computed Interface width considered to be engaged in shear transfer, bvi = 23.64(in).

Location (ft) Vu (kips)	Vnh-req (kips/in)	de (in)	a (in)	dv (in)	s_max (in)	Avh-min (in2/ft)	Avh-sm (in2/ft)	Avh-rg (in2/ft)	Avh-prvd (in2/ft)
Bearing : 0.00 179.2	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Transfer : 0.00 179.2	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Critical : 5.36 146.6	2.53	65.90	3.21	64.30	24.00	0.236	0.254	0.000	**0.000***
0.1L : 5.01 148.7	2.57	65.90	3.21	64.30	24.00	0.236	0.266	0.000	**0.000***
0.2L : 10.52 119.3	2.06	65.90	3.21	64.30	24.00	0.236	0.096	0.000	**0.000***
0.3L : 16.04 90.3	1.56	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.4L : 21.55 61.6	1.06	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.5L : 27.06 33.5	0.58	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.6L : 32.57 61.6	1.06	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.7L : 38.08 90.3	1.56	65.90	3.21	64.30	24.00	0.236	0.000	0.000	0.000
0.8L : 43.60 119.3	2.06	65.90	3.21	64.30	24.00	0.236	0.096	0.000	**0.000***
0.9L : 49.11 148.7	2.57	65.90	3.21	64.30	24.00	0.236	0.266	0.000	**0.000***
Critical : 48.76 146.6	2.53	65.90	3.21	64.30	24.00	0.236	0.254	0.000	**0.000***
Transfer : 54.12 179.2	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***
Bearing : 54.12 179.2	3.10	65.90	3.20	64.30	24.00	0.236	0.442	0.000	**0.000***

CAMBER/DEFLECTION

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 1, Beam : 1; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.023	2.30	-0.054
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			-0.000	3.00	-0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.257		-0.404

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.046	2.30	-0.107
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.013
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			-0.000	3.00	-0.000
Live Load					-0.060
Pedestrian Load					-0.000
Total	-0.228		-0.489		-0.776

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.065	2.30	-0.149
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.006	3.00	-0.018
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.048
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			-0.000	3.00	-0.000
Live Load					-0.084
Pedestrian Load					-0.000
Total	-0.313		-0.671		-1.068

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.076	2.30	-0.175
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.007	3.00	-0.021
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			-0.000	3.00	-0.000
Live Load					-0.099
Pedestrian Load					-0.000
Total	-0.366		-0.787		-1.254

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.080	2.30	-0.184
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.023
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.020	3.00	-0.059
DL-Comp. (DW)			-0.008	3.00	-0.023
Temperature			-0.000	3.00	-0.000
Live Load					-0.104
Pedestrian Load					-0.000
Total	-0.385		-0.827		-1.318

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.076	2.30	-0.175
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.007	3.00	-0.021
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			-0.000	3.00	-0.000
Live Load					-0.099
Pedestrian Load					-0.000
Total	-0.366		-0.787		-1.254

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.065	2.30	-0.149
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.006	3.00	-0.018
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.048
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			-0.000	3.00	-0.000
Live Load					-0.084
Pedestrian Load					-0.000
Total	-0.313		-0.671		-1.068

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.046	2.30	-0.107
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.013
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			-0.000	3.00	-0.000
Live Load					-0.060
Pedestrian Load					-0.000
Total	-0.228		-0.489		-0.776

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.023	2.30	-0.054
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			-0.000	3.00	-0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.257		-0.404

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 1, Beam : 2; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 1, Beam : 3; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

CAMBER AND DEFLECTIONS: SERVICE I

(Span : 1, Beam : 4; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

CAMBER AND DEFLECTIONS: SERVICE I

(Span : 1, Beam : 5; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.079	2.30	-0.183
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.014	3.00	-0.043
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.021
Temperature			0.000	3.00	0.000
Live Load					-0.098
Pedestrian Load					-0.000
Total	-0.366		-0.797		-1.280

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.067	2.30	-0.155
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.012	3.00	-0.035
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.047
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.083
Pedestrian Load					-0.000
Total	-0.313		-0.680		-1.090

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.048	2.30	-0.111
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.025
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.059
Pedestrian Load					-0.000
Total	-0.228		-0.495		-0.791

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.024	2.30	-0.056
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.012
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.260		-0.411

CAMBER AND DEFLECTIONS: SERVICE I

(Span : 1, Beam : 6; Units: in)

	Release	Mult	Erection	Mult	Final
At 0.1 x L =	5.01 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.023	2.30	-0.054
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.257		-0.404

	Release	Mult	Erection	Mult	Final
At 0.2 x L =	10.52 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.046	2.30	-0.107
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.013
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.060
Pedestrian Load					-0.000
Total	-0.228		-0.489		-0.776

	Release	Mult	Erection	Mult	Final
At 0.3 x L =	16.04 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.064	2.30	-0.148
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.006	3.00	-0.018
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.048
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.084
Pedestrian Load					-0.000
Total	-0.313		-0.671		-1.068

	Release	Mult	Erection	Mult	Final
At 0.4 x L =	21.55 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.076	2.30	-0.175
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.007	3.00	-0.021
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.099
Pedestrian Load					-0.000
Total	-0.366		-0.787		-1.254

	Release	Mult	Erection	Mult	Final
At 0.5 x L =	27.06 ft				
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.080	2.30	-0.184
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.023
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.020	3.00	-0.059
DL-Comp. (DW)			-0.008	3.00	-0.023
Temperature			0.000	3.00	0.000
Live Load					-0.104
Pedestrian Load					-0.000
Total	-0.385		-0.827		-1.317

	Release	Mult	Erection	Mult	Final
At 0.6 x L =	32.57 ft				
Prestress	0.004	1.80	0.006	2.20	0.008
Self Wt.	-0.370	1.85	-0.684	2.40	-0.888
Deck + Haunch			-0.076	2.30	-0.175
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.007	3.00	-0.021
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.099
Pedestrian Load					-0.000
Total	-0.366		-0.787		-1.254

	Release	Mult	Erection	Mult	Final
At 0.7 x L =	38.08 ft				
Prestress	0.003	1.80	0.006	2.20	0.007
Self Wt.	-0.316	1.85	-0.584	2.40	-0.758
Deck + Haunch			-0.064	2.30	-0.148
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.006	3.00	-0.018
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.016	3.00	-0.048
DL-Comp. (DW)			-0.006	3.00	-0.018
Temperature			0.000	3.00	0.000
Live Load					-0.084
Pedestrian Load					-0.000
Total	-0.313		-0.671		-1.068

	Release	Mult	Erection	Mult	Final
At 0.8 x L =	43.60 ft				
Prestress	0.002	1.80	0.004	2.20	0.005
Self Wt.	-0.231	1.85	-0.427	2.40	-0.554
Deck + Haunch			-0.046	2.30	-0.107
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.004	3.00	-0.013
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.011	3.00	-0.034
DL-Comp. (DW)			-0.004	3.00	-0.013
Temperature			0.000	3.00	0.000
Live Load					-0.060
Pedestrian Load					-0.000
Total	-0.228		-0.489		-0.776

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	49.11 ft				
Prestress	0.001	1.80	0.002	2.20	0.003
Self Wt.	-0.122	1.85	-0.226	2.40	-0.293
Deck + Haunch			-0.023	2.30	-0.054
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.006	3.00	-0.017
DL-Comp. (DW)			-0.002	3.00	-0.007
Temperature			0.000	3.00	0.000
Live Load					-0.030
Pedestrian Load					-0.000
Total	-0.121		-0.257		-0.404

Bentley		Sheet #	197
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

ULTIMATE MOMENT

ULTIMATE - Span : 1, Beam : 1, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.7	3.8	3.2	3411.4	0.057T	0.90	-	-	-	-
H/2	2.83											
583.9	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1342.4	776.6	2.54	-
0.1L	5.01											
986.2	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1274.6	1274.6	2.68	-
0.2L	10.52											
1815.3	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1131.3	1131.3	3.02	-
0.3L	16.04											
2376.8	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1027.9	1027.9	3.32	-
0.4L	21.55											
2710.6	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	964.5	964.5	3.54	-
0.5L	27.06											
2796.0	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	940.9	940.9	3.63	-
0.6L	32.57											
2710.6	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	964.5	964.5	3.54	-
0.7L	38.08											
2376.8	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1027.9	1027.9	3.32	-
0.8L	43.60											
1815.3	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1131.3	1131.3	3.02	-
0.9L	49.11											
986.2	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1274.6	1274.6	2.68	-
H/2	51.29											
583.9	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1342.4	776.6	2.54	-
Transfer	54.12											
0.0	65.9	0.007	265.7	3.8	3.2	3411.4	0.057T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 2, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.7	2.53	-
0.1L	5.01											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
0.2L	10.52											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2843.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
H/2	51.29											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.6	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)

Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)

Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 3, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	199
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.7	2.53	-
0.1L	5.01											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
0.2L	10.52											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2843.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
H/2	51.29											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.6	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)

Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)

Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 4, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.7	2.53	-
0.1L	5.01											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
0.2L	10.52											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2843.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
H/2	51.29											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.6	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 5, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	201
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.7	2.53	-
0.1L	5.01											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
0.2L	10.52											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2843.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2750.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2407.7	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1836.6	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
996.8	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1277.7	2.68	-
H/2	51.29											
590.0	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	784.6	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 6, STRENGTH I
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	202
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com , Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location	(ft)	Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00	0.0	65.9	0.007	265.7	3.8	3.2	3411.2	0.057T	0.90	-	-	-	-
H/2	2.83	583.8	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1342.0	776.4	2.54	-
0.1L	5.01	986.0	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1274.3	1274.3	2.68	-
0.2L	10.52	1815.0	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1131.2	1131.2	3.02	-
0.3L	16.04	2376.4	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1028.0	1028.0	3.32	-
0.4L	21.55	2710.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	964.6	964.6	3.54	-
0.5L	27.06	2795.4	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	941.2	941.2	3.63	-
0.6L	32.57	2710.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	964.6	964.6	3.54	-
0.7L	38.08	2376.4	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1028.0	1028.0	3.32	-
0.8L	43.60	1815.0	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1131.2	1131.2	3.02	-
0.9L	49.11	986.0	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1274.3	1274.3	2.68	-
H/2	51.29	583.8	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1342.0	776.4	2.54	-
Transfer	54.12	0.0	65.9	0.007	265.7	3.8	3.2	3411.2	0.057T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 1, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	203
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.7	3.8	3.2	3411.4	0.057T	0.90	-	-	-	-
H/2	2.83											
505.3	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1342.4	672.0	2.54	-
0.1L	5.01											
853.8	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1274.6	1135.6	2.68	-
0.2L	10.52											
1574.2	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1131.3	1131.3	3.02	-
0.3L	16.04											
2065.5	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1027.9	1027.9	3.32	-
0.4L	21.55											
2358.5	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	964.5	964.5	3.54	-
0.5L	27.06											
2437.3	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	940.9	940.9	3.63	-
0.6L	32.57											
2358.5	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	964.5	964.5	3.54	-
0.7L	38.08											
2065.5	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1027.9	1027.9	3.32	-
0.8L	43.60											
1574.2	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1131.3	1131.3	3.02	-
0.9L	49.11											
853.8	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1274.6	1135.6	2.68	-
H/2	51.29											
505.3	65.9	0.010	265.7	3.8	3.2	3415.3	0.057T	0.90	1342.4	672.0	2.54	-
Transfer	54.12											
0.0	65.9	0.007	265.7	3.8	3.2	3411.4	0.057T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 2, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
0.1L	5.01											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
0.2L	10.52											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2484.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
H/2	51.29											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 3, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer 0.0	0.00 65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2 511.3	2.83 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
0.1L 864.4	5.01 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
0.2L 1595.5	10.52 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L 2096.4	16.04 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L 2398.1	21.55 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L 2484.4	27.06 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L 2398.1	32.57 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L 2096.4	38.08 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L 1595.5	43.60 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L 864.4	49.11 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
H/2 511.3	51.29 65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
Transfer 0.0	54.12 65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 4, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
0.1L	5.01											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
0.2L	10.52											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2484.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
H/2	51.29											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 5, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	207
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-
H/2	2.83											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
0.1L	5.01											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
0.2L	10.52											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.3L	16.04											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.4L	21.55											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.5L	27.06											
2484.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	918.1	918.1	3.72	-
0.6L	32.57											
2398.1	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	946.0	946.0	3.61	-
0.7L	38.08											
2096.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1015.2	1015.2	3.37	-
0.8L	43.60											
1595.5	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1125.8	1125.8	3.04	-
0.9L	49.11											
864.4	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1277.7	1149.7	2.68	-
H/2	51.29											
511.3	65.9	0.010	265.9	3.6	3.1	3419.0	0.055T	0.90	1349.3	680.1	2.53	-
Transfer	54.12											
0.0	65.9	0.007	265.9	3.6	3.1	3415.1	0.055T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

ULTIMATE - Span : 1, Beam : 6, STRENGTH II
(Mr-prvd computed by AASHTO equations, Art. 5.7.3.2/5.7.3.3)

Bentley		Sheet #	208
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	c/dt	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	0.00											
0.0	65.9	0.007	265.7	3.8	3.2	3411.2	0.057T	0.90	-	-	-	-
H/2	2.83											
505.2	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1342.0	671.9	2.54	-
0.1L	5.01											
853.7	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1274.3	1135.4	2.68	-
0.2L	10.52											
1573.9	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1131.2	1131.2	3.02	-
0.3L	16.04											
2065.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1028.0	1028.0	3.32	-
0.4L	21.55											
2358.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	964.6	964.6	3.54	-
0.5L	27.06											
2436.8	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	941.2	941.2	3.63	-
0.6L	32.57											
2358.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	964.6	964.6	3.54	-
0.7L	38.08											
2065.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1028.0	1028.0	3.32	-
0.8L	43.60											
1573.9	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1131.2	1131.2	3.02	-
0.9L	49.11											
853.7	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1274.3	1135.4	2.68	-
H/2	51.29											
505.1	65.9	0.010	265.7	3.8	3.2	3415.2	0.057T	0.90	1342.0	671.8	2.54	-
Transfer	54.12											
0.0	65.9	0.007	265.7	3.8	3.2	3411.2	0.057T	0.90	-	-	-	-

Legend: C = Compression-Controlled (c/dt > 0.600)
I = In-Transition (0.60 >= c/dt > 0.375)
T = Tension-Controlled (c/dt <= 0.375)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : YES

	Transfer	H/2	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	H/2	Transfer
Location(ft)	0.00	2.83	5.01	10.52	16.04	21.55	27.06	32.57	38.08	43.60	49.11	51.29	54.12
ds (in)	0.00	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42	61.42
As (in2)	0.00	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64	12.64
min Fy (ksi)	0.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00
As * Fy (kips)	0.00	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40	758.40

DESIGN SUMMARY

Span: 1, Beam: 1, Exterior beam

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.19 %	
Final losses:	9.87 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3415.31	2795.95	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3415.31	2437.31	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	0.978	Midspan	1.800	0.740	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.170***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.507	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.080	2.30	-0.184
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.023
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.020	3.00	-0.059
DL-Comp. (DW)			-0.008	3.00	-0.023
Temperature			-0.000	3.00	-0.000
Live Load					-0.104
Pedestrian Load					-0.000
Total	-0.385		-0.827		-1.318

Positive values indicate upward deflection.

Span: 1, Beam: 2, Interior beam

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.19 %	
Final losses:	9.77 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2843.04	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2484.40	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	1.002	Midspan	1.800	0.771	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.199***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.511	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

Positive values indicate upward deflection.

Span: 1, Beam: 3, Interior beam

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.19 %	
Final losses:	9.77 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2843.04	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2484.40	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	1.002	Midspan	1.800	0.771	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.199***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.511	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

Positive values indicate upward deflection.

Span: 1, Beam: 4, Interior beam

Bentley		Sheet #	215
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: **KHOST_BRIDGE_9.csl**		Date	Feb/11/2014

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.19 %	
Final losses:	9.77 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2843.04	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2484.40	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Bentley		Sheet #	216
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	1.002	Midspan	1.800	0.771	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.199***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.511	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

Positive values indicate upward deflection.

Span: 1, Beam: 5, Interior beam

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.19 %	
Final losses:	9.77 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2843.04	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3419.01	2484.40	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	1.002	Midspan	1.800	0.771	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.199***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.511	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.083	2.30	-0.192
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.015	3.00	-0.045
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.058
DL-Comp. (DW)			-0.007	3.00	-0.022
Temperature			0.000	3.00	0.000
Live Load					-0.103
Pedestrian Load					-0.000
Total	-0.385		-0.837		-1.345

Positive values indicate upward deflection.

Span: 1, Beam: 6, Exterior beam

Beam type:	Non-Voided Rectangular,	600x1500(2x5)
Precast Length,	ft	55.12
Release Length,	ft	55.12
Strand Pattern:	Straight	
Strand:	DUMMY	
Strand Es,	ksi:	28000.0
No. of strands:	1	
	Draped:	0
	Straight:	1
Concrete Strength:		
	f'ci:	1.0 ksi
	f'c:	4.0 ksi
	f'ct:	4.0 ksi .
Initial losses:	4.19 %	
Final losses:	9.87 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	0.600	-0.000	Depress	OK
Precast Top w/ no reinf. (tension)	-0.095	0.015	Trans	
Precast Top w/ reinf. (tension)	-0.240			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3415.15	2795.45	Midspan	OK
Strength II (Art. 3.4.1, 5.7.2.9.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	3415.15	2436.80	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	50.00 %	0.00 %		OK
Max. Debond Total	50.00 %	0.00 %		OK

Positive Moment Envelope Stresses (ksi) (Art. 3.4.1 and 5.9.4.2)

Specification	Allow	Final 1 Comp	Loc.	Allow	Final 2 Comp	Loc.	Allow	Final 3 Comp	Loc.
Service I Limit State - Compressive	Stresses	Only							
Precast Top	2.400	0.978	Midspan	1.800	0.740	Midspan			
Precast Bot	2.400	0.005	Bearing	1.800	0.005	Bearing			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.380	-0.002	Bearing						
Precast Bot	-0.380	**-1.170***	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							1.600	0.507	Midspan
Precast Bot							1.600	0.002	Bearing

CAMBER / DEFLECTION: (PCI Design Handbook - 4th Ed.- Table 4.6.2)
0.5 x L = 27.06 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.004	1.80	0.007	2.20	0.008
Self Wt.	-0.388	1.85	-0.719	2.40	-0.932
Deck + Haunch			-0.080	2.30	-0.184
DL-Prec. (DC)			0.000	3.00	0.000
Diaphragm			-0.008	3.00	-0.023
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.020	3.00	-0.059
DL-Comp. (DW)			-0.008	3.00	-0.023
Temperature			0.000	3.00	0.000
Live Load					-0.104
Pedestrian Load					-0.000
Total	-0.385		-0.827		-1.317

Positive values indicate upward deflection.

Bentley		Sheet #	221
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	ALH
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	SAM
File Name: KHOST_BRIDGE_9.csl		Date	Feb/11/2014

DECK SLAB DESIGN INPUT/OUTPUT

Design Methodology: Empirical Method (LRFD 9.7.2)
Interior Region of Deck, ft = 24.28
Effective Length, ft = 4.10

Required/provided area in deck:

	Required	Provided	
Longitudinal Steel – top layer, in2/ft	0.18	0.62	OK
Longitudinal Steel – bottom layer, in2/ft	0.27	0.62	OK
Longitudinal Steel – Max. Spacing, in	18.00	6.00	OK
Longitudinal Steel – Min Grade Steel, ksi	60.00	60.00	OK
Transverse Steel – top layer, in2/ft	0.18	0.40	OK
Transverse Steel – bottom layer, in2/ft	0.27	0.40	OK
Transverse Steel – Max. Spacing, in	18.00	6.00	OK
Transverse Steel – Min Grade Steel, ksi	60.00	60.00	OK

Longitudinal Steel provided:

Size	fy (ksi)	Spacing (in)	Dist. From Top (in)	End Cover (in)
US#5[M16]	60.0	6.00	2.50	2.00
US#5[M16]	60.0	6.00	6.80	2.00

USE: 16Ø @ 150mm
EACH WAY

Transverse Steel provided:

Size	fy (ksi)	Spacing (in)	Dist. From Top (in)	End Cover (in)
US#4[M13]	60.0	6.00	2.00	2.00
US#4[M13]	60.0	6.00	6.80	2.00

Verification of Design Conditions:

1. Diaphragms at line of support?	YES		(Calculated)
2. Concrete Girders?	YES		
3. CIP and water cured deck?	YES		
4. Uniform Depth?	YES		
5. 6 < Eff Length to Depth Ratio < 18?	NO	5.55	(Calculated)
6. Eff Length < 13.5 ft?	YES	4.10	(Calculated)
7. Core Depth > 4.0 in?	YES	4.93	(Calculated)
8. Slab Thickness > 7.0 in?	YES	8.86	(Calculated)
9. Min. Overhang to depth ratio > 5?	NO	3.77	(Calculated)
10. Min. concrete strength > 4 ksi?	YES	4.00	(Calculated)
11. Deck composite?	YES		

Warning! Empirical Method cannot be used in this case, since all design conditions have not been satisfied.

Note: No State specific criteria have been applied for deck design.
Note: Continuous barrier not provided.

SUPERSTRUCTURE ANAYLSIS

BACKUP INFORMATION FOR SUPERSTRUCTURE DESIGN

* GEOMETRY & PERMANENT LOADS

*TEMPERATURE LOADS

*LIVE LOAD DISTRIBUTION FACTORS

* SEISMIC DESIGN CATEGORY (SDC)

GEOMETRY AND CONSPAN INPUT

Length =	50400	mm	165.31	ft							
Spans =	3		3								
Span Length =	16800	mm	55.10	ft							
Width =	10950	mm	35.92	ft							
Barrier =	225	mm	0.74	ft							
Sidewalk =	1200	mm	3.94	ft							
Barrier + Sidewalk =	1425	mm	4.67	ft							
Roadway =	8100	mm	26.57	ft							
No of Lanes	2	mm	0.01	ft							
Lane Width =	3657.6	mm	12.00	ft							
Shoulder =	392.4	mm	1.29	ft							
No of Beams =	6		6				Ixc =	1620034	in^4	bd^3/3
b =	600	mm	1.97	ft	23.62	in	cg =	29.52	in	d/2
d =	1500	mm	4.92	ft	59.04	in	eg =	33.948	in	d/2 + ts/2
							A =	1394.289	in^2	b*d
Spacing =	1850	mm	6.07	ft	72.82	in				
Distance for Beam to Beam =	9250	mm	30.34	ft	364.08	in				
Overhang, OH =	850	mm	2.79	ft	33.46	in				
Clear Overhang, OH_cl =	550	mm	1.80	ft	21.65	in				
Clear Spacing bw Beams =	1250	mm	4.10	ft						
Wearing Surface Thickness =	54	mm	0.18	ft	2.13	in				
Deck Thickness, ts =	225	mm	0.74	ft	8.86	in				
Barrier Height =	1400	mm	4.59	ft	55.10	in				
Sidewalk Height =	275	mm	0.90	ft	10.82	in				

PERMANENT LOADS	L ft	W ft	H ft	Volume cf	Unit Weight lbs/cf	Load klf	Load ksf
LEFT BARRIER	1.00	0.74	4.59	3.39	150	0.51	
LEFT SIDEWALK	1.00	3.94	0.90	3.55	150	0.53	
WEARING SURFACE	1.00	26.57	0.18	4.71	165	0.78	
WEARING SURFACE	55.12	26.57	0.18	259.38	165		0.03
RIGHT SIDEWALK	1.00	3.94	0.90	3.55	150	0.53	
RIGHT BARRIER	1.00	0.74	4.59	3.39	150	0.51	

CONSPAN INPUT

TEMPERATURE LOAD (AASHTO 3.12)

AASHTO Table 3.12.2.1-1

Climate	Concrete (°F) Range		T_Design (°F) Tmin	Tmax
Cold	10	80	10	80
Moderate	0	80	0	80

* Use moderate for areas that typically have < 14 days/yr with a T < 32

→

Khost Temperatue

	Avg (°F)	Max (°F)
High	76.1	115
Low	50.4	13.3
Daily Mean	62.6	

*Ref: Wikepedia

→

Use

Tmin = 10 °F
Tmax = 80 °F

T_{RISE} = Tmax - Daily Mean = 17.4 °F
T_{FALL} = Daily Mean - Tmin = 52.6 °F

INPUT FOR CONSPAN

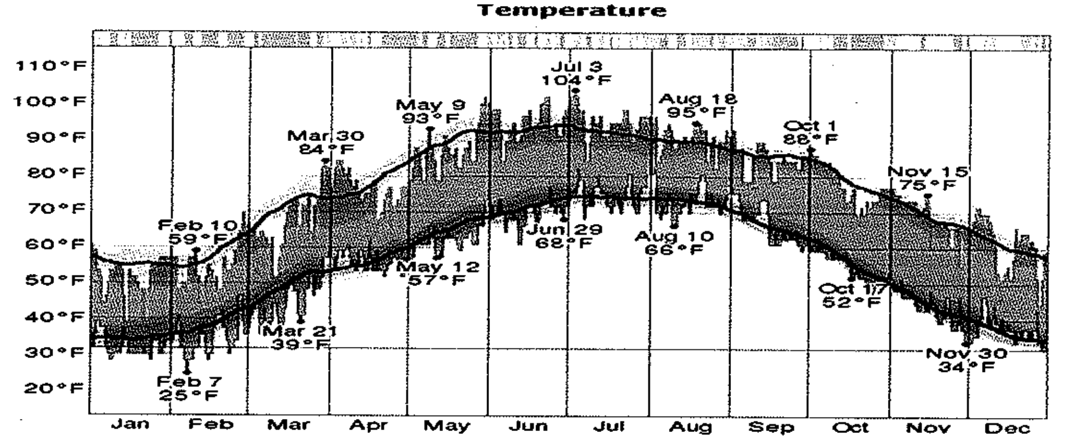
Climate data for Khost, Afghanistan

Climate data for Khost, Afghanistan

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °F	[illegible]	[illegible]	[illegible]	[illegible]	104.40	115.50	106.70	100.00	104.00	[illegible]	[illegible]	[illegible]	115.50
Average high °F	54.9	56.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	58.6	[illegible]
Daily mean °F	40.6	44.6	54	63.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	64.2	51.8	43.5	62.6
Average low °F	30.4	34	42.4	50.7	57.7	[illegible]	[illegible]	[illegible]	61.7	50.5	38.5	32	50.4
Record low °F	[illegible]	[illegible]	26.1	33.8	41.7	49.1	55.9	58.3	45	32	21	22.1	[illegible]
Precipitation mm (inches)	1.02	2.11	2.433	2.567	1.567	0.85	[illegible]	2.441	1.201	0.303	0.457	0.823	18.76
Avg. precipitation days (≥ 1.0 mm)	4.1	[illegible]	[illegible]	[illegible]	[illegible]	2.5	[illegible]	[illegible]	3.6	2.2	2.2	3.1	52.4
% humidity	60	62	62	59	50	46	63	68	62	56	56	59	58.6
Mean monthly sunshine hours	198.4	183.6	207.7	234	291.4	285	251.1	248	270	251.1	243	176.7	2,840

Source #1: NOAA (1972-1983) [2]
Source #2: (sunshine and precipitation days)[3]
http://en.wikipedia.org/wiki/Khost

Temperature



*The daily low (blue) and high (red) temperature during **2012** with the area between them shaded gray and superimposed over the corresponding averages (thick lines), and with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile). The bar at the top of the graph is red where both the daily high and low are above average, blue where they are both below average, and white otherwise.*

http://weatherspark.com/history/31368/2012/Khost-Afghanistan

LIVE LOAD DISTRIBUTION FACTORS

Live Load Distribution Factors (DF)

Action	Location	AASHTO Table	Lanes Loaded	Distribution Factors (mg = DF)		Range of Applicability
Moment	Interior	4.6.2.2.2b-1	One Design lane	DFm_si	$+\left(\frac{S}{14}\right)^{0.4} * \left(\frac{S}{L}\right)^{0.3} * \left(\frac{Kg}{12 * L * ts^3}\right)^{0.1}$	
			Multiple Design lane	DFm_mi	$+\left(\frac{S}{9.5}\right)^{0.6} * \left(\frac{S}{L}\right)^{0.2} * \left(\frac{Kg}{12 * L * ts^3}\right)^{0.1}$	
	Exterior	4.6.2.2.2d-1	One Design lane	DFm_se	Use Lever Rule DFm_se = Rxn * Multiple Presence Factor	
			Multiple Design lane	DFm_me	DFm_me = e * (DFm_mi) $e = 0.77 + (d_e/9.1) \geq 1.0$ de is (+) if girder is inside of the barrier, otherwise (-)	
Shear	Interior	4.6.2.2.3a-1	One Design lane	DFv_si	$0.36 + \left(\frac{S}{25.0}\right)$	
			Multiple Design lane	DFv_mi	$0.20 + \left(\frac{S}{12}\right) - \left(\frac{S}{35.0}\right)^2$	
	Exterior	4.6.2.2.3b-1	One Design lane	DFv_se	Use Lever Rule DFv_se = Rxn * Multiple Presence Factor	
			Multiple Design lane	DFv_me	DFv_me = e * (DFv_mi) $e = 0.60 + d_e/10.0$ de is (+) if girder is inside of the barrier, otherwise (-)	

Range of Applicability (Moment):

	min	max
S (ft) =	3.5	16
ts (in) =	4.5	12
L (ft) =	20	240
Nb =	4	≥
Kg =	10000	7000000

Range of Applicability (Shear):

	min	max
S (ft) =	3.5	16
ts (in) =	4.5	12
L (ft) =	20	240
Nb =	4	≥
Kg =	10000	7000000

Chart is applicable for:

Concrete Deck, Filled Grid, Partially Filled Grid, or Unfilled Grid Deck Composite with Reinforced Concrete Slab on Steel or Concrete Beams; Concrete T-Beams, T and Double T-Sections.

LIVE LOAD DISTRIBUTION FACTORS - GEOMETRY

Length =	50400	mm	165.31	ft				
Spans =	3		3					
Span Length =	16800	mm	55.10	ft				
Width =	10950	mm	35.92	ft				
Barrier =	225	mm	0.74	ft				
Sidewalk =	1200	mm	3.94	ft				
Barrier + Sidewalk =	1425	mm	4.67	ft				
Roadway =	8100	mm	26.57	ft				
No of Lanes	2	mm	0.01	ft				
Lane Width =	3657.6	mm	12.00	ft				
Shoulder =	392.4	mm	1.29	ft				
No of Beams =	6		6					
b =	600	mm	1.97	ft		23.62	in	
d =	1500	mm	4.92	ft		59.04	in	
					Ixc =	1620034	in^4	bd^3/3
					cg =	29.52	in	d/2
					eg =	33.948	in	d/2 + ts/2
					A =	1394.289	in^2	b*d
Spacing =	1850	mm	6.07	ft		72.82	in	
Distance for Beam to Beam =	9250	mm	30.34	ft		364.08	in	
Overhang, OH =	850	mm	2.79	ft		33.46	in	
Clear Overhang, OH_cl =	550	mm	1.80	ft		21.65	in	
Clear Spacing bw Beams =	1250	mm	4.10	ft				
Deck Thickness, ts =	225	mm	0.74	ft		8.86	in	
Barrier Height =	1400	mm	4.59	ft		55.10	in	
Sidewalk Height =	275	mm	0.90	ft		10.82	in	

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LIVE LOAD DISTRIBUTION FACTORS - MOMENT IN INTERIOR BEAMS

Distribution of Live Loads for Moment in Interior Beams

Table 4.6.2.2.2b-1—Distribution of Live Loads for Moment in Interior Beams

Type of Superstructure	Applicable Cross-Section from Table 4.6.2.2.1-1	Distribution Factors	Range of Applicability
Wood Deck on Wood or Steel Beams	a, l	See Table 4.6.2.2.2a-1	
Concrete Deck on Wood Beams	l	One Design Lane Loaded: $S/12.0$ Two or More Design Lanes Loaded: $S/10.0$	$S \leq 6.0$
Concrete Deck, Filled Grid, Partially Filled Grid, or Unfilled Grid Deck Composite with Reinforced Concrete Slab on Steel or Concrete Beams; Concrete T-Beams, T- and Double T-Sections	a, e, k and also i, j if sufficiently connected to act as a unit	One Design Lane Loaded: $0.06+\left(\frac{S}{14}\right)^{0.4}\left(\frac{S}{L}\right)^{0.3}\left(\frac{K_g}{12.0Lt_s^3}\right)^{0.1}$ Two or More Design Lanes Loaded: $0.075+\left(\frac{S}{9.5}\right)^{0.6}\left(\frac{S}{L}\right)^{0.2}\left(\frac{K_g}{12.0Lt_s^3}\right)^{0.1}$	$3.5 \leq S \leq 16.0$ $4.5 \leq t_s \leq 12.0$ $20 \leq L \leq 240$ $N_b \geq 4$ $10{,}000 \leq K_g \leq 7{,}000{,}000$
		use lesser of the values obtained from the equation above with $N_b = 3$ or the lever rule	$N_b = 3$

DFm_	Distribution factors for Moment
si	single lane, interior girders
mi	multiple lane, interior girders

Beam Spacing,	S =	6.07	ft
Thickness of Deck,	ts =	8.86	in
Bridge Length,	L =	55.10	ft
Number of Beams,	Nb =	6.00	
	Kg =	3,226,905	in^4

Req'd Range	min	max	
S =	3.5	16	OK
ts =	4.5	12	OK
L =	20	240	OK
Nb =	4	≥	OK
Kg =	10,000	7,000,000	OK

Modular Ratio, n =	1	ksi	Eb / Ed
Eb =	3000	ksi	Beam Material --> Concrete
Ed =	3000	ksi	Deck Material --> Concrete
Ixc =	1620034.01	in^4	bd^3/3
eg =	33.9	in	d/2 + ts/2
A =	1394.3	in^2	b*d
d =	59.0	in	

Moment Single Lane Interior Beam DF -->	DFm_si=	0.583
Moment Multiple Lane Interior Beam DF -->	DFm_mi=	0.759

LIVE LOAD DISTRIBUTION FACTORS - MOMENT IN EXTERIOR BEAMS

Distribution of Live Loads for Moment in Exterior Beams

Table 4.6.2.2.2d-1—Distribution of Live Loads for Moment in Exterior Longitudinal Beams

Type of Superstructure	Applicable Cross-Section from Table 4.6.2.2.1-1	One Design Lane Loaded	Two or More Design Lanes Loaded	Range of Applicability
Wood Deck on Wood or Steel Beams	a, l	Lever Rule	Lever Rule	N/A
Concrete Deck on Wood Beams	l	Lever Rule	Lever Rule	N/A
Concrete Deck, Filled Grid, Partially Filled Grid, or Unfilled Grid Deck Composite with Reinforced Concrete Slab on Steel or Concrete Beams; Concrete T-Beams, T- and Double T-Sections	a, e, k and also i, j if sufficiently connected to act as a unit	Lever Rule	$g = e\, g_{interior}$ $e = 0.77 + \frac{d_e}{9.1}$	$-1.0 \le d_e \le 5.5$
			use lesser of the values obtained from the equation above with $N_b = 3$ or the lever rule	$N_b = 3$

DFm_	Distribution factors for Moment
se	single lane, exterior girders
me	multiple lane, exterior girders

One Design Lane Loaded

Lever Rule --> Rxn * Spacing = P/2*L1 + P/2*L2

Barrier + 2' from Barrier, Axle 1 =	2.74 ft		Hinge to Axle 1, L1 =	6.12
Axle 1 + 6' = Axle 2 =	8.74		Hinge to Axle 2, L2 =	0.12
Cl of First Beam, Rxn 1 =	2.79 ft			
Cl of Second Beam, Hinge =	8.86 ft			

P/2*L1 = P*	3.06
P/2*L2 = P*	0.06
P/2*L1 + P/2*L2 = P*	3.12
Rxn = P*	0.514
Multiple Presence Factor, m =	1.2 <-- (1 Lane)

Moment Single Lane Exterior Beam DF --> DFm_se= 0.617 =Rxn*m

Two or More Design Lanes Loaded

Barrier Width =	0.74 ft
Cl of Beam to Edge of Deck, OH =	2.79 ft
de =	2.05 ft
e =	1.00
Moment Multiple Lane Exterior Beam DF --> DFm_me=	0.759

Use, e = 1

LIVE LOAD DISTRIBUTION FACTORS - SHEAR IN INTERIOR BEAMS

Distribution of Live Loads for Shear in Interior Beams

Table 4.6.2.2.3a-1—Distribution of Live Load for Shear in Interior Beams

Type of Superstructure	Applicable Cross-Section from Table 4.6.2.2.1-1	One Design Lane Loaded	Two or More Design Lanes Loaded	Range of Applicability
Wood Deck on Wood or Steel Beams	a, l	See Table 4.6.2.2.2a-1		
Concrete Deck on Wood Beams	l	Lever Rule	Lever Rule	N/A
Concrete Deck, Filled Grid, Partially Filled Grid, or Unfilled Grid Deck Composite with Reinforced Concrete Slab on Steel or Concrete Beams; Concrete T-Beams, T-and Double T-Sections	a, e, k and also i, j if sufficiently connected to act as a unit	$0.36+\frac{S}{25.0}$	$0.2+\frac{S}{12}-\left(\frac{S}{35}\right)^{2.0}$	$3.5 \le S \le 16.0$ $20 \le L \le 240$ $4.5 \le t_s \le 12.0$ $N_b \ge 4$
		Lever Rule	Lever Rule	$N_b = 3$

DFv_	Distribution factors for Shear
si	single lane, interior girders
mi	multiple lane, interior girders

Shear Single Lane Interior Beam DF --> DFv_si= 0.680

Shear Multiple Lane Interior Beam DF --> DFv_mi= 0.814

LIVE LOAD DISTRIBUTION FACTORS - SHEAR IN EXTERIOR BEAMS

Distribution of Live Loads for Shear in Exterior Beams

Table 4.6.2.2.3b-1—Distribution of Live Load for Shear in Exterior Beams

Type of Superstructure	Applicable Cross-Section from Table 4.6.2.2.1-1	One Design Lane Loaded	Two or More Design Lanes Loaded	Range of Applicability
Wood Deck on Wood or Steel Beams	a, l	Lever Rule	Lever Rule	N/A
Concrete Deck on Wood Beams	l	Lever Rule	Lever Rule	N/A
Concrete Deck, Filled Grid, Partially Filled Grid, or Unfilled Grid Deck Composite with Reinforced Concrete Slab on Steel or Concrete Beams; Concrete T-Beams, T- and Double T-Beams	a, e, k and also i, j if sufficiently connected to act as a unit	Lever Rule	$g = e\, g_{interior}$ $e = 0.6 + \frac{d_e}{10}$	$-1.0 \le d_e \le 5.5$
			Lever Rule	$N_b = 3$

DFv_	Distribution factors for Shear
se	single lane, exterior girders
me	multiple lane, exterior girders

One Design Lane Loaded

Lever Rule --> Rxn * Spacing = P/2*L1 + P/2*L2

Barrier + 2' from Barrier, Axle 1 =	2.74 ft		Hinge to Axle 1, L1 =	6.12
Axle 1 + 6' = Axle 2 =	8.74		Hinge to Axle 2, L2 =	0.12
Cl of First Beam, Rxn 1 =	2.79 ft			
Cl of Second Beam, Hinge =	8.86 ft			

P/2*L1 = P*	3.06	
P/2*L2 = P*	0.06	
P/2*L1 + P/2*L2 = P*	3.12	
Rxn = P*	0.514	
Multiple Presence Factor, m =	1.2	<-- (1 Lane)

Shear Single Lane Exterior Beam DF --> DFv_se= **0.617** =Rxn*m

Two or More Design Lanes Loaded

Barrier Width =	0.74 ft		
Cl of Beam to Edge of Deck, OH =	2.79 ft		
de =	2.05 ft		
e =	0.81	Use, e =	0.81
Shear Multiple Lane Exterior Beam DF --> DFv_me=	**0.656**	= e * DFv_mi	

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LIVE LOAD DISTRIBUTION FACTORS - SUMMARY

Summary Distribution of Live Loads for Moment in Exterior Beams

Distribution For:	Loaded Lanes	Distribution Factors		
		Interior	Exterior	Governs
Moment	Multiple	0.759	0.759	0.759
	Single	0.583	0.617	0.617
Shear	Multiple	0.814	0.656	0.814
	Single	0.680	0.617	0.680

SEISMIC DESIGN CATEGORY (SDC)

PGA =	0.29	g	* SEE ATTACHED HAZARD MAPS
S_S, 0.2 SEC =	0.64	g	* SEE ATTACHED HAZARD MAPS
S_1, 1.0 SEC =	0.47	g	* SEE ATTACHED HAZARD MAPS

Table 3.4.2.3-2—Values of F_v as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

Site Class	Mapped Spectral Response Acceleration Coefficient at 1-sec Periods				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	*	*	*	*	*

Note: Use straight line interpolation for intermediate values of S_1, where S_1 is the spectral acceleration coefficient at 1.0 sec obtained from the ground motion maps.

* Site-specific response geotechnical investigation and dynamic site response analyses should be considered (Article 3.4.3)

Assume Site Class C or D

Fv (Range for Site Class C & D) =	1.3	-->	1.6		
Fv (Range for Site Class C & D) =	1.33	-->	1.53	<--- Range for S_1 =	0.47

Say Fv = 1.53

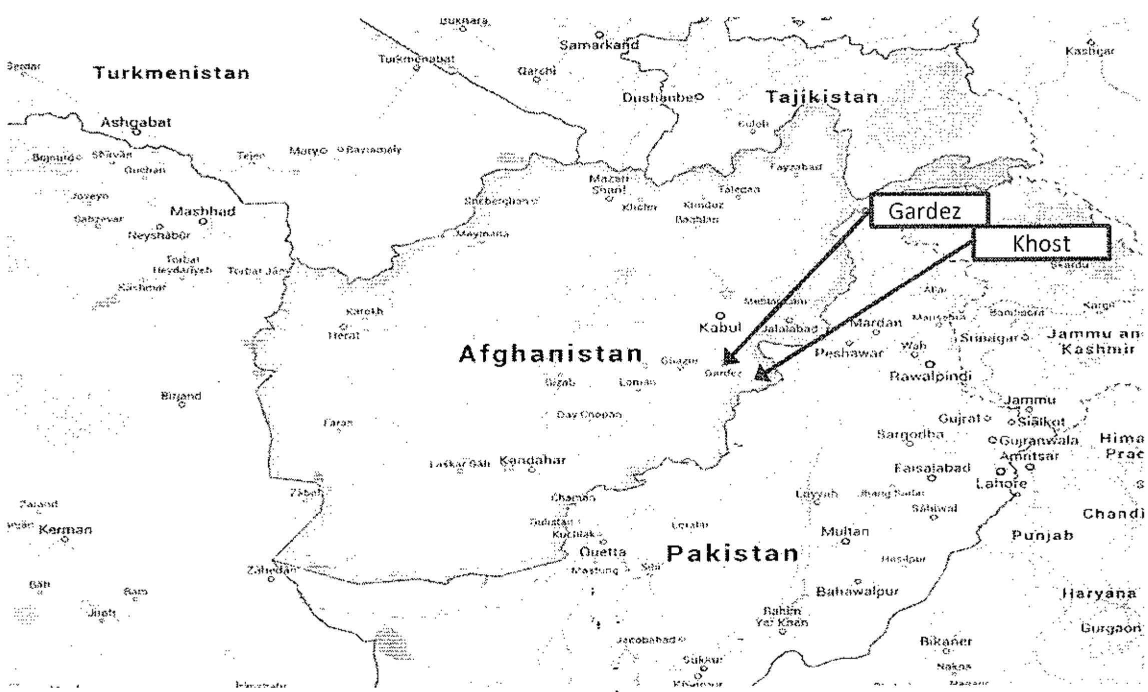
SD1 = 0.72

$$S_{D1} = F_v S_1 \qquad (3.4.1\text{-}3)$$

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

Value of $S_{D1} = F_v S_1$	SDC
$S_{D1} < 0.15$	A
$0.15 \leq S_{D1} < 0.30$	B
$0.30 \leq S_{D1} < 0.50$	C
$0.50 \leq S_{D1}$	D

Sesimic Design Cateogry , SDC = D



SEISMIC DESIGN CATEGORY (SDC)

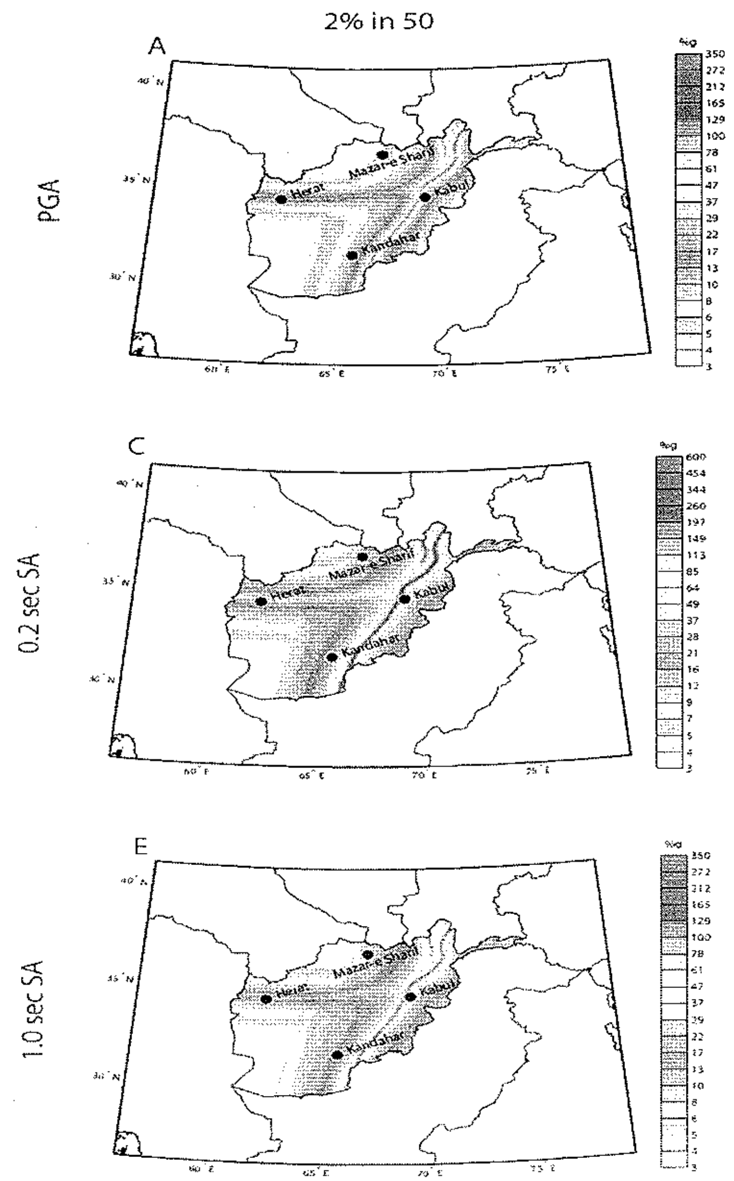


Figure 7. Ground motions for fault sources for PGA (A, B), 0.2-second SA (C, D), and 1.0-second SA (E, F) at 2-percent (A, C, E) and 10-percent (B, D, F) probability of exceedance in 50 years.

ELASTOMERIC BEARINGS & ANCHOR BOLT DESIGN

<u>This and the following five pages include beam reaction outputp from CONSPAN to be used for the elastomeric bearing design.</u>

Bentley			Sheet #	4
			Job #	Projects\1298\127-1298-
Program:	LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	alh
Version:	13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
		www.bentley.com Phone: 1-800-778-4277	Checked	
File Name:	KHOST_BRIDGE_9.csl		Date	

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	$\boxed{39.3}$	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	$\boxed{18.2}$	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	$\boxed{6.2}$	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	$\boxed{9.4}$	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	$\boxed{3.6}$	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

Span 1, BEAM 2

<u>LOADS TO BE USE FOR ELSTOMERIC BEARING DESIGN</u>

DEAD LOADS: $39.3^k + 18.2^k + 6.2^k + 9.4^k + 3.6^k = \underline{76.7}^k$

LIVE LOADS: $78.6^k + 1.3^k = \underline{79.9}^k$

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 6, 2014 @ 9:44 A.M.

Chked: alh 2.25.14

Bentley		Sheet #	7
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	alh
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: KHOST_BRIDGE_9.cst		Date	

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp.:	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I:	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I:	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

SPAN 1,
BEAM 3

For Reference
Only

Units: U.S. Units   Design Code: AASHTO LRFD   Printed on: February 6, 2014 @ 9:44 A.M.

alh 2.25.14

Bentley		Sheet #	10
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	alh
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: KHOST_BRIDGE_9.csl		Date	

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

SPAN 1,
BEAM 4

For Reference
Only

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 6, 2014 @ 9:44 A.M.

alh 2.24.14

Bentley		Sheet #	13
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8I (SELECTseries 5)	TSS-GLS-USA	Designed	alh
Version: 13.00.00.88	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: KHOST_BRIDGE_9.csl		Date	

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	48.8	82.7	154.2	205.3	235.9	246.1
Haunch (Max)	V	18.2	18.2	16.3	14.8	11.1	7.4	3.7	0.0
Diaphragm :	M	0.0	0.0	5.8	10.3	21.6	32.9	44.2	55.5
(Max)	V	6.2	6.2	3.8	2.1	2.1	2.1	2.1	2.1
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	78.6	78.6	72.7	68.2	57.5	46.9	34.3	11.1
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	78.6	78.6	72.7	68.2	57.9	48.0	38.4	29.2
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	391.4	661.8	1222.1	1606.8	1838.7	1906.1
	V	156.6	156.6	140.9	128.8	103.5	78.2	50.9	13.1
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	156.6	156.6	140.9	128.8	103.9	79.4	55.3	31.6
	M	0.0	0.0	393.9	661.8	1198.4	1556.7	1739.9	1756.0

SPAN 1,
BEAM 5
For Reference
Only

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 6, 2014 @ 9:44 A.M.

alh 2.25.14

Bentley		Sheet #	1
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	alh
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: KHOST_BRIDGE_9.csl		Date	

SHEAR/MOMENT ENVELOPE (&REACTIONS)

For Reference Only

SHEAR AND MOMENT ENVELOPE (Span : 1, Beam : 1) SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.8	79.4	148.0	197.0	226.4	236.2
Haunch (Max)	V	17.5	17.5	15.6	14.2	10.7	7.1	3.6	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	63.3	63.3	58.6	55.0	46.4	37.8	27.6	8.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	63.3	63.3	58.6	55.0	46.7	38.7	30.9	23.5
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	386.5	653.3	1205.0	1582.0	1807.1	1868.4
	V	137.5	137.5	124.2	113.9	90.8	67.8	43.1	9.9
Total :	M-	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	137.5	137.5	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	137.5	137.5	124.2	113.9	91.2	68.8	46.6	24.9
	M	0.0	0.0	389.1	653.3	1181.4	1532.0	1708.3	1718.4

alh 2.25.14

Bentley		Sheet #	16
		Job #	Projects\1298\127-1298-
Program: LEAP® CONSPAN® V8i (SELECTseries 6)	TSS-GLS-USA	Designed	alh
Version: 13.00.00.68	Copyright © Bentley Systems, Inc. 1984 - 2013	Date	Oct/28/2013
	www.bentley.com Phone: 1-800-778-4277	Checked	
File Name: KHOST_BRIDGE_9.csl		Date	

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	0.00	2.83	5.01	10.52	16.04	21.55	27.06
Self wt. :	M	0.0	0.0	105.5	178.9	333.5	443.9	510.2	532.3
(Max)	V	39.3	39.3	35.2	32.1	24.0	16.0	8.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DC(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DL-Prec. :	M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DW(Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deck + :	M	0.0	0.0	46.7	79.3	147.7	196.7	226.0	235.8
Haunch (Max)	V	17.4	17.4	15.6	14.2	10.6	7.1	3.5	0.0
Diaphragm :	M	0.0	0.0	2.9	5.1	10.8	16.4	22.1	27.7
(Max)	V	3.1	3.1	1.9	1.0	1.0	1.0	1.0	1.0
DL-Comp :	M	0.0	0.0	25.2	42.7	79.5	105.9	121.7	126.9
DC(Max)	V	9.4	9.4	8.4	7.6	5.7	3.8	1.9	0.0
DL-Comp :	M	0.0	0.0	9.6	16.3	30.5	40.6	46.6	48.6
DW(Max)	V	3.6	3.6	3.2	2.9	2.2	1.5	0.7	0.0
LL + I :	M+	0.0	0.0	193.0	324.8	591.4	763.2	862.9	878.6
	V	63.3	63.3	58.6	55.0	46.4	37.8	27.6	8.9
LL + I :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LL + I :	Vmx	63.3	63.3	58.6	55.0	46.7	38.7	30.9	23.5
	M	0.0	0.0	195.4	324.8	568.5	718.2	771.6	736.9
Pedestrian:	M+	0.0	0.0	3.6	6.1	11.3	15.0	17.3	18.0
	V	1.3	1.3	1.2	1.1	0.8	0.5	0.3	0.0
Pedestrian:	M-	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0
	V	1.3	1.3	0.6	0.0	0.0	0.0	0.0	0.0
Pedestrian:	Vmx	1.3	1.3	1.2	1.1	0.8	0.6	0.5	0.3
	M	-0.0	-0.0	3.6	6.1	10.6	10.0	9.8	9.7
Temperature:	(Rise) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Temperature:	(Fall) M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	M+	0.0	0.0	386.5	653.2	1204.8	1581.7	1806.7	1868.0
	V	137.5	137.5	124.2	113.9	90.8	67.7	43.1	9.9
Total :	M-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total :	Vmx	137.5	137.5	124.2	113.9	91.2	68.8	46.6	24.9
	M	0.0	0.0	389.0	653.2	1181.2	1531.6	1707.9	1718.0

SPAN 1,
BEAM 6
For Reference
Only

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 6, 2014 @ 9:44 A.M.

alh 2.24.14

Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: aln
Date: 2/25/2014

References:
- American Association of State Highway and Transportation Officals (AASHTO) LRFD Bridge Design Specification, 2012
- ASSHTO 14.7.6 - Elastomeric Pads and Steel-Reinforced Elastomeric Bearings - Method A
- Massachusetts Department of Transportation, MASSDOT, Standard Specifications for Highways and Bridges
- Massachusetts Department of Transportation, MASSDOT, LRFD Bridge Manual 2009

Notes: Per MASSDOT LRFD Bridge Manual 2009 the Steel Reinforced Elastomeric Bearings shall be designed:
- In accordance with ASSHTO 14.7.6. - Elastomeric Pads and Steel-Reinforced Elastomeric Bearings - Method A
- For Service I Limit State.
- Unless otherwise noted, the resistance factor, ø, shall be taken as 1.0.
- Dynamic Load allowance shall not be included.

