S-45-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Bridge Calculations

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia,
South Carolina

S-45-51 over Black Mingo Creek
Williamsburg County
SCDOT

General

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

Columbia,
South Carolina

South Carolina Department of Transportation

REQUEST FOR PROPOSALS
(Final)

Emergency Bridge Replacement Package 4

S-28-36 over Twenty-Five Mile Creek – Project ID P029412

S-40-69 over Jumping Run Creek – Project ID P029342

S-40-827 over Spring Lake – Project ID P029343

S-45-51 over Black Mingo Creek – Project ID P029461

Contract ID 8804670

A Design-Build Project

Kershaw, Richland, and Williamsburg Counties
South Carolina

December 10, 2015

- S-51 — 45 mph (meet or exceed)

2.3 Traffic Volume (ADT)

- S-69 — 700 (2015), 1150 (2036)
  - Old Leesburg Road E (L-6) — Less than 250 (2036)
  - Old Leesburg Road (L-3606) — Less than 250 (2036)
- S-827 — 4400 (2015), 5250 (2036)
- S-36 — 2200 (2015), 2600 (2036)
  - S-651 — 500 (2015), 700 (2036)
- S-51 — 700 (2015), 900 (2036)

2.4 Pavement, Shoulder & Median Width

Develop pavement, shoulder, and median widths in compliance with SCDOT Highway Design Manual Chapters 9, 13, 20, 21, and 22.

Add 3.5 ft. to shoulder width when guardrail is required.

S-69

- Through Lanes — 11 ft.
- Shoulder (outside) — 6 ft. total (2 ft. paved, 4 ft. earth)

Old Leesburg Road East (L-6)

- Through Lanes — Match existing, 9 ft. minimum
- Shoulder (outside) — Match existing, 4 ft. earth minimum

Old Leesburg Road (L-3606)

- Through Lanes — Match existing, 9 ft. minimum
- Shoulder (outside) — Match existing, 4 ft. earth minimum

S-827

- Through Lanes — 12 ft.
- Shoulder (outside) — 2 ft. Curb and Gutter with 6 ft. earthen shelf

S-36

THE OFFICE OF BRIDGE MAINTENANCE

NATIONAL BRIDGE INVENTORY
STRUCTURE INVENTORY AND APPRAISAL REPORT

IDENTIFICATION

(1) State Name - SOUTH CAROLINA Code 454
(8) Structure Number # 0004570005100100
(5) Inventory Route (On/Under) On - 171000510
(2) State Highway Department District 5
(3) County Code 89 (4) Place Code
(6) Features Intersected BLACK MINGO CREEK
(7) Facility Carried S-45-51
(9) Location 7.0 MI SW INDIANTOWN
(11) Milepoint 1.300
(12) Base Highway Network -NOT PART OF NET Code 0
(13) LRS Inventory Route & Subroute
(16) Latitude 33 Degrees 42 Minutes 38.00 Seconds
(17) Longitude 79 Degrees 34 Minutes 33.00 Seconds
(98) Border Bridge State Code % SHARE %
(99) Border Bridge Structure No. #

STRUCTURE TYPE AND MATERIAL

(43) Structure Type Main: MATERIAL -CONCRETE
Type - 1 Code 101
(44) Structure Type Appr: MATERIAL -OTHER OR N/A
Type - OTHER OR N/A Code 000
(45) Number of Spans in Main Unit 9
(46) Number of Approach Spans 0
(107) Deck Structure Type -CONCRETE PRECAST PNL Code 2
(108) Wearing Surface / Protective System:
A) Type of Wearing Surface - BITUMINOUS Code 6
B) Type of Membrane - UNKNOWN Code 8
C) Type of Deck Protection - UNKNOWN Code 8

AGE AND SERVICE

(27) Year Built 1962
(106) Year Reconstructed 1994
(42) Type of Service On -HIGHWAY
Under - WATERWAY Code 5
(28) Lanes: On Structure = 2 Under Structure = 0
(29) Average Daily Traffic 600
(30) Year of ADT 2014 (109) Truck ADT 07 %
(19) Bypass, Detour Length 7 MI

GEOMETRIC DATA

(48) Length of Maximum Span 15 FT
(49) Structure Length 135 FT
(50) Curb or Sidewalk: Left 0.0 FT Right 0.0 FT
(51) Bridge Roadway Width Curb to Curb 26 FT
(52) Deck Width Out to Out 28.2 FT
(32) Approach Roadway Width (W/Shoulders) 36 FT
(33) Bridge Median -NONE Code 0
(34) Skew 0 Deg (35) Structure Flared NO
(10) Inventory Route Min Vert Clear 99 FT 99 IN
(47) Inventory Route Total Horz Clear 26.0 FT
(53) Min Vert Clear Over Bridge Roadway 99 FT 99 IN
(54) Min Vert Underclear Ref - NOT HWY OR RX 0 FT 0 IN
(55) Min Lat Underclear Right Ref -NOT HWY OR RXR 99.9 FT
(56) Min Lat Underclear Left 0.0 FT

NAVIGATION DATA

(38) Navigation Control -NONE Code 0
(111) Pier Protection - Code
(39) Navigation Vertical Clearance FT
(116) Vert-Lift Bridge Nav Min Vert Clear FT
(40) Navigation Horizontal Clearance FT

Sufficiency Rating = 55.5
Functionally Obsolete = NO
Structurally Deficient = NO

CLASSIFICATION — Code

(112) NBIS Bridge Length - YES
(104) Highway System - NOT NHS 0
(26) Functional Class - RURAL-MIN COLL 05
(100) Strahnet Highway - NOT STRAH HWY 0
(101) Parallel Structure - NONE EXIST N
(102) Direction of Traffic - 2-WAY TRAFFIC 2
(103) Temporary Structure -
(105) Federal Lands Highways -N/A 0
(110) Designated National Network -NO 0
(20) Toll - ON FREE ROAD 3
(21) Maintain - SCDOT 1
(22) Owner - SCDOT 1
(37) Historical Significance -NOT ELIGIBLE 5

CONDITION — Code

(58) Deck - FAIR 5
(59) Superstructure - FAIR 5
(60) Substructure - FAIR 5
(61) Channel and Channel Protection - BANKS PROT 8
(62) Culverts - NOT APPLICABLE N

LOAD RATING AND POSTING — Code

(31) Design Load - H 10 1
(64) Operating Rating - LF 33
(66) Inventory Rating - LF 20
(70) Bridge Posting - EQUAL/ABOVE LEGAL LOADS 5
(41) Structure Open, Posted or Closed - A
Description -OPEN, NO RESTRICT

APPRAISAL — Code

(67) Structure Evaluation - BETTER THAN ADEQUACY 5
(68) Deck Geometry 5
(69) Underclearances, Vertical and Horizontal N
(71) Waterway Adequacy 9
(72) Approach Roadway Alignment 8
(36) Traffic Safety Features 0000
(113) Scour Critical Bridges - SCOUR WITHIN LIMITS 5

PROPOSED IMPROVEMENTS

(75) Type of Work - Code
(76) Length of Structure Improvement 135.0 FT
(94) Bridge Improvement Cost $0
(95) Roadway Improvement Costs $0
(96) Total Project Cost $0
(97) Year of Improvement Cost Estimate 2015
(114) Future ADT 834
(115) Year of Future ADT 2034

INSPECTIONS

(90) Inspection Date 08/2015 (91) Frequency 12 Mo
(92) Critical Feature Inspection: (93) CFI Date
A) Fracture Crit Detail NO Mo A)
B) Underwater Insp NO Mo B)
C) Other Special Insp NO Mo C)

1.0 GENERAL

Exhibit 4b contains structural design requirements for the replacement of the Road S-36 Bridge over Twenty-Five Mile Creek (Asset ID 8359) in Kershaw County, the replacement of the Road S-69 Bridge over Jumping Run Creek (Tributary to Colonel's Creek) (Asset ID 7290) and the Road S-827 Bridge over Spring Lake (Asset ID 8036) in Richland County, and the replacement of the Road S-51 Bridge over Black Mingo Creek (Asset ID 3999) in Williamsburg County.

2.0 CRITERIA

2.1 Bridges

2.1.1 Bridge Design

Design the new bridges in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications. Use the HL-93 design live loading.

2.1.2 Seismic Design

In accordance with the SCDOT Seismic Design Specifications for Highway Bridges, the Bridge Operational Classification (OC) for each bridge is "II."

2.1.3 Dimensions

Construct the new bridges with the following dimensions:

Bridge Location	Minimum Outside Deck Width	Minimum Clear Roadway Width (Gutter Line to Gutter Line)
S-36	43'-3"	40'-0"
S-69	36'-0"	32'-10"
S-827	40'-0"	26'-10"
S-51	36'-0"	32'-10"

With the exception of the S-827 Bridge, along each edge of deck, provide a 1'-6" wide barrier parapet and a 1½" slab extension for slip forming barriers. A 1" slab extension is permitted for cored slab spans.

For the S-827 Bridge, along each side of roadway, provide a 5'-6" sidewalk, a 10" wide railing wall, and a 2" slab extension.

2.1.4 Removal and Disposal of Existing Bridges

Remove and dispose of the existing bridges and appurtenances in accordance with the Standard Specifications for Highway Construction and all applicable laws and regulations.

2.1.5 Superstructure Types

For this project, Section 12.3.3 of the SCDOT Bridge Design Manual does not apply. Allowable superstructure types are outlined in Sections 12.3.2.1, 12.3.2.2, 12.3.2.3, and 12.3.2.4 of the SCDOT Bridge Design Manual. For the S-69 and S-51 Bridges only, the superstructure type outlined in Section 12.3.2.5 of the SCDOT Bridge Design Manual is also allowed.

For prestressed concrete girder superstructures, use prestressed concrete girders that are either I-beams or modified bulb-tee beams. Design prestressed concrete girders so that the algebraic sum of the beam camber at prestress transfer due to prestress force, the beam dead load deflections due to non-composite dead load, and superimposed dead load deflections due to applied superimposed dead loads results in a positive (upward) camber. Include the dead load from the future wearing surface in the determination of camber.

For steel welded plate girder superstructures, use structural steel girders that are "I" shaped. For steel welded plate girder and steel rolled beam superstructures, use structural steel that conforms to the requirements of AASHTO M 270 and paint the steel in accordance with Section 710 of the Standard Specifications.

At each support of prestressed concrete girder, steel welded plate girder, and steel rolled beam superstructures, connect all beams and girders to the substructure using anchor bolts.

Detail all construction stages for girder and beam bridges to consist of a minimum of two lines of girders.

2.1.6 Concrete Strengths

In prestressed concrete piles and beams, concrete design strengths are not allowed to exceed 8,000 and 10,000 psi maximum, respectively. Construct all cast-in-place concrete bridge components with Class 4000 concrete. Construct all precast concrete bridge components with concrete having a minimum compressive strength of 5000 psi.

2.1.7 Final Finish of Exposed Concrete Surfaces

Final surface finish is not required on this project.

2.1.8 Lightweight Concrete

Lightweight Concrete is not permitted for this project.

2.1.9 Post-Tensioning

Post-tensioning is not permitted for this project.

2.1.10 Bridge Decks

For girder and beam spans, construct bridge decks with reinforced cast-in-place concrete.