BEARING PAD GEOMETRY & QUANTITY

Type of Pad: Steel-Reinforced Bearings   Shape of Pad: Circular

Steel Reinforcment: 11 gage   MASSDOT 3.5.6.1

	Support 1	Support 2			
	Left Support	Right Support			
Horizontal Fixity:	Fixed	Expansion			
Diameter, D :	15.000	15.000	in		
Elastomer Top Cover Thickness, h_{r_top} :	0.250	0.250	in	>= 0.25, OK	MASSDOT 3.5.6.1
Elastomer Internal Layer Thickness, h_{r_int} :	0.375	0.375	in		
Elastomer Bottom Cover Thickness, h_{r_bot} :	0.250	0.250	in	>= 0.25, OK	MASSDOT 3.5.6.1
Steel Reinforcement Thickness, h_{reinf} :	0.1196	0.1196	in		
Number of Steel Reinforcement Layers, Ns:	6	6			
Number of Internal Elastomeric Layers, Ne:	5	5			
Design Total Elastomer Thickness, h_{rt} :	2.375	2.375	in		
Design Total Steel Reinforcement Thickness, h_s :	0.718	0.718	in		
Effective Bearing Thickness :	3.093	3.093	in		
Actual Total Bearing Thickness :	3.093	3.093	in		
Req't --> Top Elast Layer < 70% of Inner Layer :	OK	OK			MASSDOT 3.5.6.1
Req't --> Bot Elast Layer < 70% of Inner Layer :	OK	OK			MASSDOT 3.5.6.2
Number of Beams, Nbeams :	4		Interior Beams		
Number of Bearings per Beam, Nb_beam :	2				
Number of Bearings at Each Beam End, Nb_beam end :	1	1			
Total Number of Bearing per Abutment, Nb_Abut :	4	4			

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Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: alh
Date: 2/25/2014

SHAPE FACTOR (S) - AASHTO 14.7.5.3.3 & 14.7.6.3.3

Shape Factor, S for Circular Bearing Pads

	Abutment 1			Abutment 2				
	Internal	Top Cover	Bot Cover	Internal	Top Cover	Bot Cover		
Diameter, D :	15.00	15.00	15.00	15.00	15.00	15.00		
Thickness of Elastomer Layer, h_r :	0.375	0.250	0.250	0.375	0.250	0.250		
Shape Factor, S :	10.000	15.000	15.000	10.000	15.000	15.000	$= D / (4 * h_{ri})$	AASHTO 14.7.5.1-2

MATERIAL PROPERTIES

F_y : 36.0 ksi
F_{sr} : 24.0 ksi

Grade:	3.0		MASSDOT 3.5.6.2
Nominal Hardness :	60	durometer	MASSDOT 3.5.6.2
Shear Modulus @ 73F, G_{min}:	80.0	psi	MASSDOT 3.5.6.2
Shear Modulus @ 73F, G_{max}:	175.0	psi	MASSDOT 3.5.6.2

LRFD SERVICE I LOAD COMBINATION LIMIT STATE

LOAD PER BEAM END	* Load Factor	F_v (Kips)	$F_{h\text{-}long}$ (Kips)
DC	1.00	76.70	
DW	1.00	0.00	
LL+IM+PL+BR+LS	1.00	79.90	6.00
WS	0.30		
WL	1.00		
TU	1.20		
SUM		**156.60**	**6.00**

<=== For the purpose of design, DW and DC will be lumped into DC

*See AASHTO Table 3.4.1-1 for LRFD Load Factors for Service I Limit State

Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: aen
Date: 2/25/2014

COMPRESSIVE STRESS - INTERNAL LAYER - AASHTO 14.7.6.3.2

Typical Bearing Pad Plan Area, A_1 :	176.71	in^2	
h_r_max :	0.375	in	<-- hr_max = hr_int
S :	10.00		<-- S = S_int

Service I Limit State

Avg. Compressive Stress due toTotal Load, σ_s:	0.886	ksi = ΣF_v / A_1/Nb_beam end	σ_s < =	1.25*Gmin*Si	1.000	ksi	OK	AASHTO 14.7.6.3.2-7
			σ_s < =		1.250	ksi	OK	AASHTO 14.7.6.3.2-8

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Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: alh
Date: 2/25/2014

COMPRESSIVE DEFLECTION - AASHTO 14.7.5.3.3 & 14.7.6.3.3

Average Compressive Stress (DL), σ_{DL} = 0.434 ksi = ΣF_v (DL) / A_1 / Nb_beam end
Average Compressive Stress (LL), σ_{LL} = 0.452 ksi = ΣF_v (LL) / A_1 / Nb_beam end

Creep Deflection at 25 Years, a_{cr} = 0.35 — AASHTO Table 14.7.6.2-1

	Support 1			Support 2					
	Internal	Top Cover	Bot Cover	Internal	Top Cover	Bot Cover			
S :	10.00	15.00	15.00	10.00	15.00	15.00		= D / (4 * h_{ri})	AASHTO 14.7.5.1-2
Effective Modulus of B.P. in Compression, E_c :	84	189	189	84	189	189	ksi	= 4.8 * G_{min} * S^2	AASHTO C14.6.3.2-1
Computed Compressive Strain (DL), ε_{DL} :	0.00517	0.00230	0.00230	0.00517	0.00230	0.00230	ksi	= σ_{DL} / E_c	AASHTO 14.7.6.3.3-1
Computed Compressive Strain (LL), ε_{LL} :	0.00538	0.00239	0.00239	0.00538	0.00239	0.00239	ksi	= σ_{LL} / E_c	AASHTO 14.7.6.3.3-1
Deflection (DL), δ_{DL} :		0.01084			0.01084		in	= Σ (ε_{DL} * h_r)	AASHTO 14.7.5.3.6-1
Deflection (LL), δ_{LL} :		0.01129			0.01129		in	= Σ (ε_{LL} * h_r)	AASHTO 14.7.5.3.6-2
a_{cr} * Deflection (DL) :		0.00379			0.00379		in	= a_{cr} * δ_{DL}	
Long Term Dead Load Deflection, δ_{lt} :		0.01463			0.01463		in	= δ_{DL} + (a_{cr} * δ_{DL})	AASHTO 14.7.5.3.6-3

Check Initial Deflection — AASHTO 14.7.6.3.3

	Support 1			Support 2				
	Internal	Top	Bottom	Internal	Top	Bottom		
h_r :	0.3750	0.2500	0.2500	0.3750	0.2500	0.2500	in	
0.09 * h_r :	0.0338	0.0225	0.0225	0.0338	0.0225	0.0225	in	
δ_{DL} + δ_{LL} :	0.0040	0.0012	0.0012	0.0040	0.0012	0.0012	in	= (ε_{DL} * h_r) + (ε_{LL} * h_r)
Check Initial Deflection :	OK	OK	OK	OK	OK	OK		

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Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: alh
Date: 2/25/2014

SHEAR - AASHTO 14.7.5.3.2 & 14.7.6.3.4

Girder Material: Concrete

Span Length, L : 55.120 ft

Superstructure width, W : 35.930 ft

Longitudinal Dist. Subject to Temp., L_T : 55.120 ft/brg

Transverse Dist. Subject to Temp., W_T : 17.965 ft/brg

Thermal Movement — MASSDOT 3.1.7

Expansion

Thermal Expansion, α:	0.0000055	in / in / °F
$\Delta_T = T_{rise}$:	30	°F (conservative)
Long. Thermal Movement, δ_{TL} :	0.109	in
Trans. Thermal Movement, δ_{TT} :	0.036	in
Resultant Thermal Movement, δ_T :	0.115	in
Load due to Temp, $H_{u\text{-}rise}$:	1.495	k

Contraction

Thermal Expansion, α:	0.0000055	in / in / °F
$\Delta_T = T_{fall}$:	70	°F (conservative)
Long. Thermal Movement, δ_{TL} :	0.255	in
Trans. Thermal Movement, δ_{TT} :	0.083	in
Resultant Thermal Movement, δ_T :	0.268	in
Load due to Temp, $H_{u\text{-}fall}$:	3.488	k

$\delta_{TL} = L_T * \alpha * \Delta_T$

$\delta_{TT} = W_T * \alpha * \Delta_T$

$H_u = G_{max} * A_1 * \delta / h_{rt}$

Controlling

Long. Thermal Movement, δ_{TL} :	0.255	in
Trans. Thermal Movement, δ_{TT} :	0.083	in
Resultant Thermal Movement, δ_T :	0.268	in
Load due to Temp., H_u :	3.488	kips

Total Thermal Force for Abutment Design : 13.95 kips = H_u * Number of Bearings per Abutment

Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: alh
Date: 2/25/2014

SHEAR - AASHTO 14.7.5.3.2 & 14.7.6.3.4 - CONTINUED

Shrinkage

Coeff of Shrinkage, α_s:	0.000200			AASHTO 5.4.2.3
Long. Shrinkage Movement, δ_{SL}:	0.132	in	$\delta_{SL} = L_T * \alpha_s$	
Transv. Shrinkage Movement, δ_{ST}:	0.043	in	$\delta_{ST} = W_T * \alpha_s$	
Resultant Shrinkage Movement, δ_S:	0.139	in		

Wind and Breaking Loads — Since one of the supports is fixed, these Wind and Breaking forces will be transferred directly to the fixed support and will not cause any bearing deformation

Load due to Wind and Breaking, H_u :	6.000	kips
Long. Wind and Breaking Movement, δ_{LRL}:	0.000	in

Total Movement

Total Long. Movement, δ_{LT}:	0.387	in	$\delta_{TL} + \delta_{SL} + \delta_{LRL}$
Total Trans. Movement, δ_{TT}:	0.126	in	$\delta_{TT} + \delta_{ST}$
Resultant Movement, δ_{Total}:	0.407	in	

Δs:	0.488	in	$\Delta s = \delta_{Total} * \gamma_{TU}$					AASHTO 14.6.3.1-2
$2*\Delta s$:	0.977	in	<=	Suprt. 1, h_{rt} :	2.375	in	<-- OK	AASHTO 14.7.6.3.4-1
			<=	Suprt. 2, h_{rt} :	2.375	in	<-- OK	

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Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: [signature]
Date: 2/25/2014

ROTATION - AASHTO 14.7.6.3.5

Rotation Requirement: S_i^2 / n < 22 — AASHTO 14.7.6.1

Shape Factor of an elastomeric bearing, S_i:	10.00			
Number of interior layers of elastomer, n:	5.00			
S_i^2 / n:	20.00	<	22	OK

STABILITY - AASHTO 14.7.6.3.6

Support	Total Bearing Thickness	< =	D/4	Req't Met
1	3.093	< =	3.75	OK
2	3.093	< =	3.75	OK

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Circular Steel-Reinforced Elastomeric Bearing Design

GENERAL INFORMATION

Project Number: Gardez Khost Road Construction of Bridge 9
Description: Elastomeric Bearing Pad Desing
Structure: Span 1, Interior Beam Bearings at Abutment and Pier (By inspection, Interior beams control)

Designed By: SAM
Checked By: alh
Date: 2/25/2014

REINFORCEMENT - AASHTO 14.7.6.3.7 & 14.7.5.3.5

Service Limit State

ASSHTO 14.7.5.3.5-1

Avg Comp Stress due to Total Load, σ_s = 0.886 ksi
Yield Stength of Steel Reinforcement, F_y = 36.0 ksi

Support	h_{max} in	$(3 * h_{max} * \sigma_s) / F_y$	< =	h_s in	Req't Met
1	0.375	0.0277	< =	0.120	**OK**
2	0.375	0.0277	< =	0.120	**OK**

HORIZONTAL LONGITUDINAL FORCE (Unfactored) FOR THE DESIGN OF BEARING'S ANCHOR BOLTS

Bearing's Longitudinal Deflection Due to Temp. & Shrink, δ_{LT}: 0.387 in
Brng. Load Due to Temp. & Shrnkg. Deflection, $H_{T\&S\_Def}$: 5.04 kips/brng. $H_{Long\_Def} = G_{max} * A_1 * \delta_{LT} / h_{rt}$

Load Per Beam at ***Expansion*** End (Transferred Thru Brng Pad): 5.04 kips/brng.

Load Due to Breaking and Wind: 6.00 kips/brng.
Load Per Beam at Fixed End (Transferred Thru Anchor Blots): 11.04 kips/brng.

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Bearing Anchor Bolts Design

Breaking Force Per Lane = 18 Kips ← See pier and Abut. design
× 2 ← number of Lane
36 Kips per bridge
÷ 6 Bearing per bridge End
Breaking Force per Bearing = 6 Kips per bearing

Seismic Force Per Span = 3.56 Kip/LF ← See Pier Design
× 40.43' ← pier Width
144 Kip per bridge end
÷ 6 bearings per bridge end
Seismic Force Per Bearing = 24 Kip per bearing

Temperature & Shrinkage Force

Total bearing horiz. deformation δ_{LT} = 0.977 in ← see bearing Design Calcs.

This deformation is vector sum of the long. & trans. deformation. The froce resulting from this deformation shall be applied perpendicular to ~~and~~ toward the edge of the bridge seat (conservative).

⟹ Force Per Bearing $F_{T\&S} = G_{max} A_1 \delta_{LT} / h_{rt}$

$G_{max} = 0.175$ ksi
$A_1 = 176.71$ in^2
$\delta_{TL} = 0.977$ in
$h_{rt} = 2.375$ in

$\left.\right\}$ ← See Bearing Design Calculations

⟹ $F_{T\&S} = 12.72$ Kips

⟹ Total Horizontal Force On Anchor Bolt Group
$H_{Total} = 6 + 24 + 12.72 = 42.72$ Kips

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One Grant Street
Framingham, MA 01701-9005
(508) 903-2000

JOB GK Road Bridge 9 replacement
SHEET NO. ______ OF ______
CALCULATED BY SAM DATE 2/25/14
CHECKED BY alh DATE 2.26.14
SCALE ______

Bearing Anchor Bolt Design (continued)

$1\frac{1}{2}''\ \phi$ Bolt ASTM 1554 Grade 105

Area of Bolt $A_{se} = 1.41\ in^2$ ← (AISC 13th Edition Table 7-18)

Yield Stress $f_{ya} = 105$ ksi (AISC 13th ed. Table 2-5)

$1.9\ f_{ya} = 199.5\text{ksi} > 125\ \text{ksi} \Rightarrow$ Use $f_{uta} = 125$ ksi

ACI 318-05 Appendix D Sect. D.6.1.2

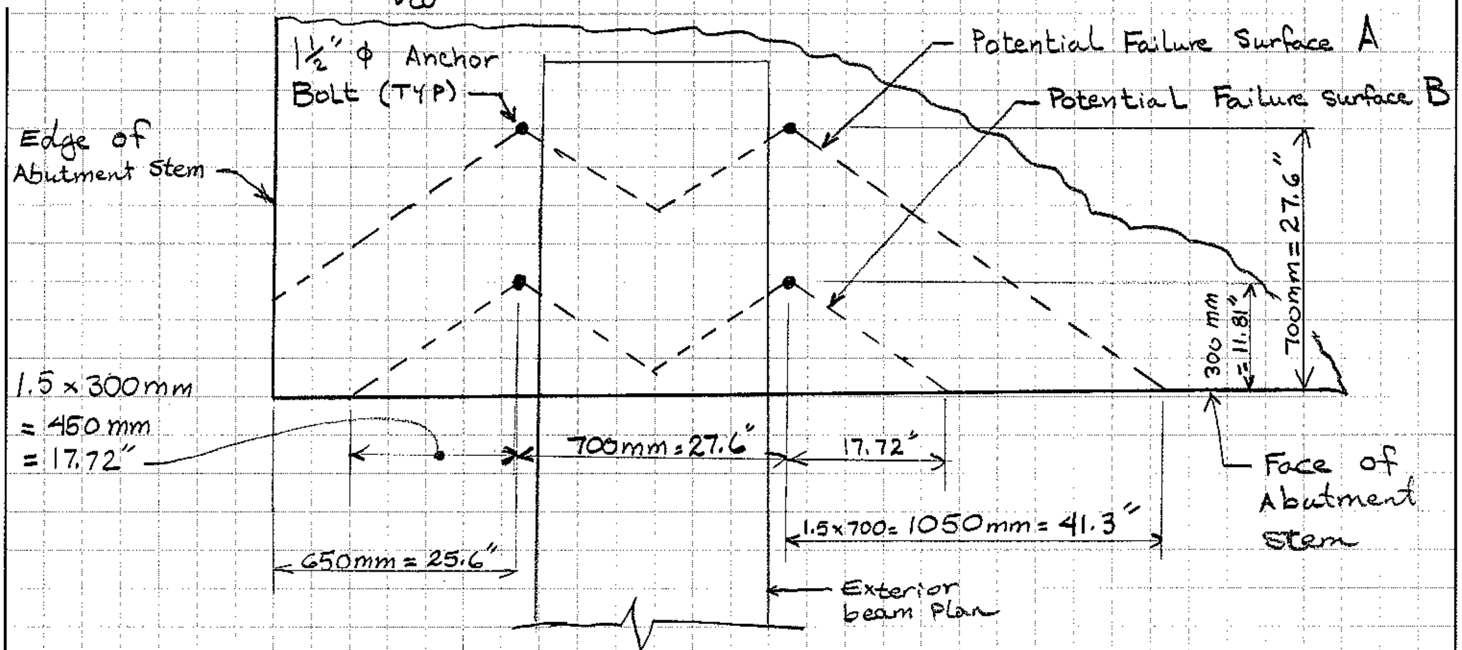
$V_{sa} = n\ 0.6\ A_{se}\ f_{uta}$

$n = 4 \Rightarrow V_{sa} = 4(0.6)(1.41)(125) = 423$ Kips

$\phi V_{sa} = 0.65\ (423\ \text{Kips}) = 275\ \text{Kips} > 42.72\ \text{Kips}$ O.K.

Check Concrete Breakout In Shear (ACI 318-05 Sect. D.6.2)

$$V_{cbg} = \frac{A_{Vc}}{A_{Vco}}\ \Psi_{ec,V}\ \Psi_{ed,V}\ \Psi_{c,V}\ V_b \longleftarrow \text{eq (D-22)}$$



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Bearing Anchor Bolt Design (continue)

Check Concrete Breakout In Shear (continue)

Failure along potential failuer surfaces A & B shall be investigated separately. Failuer along potential failure surface A shall be based on full shear force $V_u = 42.72^k$. Failure along potential failure surface B shall be based on shear force $\frac{1}{2} V_u = 21.36^k$.

Investigate Failure Surface B

$A_{V,co} = 4.5 (C_{a1})^2 \longleftarrow$ eq (D-23)

$C_{a1} = 11.81 \Rightarrow A_{V,co} = 627.6 \text{ in}^2$

$A_{V,c} = (1.5 \times 11.81'')(17.72'' + 27.6'' + 17.72'') = 1117 \text{ in}^2$

$$V_b = 7 \left(\frac{l_e}{d_o}\right)^{0.2} \sqrt{d_o} \sqrt{f'_c} (c_{a1})^{1.5} \longleftarrow \text{eq (D-24)}$$

$d_o = 38 \text{mm} = 1.5''$

$$\left.\begin{array}{l} h_{ef} = 300 \text{ mm} = 11.81'' \\ 8 d_o = 8(1.5'') = 12'' \end{array}\right\} \Rightarrow l_e = 11.81''$$

$C_{a1} = 11.81''$, $f'_c = 4000$ psi

$\Rightarrow V_b = 33.25$ Kips

$$\Psi_{ec,V} = \frac{1}{\left(1 + \frac{2e'_v}{3C_{a1}}\right)} \longleftarrow \text{eq (D-26)}$$

$e'_v = 0 \Rightarrow \Psi_{ec,V} = 1$

$\Psi_{ed,V} = 1 \longleftarrow$ eq (D-27)

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Bearing Anchor Bolt Design (continue)

Check Concrete Breakout In Shear (continue)

Investigate Failure Surface B (continue)

$\Psi_{c,V} = 1.4$

$V_{cbg} = \frac{1117}{627.6}(1)(1)(1.4)\ 33.25^k = 88.76$ kips ← eq (D-22)

Resistance ↓ ↓ Load

$\phi V_{cbg} = 0.75(88.76) = 66.57^k > 21.36^k$ ok.

Investigate Failure Along Surface A

By inspection resistance along failure surface A is greater than 66.57^k

$66.57^k > 42.72^k$ O.K.

Check Concrete Pryout Strength (Section D.6.3)

$V_{cpg} = K_{cp} N_{cbg}$ ← eq (D-30)

$K_{cp} = 2$

$N_{cbg} = \frac{A_{Nc}}{A_{Nco}} \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ ← eq (D-5)

$A_{Nco} = 9 h_{ef}^2$ ← eq (D-6), $h_{ef} = 300mm = 11.81'' \Rightarrow A_{Nco} = 1256\ in^2$

$A_{Nc} = (17.72'' + 27.6'' + 17.72'')(27.6'' + 17.72'') = 2857\ in^2$

$N_b = K_c \sqrt{f'_c}\ h_{ef}^{1.5}$ ← eq (D-7)

$K_c = 24$, $f'_c = 4000$ Psi, $h_{ef} = 11.81'' \Longrightarrow N_b = 61.6$ kips

Bearing Anchor Bolt Design (continued)

Check Concrete Pryout (continued)

$$\Psi_{ec,N} = \frac{1}{\left(1 + \frac{e'_N}{3\,h_{ef}}\right)} \longleftarrow \text{eq (D-9)}$$

$$e'_N = 0 \Longrightarrow \Psi_{ec,N} = 1$$

$$\Psi_{ed,N} = 0.7 + 0.3\,\frac{c_{a,min}}{1.5\,h_{ef}} = 0.7 + 0.3\,\frac{(11.81'')}{1.5(11.81'')} = 0.9$$

$$\Psi_{c,N} = 1.25\,, \qquad \Psi_{cp,N} = 1$$

$$N_{cbg} = \frac{2857}{1256}(1)(0.9)(1.25)(1)(61.6^k) = 157.6^k \longleftarrow \text{eq (D-5)}$$

$$V_{cpg} = 2\,N_{cbg} = 2\,(157.6) = 315.3^k$$

$$\phi V_{cpg} = 0.75\,(315.3^k) = 236.5^k \gg 42.72^k \quad \text{O.K.}$$

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SUBSTRUCTURE ANALYSIS

SUBSTRUCTURE ANALYSIS

ABUTMENT DESIGN

* SUPERSTRUCTURE DEAD LOADS ON ABUTMENT
* SUPERSTRUCTURE LIVE LOADS ON ABUTMENT
* ABUTMENT STABILITY DESIGN

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

References: AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012

Notes: This spreadsheet computes the loads on an abutment, considering the spans left or right of the abutment is simply supported.

SUPERSTRUCTURE DEAD LOAD

Abutment Length = 36.90 ft

Length =	50400	mm	165.31	ft		
Spans =	3		3			
Span Length =	16800	mm	55.10	ft		
No of Beams =	6		6			
b =	600	mm	1.97	ft	23.62	in
d =	1500	mm	4.92	ft	59.04	in
Spacing =	1850	mm	6.07	ft	72.82	in
Distance from Ext Beam to Ext Beam =	9250	mm	30.34	ft	364.08	in
Overhang, OH =	850	mm	2.79	ft	33.46	in
Clear Overhang, OH_cl =	550	mm	1.80	ft	21.65	in
Clear Spacing bw Beams =	1250	mm	4.10	ft	49.20	
Deck Thickness, ts =	225	mm	0.74	ft	8.86	in
Barrier Height =	1400	mm	4.59	ft	55.10	in
Sidewalk Height =	275	mm	0.90	ft	10.82	in

Width =	11250	mm	36.90	ft
Barrier =	225	mm	0.74	ft
Sidewalk =	1200	mm	3.94	ft
Barrier + Sidewalk =	1425	mm	4.67	ft
Roadway =	8100	mm	26.57	ft
No of Lanes	2	mm	0.01	ft
Lane Width =	3657.6	mm	12.00	ft
Shoulder =	392.4	mm	1.29	ft

BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE DEAD LOAD

CAT		Width ft	Height ft	Length ft	Volume cf	Unit Weight lbs/cf	Weight Kips	Qty #	Total Kips	DC Kips	DW Kips
DC	Beams / Girders	1.97	4.92	55.10	533.55	150	80.03	6	480.19	480.19	
DC	Sidewalks	3.94	0.90	55.10	195.40	150	29.31	2	58.62	58.62	
DC	Safety Curbs	0.00	0.00	0.00	0.00	150	0.00	0	0.00	0.00	
DC	Barriers	0.90	4.59	55.10	228.14	150	34.22	2	68.44	68.44	
DW	Wearing Surface	26.57	0.18	55.10	263.54	165	43.48	1	43.48		43.48
DC	End Diaphragms	4.10	4.92	2.46	49.62	150	7.44	10	74.43	74.43	
DC	Intermediate Diaphragms	4.10	4.92	0.98	19.77	150	2.97	5	14.83	14.83	
DW	Utilities				0.00	0	0.00	0	0.00		0.00
DW	Stay-In-Place Forms	0.00	0.00	0.00	0.00	0	0.00	0	0.00		0.00
DC	Deck	36.90	0.74	55.10	1500.60	150	225.09	1	225.09	225.09	
					0.00		0.00		0.00		
					0.00		0.00		0.00		
					0.00		0.00		0.00		
									965.09	921.61	43.48
										965.09	

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE DEAD LOAD

		DC (kips)	DW (Kips)	DL (kips)
DC	Beams / Girders	480.19		
DC	Sidewalks	58.62		
DC	Safety Curbs	0.00	0.00	
DC	Barriers	68.44		
DW	Wearing Surface		43.48	
DC	End Diaphragms	74.43		
DC	Intermediate Diaphragms	14.83		
DW	Utilities		0.00	
DW	Stay-In-Place Forms		0.00	
DC	Deck	225.09		

	DC	DW	DL	
Total Superstructure Dead Load	921.61	43.48	965.09	kips
Total Dead Load / Abutment	460.80	21.74	482.55	kips / Abutment
Length of Abutment	36.90	36.90	36.90	Abutment Length
Total (DL / Linear Foot of Abutment)	12.49	0.59	13.08	
Total (DL / Linear Foot of Pier)	24.98	1.18	26.15	
Abutment Design				
Design For: Abutment Loading	12.49	0.59	13.08	kips/LF of Abutment <-- Superstructure Dead Load (Input Tab)

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

References: AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012

Notes: This spreadsheet computes the loads on an abutment, considering the spans left or right of the abutment is simply supported.

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Live Load, LL

Type of Truck: HL	93	
Roadway Width =	26.24	ft
Design Lane Width =	12	ft
Roadway / Lane Width =	2.19	
Use --> No of Lanes =	2	
Multiple Presence Factor, m =	1	

Table 3.6.1.1.2-1—Multiple Presence Factors, *m*

Number of Loaded Lanes	Multiple Presence Factors, *m*
1	1.20
2	1.00
3	0.85
>3	0.65

Truck Loading:

	Left/Right Span			
Span Length, L =	55.10	ft		Section 3.6.1.2.2
Dynamic Load Allowance, (IM) =	1.33			Section 3.6.2.1
Number of Lanes =	2			
Multiple Presence Factor, m =	1.00			Section 3.6.1.1.2
Vmax =	59.1	kips / Lane	<-- T3.3.1.2 Shear & End Reactions	
Vmax =	118.20	kips	<- Vmax * m * # of lanes	
Reaction, LL V =	118.20	kips		
Reaction, (LL+IM) V =	157.2	kips	<-- IM * V	
Total Reaction, Truck (LL) =	118.2	kips		
Total Reaction, Truck (LL+IM) =	157.2	kips		

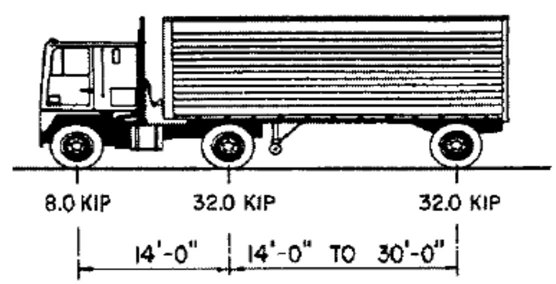

Figure 3.6.1.2.2-1

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GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Tandem Loading: Section 3.6.1.2.3

	Left/Right Span			
L =	55.10	ft		
Dynamic Load Allowance, (IM) =	1.33			Section 3.6.2.1
Number of Lanes =	2			
Multiple Presence Factor, m =	1.00			Section 3.6.1.1.2
P1 =	25	kips		
P2 =	25	kips		
Axle Spacing =	4	ft		
Vmax =	48.19	kips/ Lane		
Vmax =	96.37	Kips	<- Vmax * m * # of lanes	
Reaction, LL V =	96.37	kips		
Reaction, (LL+IM) V =	128.17	kips	<-- IM * V	
Total Reaction, Tandem (LL) =	96.4	kips		
Total Reaction, Tandem (LL+IM) =	128.2	kips		

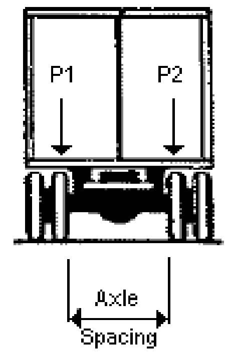
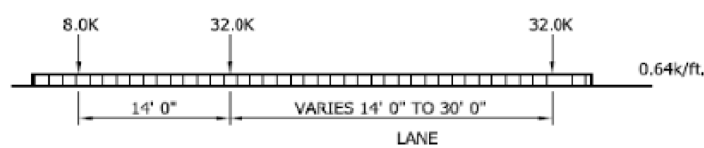


Figure 3.6.1.2.2-1

Live Load, LL (cont.)

Lane Loading: Section 3.6.1.2.4

	Left/Right Span			
L =	55.10	ft		
Number of Lanes =	2			
Multiple Presence Factor, m =	1.00			Section 3.6.1.1.2
Lane Load =	0.64	klf		
Vmax =	17.63	kips/ Lane		
Vmax =	35.27	Kips	<- Vmax * m * # of lanes	
Reaction, Lane Load (LL) =	35.3	kips		
Total Reaction, Lane Load (LL) =	35.3	kips		



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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Pedestrian Live Load

Pedestrian Live Load, PL =	0.075	ksf	<--- per AASHTO 3.6.1.6 for Sidewalks with a Width >= 2.0 ft
Width of Sidewalk =	0.00	ft	
PL =	0.000	klf	
Length of Sidewalk =	55.10	ft	Bridge Width = 36.90 ft
PL =	0.00	kips	--> PL / Abutment = 0.00 kips; --> PL / LF of Abutment = 0.00 klf

Live Loads

	LL	IM	LL + IM
Truck	59.10	1.33	78.60
Tandem	48.19	1.33	64.09
Lane	17.63	1	17.63
Truck + Lane	76.73		96.24
Tandem + lane	65.82		81.72
Max	76.73		96.24

Max =	96.24	kips	
No of Lanes =	2.00		
m =	1.00		
LL+I =	192.47	kips	
Abutment Length =	36.90	ft	
LL+ I =	5.22	klf	
LL + I + PL =	5.22	klf	<-- INPUT LOAD

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - LATERAL FORCES

Braking Force, BR

Section 3.6.4

Notes: Dynamic Load Allowance increase not required. AASHTO3.6.2.1

Braking Force ONLY applies to fixed bearings

Braking Force includes multiple presence factor

Type of Bearing: Fixed

25% Axle Weight of Design Truck =	25%	18.00	kips	Design Truck Axle Weight =	72
25% Axle Weight of Design Tandem =	25%	12.50	kips	Design Tandem Axle Weight =	50
5% (Axle Weight of Design Truck + Lane Load) =	5%	5.36	kips	Design Truck + Lane Axle Weight =	107.27
5% (Axle Weight of Design Tandem Load + Lane Load) =	5%	4.26	kips	Design Tandem + Lane Axle Weight =	85.27

Braking Force on Abutment (BR) =	18	kips	<---- 25% Axle Weight of Design Truck	
Number of Lanes =	2			
Multiple Presence Factor, m =	1			
BR =	0.98	klf	<--- BR / Abutment Length	<-- Input Load

Location of Load Application = *0.00* *ft above Bridge Seat*

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - LATERAL FORCES - EQ

Total Superstructure Dead Load =	13.08	kips		
Coefficient of Friction =	0.3			
Coefficient of Friction =	0.15		<-- Use %	50% per MassDOT 3.4.4.4 -5
DL * u =	1.96	kips		
EQ =	1.96	klf	<--- INPUT LOAD	

COEFFICIENT OF FRICTION

The following friction coefficients shall be considered in calculating the sliding friction forces :

Concrete to Soil / Rock	0.30
Concrete to Steel	0.45
Steel to Steel	0.30
Steel to Teflon Plate	0.10
Brick Masonry on moist clay	0.33
Brick Masonry on dry clay	0.50
Brick Masonry on sand	0.40
Brick Masonry on gravel	0.60
Brick Masonry to Brick	0.70
Brick Masonry on rock	0.75
Granite on Granite	0.60
Limestone on Limestone	0.75
Cement Blocks on Cement Blocks	0.65
Cement concrete on dry clay	0.40
Cement concrete on wet clay	0.20
Cement concrete on wet sand	0.40
Cement concrete on dry sand	0.50 - 0.60
Cement concrete on dry gravel	0.50 - 0.60
Cement concrete on dry rock	0.60 - 0.70
Cement concrete on wet rock	0.50
Brick on Brick	0.65
Wood on Wood	0.48

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GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

TABLE OF MAXIMUM MOMENTS, SHEARS, AND REACTIONS—SIMPLE SPANS, ONE LANE

Spans in feet; moments in thousands of foot-pounds; shears and reactions in thousands of pounds.

These values are subject to specification reduction for loading of multiple lanes.

Impact not included.

Span	Moment	End shear and end reaction (a)	Span	Moment	End shear and end reaction (a)
1	8.0(b)	32.0(b)	42	485.3(b)	56.0(b)
2	16.0(b)	32.0(b)	44	520.9(b)	56.7(b)
3	24.0(b)	32.0(b)	46	556.5(b)	57.3(b)
4	32.0(b)	32.0(b)	48	592.1(b)	58.0(b)
5	40.0(b)	32.0(b)	50	627.9(b)	58.5(b)
6	48.0(b)	32.0(b)	52	663.6(b)	59.1(b)
7	56.0(b)	32.0(b)	54	699.3(b)	59.6(b)
8	64.0(b)	32.0(b)	56	735.1(b)	60.0(b)
9	72.0(b)	32.0(b)	58	770.8(b)	60.4(b)
10	80.0(b)	32.0(b)	60	806.5(b)	60.8(b)
11	88.0(b)	32.0(b)	62	842.4(b)	61.2(b)
12	96.0(b)	32.0(b)	64	878.1(b)	61.5(b)
13	104.0(b)	32.0(b)	66	914.0(b)	61.9(b)
14	112.0(b)	32.0(b)	68	949.7(b)	62.1(b)
15	120.0(b)	34.1(b)	70	985.6(b)	62.4(b)
16	128.0(b)	36.0(b)	75	1,075.1(b)	63.1(b)
17	136.0(b)	37.7(b)	80	1,164.9(b)	63.6(b)
18	144.0(b)	39.1(b)	85	1,254.7(b)	64.1(b)
19	152.0(b)	40.4(b)	90	1,344.4(b)	64.5(b)
20	160.0(b)	41.6(b)	95	1,434.1(b)	64.9(b)
21	168.0(b)	42.7(b)	100	1,524.0(b)	65.3(b)
22	176.0(b)	43.6(b)	110	1,703.6(b)	65.9(b)
23	184.0(b)	44.5(b)	120	1,883.3(b)	66.4(b)
24	192.7(b)	45.3(b)	130	2,063.1(b)	67.6
25	207.4(b)	46.1(b)	140	2,242.8(b)	70.8
26	222.2(b)	46.8(b)	150	2,475.1	74.0
27	237.0(b)	47.4(b)	160	2,768.0	77.2
28	252.0(b)	48.0(b)	170	3,077.1	80.4
29	267.0(b)	48.8(b)	180	3,402.1	83.6
30	282.1(b)	49.6(b)	190	3,743.1	86.8
31	297.3(b)	50.3(b)	200	4,100.0	90.0
32	312.5(b)	51.0(b)	220	4,862.0	96.4
33	327.8(b)	51.6(b)	240	5,688.0	102.8
34	343.5(b)	52.2(b)	260	6,578.0	109.2
35	361.2(b)	52.8(b)	280	7,532.0	115.6
36	378.9(b)	53.3(b)	300	8,550.0	122.0
37	396.6(b)	53.8(b)			
38	414.3(b)	54.3(b)			
39	432.1(b)	54.8(b)			
40	449.8(b)	55.2(b)			

Loading -- HS 20-44 (MS18)

AASHTO Standard Specifications for Highway Bridges - 17th edition 2002

GENERAL INFORMATION

Project Number: 1298\127-1298-12001-LT0077
Description: Khost Bridge No. 9
Structure: Abutment Design

Designed By: alh
Checked By: SAM
Date: 2/27/2014

Table 3.3.1.1

Maximum Unfactored HL-93 Live Load Moments, Shears, and Reactions
Simple Spans, One Lane, w/o Dynamic Load Allowance

	MOMENTS					SHEARS & END REACTIONS			
SPAN FT	TRUCK KIP-FT	TANDEM KIP-FT	LANE KIP-FT	TOTAL KIP-FT	SPAN PT. %	TRUCK KIP	TANDEM KIP	LANE KIP	TOTAL KIP
1	8.0	6.3	0.1	8.1	0.50	32.0	25.0	0.3	32.3
2	16.0	12.5	0.3	16.3	0.50	32.0	25.0	0.6	32.6
3	24.0	18.8	0.7	24.7	0.50	32.0	25.0	1.0	33.0
4	32.0	25.0	1.3	33.3	0.50	32.0	25.0	1.3	33.3
5	40.0	31.3	2.0	42.0	0.50	32.0	30.0	1.6	33.6
6	48.0	37.5	2.9	50.9	0.50	32.0	33.3	1.9	35.3
7	56.0	43.8	3.9	59.9	0.50	32.0	35.7	2.2	38.0
8	64.0	50.0	5.1	69.1	0.50	32.0	37.5	2.6	40.1
9	72.0	62.5	6.5	78.5	0.50	32.0	38.9	2.9	41.8
10	80.0	75.0	8.0	88.0	0.50	32.0	40.0	3.2	43.2
11	84.5	92.0	9.3	101.3	0.40	32.0	40.9	3.5	44.4
12	92.2	104.0	11.1	115.1	0.40	32.0	41.7	3.8	45.5
13	103.0	115.9	13.4	129.3	0.45	32.0	42.3	4.2	46.5
14	110.9	128.3	15.5	143.8	0.45	32.0	42.9	4.5	47.3
15	118.8	140.6	17.8	158.4	0.45	34.1	43.3	4.8	48.1
16	126.7	153.0	20.3	173.3	0.45	36.0	43.8	5.1	48.9
17	134.6	165.4	22.9	188.3	0.45	37.6	44.1	5.4	49.6
18	142.6	177.8	25.7	203.4	0.45	39.1	44.4	5.8	50.2
19	150.5	190.1	28.6	218.7	0.45	40.4	44.7	6.1	50.8
20	158.4	202.5	31.7	234.2	0.45	41.6	45.0	6.4	51.4
21	166.3	214.9	34.9	249.8	0.45	42.7	45.2	6.7	52.0
22	174.2	227.3	38.3	265.6	0.45	43.6	45.5	7.0	52.5
23	182.2	239.6	41.9	281.5	0.45	44.5	45.7	7.4	53.0
24	190.1	252.0	45.6	297.6	0.45	45.3	45.8	7.7	53.5
25	198.0	264.4	49.5	313.9	0.45	46.1	46.0	8.0	54.1
26	210.2	276.8	53.5	330.3	0.45	46.8	46.2	8.3	55.1
27	226.1	289.1	57.7	346.9	0.45	47.4	46.3	8.6	56.0
28	241.9	301.5	62.1	363.6	0.45	48.0	46.4	9.0	57.0
29	257.8	313.9	66.6	380.5	0.45	48.8	46.6	9.3	58.1
30	273.6	326.3	71.3	397.5	0.45	49.6	46.7	9.6	59.2
31	289.4	338.6	76.1	414.7	0.45	50.3	46.8	9.9	60.2
32	307.0	351.0	81.1	432.1	0.45	51.0	46.9	10.2	61.2
33	324.9	363.4	86.2	449.6	0.45	51.6	47.0	10.6	62.2
34	332.0	375.0	92.5	467.5	0.50	52.2	47.1	10.9	63.1
35	350.0	387.5	98.0	485.5	0.50	52.8	47.1	11.2	64.0
36	368.0	400.0	103.7	503.7	0.50	53.3	47.2	11.5	64.9
37	386.0	412.5	109.5	522.0	0.50	53.8	47.3	11.8	65.7
38	404.0	425.0	115.5	540.5	0.50	54.3	47.4	12.2	66.5
39	422.0	437.5	121.7	559.2	0.50	54.8	47.4	12.5	67.2
40	440.0	450.0	128.0	578.0	0.50	55.2	47.5	12.8	68.0

BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB
ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Abutment Design	Date:	2/27/2014

Table 3.3.1.2

Maximum Unfactored HL-93 Live Load Moments, Shears, and Reactions
Simple Spans, One Lane, w/o Dynamic Load Allowance

	MOMENTS					SHEARS & END REACTIONS			
SPAN FT	TRUCK KIP-FT	TANDEM KIP-FT	LANE KIP-FT	TOTAL KIP-FT	SPAN PT. %	TRUCK KIP	TANDEM KIP	LANE KIP	TOTAL KIP
42	485.2	474.8	139.7	624.9	0.45	56.0	47.6	13.4	69.4
44	520.9	499.5	153.3	674.2	0.45	56.7	47.7	14.1	70.8
46	556.5	524.3	167.6	724.1	0.45	57.4	47.8	14.7	72.1
48	592.2	549.0	182.5	774.6	0.45	58.0	47.9	15.4	73.4
50	627.8	573.8	198.0	825.8	0.45	58.6	48.0	16.0	74.6
52	663.4	598.5	214.2	877.6	0.45	59.1	48.1	16.6	75.7
54	699.1	623.3	230.9	930.0	0.45	59.6	48.1	17.3	76.8
56	734.7	648.0	248.4	983.1	0.45	60.0	48.2	17.9	77.9
58	770.4	672.8	266.4	1036.8	0.45	60.4	48.3	18.6	79.0
60	806.0	697.5	285.1	1091.1	0.45	60.8	48.3	19.2	80.0
62	841.6	722.3	304.4	1146.1	0.45	61.2	48.4	19.8	81.0
64	877.3	747.0	324.4	1201.7	0.45	61.5	48.4	20.5	82.0
66	912.9	771.8	345.0	1257.9	0.45	61.8	48.5	21.1	82.9
68	948.6	796.5	366.2	1314.8	0.45	62.1	48.5	21.8	83.9
70	984.2	821.3	388.1	1372.3	0.45	62.4	48.6	22.4	84.8
75	1070.0	887.5	450.0	1520.0	0.50	63.0	48.7	24.0	87.0
80	1160.0	950.0	512.0	1672.0	0.50	63.6	48.8	25.6	89.2
85	1250.0	1012.5	578.0	1828.0	0.50	64.1	48.8	27.2	91.3
90	1340.0	1075.0	648.0	1988.0	0.50	64.5	48.9	28.8	93.3
95	1430.0	1137.5	722.0	2152.0	0.50	64.9	48.9	30.4	95.3
100	1520.0	1200.0	800.0	2320.0	0.50	65.3	49.0	32.0	97.3
110	1700.0	1325.0	968.0	2668.0	0.50	65.9	49.1	35.2	101.1
120	1880.0	1450.0	1152.0	3032.0	0.50	66.4	49.2	38.4	104.8
130	2060.0	1575.0	1352.0	3412.0	0.50	66.8	49.2	41.6	108.4
140	2240.0	1700.0	1568.0	3808.0	0.50	67.2	49.3	44.8	112.0
150	2420.0	1825.0	1800.0	4220.0	0.50	67.5	49.3	48.0	115.5
160	2600.0	1950.0	2048.0	4648.0	0.50	67.8	49.4	51.2	119.0
170	2780.0	2075.0	2312.0	5092.0	0.50	68.0	49.4	54.4	122.4
180	2960.0	2200.0	2592.0	5552.0	0.50	68.3	49.4	57.6	125.9
190	3140.0	2325.0	2888.0	6028.0	0.50	68.5	49.5	60.8	129.3
200	3320.0	2450.0	3200.0	6520.0	0.50	68.6	49.5	64.0	132.6

http://www.dot.nd.gov/manuals/bridge/lrfd-bridge-design/Section03A.pdf

CANTILEVER ABUTMENT DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions

General Notes: **This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).**

Notes for Khost Bridge No 9

Project Notes: For the Design: Design was based on the West Abutment

General Design Parameters

Input Section : 1.0

GEOMETRY INFORMATION INPUT:

PROPOSED TOP OF ROADWAY ELEV:		6105.83 ft	1861.53 m
PROPOSED TOP OF BACKWALL ELEV:		6103.09	1860.70 m
PROPOSED BRIDGE SEAT ELEV:	H_Backwall = 5.14 ft	6097.95 ft	1859.13 m
PROPOSED TOP OF FOOTING ELEV:	H_Footing = 3.28 ft	6079.00 ft	1853.35 m
PROPOSED BOT. OF FOOTING ELEV:		6075.72 ft	1852.35 m
ELEVATION OF HIGH WATER:	FOR NO WATER = 0.00	6097.36	1858.95 m
PROPOSED BRIDGE SEAT WIDTH:		3.12 ft	0.95 m
PROPOSED BACKWALL WIDTH:		1.48 ft	0.45 m
ABUTMENT/WALL DESIGN LENGTH:	1.00 Ft Actual Length=	36.90 ft	11.25 m
FOOTING LENGTH:		44.12 ft	13.45 m

DW CALCULATION INPUT:

WEARING SURFACE DEPTH:	2.13 IN x 1. Layers	0.18 ft <-- ---	0.05 m
ROADWAY WIDTH:		26.24 ft	8.00 m
BRIDGE SPAN:	Total Length = 165.312 <-- 3 Spans @	55.10 ft	16.80 m
NUMBER OF GIRDERS:		6	

MATERIAL PROPERTIES:

CUBIC WEIGHT CONCRETE:	150.00 pcf
COMP. STRENGTH OF CONC. = F'c:	4.00 ksi
MAXIMUM SIZE OF COARSE AGGREGATE	1.50 in
TENSILE STRENGTH OF REBAR = Fy:	60.00 ksi
CUBIC WEIGHT OF HOT MIX ASPHALT (HMA):	165.00 pcf

GEOTECHNICAL INFORMATION:

BEARING RESISTANCE (CAPACITY):	8.00	ksf	<-- Per Geotech Report
FACTORED BEARING RESISTANCE, qr :	8.00	ksf	<-- Assumed
WEIGHT OF SOIL BACKFILL:	115.00	Lbs/CF	<-- Assumed
WALL ON ROCK?	N	(Y OR N)	
WALL ON PILES?	N	(Y OR N)	
GRAVITY WALL?	N	(Y OR N)	
BETA: SLOPE OF BACKFILL:	0.00	DEG	<-- Assumed
THETA: BATTER ANGLE BACKWALL:	76.84	DEG	AASHTO Table 3.11.5.3-1
PHI: FRICTION ANGLE OF BACKFILL:	31.00	DEG	<-- Assumed
DELTA: ANGLE BACKWALL FRICTION:	20.67	DEG	<-- Assumed δ=2/3 ($\varnothing$)

Fill-in for Abutment / Pier Design

Khost Bridge No.10

CANTILEVER ABUTMENT DESIGN	Y
GRAVITY ABUTMENT DESIGN	N
CANTILEVER WALL DESIGN	N
GRAVITY WALL DESIGN	N
PIER DESIGN	N

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CANTILEVER ABUTMENT DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

General Loading Parameters

Input Section : 2.0

LIVE LOAD INFORMATION:

APPROACH SLAB:	Y	(Y OR N)
ROADWAY WITHIN H/2 OF TOP OF WALL:	Y	(Y OR N)
Live Load Surcharge to be Considered?:	Y	
SURCHARGE HEIGHT:	2.00	ft REF: Table 3.11.6.4-1
Construction Surcharge, q:	250.00	psf REF: C3.4.2.1

SEISMIC LOAD INFORMATION:

WALL RESTRAINED HORZ. MOVMT.(Y/N):	N	(Y OR N)
SEISMIC ACCELERATION COEFF. A:	0.290	REF: FIG.3.10.2.1-2, AASHTO
SEISMIC CATEGORY:	D	<---Assumed based on Location & AASHTO Seimic Design Guide

RAILING CLASS: S3-TL4 (CT) (PER MASSDOT LRFD BRIDGE MANUAL PART 1) 3.3.2.2 <--- N/A

Horizontal Railing Design Load	0.00	kips
Horizontal Railing Impact Length	0.00	ft
Wall Height+Rail Height	0.00	ft
Distributed Horizontal Railing Design Load @ top of wall	0.00	klf
Distributed Horizontal Railing Design Load @ bottom of wall	0.00	klf/wall height
Railing Dead Load	0.00	
Additional Moment From Railing Impact	0.00	<--- **Note:** The added moment from top of railing to bottom of railing is distributed along bottom of footing*

SURCHARGE HEIGHT (Per ASSHTO 3.11.6.4 Live Load Surchage)

ABUTMENTS ----> Table 3.11.6.4-1

Table 3.11.6.4-1 - Equivalent Height of Soil for Vehicular Loading on Abutments Perpindicular to Traffic

Abutment Height (ft)	h_{eq} (ft)
5	4
10	3
>20	2

Surcharge Height = 2.00 ft

RETAINING WALLS -- --> Table 3.11.6.4-2

See Table 3.11.6.4-2 for Equivalent Height of Soil for Vechicular Loading on Retaining Walls Parallel to Traffic.