Apply a transverse Grooved Surface Finish to cast-in-place decks in accordance with Subsection 702.4.16 of the Standard Specifications for Highway Construction.

Asphalt overlays are only permitted on cored slab spans. Apply a waterproofing system to the bridge deck prior to overlaying a deck with asphalt.

2.1.11 Stay-in-Place Bridge Deck Forms

The Contractor may use permanent stay-in-place bridge deck forms for concrete deck slabs between new beams and girders. Fabricate permanent stay-in-place bridge deck forms and supports from steel conforming to ASTM A 446/A 653, Grades 40 or 50, and having a coating class of G165 in accordance with ASTM A 525. Do not use fillers in the flutes of the stay-in-place forms. Fill form flutes with concrete as the deck slab is placed. Do not use permanent stay-in-place steel bridge deck forms in bays in which longitudinal deck construction joints are located and in bays between stages.

2.1.12 Barriers, Sidewalks, and Pedestrian Railing Walls

With the exception of the S-827 Bridge, use the concrete bridge barrier parapet (Jersey shape) and barrier transition details shown on the Bridge Drawings and Details.

For the S-827 Bridge, use the sidewalk, pedestrian railing wall (with indentations) and pedestrian railing wall transition details shown on the Bridge Drawings and Details.

2.1.13 Bridge Drainage

Design and construct the bridge deck drainage and bridge end drainage to ensure that the minimum requirements of the SCDOT Bridge Design

Manual are met and that erosion of the end fill slopes is prevented due to excessive run off at the bridge ends.

2.1.14 Pile Sizes and Types

Minimum pile sizes and acceptable pile types are listed below. No other pile types are permitted.

PILE TYPE	MINIMUM SIZE
Steel H-Piles	HP12x53
Steel Pipe Piles	12" Diam. (min. wall thickness equal to ½")
Solid Prestressed Concrete Piles	18" Square
Prestressed Concrete Pile Points	W8x58

2.1.15 Steel Pipe Pile Connection Details

The pile connection detail described in Item 2 of Section 19.2.6.3 of the SCDOT Bridge Design Manual does not apply for this project. Terminate steel pipe piles at the bottom of the end bent cap and footing. Connect the piles to the cap and footing using a reinforced concrete infill, with the reinforcing extending into the cap or footing.

2.1.16 Drilled Shaft Diameters

SCDOT Bridge Design Memorandum DM0111 contains a requirement to detail the portion of shaft below the construction casing with a diameter that is six inches smaller than the diameter of the casing. This six-inch reduction requirement does not apply to this project. For this project, detail the portion of the shaft below the bottom of the construction casing, whether in soil or rock, with a diameter that is at least two inches smaller than the diameter of the casing.

2.1.17 Crosshole Sonic Logging (CSL) Testing

Install Crosshole Sonic Logging (CSL) access tubes in all drilled shafts in accordance with the SCDOT Standard Specifications for Highway Construction, 2007 Edition. SCDOT will conduct CSL testing on all shafts.

2.1.18 Substructures

Construct Interior Single and Multi-Column Bents using cast-in-place reinforced concrete bent caps and cast-in-place reinforced concrete columns supported by cast-in-place reinforced concrete drilled shafts. If any portion of the bent cap is lower than the 100-year water elevation, detail rounded cap ends using a radius equal to half of the cap width. If a

drilled shaft is extended above ground, above the scour line, or through liquefiable soil, structurally design the shaft as a column and detail the longitudinal reinforcing steel with a maximum spacing of 8 inches center-to-center.

Construct Interior Pile Bents using cast-in-place reinforced concrete bent caps and a single row of vertical prestressed concrete piles (with or without prestressed concrete pile points). For protection of the pile, ensure concrete portions of piles with points extend a minimum of 2 feet below final ground line or predicted scour line, whichever is deeper. Do not use Interior Pile Bents to support a span having a length that exceeds 70 feet.

Interior Pile Bents are not allowed for the S-36 Bridge. Use Interior Single or Multi-Column Bents for the S-36 Bridge.

Construct end abutments as spill through type abutments (2:1 maximum slope). In addition to the requirements of Section 20.2.8 of the SCDOT Bridge Design Manual, set the elevation of the berm so that the top of the berm (embankment fill) is no greater than 4 feet below the superstructure.

The following applies to bent cap cantilevers for Interior Pile Bents and end bents:

- For a cap supported by prestressed concrete piles, provide a minimum of the equivalent of 2 pile widths of distance from the centerline of the exterior pile to the end of the cap.
- Do not detail the intersection of the centerlines of bent and exterior beam/girder on the bent cap cantilever.
- Provide a distance from the centerline of exterior pile to the edge of a slab superstructure, measured along the bent cap centerline, that is less than or equal to 30 percent of the average pile spacing of the bent.

2.1.19 Integral Interior Bent Caps

If integral interior bent caps are used on this Project, construct the caps using cast-in-place concrete.

2.1.20 Slope Protection

Protect the bridge end fills with rip rap in accordance with Standard Drawing 804-105-00.

2.1.21 Culverts

Culverts will not be permitted as substitutes for bridges.

David Yoder

From: John Hamilton <jhamilton@fmecol.com>
Sent: Wednesday, February 03, 2016 10:16 AM
To: David Yoder
Subject: RE: S-51 over Black Mingo Creek - Site Class
Attachments: b-03.pdf; b-04.pdf; STB-1.pdf; STB-4.pdf; CPT-2.pdf; CPT-3.pdf

Let's go with a Site Class C for the bridge foundations and a Site Class D for the embankments. Boring logs are attached. Thanks.

John H.

From: David Yoder [mailto:david.yoder@ice-eng.com]
Sent: Wednesday, February 03, 2016 9:34 AM
To: John Hamilton
Subject: S-51 over Black Mingo Creek - Site Class

John,

What is the site class for Black Mingo Creek?

Thanks,

David Yoder, P.E. | *Structural Engineer*
david.yoder@ice-eng.com | 803-807-3075 (C)

INFRASTRUCTURE
CONSULTING & ENGINEERING

1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3161 (W) | 803-822-0034 (F)

S-827 - Site Class D

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.18	0.33	0.15
SEE	0.37	0.73	0.38

S-36 - Site Class C

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.13	0.23	0.11
SEE	0.33	0.62	0.30

S-36 - Site Class D

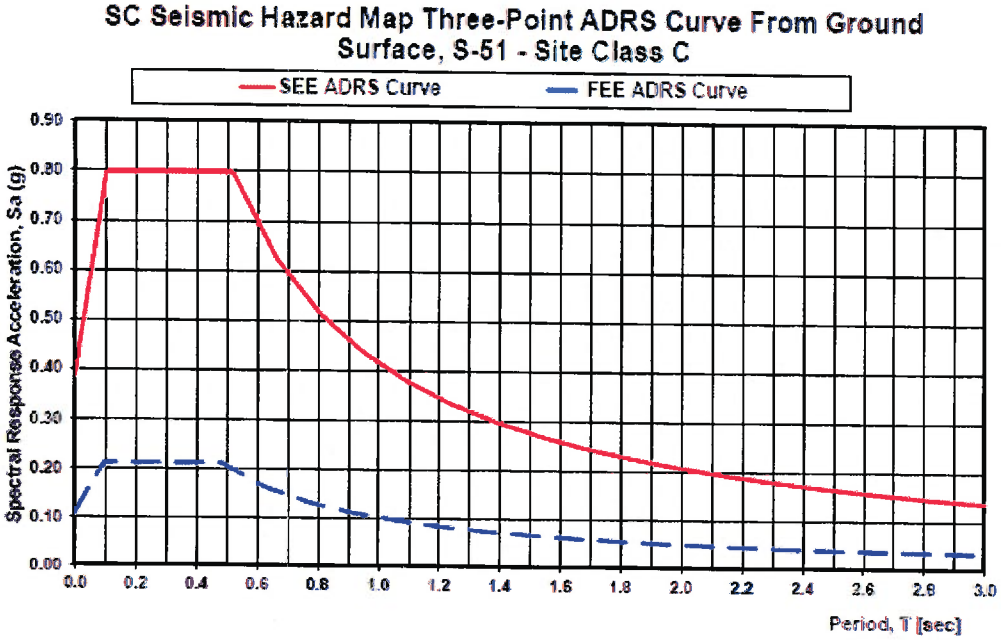
Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.17	0.31	0.16
SEE	0.36	0.72	0.39

S-51 - Site Class C

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.11	0.21	0.10
SEE	0.39	0.80	0.41

S-51 - Site Class D

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.14	0.28	0.14
SEE	0.42	0.88	0.50



FEE ADRS Curve
Three-Point Method

	T	S_a
	0.00	0.11
	0.02	0.13
	0.03	0.14
	0.05	0.16
	0.06	0.18
	0.08	0.19
To	0.10	0.21
	0.13	0.21
	0.16	0.21
	0.19	0.21
	0.23	0.21
	0.26	0.21
	0.29	0.21
	0.32	0.21
	0.35	0.21
	0.39	0.21
	0.42	0.21
	0.45	0.21
Ts	0.48	0.21
	0.63	0.16
	0.78	0.13
	0.93	0.11
	1.08	0.09
	1.22	0.08
	1.37	0.07
	1.52	0.07
	1.67	0.06
	1.82	0.06
	1.96	0.05
	2.11	0.05
	2.26	0.05
	2.41	0.04
	2.55	0.04
	2.70	0.04
	2.85	0.04
	3.00	0.03

SEE ADRS Curve
Three-Point Method

	T	Sa
	0.00	0.39
	0.02	0.45
	0.03	0.52
	0.05	0.59
	0.07	0.66
	0.09	0.73
To	0.10	0.80
	0.14	0.80
	0.17	0.80
	0.21	0.80
	0.24	0.80
	0.28	0.80
	0.31	0.80
	0.35	0.80
	0.38	0.80
	0.42	0.80
	0.45	0.80
	0.49	0.80
Ts	0.52	0.80
	0.67	0.62
	0.81	0.51
	0.96	0.43
	1.10	0.38
	1.25	0.33
	1.40	0.30
	1.54	0.27
	1.69	0.25
	1.83	0.23
	1.98	0.21
	2.12	0.20
	2.27	0.18
	2.42	0.17
	2.56	0.16
	2.71	0.15
	2.85	0.15
	3.00	0.14

Table 3.1 Bridge Operational Classification (OC)

Operational Classification (OC)	Description
I	All bridges that are located on the Interstate system or along the following roads: • US 17, US 378 from SC 441 east to I-95 • I-20 Spur from I-95 east to US 76 • US 76 from I-20 Spur east to North Carolina Additionally all bridges that meet any of the following criteria: • Structures that do not have detours • Structures with detours greater or equal to 15 miles • Structures with a design life greater than 75 years
II	All bridges that do not have a bridge OC = I and meet any of the following criteria: • A projected (20 years) ADT ≥ 500 • A projected (20 years) ADT < 500, with bridge length longer than 180' or individual span length larger than 60'
III	All bridges that do not have an OC = I or II classification.