Retaining Wall Height (ft)	heq (ft) Distance from wall backface to edge of traffic	
	0.0 ft	≥ 1.0 ft
5	5	2
10	3.5	2
>20	2	2

Distance from wall backface to edge of traffic = 0.0 ft

Surcharge Height = 2.00 ft

Note: **See 3.11.6.5 for Possible Reduction of Surcharge**

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CANTILEVER ABUTMENT DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Superstructure Loading Parameters

Input Section : 3.0

ADDITIONAL LOADS ON STRUCTURE

(load is per linear foot of structure (Abutment/ Pier/ Wall) NOT the Footing, arm from front edge of bridge seat)

LOADS		LOAD (klf)	ARM (feet)			
(DC+DW), SUPERSTRUCT. DEAD LOAD:	DL	13.08	1.72	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
DC (Structural Components & nonstructural attachments)	DC	12.49	1.72	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
DW (Wearing Surface & Utilities)	DW	0.59	1.72	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
(LL+IM+PL), LIVE LOAD, IMPACT AND PED LL:	LL+IM+PL	5.22	1.72	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
WS, WIND LOAD ON STRUCTURE:	WS	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
WL, WIND LOAD ON LIVE LOAD:	WL	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
BR, BREAKING LOAD :	BR	0.98	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
TU, THERMAL FORCE:	TU	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
EQ, SEISMIC LOAD ON SUPERSTRUCTURE:	EQ	3.92	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
CT, VEHICLE COLLISION LOAD	CT	0.00	0.00	Distance above top pf wall equal to the height of rail	Include =	Y

Note: Per AASHTO 11.5.1, abutments and retaining walls should be designed for EH, WA, LS, DS, DC, TU, EQ. Therefore, including wind and breaking forces is conservative. Say OK

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CANTILEVER ABUTMENT DESIGN -INPUT

General Information

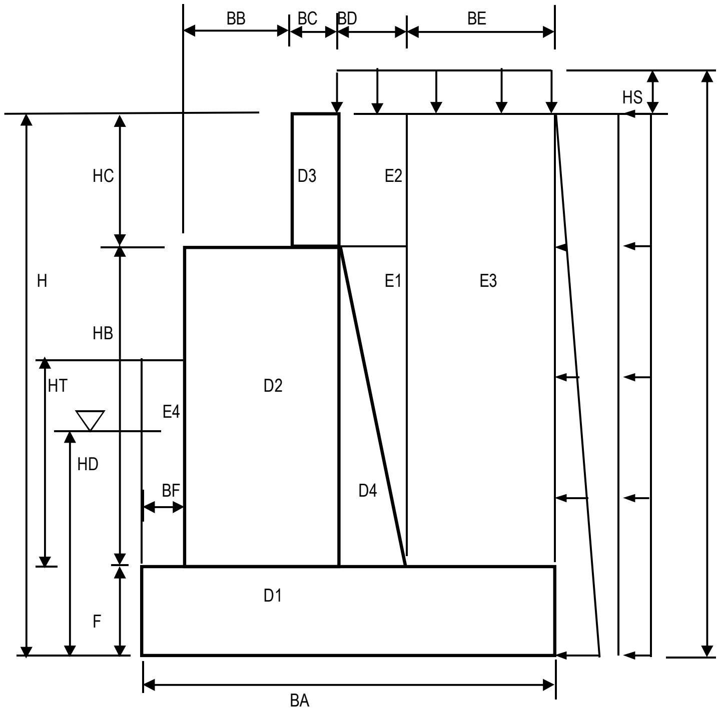
Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Abutment Geometry

Input Section : 4.0

CALCULATION OF WALL AND BACKFILL GEOMETRY:

		Prelim Size	User Adjust	Final Size (ft)	Approx Size (mm)
HEIGHT OF ABUTMENT / WALL, H:	H =	29.120	0.00	29.12	8800
HEIGHT OF FOOTING, F:	F =	3.280	1.75	5.03	1510
HEIGHT OF STEM, HB:	HB =	20.700	-1.75	18.95	5690
HEIGHT OF BACKWALL, HC:	HC =	5.140	0.00	5.14	1550
HEIGHT OF HIGH WATER, HD:	HD =	21.636	0.00	21.64	6500
HEIGHT OF SURCHARGE, HS:	HS =	2.000	0.00	2.00	600
WIDTH OF FOOTING, BA:	BA =	23.200	0.00	23.20	6960
WIDTH OF BRIDGE SEAT, BB:	BB =	3.120	0.00	3.12	940
WIDTH OF BACKWALL, BC:	BC =	1.480	0.00	1.48	450
WIDTH OF BATTER OF STEM, BD:	BD =	5.400	0.00	5.40	1620
WIDTH OF FOOTING HEEL, BE:	BE =	9.260	0.00	9.26	2780
WIDTH OF FOOTING TOE, BF:	BF =	3.936	0.00	3.94	1190
HEIGHT OF SOIL OVER TOE, HT:	HT =	3.810	6.50	10.31	3100
HEIGHT OF SOIL OVER HEEL, HH:	HH =	25.348	0.00	25.35	7610
HEIGHT OF SOIL AT BACKFACE FACE (HEEL), HS1	Hss1 =			30.378	9200
HEIGHT OF SOIL AT FRONT FACE FACE (TOE), HS2	Hss2 =			15.34	4700



OVERALL QUANTITIES:

WEIGHT OF CONCRETE WALL/L.F.:	39.396	Kips per l.f.
CONCRETE QUANTITY / L.F.:	9.727	C.Y. per l.f.

SUMMARY OF QUANTITIES:

STEEL / L.F. =	1107.996	LBS/L.F.
CONC. / L.F =	9.727	C.Y./L.F.

Geometry Check: Check Width: ok

Check Height: ok

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

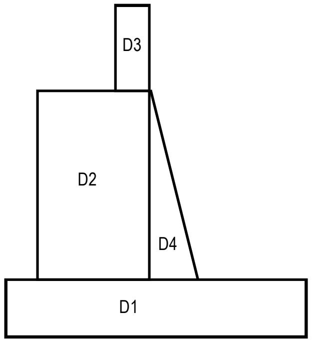
References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Notes for Khost Bridge No 9

Calculate Dead Loads

Primary Loads Section : 1.0



Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	Superstructure	12.49	5.66	70.66			
DW	Superstructure	0.59	5.66	3.33			

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Substructure Loads: Vertical: Horizontal:

AREA #		Volume (CF)	γ_{conc} (pcf)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	D1	116.70	150.00	17.50	11.60	203.05			
	D2	87.17	150.00	13.08	6.24	81.54			
	D3	7.61	150.00	1.14	7.80	8.90			
	D4	51.17	150.00	7.67	10.34	79.33			
	Subtotal Concrete			**39.40**		**372.81**			

Total Dead Load: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL DC (Super + Sub)	**51.88**		**443.47**			
TOTAL DW (Super)	**0.59**		**3.33**			
TOTAL DC (Substr. Only - Construction)	**39.40**		**372.81**			

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Earth Loads

Primary Loads Section : 2.0

Compute Horizontal Earth Pressure, EH:

Coulomb's Active Earth Pressure: (per MHD 3.1.5 and AASHTO 3.11.5.3)

PHI, ϕf =	31.00	Degrees,	Rad =	0.54
DELTA, δ =	20.67	Degrees,	Rad =	0.36
BETA, β =	0.00	Degrees,	Rad =	0.00
THETA, θ =	76.84	Degrees,	Rad =	1.34
Γ (per AASHTO Eq. 3.11.5.3-2)=	2.91			
Ka (per AASHTO Eq. 3.11.5.3-1)=	**0.395**			

Earth Pressure Coefficient to be Used for Design per MassDOT

All Walls on Rock	ko	0.485	
All Walls on Piles	ko	0.485	
Cantilever Walls < than 16' in Height	0.5*(Ko + Ka)	0.440	
Cantilever Walls > than 16' in Height	Ka	0.395	<-- USE
Gravity wall supported on Spread Footing	Ka	0.395	

At-Rest Earth Pressure Coeff:

Ko = **0.485**

Earth Pressure Coefficient to be Used for Design:

WALL ON LEDGE:	N	(Y OR N)
WALL ON PILES:	N	(Y OR N)
Wall Height:	29.12	ft
Earth pressure Type:	Ka	
Ke =	**0.395**	**<===== Governs.**

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Ko =	0.49	
Ka =	0.32	
Ke (geotech) =	**0.320**	**<=== Does not govern.**

Compute Lateral Earth Pressure:

Application of lateral earth pressure shall be per AASHTO Figure C3.11.5.3-1. This shows a different application for Gravity and Cantilever (semi-gravity) walls.
Note that the reduction in lateral earth pressures due to the water table is not included in this section. It is included in the WA (Bouyancy) section of this design.

Cantilever (semi-gravity) Walls:

Load inclination from horizontal, min = $\phi/3$ =	10.33	degrees
Load inclination from horizontal, max = $\phi*2/3$ =	20.67	degrees
GAMMA =	115.00	pcf
H = Soil Height at Back face, Hss1	**30.38**	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	20.96	kips
Arm for Horiz Load above BOF = H/3 =	10.13	ft
Arm for Vert Load from Toe = BA =	23.20	ft

Consider minimum inclination for Sliding, Overturning and Bearing Pressure:

Vertical Component, Pav = Pa*sin(ϕ/3) =	3.76	klf
Horizontal Component, Pah = Pa*cos(ϕ/3) =	20.62	klf

Consider maximum inclination for Footing Heel Reinforcement:

Vertical Component, Pav = Pa*sin(ϕ*2/3) =	7.40	klf
Horizontal Component, Pah = Pa*cos(ϕ*2/3) =	19.61	klf

←← THIS SECTION IS FOR CANTILEVER OR SEMI-GRAVITY WALLS ONLY ←←

Gravity Walls:

Load inclination from horizontal = $\delta + (90-\theta)$ =	33.83	degrees
GAMMA =	115.00	pcf
H =	30.38	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	20.96	kips
Arm for Horiz Load above BOF = H/3 =	10.13	ft
Arm for Vert Load from Toe=(BF+BB+BC+BD*2/3) =	12.14	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Pav = Pa*sin($\delta+(90-\theta)$) =	11.67	klf
Horizontal Component, Pah = Pa*cos($\delta+(90-\theta)$) =	17.41	klf
Is the wall a Gravity Wall?	N	

←← N/A ---> THIS SECTION IS FOR GRAVITY WALLS ONLY ←←

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.1

Include Passive Earth Pressure	Y
Pp Factor	1

ϕ = Soil Friction Angle	31.00	degrees
δ = Wall Interface Friction	20.67	degrees = 2/3 * ϕ --> 11.6.5.5
Kp = Passive Earth Pressure Coefficient	3.13	Fig A11.4-2 **<-- For the preliminary design it was assumed kp = kpe (see below for kpe back-up)**
γ = Unit Weight of Soil	115.00	pcf
H = Hss2= Height of Soil at Front Face - 1'	14.34	ft

Lateral EQ Load, Pp = 1/2*γ*Kp*H^2=	37.01	klf ---> Equation A11.4-4
Arm for Horiz Load above BOF = H/3 =	4.78	ft (AASHTO pg 11-112)

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.2

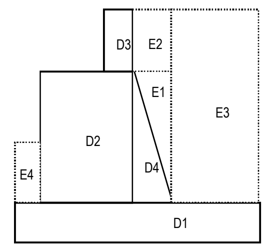
Horizontal Earth Pressure, EH: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EH: Pa	3.76	23.20	87.22	20.62	10.13	208.78
EH: Pp			0.00	-37.01	4.78	-176.90
EH (For all cases except heel reinforcement):	3.76	23.20	87.22	-16.39	14.91	-244.32
EH: Pa	7.40	23.20	171.61	19.61	10.13	198.57
EH: Pp			0.00			0.00
EH (For Heel Reinforcement):	7.40	23.20	171.61	19.61	10.13	198.57

<=== Note, Based on AASHTO Figure C11.5.6-1, both the vertical and horizontal components of EH should be included here because they carry the same load factor.

Vertical Earth Pressure, EV: Vertical: Horizontal:

AREA #		Volume (CF)	γ_{SOIL} (plf)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EV	E1	51.17	115.00	5.88	12.14	71.41			
	E2	27.76	115.00	3.19	11.24	35.86			
	E3	223.07	115.00	25.65	18.57	476.28			
	E4	40.58	115.00	4.67	1.97	9.18			
TOTAL EV				**39.40**		**592.74**			



Note, per AASHTO 11.6.1.2, the weight of the soil over the battered portion of the stem or over the base of a footing may be considered as part of the effective weight of the abutment. This is consistant with design.

Earth Surcharge, ES: (This applies for construction case only)

q =	250.00	psf
Uniform Load on Wall, p=Ke*q =	0.099	ksf
Wall Height, H =	29.12	Feet
Heel Length, BE =	9.26	Feet
Footing Width, BA =	23.20	Feet
Wall Length Considered =	1.00	ft

Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
ES	$P_{con}(h)$ = p*H*Length =				2.88	14.56	41.87
	$P_{con}(v)$ = q*BE*Length =	3.67	15.87	58.16			
TOTAL ES		**3.67**		**58.16**	**2.88**		**41.87**

CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Live Loads

Primary Loads Section : 3.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LL+IM+PL	**Superstructure**	**5.22**	**5.66**	**29.51**			
BR	**Superstructure**				**0.976**	**23.98**	**23.40**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Live Load Surcharge Loads: LS

Per AASHTO 3.11.6.4, a live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall.
If the surcharge is for highway, the intensity of the load shall be consistent with provisions of Article 3.6.1.2. See Tables 3.11.6.4-1 and 3.11.6.4-2 for equivalent heights.

Compute Horizontal Live Load Surcharge: (To be used for bearing pressure and sliding load cases):

Ke =	0.395	
Unit Weight of Soil, γ =	115.000	pcf
Surcharge Height, heq =	2.00	Feet
LS(h) =(Ke)(γ)(heq)*H =	2.65	kips
Moment arm = H/2 =	14.56	kips

Compute Vertical Live Load Surcharge: (To be used for bearing pressure cases only):

LS(v) =(γ)(heq)(BD+BE) =	3.37	kips
Moment arm = Ba-(BD+BE)/2 =	15.87	kips

Compute Vertical Live Load Surcharge: (To be used for heel reinf cases only):

LS(v) =(γ)(heq)(BE) =	2.13	kips
Moment arm (to back of batter) = BE/2 =	4.63	kips

Live Load Surcharge, LS: Summary Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LS	**LS(v)**	**3.37**	**15.87**	**53.51**			
	LS(h)				**2.65**	**14.56**	**38.52**

Total Live Load Load: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL LL+IM+PED+BR+LS	**8.59**		**83.02**	**3.62**		**61.91**
TOTAL LL+IM+PED+BR+LS (Sliding Only)	**5.22**		**29.51**	**3.62**		**61.91**
TOTAL LS (Heel Reinf Only)	**2.13**	**4.63**	**9.86**			

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Buoyancy Forces

Primary Loads Section : 4.0

HEIGHT OF STEM AT HIGH WATER:	16.61	
HEIGHT OF FOOTING AT HIGH WATER:	5.03	
WIDTH OF FOOTING, BA	23.20	
SOIL WEIGHT - WATER WEIGHT	52.60	pcf
UPWARD BOUYANT FORCE	-62.40	pcf

Horizontal Force = B(h) = (γ-(γ-62.4))*Ka)H^2/2, acts at HD/3:

Bouyant Load, WA: Vertical: Horizontal:

AREA #		VOLUME (CF)	GAMMA (#/CF)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WA	B1 (Ftg)	116.70	-62.40	-7.28	11.60	-84.47			
	B2 (Stem)	166.06	-62.40	-10.36	6.24	-64.62			
	B3 (Soil over Ftg)	219.20	-62.40	-13.68	18.57	-253.95			
	STATIC						5.77	7.21	41.60
	SEISMIC						11.50	7.21	82.96
TOTAL WA (Static)				**-31.32**		**-403.03**	**5.77**		**41.60**
TOTAL WA (Seismic)				**-31.32**		**-403.03**	**11.50**		**82.96**

Calculate Wind Loads

Primary Loads Section : 5.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WS	**Superstructure**				**0.00**	**23.98**	**0.00**
WL	**Superstructure**				**0.00**	**23.98**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Calculate Temperature Loads

Primary Loads Section : 6.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TU	**Superstructure**				**0.00**	**23.98**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Seismic Forces

Primary Loads Section : 7.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	Superstructure				3.923	23.98	94.08

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Substructure Loads:

(Ref: AASHTO 4th Ed., A11.1.1.1 for Mononobe-Okabe Analysis.)

GAMMA = unit weight of soil =	115.00	Lbs/CF		
H = height of soil face =	29.12	Feet		
PHI = angle of internal friction of soil =	31.00	Degrees =	0.54	Radians
DELTA = angle of friction between soil & abut =	20.67	Degrees =	0.36	Radians
i = backfill slope angle =	0.00	Degrees =	0.00	Radians
BETA = slope of wall to the vertical	0.00	Degrees =	0.00	Radians

A =	0.29			
kh = horizontal acceleration coefficient	0.435	Consider Cohesion?	N	------> kh = a * 0.5, Wall is NOT Restrained from Horizontal Movement
kv = vertical acceleration coefficient	0.000			
THETA = arc tan (kh/(1-Kv) =	23.51	Degrees =	0.41	Radians
Kae (per AASHTO Eq. A11.1.1.1-2) =	**0.788**	**<===== Governs.**		

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Kae (geotech) = 0.000 **<=== Does not govern.**

N/A
NOT GIVEN IN
GEOTECH REPORT

Load inclination from horizontal = δ =	20.67	degrees
Lateral EQ Load, Eae = 1/2*γ*Kae*H^2*(1-kv) =	38.40	klf
Arm for Horiz Load above BOF = H/3 =	9.71	ft (AASHTO pg 11-112)
Arm for Vert Load from Toe = BA =	23.20	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Eav = Eae*sin(δ) =	13.55	klf	Include EQ In Design =	Y
Horizontal Component, Eah = Eae*cos(δ) =	35.93	klf	EQ Factor =	1

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CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Seismic Forces

Primary Loads Section : 7.1

Include Seismic Passive Earth Pressure	Y	
Epe Factor	1	
kh = horizontal acceleration coefficient	0.435	
∅ = Soil Friction Angle	31.00	degrees
δ = Wall Interface Friction	20.67	degrees = 2/3 * ∅ --> 11.6.5.5
Kpe = Seismic Passive Earth Pressure Coefficient	3.13	Fig A11.4-2
γ = Unit Weight of Soil	115.00	pcf
Hff = Height of Soil at Front Face - 1'	14.34	ft
Lateral EQ Load, Epe = 1/2*γ*Kpe*H^2=	37.01	klf ---> Equation A11.4-4
Arm for Horiz Load above BOF = Hff/3 =	4.78	ft (AASHTO pg 11-112)

SECTION 11: WALLS, ABUTMENTS, AND PIERS 11-117

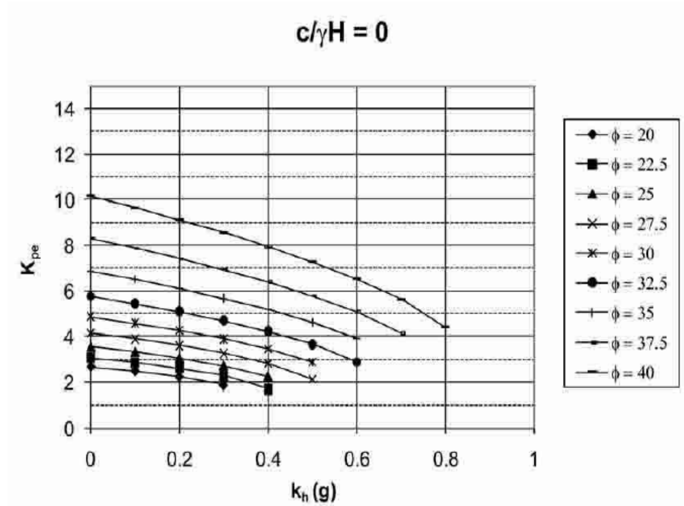

Figure A11.4-2—Seismic Passive Earth Pressure Coefficient Based on Log Spiral Procedure for $c/\gamma H$ = 0 and 0.05 (c = soil cohesion, γ = soil unit weight, and H = height or depth of wall over which the passive resistance acts)

Note: $k_h = A_s = k_{ho}$ for wall heights greater than 20 ft.

CANTILEVER ABUTMENT DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Calculate Seismic Forces Continued..

Primary Loads Section : 7.2

WALL INERTIA EFFECTS

Per **AASHTO DIV 1A 6.4.3**, seismic design should take into account forces arising from seismically inducd lateral earth pressures (as computed above), additional forces arising from wall inertia and the transfer of seismic forces from the bridge deck through bearing supports which do not slide freely.

The following table computes the inertia forces due to the weight of the concrete and backfill.

kh = 0.435

AREA #		DL (Kips)	DL*kh (Kips)	ARM (Feet)	MOM (Ft x K)
DL Wall	D1	17.50	7.61	2.52	19.15
	D2	13.08	5.69	14.51	82.50
	D3	1.14	0.50	26.55	13.18
	D4	7.67	3.34	11.35	37.88
	Subtotal	**39.40**	**17.14**	**8.91**	**152.71**
DL Backfill	E1	5.88	2.56	17.66	45.21
	E2	3.19	1.39	26.55	36.86
	E3	25.65	11.16	17.08	190.54
	E4	4.67	2.03	10.19	20.68
	Subtotal	**39.40**	**17.14**	**17.11**	**293.29**
TOTAL		**78.79**	**34.27**	**13.01**	**446.01**

Total Seismic Loads, EQ:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	EQ Superstructure =				3.923	23.98	94.077
	Eae(v)	13.55	23.20	314.43			
	Eae(h)				35.93	9.71	348.76
	Epe(v)		23.20	0.00			
	Epe (h)				-37.01	4.78	-176.90
	Fwi(h)				34.27	13.01	446.01
TOTAL EQ		**13.55**		**314.43**	**37.12**		**711.94**

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CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

References:

AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
ACI 318-08 Building Code Requirements for Structural Concrete, 2005
2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions

Notes:

This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Notes for Khost Bridge No 9

Summary of Primary Loads

Load Combinations : 1.0

INCLUDE SEISMIC = Y

Load		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)	Notes	LRFD Load Combination Load Case
Dead Load	$DC_{SUB+SUPER}$	51.88	0.00	443.47	0.00	0.00	0.00	Super + Sub	
	DW	0.59	0.00	3.33	0.00	0.00	0.00	Super Only	
	DC_{SUB}	39.40	0.00	372.81	0.00	0.00	0.00	Sub Only - Construction	LC1 only
Earth Load	EH	3.76	23.20	87.22	-16.39	14.91	-244.32	All cases except Heel	Used in all load cases
	EH	7.40	23.20	171.61	19.61	10.13	198.57	For Heel Reinforcement	Not used in any load case
	EV	39.40	0.00	592.74	0.00	0.00	0.00		
Earth Load Surcharge	ES	3.67	0.00	58.16	2.88	0.00	41.87		
Live Load Surcharge	LS(v)	3.37	15.87	53.51	0.00	0.00	0.00		
	LS(h)	0.00	0.00	0.00	2.65	14.56	38.52		
Live Load	LL+IM+PED+BR+LS	8.59	0.00	83.02	3.62	0.00	61.91		
	LL+IM+PED+BR+LS	5.22	0.00	29.51	3.62	0.00	61.91	No LS for Sliding LC	LC4, LC8 & LC10
	LS	2.13	4.63	9.86	0.00	0.00	0.00		
Bouyant Load	WA	-31.32	0.00	-403.03	5.77	0.00	41.60	Static	
	WA	-31.32	0.00	-403.03	11.50	0.00	82.96	Seismic	LC9 &LC10
Wind Load	WS	0.00	0.00	0.00	0.00	23.98	0.00		
	WL	0.00	0.00	0.00	0.00	23.98	0.00		
Temperature Load	TU	0.00	0.00	0.00	0.00	23.98	0.00		
Seismic Load	EQ	13.55	0.00	314.43	37.12	0.00	711.94		
Vehicle Collision Load	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stem Wall	LC11 & LC12
	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stability	

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CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Limit States and Load Factors

Load Combinations : 2.0

Service Limit State

Per AASHTO 10.5.2, foundation design at the service limit state shall include settlements, horizontal movements, overall stability (of earth slopes) and scour at the design flood.
* These items are part of the geotechnical scope and are therefore NOT included in this design.

Strength Limit States

Per AASHTO 10.5.3, foundation design at the strength limit strength shall include structural resistance, scour, nominal bearing resistance, overturning or excessive loss of contact, sliding and constructability.
* These items, except scour, are addressed in this design.

Extreme Events Limit States

Per AASHTO 10.5.4, foundation shall be designed for extreme events such as a seismic event and vehicle collision.
* These items are addressed in this design.

Since these factors are 1.0, they have not yet been incorporated into the design template.

Computation of the Load Modification Factor, h_i:

		Extreme	Strength
h_D Ductility Factor, (AASHTO 1.3.3):		1.00	1.00
h_R Redundancy Factor, (AASHTO 1.3.4):		1.00	1.00
h_I Operational Importance Factor, (AASHTO 1.3.5):		1.00	1.00
h_i (for loads for which γ_i(max) is appropriate) (AASHTO Eq 1.3.2.1-2):	$h_i = h_D h_R h_I \geq 0.95$	1.00	1.00
h_i (for loads for which γ_i(min) is appropriate) (AASHTO Eq 1.3.2.1-3):	$h_i = 1 / h_D h_R h_I \leq 1.00$	1.00	1.00

h_D Ductility Factor (for all other limit states h_D = 1.00)

$h_D \geq$	1.05	for nonductile components and connections.
$h_D =$	1.00	for conventional designs and details complying with the specifications.
$h_D \geq$	0.95	for components and connections for which additional ductility-enhancing m

h_R Redundancy Factor (for all other limit states h_R = 1.00)

$h_R \geq$	1.05	for nonredundant members
$h_R =$	1.00	for conventional levels of redundancy
$h_R \geq$	0.95	for exceptinal levels of redundancy

h_I Operational Importance Factor

$h_I \geq$	1.05	for a bridge of operational importance
$h_I =$	1.00	for typical bridges
$h_I \geq$	0.95	for relatively less important bridges

Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2), g_p:

	Maximum	Minimum	
DC (Dead Load, General):	1.25	0.90	
DW (Wearing Surface & Utilities):	1.50	0.65	
EH (Horiz Earth):	1.43	0.90	<-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.
ES (Horiz Earth):	1.50	0.75	
EV (Vertical Earth, Retaining Structure):	1.35	1.00	

Live Load Factor During a Seismic Event, g_{EQ}:

	Maximum	Minimum	
g_{EQ} (AASHTO C3.4.1):	0.50	0.00	<--- Seismic Included

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CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

LRFD Load Combinations & Notes

Load Combinations : 3.0

NOTES:

1. Load Combination Strength II does not need to be checked since it applies to special design vehicles.
2. Load Combination Strength III does not need to be checked during construction since WS is not a significant load.
3. Load Combination Strength IV does not need to be checked since it applies to bridges with very high dead load to live load ratios.
4. Load Combination Strength V does not need to be checked during construction since WS and WL are not significant loads.
5. Extreme Event load combinations do not need to be checked during construction.
6. Extreme Event II load combinations does not need to be checked for abutments.
7. Service limit state load combinations do not need to be checked for abutment stability / reinforcement.
8. Fatigue limit state load combinations do not need to be checked for abutment stability / reinforcement.
9. All remaining load cases shall be checked using load factors which would provide max effect for either bearing or sliding / eccentricity similar to AASHTO Figures C11.5.5-1 and C11.5.5.2.
10. Bouyancy has been included in sliding load combinations. A load factor of 0.0 has been used for bearing pressure load combinations since it is conservative to ignore sliding for these computations.

Strength	LC1	LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): gp max*(DCsub)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Strength	LC2	LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Bearing	LC3	LC3 - STRENGTH I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Sliding	LC4	LC4 - STRENGTH I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Bearing	LC5	LC5 - STRENGTH III BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Sliding	LC6	LC6 - STRENGTH III SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Bearing	LC7	LC7 - STRENGTH V BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Sliding	LC8	LC8 - STRENGTH V SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Extreme Bearing	LC9	LC9 - EXTREME EVENT I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+gEQ MAX*(LL+IM+PL+BR+LS)+1.0*(EQ)
Extreme Sliding	LC10	LC10 - EXTREME EVENT I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+gEQ MIN*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)
Extreme Bearing	LC11	LC11 - EXTREME EVENT II BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(CT)
Extreme Sliding	LC12	LC12 - EXTREME EVENT II SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(CT)

CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

LRFD Load Combinations

Load Combinations : 3.1

↓ N/A, Valid for Pile Design Only ↓

NA (for Bottom row of piles) From Pile Design = 0

Bottom Row to Edge of Toe = 0

LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): $g_{p\,max}$*(DCsub)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC_{SUB}	1.25	49.24		466.01	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
ES	1.50	5.50		87.25	4.31		62.80
SUM		**113.28**		**1477.74**	**-19.04**		**-285.36**

↓ N/A, Valid for Pile Design Only ↓

Distance of Pile Group N.A. From Footing Toe (See Pile Design Spreadsheet): 0.00 ft

Distance of Vertical Force (V) From The Footing Toe	Offset of Pile Group N.A. From Original Location of V	Equivalent Moment Due to Offset of Pile Group N.A. From Original Location of V	**Mom. to Be Used On Pile Group = O.T. Mom. - Equivalent Mom.**	**Vertical Force to Be Used On Pile Group**	**Horizontal Force to Be Used On Pile Group**
13.04 ft	13.04 ft	1477.7 k.ft	**-1763.1 k.ft**	**113.3 kip**	**-19.0 kip**

LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	64.85		554.34	0.00		0.00
DW	1.5	0.88		5.00	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
ES	1.50	5.50		87.25	4.31		62.80
SUM		**129.78**		**1571.06**	**-19.04**		**-285.36**

↓ N/A, Valid for Pile Design Only ↓

Distance of Vertical Force (V) From The Footing Toe	Offset of Pile Group N.A. From Original Location of V	Equivalent Moment Due to Offset of Pile Group N.A. From Original Location of V	**Mom. to Be Used On Pile Group = O.T. Mom. - Equivalent Mom.**	**Vertical Force to Be Used On Pile Group**	**Horizontal Force to Be Used On Pile Group**
12.11 ft	12.11 ft	1571.1 k.ft	**-1856.4 k.ft**	**129.8 kip**	**-19.0 kip**

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CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.2

LC3 - STRENGTH I BEARING: $g_{p\ max}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ max}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	64.85		554.34	0.00		0.00
DW	1.5	0.88		5.00	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
LL+IM+PL+BR+LS	1.75	15.03		145.29	6.34		108.35
WA	1.00	-31.32		-403.03	5.77		41.60
TU	0.50	0.00		0.000	0.0000		0.000
SUM		**107.99**		**1226.07**	**-11.25**		**-198.21**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.35 ft	11.35 ft	1226.1 k.ft	**-1424.3 k.ft**	**108.0 kip**	**-11.3 kip**

LC4 - STRENGTH I SLIDING: $g_{p\ min}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ min}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	46.70		399.12	0.00		0.00
DW	0.65	0.38		2.17	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.00	39.40		592.74	0.00		0.00
LL+IM+PL+BR+LS	1.75	9.13		51.65	6.34		108.35
WA (static)	1.00	-31.32		-403.03	5.77		41.60
TU	0.50	0.00		0.00	0.000		0.000
SUM		**69.64**		**766.92**	**-11.25**		**-198.21**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.01 ft	11.01 ft	766.9 k.ft	**-965.1 k.ft**	**69.6 kip**	**-11.3 kip**

LC5 - STRENGTH III BEARING: $g_{p\ max}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ max}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	64.85		554.34	0.00		0.00
DW	1.5	0.88		5.00	0.00		0.00
EH	1.425	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
WA (static)	1.00	-31.32		-403.03	5.77		41.60
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**92.96**		**1080.78**	**-17.59**		**-306.56**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.63 ft	11.63 ft	1080.8 k.ft	**-1387.3 k.ft**	**93.0 kip**	**-17.6 kip**

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CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.3

LC6 - STRENGTH III SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.90	46.70		399.12	0.00		0.00
DW	0.65	0.38		2.17	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.00	39.40		592.74	0.00		0.00
WA	1.00	-31.32		-403.03	5.77		41.60
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**60.51**		**715.28**	**-17.59**		**-306.56**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.82 ft	11.82 ft	715.3 k.ft	**-1021.8 k.ft**	**60.5 kip**	**-17.6 kip**

LC7 - STRENGTH V BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	64.85		554.34	0.00		0.00
DW	1.5	0.88		5.00	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
LL+IM+PL+BR+LS	1.35	11.59		112.08	4.89		83.58
WA	1.00	-31.32		-403.03	5.77		41.60
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**104.55**		**1192.86**	**-12.70**		**-222.98**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.41 ft	11.41 ft	1192.9 k.ft	**-1415.8 k.ft**	**104.6 kip**	**-12.7 kip**

LC8 - STRENGTH V SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	46.70		399.12	0.00		0.00
DW	0.65	0.38		2.17	0.00		0.00
EH	1.425	5.36		124.28	-23.36		-348.16
EV	1	39.40		592.74	0.00		0.00
LL+IM+PL+BR+LS	1.35	7.04		39.84	4.89		83.58
WA	1.00	-31.32		-403.03	5.77		41.60
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**67.55**		**755.12**	**-12.70**		**-222.98**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.18 ft	11.18 ft	755.1 k.ft	**-978.1 k.ft**	**67.6 kip**	**-12.7 kip**

CANTILEVER ABUTMENT DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.4

LC9 - EXTREME EVENT I BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$g_{EQ\,MAX}$*(LL+IM+PL+BR+LS)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	64.85		554.34	0.00		0.00
DW	1.5	0.88		5.00	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.35	53.18		800.20	0.00		0.00
LL+IM+PL+BR+LS	0.50	4.29		41.51	1.81		30.96
WA	0.00	0.00		0.00	0.00		0.00
EQ	1.00	13.55		314.43	37.12		711.94
SUM		**142.13**		**1839.76**	**15.57**		**394.73**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

12.94 ft	12.94 ft	1839.8 k.ft	**-1445.0 k.ft**	**142.1 kip**	**15.6 kip**

LC10 - EXTREME EVENT I SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+$g_{EQ\,MIN}$*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	46.70		399.12	0.00		0.00
DW	0.65	0.38		2.17	0.00		0.00
EH	1.43	5.36		124.28	-23.36		-348.16
EV	1.00	39.40		592.74	0.00		0.00
LL+IM+PL+BR+LS	0.00	0.00		0.00	0.00		0.00
WA (seismic)	1.00	-31.32		-403.03	11.50		82.96
EQ	1.00	13.55		314.43	37.12		711.94
SUM		**74.06**		**1029.71**	**25.26**		**446.73**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

13.90 ft	13.90 ft	1029.7 k.ft	**-583.0 k.ft**	**74.1 kip**	**25.3 kip**

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Cantilever Abutment Design - Stability

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Notes for Khost Bridge No 9

Check Bearing Resistance (per AASHTO 11.6.3.2) -- ON SOIL

Stability : 1.0

If supported on soil, the vertical stress (σ_v) shall be calculated assuming a uniformly distributed pressure (V) over an effective base area (B-2e). AASHTO Fig 11.6.3.2-1 ----> qr / $\Phi\beta$ = q_n =

If supported on rock, the vertical stress (σ_v) shall be calculated assuming a linearly distributed pressure over an effective base area. AASHTO Fig 11.6.3.2-2 ----> qr / $\Phi\beta$ = q_n =

Factored Bearing Resistance, qr: qr = $\Phi\beta$ * q_n = 8.00 ksf <--- Note per Geotech, this is factored net bearing resistance

Strength Bearing Resistance Factor, $\Phi\beta$ (AASHTO Table 11.5.7-1): 0.55 — qr = $\Phi\beta$ * q_n = 8.00 ksf -----> qr / $\Phi\beta$ = qn = 14.55 ksf

Extreme Event Bearing Resistance Factor, $\Phi\beta$ (AASHTO 10.5.5.3.3): 1.00 — qr = $\Phi\beta$ * q_n = 8.00 ksf -----> qr / $\Phi\beta$ = qn = 8.00 ksf

Note ---> See AASHTO Table 11.5.7-1 to determine $\Phi\beta$ Factor

	LOAD COMBINATION	Vertical Force (Kips)	Resisting Moment (Ft x K)	Overturn Moment (Ft x K)	Mnet (Ft x K)	Eccentricty from Toe, et=Mnet/V (Ft)	Eccentricty from CL, e=B/2-et (Ft)	σ_v on soil (ksf)	$\sigma_{v\,max}$ on rock (ksf)	$\sigma_{v\,min}$ on rock (ksf)	$\sigma_v < \Phi\beta^*q_n$; σ_v < qr	
Strength	**LC1**	113.28	1477.74	-285.36	1763.11	15.56	-3.96	3.64	-0.12	9.89	OK	
Strength	**LC2**	129.78	1571.06	-285.36	1856.43	14.30	-2.70	4.54	1.68	9.51	OK	
Bearing	**LC3**	107.99	1226.07	-198.21	1424.29	13.19	-1.59	4.09	2.74	6.57	OK	
Sliding	**LC4**	69.64	766.92	-198.21	965.14	13.86	-2.26	2.51	1.25	4.76	OK	<--*N/A Sliding Combination
Bearing	**LC5**	92.96	1080.78	-306.56	1387.34	14.92	-3.32	3.11	0.56	7.45	OK	
Sliding	**LC6**	60.51	715.28	-306.56	1021.84	16.89	-5.29	1.79	-0.96	6.17	OK	<--*N/A Sliding Combination
Bearing	**LC7**	104.55	1192.86	-222.98	1415.84	13.54	-1.94	3.86	2.24	6.77	OK	
Sliding	**LC8**	67.55	755.12	-222.98	978.10	14.48	-2.88	2.33	0.74	5.08	OK	<--*N/A Sliding Combination
Ex. Bearing	**LC9**	142.13	1839.76	394.73	1445.02	10.17	1.43	6.99	8.40	3.86	OK	
Ex. Sliding	**LC10**	74.06	1029.71	446.73	582.97	7.87	3.73	4.70	6.27	0.11	OK	<--*N/A Ex. Sliding Combination
Ex. Bearing	**LC11**	132.10	1483.82	-317.21	1801.02	13.63	-2.03	4.84	2.70	8.69	OK	
Ex. Sliding	**LC12**	68.33	715.28	-265.21	980.48	14.35	-2.75	2.38	0.85	5.04	OK	<--*N/A Ex. Sliding Combination

*** Sliding Load Combinations are Not Applicable for checking the Bearing**

Cantilever Abutment Design - Stability

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Check Overturning (per AASHTO 11.6.3.3) -- ON SOIL

Stability : 2.0

e allowable (ftgs on soil):	5.80	ft
e allowable (ftgs on rock):	8.70	ft

If e < e allowable, Overturning is OK:

	LOAD COMBINATION	Eccentricty from CL, e=B/2-et (Ft)	Check Overturning	
Strength	**LC1**	-3.96	OK	
Strength	**LC2**	-2.70	OK	
Bearing	**LC3**	-1.59	OK	
Sliding	**LC4**	-2.26	OK	**<--*N/A Sliding Combination**
Bearing	**LC5**	-3.32	OK	
Sliding	**LC6**	-5.29	OK	**<--*N/A Sliding Combination**
Bearing	**LC7**	-1.94	OK	
Sliding	**LC8**	-2.88	OK	**<--*N/A Sliding Combination**
Ex. Bearing	**LC9**	1.43	OK	
Ex. Sliding	**LC10**	3.73	OK	**<--*N/A Ex. Sliding Combination**
Ex. Bearing	**LC11**	-2.03	OK	
Ex. Sliding	**LC12**	-2.75	OK	**<--*N/A Ex. Sliding Combination**

*** Sliding Load Combinations are Not Applicable for checking Overturning**

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Cantilever Abutment Design - Stability

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Check Sliding (per AASHTO 10.6.3.4)

Stability : 3.0

Ignore Passive Resistance of Soil per MassHighway

Strength Sliding Resistance Factor, Φ_τ (AASHTO Table 11.5.7-1):	1.00	
Extreme Event Sliding Resistance Factor, Φ_ϖ (AASHTO 10.5.5.3.3):	1.00	
Internal Friction Angle of Drained Soil, Φ_f:	31.00	degrees
tan δ: = tan Φ_f (per AASHTO 10.6.3.4-2):	0.60	for concrete against soil. Multiply by 0.8 for precast concrete footing

	LOAD COMBINATION	Vertical Force (Kips)	Rt = V * tan δ: (Kips)	Φ_τ (Strength) Φ_ω (Extreme) (Kips)	Nom. Sliding Resistance Φ_τ*Rt (Kips)	Horiz Force (Kips)	Check Sliding	
Strength	**LC1**	113.28	68.07	1.00	68.07	-19.04	OK	**<--*N/A Strength Combination**
Strength	**LC2**	129.78	77.98	1.00	77.98	-19.04	OK	**<--*N/A Strength Combination**
Bearing	**LC3**	107.99	64.89	1.00	64.89	-11.25	OK	**<--*N/A Bearing Combination**
Sliding	**LC4**	69.64	41.84	1.00	41.84	-11.25	OK	
Bearing	**LC5**	92.96	55.85	1.00	55.85	-17.59	OK	**<--*N/A Bearing Combination**
Sliding	**LC6**	60.51	36.36	1.00	36.36	-17.59	OK	
Bearing	**LC7**	104.55	62.82	1.00	62.82	-12.70	OK	**<--*N/A Bearing Combination**
Sliding	**LC8**	67.55	40.59	1.00	40.59	-12.70	OK	
Ex. Bearing	**LC9**	142.13	85.40	1.00	85.40	15.57	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC10**	74.06	44.50	1.00	44.50	25.26	OK	
Ex. Bearing	**LC11**	132.10	79.38	0.60	47.69	0.00	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC12**	68.33	41.06	0.60	24.67	0.00	OK	

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Cantilever Abutment Design - Stability

General Information

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Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Results Summary:

Stability : 4.0

STABILITY RESULTS:

LOAD COMBINATION:	BEARING RESISTANCE	OVERTURNING	SLIDING	
LC1	OK	OK	OK	<== Construction
LC2	OK	OK	OK	<== Construction
LC3	OK	OK	OK	
LC4	OK	OK	OK	
LC5	OK	OK	OK	
LC6	OK	OK	OK	
LC7	OK	OK	OK	
LC8	OK	OK	OK	
LC9	OK	OK	OK	
LC10	OK	OK	OK	
LC11	OK	OK	OK	
LC12	OK	OK	OK	

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Notes for Khost Bridge No 9

Design Parameters

Reinforcement : 1.0

GEOMETRY

H of Footing, h :	5.03	ft
bw (per linear ft of wall) :	12.00	in

MATERIAL PROPERTIES

Compressive Strength: f'c :	4.00	ksi	
Min Yield Strength: fy :	60.00	ksi	
Max. Agg. Size :	1.50	in	
Es :	29000	ksi	AASHTO 5.4.3.2
Tension Reinforcement Strain: ε_s :	0.002	ε_s = fy / Es	
β :	1.881		AASHTO EQ 5.8.3.4.2-1

Design Heel and Toe Reinforcement

Reinforcement : 2.1

FACTORED HEEL DESIGN LOADS	Load Factor, γ_p AASHTO Table 3.4.1-2	Vertical Force & Design Shear (Kips)	Arm (Feet)	Design Moment (Ft x K)
DC (Heel Concrete)	1.25	8.73	4.63	40.44
EV (Heel Soil)	1.35	34.63214535	4.63	160.346833
EH (Vertical Component)	1.43	10.54	9.26	97.60
LS	1.75	0.00	4.63	0.00
SUM		**53.91**		**298.39**

* See load combs, Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2) for the above Load Factors

* EH (Vertical Component) <-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.

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General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.2

Footing Toe Width, BF: 3.94 ft

FACTORED TOE DESIGN LOADS LOAD COMBINATION	σ_v Factored Toe Pressure (ksf)	Factored Toe Shear (Kips)	Factored Toe Moment (Ft x K)
LC1	3.64	14.32	28.19
LC2	4.54	17.85	35.14
LC3	4.09	16.11	31.71
LC4	2.51	9.89	19.46
LC5	3.11	12.26	24.12
LC6	1.79	7.05	13.88
LC7	3.86	15.19	29.90
LC8	2.33	9.18	18.07
LC9	6.99	27.51	54.14
LC10	4.70	18.52	36.44
MAX		**27.51**	**54.14**

Note: Based on AASHTO 10.6.5, the structural design of an eccentrically loaded foundation can assume a triangular or eccentrically loaded area. This spreadsheet conservatively assumes a uniform pressure of sv max over the toe of the footing. Based on AASHTO Figure C5.13.3.6.1-1, The toe shear can be computed at a distance dv from the face of support. This spreadsheet computes it at the support, which is conservative.

* Factored Toe Shear = Factored Toe Pressure * BF
* Factored Toe Moment = Factored Toe Shear * BF/2

10.6.5—Structural Design

The structural design of footings shall comply with the requirements given in Section 5.

For structural design of an eccentrically loaded foundation, a triangular or trapezoidal contact stress distribution based on factored loads shall be used for footings bearing on all soil and rock conditions.

FOOTING HEEL REINF (TOP BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

FOOTING TOE REINF (BOTTOM BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

CRITICAL SECTION FOR WALLS

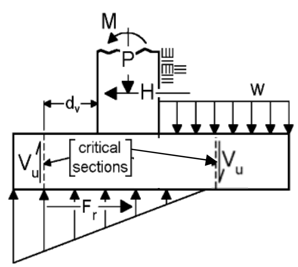

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

CRITICAL SECTION FOR ABUTMENTS

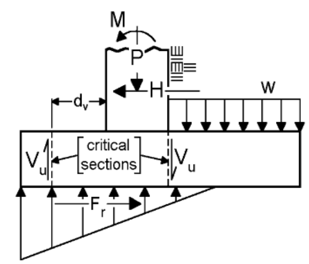

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.3

CHECK FLEXURAL RESISTANCE	**HEEL**	**TOE**	**AASHTO 5.7, 5.7.2.2, 5.7.3.2, 5.7.3.2.2**	
Factored Moment, Mu =	298.39	54.14	k*ft	
Resistance Factor, phi: Φ =	0.90	0.90		AASHTO 5.5.4.2
Assume Cover, dc =	2.00	3.00	in	ACI 318-08 - 7.7
Shear Depth: ds =	57.86	56.86	in = h - cover - 1/2db(main)	
Depth of Equivalent Stress Block: a =	2.32	2.32	in = c*β1 = Asfy/0.85f'cb	AASHTO Eq. 5.7.3.1.1-4
Nominal Flexural resistance, Mn =	447.92	440.02	kip ft = [Asfy(ds-a/2)]/12	AASHTO Eq. 5.7.3.2.2-1
Factored Resistance, ΦMn =	403.12	396.01		AASHTO Eq. 5.7.3.2.1-1
As required for Mu:	0.57	0.13	in^2	
Flexure OK?	**OK**	**OK**		

CHECK MINIMUM REINFORCEMENT	**HEEL**	**TOE**	**AASHTO 5.7.3.3.2**	
Section Modulud: Sc =	7286.66	7286.66	in^3	
Compressive Strength: f'c =	4.00	4.00	ksi	
Modulus of Rupture: fr =	0.74	0.74	ksi = $0.37*(f'c)^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	449.34	449.34	kip ft	AASHTO Eq. 5.7.3.2.2-1
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	539.21	539.21	kip ft	
Factored Moment, Mu =	298.39	54.14	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	396.85	72.01	kip ft	
Controlling Mr = min(Mr1, Mr2)	396.85	72.01	kip ft	
Factored Resistance, phi*Mn =	403.12	396.01		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	1.5549	0.2825	in^2	
As required for Temp Steel (#4@18"):	0.1333	0.1333	in^2	
As provided =	1.58	1.58	in^2	
Min Reinforcement OK?	**OK**	**OK**		

CHECK CRACK CONTROL BY DIST REINF.	**HEEL**	**TOE**	**AASHTO 5.7.3.4, 5.10.3.1**		
Exposure Factor: γ_e =	0.75	0.75	Class 2 Exposure		ASSHTO 5.7.3.4
β_s factor=	1.05	1.07		β_s factor = 1 + (dc / 0.7* (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36	ksi	f_{ss} = .6*fy	
s_{max} =	8.90	8.57	in	s_{max} < = 700 ge / βs fss	ASSHTO 5.7.3.4-1
s_{min} =	3.25	3.25	in	s_{min} = max(1.5*db,1.5*agg,1.5")+db	AASHTO 5.10.3.1.1
SPACING OK?	**OK**	**OK**			

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.4

CHECK SHEAR RESISTANCE	HEEL	TOE	AASHTO 5.13.3.6, 5.8.3		
Factored Shear Force, Vu =	53.91	27.51	kips		
Factored Moment, Mu =	298.39	54.14	k*in		
Es =	29000	29000			AASHTO 5.4.3.2
Resistance Factor, phi: Φ =	0.90	0.90			AASHTO 5.5.4.2
bw (per linear ft of wall) =	12.00	12.00	in		
Effective Depth: dv =	56.70	55.70	in	dv = max((ds-a/2),max(0.9ds, 0.72h))	AASHTO 5.8.2.9
H of Ftg, h:	60.36	60.36	in		
bw (per linear ft of ftg) =	12.00	12.00	in		
Area of Conc on Tension Side, Ac =	362.16	362.16	in	Ac = h*bw/2 =	
As (flexural) provd =	1.58	1.58	in^2		
Max. Size of Coarse Aggregate, ag =	1.50	1.50	in		
Mu min =	3056.37	1532.30	k*in	Mu min = Vu*dv =	
Mu (controlling) =	3056.37	1532.30	k*in		
Spg between top and bottom reinf, sx =	55.36	55.36	in		
Crack spg parameter, sxe =	35.87	35.87		sxe = 1.38*sx/(ag+0.63)	
Strain = ε_s=	0.0024	0.0012		ε_s=(Mu/dv+Vu)/(Es*As)	AASHTO EQ 5.8.3.4.2-4
Θ =	238.82	121.88		Θ = 29+3500*ε_s	AASHTO EQ 5.8.3.4.2-3
β =	1.18	1.72		β = 4.8/(1+750ε_s)*(51/(39+s_{xe})	
Nom Shear Resistance, Vn1 =	680.38	668.38	kips	Vn1 = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	50.86	72.67	kips	Vn2 = Vc = 0.0316*β*f'c.5*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn =	50.86	72.67	kips	Vn = min (Vn1, Vn2)	
phi*Vn =	45.77	65.40			
Shear OK?	**No Good**	**OK**			
Opposite Face Reinf As provd. =	1.58	1.58	in^2		
As min crack =	1.99	1.99	in^2	As min crack = 0.003*b*sx	
min (As front, back) > As min ?	**No Good**	**No Good**			

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

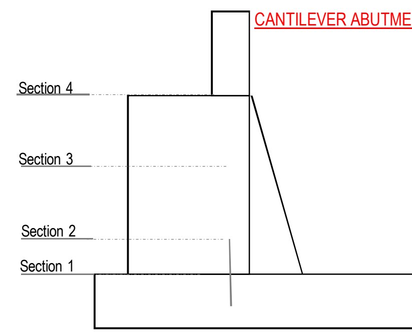
Stem Reinforcement

Reinforcement : 3.0

1. Reinforcement does not need to be checked for construction loading since that is a temporary load case.
Check the stem reinforcement at various locations along the stem and at the base of the backwall.

Height of Stem plus Backwall, h = H - F =	24.09	ft
Height of Backwall =	5.14	ft
Ftg Dowel Lap Length:	7.00	ft
Width of Stem at the Base:	10.00	ft
Width of Backwall:	1.48	ft
Width of Batter:	5.40	ft

Section	Height of h	Height from top	Width Batter	Width conc	
1	1.00	24.09	5.40	10.00	<=== This section is at the bottom of the stem.
2	0.71	17.09	3.41	8.01	<=== This section is at the top of the footing dowel.
3	0.46	11.12	1.70	6.30	<=== This section is halfway in between top of footing dowel and top of batter.
4	0.21	5.14		1.48	<=== This section is at the base of the backwall



Horizontal Earth Pressure, EH at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.12				-16.39	14.91	-244.32
Top of Ftg	24.09				-11.22	8.03	-90.08
Top of Dowel	17.09				-5.65	5.70	-32.16
Mid-Height	11.115				-2.39	3.71	-8.85
Bot of Backwall	5.14				-0.51	1.71	-0.87

Live Load Surcharge, LS at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.12				2.65	14.56	38.52
Top of Ftg	24.09				2.19	12.05	26.36
Top of Dowel	17.09				1.55	8.55	13.27
Mid-Height	11.115				1.01	5.56	5.61
Bot of Backwall	5.14				0.47	2.57	1.20

Seismic Load, EQ at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.12				37.12		711.94
Top of Ftg	24.09				30.71	12.05	369.86
Top of Dowel	17.09				21.78	8.55	186.14
Mid-Height	11.115				14.17	5.56	78.74
Bot of Backwall	5.14				6.55	2.57	16.84

CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
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Structure:	Abutment Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.1

Load Combination - STRENGTH I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	-15.98	-128.36	-8.04	-45.83	-3.40	-12.61	-0.73	-1.25
LS	1.75	3.83	46.13	2.72	23.22	1.77	9.82	0.82	2.10
SUM		**-12.16**	**-82.23**	**-5.33**	**-22.61**	**-1.64**	**-2.79**	**0.09**	**0.85**

Load Combination - EXTREME EVENT I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	-15.98	-128.36	-8.04	-45.83	-3.40	-12.61	-0.73	-1.25
LS	0.50	1.09	13.18	0.78	6.63	0.50	2.81	0.23	0.60
EQ	1.00	30.71	369.86	21.78	186.14	14.17	78.74	6.55	16.84
SUM		**15.82**	**254.68**	**14.52**	**146.95**	**11.27**	**68.94**	**6.06**	**16.19**

CHECK FLEXURAL RESISTANCE	**SECT 1**	**SECT 2**	**SECT 3**	**SECT 4**	**AASHTO 5.7**		
Section Height / Location =	24.09	17.09	11.12	5.14	ft		
Factored Moment, Mu =	254.68	146.95	68.94	16.19	k*ft		
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2	
H of Stem, h:	10.00	8.01	6.30	1.48	ft		
Cover, dc =	2.00	2.00	2.00	2.00	in	ACI 318-08: Sec 7.7.1	<-- 2" for Concrete exposed to earth or weather: No. 6 thru No 18 bars
BAR # =	6.00	6.00	6.00	6.00			
SPACING =	6.00	6.00	6.00	6.00	in		
Main Abar =	0.44	0.44	0.44	0.44	in^2		
Main db =	0.750	0.750	0.750	0.750	in		
As provd. =	0.88	0.88	0.88	0.88	in^2		
Shear Depth: ds =	117.63	93.69	73.26	15.39	in. = h - cover - 1/2db(main)		
Depth of Equivalent Stress Block: a =	1.29	1.29	1.29	1.29	in = c*β1 = Asfy/0.85f'cb	AASHTO 5.7.2.2, 5.7.3.2	
Nominal Flexural resistance, Mn =	514.70	409.38	319.48	64.85	kip ft = [Asfy(ds-a/2)]/12	AASHTO 5.7.3.2.2	
Factored Resistance, phi*Mn =	463.23	368.44	287.53	58.36		AASHTO Eq. 5.7.3.2.1-1	
As required for Mu:	0.4853	0.3520	0.2114	0.2472	in^2		
Flexure OK?	**OK**	**OK**	**OK**	**OK**			

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.2

CHECK MINIMUM REINFORCEMENT	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.3.2	
Section Modulud: Sc =	28800.00	18456.32	11440.30	630.84	in^3	
Modulus of Rupture: fr =	0.74	0.74	0.74	0.74	ksi = 0.37*(f'c)$^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	1776.00	1138.14	705.48	38.90	kip ft	
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	2131.20	1365.77	846.58	46.68	kip ft	
Factored Moment, Mu =	254.68	146.95	68.94	16.19	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	338.73	195.44	91.68	21.53	kip ft	
Controlling Mr = min(Mr1, Mr2)	338.73	195.44	91.68	21.53	kip ft	`
Factored Resistance, phi*Mn =	463.23	368.44	287.53	58.36		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	0.6425	0.4653	0.2789	0.3158	in^2	
As provided =	0.88	0.88	0.88	0.88	in^2	
Min Reinforcement OK?	**OK**	**OK**	**OK**	**OK**		

CHECK CRACK CONTROL BY DIST REINF.	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.4, 5.10.3.1	
Exposure Factor: γ_e =	0.75	0.75	0.75	0.75	Class 2 Exposure	ASSHTO 5.7.3.4
H of Stem, h:	120.00	96.06	75.63	17.76	in	
β_s factor=	1.02	1.03	1.04	1.18	1 + (dc / 0.7* (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36.00	36.00	36.00	ksi = .6*fy	
s_{max} =	10.24	10.15	10.04	8.35	in < = 700 γ_e / β_s f_{ss}	ASSHTO 5.7.3.4-1
Main db =	0.750	0.750	0.750	0.750	in	
s_{min} = max(1.5*db,1.5*agg,1.5")+db =	3.00	3.00	3.00	3.00	in	AASHTO 5.10.3.1.1
SPACING =	6.00	6.00	6.00	6.00	in	
SPACING OK?	**OK**	**OK**	**OK**	**OK**		

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
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Stem Reinforcement Cont.

Reinforcement : 3.3

CHECK SHEAR TRANSFER	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.4.1, 5.8.4.3, 5.8.4.4
Cohesion Factor, c =	0.075	0.08	0.08	0.08	ksi, assumes CJ not intentionally roughened
Friction Factor, μ =	0.6	0.60	0.60	0.60	
Fraction of strength for interface shear, K1 =	0.2	0.20	0.20	0.20	
Limiting Interface Shear Resistance, K2 =	0.8	0.80	0.80	0.80	ksi
Lvi = H of Stem, h:	120.00	96.06	75.63	17.76	ft
bvi = bw (per linear ft of wall) =	12.00	12.00	12.00	12.00	in
Interface Area, Acv = Lvi*bvi =	1440.00	1152.76	907.58	213.12	in^2
Back Face (Flexural) As provd. =	0.88	0.88	0.88	0.88	in^2
Front Face (Dowels) As provd. =	0.44	0.44	0.44	0.44	in^2
Interface Reinf Provided, Avf = As back+front =	1.320	1.32	1.32	1.32	in^2
Vni = c*Acv+μ*Avf*Fy =	155.52	133.98	115.59	63.50	kips
Vni max1 = K1*f'c*Acv =	1152.00	922.21	726.06	170.50	kips
Vni max2 = K2*Acv =	1152.00	922.21	726.06	170.50	kips
Vni (controlling) =	155.52	133.98	115.59	63.50	kips
Fact. Interface Shear Resistance, Vri=phiVni =	139.97	120.58	104.03	57.15	kips
Fact. Interface Shear Load, Vui = Vu =	15.82	14.52	11.27	6.06	kips
Vu < Vri ?	**OK**	**OK**	**OK**	**OK**	
Min Interface Shear Reinf, Avf = 0.05*Acv/Fy =	1.200	0.961	0.756	0.178	in^2
Avf > Avfmin ?	**OK**	**OK**	**OK**	**OK**	

5.8.4.3—Cohesion and Friction Factors

- For concrete placed against a clean concrete surface, free of laitance, but not intentionally roughened:

c = 0.075 ksi
μ = 0.6
K_1 = 0.2
K_2 = 0.8 ksi

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CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.4

CHECK SHEAR RESISTANCE	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.2, 5.8.3.3, 5.8.3.4.2	
Factored Shear Force, Vu =	15.82	14.52	11.27	6.06	kips	
Factored Moment, Mu =	3056.19	17.76	0.00	0.00	k*in	
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2
Effective Depth: dv =	116.98	93.04	72.61	14.74	in=max((ds-a/2),max(0.9ds,0.72h))	AASHTO 5.8.2.9
H of Stem, h:	120.00	96.06	75.63	17.76	in	
Area of Conc on Tension Side, Ac = h*bw/2 =	720.00	576.38	453.79	106.56	in	
As (flexural, back face) provd =	0.88	0.88	0.88	0.88	in^2	
Max. Size of Coarse Aggregate, ag =	1.50	1.50	1.50	1.50	in	
Mu min = Vu*dv =	1850.11	1350.53	818.30	89.28	k*in	
Mu (controlling) =	3056.19	1350.53	818.30	89.28	k*in	
sx = dv	116.98	93.04	72.61	14.74	in ---> See Figure 5.8.3.4.2-3 (Case a)	
Crack spg parameter, sxe = 1.38*sx/(ag+0.63) =	75.79	60.28	47.04	9.55		
Strain = ε_s=(Mu/d+Vu)/(Es*As) =	0.0016	0.0011	0.0009	0.0005		
Θ = 29+35000*ε_s =	166.82	115.46	89.65	48.18		
β = 4.8/(1+750εs)*(51/(39+s_{xe}) =	0.96	1.33	1.71	3.72		
Nom Shear Resistance, Vn1 =	1403.74	1116.50	871.32	176.86	kips, Vn = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	84.74	93.89	94.24	41.56	kips, 0.0316*β*f'c$^{.5}$*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn = min (Vn1, Vn2) =	84.74	93.89	94.24	41.56	kips	
phi*Vn =	76.27	84.50	84.82	37.41		
Shear OK?	OK	OK	OK	OK		
Front Face (Dowels) As provd. =	0.44	0.44	0.44	0.44	in^2	
As min crack = 0.003*b*sx =	4.21	3.35	2.61	0.53	in^2 ---> Only Applicable for Figure 5.8.3.4.2-3 Case B	
min (As front, back) > As min ?	N/A	N/A	N/A	N/A		

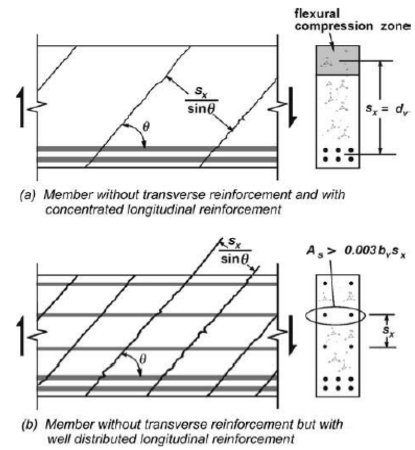

Figure 5.8.3.4.2-3—Definition of Crack Spacing Parameter, s_x

Crack Spacing Parameter, Sx --> Case = Case A

CANTILEVER ABUTMENT DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Abutment Design	**Date:**	February 27, 2014

Results Summary:

Reinforcement : 4.0

REINFORCEMENT RESULTS:

= As Provided / As Required

		STIRUP #	BAR #	SPAC.	REINF. RATIO	FLEX OK?	LBS./ L.F.	LENGTH OF BAR	No. Bars per ft	Wt. of bar PER L.F.	As/LF	SHEAR OK?
A	TOE(bot):	---	8.00	6.00	5.59	OK	244.09	22.70	2.00	5.38	1.58	OK
B	HEEL(top):	---	8.00	6.00	1.02	OK	244.09	22.70	2.00	5.38	1.58	OK
C	STEM 1 (at top of ftg):	0.00	6.00	6.00	1.37	OK	59.89	10.00	2.00	2.99	0.88	OK
D	STEM 2 (at top of ftg dwl):	0.00	6.00	6.00	1.89	OK	59.89	10.00	2.00	2.99	0.88	OK
E	STEM 3 (midpt back face):	0.00	6.00	6.00	3.16	OK	59.89	10.00	2.00	2.99	0.88	OK
F	STEM 4 (at bot of bw):	0.00	6.00	6.00	2.79	OK	59.89	10.00	2.00	2.99	0.88	OK
G	STEM 5 (front face):	0.00	6.00	12.00	---	---	26.88	17.95	1.00	1.50	0.44	
H	STEM 6 (front face dowels):	0.00	6.00	12.00	---	---	3.37	2.25	1.00	1.50	0.44	
I	FOOTING (TOP):	0.00	6.00	6.00	---	---	138.94	1.00	46.40	2.99	0.88	
J	FOOTING (BOT.)	0.00	6.00	6.00	---	---	138.94	1.00	46.40	2.99	0.88	
K	STEM (longitudinal):	0.00	6.00	12.00	---	---	72.14	1.00	48.18	1.50	0.44	
						TOTAL WT. STEEL/FT OF ABUT.=	1108.00	LBS./LF				

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SUBSTRUCTURE ANALYSIS

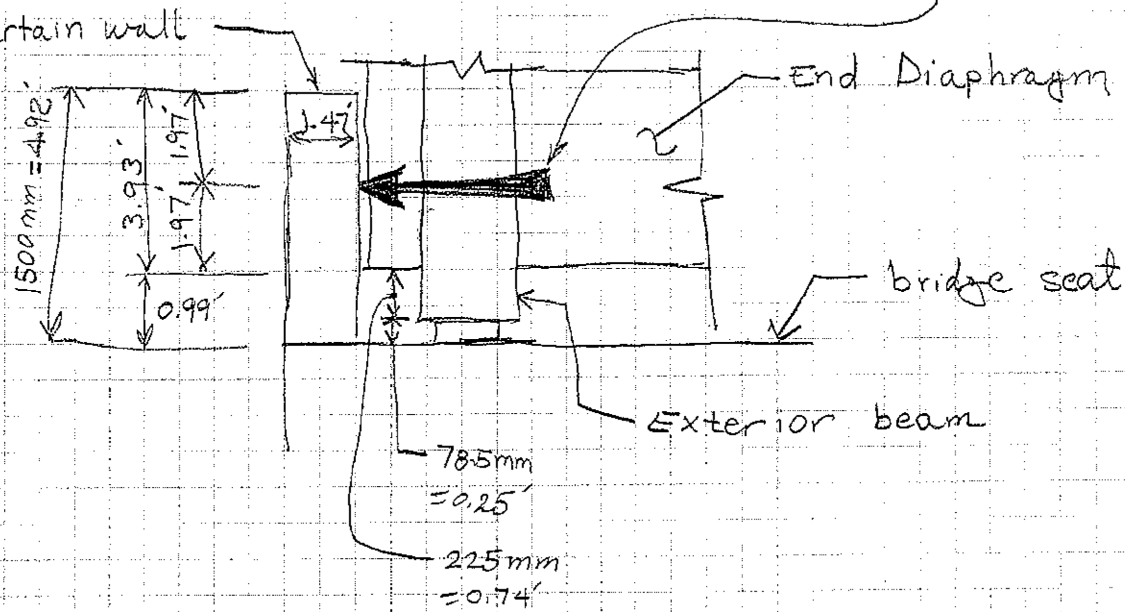
CURTAIN WALL DESIGN

Curtain Wall Design As Shear Block

Seismic Force Per Span = 144 Kips ← see anchor bolt design

Tributary Area per Span End is 1/2 a span ⇒

Seismic Force On Shear block = 144/2 = 72 kips



Bending Moment at bottom of curtain wall due to Seismic force

$= 72^K (0.99' + 1.97') = 213.12\ K \cdot ft$

$= 2557\ k \cdot in$

Width of curtain wall = 1400 mm = 4.59'

⇒ Moment Per Linear foot of Curtain Wall = $\frac{2557^{k \cdot in}}{4.59}$ k·in

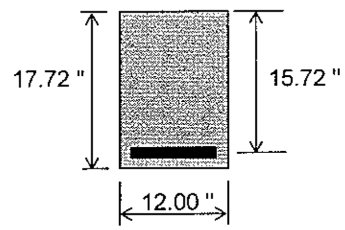
$= 557\ K \cdot in / L.F$

See next sheet for flexural design of curtain wall.

TETRA TECH	JOB GK Road - Bridge #9 Replacement
	SHEET NO. ______ OF ______
	CALCULATED BY SAM DATE 11/21/14
One Grant Street Framingham, MA 01701-9005 (508) 903-2000	CHECKED BY aln DATE 2-26-14
	SCALE

Curtain Wall Flexure Design

M_u =	557	kip.in
φ =	0.9	
F_y =	60	ksi
f_c' =	4	ksi
b =	12.00	in
d =	15.72	in
h =	17.72	in



MEMBER CROSS-SECTION
N.T.S.

The equation $M_u = \varphi \rho F_y b d^2 [1 - (\rho F_y / 1.7 f_c')]$, reduces to the following form $A\rho^2 + B\rho + C = 0$

With: A = 1412935.8
B = -160132.7
C = 557.0

Δ = B^2-4AC = 2.2494E+10
ρ = 0.003592224
ρ_{min} = 200/[F_y (psi)]= 0.00333333 < Row O.K.

ρ_{req} = 0.003592

$\rho_{max} = (3/4)\rho_{bal} = (3/4)\{ 0.85\, \beta_1 f_c'(87{,}000)/[F_y(87{,}000+F_y)]\}$
Where: β_1 = 0.85 for f_c'<= 4(ksi)
otherwise, β_1 = 0.85 - 0.05[f_c'(ksi) -4]

β_1 = 0.85

ρ_{max} = 0.02138010 > Row_req. **OK**

$A_{s\text{-}req} = \rho_{req} \cdot b \cdot d$ = 0.678 in^2

Try Bar Number: #6 Max Allowable Spacing = 7 Inch
Metric Equivalent: 20 Dia. Max Allowable Spacing = 175 mm

Use	#6	@	6	Inches ===>	$A_{s\text{-}Provided}$ =	0.884 in^2	>	0.678 **OK**
Metric Equivalent:	20 Dia.	@	150	mm =====>	$A_{s\text{-}Provided}$ =	0.989 in^2	>	0.678 **OK**

TETRA TECH, INC
One Grant Street
Framingham, MA 01701-9005
(508) 903-2000

Job: GK Road - Bridge #9 Replacement
Sheet No. ______ of ______
Calculated By: SAM Date: 2/21/2014
Checked By: aeh Date: 2.26.14
Scale: ______

0

SUBSTRUCTURE ANALYSIS

PIER DESIGN

* SUPERSTRUCTURE DEAD LOADS ON PIER
* SUPERSTRUCTURE LIVE LOADS ON PIER
* PIER STABILITY DESIGN

BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

References: AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012

Notes: This spreadsheet computes the loads on an abutment, considering the spans left or right of the abutment is simply supported.

SUPERSTRUCTURE DEAD LOAD

Abutment Length =	11250	mm	36.90	ft		
Pier Length =	12900	mm	42.31	ft		
Use =	12900	mm	42.31	ft		
Length =	50400	mm	165.31	ft		
Spans =	3		3			
Span Length =	16800	mm	55.10	ft		
No of Beams =	6		6			
b =	600	mm	1.97	ft	23.62	in
d =	1500	mm	4.92	ft	59.04	in
Spacing =	1850	mm	6.07	ft	72.82	in
Distance for Beam to Beam =	9250	mm	30.34	ft	364.08	in
Overhang, OH =	850	mm	2.79	ft	33.46	in
Clear Overhang, OH_cl =	550	mm	1.80	ft	21.65	in
Clear Spacing bw Beams =	1250	mm	4.10	ft	49.20	in
Deck Thickness, ts =	225	mm	0.74	ft	8.86	in
Barrier Height =	1400	mm	4.59	ft	55.10	in
Sidewalk Height =	275	mm	0.90	ft	10.82	in

Width =	11250	mm	36.90	ft
Barrier =	225	mm	0.74	ft
Sidewalk =	1200	mm	3.94	ft
Barrier + Sidewalk =	1425	mm	4.67	ft
Roadway =	8100	mm	26.57	ft
No of Lanes	2		2.00	
Lane Width =	3657.6	mm	12.00	ft
Shoulder =	392.4	mm	1.29	ft

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

SUPERSTRUCTURE DEAD LOAD

CAT		Width ft	Height ft	Length ft	Volume cf	Unit Weight lbs/cf	Weight Kips	Qty #	Total Kips	DC Kips	DW Kips
DC	Beams / Girders	1.97	4.92	55.10	533.55	150	80.03	6	480.19	480.19	
DC	Sidewalks	3.94	0.9	55.10	195.40	150	29.31	2	58.62	58.62	
DC	Safety Curbs	0	0	0	0.00	150	0.00	0	0.00	0.00	
DC	Barriers/ Rail	0.902	4.59	55.10	228.14	150	34.22	2	68.44	68.44	
DW	Wearing Surface	26.57	0.18	55.10	263.54	165	43.48	1	43.48		43.48
DC	End Diaphragms	4.1	4.92	2.46	49.62	150	7.44	10	74.43	74.43	
DC	Intermediate Diaphragms	4.1	4.1	0.98	16.47	150	2.47	5	12.36	12.36	
DW	Utilities				0.00	0	0.00	0	0.00		0.00
DW	Stay-In-Place Forms	0	0	0	0.00	0	0.00	0	0.00		0.00
DC	Deck	36.90	0.74	55.10	1500.60	150	225.09	1	225.09	225.09	
					0.00		0.00		0.00		
					0.00		0.00		0.00		
					0.00		0.00		0.00		
									962.62	919.14	43.48
										962.62	

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - SUPERSTRUCTURE DEAD LOAD

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

SUPERSTRUCTURE DEAD LOAD

		DC (kips)	DW (Kips)	DL (kips)
DC	Beams / Girders	480.19		
DC	Sidewalks	58.62		
DC	Safety Curbs	0.00	0.00	
DC	Barriers/ Rail	68.44		
DW	Wearing Surface		43.48	
DC	End Diaphragms	74.43		
DC	Intermediate Diaphragms	12.36		
DW	Utilities		0.00	
DW	Stay-In-Place Forms		0.00	
DC	Deck	225.09		

	DC	DW	DL		
Total Superstructure Dead Load	919.14	43.48	962.62	kips	
Total Dead Load / Abutment	459.57	21.74	481.31	kips / Abutment	
Length of Abutment	42.31	42.31	42.31	Abutment Length	
Total (DL / Linear Foot of Abutment)	10.86	0.51	11.38		
Total (DL / Linear Foot of Pier)	21.72	1.03	22.75		
Abutment Design					
Design For: Abutment Loading	10.86	0.51	11.38	kips/LF of Abutment	<-- Superstructure Dead Load (Input Tab)

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

References: AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012

Notes: This spreadsheet computes the loads on an abutment, considering the spans left or right of the abutment is simply supported.

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Live Load, LL

Type of Truck: HL	93	
Roadway Width =	26.24	ft
Lane Width =	12	ft
Roadway / Lane Width =	2.19	
Use --> No of Lanes =	2	
Multiple Presence Factor, m =	1	

Table 3.6.1.1.2-1—Multiple Presence Factors, *m*

Number of Loaded Lanes	Multiple Presence Factors, *m*
1	1.20
2	1.00
3	0.85
>3	0.65

Truck Loading:

Section 3.6.1.2.2

	Left/Right Span		
Span Length, L =	55.10	ft	
Dynamic Load Allowance, (IM) =	1.33		
Number of Lanes =	2		
Multiple Presence Factor, m =	1.00		
Vmax =	59.1	kips / Lane	<-- T3.3.1.2 Shear & End Reactions
Vmax =	118.20	kips	<- Vmax * m * # of lanes
Reaction, LL V =	118.20	kips	
Reaction, (LL+IM) V =	157.2	kips	<-- IM * V
Total Reaction, Truck (LL) =	118.2	kips	
Total Reaction, Truck (LL+IM) =	157.2	kips	

Section 3.6.2.1

Section 3.6.1.1.2

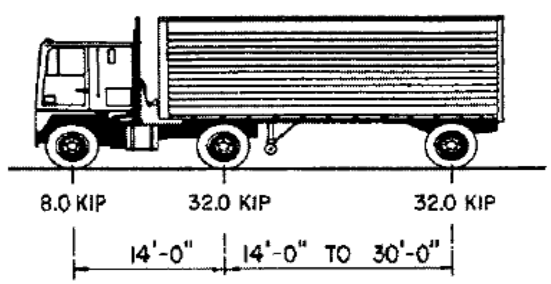


Figure 3.6.1.2.2-1

BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Tandem Loading: Section 3.6.1.2.3

	Left/Right Span			
L =	55.10	ft		
Dynamic Load Allowance, (IM) =	1.33			Section 3.6.2.1
Number of Lanes =	2			
Multiple Presence Factor, m =	1.00			Section 3.6.1.1.2
P1 =	25	kips		
P2 =	25	kips		
Axle Spacing =	4	ft		
Vmax =	48.19	kips/ Lane		
Vmax =	96.37	Kips	<- Vmax * m * # of lanes	
Reaction, LL V =	96.37	kips		
Reaction, (LL+IM) V =	128.17	kips	<-- IM * V	
Total Reaction, Tandem (LL) =	96.4	kips		
Total Reaction, Tandem (LL+IM) =	128.2	kips		

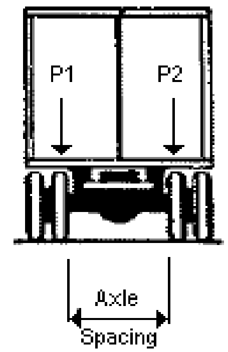
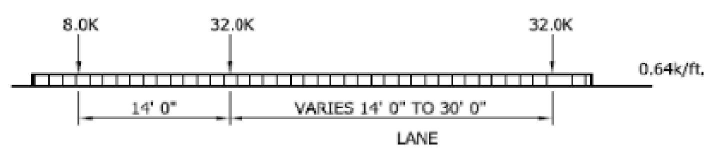


Figure 3.6.1.2.2-1

Live Load, LL (cont.)

Lane Loading: Section 3.6.1.2.4

	Left/Right Span			
L =	55.10	ft		
Number of Lanes =	2			
Multiple Presence Factor, m =	1.00			Section 3.6.1.1.2
Lane Load =	0.64	klf		
Vmax =	17.63	kips/ Lane		
Vmax =	35.27	Kips	<- Vmax * m * # of lanes	
Reaction, Lane Load (LL) =	35.3	kips		
Total Reaction, Lane Load (LL) =	35.3	kips		



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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number: 1298\127-1298-12001-LT0077
Description: Khost Bridge No. 9
Structure: Pier Design

Designed By: alh
Checked By: SAM
Date: 2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - VERTICAL FORCES (CONT.)

Pedestrian Live Load

Pedestrian Live Load, PL = 0.075 ksf <--- per AASHTO 3.6.1.6 for Sidewalks with a Width >= 2.0 ft
Width of Sidewalk = 3.95 ft
PL = 0.296 klf
Length of Sidewalk = 55.10 ft
PL = 16.32 kips

--> PL / Abutment = 8.16 kips

Bridge Width = 42.31 ft
--> PL / LF of Abutment = 0.19 klf

Live Loads

	LL	IM	LL + IM
Truck	59.10	1.33	78.60
Tandem	48.19	1.33	64.09
Lane	17.63	1	17.63
Truck + Lane	76.73		96.24
Tandem + lane	65.82		81.72
Max	76.73		96.24

Max = 96.24 kips
No of Lanes = 2.00
m = 1.00
LL+I = 192.47 kips
Abutment Length = 42.31 ft
LL+ I = 4.55 klf
LL + I + PL = 4.74 klf <-- INPUT LOAD

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - LATERAL FORCES

Braking Force, BR — Section 3.6.4

Notes: Dynamic Load Allowance increase not required. AASHTO3.6.2.1
Braking Force ONLY applies to fixed bearings
Braking Force includes multiple presence factor

Type of Bearing: Fixed

25% Axle Weight of Design Truck =	25%	18.00	kips	Design Truck Axle Weight =	72
25% Axle Weight of Design Tandem =	25%	12.50	kips	Design Tandem Axle Weight =	50
5% (Axle Weight of Design Truck + Lane Load) =	5%	5.36	kips	Design Truck + Lane Axle Weight =	107.27
5% (Axle Weight of Design Tandem Load + Lane Load) =	5%	4.26	kips	Design Tandem + Lane Axle Weight =	85.27

Braking Force on Abutment (BR) =	18	kips	<---- 25% Axle Weight of Design Truck	
Number of Lanes =	2			
Multiple Presence Factor, m =	1			
BR =	0.85	klf	<--- BR / Abutment Length	<-- Input Load

Location of Load Application = 0.00 ft above Bridge Seat

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BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB

ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

SUPERSTRUCTURE LOADING ON ABUTMENT - LATERAL FORCES - EQ

Total Superstructure Dead Load =	22.75	kips	
Coefficient of Friction =	0.3		
Coefficient of Friction =	0.15		<-- Use % 50% per MassDOT 3.4.4.5
DL * u =	3.41	kips	
EQ =	3.41	klf	<--- INPUT LOAD

COEFFICIENT OF FRICTION

The following friction coefficients shall be considered in calculating the sliding friction forces :

Concrete to Soil / Rock	0.30
Concrete to Steel	0.45
Steel to Steel	0.30
Steel to Teflon Plate	0.10
Brick Masonry on moist clay	0.33
Brick Masonry on dry clay	0.50
Brick Masonry on sand	0.40
Brick Masonry on gravel	0.60
Brick Masonry to Brick	0.70
Brick Masonry on rock	0.75
Granite on Granite	0.60
Limestone on Limestone	0.75
Cement Blocks on Cement Blocks	0.65
Cement concrete on dry clay	0.40
Cement concrete on wet clay	0.20
Cement concrete on wet sand	0.40
Cement concrete on dry sand	0.50 - 0.60
Cement concrete on dry gravel	0.50 - 0.60
Cement concrete on dry rock	0.60 - 0.70
Cement concrete on wet rock	0.50
Brick on Brick	0.65
Wood on Wood	0.48

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

TABLE OF MAXIMUM MOMENTS, SHEARS, AND REACTIONS— SIMPLE SPANS, ONE LANE

Spans in feet; moments in thousands of foot-pounds; shears and reactions in thousands of pounds.

These values are subject to specification reduction for loading of multiple lanes.

Impact not included.

Span	Moment	End shear and end reaction (a)	Span	Moment	End shear and end reaction (a)
1	8.0(b)	32.0(b)	42	485.3(b)	56.0(b)
2	16.0(b)	32.0(b)	44	520.9(b)	56.7(b)
3	24.0(b)	32.0(b)	46	556.5(b)	57.3(b)
4	32.0(b)	32.0(b)	48	592.1(b)	58.0(b)
5	40.0(b)	32.0(b)	50	627.9(b)	58.5(b)
6	48.0(b)	32.0(b)	52	663.6(b)	59.1(b)
7	56.0(b)	32.0(b)	54	699.3(b)	59.6(b)
8	64.0(b)	32.0(b)	56	735.1(b)	60.0(b)
9	72.0(b)	32.0(b)	58	770.8(b)	60.4(b)
10	80.0(b)	32.0(b)	60	806.5(b)	60.8(b)
11	88.0(b)	32.0(b)	62	842.4(b)	61.2(b)
12	96.0(b)	32.0(b)	64	878.1(b)	61.5(b)
13	104.0(b)	32.0(b)	66	914.0(b)	61.9(b)
14	112.0(b)	32.0(b)	68	949.7(b)	62.1(b)
15	120.0(b)	34.1(b)	70	985.6(b)	62.4(b)
16	128.0(b)	36.0(b)	75	1,075.1(b)	63.1(b)
17	136.0(b)	37.7(b)	80	1,164.9(b)	63.6(b)
18	144.0(b)	39.1(b)	85	1,254.7(b)	64.1(b)
19	152.0(b)	40.4(b)	90	1,344.4(b)	64.5(b)
20	160.0(b)	41.6(b)	95	1,434.1(b)	64.9(b)
21	168.0(b)	42.7(b)	100	1,524.0(b)	65.3(b)
22	176.0(b)	43.6(b)	110	1,703.6(b)	65.9(b)
23	184.0(b)	44.5(b)	120	1,883.3(b)	66.4(b)
24	192.7(b)	45.3(b)	130	2,063.1(b)	67.6
25	207.4(b)	46.1(b)	140	2,242.8(b)	70.8
26	222.2(b)	46.8(b)	150	2,475.1	74.0
27	237.0(b)	47.4(b)	160	2,768.0	77.2
28	252.0(b)	48.0(b)	170	3,077.1	80.4
29	267.0(b)	48.8(b)	180	3,402.1	83.6
30	282.1(b)	49.6(b)	190	3,743.1	86.8
31	297.3(b)	50.3(b)	200	4,100.0	90.0
32	312.5(b)	51.0(b)	220	4,862.0	96.4
33	327.8(b)	51.6(b)	240	5,688.0	102.8
34	343.5(b)	52.2(b)	260	6,578.0	109.2
35	361.2(b)	52.8(b)	280	7,532.0	115.6
36	378.9(b)	53.3(b)	300	8,550.0	122.0
37	396.6(b)	53.8(b)			
38	414.3(b)	54.3(b)			
39	432.1(b)	54.8(b)			
40	449.8(b)	55.2(b)			

Loading -- HS 20-44 (MS18)

AASHTO Standard Specifications for Highway Bridges - 17th edition 2002

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GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

Table 3.3.1.1

Maximum Unfactored HL-93 Live Load Moments, Shears, and Reactions
Simple Spans, One Lane, w/o Dynamic Load Allowance

SPAN	MOMENTS					SHEARS & END REACTIONS			
SPAN	TRUCK	TANDEM	LANE	TOTAL	SPAN PT.	TRUCK	TANDEM	LANE	TOTAL
FT	KIP-FT	KIP-FT	KIP-FT	KIP-FT	%	KIP	KIP	KIP	KIP
1	8.0	6.3	0.1	8.1	0.50	32.0	25.0	0.3	32.3
2	16.0	12.5	0.3	16.3	0.50	32.0	25.0	0.6	32.6
3	24.0	18.8	0.7	24.7	0.50	32.0	25.0	1.0	33.0
4	32.0	25.0	1.3	33.3	0.50	32.0	25.0	1.3	33.3
5	40.0	31.3	2.0	42.0	0.50	32.0	30.0	1.6	33.6
6	48.0	37.5	2.9	50.9	0.50	32.0	33.3	1.9	35.3
7	56.0	43.8	3.9	59.9	0.50	32.0	35.7	2.2	38.0
8	64.0	50.0	5.1	69.1	0.50	32.0	37.5	2.6	40.1
9	72.0	62.5	6.5	78.5	0.50	32.0	38.9	2.9	41.8
10	80.0	75.0	8.0	88.0	0.50	32.0	40.0	3.2	43.2
11	84.5	92.0	9.3	101.3	0.40	32.0	40.9	3.5	44.4
12	92.2	104.0	11.1	115.1	0.40	32.0	41.7	3.8	45.5
13	103.0	115.9	13.4	129.3	0.45	32.0	42.3	4.2	46.5
14	110.9	128.3	15.5	143.8	0.45	32.0	42.9	4.5	47.3
15	118.8	140.6	17.8	158.4	0.45	34.1	43.3	4.8	48.1
16	126.7	153.0	20.3	173.3	0.45	36.0	43.8	5.1	48.9
17	134.6	165.4	22.9	188.3	0.45	37.6	44.1	5.4	49.6
18	142.6	177.8	25.7	203.4	0.45	39.1	44.4	5.8	50.2
19	150.5	190.1	28.6	218.7	0.45	40.4	44.7	6.1	50.8
20	158.4	202.5	31.7	234.2	0.45	41.6	45.0	6.4	51.4
21	166.3	214.9	34.9	249.8	0.45	42.7	45.2	6.7	52.0
22	174.2	227.3	38.3	265.6	0.45	43.6	45.5	7.0	52.5
23	182.2	239.6	41.9	281.5	0.45	44.5	45.7	7.4	53.0
24	190.1	252.0	45.6	297.6	0.45	45.3	45.8	7.7	53.5
25	198.0	264.4	49.5	313.9	0.45	46.1	46.0	8.0	54.1
26	210.2	276.8	53.5	330.3	0.45	46.8	46.2	8.3	55.1
27	226.1	289.1	57.7	346.9	0.45	47.4	46.3	8.6	56.0
28	241.9	301.5	62.1	363.6	0.45	48.0	46.4	9.0	57.0
29	257.8	313.9	66.6	380.5	0.45	48.8	46.6	9.3	58.1
30	273.6	326.3	71.3	397.5	0.45	49.6	46.7	9.6	59.2
31	289.4	338.6	76.1	414.7	0.45	50.3	46.8	9.9	60.2
32	307.0	351.0	81.1	432.1	0.45	51.0	46.9	10.2	61.2
33	324.9	363.4	86.2	449.6	0.45	51.6	47.0	10.6	62.2
34	332.0	375.0	92.5	467.5	0.50	52.2	47.1	10.9	63.1
35	350.0	387.5	98.0	485.5	0.50	52.8	47.1	11.2	64.0
36	368.0	400.0	103.7	503.7	0.50	53.3	47.2	11.5	64.9
37	386.0	412.5	109.5	522.0	0.50	53.8	47.3	11.8	65.7
38	404.0	425.0	115.5	540.5	0.50	54.3	47.4	12.2	66.5
39	422.0	437.5	121.7	559.2	0.50	54.8	47.4	12.5	67.2
40	440.0	450.0	128.0	578.0	0.50	55.2	47.5	12.8	68.0

BACKUP CALCULATIONS TO BE USED IN THE INPUT TAB
ABUTMENT LOADING CALCULATIONS - LIVE LOAD (LL), BREAKING FORCE (BR) & SEISMIC LOAD (EQ)

GENERAL INFORMATION

Project Number:	1298\127-1298-12001-LT0077	Designed By:	alh
Description:	Khost Bridge No. 9	Checked By:	SAM
Structure:	Pier Design	Date:	2/27/2014

Table 3.3.1.2

Maximum Unfactored HL-93 Live Load Moments, Shears, and Reactions

Simple Spans, One Lane, w/o Dynamic Load Allowance

	MOMENTS					SHEARS & END REACTIONS			
SPAN FT	TRUCK KIP-FT	TANDEM KIP-FT	LANE KIP-FT	TOTAL KIP-FT	SPAN PT. %	TRUCK KIP	TANDEM KIP	LANE KIP	TOTAL KIP
42	485.2	474.8	139.7	624.9	0.45	56.0	47.6	13.4	69.4
44	520.9	499.5	153.3	674.2	0.45	56.7	47.7	14.1	70.8
46	556.5	524.3	167.6	724.1	0.45	57.4	47.8	14.7	72.1
48	592.2	549.0	182.5	774.6	0.45	58.0	47.9	15.4	73.4
50	627.8	573.8	198.0	825.8	0.45	58.6	48.0	16.0	74.6
52	663.4	598.5	214.2	877.6	0.45	59.1	48.1	16.6	75.7
54	699.1	623.3	230.9	930.0	0.45	59.6	48.1	17.3	76.8
56	734.7	648.0	248.4	983.1	0.45	60.0	48.2	17.9	77.9
58	770.4	672.8	266.4	1036.8	0.45	60.4	48.3	18.6	79.0
60	806.0	697.5	285.1	1091.1	0.45	60.8	48.3	19.2	80.0
62	841.6	722.3	304.4	1146.1	0.45	61.2	48.4	19.8	81.0
64	877.3	747.0	324.4	1201.7	0.45	61.5	48.4	20.5	82.0
66	912.9	771.8	345.0	1257.9	0.45	61.8	48.5	21.1	82.9
68	948.6	796.5	366.2	1314.8	0.45	62.1	48.5	21.8	83.9
70	984.2	821.3	388.1	1372.3	0.45	62.4	48.6	22.4	84.8
75	1070.0	887.5	450.0	1520.0	0.50	63.0	48.7	24.0	87.0
80	1160.0	950.0	512.0	1672.0	0.50	63.6	48.8	25.6	89.2
85	1250.0	1012.5	578.0	1828.0	0.50	64.1	48.8	27.2	91.3
90	1340.0	1075.0	648.0	1988.0	0.50	64.5	48.9	28.8	93.3
95	1430.0	1137.5	722.0	2152.0	0.50	64.9	48.9	30.4	95.3
100	1520.0	1200.0	800.0	2320.0	0.50	65.3	49.0	32.0	97.3
110	1700.0	1325.0	968.0	2668.0	0.50	65.9	49.1	35.2	101.1
120	1880.0	1450.0	1152.0	3032.0	0.50	66.4	49.2	38.4	104.8
130	2060.0	1575.0	1352.0	3412.0	0.50	66.8	49.2	41.6	108.4
140	2240.0	1700.0	1568.0	3808.0	0.50	67.2	49.3	44.8	112.0
150	2420.0	1825.0	1800.0	4220.0	0.50	67.5	49.3	48.0	115.5
160	2600.0	1950.0	2048.0	4648.0	0.50	67.8	49.4	51.2	119.0
170	2780.0	2075.0	2312.0	5092.0	0.50	68.0	49.4	54.4	122.4
180	2960.0	2200.0	2592.0	5552.0	0.50	68.3	49.4	57.6	125.9
190	3140.0	2325.0	2888.0	6028.0	0.50	68.5	49.5	60.8	129.3
200	3320.0	2450.0	3200.0	6520.0	0.50	68.6	49.5	64.0	132.6

http://www.dot.nd.gov/manuals/bridge/lrfd-bridge-design/Section03A.pdf

Calculate Average Soil Weight

Pier 1

Total Backfill Height =	4285	mm	14.05	ft
Footing Height =	1500	mm	4.92	ft
Total Height above the footing =	2785	mm	9.13	ft
Height of Rip Rap =	1500	mm	4.92	ft
Height of Soil =	1285	mm	4.21	ft

Unit Weight of Rip Rap =	165	pcf
Unit Weight of Soil =	115	pcf
Weight of Rip Rap =	811.80	psf
Weight of Soil =	484.70	psf
Total Weight =	1297	psf
Avg Unit Weight =	142	pcf

Pier 2

Total Backfill Height =	4355	mm	14.28	ft
Footing Height =	1500	mm	4.92	ft
Total Height above the footing =	2855	mm	9.36	ft
Height of Rip Rap =	1500	mm	4.92	ft
Height of Soil =	1355	mm	4.44	ft

Unit Weight of Rip Rap =	165	pcf
Unit Weight of Soil =	115	pcf
Weight of Rip Rap =	811.80	psf
Weight of Soil =	511.11	psf
Total Weight =	1323	psf
Avg Unit Weight =	141	pcf

PIER DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

References:

AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012	AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011
ACI 318-08 Building Code Requirements for Structural Concrete, 2005	
2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions	

General Notes: **This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).**

Pier Options | **Khost Bridge Notes**

Project Notes: For the Preliminary Design it was assumed: 1) the centroid of the superstructure loads were located at the CL of the pier. 2) The superstructure Pier loads = 2 x the superstructure loads / pier length 3) This design was based on Pier 1

General Design Parameters

Input Section : 1.0

GEOMETRY INFORMATION INPUT:

PROPOSED TOP OF ROADWAY ELEV:				ft		m
PROPOSED TOP OF BACKWALL ELEV:			6097.43	ft	1858.973	m
PROPOSED BRIDGE SEAT ELEV:	H_Backwall = 0.00 ft		6097.43	ft	1858.973	m
PROPOSED TOP OF FOOTING ELEV:	H_Footing = 2.95 ft		6071.88	ft	1851.183	m
PROPOSED BOT. OF FOOTING ELEV:			6068.93	ft	1850.284	m
ELEVATION OF HIGH WATER:		FOR NO WATER = 0.00	6097.36	ft	1858.951	m
PROPOSED BRIDGE SEAT WIDTH:			4.92	ft	1.500	m
PROPOSED BACKWALL WIDTH:			0.00	ft	0.000	m
ABUTMENT/WALL DESIGN LENGTH:	1.00	Design for:	42.31	ft	12.900	m
FOOTING LENGTH			44.12	ft	13.450	m

DW CALCULATION INPUT:

WEARING SURFACE DEPTH:	2.00 IN	x 1. Layers	0.17	ft <-- ---	0.051	m
ROADWAY WIDTH:			26.24	ft	8.000	m
BRIDGE SPAN:	Total Length = 165.312	<-- 3 Spans @	55.10	ft	16.800	m
NUMBER OF GIRDERS:			6			

Fill-in for Abutment / Pier Design

Ref: Khost Bridge No.10

MATERIAL PROPERTIES:

CUBIC WEIGHT CONCRETE:	150.00	pcf
COMP. STRENGTH OF CONC. = F'c:	4.00	ksi
MAXIMUM SIZE OF COARSE AGGREGATE	1.50	in
TENSILE STRENGTH OF REBAR = Fy:	60.00	ksi
CUBIC WEIGHT OF HOT MIX ASPHALT (HMA):	165.00	pcf

GEOTECHNICAL INFORMATION:

BEARING RESISTANCE (CAPACITY):	8.00	ksf	<-- Per Geotech Report
FACTORED BEARING RESISTANCE, qr :	8.00	ksf	<-- Assumed
WEIGHT OF SOIL BACKFILL:	142	Lbs/CF	<-- Assumed
WALL ON ROCK?	N	(Y OR N)	
WALL ON PILES?	N	(Y OR N)	
GRAVITY WALL?	N	(Y OR N)	
BETA: SLOPE OF BACKFILL:	0.00	DEG	<-- Assumed
THETA: BATTER ANGLE BACKWALL:	90.00	DEG	AASHTO Table 3.11.5.3-1
PHI: FRICTION ANGLE OF BACKFILL:	31.00	DEG	<-- Assumed
DELTA: ANGLE BACKWALL FRICTION:	20.67	DEG	<-- Assumed δ=2/3 ($\varnothing$)

CANTILEVER ABUTMENT DESIGN	N
GRAVITY ABUTMENT DESIGN	N
CANTILEVER WALL DESIGN	N
GRAVITY WALL DESIGN	N
PIER DESIGN	Y

PIER DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

General Loading Parameters

Input Section : 2.0

LIVE LOAD INFORMATION:

APPROACH SLAB:	N	(Y OR N)
ROADWAY WITHIN H/2 OF TOP OF WALL:	N	(Y OR N)
Live Load Surcharge to be Considered?:	N	
SURCHARGE HEIGHT:	0.00	ft REF: Table 3.11.6.4-1
Construction Surcharge, q:	250.00	psf REF: C3.4.2.1

SEISMIC LOAD INFORMATION:

WALL RESTRAINED HORZ. MOVMT.(Y/N):	N	(Y OR N)
SEISMIC ACCELERATION COEFF. A:	0.290	REF: FIG.3.10.2.1-2, AASHTO
SEISMIC CATEGORY:	D	**<---Assumed based on Location & AASHTO Seimic Design Guide**

RAILING CLASS: S3-TL4 (CT) (PER MASSDOT LRFD BRIDGE MANUAL PART 1) 3.3.2.2 **<--- N/A**

Horizontal Railing Design Load	0.00	kips
Horizontal Railing Impact Length	0.00	ft
Wall Height+Rail Height	0.00	ft
Distributed Horizontal Railing Design Load @ top of wall	0.00	klf
Distributed Horizontal Railing Design Load @ bottom of wall	0.00	klf/wall height
Railing Dead Load	0.00	
Additional Moment From Railing Impact	0.00	<--- **Note:** The added moment from top of railing to bottom of railing is distributed along bottom of footing*

STREAM PRESSURE

Pmax	0.00	psf
Consider Stream Flow:	N	<--- Do not consider stream pressure perpendicular to the face of the pier since the Piers are parallel to the flow. Do not include stream pressure for this bridge.

SURCHARGE HEIGHT (Per ASSHTO 3.11.6.4 Live Load Surchage)

ABUTMENTS (N/A for PIERS) ----> Table 3.11.6.4-1

Table 3.11.6.4-1 - Equivalent Height of Soil for Vehicular Loading on Abutments Perpindicular to Traffic

Abutment Height (ft)	h_{eq} (ft)
5	4
10	3
>20	2

Surcharge Height = 0.00 ft

RETAINING WALLS ----> Table 3.11.6.4-2

See Table 3.11.6.4-2 for Equivalent Height of Soil for Vechicular Loading on Retaining Walls Parallel to Traffic.

Retaining Wall Height (ft)	heq (ft) Distance from wall backface to edge of traffic.	
	0.0 ft	≥ 1.0 ft
5	5	2
10	3.5	2
>20	2	2

Distance from wall backface to edge of traffic = 0.0 ft

Surcharge Height = 0.00 ft

Note: See 3.11.6.5 for Possible Reduction of Surcharge

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PIER DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Superstructure Loading Parameters

Input Section : 3.0

ADDITIONAL LOADS ON STRUCTURE

(load is per linear foot of structure (Abutment/ Pier/ Wall) NOT the Footing, arm from front edge of bridge seat)

LOADS		LOAD (klf)	ARM (feet)			
(DC+DW), SUPERSTRUCT. DEAD LOAD:	DL	22.75	2.46	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
DC (Structural Components & nonstructural attachments)	DC	21.72	2.46	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
DW (Wearing Surface & Utilities)	DW	1.03	2.46	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
(LL+IM+PL), LIVE LOAD, IMPACT AND PED LL:	LL+IM+PL	9.48	2.46	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	Y
WS, WIND LOAD ON STRUCTURE:	WS	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
WL, WIND LOAD ON LIVE LOAD:	WL	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
BR, BREAKING LOAD :	BR	0.85	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
TU, THERMAL FORCE:	TU	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
EQ, SEISMIC LOAD ON SUPERSTRUCTURE:	EQ	3.41	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	Y
CT, VEHICLE COLLISION LOAD	CT	0.00	0.00	Distance above top pf wall equal to the height of rail	Include =	Y

Note: Per AASHTO 11.5.1, abutments and retaining walls should be designed for EH, WA, LS, DS, DC, TU, EQ. Therefore, including wind and breaking forces is conservative. Say OK

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PIER DESIGN -INPUT

General Information

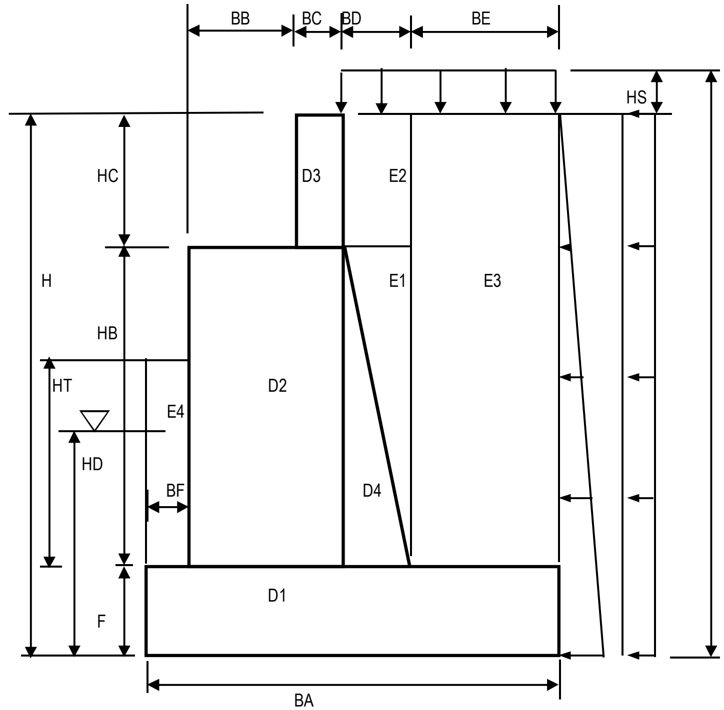
Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Abutment Geometry

Input Section : 4.0

CALCULATION OF WALL AND BACKFILL GEOMETRY:

		Prelim Size	User Adjust	Final Size (ft)	Approx Size (mm)
HEIGHT OF ABUTMENT / WALL, H:	H =	30.500	0.00	30.50	9200
HEIGHT OF FOOTING, F:	F =	2.950	2.00	4.95	1500
HEIGHT OF STEM, HB:	HB =	27.550	-2.00	25.55	7700
HEIGHT OF BACKWALL, HC:	HC =	0.000	0.00	0.00	0
HEIGHT OF HIGH WATER, HD:	HD =	28.430	0.00	28.43	8600
HEIGHT OF SURCHARGE, HS:	HS =	0.000	0.00	0.00	0
WIDTH OF FOOTING, BA:	BA =	15.420	3.00	18.42	5530
WIDTH OF BRIDGE SEAT, BB:	BB =	4.920	0.00	4.92	1480
WIDTH OF BACKWALL, BC:	BC =	0.000	0.00	0.00	0
WIDTH OF BATTER OF STEM, BD:	BD =	0.000	0.00	0.00	0
WIDTH OF FOOTING HEEL, BE:	BE =	6.750	0.00	6.75	2030
WIDTH OF FOOTING TOE, BF:	BF =	6.750	0.00	6.75	2030
HEIGHT OF SOIL OVER TOE, HT:	HT =	11.100	-2.00	9.10	2800
HEIGHT OF SOIL OVER HEEL, HH:	HH =	11.100	-2.00	9.10	2800
HEIGHT OF SOIL AT BACKFACE FACE (HEEL), HS1	Hss1 =			14.05	4300
HEIGHT OF SOIL AT FRONT FACE FACE (TOE), HS2	Hss2 =			14.05	4300



OVERALL QUANTITIES:

WEIGHT OF CONCRETE WALL/L.F.:	32.533	Kips per l.f.
CONCRETE QUANTITY / L.F.:	8.033	C.Y. per l.f.

SUMMARY OF QUANTITIES:

STEEL / L.F. =	620.583	LBS/L.F.
CONC. / L.F =	8.033	C.Y./L.F.

Geometry Check: Check Width: ok
Check Height: ok

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PIER DESIGN - PRIMARY LOADS

General Information

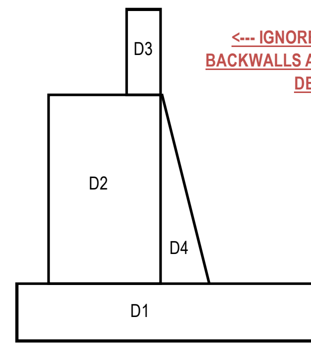
Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).
Pier Options **Khost Bridge Notes**

Calculate Dead Loads

Primary Loads Section : 1.0



<--- IGNORE SECTION D3, BACKWALLS ARE N/A FOR PIER DESIGN

Superstructure Loads:

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	Superstructure	21.72	9.21	200.07			
DW	Superstructure	1.03	9.21	9.47			

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Substructure Loads:

AREA #		Vertical: Volume (CF)	γ_{conc} (pcf)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	D1	91.18	150.00	13.68	9.21	125.96			
	D2	125.71	150.00	18.86	9.21	173.66			
	D3	0.00	150.00	0.00	11.67	0.00			
	D4	0.00	150.00	0.00	11.67	0.00			
	Subtotal Concrete			**32.53**		**299.63**			

<-- N/A FOR PIER DESIGN

Total Dead Load:

AREA #	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL DC (Super + Sub)	**54.26**		**499.69**			
TOTAL DW (Super)	**1.03**		**9.47**			
TOTAL DC (Substr. Only - Construction)	**32.53**		**299.63**			

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Earth Loads

Primary Loads Section : 2.0

Compute Horizontal Earth Pressure, EH:

Coulomb's Active Earth Pressure: (per MHD 3.1.5 and AASHTO 3.11.5.3)

PHI, ϕf =	31.00	Degrees, Rad =	0.54
DELTA, δ =	20.67	Degrees, Rad =	0.36
BETA, β =	0.00	Degrees, Rad =	0.00
THETA, θ =	90.00	Degrees, Rad =	1.57
Γ (per AASHTO Eq. 3.11.5.3-2)=	2.75		
Ka (per AASHTO Eq. 3.11.5.3-1)=	**0.286**		

Earth Pressure Coefficient to be Used for Design per MassDOT

All Walls on Rock	ko	0.485	
All Walls on Piles	ko	0.485	
Cantilever Walls < than 16' in Height	0.5*(Ko + Ka)	0.385	
Cantilever Walls > than 16' in Height	Ka	0.286	<-- USE
Gravity wall supported on Spread Footing	Ka	0.286	

At-Rest Earth Pressure Coeff:

Ko = **0.485**

Earth Pressure Coefficient to be Used for Design:

WALL ON LEDGE:	N	(Y OR N)
WALL ON PILES:	N	(Y OR N)
Wall Height:	30.5	ft
Earth pressure Type:	Ka	
Ke =	**0.286**	<=== **Does not govern.**

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Ko =	0.49	
Ka =	0.32	
Ke (geotech) =	**0.320**	<===== **Governs.**

Compute Lateral Earth Pressure:

Application of lateral earth pressure shall be per AASHTO Figure C3.11.5.3-1. This shows a different application for Gravity and Cantilever (semi-gravity) walls.
Note that the reduction in lateral earth pressures due to the water table is not included in this section. It is included in the WA (Bouyancy) section of this design.