Table 3.2 Bridge Seismic Analysis Requirements

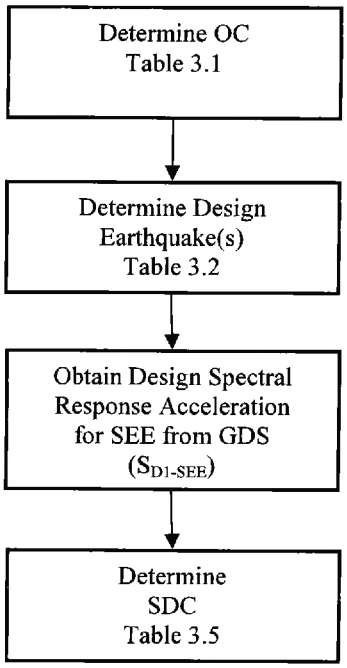
Operational Classification (OC)	Analysis Description ♦
I, II	Seismic analysis shall be performed for the following design earthquakes: • Functional Evaluation Earthquake (FEE) only when potential liquefiable soil or slope instability (see Geotechnical Design Manual for more information) exists and no geotechnical mitigation is performed. • Safety Evaluation Earthquake (SEE)
III	Seismic analysis required for Safety Evaluation Earthquake (SEE) only.

♦ For design requirements of temporary bridges and staged construction, see Section 3.11. For design requirements for pedestrian bridges, see Section 3.12.

Detailed seismic analysis is not required for SDC A or Single Span bridges, however minimum detailing shall be provided, see Section 3.13.1.

3.5 SEISMIC DESIGN CATEGORY (SDC)

Bridges are assigned a Seismic Design Category (SDC) based on the operational classification and the design SEE acceleration coefficient at one-second period ($S_{D1\text{-}SEE}$). There are four Seismic Design Categories, SDC A through SDC D. Table 3.5 lists the SDC based on the OC and $S_{D1\text{-}SEE}$. Use the flow chart in Figure 3.2 to determine the SDC for a structure.



(GDS Stands for Regional Production Group Geotechnical Design Squad)

Figure 3.1 Flow Chart to Determine SDC

Table 3.5 Seismic Design Category (SDC)

Value of $S_{D1\text{-}SEE}$	Operational Classification (OC)		
	I	II	III
$S_{D1\text{-}SEE} < 0.30g$	B	A	A
$0.30g \le S_{D1\text{-}SEE} < 0.45g$	C	B	A
$0.45g \le S_{D1\text{-}SEE} < 0.60g$	C	C	B
$S_{D1\text{-}SEE} \ge 0.60g$	D	C	B

3.6 SEISMIC DEMAND

Seismic demand includes displacement demand and force demand.

Displacement demand can be obtained from a Multimode Spectral Analysis (MSA). This procedure is described in Section 5.2. Section 5 covers displacement demand modeling and computations. Upper limits of the displacement demand are given in Table 3.6. If displacement performance limits are exceeded, the designer shall consider other types of substructure configurations or change bridge geometry.

The design force demand is obtained from the MSA or the overstrength capacity of the ductile components, depending on the displacement demand of the structure.

If the displacement demand of the structure is less than the yield displacement, the force demand can be directly obtained from the MSA.

If the displacement demand is greater than the yield displacement, the MSA should not be used to obtain force demand. The force demand from the MSA in this situation does not recognize the force limit state associated with yield and computes unrealistic moment and shear demand. In this situation, the force demand is computed from the overstrength capacity of the ductile components as described in Section 6.7.5.

David Yoder

From: Ronnie Smoak
Sent: Tuesday, February 16, 2016 8:04 AM
To: David Yoder
Cc: Lauren Warmuth
Subject: RE: S-51 over Black Mingo - Final Hydro Data

Hydrology Data for Riverine Bridges: (Only complete this section if riverine flow is the dominant flow) (		
D.A. =	107	sq. mi. (or acres)
Q_{Design} =	4160	cfs
$Vel._{Design}$ =	2.90	ft./sec.
Design Headwater Elevation =	22.21	ft.
Including	0.26	ft. backwater
Q_{100} =	6349	cfs
Vel_{100} =	3.90	ft/sec
100 Year Headwater Elev. =	23.56	ft.
Including	0.46	ft. backwater
Overtopping Flood:		
Q = >8,350 cfs	Probability =	> 0.20 %

From: David Yoder
Sent: Tuesday, February 16, 2016 7:58 AM
To: Ronnie Smoak <ron.smoak@ice-eng.com>
Cc: Lauren Warmuth <lauren.warmuth@ice-eng.com>
Subject: RE: S-51 over Black Mingo - Final Hydro Data

What about the Hydro Data table information with WSE, velocities, etc. ?

From: Ronnie Smoak
Sent: Tuesday, February 16, 2016 7:55 AM
To: David Yoder <david.yoder@ice-eng.com>
Cc: Lauren Warmuth <lauren.warmuth@ice-eng.com>
Subject: RE: S-51 over Black Mingo - Final Hydro Data

David, I have listed our final scour values below. We still haven't received word back from John Hamilton, but that won't affect the actual numbers. All values are from the Envelope Curve method with the exception of the Channel Contraction Scour which is noted. Also the erodibility index indicated no scour in the rock like layer so once we receive word from John we can just cut it off at that elevation for Bent 3.

100 YR 500 YR

LOB Contraction Scour	0.00	0.00	
ROB Contraction Scour	0.00	0.00	
Channel Contraction Scour	7.35	9.71	(Values are from HEC-18 Method)
Pier Scour	4.21	4.63	
Total Scour (Contraction + Pier)	11.56	14.34	
Left Abutment Scour	15.15	19.70	
Right Abutment Scour	4.29	5.58	

Regards,

Ronnie Smoak, PE | *Transportation Engineer*
ronnie.smoak@ice-eng.com | 803-242-0954 (C)

From: David Yoder
Sent: Monday, February 15, 2016 9:04 PM
To: Ronnie Smoak <ron.smoak@ice-eng.com>
Cc: Lauren Warmuth <lauren.warmuth@ice-eng.com>; David Yoder <david.yoder@ice-eng.com>
Subject: S-51 over Black Mingo - Final Hydro Data

Ronnie,

Can you please send me the final Hydro values for Black Mingo in the AM?

Thanks for all your help,

David Yoder, P.E. | *Structural Engineer*
david.yoder@ice-eng.com | 803-807-3075 (C)

INFRASTRUCTURE CONSULTING & ENGINEERING

1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3161 (W) | 803-822-0034 (F)

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Cored Slabs

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

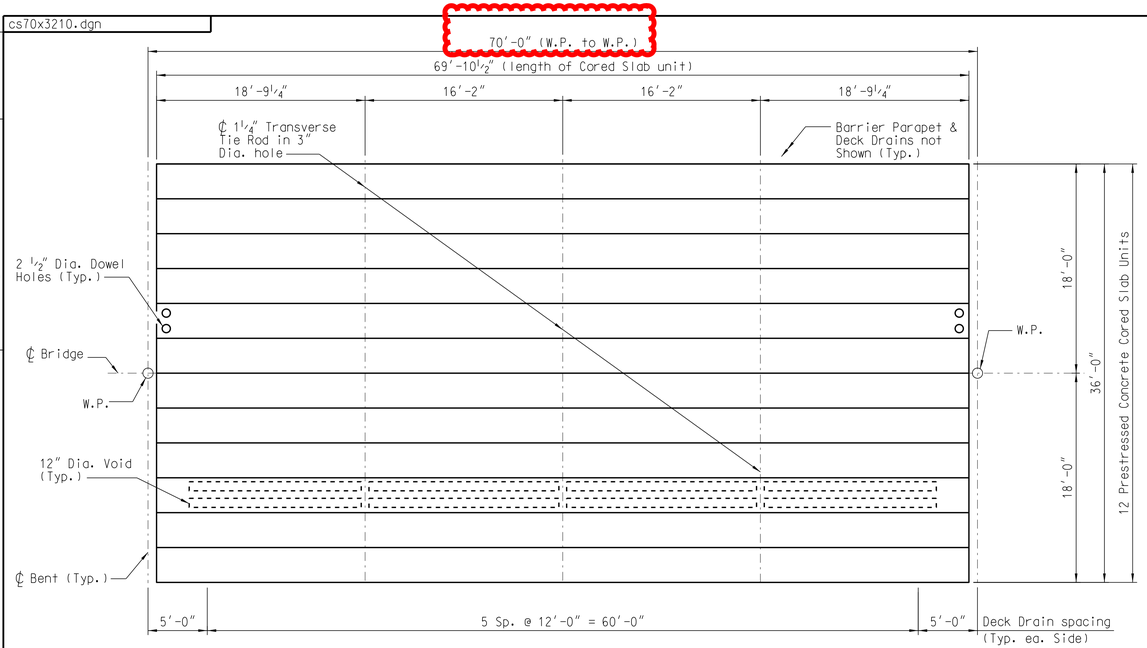
Columbia, South Carolina

cs70x3210.dgn

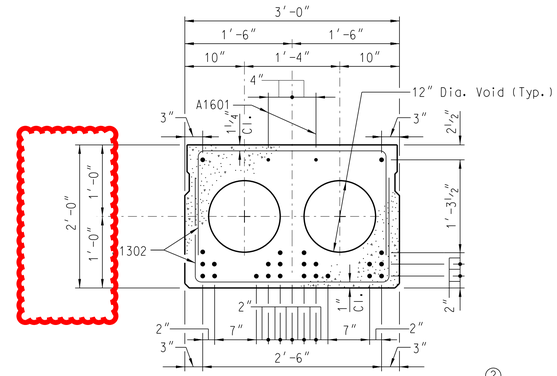
BRIDGE PLANS ID	SHEET NO.
XXXXXXX-BXX	XX

STRAND DATA
(0.6" Dia. Low Relaxation Grade 270)

Area	0.217 in 2
Tensioning Load	43.9 kips



PLAN - 70' SPAN



INTERIOR SLAB SECTION ②

24 - 0.6" Dia. L.R. Strand Layout

f'c = 8.0 ksi
f'ci = 6.4 ksi

② For Exterior Slab Section details see Sh. XX.

DEAD LOAD DEFLECTION & CAMBER	
Camber at Erection (Slab alone in place)	2 7/16" ↑
Deflection due to Barrier Parapet and Asphalt Wearing Surface	½" ↓
Final Camber	1 15/16" ↑

For Information Only - Paid for as Cored Slab

BILL OF MATERIAL
ONE 70' CORED SLAB UNIT

MARK	TOTAL REQ'D.	DIMENSION "a"	"b"	"c"	"d"	LENGTH
A1601	4	35'-9"	—	—	—	35'-9"
GB1601	71	①	—	—	—	5'-3"
J1301	8	1'-9"	1'-7"	—	—	4'-11"
J1302	154	2'-8"	1'-7"	—	—	5'-10"
J1303	4	1'-8½"	2'-8"	—	—	7'-1"
J1601	8	2'-7"	6"	—	—	3'-7"

QUANTITIES

ITEM	UNIT	INTERIOR	EXTERIOR
Reinforcing Steel	LB	824	1213
Concrete, Class 8000	CY	11.8	11.9
0.6" Dia. L.R. Strands	LF	1677	1677

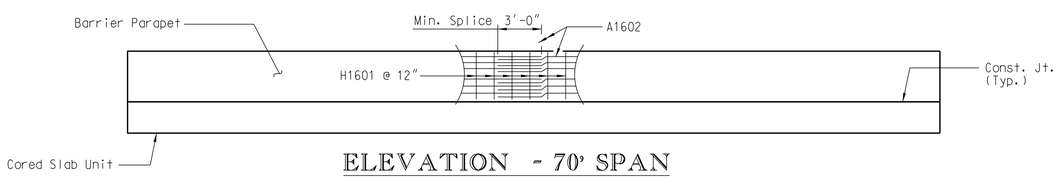
① GB1601 bars required for exterior units only. For dimensions of GB1601 bar, see sheet titled "Reinforcing Bending Details".