Cantilever (semi-gravity) Walls:

THIS SECTION IS FOR CANTILEVER OR SEMI-GRAVITY WALLS ONLY

Load inclination from horizontal, min = $\phi/3$ =	10.33	degrees
Load inclination from horizontal, max = $\phi*2/3$ =	20.67	degrees
GAMMA =	141.93	pcf
H = Soil Height at Back face, Hss1	14.05	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	4.48	kips
Arm for Horiz Load above BOF = H/3 =	4.68	ft
Arm for Vert Load from Toe = F =	18.42	ft

Consider minimum inclination for Sliding, Overturning and Bearing Pressure:

Vertical Component, Pav = Pa*sin($\phi/3$) =	0.80	klf
Horizontal Component, Pah = Pa*cos($\phi/3$) =	4.41	klf

Consider maximum inclination for Footing Heel Reinforcement:

Vertical Component, Pav = Pa*sin($\phi*2/3$) =	1.58	klf
Horizontal Component, Pah = Pa*cos($\phi*2/3$) =	4.19	klf

Gravity Walls:

N/A ---> THIS SECTION IS FOR GRAVITY WALLS ONLY

Load inclination from horizontal = $\delta + (90-\theta)$ =	20.67	degrees
GAMMA =	141.93	pcf
H =	14.05	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	4.48	kips
Arm for Horiz Load above BOF = H/3 =	4.68	ft
Arm for Vert Load from Toe=(BF+BB+BC+BD*2/3) =	11.67	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Pav = Pa*sin($\delta+(90-\theta)$) =	1.58	klf
Horizontal Component, Pah = Pa*cos($\delta+(90-\theta)$) =	4.19	klf
Is the wall a Gravity Wall?	N	

PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.1

Include Passive Earth Pressure	N
Pp Factor	0

ϕ = Soil Friction Angle	31.00	degrees	
δ = Wall Interface Friction	20.67	degrees = 2/3 * ϕ --> 11.6.5.5	
Kp = Passive Earth Pressure Coefficient	3.13	Fig A11.4-2	<-- For the preliminary design it was assumed kp = kpe (see below for kpe back-up)
γ = Unit Weight of Soil	141.93	pcf	
H = Hss2= Height of Soil at Front Face	14.05	ft	
Lateral EQ Load, Pp = 1/2*γ*Kp*H^2=	0.00	klf ---> Equation A11.4-4	
Arm for Horiz Load above BOF = H/3 =	4.68	ft (AASHTO pg 11-112)	

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.2

Horizontal Earth Pressure, EH:

AREA #	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EH: Pa	0.80	18.42	14.81	4.41	4.68	20.65
EH: Pp			0.00	0.00	4.68	0.00
EH (For all cases except heel reinforcement):	0.80	18.42	14.81	4.41	9.37	41.31
EH: Pa	1.58	18.42	29.14	4.19	4.68	19.64
EH: Pp			0.00			0.00
EH (For Heel Reinforcement):	1.58	18.42	29.14	4.19	4.68	19.64

<=== Note, Based on AASHTO Figure C11.5.6-1, both the vertical and horizontal components of EH should be included here because they carry the same load factor.

Vertical Earth Pressure, EV:

AREA #		Volume (CF)	γ_{SOIL} (plf)	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)	
EV	E1	0.00	141.93	0.00	11.67	0.00				<-- N/A Batter = 0
	E2	0.00	141.93	0.00	11.67	0.00				<-- N/A Batter = 0
	E3	172.46	141.93	24.48	15.05	368.27				
	E4	61.43	141.93	8.72	3.38	29.42				
TOTAL EV				33.20		397.69				

Note, **per AASHTO 11.6.1.2**, the weight of the soil over the battered portion of the stem or over the base of a footing may be considered as part of the effective weight of the abutment. This is consistant with design.

Earth Surcharge, ES: (This applies for construction case only)

q =	250.00	psf
Uniform Load on Wall, p=Ke*q =	0.080	ksf
Wall Height, H =	30.50	Feet
Heel Length, BE =	6.75	Feet
Footing Width, BA =	18.42	Feet
Wall Length Considered =	1.00	ft

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
ES	$P_{con}(h)$ = p*H*Length =				2.44	15.25	37.21
	$P_{con}(v)$ = q*BE*Length =	1.69	15.05	25.39			
TOTAL ES		1.69		25.39	2.44		37.21

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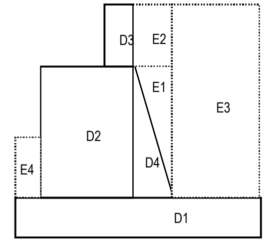
PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Live Loads

Primary Loads Section : 3.0



<--- IGNORE SECTION D3, BACKWALLS ARE N/A FOR PIER DESIGN

Superstructure Loads:

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LL+IM+PL	**Superstructure**	**9.48**	**9.21**	**87.34**			
BR	**Superstructure**				**0.851**	**30.50**	**25.95**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Live Load Surcharge Loads: LS

Per AASHTO 3.11.6.4, a live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall.
If the surcharge is for highway, the intensity of the load shall be consistent with provisions of Article 3.6.1.2. See Tables 3.11.6.4-1 and 3.11.6.4-2 for equivalent heights.

Compute Horizontal Live Load Surcharge: (To be used for bearing pressure and sliding load cases):

Ke =	0.286	
Unit Weight of Soil, γ =	141.930	pcf
Surcharge Height, heq =	0.00	Feet
LS(h) =(Ke)(γ)(heq)*H =	0.00	kips
Moment arm = H/2 =	15.25	kips

Compute Vertical Live Load Surcharge: (To be used for bearing pressure cases only):

LS(v) =(γ)(heq)(BD+BE) =	0.00	kips
Moment arm = Ba-(BD+BE)/2 =	15.05	kips

Compute Vertical Live Load Surcharge: (To be used for heel reinf cases only):

LS(v) =(γ)(heq)(BE) =	0.00	kips
Moment arm (to back of batter) = BE/2 =	3.38	kips

Live Load Surcharge, LS: Summary

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LS	**LS(v)**	**0.00**	**15.05**	**0.00**			
	LS(h)				**0.00**	**15.25**	**0.00**

Total Live Load Load:

AREA #	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL LL+IM+PED+BR+LS	**9.48**		**87.34**	**0.85**		**25.95**
TOTAL LL+IM+PED+BR+LS (Sliding Only)	**9.48**		**87.34**	**0.85**		**25.95**
TOTAL LS (Heel Reinf Only)	**0.00**	**3.38**	**0.00**			

PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Water load (Buoyancy Forces)

Primary Loads Section : 4.0

HEIGHT OF STEM AT HIGH WATER:	23.48	
HEIGHT OF FOOTING AT HIGH WATER:	4.95	
WIDTH OF FOOTING, BA	18.42	
SOIL WEIGHT - WATER WEIGHT	79.53	pcf
UPWARD BOUYANT FORCE	-62.40	pcf

Horizontal Force = B(h) = (γ-(γ-62.4))*Ka)H^2/2, acts at HD/3:

INCLUDE HORIZONTAL FORCE? N

<-- Note: The Horizontal load is Not Applicable since the hydrostatic force is equal and opposite on both sides.

Bouyant Load, WA:

AREA #		VOLUME (CF)	GAMMA (#/CF)	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WA	B1 (Ftg)	91.18	-62.40	-5.69	9.21	-52.40			
	B2 (Stem)	115.52	-62.40	-7.21	9.21	-66.39			
	B3 (Soil over Ftg)	316.98	-62.40	-19.78	15.05	-297.58			
	STATIC						8.07	9.48	76.47
	SEISMIC						19.86	9.48	188.22
TOTAL WA (BL) (Static)				**-32.68**		**-416.38**	**0.00**		**0.00**
TOTAL WA (BL) (Seismic)				**-32.68**		**-416.38**	**0.00**		**0.00**

Calculate Stream Flow Pressure

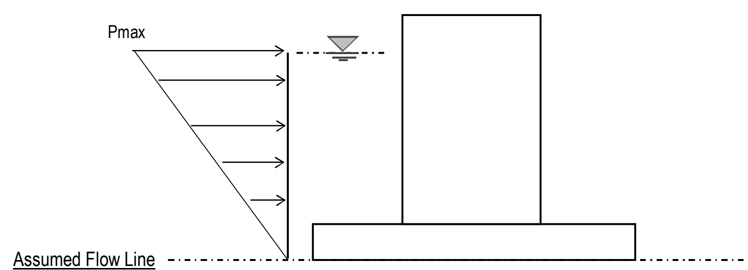
Primary Loads Section : 4.1

Note: The flow line is conservatively assumed to act at the bottom of the footing

Pmax:	0.0000	ksf
APPLIED:	N	

Force = 0.5 * Pmax * HD
Arm = HD * (2/3)

LOAD	HORIZONTAL: **FORCE (Kips)**	**ARM (Feet)**	**MOM (Ft x K)**
WA (SF)	0.00	18.95	0.00



Calculate Water Load & Stream Flow Load WA

Primary Loads Section : 4.2

Water Load (Bouyancy) & Stream Flow, WA:

AREA #	VOLUME (CF)	GAMMA (#/CF)	Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL WA (Static)			-32.68		-416.38	0.00		0.00
TOTAL WA (Seismic)			-32.68		-416.38	0.00		0.00

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Wind Loads

Primary Loads Section : 5.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WS	**Superstructure**				**0.00**	**30.50**	**0.00**
WL	**Superstructure**				**0.00**	**30.50**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Calculate Temperature Loads

Primary Loads Section : 6.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TU	**Superstructure**				**0.00**	**30.50**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Seismic Forces

Primary Loads Section : 7.0

Superstructure Loads:

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	Superstructure				**3.413**	**30.50**	**104.08**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Substructure Loads:

(Ref: AASHTO 4th Ed., A11.1.1.1 for Mononobe-Okabe Analysis.)

GAMMA = unit weight of soil =	141.93	Lbs/CF		
H = height of soil face =	30.50	Feet		
PHI = angle of internal friction of soil =	31.00	Degrees =	0.54	Radians
DELTA = angle of friction between soil & abut =	20.67	Degrees =	0.36	Radians
i = backfill slope angle =	0.00	Degrees =	0.00	Radians
BETA = slope of wall to the vertical	0.00	Degrees =	0.00	Radians

A =	0.29			
kh = horizontal acceleration coefficient	0.435	Consider Cohesion?	N	------> kh = a * 0.5, Wall is NOT Restrained from Horizontal Movement
kv = vertical acceleration coefficient	0.000			
THETA = arc tan (kh/(1-Kv) =	23.51	Degrees =	0.41	Radians
Kae (per AASHTO Eq. A11.1.1.1-2) =	**0.788**	<===== **Governs.**		

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Kae (geotech) = **0.000** <=== **Does not govern.**

N/A
NOT GIVEN IN GEOTECH
REPORT

Load inclination from horizontal = δ =	20.67	degrees
Lateral EQ Load, Eae = 1/2*γ*Kae*H^2*(1-kv) =	51.99	klf
Arm for Horiz Load above BOF = H/3 =	10.17	ft (AASHTO pg 11-112)
Arm for Vert Load from Toe = BA =	18.42	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Eav = Eae*sin(δ) =	18.35	klf	Include EQ In Design =	Y
Horizontal Component, Eah = Eae*cos(δ) =	48.65	klf	EQ Factor =	1

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Seismic Forces

Primary Loads Section : 7.1

Include Seismic Passive Earth Pressure	N	
Epe Factor	0	
kh = horizontal acceleration coefficient	0.435	
∅ = Soil Friction Angle	31.00	degrees
δ = Wall Interface Friction	20.67	degrees = 2/3 * ∅ --> 11.6.5.5
Kpe = Seismic Passive Earth Pressure Coefficient	3.13	Fig A11.4-2
γ = Unit Weight of Soil	141.93	pcf
Hff = Height of Soil at Front Face	14.05	ft
Lateral EQ Load, Epe = 1/2*γ*Kpe*H^2=	0.00	klf ---> Equation A11.4-4
Arm for Horiz Load above BOF = Hff/3 =	4.68	ft (AASHTO pg 11-112)

SECTION 11: WALLS, ABUTMENTS, AND PIERS 11-117

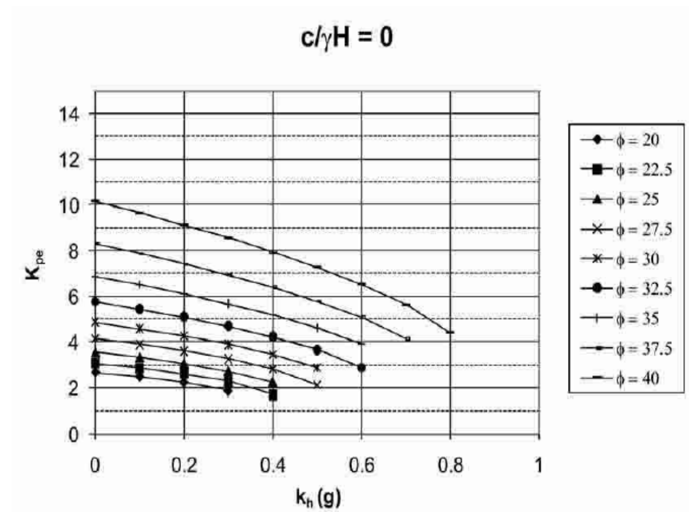

Figure A11.4-2—Seismic Passive Earth Pressure Coefficient Based on Log Spiral Procedure for $c/\gamma H$ = 0 and 0.05 (c = soil cohesion, γ = soil unit weight, and H = height or depth of wall over which the passive resistance acts)

Note: $k_h = A_s = k_{ho}$ for wall heights greater than 20 ft.

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Seismic Forces Continued..

Primary Loads Section : 7.2

WALL INERTIA EFFECTS

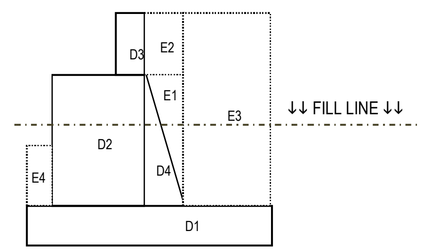
Per **AASHTO DIV 1A 6.4.3**, seismic design should take into account forces arising from seismically inducd lateral earth pressures (as computed above), additional forces arising from wall inertia and the transfer of seismic forces from the bridge deck through bearing supports which do not slide freely.

The following table computes the inertia forces due to the weight of the concrete and backfill.

kh = 0.435

AREA #		DL (Kips)	DL*kh (Kips)	ARM (Feet)	MOM (Ft x K)	% of DL to be included
DL Wall	D1	0.00	0.00	2.48	0.00	0%
	D2	12.14	5.28	17.73	93.60	64%
	D3	0.00	0.00	30.50	0.00	100%
	D4	0.00	0.00	13.47	0.00	0% n/a
	Subtotal	**12.14**	**5.28**	**17.73**	**93.60**	
DL Backfill	E1	0.00	0.00	21.98	0.00	0%
	E2	0.00	0.00	30.50	0.00	0%
	E3	0.00	0.00	17.73	0.00	0%
	E4	0.00	0.00	9.50	0.00	0%
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	
TOTAL		**12.14**	**5.28**	**17.73**	**93.60**	

FOR PIERS: Include DL above Fill Only



Total Seismic Loads, EQ:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	EQ Superstructure =				3.413	30.50	104.084
	Eae(v)	18.35	18.42	338.00			
	Eae(h)				0.00	10.17	0.00
	Epe(v)		18.42	0.00			
	Epe				0.00	4.68	0.00
	Fwi(h)				5.28	17.73	93.60
TOTAL EQ		**18.35**		**338.00**	**8.69**		**197.69**

% Eae(h) to be included: 0% **FOR PIERS: M-O ANALYSIS IS FOR RETAINED SOILS --> N/A FOR PIERS**

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Calculate Vehicle Collision Loads

Primary Loads Section : 8.2

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
CT (Stem Design)	**Superstructure**				**0.00**	**0.00**	**0.00**
CT	**Superstructure**				**0.00**	**0.00**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

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PIER DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Summary of Primary Loads

Primary Loads Section : 9.2

	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL DC (Super + Sub)	54.26		499.69			
TOTAL DW (Super)	1.03		9.47			
TOTAL DC (Substr. Only - Construction)	32.53		299.63			
EH (For all cases except heel reinforcement):	0.80	18.42	14.81	4.41	9.37	41.31
EH (For Heel Reinforcement):	1.58	18.42	29.14	4.19	4.68	19.64
TOTAL EV	33.20		397.69			
TOTAL ES	1.69		25.39	2.44		37.21
TOTAL LL+IM+PED+BR+LS	9.48	0.00	87.34	0.85	0.00	25.95
TOTAL LL+IM+PED+BR+LS (Sliding Only)	9.48	0.00	87.34	0.85	0.00	25.95
TOTAL LS (Heel Reinf Only)	0.00	3.38	0.00	0.00	0.00	0.00
TOTAL WA (Static)	-32.68		-416.38	0.00		0.00
TOTAL WA (Seismic)	-32.68		-416.38	0.00		0.00
WS Superstructure				0.00	30.50	0.00
WL Superstructure				0.00	30.50	0.00
TU Superstructure				0.00	30.50	0.00
TOTAL EQ	18.35		338.00	8.69		197.69
CT (Stem Design)	0.00	0.00	0.00	0.00	0.00	0.00
CT	0.00	0.00	0.00	0.00	0.00	0.00

PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Khost Bridge Notes

Summary of Primary Loads

Load Combinations : 1.0

INCLUDE SEISMIC = Y

Load		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)	Notes	LRFD Load Combination Load Case
Dead Load	$DC_{SUB+SUPER}$	54.26	0.00	499.69	0.00	0.00	0.00	Super + Sub	
	DW	1.03	0.00	9.47	0.00	0.00	0.00	Super Only	
	DC_{SUB}	32.53	0.00	299.63	0.00	0.00	0.00	Sub Only - Construction	LC1 only
Earth Load	EH	0.80	18.42	14.81	4.41	9.37	41.31	All cases except Heel	Used in all load cases
	EH	1.58	18.42	29.14	4.19	4.68	19.64	For Heel Reinforcement	Not used in any load case
	EV	33.20	0.00	397.69	0.00	0.00	0.00		
Earth Load Surcharge	ES	1.69	0.00	25.39	2.44	0.00	37.21		
Live Load Surcharge	LS(v)	0.00	15.05	0.00	0.00	0.00	0.00		
	LS(h)	0.00	0.00	0.00	0.00	15.25	0.00		
Live Load	LL+IM+PED+BR+LS	9.48	0.00	87.34	0.85	0.00	25.95		
	LL+IM+PED+BR+LS	9.48	0.00	87.34	0.85	0.00	25.95	No LS for Sliding LC	LC4, LC8 & LC10
	LS	0.00	3.38	0.00	0.00	0.00	0.00		
Bouyant Load & Stream Force	WA	-32.68	0.00	-416.38	0.00	0.00	0.00	Static	
	WA	-32.68	0.00	-416.38	0.00	0.00	0.00	Seismic	LC9 &LC10
Wind Load	WS	0.00	0.00	0.00	0.00	30.50	0.00		
	WL	0.00	0.00	0.00	0.00	30.50	0.00		
Temperature Load	TU	0.00	0.00	0.00	0.00	30.50	0.00		
Seismic Load	EQ	18.35	0.00	338.00	8.69	0.00	197.69		
Vehicle Collision Load	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stem Wall	LC11 & LC12
	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stability	

PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Limit States and Load Factors

Load Combinations : 2.0

Service Limit State

Per AASHTO 10.5.2, foundation design at the service limit state shall include settlements, horizontal movements, overall stability (of earth slopes) and scour at the design flood.
* These items are part of the geotechnical scope and are therefore NOT included in this design.

Strength Limit States

Per AASHTO 10.5.3, foundation design at the strength limit strength shall include structural resistance, scour, nominal bearing resistance, overturning or excessive loss of contact, sliding and constructability.
* These items, except scour, are addressed in this design.

Extreme Events Limit States

Per AASHTO 10.5.4, foundation shall be designed for extreme events such as a seismic event and vehicle collision.
* These items are addressed in this design.

Since these factors are 1.0, they have not yet been incorporated into the design template.

Computation of the Load Modification Factor, h_i:

		Extreme	Strength
h_D Ductility Factor, (AASHTO 1.3.3):		1.00	1.00
h_R Redundancy Factor, (AASHTO 1.3.4):		1.00	1.00
h_I Operational Importance Factor, (AASHTO 1.3.5):		1.00	1.00
h_i (for loads for which γ_i(max) is appropriate) (AASHTO Eq 1.3.2.1-2):	$h_i = h_D h_R h_I \geq 0.95$	1.00	1.00
h_i (for loads for which γ_i(min) is appropriate) (AASHTO Eq 1.3.2.1-3):	$h_i = 1 / h_D h_R h_I \leq 1.00$	1.00	1.00

h_D Ductility Factor (for all other limit states h_D = 1.00)

$h_D \geq$	1.05	for nonductile components and connections.
$h_D =$	1.00	for conventional designs and details complying with the specifications.
$h_D \geq$	0.95	for components and connections for which additional ductility-enhancing m

h_R Redundancy Factor (for all other limit states h_R = 1.00)

$h_R \geq$	1.05	for nonredundant members
$h_R =$	1.00	for conventional levels of redundancy
$h_R \geq$	0.95	for exceptinal levels of redundancy

h_I Operational Importance Factor

$h_I \geq$	1.05	for a bridge of operational importance
$h_I =$	1.00	for typical bridges
$h_I \geq$	0.95	for relatively less important bridges

Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2), g_p:

	Maximum	Minimum
DC (Dead Load, General):	1.25	0.90
DW (Wearing Surface & Utilities):	1.50	0.65
EH (Horiz Earth):	1.43	0.90
ES (Horiz Earth):	1.50	0.75
EV (Vertical Earth, Retaining Structure):	1.35	1.00

<-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.

Live Load Factor During a Seismic Event, g_{EQ}:

	Maximum	Minimum
g_{EQ} (AASHTO C3.4.1):	0.50	0.00

<--- Seismic Included

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PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations & Notes

Load Combinations : 3.0

NOTES:

1. Load Combination Strength II does not need to be checked since it applies to special design vehicles.
2. Load Combination Strength III does not need to be checked during construction since WS is not a significant load.
3. Load Combination Strength IV does not need to be checked since it applies to bridges with very high dead load to live load ratios.
4. Load Combination Strength V does not need to be checked during construction since WS and WL are not significant loads.
5. Extreme Event load combinations do not need to be checked during construction.
6. Extreme Event II load combinations does not need to be checked for abutments.
7. Service limit state load combinations do not need to be checked for abutment stability / reinforcement.
8. Fatigue limit state load combinations do not need to be checked for abutment stability / reinforcement.
9. All remaining load cases shall be checked using load factors which would provide max effect for either bearing or sliding / eccentricity similar to AASHTO Figures C11.5.5-1 and C11.5.5.2.
10. Bouyancy has been included in sliding load combinations. A load factor of 0.0 has been used for bearing pressure load combinations since it is conservative to ignore sliding for these computations.

Strength	LC1	LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): gp max*(DCsub)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Strength	LC2	LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Bearing	LC3	LC3 - STRENGTH I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Sliding	LC4	LC4 - STRENGTH I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Bearing	LC5	LC5 - STRENGTH III BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Sliding	LC6	LC6 - STRENGTH III SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Bearing	LC7	LC7 - STRENGTH V BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Sliding	LC8	LC8 - STRENGTH V SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Extreme Bearing	LC9	LC9 - EXTREME EVENT I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+gEQ MAX*(LL+IM+PL+BR+LS)+1.0*(EQ)
Extreme Sliding	LC10	LC10 - EXTREME EVENT I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+gEQ MIN*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)
Extreme Bearing	LC11	LC11 - EXTREME EVENT II BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(CT)
Extreme Sliding	LC12	LC12 - EXTREME EVENT II SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(CT)

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PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations

Load Combinations : 3.1

↓ N/A, Valid for Pile Design Only ↓

NA (for Bottom row of piles) From Pile Design = 0

Bottom Row to Edge of Toe = 0

↓ N/A, Valid for Pile Design Only ↓

Distance of Pile Group N.A. From Footing Toe (See Pile Design Spreadsheet): 0.00 ft

LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): $g_{p\,max}$*(DCsub)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC_{SUB}	1.25	40.67		374.53	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
ES	1.50	2.53		38.08	3.66		55.82
SUM		**89.16**		**970.60**	**9.94**		**114.68**

Distance of Vertical Force (V) From The Footing Toe	Offset of Pile Group N.A. From Original Location of V	Equivalent Moment Due to Offset of Pile Group N.A. From Original Location of V	**Mom. to Be Used On Pile Group = O.T. Mom. - Equivalent Mom.**	**Vertical Force to Be Used On Pile Group**	**Horizontal Force to Be Used On Pile Group**
10.89 ft	10.89 ft	970.6 k.ft	**-855.9 k.ft**	**89.2 kip**	**9.9 kip**

LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
ES	1.50	2.53		38.08	3.66		55.82
SUM		**117.85**		**1234.88**	**9.94**		**114.68**

↓ N/A, Valid for Pile Design Only ↓

Distance of Vertical Force (V) From The Footing Toe	Offset of Pile Group N.A. From Original Location of V	Equivalent Moment Due to Offset of Pile Group N.A. From Original Location of V	**Mom. to Be Used On Pile Group = O.T. Mom. - Equivalent Mom.**	**Vertical Force to Be Used On Pile Group**	**Horizontal Force to Be Used On Pile Group**
10.48 ft	10.48 ft	1234.9 k.ft	**-1120.2 k.ft**	**117.9 kip**	**9.9 kip**

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PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.2

LC3 - STRENGTH I BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
LL+IM+PL+BR+LS	1.75	16.60		152.85	1.49		45.41
WA	1.00	-32.68		-416.38	0.00		0.00
TU	0.50	0.00		0.000	0.0000		0.000
SUM		**99.24**		**933.28**	**7.77**		**104.28**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

9.40 ft	9.40 ft	933.3 k.ft	**-829.0 k.ft**	**99.2 kip**	**7.8 kip**

LC4 - STRENGTH I SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	48.83		449.72	0.00		0.00
DW	0.65	0.67		6.15	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.00	33.20		397.69	0.00		0.00
LL+IM+PL+BR+LS	1.75	16.60		152.85	1.49		45.41
WA (static)	1.00	-32.68		-416.38	0.00		0.00
TU	0.50	0.00		0.00	0.000		0.000
SUM		**67.76**		**611.15**	**7.77**		**104.28**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

9.02 ft	9.02 ft	611.1 k.ft	**-506.9 k.ft**	**67.8 kip**	**7.8 kip**

LC5 - STRENGTH III BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.425	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
WA (static)	1.00	-32.68		-416.38	0.00		0.00
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**82.64**		**780.43**	**6.28**		**58.86**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

9.44 ft	9.44 ft	780.4 k.ft	**-721.6 k.ft**	**82.6 kip**	**6.3 kip**

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General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.3

LC6 - STRENGTH III SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.90	48.83		449.72	0.00		0.00
DW	0.65	0.67		6.15	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.00	33.20		397.69	0.00		0.00
WA	1.00	-32.68		-416.38	0.00		0.00
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**51.16**		**458.30**	**6.28**		**58.86**

Load Factors Based on this particular LRFD Combination

↓ **N/A, Valid for Pile Design Only** ↓

8.96 ft	8.96 ft	458.3 k.ft	**-399.4 k.ft**	**51.2 kip**	**6.3 kip**

LC7 - STRENGTH V BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
LL+IM+PL+BR+LS	1.35	12.80		117.91	1.15		35.03
WA	1.00	-32.68		-416.38	0.00		0.00
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**95.45**		**898.34**	**7.43**		**93.90**

Load Factors Based on this particular LRFD Combination

↓ **N/A, Valid for Pile Design Only** ↓

9.41 ft	9.41 ft	898.3 k.ft	**-804.4 k.ft**	**95.4 kip**	**7.4 kip**

LC8 - STRENGTH V SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	48.83		449.72	0.00		0.00
DW	0.65	0.67		6.15	0.00		0.00
EH	1.425	1.15		21.11	6.28		58.86
EV	1	33.20		397.69	0.00		0.00
LL+IM+PL+BR+LS	1.35	12.80		117.91	1.15		35.03
WA	1.00	-32.68		-416.38	0.00		0.00
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**63.96**		**576.21**	**7.43**		**93.90**

Load Factors Based on this particular LRFD Combination

↓ **N/A, Valid for Pile Design Only** ↓

9.01 ft	9.01 ft	576.2 k.ft	**-482.3 k.ft**	**64.0 kip**	**7.4 kip**

PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.4

LC9 - EXTREME EVENT I BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$g_{EQ\,MAX}$*(LL+IM+PL+BR+LS)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
LL+IM+PL+BR+LS	0.50	4.74		43.67	0.43		12.98
WA	0.00	0.00		0.00	0.00		0.00
EQ	1.00	18.35		338.00	8.69		197.69
SUM		**138.41**		**1578.47**	**15.40**		**269.53**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.40 ft	11.40 ft	1578.5 k.ft	**-1308.9 k.ft**	**138.4 kip**	**15.4 kip**

LC10 - EXTREME EVENT I SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+$g_{EQ\,MIN}$*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	48.83		449.72	0.00		0.00
DW	0.65	0.67		6.15	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.00	33.20		397.69	0.00		0.00
LL+IM+PL+BR+LS	0.00	0.00		0.00	0.00		0.00
WA (seismic)	1.00	-32.68		-416.38	0.00		0.00
EQ	1.00	18.35		338.00	8.69		197.69
SUM		**69.51**		**796.30**	**14.98**		**256.55**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

11.46 ft	11.46 ft	796.3 k.ft	**-539.7 k.ft**	**69.5 kip**	**15.0 kip**

PIER DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.4

LC11 - EXTREME EVENT II BEARING: $g_{p\ max}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ max}$*(EV)+$g_{EQ\ MAX}$*(LL+IM+PL+BR+LS)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	67.82		624.62	0.00		0.00
DW	1.5	1.54		14.20	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.35	44.81		536.88	0.00		0.00
LL+IM+PL+BR+LS	0.50	4.74		0.00	0.43		12.98
WA	0.00	0.00		0.00	0.00		0.00
CT	1.00	9.48		0.00	0.00		0.00
SUM		**129.55**		**1196.80**	**6.71**		**71.84**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

9.24 ft	9.24 ft	1196.8 k.ft	**-1125.0 k.ft**	**129.5 kip**	**6.7 kip**

LC12 - EXTREME EVENT II SLIDING: $g_{p\ min}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ min}$*(EV)+$g_{EQ\ MIN}$*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	48.83		449.72	0.00		0.00
DW	0.65	0.67		6.15	0.00		0.00
EH	1.43	1.15		21.11	6.28		58.86
EV	1.00	33.20		397.69	0.00		0.00
LL+IM+PL+BR+LS	0.50	4.74		0.00	0.00		0.00
WA (seismic)	1.00	-32.68		-416.38	0.00		0.00
CT	1.00	9.48		0.00	0.00		0.00
SUM		**65.39**		**458.30**	**6.28**		**58.86**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.01 ft	7.01 ft	458.3 k.ft	**-399.4 k.ft**	**65.4 kip**	**6.3 kip**

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PIER DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes: **This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).**

Check Bearing Resistance (per AASHTO 11.6.3.2) -- ON SOIL

Stability : 1.0

If supported on soil, the vertical stress (σ_v) shall be calculated assuming a uniformly distributed pressure (V) over an effective base area (B-2e). AASHTO Fig 11.6.3.2-1 ----> qr / Φβ = q_n =

If supported on rock, the vertical stress (σ_v) shall be calculated assuming a linearly distributed pressure over an effective base area. AASHTO Fig 11.6.3.2-2 ----> qr / Φβ = q_n =

Factored Bearing Resistance, qr: qr = Φβ * q_n = 8.00 ksf **<--- Note per Geotech, this is factored net bearing resistance**

Strength Bearing Resistance Factor, Φβ (AASHTO Table 11.5.7-1): 0.55 qr = Φβ * q_n = 8.00 ksf -----> qr / Φβ = qn = 14.55 ksf

Extreme Event Bearing Resistance Factor, Φβ (AASHTO 10.5.5.3.3): 1.00 qr = Φβ * q_n = 8.00 ksf -----> qr / Φβ = qn = 8.00 ksf

Note ---> See AASHTO Table 11.5.7-1 to determine Φβ Factor

	LOAD COMBINATION	Vertical Force (Kips)	Resisting Moment (Ft x K)	Overturn Moment (Ft x K)	Mnet (Ft x K)	Eccentricity from Toe, et=Mnet/V (Ft)	Eccentricity from CL, e=B/2-et (Ft)	σ_v on soil (ksf)	$\sigma_{v\,max}$ on rock (ksf)	$\sigma_{v\,min}$ on rock (ksf)	$\sigma_v < \Phi\beta * q_n$	
Strength	**LC1**	89.16	970.60	114.68	855.92	9.60	-0.39	4.64	4.23	5.46	OK	
Strength	**LC2**	117.85	1234.88	114.68	1120.21	9.51	-0.30	6.20	5.78	7.01	OK	
Bearing	**LC3**	99.24	933.28	104.28	829.00	8.35	0.86	5.94	6.89	3.88	OK	
Sliding	**LC4**	67.76	611.15	104.28	506.87	7.48	1.73	4.53	5.75	1.61	OK	<--*N/A Sliding Combination
Bearing	**LC5**	82.64	780.43	58.86	721.56	8.73	0.48	4.73	5.19	3.79	OK	
Sliding	**LC6**	51.16	458.30	58.86	399.43	7.81	1.40	3.28	4.05	1.51	OK	<--*N/A Sliding Combination
Bearing	**LC7**	95.45	898.34	93.90	804.44	8.43	0.78	5.66	6.50	3.86	OK	
Sliding	**LC8**	63.96	576.21	93.90	482.32	7.54	1.67	4.24	5.36	1.58	OK	<--*N/A Sliding Combination
Ex. Bearing	**LC9**	138.41	1578.47	269.53	1308.95	9.46	-0.25	7.32	6.91	8.12	OK	
Ex. Sliding	**LC10**	69.51	796.30	256.55	539.74	7.76	1.45	4.48	5.55	2.00	OK	<--*N/A Ex. Sliding Combination
Ex. Bearing	**LC11**	129.55	1196.80	71.84	1124.96	8.68	0.53	7.46	8.24	5.83	OK	
Ex. Sliding	**LC12**	65.39	458.30	58.86	399.43	6.11	3.10	5.35	7.14	0.00	OK	<--*N/A Ex. Sliding Combination

*** Sliding Load Combinations are Not Applicable for checking the Bearing**

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PIER DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Check Overturning (per AASHTO 11.6.3.3) -- ON SOIL

Stability : 2.0

e allowable (ftgs on soil): 4.61 ft

e allowable (ftgs on rock): 6.91 ft

If e < e allowable, Overturning is OK:

	LOAD COMBINATION	Eccentricty from CL, e=B/2-et (Ft)	Check Overturning	
Strength	**LC1**	-0.39	OK	
Strength	**LC2**	-0.30	OK	
Bearing	**LC3**	0.86	OK	
Sliding	**LC4**	1.73	OK	<--*N/A Sliding Combination
Bearing	**LC5**	0.48	OK	
Sliding	**LC6**	1.40	OK	<--*N/A Sliding Combination
Bearing	**LC7**	0.78	OK	
Sliding	**LC8**	1.67	OK	<--*N/A Sliding Combination
Ex. Bearing	**LC9**	-0.25	OK	
Ex. Sliding	**LC10**	1.45	OK	<--*N/A Ex. Sliding Combination
Ex. Bearing	**LC11**	0.53	OK	
Ex. Sliding	**LC12**	3.10	OK	<--*N/A Ex. Sliding Combination

*** Sliding Load Combinations are Not Applicable for checking Overturning**

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PIER DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Check Sliding (per AASHTO 10.6.3.4)

Stability : 3.0

Ignore Passive Resistance of Soil per MassHighway

Strength Sliding Resistance Factor, Φ_τ (AASHTO Table 11.5.7-1):	1.00	
Extreme Event Sliding Resistance Factor, Φ_ϖ (AASHTO 10.5.5.3.3):	1.00	
Internal Friction Angle of Drained Soil, Φ_f:	31.00	degrees
tan δ: = tan Φ_f (per AASHTO 10.6.3.4-2):	0.60	for concrete against soil. Multiply by 0.8 for precast concrete footing

	LOAD COMBINATION	Vertical Force (Kips)	Rt = V * tan δ: (Kips)	Φ_τ (Strength) Φ_ω (Extreme) (Kips)	Nom. Sliding Resistance Φ_τ*Rt (Kips)	Horiz Force (Kips)	Check Sliding	
Strength	**LC1**	89.16	53.57	1.00	53.57	9.94	OK	**<--*N/A Strength Combination**
Strength	**LC2**	117.85	70.81	1.00	70.81	9.94	OK	**<--*N/A Strength Combination**
Bearing	**LC3**	99.24	59.63	1.00	59.63	7.77	OK	**<--*N/A Bearing Combination**
Sliding	**LC4**	67.76	40.71	1.00	40.71	7.77	OK	
Bearing	**LC5**	82.64	49.66	1.00	49.66	6.28	OK	**<--*N/A Bearing Combination**
Sliding	**LC6**	51.16	30.74	1.00	30.74	6.28	OK	
Bearing	**LC7**	95.45	57.35	1.00	57.35	7.43	OK	**<--*N/A Bearing Combination**
Sliding	**LC8**	63.96	38.43	1.00	38.43	7.43	OK	
Ex. Bearing	**LC9**	138.41	83.17	1.00	83.17	15.40	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC10**	69.51	41.77	1.00	41.77	14.98	OK	
Ex. Bearing	**LC11**	129.55	77.84	0.60	46.77	0.00	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC12**	65.39	39.29	0.60	23.61	0.00	OK	

Results Summary:

Stability : 4.0

STABILITY RESULTS:

LOAD COMBINATION:	**BEARING RESISTANCE**	**OVERTURNING**	**SLIDING**	
LC1	OK	OK	OK	<== Construction
LC2	OK	OK	OK	<== Construction
LC3	OK	OK	OK	
LC4	OK	OK	OK	
LC5	OK	OK	OK	
LC6	OK	OK	OK	
LC7	OK	OK	OK	
LC8	OK	OK	OK	
LC9	OK	OK	OK	
LC10	OK	OK	OK	
LC11	OK	OK	OK	
LC12	OK	OK	OK	

PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

References:

- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:

This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Pier Options

Khost Bridge Notes

Design Parameters

Reinforcement : 1.0

GEOMETRY

H of Footing, h :	4.95	ft
bw (per linear ft of wall) :	12.00	in

MATERIAL PROPERTIES

Compressive Strength: f'c :	4.00	ksi	
Min Yield Strength: fy :	60.00	ksi	
Max. Agg. Size :	1.50	in	
Es :	29000	ksi	AASHTO 5.4.3.2
Tension Reinforcement Strain: ε_s :	0.002	ε_s = fy / Es	
β :	1.881		AASHTO EQ 5.8.3.4.2-1

Design Heel and Toe Reinforcement

Reinforcement : 2.1

FACTORED HEEL DESIGN LOADS	Load Factor, γ_p AASHTO Table 3.4.1-2	Vertical Force & Design Shear (Kips)	Arm (Feet)	Design Moment (Ft x K)
DC (Heel Concrete)	1.25	6.26	3.38	21.14
EV (Heel Soil)	1.35	33.04475936	3.38	111.53
EH (Vertical Component)	1.43	2.25	6.75	15.22
LS	1.75	0.00	3.38	0.00
SUM		**41.56**		**147.89**

* See load combs, Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2) for the above Load Factors

* EH (Vertical Component) <-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.

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General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.2

Footing Toe Width, BF: 6.75 ft

FACTORED TOE DESIGN LOADS LOAD COMBINATION	σ_v Factored Toe Pressure (ksf)	Factored Toe Shear (Kips)	Factored Toe Moment (Ft x K)
LC1	4.64	31.34	105.79
LC2	6.20	41.85	141.23
LC3	5.94	40.09	135.32
LC4	4.53	30.57	103.17
LC5	4.73	31.95	107.82
LC6	3.28	22.12	74.64
LC7	5.66	38.22	128.99
LC8	4.24	28.63	96.63
LC9	7.32	49.40	166.72
LC10	4.48	30.21	101.97
MAX		**49.40**	**166.72**

Note: Based on AASHTO 10.6.5, the structural design of an eccentrically loaded foundation can assume a triangular or eccentrically loaded area. This spreadsheet conservatively assumes a uniform pressure of sv max over the toe of the footing. Based on AASHTO Figure C5.13.3.6.1-1, The toe shear can be computed at a distance dv from the face of support. This spreadsheet computes it at the support, which is conservative.

10.6.5—Structural Design

The structural design of footings shall comply with the requirements given in Section 5.

For structural design of an eccentrically loaded foundation, a triangular or trapezoidal contact stress distribution based on factored loads shall be used for footings bearing on all soil and rock conditions.

FOOTING HEEL REINF (TOP BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

FOOTING TOE REINF (BOTTOM BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

CRITICAL SECTION FOR WALLS

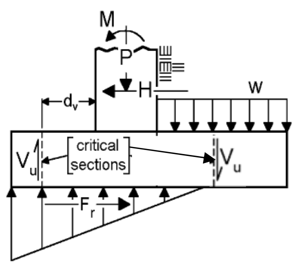

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

CRITICAL SECTION FOR ABUTMENTS

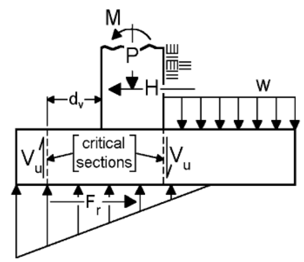

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

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PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.3

CHECK FLEXURAL RESISTANCE	HEEL	TOE	AASHTO 5.7, 5.7.2.2, 5.7.3.2, 5.7.3.2.2	
Factored Moment, Mu =	147.89	166.72	k*ft	
Resistance Factor, phi: Φ =	0.90	0.90		AASHTO 5.5.4.2
Assume Cover, dc =	2.00	3.00	in	ACI 318-08 - 7.7
Shear Depth: ds =	56.90	55.90	in = h - cover - 1/2db(main)	
Depth of Equivalent Stress Block: a =	2.32	2.32	in = c*β1 = Asfy/0.85f'cb	AASHTO Eq. 5.7.3.1.1-4
Nominal Flexural resistance, Mn =	440.33	432.43	kip ft = [Asfy(ds-a/2)]/12	AASHTO Eq. 5.7.3.2.2-1
Factored Resistance, ΦMn =	396.30	389.19		AASHTO Eq. 5.7.3.2.1-1
As required for Mu:	0.60	0.67	in^2	
Flexure OK?	**OK**	**OK**		

CHECK MINIMUM REINFORCEMENT	HEEL	TOE	AASHTO 5.7.3.3.2	
Section Modulud: Sc =	7056.72	7056.72	in^3	
Compressive Strength: f'c =	4.00	4.00	ksi	
Modulus of Rupture: fr =	0.74	0.74	ksi = $0.37*(f'c)^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	435.16	435.16	kip ft	AASHTO Eq. 5.7.3.2.2-1
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	522.20	522.20	kip ft	
Factored Moment, Mu =	147.89	166.72	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	196.69	221.73	kip ft	
Controlling Mr = min(Mr1, Mr2)	196.69	221.73	kip ft	
Factored Resistance, phi*Mn =	396.30	389.19		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	0.7760	0.8919	in^2	
As required for Temp Steel (#4@18"):	0.1333	0.1333	in^2	
As provided =	1.58	1.58	in^2	
Min Reinforcement OK?	**OK**	**OK**		

CHECK CRACK CONTROL BY DIST REINF.	HEEL	TOE	AASHTO 5.7.3.4, 5.10.3.1		
Exposure Factor: γ_e =	0.75	0.75	Class 2 Exposure		ASSHTO 5.7.3.4
β_s factor=	1.05	1.08		β_s factor = 1 + (dc / 0.7* (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36	ksi	f_{ss} = .6*fy	
s_{max} =	8.89	8.55	in	s_{max} < = 700 ge / βs fss	ASSHTO 5.7.3.4-1
s_{min} =	3.25	3.25	in	s_{min} = max(1.5*db,1.5*agg,1.5")+db	AASHTO 5.10.3.1.1
SPACING OK?	**OK**	**OK**			

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PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.4

CHECK SHEAR RESISTANCE	HEEL	TOE	AASHTO 5.13.3.6, 5.8.3		
Factored Shear Force, Vu =	41.56	49.40	kips		
Factored Moment, Mu =	147.89	166.72	k*in		
Es =	29000	29000			AASHTO 5.4.3.2
Resistance Factor, phi: Φ =	0.90	0.90			AASHTO 5.5.4.2
bw (per linear ft of wall) =	12.00	12.00	in		
Effective Depth: dv =	55.74	54.74	in	dv = max((ds-a/2),max(0.9ds, 0.72h))	AASHTO 5.8.2.9
H of Ftg, h:	59.40	59.40	in		
bw (per linear ft of ftg) =	12.00	12.00	in		
Area of Conc on Tension Side, Ac =	356.40	356.40	in	Ac = h*bw/2 =	
As (flexural) provd =	1.58	1.58	in^2		
Max. Size of Coarse Aggregate, ag =	1.50	1.50	in		
Mu min =	2316.71	2703.91	k*in	Mu min = Vu*dv =	
Mu (controlling) =	2316.71	2703.91	k*in		
Spg between top and bottom reinf, sx =	54.40	54.40	in		
Crack spg parameter, sxe =	35.25	35.25		sxe = 1.38*sx/(ag+0.63)	
Strain = ε_s=	0.0018	0.0022		ε_s=(Mu/dv+Vu)/(Es*As)	AASHTO EQ 5.8.3.4.2-4
Θ =	184.14	218.85		Θ = 29+3500*ε_s	AASHTO EQ 5.8.3.4.2-3
β =	1.40	1.26		β = 4.8/(1+750ε_s)*(51/(39+s_{xe})	
Nom Shear Resistance, Vn1 =	668.86	656.86	kips	Vn1 = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	59.04	52.30	kips	Vn2 = Vc = 0.0316*β*f'c.5*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn =	59.04	52.30	kips	Vn = min (Vn1, Vn2)	
phi*Vn =	53.14	47.07			
Shear OK?	**OK**	**OK**			
Opposite Face Reinf As provd. =	1.58	1.58	in^2		
As min crack =	1.96	1.96	in^2	As min crack = 0.003*b*sx	
min (As front, back) > As min ?	**N/A**	**N/A**			

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PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

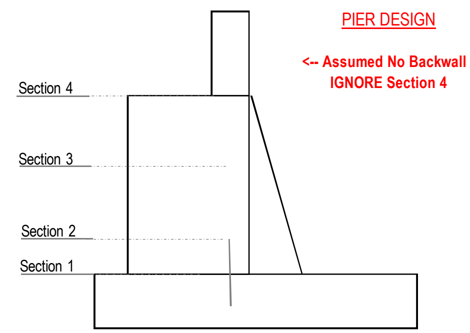
Stem Reinforcement

Reinforcement : 3.0

1. Reinforcement does not need to be checked for construction loading since that is a temporary load case.
Check the stem reinforcement at various locations along the stem and at the base of the backwall.

Height of Stem plus Backwall, h = H - F =	25.55	ft
Height of Backwall =	0.00	ft
Ftg Dowel Lap Length:	7.00	ft
Width of Stem at the Base:	4.92	ft
Width of Backwall:	0.00	ft
Width of Batter:	0.00	ft

Section	Height of h	Height from top	Width Batter	Width conc	
1	1.00	25.55	0.00	4.92	<=== This section is at the bottom of the stem.
2	0.73	18.55	0.00	4.92	<=== This section is at the top of the footing dowel.
3	0.36	9.28	0.00	4.92	<=== This section is halfway in between top of footing dowel and top of batter.
4	0.00	0.00		0.00	<=== This section is at the base of the backwall



Horizontal Earth Pressure, EH at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	30.5				4.41	9.37	41.31
Top of Ftg	25.55				3.09	8.52	26.36
Top of Dowel	18.55				1.63	6.18	10.09
Mid-Height	9.275				0.41	3.09	1.26
Bot of Backwall	0				0.00	0.00	0.00

Live Load Surcharge, LS at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	30.5				0.00	15.25	0.00
Top of Ftg	25.55				0.00	12.78	0.00
Top of Dowel	18.55				0.00	9.28	0.00
Mid-Height	9.275				0.00	4.64	0.00
Bot of Backwall	0				0.00	0.00	0.00

Seismic Load, EQ at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	30.5				8.69		197.69
Top of Ftg	25.55				7.28	12.78	93.04
Top of Dowel	18.55				5.29	9.28	49.04
Mid-Height	9.275				2.64	4.64	12.26
Bot of Backwall	0				0.00	0.00	0.00

PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.1

Load Combination - STRENGTH I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	4.41	37.56	2.32	14.37	0.58	1.80	0.00	0.00
LS	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUM		**4.41**	**37.56**	**2.32**	**14.37**	**0.58**	**1.80**	**0.00**	**0.00**

Load Combination - EXTREME EVENT I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	4.41	37.56	2.32	14.37	0.58	1.80	0.00	0.00
LS	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EQ	1.00	7.28	93.04	5.29	49.04	2.64	12.26	0.00	0.00
SUM		**11.69**	**130.59**	**7.61**	**63.41**	**3.22**	**14.06**	**0.00**	**0.00**

<-- Assumed No Backwall - IGNORE Section 4

CHECK FLEXURAL RESISTANCE	**SECT 1**	**SECT 2**	**SECT 3**	**SECT 4**	**AASHTO 5.7**		
Section Height / Location =	25.55	18.55	9.28	0.00	ft		
Factored Moment, Mu =	130.59	63.41	14.06	0.00	k*ft		
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2	
H of Stem, h:	4.92	4.92	4.92	0.00	ft		
Cover, dc =	2.00	2.00	2.00	2.00	in	ACI 318-08: Sec 7.7.1	<-- 2" for Concrete exposed to earth or weather: No. 6 thru No 18 bars
BAR # =	8.00	8.00	8.00	0.00			
SPACING =	8.00	8.00	8.00	8.00	in		
Main Abar =	0.79	0.79	0.79	0.00	in^2		
Main db =	1.000	1.000	1.000	0.000	in		
As provd. =	1.19	1.19	1.19	0.00	in^2		
Shear Depth: ds =	56.54	56.54	56.54	-2.00	in. = h - cover - 1/2db(main)		
Depth of Equivalent Stress Block: a =	1.74	1.74	1.74	0.00	in = c*β1 = Asfy/0.85f'cb	AASHTO 5.7.2.2, 5.7.3.2	
Nominal Flexural resistance, Mn =	329.84	329.84	329.84	0.00	kip ft = [Asfy(ds-a/2)]/12	AASHTO 5.7.3.2.2	
Factored Resistance, phi*Mn =	296.85	296.85	296.85	0.00		AASHTO Eq. 5.7.3.2.1-1	
As required for Mu:	0.5250	0.2540	0.0562	0.0000	in^2		
Flexure OK?	OK	OK	OK	N/A			

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PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.2

CHECK MINIMUM REINFORCEMENT	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.3.2	
Section Modulud: Sc =	6971.44	6971.44	6971.44	0.00	in^3	
Modulus of Rupture: fr =	0.74	0.74	0.74	0.74	ksi = $0.37*(f'c)^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	429.91	429.91	429.91	0.00	kip ft	
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	515.89	515.89	515.89	0.00	kip ft	
Factored Moment, Mu =	130.59	63.41	14.06	0.00	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	173.69	84.34	18.70	0.00	kip ft	
Controlling Mr = min(Mr1, Mr2)	173.69	84.34	18.70	0.00	kip ft	`
Factored Resistance, phi*Mn =	296.85	296.85	296.85	0.00		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	0.6888	0.3329	0.0736	-2.7200	in^2	
As provided =	1.19	1.19	1.19	0.00	in^2	
Min Reinforcement OK?	**OK**	**OK**	**OK**	**N/A**		

<-- Assumed No Backwall - IGNORE Section 4

CHECK CRACK CONTROL BY DIST REINF.	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.4, 5.10.3.1	
Exposure Factor: γ_e =	0.75	0.75	0.75	0.75	Class 2 Exposure	ASSHTO 5.7.3.4
H of Stem, h:	59.04	59.04	59.04	0.00	in	
β_s factor=	1.05	1.05	1.05	-0.43	1 + (dc / 0.7* (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36.00	36.00	36.00	ksi = .6*fy	
s_{max} =	9.89	9.89	9.89	-38.03	in < = $700\ \gamma_e\ /\ \beta_s\ f_{ss}$	ASSHTO 5.7.3.4-1
Main db =	1.000	1.000	1.000	0.000	in	
s_{min} = max(1.5*db,1.5*agg,1.5")+db =	3.25	3.25	3.25	2.25	in	AASHTO 5.10.3.1.1
SPACING =	8.00	8.00	8.00	8.00	in	
SPACING OK?	**OK**	**OK**	**OK**	**N/A**		

<-- Assumed No Backwall - IGNORE Section 4

PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.3

CHECK SHEAR TRANSFER	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.4.1, 5.8.4.3, 5.8.4.4
Cohesion Factor, c =	0.075	0.075	0.075	0.075	ksi, assumes CJ not intentionally roughened
Friction Factor, μ =	0.6	0.60	0.60	0.60	
Fraction of strength for interface shear, K1 =	0.2	0.20	0.20	0.20	
Limiting Interface Shear Resistance, K2 =	0.8	0.80	0.80	0.80	ksi
Lvi = H of Stem, h:	59.04	59.04	59.04	0.00	ft
bvi = bw (per linear ft of wall) =	12.00	12.00	12.00	12.00	in
Interface Area, Acv = Lvi*bvi =	708.48	708.48	708.48	0.00	in^2
Back Face (Flexural) As provd. =	1.19	1.19	1.19	0.00	in^2
Front Face (Dowels) As provd. =	1.58	1.58	1.58	1.58	in^2
Interface Reinf Provided, Avf = As back+front =	2.77	2.77	2.77	1.58	in^2
Vni = c*Acv+μ*Avf*Fy =	152.68	152.68	152.68	56.88	kips
Vni max1 = K1*f'c*Acv =	566.78	566.78	566.78	0.00	kips
Vni max2 = K2*Acv =	566.78	566.78	566.78	0.00	kips
Vni (controlling) =	152.68	152.68	152.68	0.00	kips
Fact. Interface Shear Resistance, Vri=phiVni =	137.41	137.41	137.41	0.00	kips
Fact. Interface Shear Load, Vui = Vu =	11.69	7.61	3.22	0.00	kips
Vu < Vri ?	**OK**	**OK**	**OK**	**N/A**	
Min Interface Shear Reinf, Avf = 0.05*Acv/Fy =	0.590	0.590	0.590	0.000	in^2
Avf > Avfmin ?	**OK**	**OK**	**OK**	**N/A**	

<-- Assumed No Backwall - IGNORE Section 4

5.8.4.3—Cohesion and Friction Factors

- For concrete placed against a clean concrete surface, free of laitance, but not intentionally roughened:

c = 0.075 ksi
μ = 0.6
K_1 = 0.2
K_2 = 0.8 ksi

PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.4

<-- Assumed No Backwall - IGNORE Section 4

CHECK SHEAR RESISTANCE	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.2, 5.8.3.3, 5.8.3.4.2	
Factored Shear Force, Vu =	11.69	7.61	3.22	0.00	kips	
Factored Moment, Mu =	1567.13	0.00	0.00	0.00	k*in	
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2
Effective Depth: dv =	55.67	55.67	55.67	0.00	in=max((ds-a/2),max(0.9ds,0.72h))	AASHTO 5.8.2.9
H of Stem, h:	59.04	59.04	59.04	0.00	in	
Area of Conc on Tension Side, Ac = h*bw/2 =	354.24	354.24	354.24	0.00	in	
As (flexural, back face) provd =	1.19	1.19	1.19	0.00	in^2	
Max. Size of Coarse Aggregate, ag =	1.50	1.50	1.50	1.50	in	
Mu min = Vu*dv =	650.91	423.75	179.52	0.00	k*in	
Mu (controlling) =	1567.13	423.75	179.52	0.00	k*in	
sx = dv	55.67	55.67	55.67	0.00	in ---> See Figure 5.8.3.4.2-3 (Case a)	
Crack spg parameter, sxe = 1.38*sx/(ag+0.63) =	36.07	36.07	36.07	0.00		
Strain = ε_s=(Mu/d+Vu)/(Es*As) =	0.0012	0.0004	0.0002	#DIV/0!		
Θ = 29+35000*ε_s =	117.68	44.97	19.05	#DIV/0!		
β = 4.8/(1+750εs)*(51/(39+s_{xe})) =	1.74	2.45	2.86	#DIV/0!		
Nom Shear Resistance, Vn1 =	668.02	668.02	668.02	0.00	kips, Vn = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	73.64	103.34	120.69	#DIV/0!	kips, 0.0316*β*$f'c^{.5}$*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn = min (Vn1, Vn2) =	73.64	103.34	120.69	#DIV/0!	kips	
phi*Vn =	66.28	93.01	108.62	#DIV/0!		
Shear OK?	OK	OK	OK	N/A		
Front Face (Dowels) As provd. =	1.58	1.58	1.58	1.58	in^2	
As min crack = 0.003*b*sx =	2.00	2.00	2.00	0.00	in^2 ---> Only Applicable for Figure 5.8.3.4.2-3 Case B	
min (As front, back) > As min ?	N/A	N/A	N/A	N/A		

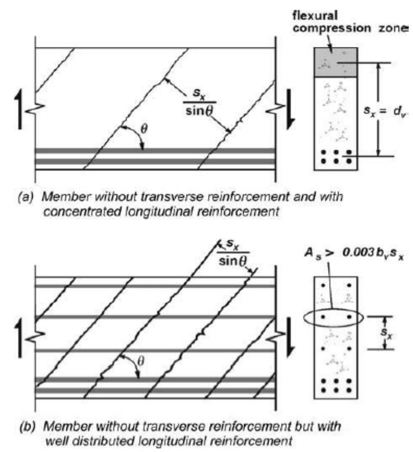

Figure 5.8.3.4.2-3—Definition of Crack Spacing Parameter, s_x

Crack Spacing Parameter, Sx --> Case = Case A

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PIER DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Pier Design	**Date:**	February 27, 2014

Results Summary:

Reinforcement : 4.0

REINFORCEMENT RESULTS:

= As Provided / As Required

		STIRUP #	BAR #	SPAC.	REINF. RATIO	FLEX OK?	LBS./ L.F.	LENGTH OF BAR	No. Bars per ft	Wt. of bar PER L.F.	As/LF	SHEAR OK?
A	TOE(bot):	---	8.00	6.00	1.77	OK	192.69	17.92	2.00	5.38	1.58	OK
B	HEEL(top):	---	8.00	6.00	2.04	OK	192.69	17.92	2.00	5.38	1.58	OK
C	STEM 1 (at top of ftg):	0.00	8.00	8.00	1.72	OK	42.34	7.00	1.50	4.03	1.19	OK
D	STEM 2 (at top of ftg dwl - backface):	0.00	8.00	8.00	3.56	OK	48.63	8.04	1.50	4.03	1.19	OK
E	STEM 3 (midpt back face):	0.00	8.00	8.00	16.11	OK	24.31	4.02	1.50	4.03	1.19	OK
F	STEM 4 (at bot of bw):	0.00	0.00	8.00	0.00	N/A	0.00	8.04	1.50	0.00	0.00	N/A <--- N/A No Backwall
G	STEM 5 (front face):	0.00	5.00	12.00	---	---	8.48	8.04	1.00	1.05	0.31	
H	STEM 6 (front face dowels):	0.00	8.00	6.00	---	---	21.51	2.00	2.00	5.38	1.58	
I	FOOTING (TOP):	0.00	6.00	12.00	---	---	27.58	1.00	18.42	1.50	0.44	
J	FOOTING (BOT.)	0.00	6.00	12.00	---	---	27.58	1.00	18.42	1.50	0.44	
K	STEM (longitudinal):	0.00	4.00	12.00	---	---	34.78	1.00	51.10	0.68	0.20	
	TOTAL WT. STEEL/FT OF ABUT.=						620.58	LBS./LF				

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SUBSTRUCTURE ANALYSIS

RETAINING WALL DESIGN

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CANTILEVER WALL DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

References:

AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012	AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011
ACI 318-08 Building Code Requirements for Structural Concrete, 2005	
2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions	

General Notes: **This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).**

Wall Design | **Khost Bridge Notes**

Project Notes:

General Design Parameters

Input Section : 1.0

GEOMETRY INFORMATION INPUT:

PROPOSED TOP OF ROADWAY ELEV:				ft	m
PROPOSED TOP OF BACKWALL ELEV:			6104.08	ft	1861.000 m
PROPOSED BRIDGE SEAT ELEV:	H_Backwall = 0.00 ft		6104.08	ft	1861.000 m
PROPOSED TOP OF FOOTING ELEV:	H_Footing = 3.28 ft		6078.31	ft	1853.143 m
PROPOSED BOT. OF FOOTING ELEV:			6075.03	ft	1852.143 m
ELEVATION OF HIGH WATER:		FOR NO WATER = 0.00	6097.36	ft	1858.951 m
PROPOSED BRIDGE SEAT WIDTH:			1.97	ft	0.601 m
PROPOSED BACKWALL WIDTH:			0.00	ft	0.000 m
ABUTMENT/WALL DESIGN LENGTH:	1.00	Design for:	1.00	ft	0.305 m
FOOTING LENGTH		Design for:	1.00	ft	0.305 m

DW CALCULATION INPUT:

WEARING SURFACE DEPTH:	0.00 IN	x 1. Layers	0.00	ft <-- ---	0.000 m
ROADWAY WIDTH:			0.00	ft	0.000 m
BRIDGE SPAN:	**Total Length = 0**		0.00	ft	0.000 m
NUMBER OF GIRDERS:			0		

WALL DESIGN - N/A

-

MATERIAL PROPERTIES:

CUBIC WEIGHT CONCRETE:	150.00	pcf
COMP. STRENGTH OF CONC. = F'c:	4.00	ksi
MAXIMUM SIZE OF COARSE AGGREGATE	1.50	in
TENSILE STRENGTH OF REBAR = Fy:	60.00	ksi
CUBIC WEIGHT OF HOT MIX ASPHALT (HMA):	165.00	pcf

GEOTECHNICAL INFORMATION:

BEARING RESISTANCE (CAPACITY):	8.00	ksf	<-- Per Geotech Report
FACTORED BEARING RESISTANCE, qr :	8.00	ksf	<-- Assumed
WEIGHT OF SOIL BACKFILL:	115.00	Lbs/CF	<-- Assumed
WALL ON ROCK?	N	(Y OR N)	
WALL ON PILES?	N	(Y OR N)	
GRAVITY WALL?	N	(Y OR N)	
BETA: SLOPE OF BACKFILL:	0.00	DEG	<-- Assumed
THETA: BATTER ANGLE BACKWALL:	82.03	DEG	AASHTO Table 3.11.5.3-1
PHI: FRICTION ANGLE OF BACKFILL:	31.00	DEG	<-- Assumed
DELTA: ANGLE BACKWALL FRICTION:	20.67	DEG	<-- Assumed δ=2/3 ($\varnothing$)

CANTILEVER ABUTMENT DESIGN	N
GRAVITY ABUTMENT DESIGN	N
CANTILEVER WALL DESIGN	Y
GRAVITY WALL DESIGN	N
PIER DESIGN	N

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CANTILEVER WALL DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

General Loading Parameters

Input Section : 2.0

LIVE LOAD INFORMATION:

APPROACH SLAB:	N	(Y OR N)	<-- Wall Design - No Approach Slab
ROADWAY WITHIN H/2 OF TOP OF WALL:	N	(Y OR N)	
Live Load Surcharge to be Considered?:	N		
SURCHARGE HEIGHT:	0.00	ft REF: Table 3.11.6.4-2	
Construction Surcharge, q:	250.00	psf REF: C3.4.2.1	

SEISMIC LOAD INFORMATION:

WALL RESTRAINED HORZ. MOVMT.(Y/N):	N	(Y OR N)	
SEISMIC ACCELERATION COEFF. A:	0.290	REF: FIG.3.10.2.1-2, AASHTO	
SEISMIC CATEGORY:	D	**<---Assumed based on Location & AASHTO Seimic Design Guide**	

RAILING CLASS: S3-TL4 (CT) (PER MASSDOT LRFD BRIDGE MANUAL PART 1) 3.3.2.2 **<--- N/A**

Horizontal Railing Design Load	0.00	kips
Horizontal Railing Impact Length	0.00	ft
Wall Height+Rail Height	0.00	ft
Distributed Horizontal Railing Design Load @ top of wall	0.00	klf
Distributed Horizontal Railing Design Load @ bottom of wall	0.00	klf/wall height
Railing Dead Load	0.00	
Additional Moment From Railing Impact	0.00	<--- **Note:** The added moment from top of railing to bottom of railing is distributed along bottom of footing*

STREAM PRESSURE

Pmax	0.00	psf
Consider Stream Flow:	N	<--- Do not include stream pressure for the wall.

SURCHARGE HEIGHT (Per ASSHTO 3.11.6.4 Live Load Surchage)

ABUTMENTS (N/A for PIERS) ----> Table 3.11.6.4-1

Table 3.11.6.4-1 - Equivalent Height of Soil for Vehicular Loading on Abutments Perpindicular to Traffic

Abutment Height (ft)	h_{eq} (ft)
5	4
10	3
>20	2

Surcharge Height = 0.00 ft

RETAINING WALLS -- --> Table 3.11.6.4-2

See Table 3.11.6.4-2 for Equivalent Height of Soil for Vechicular Loading on Retaining Walls Parallel to Traffic.

Retaining Wall Height (ft)	heq (ft) Distance from wall backface to edge of traffic.	
	0.0 ft	≥ 1.0 ft
5	5	2
10	3.5	2
>20	2	2

Distance from wall backface to edge of traffic = 0.0 ft

Surcharge Height = 0.00 ft

Note: See 3.11.6.5 for Possible Reduction of Surcharge

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CANTILEVER WALL DESIGN -INPUT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Superstructure Loading Parameters

Input Section : 3.0

ADDITIONAL LOADS ON STRUCTURE **WALL DESIGN - N/A**

(load is per linear foot of structure (Abutment/ Pier/ Wall) NOT the Footing, arm from front edge of bridge seat)

LOADS		LOAD (klf)	ARM (feet)				
(DC+DW), SUPERSTRUCT. DEAD LOAD:	DL	0.00	0.99	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	N	<-- N/A For Wall Design
DC (Structural Components & nonstructural attachments)	DC	0.00	0.99	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	N	<-- N/A For Wall Design
DW (Wearing Surface & Utilities)	DW	0.00	0.99	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	N	<-- N/A For Wall Design
(LL+IM+PL), LIVE LOAD, IMPACT AND PED LL:	LL+IM+PL	0.00	0.99	Distance from front face of the abutment/Pier/Wall to CL of bearing	Include =	N	<-- N/A For Wall Design
WS, WIND LOAD ON STRUCTURE:	WS	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	N	<-- N/A For Wall Design
WL, WIND LOAD ON LIVE LOAD:	WL	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	N	<-- N/A For Wall Design
BR, BREAKING LOAD :	BR	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	N	<-- N/A For Wall Design
TU, THERMAL FORCE:	TU	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	N	<-- N/A For Wall Design
EQ, SEISMIC LOAD ON SUPERSTRUCTURE:	EQ	0.00	0.00	Distance above the bridge seat where the longitudinal force is applied.	Include =	N	<-- N/A For Wall Design
CT, VEHICLE COLLISION LOAD	CT	0.00	0.00	Distance above top pf wall equal to the height of rail	Include =	N	<-- N/A For Wall Design

Note: Per AASHTO 11.5.1, abutments and retaining walls should be designed for EH, WA, LS, DS, DC, TU, EQ. Therefore, including wind and breaking forces is conservative. Say OK

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CANTILEVER WALL DESIGN -INPUT

General Information

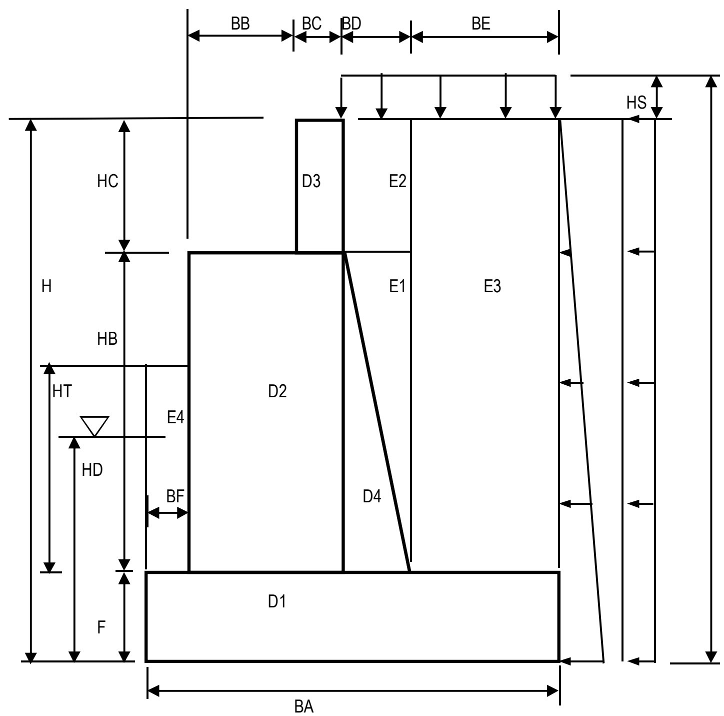
Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Abutment Geometry

Input Section : 4.0

CALCULATION OF WALL AND BACKFILL GEOMETRY:

		Prelim Size	User Adjust	Final Size (ft)	Approx Size (mm)
HEIGHT OF ABUTMENT / WALL, H:	H =	29.050	0.00	29.05	8800
HEIGHT OF FOOTING, F:	F =	3.280	0.00	3.28	1000
HEIGHT OF STEM, HB:	HB =	25.770	0.00	25.77	7800
HEIGHT OF BACKWALL, HC:	HC =	0.000	0.00	0.00	0
HEIGHT OF HIGH WATER, HD:	HD =	22.330	0.00	22.33	6700
HEIGHT OF SURCHARGE, HS:	HS =	0.000	0.00	0.00	0
WIDTH OF FOOTING, BA:	BA =	14.760	0.00	14.76	4430
WIDTH OF BRIDGE SEAT, BB:	BB =	1.970	0.00	1.97	600
WIDTH OF BACKWALL, BC:	BC =	0.000	0.00	0.00	0
WIDTH OF BATTER OF STEM, BD:	BD =	1.970	1.50	3.47	1050
WIDTH OF FOOTING HEEL, BE:	BE =	8.000	-0.65	7.35	2210
WIDTH OF FOOTING TOE, BF:	BF =	1.970	0.00	1.97	600
HEIGHT OF SOIL OVER TOE, HT:	HT =	25.770	0.00	25.77	7740
HEIGHT OF SOIL OVER HEEL, HH:	HH =	25.770	0.00	25.77	7800
HEIGHT OF SOIL AT BACKFACE FACE (HEEL), HS1	Hss1 =	29.05		29.05	8800
HEIGHT OF SOIL AT FRONT FACE FACE (TOE), HS2	Hss2 =	29.05	19.00	10.05	3100



OVERALL QUANTITIES:

WEIGHT OF CONCRETE WALL/L.F.:	21.584	Kips per l.f.
CONCRETE QUANTITY / L.F.:	5.329	C.Y. per l.f.

SUMMARY OF QUANTITIES:

STEEL / L.F. =	671.317	LBS/L.F.
CONC. / L.F =	5.329	C.Y./L.F.

Geometry Check: Check Width: ok
Check Height: ok

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:
- This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).
- Wall Design **Khost Bridge Notes**

Calculate Dead Loads

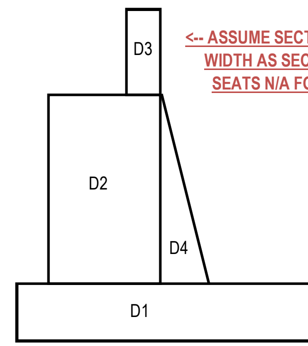
Primary Loads Section : 1.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	Superstructure	0.00	2.96	0.00			
DW	Superstructure	0.00	2.96	0.00			

<-- N/A FOR WALL DESIGN

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.



<-- ASSUME SECTION D3 IS THE SAME WIDTH AS SECTION D2 - BRIDGE SEATS N/A FOR WALL DESIGN

Substructure Loads: Vertical: Horizontal:

AREA #		Volume (CF)	γ_{conc} (pcf)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	D1	48.41	150.00	7.26	7.38	53.59			
	D2	50.77	150.00	7.62	2.96	22.50			
	D3	0.00	150.00	0.00	3.94	0.00			
	D4	44.71	150.00	6.71	5.10	34.18			
	Subtotal Concrete			**21.58**		**110.28**			

<-- N/A FOR WALL DESIGN

Total Dead Load: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL DC (Super + Sub)	**21.58**		**110.28**			
TOTAL DW (Super)	**0.00**		**0.00**			
TOTAL DC (Substr. Only - Construction)	**21.58**		**110.28**			

<--SUPERSTRUCTURE LOADS N/A FOR WALL DESIGN

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Earth Loads

Primary Loads Section : 2.0

Compute Horizontal Earth Pressure, EH:

Coulomb's Active Earth Pressure: (per MHD 3.1.5 and AASHTO 3.11.5.3)

PHI, ϕf =	31.00	Degrees, Rad =	0.54
DELTA, δ =	20.67	Degrees, Rad =	0.36
BETA, β =	0.00	Degrees, Rad =	0.00
THETA, θ =	82.03	Degrees, Rad =	1.43
Γ (per AASHTO Eq. 3.11.5.3-2)=	2.83		
Ka (per AASHTO Eq. 3.11.5.3-1)=	**0.348**		

Earth Pressure Coefficient to be Used for Design per MassDOT

All Walls on Rock	ko	0.485	
All Walls on Piles	ko	0.485	
Cantilever Walls < than 16' in Height	0.5*(Ko + Ka)	0.416	
Cantilever Walls > than 16' in Height	Ka	0.348	<-- USE
Gravity wall supported on Spread Footing	Ka	0.348	

At-Rest Earth Pressure Coeff:

Ko = **0.485**

Earth Pressure Coefficient to be Used for Design: 'Active pressure coefficients shall be estimated using Coulomb Theory.

WALL ON LEDGE:	N	(Y OR N)
WALL ON PILES:	N	(Y OR N)
Wall Height:	29.05	ft
Earth pressure Type:	Ka	
Ke =	**0.348**	**<===== Governs.**

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Ko =	0.49	
Ka =	0.32	
Ke (geotech) =	**0.320**	**<=== Does not govern.**

Compute Lateral Earth Pressure:

Application of lateral earth pressure shall be per AASHTO Figure C3.11.5.3-1. This shows a different application for Gravity and Cantilever (semi-gravity) walls.
Note that the reduction in lateral earth pressures due to the water table is not included in this section. It is included in the WA (Bouyancy) section of this design.

Cantilever (semi-gravity) Walls:

Load inclination from horizontal, min = $\phi/3$ =	10.33	degrees
Load inclination from horizontal, max = $\phi*2/3$ =	20.67	degrees
GAMMA =	115.00	pcf
H = Soil Height at Back face, Hss1	29.05	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	16.88	kips
Arm for Horiz Load above BOF = H/3 =	9.68	ft
Arm for Vert Load from Toe = F =	14.76	ft

Consider minimum inclination for Sliding, Overturning and Bearing Pressure:

Vertical Component, Pav = Pa*sin(ϕ/3) =	3.03	klf
Horizontal Component, Pah = Pa*cos(ϕ/3) =	16.61	klf

Consider maximum inclination for Footing Heel Reinforcement:

Vertical Component, Pav = Pa*sin(ϕ*2/3) =	5.96	klf
Horizontal Component, Pah = Pa*cos(ϕ*2/3) =	15.80	klf

←← THIS SECTION IS FOR CANTILEVER OR SEMI-GRAVITY WALLS ONLY ←←

Gravity Walls:

Load inclination from horizontal = $\delta + (90-\theta)$ =	28.64	degrees
GAMMA =	115.00	pcf
H =	29.05	Feet
Lateral Earth Load, Pa = 1/2*Ke*γ*H^2 =	16.88	kips
Arm for Horiz Load above BOF = H/3 =	9.68	ft
Arm for Vert Load from Toe=(BF+BB+BC+BD*2/3) =	6.25	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Pav = Pa*sin($\delta+(90-\theta)$) =	8.09	klf
Horizontal Component, Pah = Pa*cos($\delta+(90-\theta)$) =	14.82	klf
Is the wall a Gravity Wall?	N	

←← N/A ---> THIS SECTION IS FOR GRAVITY WALLS ONLY ←←

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.1

Include Passive Earth Pressure	Y
Pp Factor	1

ϕ = Soil Friction Angle	31.00	degrees
δ = Wall Interface Friction	20.67	degrees = 2/3 * ϕ --> 11.6.5.5
Kp = Passive Earth Pressure Coefficient	3.13	Fig A11.4-2
γ = Unit Weight of Soil	115.00	pcf
H = Hss2= Height of Soil at Front Face - 1'	9.05	ft
Lateral EQ Load, Pp = 1/2*γ*Kp*H^2=	14.74	klf ---> Equation A11.4-4
Arm for Horiz Load above BOF = H/3 =	3.02	ft (AASHTO pg 11-112)

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Earth Loads Continued..

Primary Loads Section : 2.2

Horizontal Earth Pressure, EH: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EH: Pa	3.03	14.76	44.70	16.61	9.68	160.83
EH: Pp			0.00	-14.74	3.02	-44.47
EH (For all cases except heel reinforcement):	3.03	14.76	44.70	1.87	12.70	23.73
EH: Pa	5.96	14.76	87.94	15.80	9.68	152.96
EH: Pp			0.00			0.00
EH (For Heel Reinforcement):	5.96	14.76	87.94	15.80	9.68	152.96

<=== Note, Based on AASHTO Figure C11.5.6-1, both the vertical and horizontal components of EH should be included here because they carry the same load factor.

Vertical Earth Pressure, EV: Vertical: Horizontal:

AREA #		Volume (CF)	γ_{SOIL} (plf)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EV	E1	44.71	115.00	5.14	6.25	32.15			
	E2	0.00	115.00	0.00	5.68	0.00			
	E3	189.41	115.00	21.78	11.09	241.45			
	E4	50.77	115.00	5.84	0.99	5.75			
TOTAL EV				**32.76**		**279.36**			

Note, **per AASHTO 11.6.1.2**, the weight of the soil over the battered portion of the stem or over the base of a footing may be considered as part of the effective weight of the abutment. This is consistant with design.

Earth Surcharge, ES: (This applies for construction case only)

q =	250.00	psf
Uniform Load on Wall, p=Ke*q =	0.087	ksf
Wall Height, H =	29.05	Feet
Heel Length, BE =	7.35	Feet
Footing Width, BA =	14.76	Feet
Wall Length Considered =	1.00	ft

Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
ES	$P_{con}(h)$ = p*H*Length =				2.53	14.53	36.70
	$P_{con}(v)$ = q*BE*Length =	2.71	9.35	25.29			
TOTAL ES		**2.71**		**25.29**	**2.53**		**36.70**

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

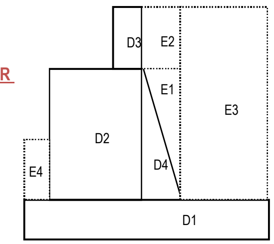
Calculate Live Loads

Primary Loads Section : 3.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LL+IM+PL	**Superstructure**	0.00	2.96	0.00			
BR	**Superstructure**				0.000	29.05	0.00

<--SUPERSTRUCTURE LOADS N/A FOR WALL DESIGN



<-- ASSUME SECTION D3 IS THE SAME WIDTH AS SECTION D2 - BRIDGE SEATS N/A FOR WALL DESIGN

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Live Load Surcharge Loads: LS

Per AASHTO 3.11.6.4, a live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall.
If the surcharge is for highway, the intensity of the load shall be consistent with provisions of Article 3.6.1.2. See Tables 3.11.6.4-1 and 3.11.6.4-2 for equivalent heights.

Compute Horizontal Live Load Surcharge: (To be used for bearing pressure and sliding load cases):

Ke =	0.348	
Unit Weight of Soil, γ =	115.000	pcf
Surcharge Height, heq =	0.00	Feet
LS(h) =(Ke)(γ)(heq)*H =	0.00	kips
Moment arm = H/2 =	14.53	kips

Compute Vertical Live Load Surcharge: (To be used for bearing pressure cases only):

LS(v) =(γ)(heq)(BD+BE) =	0.00	kips
Moment arm = Ba-(BD+BE)/2 =	9.35	kips

Compute Vertical Live Load Surcharge: (To be used for heel reinf cases only):

LS(v) =(γ)(heq)(BE) =	0.00	kips
Moment arm (to back of batter) = BE/2 =	3.68	kips

Live Load Surcharge, LS: Summary Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
LS	**LS(v)**	0.00	9.35	0.00			
	LS(h)				0.00	14.53	0.00

Total Live Load Load: Vertical: Horizontal:

AREA #	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL LL+IM+PED+BR+LS	0.00		0.00	0.00		0.00
TOTAL LL+IM+PED+BR+LS (Sliding Only)	0.00		0.00	0.00		0.00
TOTAL LS (Heel Reinf Only)	0.00	3.68	0.00			

CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Water load (Buoyancy Forces)

Primary Loads Section : 4.0

HEIGHT OF STEM AT HIGH WATER:	19.05	
HEIGHT OF FOOTING AT HIGH WATER:	3.28	
WIDTH OF FOOTING, BA	14.76	
SOIL WEIGHT - WATER WEIGHT	52.60	pcf
UPWARD BOUYANT FORCE	-62.40	pcf

INCLUDE HORIZONTAL FORCE? Y

Horizontal Force = B(h) = (γ-(γ-62.4))*Ka)H^2/2, acts at HD/3:

Bouyant Load, WA: Vertical: Horizontal:

AREA #		VOLUME (CF)	GAMMA (#/CF)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WA	B1 (Ftg)	48.41	-62.40	-3.02	7.38	-22.29			
	B2 (Stem)	103.63	-62.40	-6.47	2.96	-19.11			
	B3 (Soil over Ftg)	177.55	-62.40	-11.08	11.09	-122.81			
	STATIC						5.41	7.44	40.29
	SEISMIC						12.25	7.44	91.20
TOTAL WA (BL) (Static)				**-20.57**		**-164.21**	**5.41**		**40.29**
TOTAL WA (BL) (Seismic)				**-20.57**		**-164.21**	**12.25**		**91.20**

Calculate Stream Flow Pressure

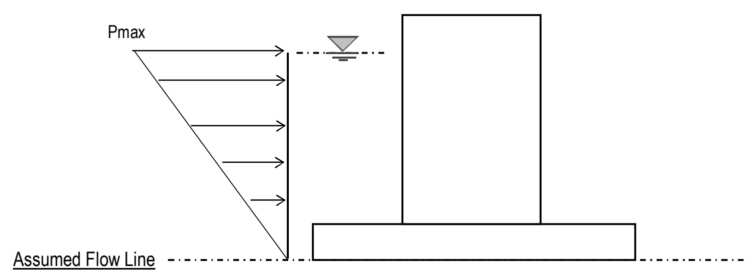
Primary Loads Section : 4.1

Note: The flow line is conservatively assumed to act at the bottom of the footing

Pmax:	0.0000	ksf
APPLIED:	N	

Force = 0.5 * Pmax * HD
Arm = HD * (2/3)

LOAD	HORIZONTAL		
	FORCE (Kips)	**ARM (Feet)**	**MOM (Ft x K)**
WA (SF)	0.00	14.89	0.00



Calculate Water Load & Stream Flow Load WA

Primary Loads Section : 4.2

Water Load (Bouyancy) & Stream Flow, WA: Vertical: Horizontal:

AREA #	VOLUME (CF)	GAMMA (#/CF)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL WA (Static)			-20.57		-164.21	5.41		40.29
TOTAL WA (Seismic)			-20.57		-164.21	12.25		91.20

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Wind Loads

Primary Loads Section : 5.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
WS	**Superstructure**				**0.00**	**29.05**	**0.00**
WL	**Superstructure**				**0.00**	**29.05**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Calculate Temperature Loads

Primary Loads Section : 6.0

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TU	**Superstructure**				**0.00**	**29.05**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Seismic Forces

This section is not applicable for the wall design analysis. Primary Loads Section : 7.0

Superstructure Loads:

AREA #		Vertical: Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horizontal: Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	**Superstructure**				**0.000**	**29.05**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

Substructure Loads:

(Ref: AASHTO 4th Ed., A11.1.1.1 for Mononobe-Okabe Analysis.)

GAMMA = unit weight of soil =	115.00	Lbs/CF		
H = height of soil face =	29.05	Feet		
PHI = angle of internal friction of soil =	31.00	Degrees =	0.54	Radians
DELTA = angle of friction between soil & abut =	20.67	Degrees =	0.36	Radians
i = backfill slope angle =	0.00	Degrees =	0.00	Radians
BETA = slope of wall to the vertical	0.00	Degrees =	0.00	Radians

A =	0.29			
kh = horizontal acceleration coefficient	0.435			
kv = vertical acceleration coefficient	0.000			
THETA = arc tan (kh/(1-Kv) =	23.51	Degrees =	0.41	Radians
Kae (per AASHTO Eq. A11.1.1.1-2) =	**0.788**	**<===== Governs.**		

Consider Cohesion? N ------> kh = a * 0.5, Wall is NOT Restrained from Horizontal Movement

Earth Pressure Coefficients to be Used for Design per Geotechnical Report:

Kae (geotech) = **0.000** **<=== Does not govern.**

N/A
NOT GIVEN IN GEOTECH
REPORT

Load inclination from horizontal = δ =	20.67	degrees
Lateral EQ Load, Eae = 1/2*γ*Kae*H^2*(1-kv) =	38.22	klf
Arm for Horiz Load above BOF = H/3 =	9.68	ft (AASHTO pg 11-112)
Arm for Vert Load from Toe = BA =	14.76	ft

Consider for Sliding, Overturning, Bearing Pressure and Footing Reinforcement:

Vertical Component, Eav = Eae*sin(δ) =	13.49	klf	Include EQ In Design =	Y
Horizontal Component, Eah = Eae*cos(δ) =	35.76	klf	EQ Factor =	1

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Seismic Forces

This section is not applicable for the wall design analysis. Primary Loads Section : 7.1

Include Seismic Passive Earth Pressure	Y	
Epe Factor	1	
kh = horizontal acceleration coefficient	0.435	
∅ = Soil Friction Angle	31.00	degrees
δ = Wall Interface Friction	20.67	degrees = 2/3 * ∅ --> 11.6.5.5
Kpe = Seismic Passive Earth Pressure Coefficient	3.13	Fig A11.4-2
γ = Unit Weight of Soil	115.00	pcf
Hff = Height of Soil at Front Face -1'	28.05	ft
Lateral EQ Load, Epe = 1/2*γ*Kpe*H^2=	141.60	klf ---> Equation A11.4-4
Arm for Horiz Load above BOF = Hff/3 =	9.35	ft (AASHTO pg 11-112)

SECTION 11: WALLS, ABUTMENTS, AND PIERS 11-117

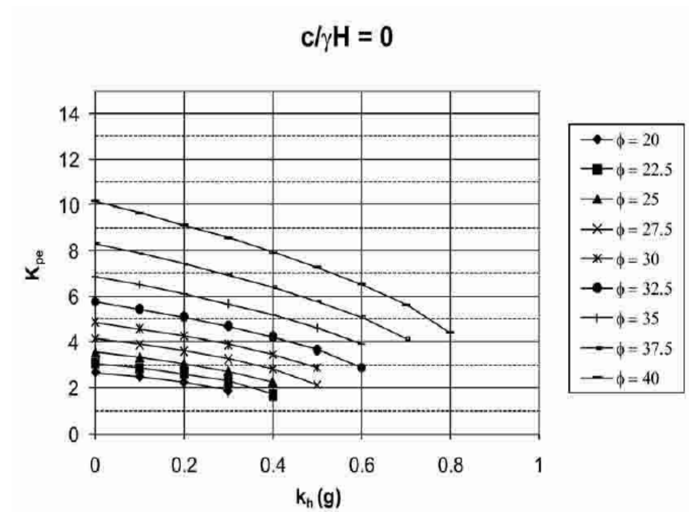


Figure A11.4-2—Seismic Passive Earth Pressure Coefficient Based on Log Spiral Procedure for $c/\gamma H$ = 0 and 0.05 (c = soil cohesion, γ = soil unit weight, and H = height or depth of wall over which the passive resistance acts)

Note: $k_h = A_s = k_{ho}$ for wall heights greater than 20 ft.

CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Seismic Forces Continued..

This section is not applicable for the wall design analysis.

Primary Loads Section : 7.2

WALL INERTIA EFFECTS

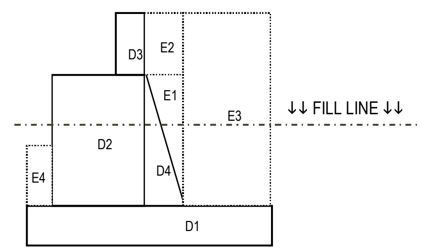
Per **AASHTO DIV 1A 6.4.3**, seismic design should take into account forces arising from seismically inducd lateral earth pressures (as computed above), additional forces arising from wall inertia and the transfer of seismic forces from the bridge deck through bearing supports which do not slide freely.

The following table computes the inertia forces due to the weight of the concrete and backfill.

kh = 0.435

FOR PIERS: Include DL above Fill Only

AREA #		DL (Kips)	DL*kh (Kips)	ARM (Feet)	MOM (Ft x K)	% of DL to be included
DL Wall	D1	7.26	3.16	1.64	5.18	100%
	D2	7.62	3.31	16.17	53.55	100%
	D3	0.00	0.00	29.05	0.00	100%
	D4	6.71	2.92	11.87	34.63	100% n/a
	Subtotal	**21.58**	**9.39**	**9.94**	**93.36**	
DL Backfill	E1	5.14	2.24	20.46	45.76	100%
	E2	0.00	0.00	29.05	0.00	100%
	E3	147.00	63.95	16.17	1033.67	100%
	E4	5.84	2.54	16.17	41.05	100%
	Subtotal	**157.98**	**68.72**	**16.30**	**1120.49**	
TOTAL		**179.56**	**78.11**	**15.54**	**1213.84**	



Total Seismic Loads, EQ:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
EQ	EQ Superstructure =				0.000	29.05	0.000
	Eae(v)	13.49	14.76	199.08			
	Eae(h)				35.76	9.68	346.25
	Epe(v)		14.76	0.00			
	Epe				-141.60	9.35	-1324.00
	Fwi(h)				78.11	15.54	1213.84
TOTAL EQ		**13.49**		**199.08**	**-27.74**		**236.09**

% Eae(h) to be included: 100% **FOR PIERS: M-O ANALYSIS IS FOR RETAINED SOILS --> N/A FOR PIERS**

CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Calculate Vehicle Collision Loads

Primary Loads Section : 8.2

Superstructure Loads: Vertical: Horizontal:

AREA #		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
CT (Stem Design)	**Superstructure**				**0.00**	**0.00**	**0.00**
CT	**Superstructure**				**0.00**	**0.00**	**0.00**

* See the load column under "Additional Loads on Structure" in the "General Loading Parameters" section for the above forces.

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CANTILEVER WALL DESIGN - PRIMARY LOADS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Summary of Primary Loads

Primary Loads Section : 9.2

	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
TOTAL DC (Super + Sub)	21.58		110.28			
TOTAL DW (Super)	0.00		0.00			
TOTAL DC (Substr. Only - Construction)	21.58		110.28			
EH (For all cases except heel reinforcement):	3.03	14.76	44.70	1.87	12.70	23.73
EH (For Heel Reinforcement):	5.96	14.76	87.94	15.80	9.68	152.96
TOTAL EV	32.76		279.36			
TOTAL ES	2.71		25.29	2.53		36.70
TOTAL LL+IM+PED+BR+LS	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL LL+IM+PED+BR+LS (Sliding Only)	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL LS (Heel Reinf Only)	0.00	3.68	0.00	0.00	0.00	0.00
TOTAL WA (Static)	-20.57		-164.21	5.41		40.29
TOTAL WA (Seismic)	-20.57		-164.21	12.25		91.20
WS Superstructure				0.00	29.05	0.00
WL Superstructure				0.00	29.05	0.00
TU Superstructure				0.00	29.05	0.00
TOTAL EQ	13.49		199.08	-27.74		236.09
CT (Stem Design)	0.00	0.00	0.00	0.00	0.00	0.00
CT	0.00	0.00	0.00	0.00	0.00	0.00

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CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).

Khost Bridge Notes

Summary of Primary Loads

Load Combinations : 1.0

INCLUDE SEISMIC = Y

Load		Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)	Notes	LRFD Load Combination Load Case
Dead Load	$DC_{SUB+SUPER}$	21.58	0.00	110.28	0.00	0.00	0.00	Super + Sub	
	DW	0.00	0.00	0.00	0.00	0.00	0.00	Super Only	
	DC_{SUB}	21.58	0.00	110.28	0.00	0.00	0.00	Sub Only - Construction	LC1 only
Earth Load	EH	3.03	14.76	44.70	1.87	12.70	23.73	All cases except Heel	Used in all load cases
	EH	5.96	14.76	87.94	15.80	9.68	152.96	For Heel Reinforcement	Not used in any load case
	EV	32.76	0.00	279.36	0.00	0.00	0.00		
Earth Load Surcharge	ES	2.71	0.00	25.29	2.53	0.00	36.70		
Live Load Surcharge	LS(v)	0.00	9.35	0.00	0.00	0.00	0.00		
	LS(h)	0.00	0.00	0.00	0.00	14.53	0.00		
Live Load	LL+IM+PED+BR+LS	0.00	0.00	0.00	0.00	0.00	0.00		
	LL+IM+PED+BR+LS	0.00	0.00	0.00	0.00	0.00	0.00	No LS for Sliding LC	LC4, LC8 & LC10
	LS	0.00	3.68	0.00	0.00	0.00	0.00		
Bouyant Load & Stream Force	WA	-20.57	0.00	-164.21	5.41	0.00	40.29	Static	
	WA	-20.57	0.00	-164.21	12.25	0.00	91.20	Seismic	LC9 &LC10
Wind Load	WS	0.00	0.00	0.00	0.00	29.05	0.00		
	WL	0.00	0.00	0.00	0.00	29.05	0.00		
Temperature Load	TU	0.00	0.00	0.00	0.00	29.05	0.00		
Seismic Load	EQ	13.49	0.00	199.08	-27.74	0.00	236.09		
Vehicle Collision Load	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stem Wall	LC11 & LC12
	CT	0.00	0.00	0.00	0.00	0.00	0.00	Stability	

CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Limit States and Load Factors

Load Combinations : 2.0

Service Limit State

Per AASHTO 10.5.2, foundation design at the service limit state shall include settlements, horizontal movements, overall stability (of earth slopes) and scour at the design flood.
* These items are part of the geotechnical scope and are therefore NOT included in this design.

Strength Limit States

Per AASHTO 10.5.3, foundation design at the strength limit strength shall include structural resistance, scour, nominal bearing resistance, overturning or excessive loss of contact, sliding and constructability.
* These items, except scour, are addressed in this design.

Extreme Events Limit States

Per AASHTO 10.5.4, foundation shall be designed for extreme events such as a seismic event and vehicle collision.
* These items are addressed in this design.

Since these factors are 1.0, they have not yet been incorporated into the design template.

Computation of the Load Modification Factor, h_i:

		Extreme	Strength
h_D Ductility Factor, (AASHTO 1.3.3):		1.00	1.00
h_R Redundancy Factor, (AASHTO 1.3.4):		1.00	1.00
h_I Operational Importance Factor, (AASHTO 1.3.5):		1.00	1.00
h_i (for loads for which γ_i(max) is appropriate) (AASHTO Eq 1.3.2.1-2):	$h_i = h_D h_R h_I \geq 0.95$	1.00	1.00
h_i (for loads for which γ_i(min) is appropriate) (AASHTO Eq 1.3.2.1-3):	$h_i = 1 / h_D h_R h_I \leq 1.00$	1.00	1.00

h_D Ductility Factor (for all other limit states $h_D = 1.00$)

$h_D \geq$	1.05	for nonductile components and connections.
$h_D =$	1.00	for conventional designs and details complying with the specifications.
$h_D \geq$	0.95	for components and connections for which additional ductility-enhancing m

h_R Redundancy Factor (for all other limit states $h_R = 1.00$)

$h_R \geq$	1.05	for nonredundant members
$h_R =$	1.00	for conventional levels of redundancy
$h_R \geq$	0.95	for exceptinal levels of redundancy

h_I Operational Importance Factor

$h_I \geq$	1.05	for a bridge of operational importance
$h_I =$	1.00	for typical bridges
$h_I \geq$	0.95	for relatively less important bridges

Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2), g_p:

	Maximum	Minimum	
DC (Dead Load, General):	1.25	0.90	
DW (Wearing Surface & Utilities):	1.50	0.65	
EH (Horiz Earth):	1.43	0.90	<-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.
ES (Horiz Earth):	1.50	0.75	
EV (Vertical Earth, Retaining Structure):	1.35	1.00	

Live Load Factor During a Seismic Event, g_{EQ}:

	Maximum	Minimum	
g_{EQ} (AASHTO C3.4.1):	0.50	0.00	<--- **Seismic Included**

CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations & Notes

Load Combinations : 3.0

NOTES:

1. Load Combination Strength II does not need to be checked since it applies to special design vehicles.
2. Load Combination Strength III does not need to be checked during construction since WS is not a significant load.
3. Load Combination Strength IV does not need to be checked since it applies to bridges with very high dead load to live load ratios.
4. Load Combination Strength V does not need to be checked during construction since WS and WL are not significant loads.
5. Extreme Event load combinations do not need to be checked during construction.
6. Extreme Event II load combinations does not need to be checked for abutments.
7. Service limit state load combinations do not need to be checked for abutment stability / reinforcement.
8. Fatigue limit state load combinations do not need to be checked for abutment stability / reinforcement.
9. All remaining load cases shall be checked using load factors which would provide max effect for either bearing or sliding / eccentricity similar to AASHTO Figures C11.5.5-1 and C11.5.5.2.
10. Bouyancy has been included in sliding load combinations. A load factor of 0.0 has been used for bearing pressure load combinations since it is conservative to ignore sliding for these computations.

Strength	LC1	LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): gp max*(DCsub)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Strength	LC2	LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+γp max*(ES)
Bearing	LC3	LC3 - STRENGTH I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Sliding	LC4	LC4 - STRENGTH I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)
Bearing	LC5	LC5 - STRENGTH III BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Sliding	LC6	LC6 - STRENGTH III SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)
Bearing	LC7	LC7 - STRENGTH V BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Sliding	LC8	LC8 - STRENGTH V SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)
Extreme Bearing	LC9	LC9 - EXTREME EVENT I BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+gEQ MAX*(LL+IM+PL+BR+LS)+1.0*(EQ)
Extreme Sliding	LC10	LC10 - EXTREME EVENT I SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+gEQ MIN*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)
Extreme Bearing	LC11	LC11 - EXTREME EVENT II BEARING: gp max*(DC+DW)+gp max*(EH)+gp max*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(CT)
Extreme Sliding	LC12	LC12 - EXTREME EVENT II SLIDING: gp min*(DC+DW)+gp max*(EH)+gp min*(EV)+0.50*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(CT)

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CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations

Load Combinations : 3.1

↓ N/A, Valid for Pile Design Only ↓

NA (for Bottom row of piles) From Pile Design = 0

Bottom Row to Edge of Toe = 0

LC1 - STRENGTH I CONSTRUCTION (Before Bridge Construction): $g_{p\,max}$*(DCsub)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC_{SUB}	1.25	26.98		137.85	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
ES	1.50	4.06		37.94	3.79		55.05
SUM		**79.58**		**616.61**	**6.45**		**88.86**

↓ N/A, Valid for Pile Design Only ↓

Distance of Pile Group N.A. From Footing Toe (See Pile Design Spreadsheet): 0.00 ft

Distance of Vertical Force (V) From The Footing Toe	Offset of Pile Group N.A. From Original Location of V	Equivalent Moment Due to Offset of Pile Group N.A. From Original Location of V	**Mom. to Be Used On Pile Group = O.T. Mom. - Equivalent Mom.**	**Vertical Force to Be Used On Pile Group**	**Horizontal Force to Be Used On Pile Group**
7.75 ft	7.75 ft	616.6 k.ft	**-527.8 k.ft**	**79.6 kip**	**6.5 kip**

LC2 - STRENGTH I CONSTRUCTION (Before Bridge LL): $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+$\gamma_{p\,max}$*(ES)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
ES	1.50	4.06		37.94	3.79		55.05
SUM		**79.58**		**616.61**	**6.45**		**88.86**

↓ N/A, Valid for Pile Design Only ↓

7.75 ft	7.75 ft	616.6 k.ft	**-527.8 k.ft**	**79.6 kip**	**6.5 kip**

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CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.2

LC3 - STRENGTH I BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
LL+IM+PL+BR+LS	1.75	0.00		0.00	0.00		0.00
WA	1.00	-20.57		-164.21	5.41		40.29
TU	0.50	0.00		0.000	0.0000		0.000
SUM		**54.96**		**414.46**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.54 ft	7.54 ft	414.5 k.ft	**-340.4 k.ft**	**55.0 kip**	**8.1 kip**

LC4 - STRENGTH I SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.75*(LL+IM+PL+BR+LS)+1.0*(WA)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	19.43		99.25	0.00		0.00
DW	0.65	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.00	32.76		279.36	0.00		0.00
LL+IM+PL+BR+LS	1.75	0.00		0.00	0.00		0.00
WA (static)	1.00	-20.57		-164.21	5.41		40.29
TU	0.50	0.00		0.00	0.000		0.000
SUM		**35.94**		**278.09**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.74 ft	7.74 ft	278.1 k.ft	**-204.0 k.ft**	**35.9 kip**	**8.1 kip**

LC5 - STRENGTH III BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.425	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
WA (static)	1.00	-20.57		-164.21	5.41		40.29
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**54.96**		**414.46**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.54 ft	7.54 ft	414.5 k.ft	**-340.4 k.ft**	**55.0 kip**	**8.1 kip**

CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.3

LC6 - STRENGTH III SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.0*(WA)+1.4*(WS)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.90	19.43		99.25	0.00		0.00
DW	0.65	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.00	32.76		279.36	0.00		0.00
WA	1.00	-20.57		-164.21	5.41		40.29
WS	1.40	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**35.94**		**278.09**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.74 ft	7.74 ft	278.1 k.ft	**-204.0 k.ft**	**35.9 kip**	**8.1 kip**

LC7 - STRENGTH V BEARING: $g_{p\,max}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,max}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
LL+IM+PL+BR+LS	1.35	0.00		0.00	0.00		0.00
WA	1.00	-20.57		-164.21	5.41		40.29
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**54.96**		**414.46**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.54 ft	7.54 ft	414.5 k.ft	**-340.4 k.ft**	**55.0 kip**	**8.1 kip**

LC8 - STRENGTH V SLIDING: $g_{p\,min}$*(DC+DW)+$g_{p\,max}$*(EH)+$g_{p\,min}$*(EV)+1.35*(LL+IM+PL+BR+LS)+1.0*(WA)+0.4*(WS)+1.0*(WL)+0.50*(TU)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	19.43		99.25	0.00		0.00
DW	0.65	0.00		0.00	0.00		0.00
EH	1.425	4.32		63.69	2.66		33.81
EV	1	32.76		279.36	0.00		0.00
LL+IM+PL+BR+LS	1.35	0.00		0.00	0.00		0.00
WA	1.00	-20.57		-164.21	5.41		40.29
WS	0.40	0.00		0.00	0.00		0.00
WL	1.00	0.00		0.00	0.00		0.00
TU	0.50	0.00		0.00	0.0000		0.0000
SUM		**35.94**		**278.09**	**8.07**		**74.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

7.74 ft	7.74 ft	278.1 k.ft	**-204.0 k.ft**	**35.9 kip**	**8.1 kip**

CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.4

LC9 - EXTREME EVENT I BEARING: $g_{p\ max}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ max}$*(EV)+$g_{EQ\ MAX}$*(LL+IM+PL+BR+LS)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
LL+IM+PL+BR+LS	0.50	0.00		0.00	0.00		0.00
WA	0.00	0.00		0.00	0.00		0.00
EQ	1.00	13.49		199.08	-27.74		236.09
SUM		**89.01**		**777.75**	**-25.08**		**269.90**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

8.74 ft	8.74 ft	777.8 k.ft	**-507.9 k.ft**	**89.0 kip**	**-25.1 kip**

LC10 - EXTREME EVENT I SLIDING: $g_{p\ min}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ min}$*(EV)+$g_{EQ\ MIN}$*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	19.43		99.25	0.00		0.00
DW	0.65	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.00	32.76		279.36	0.00		0.00
LL+IM+PL+BR+LS	0.00	0.00		0.00	0.00		0.00
WA (seismic)	1.00	-20.57		-164.21	12.25		91.20
EQ	1.00	13.49		199.08	-27.74		236.09
SUM		**49.42**		**477.17**	**-12.82**		**361.10**

Load Factors Based on this particular LRFD Combination

↓ N/A, Valid for Pile Design Only ↓

9.65 ft	9.65 ft	477.2 k.ft	**-116.1 k.ft**	**49.4 kip**	**-12.8 kip**

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CANTILEVER WALL DESIGN - LOAD COMBINATIONS

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

LRFD Load Combinations Cont.