BILL OF MATERIAL
ONE 70' BARRIER PARAPET

MARK	TOTAL REQ'D.	"a"	"b"	"c"	"d"	LENGTH
A1601	14	36'-4"	—	—	—	36'-4"
H1601	71	2'-4"	2'-4"	7⅜"	—	5'-2"

QUANTITIES

ITEM	UNIT	TOTAL
Reinforcing Steel	LB	913
Length of Barrier Parapet	LF	70.0



ELEVATION - 70' SPAN

(Note: GB1601 bars in slab not shown for clarity.)

Note to Designer:

Use of barrier parapet transition or vertical railing wall will require additional design and detailing by the User's Engineer.

Due to the camber of the slab units, modifications to the design and detailing by the User's Engineer may be required to maintain the required finished grade profile.

This drawing furnished for information only. All dimensions shown are sheet specific. Any use of this design and drawing, including dimensions, must be checked by the User's Engineer to ensure design is adequate for the intended use. All drawings must be signed and sealed by a South Carolina Registered Professional Engineer when used.

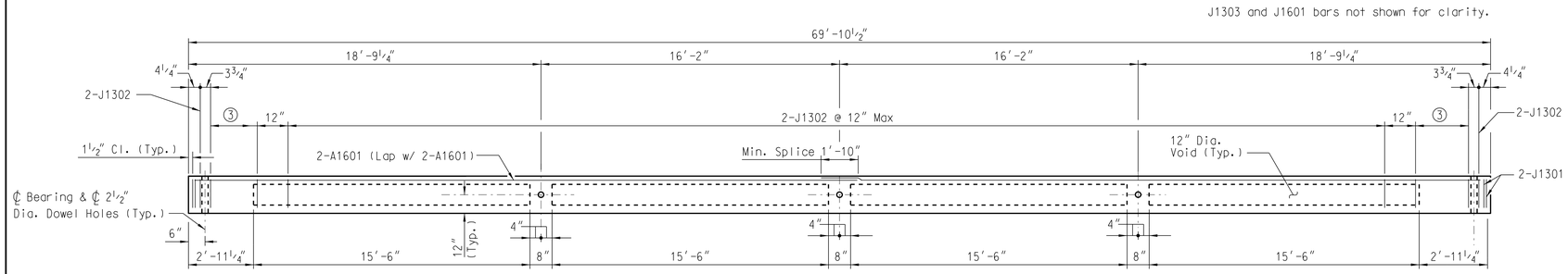
ESTIMATED QUANTITIES - ONE 70' SPAN

ITEM	UNIT	TOTAL
3'-0" x 2'-0" Cored Slab	LF	838.5
Elastomeric Bearing	EA	24
Reinforcing Steel for Structures (Bridge)	LB	1826
Concrete Bridge Barrier Parapet	LF	140.0

Notes:

Shift J1302 stirrups as necessary to clear transverse tie rods.

J1303 and J1601 bars not shown for clarity.



TYPICAL ELEVATION - 70' CORED SLAB UNIT

③ 2-J1302 @ 6" = 2'-6"

W.P. - Work Point
For additional notes and details, see Sh. XX & XX.

REV.			
REV.	JXY	SAN	3-14
	New Border		
REV.	MRW	SAN	1-10
	Plan & Notes		
REVIEWED			
QUAN.	MRW	SAN	5-08
DR.	MRW	SAN	5-08
DES.	MRW	SAN	5-08
	BY	CHK.	DATE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

70'-0" PRESTRESSED CONC. CORED SLAB SPAN (3'-0" x 2'-0")

COUNTY XXXXXXXX | ROUTE XXXXXX

DRAWING NO. 704-70

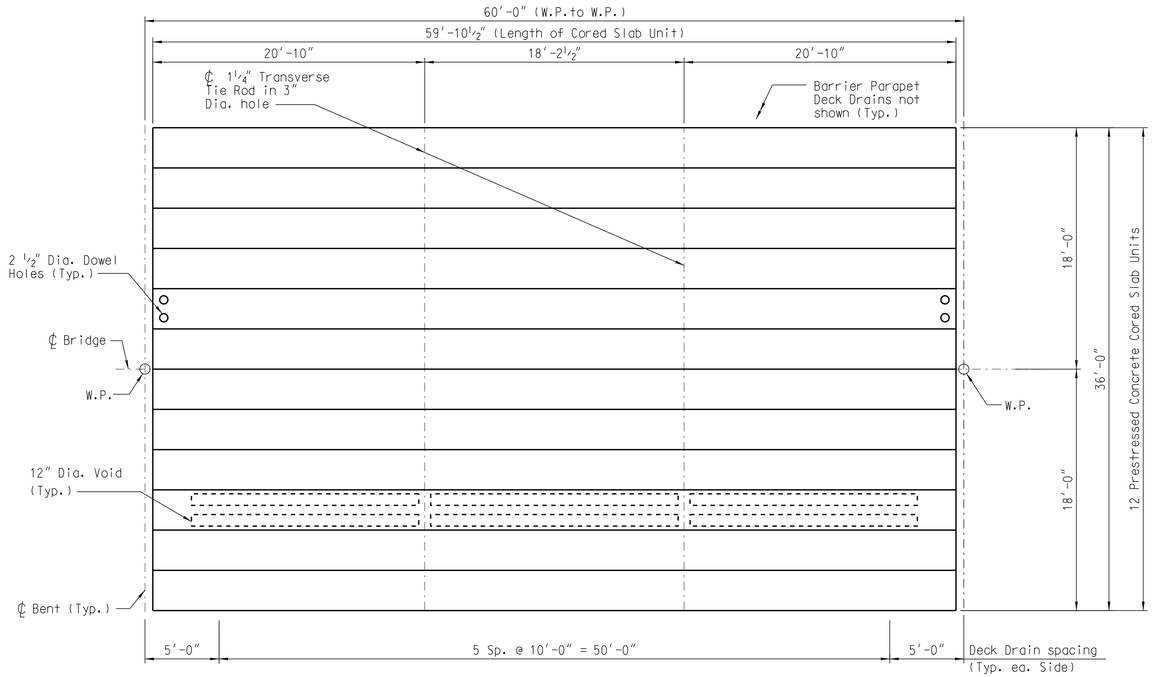
Printed: Thursday, March 27, 2014 7:57:35 AM

cs60x3210.DGN

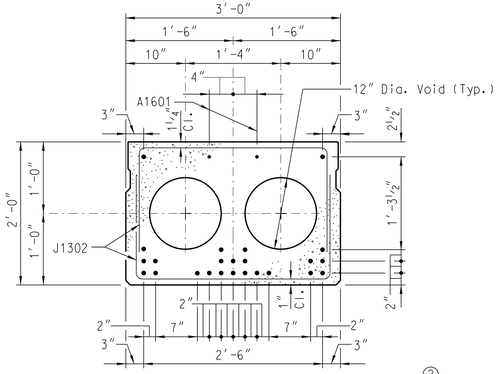
BRIDGE PLANS ID	SHEET NO.
XXXXXXX-BXX	XX

STRAND DATA
(1/2" Dia. Low Relaxation Grade 270)

Area	0.153 in 2
Tensioning Load	31.0 kips



PLAN - 60' SPAN



INTERIOR SLAB SECTION ②

24-½" Dia. L.R. Strand Layout

f'c = 6.0 ksi
f'ci = 4.8 ksi

② For Exterior Slab Section details see Sh. XX.

DEAD LOAD DEFLECTION & CAMBER	
Camber at Erection (Slab alone in place)	1 7/16" ↑
Deflection due to Barrier Parapet and Asphalt Wearing Surface	5/16" ↓
Final Camber	1 1/8" ↑

For Information Only - Paid for as Cored Slab

BILL OF MATERIAL
ONE 60' CORED SLAB UNIT

MARK	TOTAL REQ'D.	DIMENSION "a"	"b"	"c"	"d"	LENGTH
A1601	4	30'-9"	—	—	—	30'-9"
GB1601	61	①	—	—	—	5'-3"
J1301	8	1'-9"	1'-7"	—	—	4'-11"
J1302	134	2'-8"	1'-7"	—	—	5'-10"
J1303	4	1'-8½"	2'-8"	—	—	7'-1"
J1601	8	2'-7"	6"	—	—	3'-7"

QUANTITIES

ITEM	UNIT	INTERIOR	EXTERIOR
Reinforcing Steel	LB	726	1060
Concrete, Class 6000	CY	10.1	10.2
½" Dia. L.R. Strands	LF	1437	1437

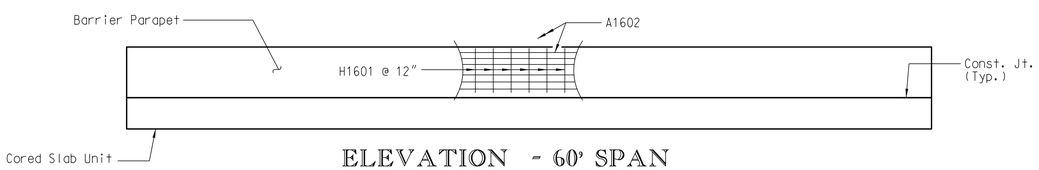
① GB1601 bars required for exterior units only. For dimensions of GB1601 bar, see sheet titled "Reinforcing Bending Details".

BILL OF MATERIAL
ONE 60' BARRIER PARAPET

MARK	TOTAL REQ'D.	"a"	"b"	"c"	"d"	LENGTH
A1601	7	59'-6"	—	—	—	59'-6"
H1601	61	2'-4"	2'-4"	7⅜"	—	5'-2"

QUANTITIES

ITEM	UNIT	TOTAL
Reinforcing Steel	LB	763
Length of Barrier Parapet	LF	60.0



ELEVATION - 60' SPAN

(Note: GB1601 bars in slab not shown for clarity.)

Note to Designer:

Use of barrier parapet transition or vertical railing wall will require additional design and detailing by the User's Engineer.

Due to the camber of the slab units, modifications to the design and detailing by the User's Engineer may be required to maintain the required finished grade profile.

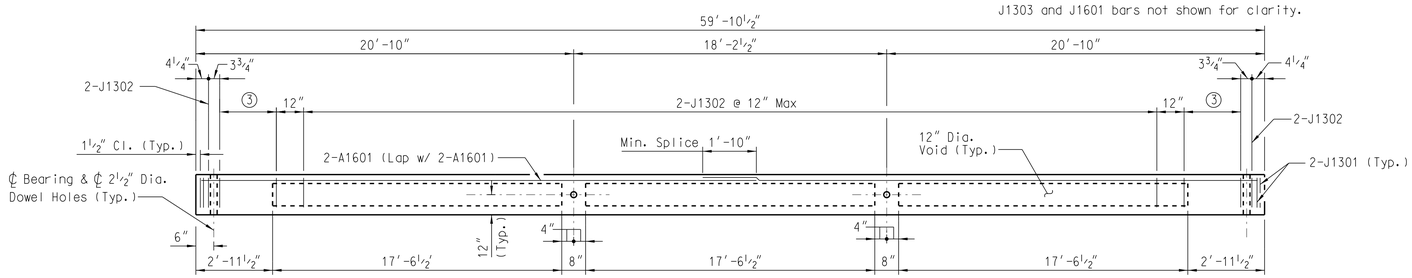
This drawing furnished for information only. All dimensions shown are sheet specific. Any use of this design and drawing, including dimensions, must be checked by the User's Engineer to ensure design is adequate for the intended use. All drawings must be signed and segled by a South Carolina Registered Professional Engineer when used.