Load Combinations : 3.4

LC11 - EXTREME EVENT II BEARING: $g_{p\ max}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ max}$*(EV)+$g_{EQ\ MAX}$*(LL+IM+PL+BR+LS)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	1.25	26.98		137.85	0.00		0.00
DW	1.5	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.35	44.23		377.13	0.00		0.00
LL+IM+PL+BR+LS	0.50	0.00		0.00	0.00		0.00
WA	0.00	0.00		0.00	0.00		0.00
CT	1.00	0.00		0.00	0.00		0.00
SUM		**75.52**		**578.67**	**2.66**		**33.81**

Load Factors Based on this particular LRFD Combination

↓ **N/A, Valid for Pile Design Only** ↓

7.66 ft	7.66 ft	578.7 k.ft	**-544.9 k.ft**	**75.5 kip**	**2.7 kip**

LC12 - EXTREME EVENT II SLIDING: $g_{p\ min}$*(DC+DW)+$g_{p\ max}$*(EH)+$g_{p\ min}$*(EV)+$g_{EQ\ MIN}$*(LL+IM+PL+BR+LS)+1.0*(WA)+1.0*(EQ)

LOAD	Load Factor	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
DC	0.9	19.43		99.25	0.00		0.00
DW	0.65	0.00		0.00	0.00		0.00
EH	1.43	4.32		63.69	2.66		33.81
EV	1.00	32.76		279.36	0.00		0.00
LL+IM+PL+BR+LS	0.50	0.00		0.00	0.00		0.00
WA (seismic)	1.00	-20.57		-164.21	0.00		91.20
CT	1.00	0.00		0.00	0.00		0.00
SUM		**35.94**		**278.09**	**2.66**		**125.01**

Load Factors Based on this particular LRFD Combination

↓ **N/A, Valid for Pile Design Only** ↓

7.74 ft	7.74 ft	278.1 k.ft	**-153.1 k.ft**	**35.9 kip**	**2.7 kip**

CANTILEVER WALL DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes: **This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).**

Check Bearing Resistance (per AASHTO 11.6.3.2) -- ON SOIL

Stability : 1.0

If supported on soil, the vertical stress (σ_v) shall be calculated assuming a uniformly distributed pressure (V) over an effective base area (B-2e). AASHTO Fig 11.6.3.2-1 ----> $qr\ /\ \Phi\beta = q_n$ =

If supported on rock, the vertical stress (σ_v) shall be calculated assuming a linearly distributed pressure over an effective base area. AASHTO Fig 11.6.3.2-2 ----> $qr\ /\ \Phi\beta = q_n$ =

Factored Bearing Resistance, qr: $qr = \Phi\beta * q_n$ = 8.00 ksf **<--- Note per Geotech, this is factored net bearing resistance**

Strength Bearing Resistance Factor, $\Phi\beta$ (AASHTO Table 11.5.7-1): 0.55 — $qr = \Phi\beta * q_n$ = 8.00 ksf -----> $qr\ /\ \Phi\beta$ = qn = 14.55 ksf

Extreme Event Bearing Resistance Factor, $\Phi\beta$ (AASHTO 10.5.5.3.3): 1.00 — $qr = \Phi\beta * q_n$ = 8.00 ksf -----> $qr\ /\ \Phi\beta$ = qn = 8.00 ksf

Note ---> See AASHTO Table 11.5.7-1 to determine $\Phi\beta$ Factor

	LOAD COMBINATION	Vertical Force (Kips)	Resisting Moment (Ft x K)	Overturn Moment (Ft x K)	Mnet (Ft x K)	Eccentricity from Toe, et=Mnet/V (Ft)	Eccentricity from CL, e=B/2-et (Ft)	σ_v on soil (ksf)	$\sigma_{v\,max}$ on rock (ksf)	$\sigma_{v\,min}$ on rock (ksf)	$\sigma_v < \Phi\beta * q_n$	
Strength	**LC1**	79.58	616.61	88.86	527.75	6.63	0.75	6.00	7.03	3.75	OK	
Strength	**LC2**	79.58	616.61	88.86	527.75	6.63	0.75	6.00	7.03	3.75	OK	
Bearing	**LC3**	54.96	414.46	74.10	340.36	6.19	1.19	4.44	5.52	1.93	OK	
Sliding	**LC4**	35.94	278.09	74.10	203.99	5.68	1.70	3.17	4.12	0.75	OK	<--*N/A Sliding Combination
Bearing	**LC5**	54.96	414.46	74.10	340.36	6.19	1.19	4.44	5.52	1.93	OK	
Sliding	**LC6**	35.94	278.09	74.10	203.99	5.68	1.70	3.17	4.12	0.75	OK	<--*N/A Sliding Combination
Bearing	**LC7**	54.96	414.46	74.10	340.36	6.19	1.19	4.44	5.52	1.93	OK	
Sliding	**LC8**	35.94	278.09	74.10	203.99	5.68	1.70	3.17	4.12	0.75	OK	<--*N/A Sliding Combination
Ex. Bearing	**LC9**	89.01	777.75	269.90	507.85	5.71	1.67	7.80	10.14	1.93	OK	
Ex. Sliding	**LC10**	49.42	477.17	361.10	116.07	2.35	5.03	10.52	14.03	0.00	N/A	<--*N/A Ex. Sliding Combination
Ex. Bearing	**LC11**	75.52	578.67	33.81	544.86	7.21	0.17	5.23	5.46	4.77	OK	
Ex. Sliding	**LC12**	35.94	278.09	125.01	153.08	4.26	3.12	4.22	5.62	0.00	OK	<--*N/A Ex. Sliding Combination

*** Sliding Load Combinations are Not Applicable for checking the Bearing**

CANTILEVER WALL DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Check Overturning (per AASHTO 11.6.3.3) -- ON SOIL

Stability : 2.0

e allowable (ftgs on soil):	3.69	ft
e allowable (ftgs on rock):	5.54	ft

If e < e allowable, Overturning is OK:

	LOAD COMBINATION	Eccentricty from CL, e=B/2-et (Ft)	Check Overturning	
Strength	**LC1**	0.75	OK	
Strength	**LC2**	0.75	OK	
Bearing	**LC3**	1.19	OK	
Sliding	**LC4**	1.70	OK	**<--*N/A Sliding Combination**
Bearing	**LC5**	1.19	OK	
Sliding	**LC6**	1.70	OK	**<--*N/A Sliding Combination**
Bearing	**LC7**	1.19	OK	
Sliding	**LC8**	1.70	OK	**<--*N/A Sliding Combination**
Ex. Bearing	**LC9**	1.67	OK	
Ex. Sliding	**LC10**	5.03	N/A	**<--*N/A Ex. Sliding Combination**
Ex. Bearing	**LC11**	0.17	OK	
Ex. Sliding	**LC12**	3.12	OK	**<--*N/A Ex. Sliding Combination**

*** Sliding Load Combinations are Not Applicable for checking Overturning**

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CANTILEVER WALL DESIGN

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Check Sliding (per AASHTO 10.6.3.4)

Stability : 3.0

Ignore Passive Resistance of Soil per MassHighway

Strength Sliding Resistance Factor, Φ_τ (AASHTO Table 11.5.7-1):	1.00	
Extreme Event Sliding Resistance Factor, Φ_ϖ (AASHTO 10.5.5.3.3):	1.00	
Internal Friction Angle of Drained Soil, Φ_f:	31.00	degrees
tan δ: = tan Φ_f (per AASHTO 10.6.3.4-2):	0.60	for concrete against soil. Multiply by 0.8 for precast concrete footing

	LOAD COMBINATION	Vertical Force (Kips)	Rt = V * tan δ: (Kips)	Φ_τ (Strength) Φ_ω (Extreme) (Kips)	Nom. Sliding Resistance Φ_τ*Rt (Kips)	Horiz Force (Kips)	Check Sliding	
Strength	**LC1**	79.58	47.82	1.00	47.82	6.45	OK	**<--*N/A Strength Combination**
Strength	**LC2**	79.58	47.82	1.00	47.82	6.45	OK	**<--*N/A Strength Combination**
Bearing	**LC3**	54.96	33.02	1.00	33.02	8.07	OK	**<--*N/A Bearing Combination**
Sliding	**LC4**	35.94	21.59	1.00	21.59	8.07	OK	
Bearing	**LC5**	54.96	33.02	1.00	33.02	8.07	OK	**<--*N/A Bearing Combination**
Sliding	**LC6**	35.94	21.59	1.00	21.59	8.07	OK	
Bearing	**LC7**	54.96	33.02	1.00	33.02	8.07	OK	**<--*N/A Bearing Combination**
Sliding	**LC8**	35.94	21.59	1.00	21.59	8.07	OK	
Ex. Bearing	**LC9**	89.01	53.48	1.00	53.48	-25.08	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC10**	49.42	29.70	1.00	29.70	-12.82	OK	
Ex. Bearing	**LC11**	75.52	45.38	0.60	27.27	0.00	OK	**<--*N/A Ex. Bearing Combination**
Ex. Sliding	**LC12**	35.94	21.59	0.60	12.97	0.00	OK	

Results Summary:

Stability : 4.0

STABILITY RESULTS:

LOAD COMBINATION:	BEARING RESISTANCE	OVERTURNING	SLIDING	
LC1	OK	OK	OK	<== Construction
LC2	OK	OK	OK	<== Construction
LC3	OK	OK	OK	
LC4	OK	OK	OK	
LC5	OK	OK	OK	
LC6	OK	OK	OK	
LC7	OK	OK	OK	
LC8	OK	OK	OK	
LC9	OK	OK	OK	
LC10	N/A	N/A	OK	
LC11	OK	OK	OK	
LC12	OK	OK	OK	

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

References:
- AASHTO LRFD Bridge Design Specifications, 6th Edition, 2012
- ACI 318-08 Building Code Requirements for Structural Concrete, 2005
- 2009 MassDOT LRFD Bridge Manual, including draft Novemeber 2012 provisions
- AASHTO Guide Specifications for LRFD Seismic Bridge Design 2011

Notes:
This template assumes that the soils strata behind the abutment is uniform (only 1 strata is considered).
Wall Design
Khost Bridge Notes

Design Parameters

Reinforcement : 1.0

GEOMETRY

H of Footing, h :	3.28	ft
bw (per linear ft of wall) :	12.00	in

MATERIAL PROPERTIES

Compressive Strength: f'c :	4.00	ksi	
Min Yield Strength: fy :	60.00	ksi	
Max. Agg. Size :	1.50	in	
Es :	29000	ksi	AASHTO 5.4.3.2
Tension Reinforcement Strain: ε_s :	0.002	ε_s = fy / Es	
β :	1.881		AASHTO EQ 5.8.3.4.2-1

Design Heel and Toe Reinforcement

Reinforcement : 2.1

FACTORED HEEL DESIGN LOADS	Load Factor, γ_p AASHTO Table 3.4.1-2	Vertical Force & Design Shear (Kips)	Arm (Feet)	Design Moment (Ft x K)
DC (Heel Concrete)	1.25	4.52	3.68	16.61
EV (Heel Soil)	1.35	29.41	3.68	108.07
EH (Vertical Component)	1.43	8.49	7.35	62.41
LS	1.75	0.00	3.68	0.00
SUM		**42.42**		**187.08**

* See load combs, Load Factors for Permanent Loads (per AASHTO Table 3.4.1-2) for the above Load Factors

* EH (Vertical Component) <-- An average of Active and At-rest Coefficients used based on MHD's earth pressure design guidelines.

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.2

Footing Toe Width, BF: 1.97 ft

FACTORED TOE DESIGN LOADS LOAD COMBINATION	σ_v Factored Toe Pressure (ksf)	Factored Toe Shear (Kips)	Factored Toe Moment (Ft x K)
LC1	6.00	11.82	11.64
LC2	6.00	11.82	11.64
LC3	4.44	8.74	8.61
LC4	3.17	6.24	6.14
LC5	4.44	8.74	8.61
LC6	3.17	6.24	6.14
LC7	4.44	8.74	8.61
LC8	3.17	6.24	6.14
LC9	7.80	15.37	15.14
LC10	10.52	20.73	20.42
MAX		**20.73**	**20.42**

Note: Based on AASHTO 10.6.5, the structural design of an eccentrically loaded foundation can assume a triangular or eccentrically loaded area. This spreadsheet conservatively assumes a uniform pressure of sv max over the toe of the footing. Based on AASHTO Figure C5.13.3.6.1-1, The toe and heel shear can be computed at a distance dv from the face of support. This spreadsheet computes it at the support, which is conservative.

10.6.5—Structural Design

The structural design of footings shall comply with the requirements given in Section 5.

For structural design of an eccentrically loaded foundation, a triangular or trapezoidal contact stress distribution based on factored loads shall be used for footings bearing on all soil and rock conditions.

FOOTING HEEL REINF (TOP BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

FOOTING TOE REINF (BOTTOM BARS):

USE #	**8.00**	**@**	**6.00 IN**
Abar =	0.79	in^2	
dbar =	1.00	in	
Asprov =	1.58	in^2	

CRITICAL SECTION FOR WALLS

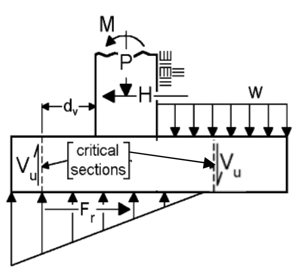

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

CRITICAL SECTION FOR ABUTMENTS

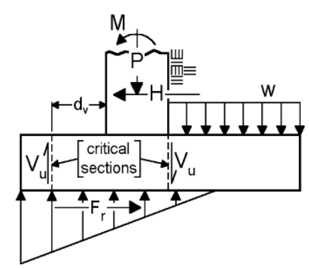

Figure C5.13.3.6.1-1—Example of Critical Section for Shear in Footings

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General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.3

CHECK FLEXURAL RESISTANCE	HEEL	TOE	AASHTO 5.7, 5.7.2.2, 5.7.3.2, 5.7.3.2.2	
Factored Moment, Mu =	187.08	20.42	k*ft	
Resistance Factor, phi: Φ =	0.90	0.90		AASHTO 5.5.4.2
Assume Cover, dc =	2.00	3.00	in	ACI 318-08 - 7.7
Shear Depth: ds =	36.86	35.86	in = h - cover - 1/2db(main)	
Depth of Equivalent Stress Block: a =	2.32	2.32	in = c*β1 = Asfy/0.85f'cb	AASHTO Eq. 5.7.3.1.1-4
Nominal Flexural resistance, Mn =	282.02	274.12	kip ft = [Asfy(ds-a/2)]/12	AASHTO Eq. 5.7.3.2.2-1
Factored Resistance, ΦMn =	253.81	246.70		AASHTO Eq. 5.7.3.2.1-1
As required for Mu:	0.68	0.09	in^2	
Flexure OK?	**OK**	**OK**		

CHECK MINIMUM REINFORCEMENT	HEEL	TOE	AASHTO 5.7.3.3.2	
Section Modulud: Sc =	3098.42	3098.42	in^3	
Compressive Strength: f'c =	4.00	4.00	ksi	
Modulus of Rupture: fr =	0.74	0.74	ksi = $0.37*(f'c)^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	191.07	191.07	kip ft	AASHTO Eq. 5.7.3.2.2-1
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	229.28	229.28	kip ft	
Factored Moment, Mu =	187.08	20.42	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	248.82	27.16	kip ft	
Controlling Mr = min(Mr1, Mr2)	229.28	27.16	kip ft	
Factored Resistance, phi*Mn =	253.81	246.70		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	1.4227	0.1689	in^2	
As required for Temp Steel (#4@18"):	0.1333	0.1333	in^2	
As provided =	1.58	1.58	in^2	
Min Reinforcement OK?	**OK**	**OK**		

CHECK CRACK CONTROL BY DIST REINF.	HEEL	TOE	AASHTO 5.7.3.4, 5.10.3.1		
Exposure Factor: γ_e =	0.75	0.75	Class 2 Exposure		ASSHTO 5.7.3.4
β_s factor=	1.08	1.12		β_s factor = 1 + (dc / 0.7 * (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36	ksi	f_{ss} = .6*fy	
s_{max} =	8.55	8.05	in	s_{max} < = 700 ge / βs fss	ASSHTO 5.7.3.4-1
s_{min} =	3.25	3.25	in	s_{min} = max(1.5*db,1.5*agg,1.5")+db	AASHTO 5.10.3.1.1
SPACING OK?	**OK**	**OK**			

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Design Heel and Toe Reinforcement Cont.

Reinforcement : 2.4

CHECK SHEAR RESISTANCE	HEEL	TOE	AASHTO 5.13.3.6, 5.8.3		
Factored Shear Force, Vu =	42.42	20.73	kips		
Factored Moment, Mu =	187.08	20.42	k*in		
Es =	29000	29000			AASHTO 5.4.3.2
Resistance Factor, phi: Φ =	0.90	0.90			AASHTO 5.5.4.2
bw (per linear ft of wall) =	12.00	12.00	in		
Effective Depth: dv =	35.70	34.70	in	dv = max((ds-a/2),max(0.9ds, 0.72h))	AASHTO 5.8.2.9
H of Ftg, h:	39.36	39.36	in		
bw (per linear ft of ftg) =	12.00	12.00	in		
Area of Conc on Tension Side, Ac =	236.16	236.16	in	Ac = h*bw/2 =	
As (flexural) provd =	1.58	1.58	in^2		
Max. Size of Coarse Aggregate, ag =	1.50	1.50	in		
Mu min =	1514.20	719.28	k*in	Mu min = Vu*dv =	
Mu (controlling) =	1514.20	719.28	k*in		
Spg between top and bottom reinf, sx =	34.36	34.36	in		
Crack spg parameter, sxe =	22.26	22.26		sxe = 1.38*sx/(ag+0.63)	
Strain = ε_s=	0.0019	0.0009		ε_s=(Mu/dv+Vu)/(Es*As)	AASHTO EQ 5.8.3.4.2-4
Θ =	187.92	91.84		Θ = 29+3500*ε_s	AASHTO EQ 5.8.3.4.2-3
β =	1.67	2.38		β = 4.8/(1+750ε_s)*(51/(39+s_{xe}))	
Nom Shear Resistance, Vn1 =	428.38	416.38	kips	Vn1 = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	45.29	62.64	kips	Vn2 = Vc = 0.0316*β*f'c.5*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn =	45.29	62.64	kips	Vn = min (Vn1, Vn2)	
phi*Vn =	40.76	56.38			
Shear OK?	OK	OK			
Opposite Face Reinf As provd. =	1.58	1.58	in^2		
As min crack =	1.24	1.24	in^2	As min crack = 0.003*b*sx	
min (As front, back) > As min ?	N/A	N/A			

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Stem Reinforcement

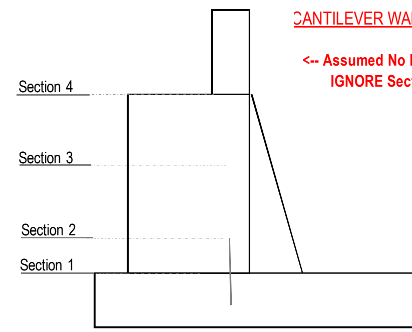
Reinforcement : 3.0

1. Reinforcement does not need to be checked for construction loading since that is a temporary load case.
Check the stem reinforcement at various locations along the stem and at the base of the backwall.

Height of Stem plus Backwall, h = H - F =	25.77	ft
Height of Backwall =	0.00	ft
Ftg Dowel Lap Length:	7.00	ft
Width of Stem at the Base:	5.44	ft
Width of Backwall:	0.00	ft
Width of Batter:	3.47	ft

Section	Height of h	Height from top	Width Batter	Width conc	
1	1.00	25.77	3.47	5.44	<=== This section is at the bottom of the stem.
2	0.73	18.77	2.53	4.50	<=== This section is at the top of the footing dowel.
3	0.36	9.39	1.26	3.23	<=== This section is halfway in between top of footing dowel and top of batter.
4	0.00	0.00		0.00	<=== This section is at the base of the backwall

CANTILEVER WALL DESIGN



<-- Assumed No Backwall - IGNORE Section 4

Horizontal Earth Pressure, EH at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.05				1.87	12.70	23.73
Top of Ftg	25.77				1.47	8.59	12.63
Top of Dowel	18.77				0.78	6.26	4.88
Mid-Height	9.385				0.19	3.13	0.61
Bot of Backwall	0				0.00	0.00	0.00

Live Load Surcharge, LS at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.05				0.00	14.53	0.00
Top of Ftg	25.77				0.00	12.89	0.00
Top of Dowel	18.77				0.00	9.39	0.00
Mid-Height	9.385				0.00	4.69	0.00
Bot of Backwall	0				0.00	0.00	0.00

Seismic Load, EQ at Various Heights along Stem:

	Height from Top of Wall (Feet)	Vertical Force (Kips)	Arm (Feet)	Resisting Moment (Ft x K)	Horiz Force (Kips)	Arm (Feet)	Overturn Moment (Ft x K)
Original Calcs	29.05				-27.74		236.09
Top of Ftg	25.77				-24.61	12.89	-317.04
Top of Dowel	18.77				-17.92	9.39	-168.20
Mid-Height	9.385				-8.96	4.69	-42.05
Bot of Backwall	0				0.00	0.00	0.00

CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.1

Load Combination - STRENGTH I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	2.09	18.00	1.11	6.95	0.28	0.87	0.00	0.00
LS	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUM		**2.09**	**18.00**	**1.11**	**6.95**	**0.28**	**0.87**	**0.00**	**0.00**

Load Combination - EXTREME EVENT I		At Top of Ftg		Top of Dowel		Mid-Height Abut		Bot of Backwall	
LOAD	Load Factor	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)	Horiz Force (Kips)	Overturn Moment (Ft x K)
EH	1.43	2.09	18.00	1.11	6.95	0.28	0.87	0.00	0.00
LS	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EQ	1.00	-24.61	-317.04	-17.92	-168.20	-8.96	-42.05	0.00	0.00
SUM		**-22.51**	**-299.05**	**-16.81**	**-161.24**	**-8.68**	**-41.18**	**0.00**	**0.00**

CHECK FLEXURAL RESISTANCE	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7		
Section Height / Location =	25.77	18.77	9.39	0.00	ft		
Factored Moment, Mu =	18.00	6.95	0.87	0.00	k*ft		
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2	
H of Stem, h:	5.44	4.50	3.23	0.00	ft		
Cover, dc =	2.00	2.00	2.00	2.00	in	ACI 318-08: Sec 7.7.1	<-- 2" for Concrete exposed to earth or weather: No. 6 thru No 18 bars
BAR # =	8.00	8.00	8.00	0.00			
SPACING =	8.00	8.00	8.00	6.00	in		
Main Abar =	0.79	0.79	0.79	0.00	in^2		
Main db =	1.000	1.000	1.000	0.000	in		
As provd. =	1.19	1.19	1.19	0.00	in^2		
Shear Depth: ds =	62.78	51.47	36.30	-2.00	in. = h - cover - 1/2db(main)		
Depth of Equivalent Stress Block: a =	1.74	1.74	1.74	0.00	in = c*β1 = Asfy/0.85f'cb	AASHTO 5.7.2.2, 5.7.3.2	
Nominal Flexural resistance, Mn =	366.81	299.79	209.94	0.00	kip ft = [Asfy(ds-a/2)]/12	AASHTO 5.7.3.2.2	
Factored Resistance, phi*Mn =	330.13	269.81	188.95	0.00		AASHTO Eq. 5.7.3.2.1-1	
As required for Mu:	0.0646	0.0306	0.0055	0.0000	in^2		
Flexure OK?	**OK**	**OK**	**OK**	**N/A**			

<-- Assumed No Backwall - IGNORE Section 4

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.2

CHECK MINIMUM REINFORCEMENT	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.3.2	
Section Modulud: Sc =	8522.96	5825.34	3011.59	0.00	in^3	
Modulus of Rupture: fr =	0.74	0.74	0.74	0.74	ksi = $0.37*(f'c)^{1/2}$	AASHTO 5.4.2.6
Cracking Moment: Mcr = Sc*fr =	525.58	359.23	185.71	0.00	kip ft	
Factored Flexural Resistance: Mr1 = 1.2*Mcr =	630.70	431.08	222.86	0.00	kip ft	
Factored Moment, Mu =	18.00	6.95	0.87	0.00	k*ft	
Factored Flexural Resistance: Mr2 = 1.33*Mu =	23.93	9.25	1.16	0.00	kip ft	
Controlling Mr = min(Mr1, Mr2)	23.93	9.25	1.16	0.00	kip ft	`
Factored Resistance, phi*Mn =	330.13	269.81	188.95	0.00		AASHTO Eq. 5.7.3.2.1-1
As required for Mr:	0.0848	0.0400	0.0071	-2.7200	in^2	
As provided =	1.19	1.19	1.19	0.00	in^2	
Min Reinforcement OK?	**OK**	**OK**	**OK**	**N/A**		

<-- Assumed No Backwall - IGNORE Section 4

CHECK CRACK CONTROL BY DIST REINF.	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.7.3.4, 5.10.3.1	
Exposure Factor: γ_e =	0.75	0.75	0.75	0.75	Class 2 Exposure	ASSHTO 5.7.3.4
H of Stem, h:	65.28	53.97	38.80	0.00	in	
β_s factor=	1.05	1.05	1.08	-0.43	1 + (dc / 0.7* (h-dc))	ASSHTO 5.7.3.4-1
f_{ss} =	36	36.00	36.00	36.00	ksi = .6*fy	
s_{max} =	9.95	9.82	9.53	-38.03	in < = $700\ \gamma_e / \beta_s f_{ss}$	ASSHTO 5.7.3.4-1
Main db =	1.000	1.000	1.000	0.000	in	
s_{min} = max(1.5*db,1.5*agg,1.5")+db =	3.25	3.25	3.25	2.25	in	AASHTO 5.10.3.1.1
SPACING =	8.00	8.00	8.00	6.00	in	
SPACING OK?	**OK**	**OK**	**OK**	**N/A**		

<-- Assumed No Backwall - IGNORE Section 4

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.3

CHECK SHEAR TRANSFER	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.4.1, 5.8.4.3, 5.8.4.4
Cohesion Factor, c =	0.075	0.075	0.075	0.075	ksi, assumes CJ not intentionally roughened
Friction Factor, μ =	0.6	0.60	0.60	0.60	
Fraction of strength for interface shear, K1 =	0.2	0.20	0.20	0.20	
Limiting Interface Shear Resistance, K2 =	0.8	0.80	0.80	0.80	ksi
Lvi = H of Stem, h:	65.28	53.97	38.80	0.00	ft
bvi = bw (per linear ft of wall) =	12.00	12.00	12.00	12.00	in
Interface Area, Acv = Lvi*bvi =	783.36	647.63	465.66	0.00	in^2
Back Face (Flexural) As provd. =	1.19	1.19	1.19	0.00	in^2
Front Face (Dowels) As provd. =	0.44	0.44	0.44	0.44	in^2
Interface Reinf Provided, Avf = As back+front =	1.63	1.63	1.63	0.44	in^2
Vni = c*Acv+μ*Avf*Fy =	117.25	107.07	93.42	15.84	kips
Vni max1 = K1*f'c*Acv =	626.69	518.10	372.52	0.00	kips
Vni max2 = K2*Acv =	626.69	518.10	372.52	0.00	kips
Vni (controlling) =	117.25	107.07	93.42	0.00	kips
Fact. Interface Shear Resistance, Vri=phiVni =	105.53	96.37	84.08	0.00	kips
Fact. Interface Shear Load, Vui = Vu =	2.09	1.11	0.28	0.00	kips
Vu < Vri ?	**OK**	**OK**	**OK**	**N/A**	
Min Interface Shear Reinf, Avf = 0.05*Acv/Fy =	0.653	0.540	0.388	0.000	in^2
Avf > Avfmin ?	**OK**	**OK**	**OK**	**N/A**	

<-- Assumed No Backwall - IGNORE Section 4

5.8.4.3—Cohesion and Friction Factors

- For concrete placed against a clean concrete surface, free of laitance, but not intentionally roughened:

c = 0.075 ksi
μ = 0.6
K_1 = 0.2
K_2 = 0.8 ksi

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CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Stem Reinforcement Cont.

Reinforcement : 3.4

CHECK SHEAR RESISTANCE	SECT 1	SECT 2	SECT 3	SECT 4	AASHTO 5.8.2, 5.8.3.3, 5.8.3.4.2	
Factored Shear Force, Vu =	2.09	1.11	0.28	0.00	kips	
Factored Moment, Mu =	215.95	0.00	0.00	0.00	k*in	
Resistance Factor, phi: Φ =	0.90	0.90	0.90	0.90		AASHTO 5.5.4.2
Effective Depth: dv =	61.91	50.60	35.43	0.00	in=max((ds-a/2),max(0.9ds,0.72h))	AASHTO 5.8.2.9
H of Stem, h:	65.28	53.97	38.80	0.00	in	
Area of Conc on Tension Side, Ac = h*bw/2 =	391.68	323.82	232.83	0.00	in	
As (flexural, back face) provd =	1.19	1.19	1.19	0.00	in^2	
Max. Size of Coarse Aggregate, ag =	1.50	1.50	1.50	1.50	in	
Mu min = Vu*dv =	129.70	56.23	9.85	0.00	k*in	
Mu (controlling) =	215.95	56.23	9.85	0.00	k*in	
sx = dv	61.91	50.60	35.43	0.00	in ---> See Figure 5.8.3.4.2-3 (Case a)	
Crack spg parameter, sxe = 1.38*sx/(ag+0.63) =	40.11	32.78	22.96	0.00		
Strain = ε_s=(Mu/d+Vu)/(Es*As) =	0.0002	0.0001	0.0000	#DIV/0!		
Θ = 29+35000*ε_s =	16.49	6.57	1.64	#DIV/0!		
β = 4.8/(1+750εs)*(51/(39+s_{xe}) =	2.76	3.25	3.90	#DIV/0!		
Nom Shear Resistance, Vn1 =	742.90	607.17	425.20	0.00	kips, Vn = 0.25*f'c*bv*dv	AASHTO 5.8.3.3-2
Nominal Shear Resistance: Vn2 = Vc =	129.51	124.81	104.91	#DIV/0!	kips, 0.0316*β*f'c$^{.5}$*bv*dv	AASHTO 5.8.3.3-3
Nom Shear Resistance, Vn = min (Vn1, Vn2) =	129.51	124.81	104.91	#DIV/0!	kips	
phi*Vn =	116.56	112.33	94.41	#DIV/0!		
Shear OK?	OK	OK	OK	N/A		
Front Face (Dowels) As provd. =	0.44	0.44	0.44	0.44	in^2	
As min crack = 0.003*b*sx =	2.23	1.82	1.28	0.00	in^2 ---> Only Applicable for Figure 5.8.3.4.2-3 Case B	
min (As front, back) > As min ?	N/A	N/A	N/A	N/A		

<-- Assumed No Backwall - IGNORE Section 4

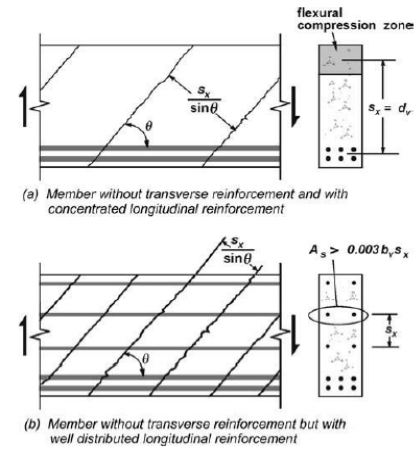

Figure 5.8.3.4.2-3—Definition of Crack Spacing Parameter, s_x

Crack Spacing Parameter, Sx --> Case = Case A

CANTILEVER WALL DESIGN -REINFORCEMENT

General Information

Project Number:	1298\127-1298-12001-LT0077	**Designed By:**	ALH
Description:	Khost Bridge No. 9	**Checked By:**	SAM
Structure:	Wall Design	**Date:**	February 27, 2014

Results Summary:

Reinforcement : 4.0

REINFORCEMENT RESULTS:

= As Provided / As Required

		STIRUP #	BAR #	SPAC.	REINF. RATIO	FLEX OK?	LBS./ L.F.	LENGTH OF BAR	No. Bars per ft	Wt. of bar PER L.F.	As/LF	SHEAR OK?
A	TOE(bot):	---	8.00	6.00	9.36	OK	153.33	14.26	2.00	5.38	1.58	OK
B	HEEL(top):	---	8.00	6.00	1.11	OK	153.33	14.26	2.00	5.38	1.58	OK
C	STEM 1 (at top of ftg):	0.00	8.00	8.00	13.97	OK	42.34	7.00	1.50	4.03	1.19	OK
D	STEM 2 (at top of ftg dwl - backface):	0.00	8.00	8.00	29.66	OK	80.18	13.26	1.50	4.03	1.19	OK
E	STEM 3 (midpt back face):	0.00	8.00	8.00	167.44	OK	80.18	13.26	1.50	4.03	1.19	OK
F	STEM 4 (at bot of bw):	0.00	0.00	6.00	0.00	N/A	0.00	13.26	2.00	0.00	0.00	N/A <--- N/A No Backwall
G	STEM 5 (front face):	0.00	6.00	12.00	---	---	37.09	24.77	1.00	1.50	0.44	
H	STEM 6 (front face dowels):	0.00	6.00	12.00	---	---	3.49	2.33	1.00	1.50	0.44	
I	FOOTING (TOP):	0.00	6.00	12.00	---	---	22.10	1.00	14.76	1.50	0.44	
J	FOOTING (BOT.)	0.00	6.00	12.00	---	---	22.10	1.00	14.76	1.50	0.44	
K	STEM (longitudinal):	0.00	6.00	12.00	---	---	77.17	1.00	51.54	1.50	0.44	
					TOTAL WT. STEEL/FT OF ABUT.=		671.32	LBS./LF				

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Section 5
Bill of Quantities

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name **Gardez - Khost Road Phase IV - Construction of Bridge #09**

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION		Bill of Quantity (BOQ)-Bridge09			Quantity	Price	
	BoQ Ref. #	Description	UNIT	Civil	Structural	Section 2 Phase IV Construction of Bridge#09	Unit Price	Total Price
Division 150 - Project Requirements					-			$0.00
Section 151	**Mobilization**				-			$0.00
	08-151-01	Mobilization	LS		-			$0.00
Section 159	**Demining**				-			$0.00
	08-159-01	De-mining and Technical survey	m2		-			$0.00
	08-159-02	Mine Clearance	m^2		-			$0.00
Section 160	**Snow Removal**				-			$0.00
	08- 160-01	Snow Removal	day		-			$0.00
		Emergency Work	day		-			$0.00
					-			$0.00
					-			$0.00
Division 200 - Earthwork					-			$0.00
Section 201 (Section 31 10 00)	**Clearing and Grubbing**				-			$0.00
	08-201-01	Clearing and Grubbing	ha		-			$0.00
Section 203 (Section 02 41 19)	**Removal of Structure and Obstructions**				-			$0.00
	08-203-01	Removal and disposal of existing structure (Retaining wall, Head wall, wing wall, culverts, lined Ditch)	m^3	58.00	-	58.00		$0.00
	08-203-02	Removal and disposal of existing pavement (asphalt)	m^3	203.00	-	203.00		$0.00
	08-203-03	Removal and Disposal of Existing PCC Pavement	m^3		-			$0.00
	08-203-04	Removal and Disposal of Existing Bridge	each		1.00	1.00		$0.00
					-			$0.00
Section 204 (Section 31 20 00, 31 23 19, 31 25 00, & 31 52 13)	**Excavation and Embankment**				-			$0.00
	08- 204-01	Roadway Excavation	m^3	402.00	-	402.00		$0.00
	08- 204-02	Bridge Excavation	m^3		8,650.00	8,650.00		$0.00
	08- 204-02	River Training Soil Excavation	m^3		-			$0.00
	08- 204-03	Select Topping	m^3		-	-		$0.00
	08- 204-04	Structural Backfill	m^3		6,525.00	6,525.00		$0.00
	08- 204-05	Embankment	m^3	3,768.00	-	3,768.00		$0.00
	08-204-06	Embankment(Granular material with 0-8% passing 75µm sieve)	m^3		-			$0.00
	08-204-07	Erosion Control	m	429.00				$0.00
	08-204-08	Cofferdam (Control/Diversion of Water)	LS		1.00			$0.00

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name **Gardez - Khost Road Phase IV - Construction of Bridge #09**

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION		Bill of Quantity (BOQ)-Bridge09			Quantity	Price	
	BoQ Ref. #	Description	UNIT	Civil	Structural	Section 2 Phase IV Construction of Bridge#09	Unit Price	Total Price
Section 205	**Rock Blasting**				-			$0.00
(Section 31 20 00)	08-205-01	Rock Excavation (Inclusive of blasting assumed 10% of total bridge excavtion)	m^3		975.00	975.00		$0.00
					-			$0.00
Division 250- Slope Reinforcement and Retaining wall					-			$0.00
					-			$0.00
Section 251 (Section 31 37 00)	**Riprap**				-			$0.00
	08-251-01	Placed Riprap (at walls, allowance)	m^3		10.00	10.00		$0.00
	08-251-02	Grouted Riprap	m^3	246.00	-	246.00		$0.00
Section 253	**Gabions and Revet Mattresses**				-			$0.00
	08-253-01	Gabions and Revet Mattresses	m^3		-			$0.00
					-			$0.00
Division 300- Aggregate Course					-			$0.00
					-			$0.00
Section 301 (Section 32 12 16)	**Untreated Aggregate Course**				-			$0.00
	08- 301-01	Crushed Aggregate Base Grad. Des. D, 200 mm Carriageway	m^3	489.00	-	489.00		$0.00
	08- 301-02	Crushed Aggregate Base Grad. Des. D, 325 mm, Shoulder	m^3	372.00	-	372.00		$0.00
	08-301-03	Crushed Aggregate Base Grad. Des. D, 300 mm, Side Road	m^3	274.00				
	08- 301-05	Crushed Aggregrate for Underdrain and Under Approach Slab	m^3	17.00	-			$0.00
					-			$0.00
Division 400- Asphalt pavement and surface Treatment					-			$0.00
					-			$0.00
Section 400.3.1	**Asphalt Concrete Surface (Wearing Course)**				-			$0.00
(Section 32 12 16)	08-400.3.1-01	50 mm Asphalt Concrete Surface (Wearing Course)	m^2	3,087.00	-	3,087.00		$0.00
Section 400.3.2	**Asphalt Concrete Binder Course**				-	-		$0.00
(Section 32 12 16)	08-400.3.2-01	75 mm Asphalt Concrete Binder Course	m^2	2,442.00	-	2,442.00		$0.00
Section 411	**Asphalt Prime Coat**				-	-		$0.00
(Section 32 12 16)	08-411-01	Asphalt Prime Coat	m^2	3,230.00	-	3,230.00		$0.00
Section 412	**Asphalt Tack Coat**				-	-		$0.00
(Section 32 12 16)	08-412-01	Asphalt Tack Coat Emulsified Asphalt	m^2	2,526.00	-	2,526.00		$0.00
					-			$0.00

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name **Gardez - Khost Road Phase IV - Construction of Bridge #09**

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION		Bill of Quantity (BOQ)-Bridge09			Quantity	Price	
	BoQ Ref. #	Description	UNIT	Civil	Structural	Section 2 Phase IV Construction of Bridge#09	Unit Price	Total Price
Division 500- Rigid Pavement					-			$0.00
					-			$0.00
Section 500.1	**Rigid Pavements**				-			$0.00
	08-501-01	Portland Cement Pavement, 250mm thick (New and patching)	m^2		-			$0.00
					-			$0.00
Division 550-Bridges and Culverts Construction					-			$0.00
Section 552 (Section 03 30 00 & 07 95 66)	**Structural Concrete**				-			$0.00
	08-552-01	Plain Cement Concrete, Class B (15MPa) below footings	m^3		50.00	50.00		$0.00
	08-552-02	Structural Concrete, Class A (25MPa) for reinforced concrete box culverts, cut-off walls, wing walls, sleeper slabs	m^3		-			$0.00
	08-552-03	Plain Cement Concrete Class B (15MPa) below pier and abutment pile caps and approach slabs	m^3		-			$0.00
	08-552-04	Structural Concrete (27.5MPa) for piers,abutments, Walls, and Approach slabs	m^3	2.00	1,410.00	1,412.00		$0.00
	08-552-05	Structural Concrete (27.5MPa) for reinforced concrete deck slabs , beams and diaphragms	m^3		450.00	450.00		$0.00
	08-552-06	Structural Concrete (27.5MPa) for curbs, barriers and sidewalks	m^3		70.00	70.00		$0.00
	08-552-07	Structural Concrete (27.5MPa) for scour mattress	m^3		625.00	625.00		$0.00
	08-552-08	Scuppers	each		6.00	6.00		$0.00
	08-552-09	Weep Holes in Abutments and Walls	each		16.00	16.00		$0.00
	08-552-10	Strip Seal Joint System	lm		40.00	40.00		$0.00
	08-552-12	PVC Drain Pipe	lm	30.00		30.00		$0.00
Section 554 (Section 03 30 00)	**Reinforcing Steel**				-			$0.00
	08-554-01	Reinforcing steel Grade 60 in abutments, piers, walls and approach slabs	ton		100.00	100.00		$0.00
	08-554-02	Reinforcing steel Grade 60 for Barriers, Curb and Sidewalks	ton		10.00	10.00		$0.00
	08-554-03	Reinforcing steel grade 60 in diaphragms, beams, deck slabs	ton		45.00	45.00		$0.00
	08-554-04	Reinforcing steel grade 60 in scour mattress	ton		65.00	65.00		$0.00

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name **Gardez - Khost Road Phase IV - Construction of Bridge #09**

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION		Bill of Quantity (BOQ)-Bridge09			Quantity	Price	
	BoQ Ref. #	Description	UNIT	Civil	Structural	Section 2 Phase IV Construction of Bridge#09	Unit Price	Total Price
Section 556	**Bridge Railing**				-			$0.00
	08-556-01	Concrete Barrier as Bridge Railing, 30 Mpa Structural Concrete	lm		-			$0.00
	08-556-02	Bridge Steel Railing with RC Post	lm		-			$0.00
					-			
Section 559 (Section 07 11 13 & 07 15 53)	**Waterproofing**				-			$0.00
	08-559-01	Waterproofing Membrane	m^2		415.00	415.00		$0.00
	08-559-02	Bituminous Dampproofing	m^2		150.00	150.00		
					-			
Section 564 (Section 07 95 63)	**Bearing Devices**				-			$0.00
	08-564-01	Reinforced Elastomeric Bearings	ea		36.00	36.00		$0.00
					-			$0.00
Section 567	**Subsurface Exploration**				-			$0.00
	08-567-01	Soil Investigation Borings	lm		-			$0.00
	08-567-02	Standard Penetration Testing	tests		-			
	08-567-03	Rock Coring	lm		-			$0.00
	08-567-04	Axial Compressive Testing of Rock Core Samples	each		-			$0.00
	08-567-05	Split Spoon Samples	each		-			$0.00
	08-567-06	Consolidation Test	each		-			$0.00
					-			$0.00
Section 568	**Repair of Bridge Structures**				-			$0.00
	08-568-01	Sealing of Cracks by injection of Epoxy Resin, Conform to AASHTO M 235	m^2		-			$0.00
	08-568-02	Patching of Cracks using Non Shrink Grout, Conform to ASTM C1107	m^2		-			$0.00
					-			$0.00

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name **Gardez - Khost Road Phase IV - Construction of Bridge #09**

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION		Bill of Quantity (BOQ)-Bridge09			Quantity	Price	
	BoQ Ref. #	Description	UNIT	Civil	Structural	Section 2 Phase IV Construction of Bridge#09	Unit Price	Total Price
Division 600-Incidental Construction					-			$0.00
Section 602	**Reinforced Concrete Culverts, mortared joints**				-			$0.00
	08- 602-01	RC_Pipe, Ø 610 mm	lm		-			$0.00
	08- 602-02	RC_Pipe, Ø 1000 mm	lm		-			$0.00
	08- 602-03	RC_Box, 2000x2000 mm	lm		-			$0.00
					-			$0.00
					-			$0.00
Section 607	**Cleaning & Repairing**				-			$0.00
	08-607-03	Cleaning, Reconditioning and Repairing of existing Drainage structure	lm		-			$0.00
Section 608	**Paved Waterways**				-			$0.00
	08-608-01	Type 2_ Class "B" Stone Masonry Lined Ditch A (Trapezoidal)	lm		-			$0.00
Section 620 (Section 32 32 40)	**Stone Masonry**				-			$0.00
	08-620-01	Class "B" _ Retaining Wall, Guardwall, Culvert-Inlet/Outlet Structure, Bed Protection, causeways	m^3	125.00	-	125.00		$0.00
					-			$0.00
Section 633	**Permanent Traffic Control**				-			$0.00
(Section 10 14 01)	08-633-01	Road Signs, Series R/W/I/S, with aluminum panels, retro reflective sheeting type IX, type L-1 letters, galvanized steel posts	ea	3.00	-			$0.00
Section 634 (Section 32 12 16)	**Permanent Pavement Markings**				-			$0.00
	08-634-01	Type "A" Pavement Marking	m^2	157.00	-	157.00		$0.00
Section 638	**Project Information Signages**				-			$0.00
	08-638-01	Project Information Signages	ls		-			$0.00
					-			$0.00
		Total Estimated Cost						

Bill of Quantities Back-up

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name Gardez - Khost Road Phase IV - Construction of Bridge #09

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION BoQ Ref. #	Description	UNIT	Civil
Division 150 - Project Requirements				
Section 151	Mobilization			
	08-151-01	Mobilization	LS	
Section 159	Demining			
	08-159-01	De-mining and Technical survey	m^2	
	08-159-02	Mine Clearance	m^2	
Section 160	Snow Removal			
	08- 160-01	Snow Removal	day	
		Emergency Work	day	
Division 200 - Earthwork				
Section 201 (Section 31 10 00)	Clearing and Grubbing			
	08-201-01	Clearing and Grubbing	ha	
Section 203	Removal of Structure and Obstructions			
	08-203-01	Removal and disposal of existing structure (Retaining wall, Head wall, wing wall, culverts, lined Ditch)	m^3	58.00
	08-203-02	Removal and disposal of existing pavement (asphalt)	m^3	203.00
	08-203-03	Removal and Disposal of Existing PCC Pavement	m^3	
	08-203-04	Removal and Disposal of Existing Bridge	each	
Section 204	Excavation and Embankment			
	08- 204-01	Roadway Excavation	m^3	402.00
	08- 204-02	Bridge Excavation	m^3	
	08- 204-02	River Training Soil Excavation	m^3	
	08- 204-03	Select Topping	m^3	
	08- 204-04	Structural Backfill	m^3	
	08- 204-05	Embankment	m^3	3768.00
	08-204-06	Embankment(Granular material with 0-8% passing 75μm sieve)	m^3	
	08-204-07	Erosion Control	m	429.00
Section 205	Rock Blasting			
(Section 31 20 00)	08-205-01	Rock Excavation (Inclusive of blasting assumed 10% of total bridge excavtion)	m^3	
Division 250- Slope Reinforcement and Retaining wall				
Section 251	Riprap			
	08-251-01	Placed Riprap (at Abutments & Piers 1,500mm thick)	m^3	
	08-251-02	Grouted Riprap	m^3	246.00
Section 253	Gabions and Revet Mattresses			
	08-253-01	Gabions and Revet Mattresses	m^3	
Division 300- Aggregate Course				
Section 301	Untreated Aggregate Course			
	08- 301-01	Crushed Aggregate Base Grad. Des. D, 200 mm Carriageway	m^3	489.00
	08- 301-02	Crushed Aggregate Base Grad. Des. D, 325 mm, Shoulder	m^3	372.00
	08-301-03	Crushed Aggregate Base Grad. Des. D, 300 mm, Side Road	m^3	274.00
	08- 301-05	Crushed Aggregrate for Underdrain and Under Approach Slab	m^3	17.00
Division 400- Asphalt pavement and surface Treatment				

USAID Spec No. (UFGS Spec No.)	ITEM DESCRIPTION BoQ Ref. #	Description	UNIT	Civil
Section 400.3.1	Asphalt Concrete Surface (Wearing Course)			
(Section 32 12 16)	08-400.3.1-01	50 mm Asphalt Concrete Surface (Wearing Course)	m^2	3087.00
Section 400.3.2	Asphalt Concrete Binder Course			
(Section 32 12 16)	08-400.3.2-01	75 mm Asphalt Concrete Binder Course	m^2	2442.00
Section 411	Asphalt Prime Coat			
(Section 32 12 16)	08-411-01	Asphalt Prime Coat	m^2	3230.00
Section 412	Asphalt Tack Coat			
(Section 32 12 16)	08-412-01	Asphalt Tack Coat Emulsified Asphalt	m^2	2526.00
Division 500- Rigid Pavement				
Section 500.1	Rigid Pavements			
	08-501-01	Portland Cement Pavement, 250mm thick (New and patching)	m^2	
Division 550-Bridges and Culverts Construction				
Section 552	Structural Concrete			
	08-552-01	Plain Cement Concrete, Class B (15MPa) below footings	m^3	
	08-552-02	Structural Concrete, Class A (25MPa) for reinforced concrete box culverts, cut-off walls, wing walls, sleeper slabs	m^3	
	08-552-03	Plain Cement Concrete Class B (15MPa) below pier and abutment pile caps and approach slabs	m^3	
	08-552-04	Structural Concrete (27.5MPa) for piers,abutments, Walls, and Approach slabs	m^3	2.00
	08-552-05	Structural Concrete (27.5MPa) for reinforced concrete deck slabs ,beams and diaphragms	m^3	
	08-552-06	Structural Concrete (27.5MPa) for curbs, barriers and sidewalks	m^3	
	08-552-09	Drainage Spouts in Super-structure	each	
	08-552-10	Weep Holes in Abutments and Walls	each	
	08-552-11	Asphaltic Bridge Joints	lm	
	08-552-12	PVC Drain Pipe	lm	30.00
Section 554	Reinforcing Steel			
	08-554-01	Reinforcing steel Grade 60 for abutments, piers, walls and approach slabs	ton	
	08-554-02	Reinforcing steel Grade 60 for Barriers, Curb and Sidewalks	ton	
	08-554-03	Reinforcing steel grade 60 for diaphragms, beams, deck slabs	ton	
Section 556	Bridge Railing			
	08-556-01	Concrete Barrier as Bridge Railing, 30 Mpa Structural Concrete	lm	
	08-556-02	Bridge Steel Railing with RC Post	lm	
Section 559	Waterproofing			
	08-559-01	Waterproofing Membrane	m^2	
	08-559-02	Bituminous Dampproofing	m^2	
Section 564	Bearing Devices			
	08-564-01	Reinforced Elastomeric Bearings	lm	
Section 567	Subsurface Exploration			
	08-567-01	Soil Investigation Borings	lm	
	08-567-02	Standard Penetration Testing	tests	
	08-567-03	Rock Coring	lm	
	08-567-04	Axial Compressive Testing of Rock Core Samples	each	

USAID Spec No.	ITEM DESCRIPTION			
(UFGS Spec No.)	BoQ Ref. #	Description	UNIT	Civil
	08-567-05	Split Spoon Samples	each	
	08-567-06	Consolidation Test	each	
Section 568	Repair of Bridge Structures			
	08-568-01	Sealing of Cracks by injection of Epoxy Resin, Conform to AASHTO M 235	m^2	
	08-568-02	Patching of Cracks using Non Shrink Grout, Conform to ASTM C1107	m^2	
Division 600-Incidental Construction				
Section 602	Reinforced Concrete Culverts, mortared joints			
	08- 602-01	RC_Pipe, Ø 610 mm	lm	
	08- 602-02	RC_Pipe, Ø 1000 mm	lm	
	08- 602-03	RC_Box, 2000x2000 mm	lm	
Section 607	Cleaning & Repairing			
	08-607-03	Cleaning, Reconditioning and Repairing of existing Drainage structure	lm	
Section 608	Paved Waterways			
	08-608-01	Type 2_ Class "B" Stone Masonry Lined Ditch A (Trapezoidal)	lm	
Section 620	Stone Masonry			
	08-620-01	Class "B" _ Retaining Wall, Guardwall, Culvert-Inlet/Outlet Structure, Bed Protection, causeways	m^3	125.00
Section 633	Permanent Traffic Control			
	08-633-01	Road Signs, Series R/W/I/S, with aluminum panels, retro reflective sheeting type IX, type L-1 letters, galvanized steel posts	ea	3.00
Section 634	Permanent Pavement Markings			
	08-634-01	Type "A" Pavement Marking	m^2	157.00
Section 638	Project Information Signages			
	08-638-01	Project Information Signages	ls	
		Total Estimated Cost		

ITEM No. 08-203-01 - REMOAL AND DISPOSAL OF EXISTING STRUCTURE **CU.M.**

Station	Description	Depth (m)	Area (sq.m.)	Volume (cu.m.)
49+995.68 - 50+011.93 LT	Slope Protection	0.30	27.40	8.2
50+057.72 - 50+067.88 LT	Slope Protection	0.30	15.97	4.8
50+055.14 - 50+063.15 RT	Slope Protection	0.30	4.69	1.4
50+059.60 - 50+083.40 RT	Concrete Barrier	1.00	13.00	13
50+063.51 - 50+078.02 LT	Concrete Barrier	1.00	7.85	7.9
50+166.80 - 50+178.66 LT	Concrete Barrier	1.00	7.23	7.2
50+192.42 - 50+210.32 LT	Concrete Barrier	1.00	12.47	12.5

Subtotal	55	cu.m.
Contingency (5%)	2.8	cu.m.
Total for Item	57.8	cu.m.

SAY **58** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 1 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-203-02 - REMOAL AND DISPOSAL OF EXISTING PAVEMENT **CU.M.**

Station	Description	Area (sq.m.)	Thickness (m)	Volume (cu.m.)
50+057.22 - 50+240.00	Pavement Limits	1543.14	0.125	192.9

Subtotal	192.9	cu.m.
Contingency (5%)	9.6	cu.m.
Total for Item	202.5	cu.m.

SAY **203** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 2 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-204-01 - Roadway Excavation **CU.M.**

(See Attached Cut-Fill Estimate)

Subtotal	382.9	cu.m.
Contingency (5%)	19.1	cu.m.
Total for Item	402	cu.m.

SAY **402** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 3 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-204-05 - Embankment **CU.M.**

(See Attached Cut-Fill Estimate)

Subtotal	3588.00	cu.m.
Contingency (5%)	179.4	cu.m.
Total for Item	3767.4	cu.m.

SAY **3768** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 4 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-204-07 - EROSION CONTROL **LM**

Station	Description	Length (LM)	
49+896 - 50+008 RT	Erosion Control West of Bridge RT	112.00	112.000
49+868.26 - 49+979.28 LT	Erosion Control West of Bridge LT	111.00	111.020
49+992.50 - 50+008 LT	Erosion Control West of Bridge LT	15.50	15.500
50+070 - 50+240 RT LT	Erosion Control East of Bridge LT	170.00	170.000

Subtotal	408.50	LM
Contingency (5%)	20.4	LM
Total for Item	428.9	LM

SAY **429** **LM**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 5 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-251-02 - GROUTED RIP RAP **CU.M.**

Station	Description	Area (sq.m.)	Width (m)	Volume (cu.m.)
50+000 - 50+014	Slope Protection-Left			34.32
50+002 - 50+013	Slope Protection-Right			20.76
50+065.00 - 50+150.00	Slope Protection-Left			169.8
50+051	SW corner of conc. Pad	29.41	0.3	8.823

(Calculated from Cross Sections)

Subtotal	233.703	cu.m.
Contingency (5%)	11.7	cu.m.
Total for Item	245.403	cu.m.

SAY **246** **CU.M.**

ITEM No. 08-301-01 - CRUSHED AGGREGATE BASE GRAD. DES, 200mm CARRIAGEWAY **CU.M.**

Station	Description	Area (sq.m.)	Thickness (m)	Volume (cu.m.)
49+868.26 - 50+013.28	Pavement Limits	1127.267	0.200	225.5
50+064.65 - 50+240.00	Pavement Limits	1197.878	0.200	239.6

(Areas from AutoCAD)
(Including paved portion of access road)

Subtotal	465.1	cu.m.
Contingency (5%)	23.3	cu.m.
Total for Item	488.4	cu.m.

SAY **489** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 7 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-301-02 - CRUSHED AGGREGATE BASE GRAD. DES, 325mm SHOULDER **CU.M.**

Station	Description	Area (sq.m.)	Thickness (m)	Volume (cu.m.)
49+868.26 - 50+013.28	Pavement Limits			216.6
50+064.65 - 50+240.00	Pavement Limits			137.5

(Calculated from cross-sections)

Subtotal	354.1	cu.m.
Contingency (5%)	17.7	cu.m.
Total for Item	371.8	cu.m.

SAY **372** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 8 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-301-03 - CRUSHED AGGREGATE BASE GRAD. DES, 300mm SIDE ROAD **CU.M.**

Station	Description			Volume (cu.m.)
49+978.092	Side Road			260.83

(Calculated from Cross Sections)

Subtotal	260.83	cu.m.
Contingency (5%)	13	cu.m.
Total for Item	273.83	cu.m.

SAY **274** **CU.M.**

TETRA TECH
One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 9 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-301-05 - CRUSHED AGGREGATE FOR UNDERDRAIN AND UNDER APPROACH SLAB **CU.M.**

Station	Description			Volume (cu.m.)
50+012.6	Underdrain			2.04
50+065.4	Underdrain			2.04
50+012.6	Approach Slab			6
50+065.4	Approach Slab			6

(Calculated from Cross Sections)

Subtotal	16.08	cu.m.
Contingency (5%)	0.8	cu.m.
Total for Item	16.88	cu.m.

SAY **17** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9

SHEET NO. 10 OF 19

CALCULATED BY: ANF DATE: 3/28/2014

CHECKED BY: JKM DATE:

ITEM No. 08-400.3.1-01 - 50mm ASPHALT CONCRETE SURFACE (WEARING COUSRE) **SQ.M.**

Station	Description			Area (sq.m.)
49+868.26 - 50+240.00	Pavement Limits			2939.916

(goes over bridge, carriageway only)
(Including paved portion of access road)
(Area from AutoCAD)

Subtotal	2939.916	sq.m.
Contingency (5%)	147	sq.m.
Total for Item	3086.916	sq.m.

SAY **3087** **SQ.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO.	127-1298-12001-LT0077-Bridge No. 9		
SHEET NO.	11	OF	19
CALCULATED BY:	ANF	DATE:	3/28/2014
CHECKED BY:	JKM	DATE:	

ITEM No. 08-400.3.2-01 - 75mm ASPHALT CONCRETE BINDER COURSE **SQ.M.**

Station	Description			Area (sq.m.)
49+868.26 - 50+013.28	Pavement Limits			1127.267
50+064.65 - 50+240.00	Pavement Limits			1197.878

Subtotal	2325.145	sq.m.
Contingency (5%)	116.3	sq.m.
Total for Item	2441.445	sq.m.

(does not go over bridge, carriageway only)
(Including paved portion of access road)
(Not over approach slab)
(Areas from AutoCAD)

SAY **2442** **SQ.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 12 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-411-01 - ASPHALT PRIME COAT **SQ.M.**

Station	Description			Area (sq.m.)
49+868.26 - 50+013.28	Pavement Limits			1462.639
50+064.65 - 50+240.00	Pavement Limits			1612.706

(does not go over bridge, carriageway + shoulder)
(Including paved portion of access road)
(Areas from AutoCAD)

Subtotal	3075.345	sq.m.
Contingency (5%)	153.8	sq.m.
Total for Item	3229.145	sq.m.

SAY **3230** **SQ.M.**

TETRA TECH
One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 13 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-412-01 - 75mm ASPHALT TACK COAT EMULSIFIED ASPHALT **SQ.M.**

Station	Description			Area (sq.m.)
49+868.26 - 50+013.28	Pavement Limits			1167.267
50+064.65 - 50+240.00	Pavement Limits			1237.878

(does not go over bridge, carriageway only)
(Including paved portion of access road)
(Areas from AutoCAD)

Subtotal	2405.145	sq.m.
Contingency (5%)	120.3	sq.m.
Total for Item	2525.445	sq.m.

SAY **2526** **SQ.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 14 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-552-04 STRUCTURAL CONCRETE (27.5 Mpa) **CU.M.**

Description	Length (m)	Width (m)	Height (m)	Quantity	Volume (cu.m.)
Signs Posts	0.7	0.3	0.3	3	0.2
Curbs	2	0.250	0.45	4	0.9

Subtotal	1.1	cu.m.
Contingency (5%)	0.1	cu.m.
Total for Item	1.2	cu.m.

SAY **2** **CU.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO.	127-1298-12001-LT0077-Bridge No. 9		
SHEET NO.	15	OF	19
CALCULATED BY:	ANF	DATE:	3/28/2014
CHECKED BY:	JKM	DATE:	

ITEM No. 08-552-12 PVC Drain Pipe **LM**

Station	Description			Length (lm)
50+012.6	Drain Pipe			14
50+065.4	Drain Pipe			14

Subtotal	28	lm
Contingency (5%)	1.4	lm
Total for Item	29.4	lm

SAY **30** **LM**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 16 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-620-01 STONE MASONRY **CU.M.**

Station	Description	Length (m)	Width (m)	Height (m)	Volume (cu.m.)
50+000 - 50+013.06 LT	Guardwall	13.722	0.5	1.625	11.1
49+990 - 50+013.06 RT	Guardwall	21.822	0.5	1.625	17.7
50+064.9 - 50+150 LT	Guardwall	85.368	0.5	1.625	69.4
50+064.9 - 50+090 RT	Guardwall	24.828	0.5	1.625	20.2

Subtotal	118.4	cu.m.
Contingency (5%)	5.9	cu.m.
Total for Item	124.3	cu.m.

SAY **125** **CU.M.**

TETRA TECH
One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9
SHEET NO. 17 OF 19
CALCULATED BY: ANF DATE: 3/28/2014
CHECKED BY: JKM DATE:

ITEM No. 08-633-01 Signs **EA**

Station	Description	Quantity (Each)
Side Road (49+978.092 LT)	R1-1 Sign	1
50+090 LT	DW-6i Sign	1
50+140 LT	DW-1 Sign	1

Total:	3	EA

SAY **3** **EA**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9

SHEET NO. 18 OF 19

CALCULATED BY: ANF DATE: 3/28/2014

CHECKED BY: JKM DATE:

ITEM No. 08-634-01- TYPE "A" PAVEMENT MARKING **SQ.M.**

Station	Description	Length (m)	Width (m)	Area (Sq.m.)
49+868.26 - 50+240.00	Double Centerline	371.74	0.200	74.348
49+868.26 - 49+978.34	Left Edgeline: Solid	110.08	0.100	11.008
49+978.34 - 49+992.50	Left Edgeline: Dashed	14.16	0.100	1.416
49+992.50 - 50+240.00	Left Edgeline: Solid	247.5	0.100	24.75
49+868.26 - 50+240.00	Right Edgeline: Solid	371.74	0.100	37.174

Subtotal	148.696	sq.m.
Contingency (5%)	7.4	sq.m.
Total for Item	156.096	sq.m.

SAY **157** **SQ.M.**

TETRA TECH

One Grant Street
Framingham, MA 01703-9005
(508) 903-2000

JOB NO. 127-1298-12001-LT0077-Bridge No. 9

SHEET NO. 20 OF 19

CALCULATED BY: ANF DATE: 3/28/2014

CHECKED BY: JKM DATE:

CUT FILL ESTIMATIONS

	CUT							FILL						
STATION	X-SEC AREA LEFT (m^2)	X-SEC AREA RIGHT (m^2)	AVG. AREA LEFT (m^2)	AVG. AREA RIGHT (m^2)	CUT QUANTITY LEFT (m^3)	CUT QUANTITY RIGHT (m^3)	CUT QUANTITY TOTAL (m^3)	X-SEC AREA LEFT (m^2)	X-SEC AREA RIGHT (m^2)	AVG. AREA LEFT (m^2)	AVG. AREA RIGHT (m^2)	FILL QUANTITY LEFT (m^3)	FILL QUANTITY RIGHT (m^3)	FILL QUANTITY TOTAL (m^3)
49+868	0.000	0.000						0.000	0.000					
			1.377	1.447	16.518	17.364	33.882			0.000	0.000	0.000	0.000	0.000
49+880	2.753	2.894						0.000	0.000					
			2.436	3.837	48.710	76.730	125.440			0.000	0.000	0.000	0.000	0.000
49+900	2.118	4.779						0.000	0.000					
			1.366	3.283	27.310	65.650	92.960			0.049	0.000	0.970	0.000	0.970
49+920	0.613	1.786						0.097	0.000					
			0.307	0.928	6.130	18.550	24.680			1.725	0.415	34.500	8.290	42.790
49+940	0.000	0.069						3.353	0.829					
			0.000	0.035	0.000	0.690	0.690			12.533	2.851	250.650	57.010	307.660
49+960	0.000	0.000						21.712	4.872					
			0.000	0.000	0.000	0.000	0.000			24.323	7.857	486.460	157.130	643.590
49+980	0.000	0.000						26.934	10.841					
			0.000	0.000	0.000	0.000	0.000			17.539	10.616	350.780	212.320	563.100
50+000	0.000	0.000						8.144	10.391					
50+080	0.000	0.000						12.563	13.974					
			0.0	0.0	0.0	0.0	0.0			11.3	14.2	226.7	283.6	510.4
50+100	0.000	0.000						10.108	14.390					
			0.0	0.0	0.0	0.0	0.0			8.9	13.0	178.1	259.2	437.3
50+120	0.000	0.000						7.702	11.531					
			0.0	0.0	0.0	0.0	0.0			7.2	10.3	143.8	205.4	349.2
50+140	0.000	0.000						6.678	9.007					
			0.0	0.0	0.0	0.0	0.0			6.2	7.2	124.0	144.3	268.3
50+160	0.000	0.000						5.726	5.421					
			0.0	0.0	0.0	0.0	0.0			3.4	3.9	68.6	78.5	147.1
50+180	0.000	0.000						1.136	2.430					
			0.6	0.2	11.2	3.7	15.0			0.7	1.5	14.3	30.1	44.4
50+200	1.124	0.371						0.298	0.577					
			1.0	0.8	20.6	16.9	37.5			0.2	0.3	4.8	5.8	10.5
50+220	0.934	1.321						0.179	0.000					
			1.2	1.5	23.1	29.7	52.8			0.1	0.0	1.8	0.0	1.8
50+240	1.375	1.652												
Side Road														260.883
				TOTAL	**153.6**	**229.3**	**382.9**				**TOTAL**	**1,885.5**	**1,441.6**	**3,588.0**

Gardez-Khost Road Project

Section 2 --- Km 27+000 to 65+000

Project Name — Gardez - Khost Road Phase IV - Construction of Bridge #09

USAID Spec No.	ITEM DESCRIPTION			
(UFGS Spec No.)	BoQ Ref. #	Description	UNIT	Structural
Division 150 - Project Requirements				
Section 151	Mobilization			
	08-151-01	Mobilization	LS	
Section 159	Demining			
	08-159-01	De-mining and Technical survey	m^2	
	08-159-02	Mine Clearance	m^2	
Section 160	Snow Removal			
	08- 160-01	Snow Removal	day	
		Emergency Work	day	
Division 200 - Earthwork				
Section 201 (Section 31 10 00)	Clearing and Grubbing			
	08-201-01	Clearing and Grubbing	ha	
Section 203 (Section 02 41 19)	Removal of Structure and Obstructions			
	08-203-01	Removal and disposal of existing structure (Retaining wall, Head wall, wing wall, culverts, lined Ditch)	m^3	
	08-203-02	Removal and disposal of existing pavement (asphalt)	m^3	
	08-203-03	Removal and Disposal of Existing PCC Pavement	m^3	
	08-203-04	Removal and Disposal of Existing Bridge	each	1.00
Section 204 (Section 31 20 00, 31 23 19, 31 25 00, & 31 52 13)	Excavation and Embankment			
	08- 204-01	Roadway Excavation	m^3	
	08- 204-02	Bridge Excavation	m^3	8,650.00
	08- 204-02	River Training Soil Excavation	m^3	
	08- 204-03	Select Topping	m^3	
	08- 204-04	Structural Backfill	m^3	6,525.00
	08- 204-05	Embankment	m^3	
	08-204-06	Embankment(Granular material with 0-8% passing 75µm sieve)	m^3	
	08-204-07	Erosion Control	m	
	08-204-08	Cofferdam (Control/Diversion of Water)	LS	1.00
Section 205	Rock Blasting			
(Section 31 20 00)	08-205-01	Rock Excavation (Inclusive of blasting assumed 10% of total bridge excavtion)	m^3	975.00
Division 250- Slope Reinforcement and Retaining wall				
Section 251 (Section 31 37 00)	Riprap			
	08-251-01	Placed Riprap (at walls, allowance)	m^3	10.00
	08-251-02	Grouted Riprap	m^3	
Section 253	Gabions and Revet Mattresses			
	08-253-01	Gabions and Revet Mattresses	m^3	
Division 300- Aggregate Course				
Section 301 (Section 32 12 16)	Untreated Aggregate Course			
	08- 301-01	Crushed Aggregate Base Grad. Des. D, 200 mm Carriageway	m3	
	08- 301-02	Crushed Aggregate Base Grad. Des. D, 325 mm, Shoulder	m3	
	08-301-03	Crushed Aggregate Base Grad. Des. D, 300 mm, Side Road	m3	
	08- 301-05	Stone Aggregate for Catch Trench, 75 mm (max.)	m3	
Division 400- Asphalt pavement and surface Treatment				

Section 400.3.1	Asphalt Concrete Surface (Wearing Course)			
(Section 32 12 16)	08-400.3.1-01	50 mm Asphalt Concrete Surface (Wearing Course)	m^2	
Section 400.3.2	Asphalt Concrete Binder Course			
(Section 32 12 16)	08-400.3.2-01	75 mm Asphalt Concrete Binder Course	m^2	
Section 411	Asphalt Prime Coat			
(Section 32 12 16)	08-411-01	Asphalt Prime Coat	m^2	
Section 412	Asphalt Tack Coat			
(Section 32 12 16)	08-412-01	Asphalt Tack Coat Emulsified Asphalt	m^2	
Division 500- Rigid Pavement				
Section 500.1	Rigid Pavements			
	08-501-01	Portland Cement Pavement, 250mm thick (New and patching)	m^2	
Division 550-Bridges and Culverts Construction				
Section 552 (Section 03 30 00 & 07 95 65)	Structural Concrete			
	08-552-01	Plain Cement Concrete, Class B (15MPa) below footings	m^3	50.00
	08-552-02	Structural Concrete, Class A (25MPa) for reinforced concrete box culverts, cut-off walls, wing walls, sleeper slabs	m^3	
	08-552-03	Plain Cement Concrete Class B (15MPa) below pier and abutment pile caps and approach slabs	m^3	
	08-552-04	Structural Concrete (27.5MPa) for piers,abutments, Walls, and Approach slabs	m^3	1,410.00
	08-552-05	Structural Concrete (27.5MPa) for reinforced concrete deck slabs ,beams and diaphragms	m^3	450.00
	08-552-06	Structural Concrete (27.5MPa) for curbs, barriers and sidewalks	m^3	70.00
	08-552-07	Structural Concrete (27.5MPa) for scour mattress	m^3	625.00
	08-552-08	Scuppers	each	6.00
	08-552-09	Weep Holes in Abutments and Walls	each	16.00
	08-552-10	Strip Seal Joint System	lm	40.00
Section 554 (Section 03 30 00)	Reinforcing Steel			
	08-554-01	Reinforcing steel Grade 60 for abutments, piers, walls and approach slabs	ton	100.00
	08-554-02	Reinforcing steel Grade 60 for Barriers, Curb and Sidewalks	ton	10.00
	08-554-03	Reinforcing steel grade 60 for diaphragms, beams, deck slabs	ton	45.00
	08-554-04	Reinforcing steel grade 60 in scour mattress	ton	65.00
Section 556	Bridge Railing			
	08-556-01	Concrete Barrier as Bridge Railing, 30 Mpa Structural Concrete	lm	
	08-556-02	Bridge Steel Railing with RC Post	lm	
Section 559 (Section 07 11 13 & 07 15 53)	Waterproofing			
	08-559-01	Waterproofing Membrane	m^2	415.00
	08-559-02	Bituminous Dampproofing	m^2	150.00
Section 564 (Section 07 95 63)	Bearing Devices			
	08-564-01	Reinforced Elastomeric Bearings	ea	36.00
Section 567	Subsurface Exploration			
	08-567-01	Soil Investigation Borings	lm	
	08-567-02	Standard Penetration Testing	tests	
	08-567-03	Rock Coring	lm	
	08-567-04	Axial Compressive Testing of Rock Core Samples	each	
	08-567-05	Split Spoon Samples	each	

	08-567-06	Consolidation Test	each	
Section 568	Repair of Bridge Structures			
	08-568-01	Sealing of Cracks by injection of Epoxy Resin, Conform to AASHTO M 235	m^2	
	08-568-02	Patching of Cracks using Non Shrink Grout, Conform to ASTM C1107	m^2	
Division 600-Incidental Construction				
Section 602	Reinforced Concrete Culverts, mortared joints			
	08- 602-01	RC_Pipe, Ø 610 mm	lm	
	08- 602-02	RC_Pipe, Ø 1000 mm	lm	
	08- 602-03	RC_Box, 2000x2000 mm	lm	
Section 607	Cleaning & Repairing			
	08-607-03	Cleaning, Reconditioning and Repairing of existing Drainage structure	lm	
Section 608	Paved Waterways			
	08-608-01	Type 2_ Class "B" Stone Masonry Lined Ditch A (Trapezoidal)	lm	
Section 620 (Section 32 32 40)	Stone Masonry			
	08-620-01	Class "B" _ Retaining Wall, Guardwall, Culvert-Inlet/Outlet Structure, Bed Protection, causeways	m^3	
Section 633	Permanent Traffic Control			
	08-633-01	Road Signs, Series R/W/I/S, with aluminum panels, retro reflective sheeting type IX, type L-1 letters, galvanized steel posts	ea	
Section 634 (Section 32 12 16)	Permanent Pavement Markings			
	08-634-01	Type "A" Pavement Marking	m^2	
Section 638	Project Information Signages			
	08-638-01	Project Information Signages	ls	
		Total Estimated Cost		

Reinforced Concrete Beams Quantities

Loading HL93

Bridge Length =	50.4	m
Span Length =	16.8	m
No. of Spans =	3	

Concrete	Length (m)	Width (m)	Height (m)	Volume (m^3)	Qty	Total Volume (m^3)	
Abutments							
Abutment Footing	13.45	7.00	1.50	141.23	2	282.45	
Abutment Stem - East	10.95	1.40	6.01	92.15	1	92.15	
Abutment Stem - West	10.95	1.40	5.80	88.91	1	88.91	
Abutment Backwall	10.05	0.45	1.55	7.01	2	14.02	
Abutment Batter - East	10.95	1.60	6.01	52.66	1	52.66	
Abutment Batter - West	10.95	1.60	5.80	50.81	1	50.81	
Abutment Keeper Block	1.40	0.45	4.50	2.84	4	11.34	
Approach Slab	5.00	10.95	0.30	16.43	2	32.85	
Approach Slab Support	10.95	1.39		15.27	2	30.54	<--- Area taken from CAD
Abutment Totals				452.02		655.73	
Piers							
Pier Footing	13.45	5.60	1.50	112.98	2	225.96	
Pier Stem	11.40	1.50	7.70	131.67	2	263.34	
Pier Ends	0.75	0.75	9.83	5.53	4	22.11	
Pier Keeper	0.45	1.50	1.50	1.01	4	4.05	
Pier Totals				251.19		515.46	
Superstructure							
Beam	16.80	0.60	1.50	15.12	18	272.16	
End Diaphragm	1.25	0.75	1.50	1.41	10	14.06	
Pier Diaphragm	1.25	1.20	1.50	2.25	10	22.50	
Interior Diaphagm	1.25	0.30	1.50	0.56	15	8.44	
Deck	50.40	10.95	0.23	124.17	1	124.17	= 441.33 CM
Barrier	50.40	0.23	1.40	15.88	2	31.75	
Sidewalk	50.40	1.20	0.28	16.63	2	33.26	= 65.02 CM
Superstructure Totals						506.35	
Walls (Calculated using avg widths and avg heights)							
Wall Stem - Southwest	7.74	0.85	7.01	46.12	1	46.12	
Wall Stem - Northwest	7.00	0.85	6.26	37.25	1	37.25	
Wall Stem - Northeast	7.00	0.85	6.37	37.90	1	37.90	
Wall Stem - Southeast	3.50	0.85	7.79	23.18	1	23.18	
Wall Footing - Southwest	7.74	4.50	1.00	17.42	1	17.42	
Wall Footing - Northwest	7.00	4.50	1.00	15.75	1	15.75	
Wall Footing - Northeast	7.00	4.50	1.00	31.50	1	31.50	
Wall Footing - Southeast	3.50	4.50	1.00	15.75	1	15.75	
Wall Totals						224.86	
Concrete Apron Concrete							
Concrete Apron Concrete				625.00	1	625.00	
Concrete Apron Concrete						625.00	
Concrete Totals						2527	
Say --->						2555	m^3

Plain Concrete Class B (15Mpa) Lean Concrete below Footings	Length m	Width m	Height m	Volume m^3	Qty	Total Volume m^3
Abutment	13.45	7.00	0.10	9.42	2	18.83
Pier	13.45	5.60	0.10	7.53	2	15.06
Southwest Wall	7.74	4.50	0.10	3.48	1	3.48
Northwest	7.00	4.50	0.10	3.15	1	3.15
Northeast	7.00	4.50	0.10	3.15	1	3.15
Southeast	3.50	4.50	0.10	1.58	1	1.58
Total						45.25
Say -->						50

	Totals (Without Contingency)	
Substructure Concrete Totals	1171 Cubic Meter, -->	Say 1180
Deck Beams & Diaphgrams Concrete Totals	441 Cubic Meter, -->	Say 450
Barrier & Sidewalks Concrete Totals	65 Cubic Meter, -->	Say 70
Wall Concrete Totals	225 Cubic Meter, -->	Say 230
Piers, Abutments, Walls, Approach Slab Concrete Totals	1396 Cubic Meter, -->	Say 1410
Concrete Apron Totals	625 Cubic Meter, -->	Say 625
Total Concrete	2527 Cubic Meter, -->	Say 2555
Total Plain Concrete	45 Cubic Meter, -->	Say 50

Reinforcement Steel	Volume (m^3)	Volume (cy)	#Steel/ cy Conc	Steel (lbs)	Qty	Total Steel (lbs)			Totals (Without Contingency)	
Abutments										
Abutment Footing	141.23	184.72	120	22165.83	2	44331.66				
Abutment Stem - East	92.15	120.53	100	12052.58	1	12052.58				
Abutment Stem - West	88.91	116.30	100	11629.51	1	11629.51				
Abutment Backwall	7.01	9.17	150	1375.28	2	2750.57				
Abutment Batter - East	52.66	68.87	100	6887.19	1	6887.19				
Abutment Batter - West	50.81	66.45	100	6645.43	1	6645.43				
Abutment Keeper Block	2.84	3.71	150	556.21	4	2224.82				
Approach Slab	16.43	21.48	150	3222.46	2	6444.92				
Approach Slab Support	15.27	19.97	150	2995.80	3	8987.41				
Abutment Totals						101954.09	= 46246 kg			
Piers										
Pier Footing	112.98	147.77	120	17732.66	2	35465.33				
Pier Stem	131.67	172.22	100	17221.78	2	34443.56				
Pier Ends	5.53	7.23	150	1084.38	4	4337.52				
Pier Keeper	1.01	1.32	150	198.64	4	794.58				
Pier Totals						75040.98	= 34038 kg	Substructure Reinforcement Totals	80.3 Metric Tons, -->	Say 85
Superstructure										
Beam	15.12	19.78	150	2966.43	18	53395.75				
End Diaphragm	1.41	1.84	150	275.90	10	2758.96				
Pier Diaphragm	2.25	2.94	150	441.43	10	4414.33				
Interior Diaphagm	0.56	0.74	150	110.36	15	1655.37				
Deck	124.17	162.41	200	32482.42	1	32482.42	= 42958 kg	Deck, Beams & Diaphgrams Reinforcement Totals	43.0 Metric Tons, -->	Say 45
Barrier	15.88	20.77	150	3114.75	2	6229.50				
Sidewalk + Curb	16.63	21.75	150	3263.07	2	6526.15	= 5786 kg	Barrier & Sidewalks Reinforcement Totals	5.8 Metric Tons, -->	Say 10
Superstructure Totals						107462.48				
Walls (Calculated using avg widths and avg heights)										
Wall Stem - Southwest	46.12	60.32	100	6032.11	1	6032.11				
Wall Stem - Northwest	37.25	48.72	100	4871.72	1	4871.72				
Wall Stem - Northeast	37.90	49.57	100	4957.33	1	4957.33				
Wall Stem - Southeast	23.18	30.31	100	3031.21	1	3031.21				
Wall Footing - Southwest	17.42	22.78	120	2733.35	1	2733.35				
Wall Footing - Northwest	15.75	20.60	120	2472.03	1	2472.03				
Wall Footing - Northeast	31.50	41.20	120	4944.05	1	4944.05				
Wall Footing - Southeast	15.75	20.60	120	2472.03	1	2472.03				
Wall Totals						31513.82	= 14294 kg	Wall Reinforcement Totals	14.3 Metric Tons, -->	Say 15
Concrete Apron Concrete								Piers, Abutments, Walls, Approach Slab Reinforcement Totals	94.6 Metric Tons, -->	Say 100
Concrete Apron Concrete	625.00	817.47	175	143057.03	1	143057.03				
Concrete Apron Concrete						143057.03	= 64890 kg	Concrete Apron Totals	64.9 Metric Tons, -->	Say 65
Steel Totals						459028.40	lbs			
Steel Totals						208212	kg			
Say --->						209000	kg			
Steel Totals						208	Metric Tons	Reinforcement Totals	208212 Kg, -->	Say 209000
Say --->						220	Metric Tons	Reinforcement Totals	208.2 Metric Tons, -->	Say 220

Excavation	Length (m)	Width (m)	Top Length (m)	Top Width (m)	Height (m)	Volume (m^3)	Qty	Total Volume (m^3)			Totals (Without Contingency)	
Substructure												
Abutment	14.05	7.60	23.85	18.95	4.90	916.89	2	1833.77				
Pier	14.05	6.20	22.75	14.90	4.35	926.73	2	1853.47		Soil Exc. (90%)	3319 Cubic Meter, -->	Say 3400
Abutment & Pier Excavation								3687.24	m^3	Rock Exc. (10%)	369 Cubic Meter, -->	Say 375
Wall - Southwest	8.34	5.10			4.20	178.83	1	178.83				
Wall - Northwest	7.60	5.10			4.98	192.99	1	192.99				
Wall - Northeast	7.60	5.10			6.79	263.14	1	263.14				
Wall - Southeast	4.10	5.10			8.16	170.60	1	170.60		Soil Exc. (90%)	725 Cubic Meter, -->	Say 750
Wall Excavation								805.55	m^3	Rock Exc. (10%)	81 Cubic Meter, -->	Say 100
Apron Excavation (North)	69.63		Area =	35.00		2436.98	1	2436.98				
Apron Excavation (South)	67.33		Area =	35.00		2356.59	1	2356.59		Soil Exc. (90%)	4314 Cubic Meter, -->	Say 4500
Apron Excavation								4793.57	m^3	Rock Exc. (10%)	479 Cubic Meter, -->	Say 500
Excavation Totals								9286	m^3			
Say --->								9625	m^3	Excavation Totals	9286 Cubic Meter, -->	Say 9625
Soil Excavation Totals								4044	m^3			
Say --->								8650	m^3	Soil Excavation Totals	8358 Cubic Meter, -->	Say 8650
Rock Excavation Totals								449	m^3			
Say --->								975	m^3	Rock Excavation Totals	929 Cubic Meter, -->	Say 975
Backfill	**Bot Length (m)**	**Bot Width (m)**	**Top Length (m)**	**Top Width (m)**	**Height (m)**	**Volume (m^3)**	**Qty**	**Total Volume (m^3)**				
Abutment												
Abutment Backfill Area (total)	14.05	7.60	26.42	20.24	6.19	1983.49	2	3966.99				
Abutment Concrete Volume						-581.00	1	-581.00				
Abutment Totals (plus 25% compaction)						1402.50		4232.49		Backfill Abutment	4232 Cubic Meter, -->	Say 4300
Abutment Rip Rap	19.40	9.50	11.40	1.50	1.50	-250.80	0	0.00		Rip Rap Abutment	0 Cubic Meter, -->	Say 0
Abutment Scour Apron Backfill												
Abutment (West)	13.45			Area (from CAD) =	10.45	140.50	1	140.50				
Abutment (East)	13.45			Area (from CAD) =	11.35	152.66	1	152.66				
Total Abutment Scour Apron Backfill								293.16		Backfill Apron @ Abutment	293 Cubic Meter, -->	Say 300
Pier												
Pier Excavation Area (total)	14.05	6.20	22.75	14.90	4.35	926.73	2	1853.47				
Pier Footing			13.45	5.60	1.50	-112.98	2	-225.96		Backfill Pier	1530 Cubic Meter, -->	Say 1550
Pier Stem			11.40	1.50	2.85	-48.74	2	-97.47		Rip Rap Pier	0 Cubic Meter, -->	Say 0
Pier Rip Rap								0.00				
Pier Totals						765.02		1530.04				
Wall Backfill				**Area m^2**	**Length m**	**Volume m^3**	**Qty**	**Total Volume (m^3)**				
Walls (Areas from CAD)												
Southwest	Heel - Soil			37.82	2.2	83.20	1	83.20				
Northwest	Heel - Soil			30.36	2.2	66.78	1	66.78				
Northeast	Heel - Soil			31.29	2.2	68.85	1	68.85				
Southeast	Heel - Soil			26.74	2.2	58.83	1	58.83				
Southwest	Toe - Soil			9.70	0.6	5.82	1	5.82				
Northwest	Toe - Soil			8.85	0.6	5.31	1	5.31				
Northeast	Toe - Soil			9.89	0.6	5.94	1	5.94				
Southeast	Toe - Soil			7.00	0.6	4.20	1	4.20				
Wall Backfill Totals								298.93				
Wall Backfill Total + 25% Compaction								373.66		Backfill Wall Totals	374 Cubic Meter, -->	Say 375
Southwest	Toe - Riprap			8.14	0.6	4.88	0	0.00				
Northwest	Toe - Riprap			13.09	0.6	7.86	0	0.00				
Northeast	Toe - Riprap			15.65	0.6	9.39	0	0.00				
Southeast	Toe - Riprap			23.52	0.6	14.11	0	0.00				
Wall Riprap Totals (for allowance ONLY)								10.00		Riprap Wall Totals	10 Cubic Meter, -->	Say 10
Backfill Totals								6136		Backfill total	6136 Cubic Meter, -->	Say 6525
Say --->								6525	m^3			
RiprapTotals								10				
Say --->								10	m^3	Rip Rap Total	10 Cubic Meter, -->	Say 10

Elastomeric Bearing Pads	# of Spans	Beams Per Span	Bearings Per Beam	Total Qty (#)	
Abutment and Piers					
Elastomeric Bearings	3.00	6.00	2.00	36	
Elastomeric Bearing Pad Totals				36	Ea
Say --->				36	Ea

Strip Seal Joint	Lane Width (m)	Number of Lanes	# Of Joints	Total Joint Length (m)	
Abutment and Piers					
Strip Seal Joint	4.05	2.00	4.00	32.4	
Asphaltic Bridge Joint Totals				32	m
Say --->				40	m

Bituminous Dampproofing	Length (m)	Height (m)	Area (m^2)	Qty	Total Area (m^2)	
Abutments						
Behind Abutment Stem	10.95	6.01	65.82	2	131.64	
			90.82		131.64	
Bituminous Damp-proofing Totals					132	m^2
Say --->					150	m^2

Wearing Surface & Membrane Waterproofing	Length (m)	Width (m)	Area (m^2)	Qty	Total Area (m^2)	
Roadway						
Asphalt Paving (50mm thick)	50.40	8.10	408.24	1	408.24	
Total			408.24		408.24	
Wearing Surface & Membrane Waterproofing Totals					408	m^2
Say --->					415	m^2

Weep Holes	# per Wall	Qty	Total Area (m^2)	
Abutments				
Weep Holes	4	2	8.00	
Abutment Totals	4		8.00	
Walls				
Weep Holes - Southwest	2	1	2.00	
Weep Holes - Northwest	2	1	2.00	
Weep Holes - Northeast	2	1	2.00	
Weep Holes - Southeast	2	1	2.00	
Wall Totals	2		8.00	
Weep Hole Totals			16	m^3
Say --->			16	m^3

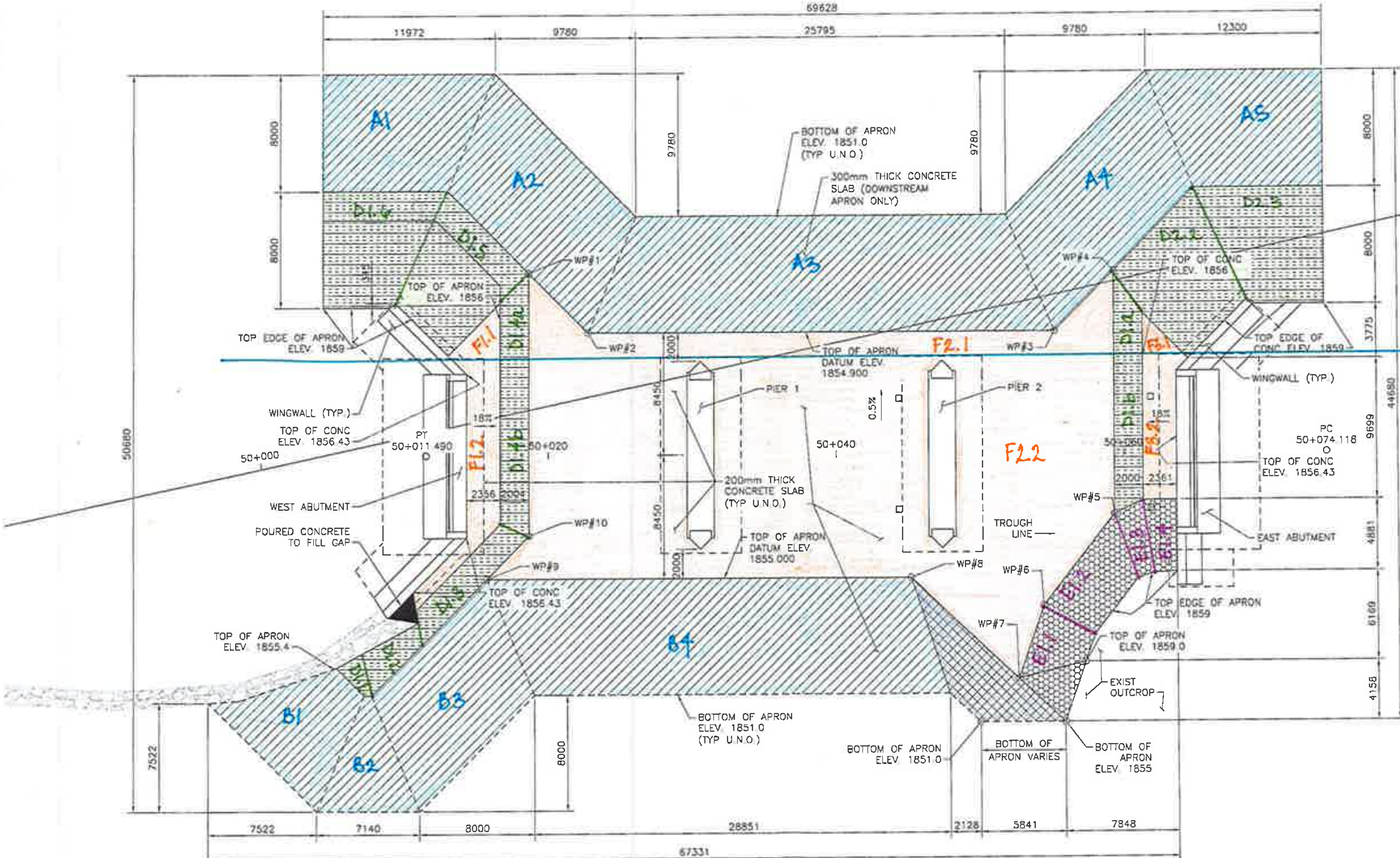
Scuppers	No Spouts / Each Side Span	No of Sides	No of Spans	Qty	No of Drainage Spouts
Scuppers	1.00	2.00	3.00	6	6.00
Total					6.00
Say -->					6

Cofferdam (Control/Diversion of Water)				QTY	
Cofferdam (Control/Diversion of Water)					
Cofferdam (Control/Diversion of Water)				1	
Cofferdam Totals				1	LS
Say --->				1	LS

EXCAVATION & BACKFILL TAKE-OFFS

	West Abutment				East Abutment				West Abutment				East Abutment			
Elevations	Southwest		Northwest		Northeast		Southeast		Southwest		Northwest		Northeast		Southeast	
Top of Wall	1859.64	1861.08	1861.08	1858.15	1858.15	1860.87	1860.87	1861.00	6099.62	6104.35	6104.35	6094.73	6094.73	6103.65	6103.65	6104.08
Bottom of Footing	1852.36	1852.36	1852.36	1852.36	1852.14	1852.14	1852.14	1852.14	6075.72	6075.72	6075.72	6075.72	6075.03	6075.03	6075.03	6075.03
Top of Footing	1853.36	1853.36	1853.36	1853.36	1853.14	1853.14	1853.14	1853.14	6079.00	6079.00	6079.00	6079.00	6078.31	6078.31	6078.31	6078.31
	1858.95	1858.95	1858.95	1858.95	1858.95	1858.95	1858.95	1858.95	6097.36	6097.36	6097.36	6097.36	6097.36	6097.36	6097.36	6097.36
									0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Heights									0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	7.29	8.73	8.73	5.80	6.01	8.73	8.73	8.86	23.89	28.62	28.62	19.01	19.70	28.62	28.62	29.05
Footing Height	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	3.28	3.28	3.28	3.28	3.28	3.28	3.28	3.28
Stem Height	6.29	7.73	7.73	4.80	5.01	7.73	7.73	7.86	20.61	25.34	25.34	15.73	16.42	25.34	25.34	25.77
Avg Stem Height	7.01		6.26		6.37		7.79		22.98		20.53		20.88		25.55	
Width																
Bridge Seat	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97
Footing	4.50	4.50	4.50	4.50	4.50	4.50	4.50	4.50	14.76	14.76	14.76	14.76	14.76	14.76	14.76	14.76
Toe	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97
Stem	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94
	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	8.20	8.20	8.20	8.20	8.20	8.20	8.20	8.20
	Southwest		Northwest		Northeast		Southeast									
Existing Grade Point	1854.79		1857.25		1859.59		1858.91									
Existing Grade Point	1859.81		1860.00		1858.00		1862.00									
Existing Grade Point	1855.08		1854.75		1859.21		1860.00									
Avg Grade at Wall	1856.56		1857.33		1858.93		1860.30									
Excavation Height	4.20	4.20	4.98	4.98	6.79	6.79	8.16	8.16								

		Area mm^2	Area m^2	Length m	Volume m^3
Southwest	Heel - Soil	37816521.9	37.82	2.2	83.20
Northwest	Heel - Soil	30356349.1	30.36	2.2	66.78
Northeast	Heel - Soil	31294090.6	31.29	2.2	68.85
Southeast	Heel - Soil	26743138	26.74	2.2	58.83
Southwest	Toe - Soil	9698054.7	9.70	0.6	5.82
Northwest	Toe - Soil	8850148.5	8.85	0.6	5.31
Northeast	Toe - Soil	9894545.3	9.89	0.6	5.94
Southeast	Toe - Soil	6996500	7.00	0.6	4.20



TOP OF CONCRETE APRON ELEVATIONS PLAN

SCALE 1:150

CONCRETE MATTRESS WORKING POINTS			
WP	STA	OFFSET	ELEV.
WP1	50+18.660	12.579 LT	1854.887
WP2	50+22.799	8.450 LT	1854.900
WP3	50+55.211	8.450 LT	1854.900
WP4	50+59.336	12.575 LT	1854.887
WP5	50+59.336	4.161 RT	1854.929
WP6	50+24.386	10.429 RT	1854.898
WP7	50+52.647	15.438 RT	1854.873
WP8	50+45.210	8.450 RT	1854.900
WP9	50+15.718	8.450 RT	1854.900
WP10	50+21.340	5.508 RT	1852.922

LEGEND (APPROXIMATE SLOPES)

- A&B 2:1 SLOPE (BELOW CHANNEL)
- C 1:1 SLOPE (BELOW CHANNEL)
- D 2:1 SLOPE (ABOVE CHANNEL)
- E 1:1 SLOPE (ABOVE CHANNEL)
- F RELATIVELY FLAT AREA. SLOPE TO PROMOTE DRAINAGE AS NOTED.

0 3000 6000 9000 15000mm
1:150

N

UNLESS OTHERWISE NOTED, ALL LINEAR DIMENSIONS SHOWN ARE IN MILLIMETERS.

NOTE: A3 SIZE REDUCED TO HALF SCALE.

ISLAMIC REPUBLIC OF AFGHANISTAN AND UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT

TETRA TECH

AFGHANISTAN ENGINEERING SUPPORT PROGRAM

AESP

PROJECT TITLE:

GARDEZ TO KHOST ROAD CONSTRUCTION OF BRIDGE NO. 9 WO.LT.0077

SHEET CONTENTS:

CONCRETE MATTRESS PLAN

DESIGNED BY	DATE
ALH	02-28-2014
DRAWN BY	SUBMITTED BY
AC	TETRA TECH
CHECKED BY	CAD FILE NAME
SAM	LT0077-S-102

SYM	SUBMITTAL/REVISION DESCRIPTION	DATE	APR
0	FINAL DESIGN SUBMITTAL	03/28/14	APL

DRAWING REFERENCE NUMBER:

LT0077

S-102

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Section & Section No			Slab Thickness	Approx Slope	Section Location In Ref to Channel	PLAN AREA CAD	Elev. Ref. Points	EL	EL	Avg El 1	Elev. Ref. Points	EL	EL	Avg El 2	Height	Width 1	Width 2	Avg Width (Plan)	Width (Slope)	Length 1	Length 2	Avg Length	Area		Volume	Section	Area	Volume
			mm			sq_m		M	M	M		M	M	M	M	mm	mm	mm	mm	mm	mm	mm	mm	SM	CM		SM	CM
A	1		300	2:1	Below	62.52	WP1	1854.887		1854.887	BOA	1851		1851	3.89	8000.00	8000.00	8000	8894.31	8658	11972	10315	91,744,818	91.74	27.52	A1	91.74	27.52
	2		300			110.65	WP1/2	1854.887	1854.900	1854.8935	BOA	1851		1851	3.89	8000.00	8000.00	8000	8897.15	13832	13832	13832	123,065,429	123.07	36.92	A2	123.07	36.92
	3		300			232.87	TOA	1854.900		1854.900	BOA	1851		1851	3.90	8000.00	8000.00	8000	8900.00	25795	32432	29113.5	259,110,150	259.11	77.73	A3	259.11	77.73
	4		300			110.54	WP3/4	1854.900		1854.900	BOA	1851		1851	3.90	8000.00	8000.00	8000	8900.00	13832	13832	13832	123,104,800	123.10	36.93	A4	123.10	36.93
	5		300			85.15	WP4	1854.887		1854.887	BOA	1851		1851	3.89	8000.00	8000.00	8000	8894.31	12300	8986	10643	94,662,152	94.66	28.40	A5	94.66	28.40
B	1		200	2:1	Below	51.50	TOA	1855.4		1855.4	BOA	1851		1851	4.40	9224.00	8659.00	8941.5	9965.46	10637	2731	6684	66,609,144	66.61	13.32	B1	66.61	13.32
	2		200			30.61	TOA	1855.4		1855.4	BOA	1851		1851	4.40	8659.00	8659.00	8659	9712.79	7140	513	3826.5	37,165,989	37.17	7.43	B2	37.17	7.43
	3		200			90.51	TOA/TOC	1855.4	1856.43	1855.915	BOA	1851		1851	4.91	8659.00	8659.00	8659	9956.68	11314	11314	11314	112,649,694	112.65	22.53	B3	112.65	22.53
	4		200			233.37	TOA	1855		1855	BOA	1851		1851	4.00	8659.00	8435.00	8547	9436.69	29492	28851	29171.5	275,282,543	275.28	55.06	B4	275.28	55.06
C	1		200	1:1	Below	35.048	BOA	1851		1851	WP7/8	1854.873	1854.900	1854.89	3.89	5841.00	8435.00	7138	8127.48	2921	14603	8762	71,212,977	71.21	14.24	C1	71.21	14.24
D	1		Varies	2:1	Above	171.90	-	-	-	-	-	-	-	-	Varies	-	-	Varies	Varies	-	-	Varies	218,158,560	218.16	57.59	D1	218.16	57.59
		1.1	200	2:1	Above		TOA	1855.4		1855.4	TOC	1856.43		1856.43	1.03	2731	3294	3012.5	3183.72	513	2831	1672	5,323,175	5.32	1.06			
		1.2	200				TOA	1855.4		1855.4	TOC	1856.43		1856.43	1.03	3294	2469	2881.5	3060.06	3614	4891	4252.5	13,012,888	13.01	2.60			
		1.3	200				TOA	1856		1856	TOC/WP10	1856.43	1852.922	1854.68	1.32	2469	2167	2318	2669.48	8302	10675	9488.5	25,329,319	25.33	5.07			
		1.4a	300				TOA	1856		1856	WP1	1854.887		1854.89	1.11	2004	2858	2431	2673.67	5007	5854	5430.5	14,519,384	14.52	4.36			
		1.4b	200				TOA	1856		1856	WP1&10	1854.887	1852.922	1853.90	2.10	2004	2167	2085.5	2956.42	11408	12231	11819.5	34,943,429	34.94	6.99			
		1.5	300				TOA	1859		1859	WP1	1854.887		1854.89	4.11	8000	8485	8242.5	9211.71	7992	5190	6591	60,714,371	60.71	18.21			
		1.6	300				TOA	1859		1859	WP1	1854.887		1854.89	4.11	8945	8000	8472.5	9418.07	8658	5000	6829	64,315,994	64.32	19.29			
	2		Varies	2:1	Above	142.97	-	-	-	-	-	-	-	-	Varies	-	-	Varies	Varies	-	-	Varies	183,573,516	183.57	51.18	D2	183.57	51.18
		2.1a	300	2:1	Above		WP4/5	1854.887	1854.929	1854.908	TOC	1856		1856	1.09	2000	3542	2771	2978.41	5850	2926	4388	13,069,248	13.07	3.92			
		2.1b	200				WP4/6	1854.929	1854.898	1854.9135	TOC	1858		1858	3.09	2000	2201	2100.5	3733.44	9974	10886	10430	38,939,791	38.94	7.79			
		2.2	300				WP4	1854.887		1854.887	TOC	1859		1859	4.11	8027	8485	8256	9223.79	7998	5825	6911.5	63,750,226	63.75	19.13			
		2.3	300				WP4	1854.887		1854.887	TOC	1859		1859	4.11	9072	8000	8536	9475.23	8986	5328	7157	67,814,252	67.81	20.34			
E	1		200	1:1	Above	67.02	-	-	-	-	-	-	-	-	Varies	-	-	Varies	Varies	-	-	Varies	96,552,274	96.55	19.31	E1	96.55	19.31
		1.1	200	1:1	Above		WP6&7	1854.898	1854.873	1854.8855	TOA	1859		1859	4.11	4055	4398	4226.5	5898.51	6389	5303	5846	34,482,686	34.48	6.90			
		1.2	200				WP5&6	1854.929	1854.898	1854.9135	TOA	1859		1859	4.09	4055	4732	4393.5	6000.19	7987	4791	6389	38,335,238	38.34	7.67			
		1.3	200				WP5	1854.929		1854.929	TOA	1859		1859	4.07	4732	5022	4877	6352.81	2201	1100	1650.5	10,485,310	10.49	2.10			
		1.4	200				WP5	1854.929		1854.929	TOA	1859		1859	4.07	5022	4880	4951	6409.79	2364	1770	2067	13,249,041	13.25	2.65			
F	1		Varies	Flat	-	42.61																	42,614,429	42.61	9.25	F1	42.61	9.25
		1.1	300	Flat	-	7.25																	7,247,946	7.25	2.17			
		1.2	200			35.37																	35,366,483	35.37	7.07			
	2		Varies	Flat	-	691.28																	691,282,101	691.28	146.98	F2	691.28	146.98
		2.1	300	Flat	-	87.20																	87,203,465	87.20	26.16			
		2.2	200			604.08																	604,078,635	604.08	120.82			
	3		Varies	Flat	-	28.48																	28,479,387	28.48	6.12	F3	28.48	6.12
		3.1	300	Flat	-	4.29																	4,285,288	4.29	1.29			
		3.2	200			24.19																	24,194,099	24.19	4.84			
Total						2207.02																					2515.27	610.5
																											Say -->	625.0 CM

WP	EL
1	1854.887
2	1854.900
3	1854.900
4	1854.887
5	1854.929
6	1854.898
7	1854.873
8	1854.900
9	1854.900
10	1852.922

Eslimate Rebar

#12 bars @ 250 Each Way & T&B

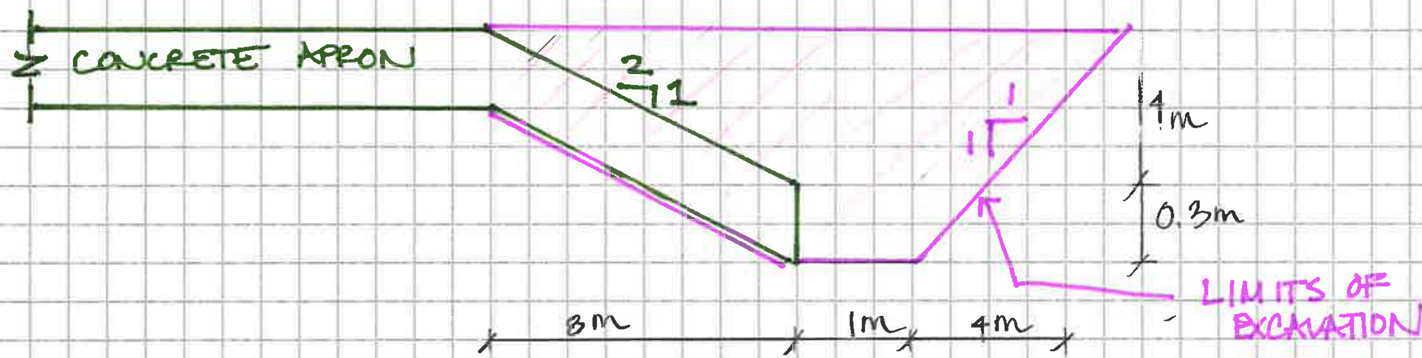
Say -->	Slab	Length =	1	ft	
		Width =	1	ft	
		Thickness =	0.656	ft	
		Bar Diameter =	#4		
		Bar Area =	0.2	sq_in	0.0014 sq_ft
		Spacing =	8	in	
	Trans.	Length of Bar =	1	ft	
		No of Bars Top =	1.5		
		No of Bars Bot =	1.5		
		Total No. Bars =	3		
		Total Length of Bars =	3	ft	
	Long.	Length of Bar =	1	ft	
		No of Bars Top =	1.5		
		No of Bars Bot =	1.5		
		Total No. Bars =	3		
		Total Length of Bars =	3	ft	

Rebar

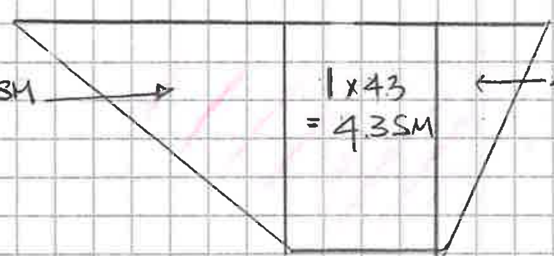
Total No. of Bars EW & TB =	6	
Total Length of Bars EW & TB =	6	ft
Bar Weight =	0.668	lbs/ft
Total Weight =	4.008	lbs
Slab Volume =	0.66	cu_ft
Rebar (lbs) / Conc (cu_ft) =	6.11	lbs/ cu_ft
Rebar (lbs) / Conc (cy) =	164.96	lbs/ cy
Say =	175	lbs/ cy
Total Concrete Volume =	625	CM
Total Concrete Volume =	818	CY
Rebar Ratio =	175	lbs/ cy
Total Weight of Rebar =	143,063	lbs
Total Weight of Rebar =	64,893	kg
Say =	65,000	kg

APRON EXCAVATION

CALCULATE AREA



8 X 4.3 X 0.5 = 17.2 SM



4.3 X 4 X 0.5 = 8.6 SM

TOTAL EXCAVATION AREA = 17.2 + 4.3 + 8.6 = 30.1 SM SAY → 35 SQ.M

JOB

SHEET NO. OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

TETRA TECH

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