ESTIMATED QUANTITIES - ONE 60' SPAN		
ITEM	UNIT	TOTAL
3'-0" x 2'-0" Cored Slab	LF	718.5
Elastomeric Bearing	EA	24
Reinforcing Steel for Structures (Bridge)	LB	1526
Concrete Bridge Barrier Parapet	LF	120.0

Notes:

Shift J1302 stirrups as necessary to clear transverse tie rods.

J1303 and J1601 bars not shown for clarity.



TYPICAL ELEVATION - 60' CORED SLAB UNIT

③ 2-J1302 @ 6" = 2'-6"

W.P. - Work Point
For additional notes and details, see Sh. XX & XX.

REV.			
REV.	JXY	SAN	3-14
	New Border		
REV.	MRW	SAN	1-10
	Plan & Notes		
REVIEWED			
QUAN.	MRW	SAN	5-08
DR.	MRW	SAN	5-08
DES.	MRW	SAN	5-08
	BY	CHK.	DATE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

60'-0" PRESTRESSED CONC. CORED SLAB SPAN (3'-0" x 2'-0")

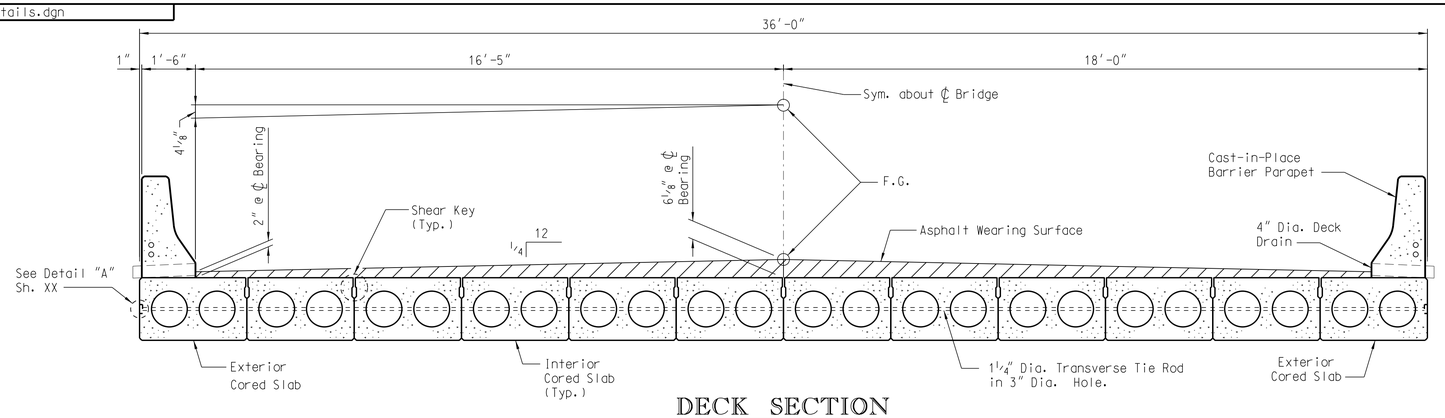
COUNTY XXXXXXXX | ROUTE XXXXXX

DRAWING NO. 704-60

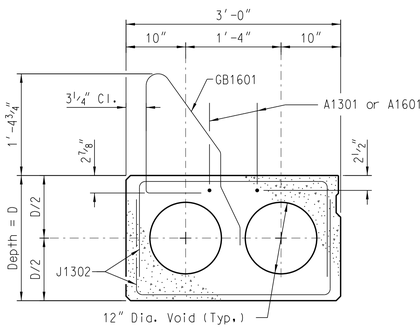
Printed: Monday, March 31, 2014 7:38:22 AM

csdetails.dgn

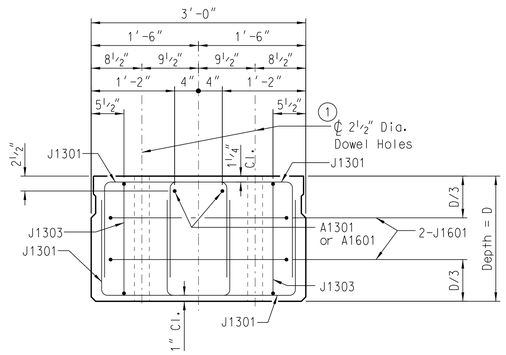
BRIDGE PLANS ID	SHEET NO.
XXXXXXX-BXX	XX



DECK SECTION

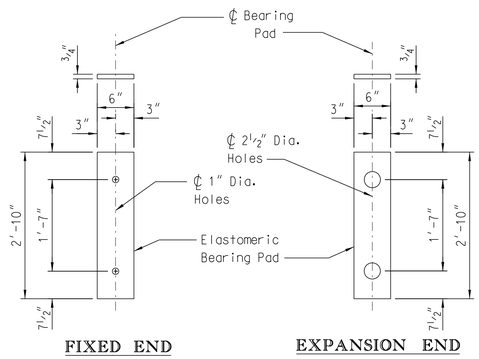


EXTERIOR SLAB SECTION ②



END ELEVATION ②

Interior Slab Section shown (Exterior Slab Section similar except Shear Key location.)



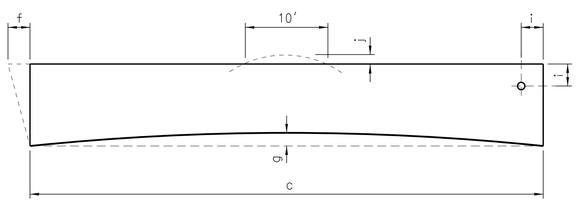
ELASTOMERIC BEARING DETAILS

(60 Durometer)

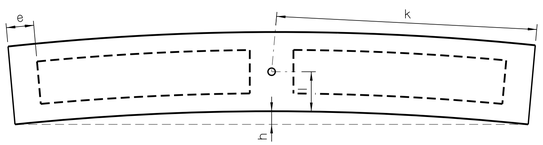
① Remove all pipes prior to grouting.

② For prestressed strand layout, see Section on Sh. XX.

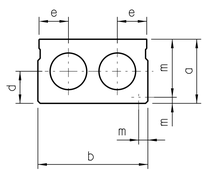
TOLERANCES



PLAN



ELEVATION



CROSS SECTION

a	Depth	$+\frac{3}{8}''$ to $-\frac{1}{8}''$
b	Width	$\pm \frac{1}{4}''$
c	Length (Length of adjacent cored slab units must be within $\pm \frac{1}{4}''$.)	$\pm \frac{1}{8}''$ per 10'
d	Position of Voids: Vertical	$\pm \frac{3}{8}''$
e	Position of Voids: Horizontal	$\pm \frac{3}{8}''$
	Position of Void Ends: Longitudinal	$\pm 1''$
f	Square Ends: Deviation from square (horizontal or vertical) or designated skew	$\pm \frac{1}{4}''$
g	Horizontial Alignment: Deviation from a straight line parallel to the center line of member	$\pm \frac{3}{8}''$
h	Camber: Differential between adjacent units	$\frac{1}{4}''$ in 10', $\frac{3}{4}''$ max.
h	Camber: Differential between high and low members of the same span	$\frac{3}{4}''$ max.
i	Position of Dowel Holes: Deviation from plan position	$\pm \frac{1}{4}''$
	Width: Differential of adjacent spans in the same structure	$\pm \frac{3}{4}''$
	Bearing Area: Deviation from plan surface	$\pm \frac{1}{16}''$
j	Local Smoothness	$\frac{1}{4}''$ in 10'
k	Horizontal Position of holes for Transverse Tie Rods	$\pm \frac{1}{2}''$
l	Vertical Position of holes for Transverse Tie Rods	$\pm \frac{3}{8}''$
m	Position of Strands	$\pm \frac{1}{4}''$

NOTES:

See Section 704 of the Standard Specifications and the Special Provisions for additional requirements and information regarding prestressed concrete cored slab units. Submit shop drawings in accordance with the Standard Specifications.

Include all costs associated with furnishing, fabricating, and placing concrete, prestressing strands, and reinforcing steel cast into the cored slab units in the unit price bid for 3'-0" x 1'-9" Cored Slab and/or 3'-0" x 2'-0" Cored Slab as appropriate for this project.

Use prestressing strands that conform to the latest AASHTO M 203 for grade 270 (low relaxation).

Use reinforcing steel that conforms to ASTM A 706 Grade 60.

The tensioning load in all X" Dia. low relaxation strands is XXX kips. Do not release the strands until the compressive strength of the concrete has reached the value shown for f'ci.

When casting the cored slabs, use a positive hold-down system to prevent the voids from rising or moving sideways. Use a non-corrosive hold-down system that is designed to remain in place until the concrete attains the specified release strength. At least three weeks prior to casting the cored slab units, submit to the RCE, detailed drawings of the proposed hold-down system. Include structural details, locations, and spacing for the proposed hold-down system in the submittal.

Always maintain cored slab units in an upright position. Use lifting devices located within 2'-6" of the ends to lift or handle the cored slab units. Provide a 1" deep recess at the lifting devices. Grout the recesses prior to waterproofing the top surface of the cored slab units. Do not permit the cored slab units to be placed or stored on interior supports causing negative moments.

Tie rod assemblies include a $1\frac{1}{4}''$ Dia. rod, two heavy hex nuts, two lockwashers, and two $5'' \times 5'' \times \frac{5}{8}''$ plate washers. Thread 8" on each end of the tie rods. Provide tie rods and plate washers meeting the requirements of AASHTO M 270, Grade 36. Provide nuts meeting the requirements of ASTM A 563, Grade A. Galvanize tie rods and all hardware in accordance with ASTM A 123, ASTM A 153, or ASTM F 2329 as applicable. Tie rods are to be installed for test fit during fit up of span in casting yard. Include all costs associated with furnishing and installing tie rod assemblies in the unit price bid for 3'-0" x 1'-9" Cored Slab and/or 3'-0" x 2'-0" Cored Slab as appropriate for this project.

Place cored slab units so that the maximum transverse joint width at any location along the bent does not exceed $1\frac{7}{8}''$.

Grout all shear keys, dowel holes, and recesses for transverse tie rods after tightening the transverse tie rods. At expansion ends of slab units, fill the dowel holes with cold applied elastic filler to $1\frac{1}{2}''$ above the top of dowels and fill the remaining portion with grout. After the grout has cured for a minimum of three days, and has attained the required strength, place the barrier parapet.

Provide deck drains made of 4" nominal diameter fiberglass pipe meeting the requirements of ASTM D 2996. Include all costs associated with furnishing and installing deck drains in the unit price bid for Concrete Bridge Barrier Parapet.

Apply a bridge deck waterproofing system, that complies with the requirements of Section 814 of the Standard Specifications, to the top surface of the cored slab units prior to placing the asphalt wearing surface.

Include all costs associated with furnishing and installing joint, shear key, recess, and dowel hole filler materials including grout, backer rod, and cold applied elastic filler in the unit price bid for 3'-0" x 1'-9" Cored Slab and/or 3'-0" x 2'-0" Cored Slab as appropriate for this project.

For locations of fixed and expansion bearings, see "Bridge Plan & Profile".

For locations of deck drains, see Sh. XX.

Note to Designer:

Use of barrier parapet transition or vertical railing wall will require additional design and detailing by the User's Engineer.

Due to the camber of the slab units, modifications to the design and detailing by the User's Engineer may be required to maintain the required finished grade profile.

This drawing furnished for information only. All dimensions shown are sheet specific. Any use of this design and drawing, including dimensions, must be checked by the User's Engineer to ensure design is adequate for the intended use. All drawings must be signed and sealed by a South Carolina Registered Professional Engineer when used.

Design Assumptions:
The Live Load Distribution Factor (LLDF) is calculated based on the condition of being only connected enough to prevent relative vertical displacement at the interface (not post-tensioned).

For design and deflection checks, the dead load of the barrier is distributed equally to the 3 outermost units and the dead load of the asphalt wearing surface is distributed equally to all units.

Printed: Thursday, March 27, 2014 7:42:44 AM

REV.			
REV.	JXY	SAN	3-14
	New Border		
REV.	MRW	SAN	1-10
	Plan & Notes		
REVIEWED			
QUAN.	PNP	SAN	5-08
DR.	PNP	SAN	5-08
DES.	PNP	SAN	5-08
	BY	CHK.	DATE

SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

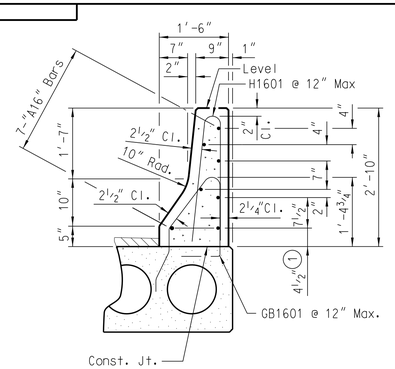
PRESTRESSED CONCRETE CORED SLAB DETAILS (1 of 2)

COUNTY: XXXXXXXX
ROUTE: XXXXXX

DRAWING NO. 704-29a

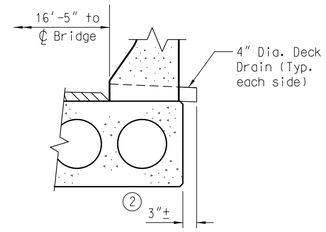
csdetails.dgn

BRIDGE PLANS ID	SHEET NO.
XXXXXXX-BXX	XX

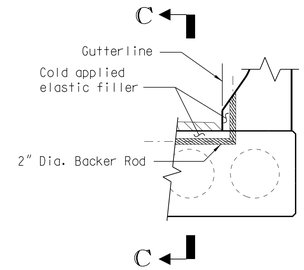


SECTION THRU BARRIER PARAPET

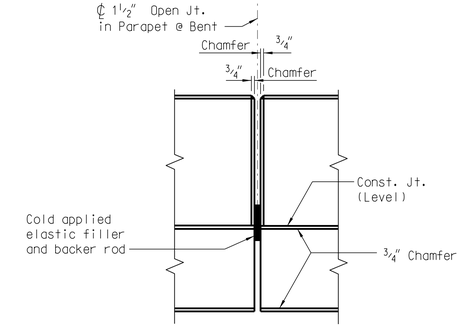
(Deck Drains not shown)



DRAIN DETAIL



INTERIOR BENT JOINT DETAIL



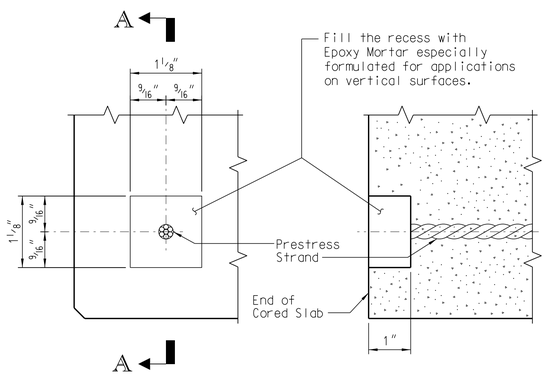
ELEVATION AT INTERIOR BENT

Notes:

For additional notes and details see Sh. XX.

① Adjust bottom "A16" bars to clear deck drains.

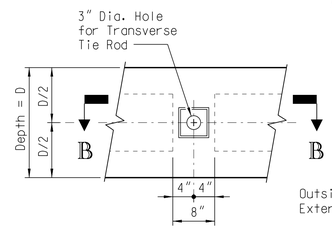
② Place end of deck drains flush with face of barrier parapet on traffic side. Raise the traffic end of the drain ½" by placing the drain on a bed of grout and sloping to provide positive drainage. Place asphalt to provide positive drainage. At no additional expense to the Department, it is permissible to provide coupling for deck drains that facilitates slip forming of the barrier parapet.



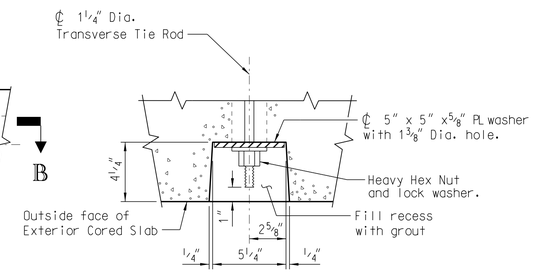
PART ELEVATION AT END OF CORED SLAB

SECTION A-A

GROUTED RECESS AT END OF PRETENSIONED STRAND



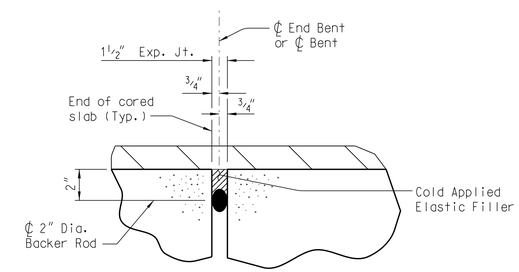
ELEVATION VIEW



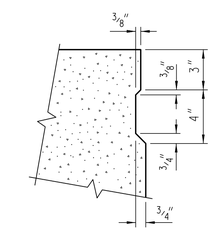
SECTION B-B

DETAIL "A"

(See Deck Section Sh. XX)

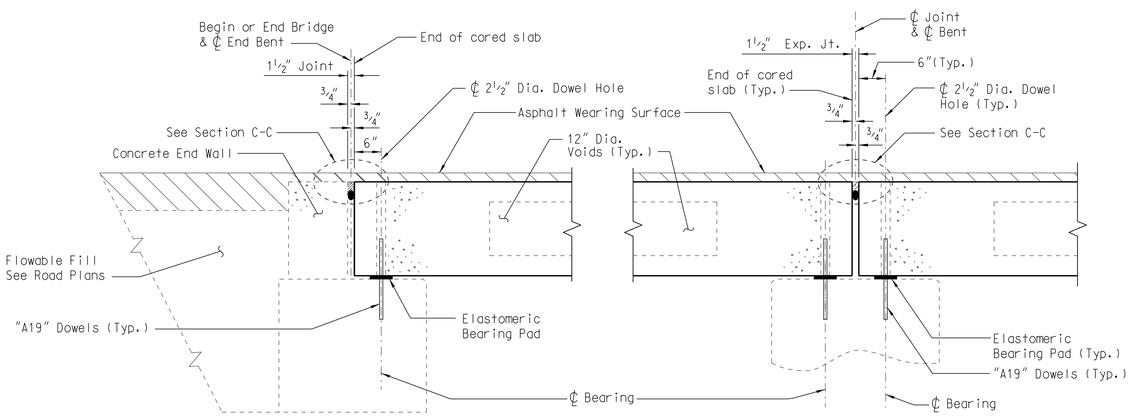


SECTION C-C



SHEAR KEY DETAIL

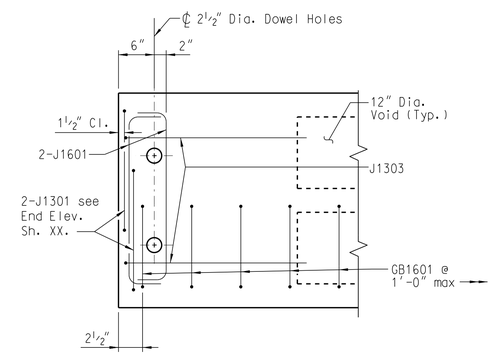
Note: Omit Shear Key on Outside Face of Exterior Cored Slabs.



SECTION AT END BENT

(Without Approach Slab)

SECTION AT INTERIOR BENT



PART PLAN EXTERIOR SLAB

Note: Interior slab similar except omit GB1601 bars. (Additional reinforcement not shown)

Note to Designer:

Use of barrier parapet transition or vertical railing wall will require additional design and detailing by the User's Engineer.

Due to the camber of the slab units, modifications to the design and detailing by the User's Engineer may be required to maintain the required finished grade profile.

If approach slab is used, replace "Section at End Bent" with detail located outside of sheet border.

This drawing furnished for information only. All dimensions shown are sheet specific. Any use of this design and drawing, including dimensions, must be checked by the User's Engineer to ensure design is adequate for the intended use. All drawings must be signed and sealed by a South Carolina Registered Professional Engineer when used.

REV.			
REV.	JXY	SAN	3-14
	New Border		
REV.	MRW	SAN	1-10
	Plan & Notes		
REVIEWED			
QUAN.	PNP	SAN	5-08
DR.	PNP	SAN	5-08
DES.	PNP	SAN	5-08
	BY	CHK.	DATE

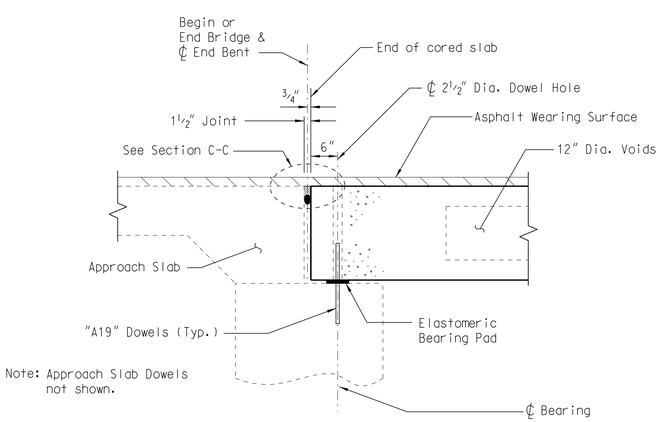
SOUTH CAROLINA
DEPARTMENT OF TRANSPORTATION

PRESTRESSED CONCRETE CORED SLAB DETAILS (2 of 2)

COUNTY XXXXXXXX | ROUTE XXXXXX

DRAWING NO. 704-29b

Printed: Thursday, March 27, 2014 7:42:46 AM



SECTION AT END BENT

(With Approach Slab)

REV.	JXY	SAN	3-14
	Add Border		
REV.	MRW	SAN	1-10
	Plan & Notes		
DR.	PNP	SAN	5-08

Printed: Thursday, March 27, 2014 7:42:47 AM

DRAWING NO. 704-29b

S-45-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Beam Design
Span A and C

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia,
South Carolina

Span A - Back Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevation [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Cl Bearing at Cl Alignment	B	67+61.560	28.018					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	67+61.560	28.018	16.4167	0.032000	28.543		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	67+61.560	28.018	-16.4167	0.032000	27.492		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032	SLOPE		
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								3.00
Top of cored slab at left gutter	E					28.293		
Top of cored slab at CL	F					27.768		
Top of cored slab at right gutter	G					27.242		
Asphalt thickness Left Gutter	A-E							3.00 OK > Min Thick
Asphalt thickness CL	B-F							3.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							3.00 OK > Min Thick

Span A - Mid Span

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Mid Span at Cl Alignment	B	67+79.750	28.095					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	67+79.750	28.095	16.4167	0.032000	28.620		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	67+79.750	28.095	-16.4167	0.032000	27.570		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032	SLOPE		
Min asphalt thick set by Engr								2.00

AVG Top of cored slab at left gutter	E	{ interpolated between back bearing and ahead bearing}	28.362	2.30	OK > Min Thick
AVG Top of cored slab at CL	F	{ interpolated between back bearing and ahead bearing}	27.836	2.30	OK > Min Thick
AVG Top of cored slab at right gutter	G	{ interpolated between back bearing and ahead bearing}	27.311	2.30	OK > Min Thick
Asphalt thickness Left Gutter	A-E				
Asphalt thickness CL	B-F				
Asphalt thickness Right Gutter	C-G				
Girder Camber from design [in]	0.806	[in]			

Span A - Ahead Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
CI Bearing at CI Alignment	B	67+97.940	28.155					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
CI Bearing at left gutter	A	67+97.940	28.155	16.4167	0.032000	28.680		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
CI Bearing at right gutter	C	67+97.940	28.155	-16.4167	0.032000	27.630		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032 SLOPE			
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								3.00
Top of cored slab at left gutter	E					28.430		
Top of cored slab at CL	F					27.905		
Top of cored slab at right gutter	G					27.380		
Asphalt thickness Left Gutter	A-E							3.00 OK > Min Thick
Asphalt thickness CL	B-F							3.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							3.00 OK > Min Thick

Span C - Back Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Cl Bearing at Cl Alignment	B	68+69.060	28.226					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	68+69.060	28.226	16.4167	0.032000	28.751		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	68+69.060	28.226	-16.4167	0.032000	27.701		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032 SLOPE			
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								3.00
Top of cored slab at left gutter	E					28.501		
Top of cored slab at CL	F					27.976		
Top of cored slab at right gutter	G					27.451		
Asphalt thickness Left Gutter	A-E							3.00 OK > Min Thick
Asphalt thickness CL	B-F							3.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							3.00 OK > Min Thick

Span C - Mid Span

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Mid Span at Cl Alignment	B	68+96.750	28.183					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	68+96.750	28.183	16.4167	0.032000	28.709		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	68+96.750	28.183	-16.4167	0.032000	27.658		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032	SLOPE		
Min asphalt thick set by Engr								2.00

AVG Top of cored slab at left gutter	E	{interpolated between back bearing and ahead bearing}	28.439	2.40	OK > Min Thick
AVG Top of cored slab at CL	F	{interpolated between back bearing and ahead bearing}	27.913	2.40	OK > Min Thick
AVG Top of cored slab at right gutter	G	{interpolated between back bearing and ahead bearing}	27.388	2.40	OK > Min Thick
Asphalt thickness Left Gutter	A-E				
Asphalt thickness CL	B-F				
Asphalt thickness Right Gutter	C-G				
Girder Camber from design [in]	0.839	[in]			

Span C - Ahead Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Cl Bearing at Cl Alignment	B	69+24.440	28.101					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	69+24.440	28.101	16.4167	0.032000	28.626		
OGL gutter offset right				16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	69+24.440	28.101	-16.4167	0.032000	27.576		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032 SLOPE			
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								3.00
Top of cored slab at left gutter	E					28.376		
Top of cored slab at CL	F					27.851		
Top of cored slab at right gutter	G					27.326		
Asphalt thickness Left Gutter	A-E							3.00 OK > Min Thick
Asphalt thickness CL	B-F							3.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							3.00 OK > Min Thick

Bentley			Sheet #	1
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	**Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl**		Date	Feb/3/2016

PROJECT DATA

Project:	S-51 over Black Mingo
Designer:	CSB
Date:	Feb/3/2016
Checked By:	DKY
Date Checked:	Feb/3/2016
User job number:	
State:	SC, State Job #:
State Specification:	None
Design Code:	AASHTO LRFD - [6th Edition, with 2013 Interim Revisions]
Units:	US
Span Type:	Multi-Span (Non-Continuous)
Flared Girder:	No
Comments:	37'-6" Span A and 56'-6" Span C Simple Model 37'-6" - 70'-0" - 56'-6" Cored Slab No Skew
File Name:	Z:\Projects\15-42 Emerg Bridge Replace PKG 4\S-51 Battery Park Rd\Structures\Final Design\Superstructure\Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A and C Model_020316.csl

Bentley			Sheet #	2
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	**Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl**		Date	Feb/3/2016

GEOMETRY DATA

BRIDGE LAYOUT

Overall Width (ft)	36.000
Left curb (ft)	1.583
Right curb (ft)	1.583
Curb-to-curb width (ft)	32.834
Number of spans	3
Number of lanes	2
Lane width (ft)	12.000
Eff Deck thick (in)	0.000
Sacrificial thick (in)	0.000
Haunch thickness (in)	0.000
Haunch width (in)	36.000

SPAN DATA

Span	Pier-to-pier ft	Precast ft	Brg-to-brg ft	Pier CL ft	Release ft	StartSkew	EndSkew	Bridge c/s M.I. in4
1	36.938	37.375	36.375	-0.500	37.375	0.00	0.00	473232.00
2	70.000	69.875	68.875	0.063	69.875	0.00	0.00	473232.00
3	55.938	56.375	55.375	-0.500	56.375	0.00	0.00	473232.00

BEAM DATA

Span: 1

No	ID	Loc-prev ft	Area in2	MI(Ixx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

Span: 2

No	ID	Loc-prev ft	Area in2	MI(Ixx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

Span: 3

No	ID	Loc-prev ft	Area in2	MI(Ixx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

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)	5.000	6.000	4.000
Wc (pcf)	150.000	150.000	150.000
Ec (ksi)	4286.830	4695.980	3834.250
K1	1.000	1.000	1.000
Thermal coeff.(1/°F)	0.00000600		

STRAND AND REBAR PROPERTIES

PRESTRESSED STEEL:
6/10-270K-LL, Low relaxation strands
Straight Pattern
Strand Diameter = 0.600 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

LOADS DATA

Loads generated using Permanent Load Wizard: NO
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

Span	Beam	DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
1	1	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	2	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	3	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	4	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	5	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	6	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	7	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	8	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	9	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	10	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	11	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
1	12	DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)
2	1	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	2	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	3	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	4	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	5	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	6	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	7	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	8	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	9	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	10	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	11	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
2	12	DC	Line	0.124	0.000	0.124	68.875	Asphalt Overlay (2.75" Avg.)
3	1	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	2	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	3	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	4	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	5	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	6	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	7	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	8	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	9	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	10	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	11	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)
3	12	DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)

DIAPHRAGM LOADS

Span	Beam	Load (kips)	Location (ft)
1	1	0.160	12.708
1	1	0.160	23.667
1	2	0.160	12.708
1	2	0.160	23.667
1	3	0.160	12.708
1	3	0.160	23.667
1	4	0.160	12.708
1	4	0.160	23.667
1	5	0.160	12.708
1	5	0.160	23.667
1	6	0.160	12.708
1	6	0.160	23.667
1	7	0.160	12.708
1	7	0.160	23.667
1	8	0.160	12.708
1	8	0.160	23.667
1	9	0.160	12.708
1	9	0.160	23.667
1	10	0.160	12.708
1	10	0.160	23.667
1	11	0.160	12.708
1	11	0.160	23.667
1	12	0.160	12.708
1	12	0.160	23.667
3	1	0.160	19.167
3	1	0.160	36.208
3	2	0.160	19.167
3	2	0.160	36.208
3	3	0.160	19.167
3	3	0.160	36.208
3	4	0.160	19.167
3	4	0.160	36.208
3	5	0.160	19.167
3	5	0.160	36.208
3	6	0.160	19.167
3	6	0.160	36.208
3	7	0.160	19.167
3	7	0.160	36.208
3	8	0.160	19.167
3	8	0.160	36.208
3	9	0.160	19.167
3	9	0.160	36.208
3	10	0.160	19.167
3	10	0.160	36.208
3	11	0.160	19.167
3	11	0.160	36.208
3	12	0.160	19.167
3	12	0.160	36.208

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	0.410	0.000	0.410	36.375	Right Barrier
1	DC	Line	0.410	0.000	0.410	36.375	Left Barrier
1	DW	Area	0.015	32.633	-	-	FWS
2	DC	Line	0.410	0.000	0.410	68.875	Right Barrier
2	DC	Line	0.410	0.000	0.410	68.875	Left Barrier
2	DW	Area	0.015	32.633	-	-	FWS
3	DC	Line	0.410	0.000	0.410	55.375	Right Barrier
3	DC	Line	0.410	0.000	0.410	55.375	Left Barrier
3	DW	Area	0.015	32.633	-	-	FWS

TEMPERATURE LOADS - NONE

LIVE LOADS
Live load deflection: included.

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

Pedestrian Load - NONE

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)
Service I:	1.00	1.00	-	1.00	-
Service III:	0.80	1.00	-	1.00	-
Strength I:	1.75	1.25	0.90	1.50	0.65
Fatigue I:	1.50	-	-	-	-

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	1.00
	Debonded	2.00

Camber & Deflection Multiplier (PCI ref.)

	Erection	Final
Prestress:	1.80	2.45
Self. Wt:	1.85	2.70
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:	Strain Compatibility method.
Ultimate Concrete Strain:	0.0030
Horizontal Shear, Beam and Slab effects in Vu:	EXCLUDED

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

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	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	1.00
Shear	0.90

PRESTRESS LOSSES:

Time Dependent Losses, Approximate Method (Art.5.9.5.3)
Days to release = 0.75
Rel. Humid.(RH) = 75.0 %

BEAM REINFORCEMENT

BEAM SPECIFIC MATERIAL PROPERTIES:

Span#, Beam#	Tendon-ID	Girder-f'ci ksi	Girder-f'c ksi	Deck-f'c ksi
Span:1, Beam:1	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:2	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:3	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:4	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:5	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:6	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:7	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:8	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:9	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:10	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:11	6/10-270K-LL	5.00	6.00	4.00
Span:1, Beam:12	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:1	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:2	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:3	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:4	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:5	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:6	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:7	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:8	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:9	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:10	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:11	6/10-270K-LL	5.00	6.00	4.00
Span:2, Beam:12	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:1	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:2	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:3	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:4	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:5	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:6	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:7	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:8	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:9	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:10	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:11	6/10-270K-LL	5.00	6.00	4.00
Span:3, Beam:12	6/10-270K-LL	5.00	6.00	4.00

Span:1, Beam:1

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:2

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:3

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:4

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:5

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:6

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:7

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:8

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:9

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:10

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:11

PRESTRESSED STEEL:

16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:1, Beam:12

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

Span:2, Beam:1

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:2

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:3

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:4

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:5

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:6

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:7

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:8

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:9

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:10

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:11

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:12

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:1

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:2

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:3

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:4

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:5

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:6

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:7

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:8

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:9

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:10

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:11

PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

Span:3, Beam:12

PRESTRESSED STEEL:

16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

PROPERTIES
Span:1, Beam:1
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab					
Type	Rect. Beams w/ Circular Voids					
Flng width	Top	36.000	in	Bot	36.000	in
thick	Top	6.000	in	Bot	6.000	in
Stems	No	0				
	Top	N/A				
	Bot	N/A				
Shear width		12.000	in			

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt/Rt	1.50/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Exterior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	12.71
0.16	23.67

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	37.375	ft
Release length	37.375	ft
Design length	36.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.268	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.261	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.285	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.281	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.268	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.285	(Calculated)	
Live Shear		(2+ lanes loaded)	0.183	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.183	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.8165
Use transformed strand and rebar: No

Span:1, Beam:1
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:1, Beam:1
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.500	ft
Dev. Len, debonded	13.001	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.109	in

Span:1, Beam:1
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
598.000	740	442.520	6.131	24831.068	127.960	0.000

Span:1, Beam:1
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4287	ksi

AASHTO LOSSES

Elastic Shortening 10.34 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.555 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.27	ksi	0.01	ksi
due	to Composite Loads	-0.37	ksi	0.02	ksi
due	to Live Loads	-1.82	ksi	0.12	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial			Final		
Steel relaxation	0.00	ksi			2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi			9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi			8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	10.34	ksi	(5.11 %)		18.33	ksi	(9.05 %)
Total Prestress Losses					28.67	ksi	(14.16 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 173.8 ksi < 0.80 fpy, OK

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	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	53.3	22.6	67.1	123.2	158.4	181.3	187.3
	V	15.3	13.6	14.6	13.2	11.0	8.9	7.2	0.6
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	15.3	13.6	14.6	13.2	11.0	9.0	7.5	6.0
	M	0.0	53.6	22.9	67.1	119.2	150.4	169.2	168.9
Total :	M+	0.0	94.7	39.8	119.5	223.6	293.2	336.9	349.8
	V	33.0	29.0	31.4	27.8	22.0	16.3	10.9	0.6
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	33.0	29.0	31.4	27.8	22.0	16.5	11.2	6.0
	M	0.0	95.0	40.2	119.5	219.5	285.3	324.8	331.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
DL-Comp :	M	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	183.0	163.6	130.9	77.3	33.8	63.9	11.6
	V	1.0	1.0	3.1	5.3	10.3	6.9	12.6
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	6.8	8.7	10.6	12.7	14.2	13.2	14.9
	M	160.0	152.4	124.5	75.3	34.0	62.7	12.8
Total :	M+	338.9	299.2	232.4	131.2	52.8	106.8	13.4
	V	4.5	8.3	14.0	19.8	27.0	22.2	30.2
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	10.4	16.0	21.5	27.3	30.9	28.5	32.6
	M	315.9	288.0	226.0	129.2	53.0	105.6	14.6

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	42.7	18.1	53.7	98.6	126.7	145.1	149.9
	V	12.2	10.9	11.7	10.5	8.8	7.1	5.8	0.5
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	12.2	10.9	11.7	10.5	8.8	7.2	6.0	4.8
	M	0.0	42.9	18.3	53.7	95.3	120.3	135.4	135.2
Total :	M+	0.0	84.0	35.3	106.1	198.9	261.5	300.6	312.3
	V	30.0	26.3	28.5	25.2	19.8	14.5	9.4	0.5
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	30.0	26.3	28.5	25.2	19.8	14.7	9.7	4.8
	M	0.0	84.3	35.6	106.1	195.7	255.2	290.9	297.6

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
DL-Comp :	M	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	146.4	130.9	104.7	61.8	27.0	51.1	9.3
	V	0.8	0.8	2.5	4.2	8.2	5.6	10.0
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	5.5	6.9	8.5	10.2	11.4	10.6	11.9
	M	128.0	122.0	99.6	60.2	27.2	50.1	10.2
Total :	M+	302.3	266.5	206.2	115.8	46.0	94.1	11.1
	V	4.3	8.1	13.4	18.8	24.9	20.8	27.7
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	9.0	14.3	19.4	24.7	28.1	25.8	29.6
	M	283.9	257.5	201.1	114.2	46.2	93.1	12.0

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

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	35.2	14.7	44.5	85.2	114.2	131.6	137.4
(Max)	V	15.1	13.0	14.3	12.4	9.3	6.2	3.1	0.0
Self wt. :	M	0.0	25.3	10.6	32.1	61.3	82.2	94.7	98.9
(Min)	V	10.9	9.4	10.3	8.9	6.7	4.5	2.2	0.0
DL-Prec. :	M	0.0	6.5	2.7	8.2	15.7	21.0	24.3	25.3
DC(Max)	V	2.8	2.4	2.6	2.3	1.7	1.1	0.6	0.0
DL-Prec. :	M	0.0	4.7	2.0	5.9	11.3	15.2	17.5	18.2
DC(Min)	V	2.0	1.7	1.9	1.6	1.2	0.8	0.4	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	0.6	1.4	2.1	2.5	2.5
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.5	1.0	1.5	1.8	1.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	7.4	3.1	9.3	17.9	24.0	27.8	29.1
DC(Max)	V	3.2	2.7	3.0	2.6	2.0	1.3	0.7	0.0
DL-Comp :	M	0.0	5.3	2.2	6.7	12.9	17.3	20.0	21.0
DC(Min)	V	2.3	2.0	2.1	1.9	1.4	1.0	0.5	0.0
DL-Comp :	M	0.0	2.7	1.1	3.4	6.4	8.6	10.0	10.5
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
DL-Comp :	M	0.0	1.1	0.5	1.5	2.8	3.7	4.3	4.5
DW(Min)	V	0.5	0.4	0.5	0.4	0.3	0.2	0.1	0.0
LL + I :	M+	0.0	93.4	39.5	117.5	215.6	277.1	317.3	327.8
	V	26.8	23.9	25.6	23.0	19.2	15.6	12.7	1.0
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	26.8	23.9	25.6	23.0	19.2	15.8	13.2	10.5
	M	0.0	93.8	40.1	117.5	208.6	263.3	296.1	295.6
Total :	M+	0.0	145.5	61.3	183.5	342.1	447.1	513.4	532.7
	V	49.1	43.2	46.8	41.5	33.1	24.9	17.3	1.1
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	49.1	43.2	46.8	41.5	33.1	25.2	17.8	10.5
	M	0.0	146.0	61.9	183.5	335.1	433.2	492.2	500.5

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:02 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	131.6	114.2	85.2	44.5	14.7	35.2	0.0
(Max)	V	3.1	6.2	9.3	12.4	14.3	13.0	15.1
Self wt. :	M	94.7	82.2	61.3	32.1	10.6	25.3	0.0
(Min)	V	2.2	4.5	6.7	8.9	10.3	9.4	10.9
DL-Prec. :	M	24.3	21.0	15.7	8.2	2.7	6.5	0.0
DC(Max)	V	0.6	1.1	1.7	2.3	2.6	2.4	2.8
DL-Prec. :	M	17.5	15.2	11.3	5.9	2.0	4.7	0.0
DC(Min)	V	0.4	0.8	1.2	1.6	1.9	1.7	2.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.5	2.1	1.4	0.6	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	1.8	1.5	1.0	0.5	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	28.1	24.7	18.9	10.8	4.7	8.9	1.7
DC(Max)	V	0.6	1.2	1.9	2.5	2.9	2.6	3.1
DL-Comp :	M	20.2	17.8	13.6	7.7	3.4	6.4	1.3
DC(Min)	V	0.4	0.9	1.3	1.8	2.1	1.9	2.2
DL-Comp :	M	10.1	8.9	6.8	3.9	1.7	3.2	0.6
DW(Max)	V	0.2	0.4	0.7	0.9	1.0	0.9	1.1
DL-Comp :	M	4.4	3.9	3.0	1.7	0.7	1.4	0.3
DW(Min)	V	0.1	0.2	0.3	0.4	0.5	0.4	0.5
LL + I :	M+	320.3	286.3	229.1	135.3	59.2	111.8	20.3
	V	1.7	1.8	5.4	9.2	18.0	12.1	22.0
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	12.0	15.2	18.6	22.3	24.9	23.2	26.1
	M	280.0	266.8	217.8	131.8	59.6	109.7	22.3
Total :	M+	516.9	457.3	357.1	203.3	83.2	166.0	22.7
	V	6.2	11.0	19.2	27.6	39.1	31.4	44.2
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	16.4	24.4	32.3	40.6	46.0	42.4	48.4
	M	476.6	437.7	345.8	199.8	83.6	163.9	24.7

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	15.1	15.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.8	2.8
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	18.9	18.4
DL-Comp.(DW)	13.6	13.2
Live	114.8	114.8
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:02 A.M.

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	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	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	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	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	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	34.6	14.5	43.7	82.7	109.5	124.1	126.6
	V	10.0	9.0	9.6	8.7	7.6	6.6	5.5	4.0
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	10.0	9.0	9.6	8.7	7.6	6.6	5.5	4.5
	M	0.0	34.6	14.5	43.7	82.7	109.5	124.1	126.4
Total :	M+	0.0	75.9	31.8	96.1	183.1	244.4	279.6	289.1
	V	27.8	24.3	26.4	23.3	18.7	14.0	9.2	4.0
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	27.8	24.3	26.4	23.3	18.7	14.0	9.2	4.5
	M	0.0	75.9	31.8	96.1	183.1	244.4	279.6	288.9

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
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	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
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	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
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+	125.8	112.7	87.5	50.0	22.0	41.2	8.2
	V	2.9	1.9	0.8	8.5	9.4	8.8	9.8
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	5.3	6.4	7.4	8.5	9.4	8.8	9.8
	M	123.8	111.4	86.8	50.0	22.1	41.3	8.2
Total :	M+	281.7	248.3	188.9	103.9	41.0	84.2	10.0
	V	6.5	9.2	11.7	23.0	26.1	24.0	27.4
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	8.9	13.7	18.3	23.0	26.1	24.0	27.4
	M	279.7	247.0	188.3	103.9	41.1	84.2	10.0

POSITIVE ENVELOPE STRESSES

Span : 1, Beam : 1, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.16 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.359	2.152	1.076	2.152	2.152	2.152	2.152	2.152
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.014	0.031	0.055	0.072	0.082	0.085
Bottom	-0.005	-0.026	-0.014	-0.031	-0.055	-0.072	-0.082	-0.085
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.042	0.233	0.123	0.282	0.478	0.597	0.668	0.684
Bottom	-0.042	-0.233	-0.123	-0.282	-0.478	-0.597	-0.668	-0.684
Final 1 (P/S + DL + LL)								
Precast-top	0.006	0.131	0.063	0.220	0.590	0.834	0.979	1.018
Bottom	0.310	1.761	0.883	1.672	1.303	1.059	0.914	0.874
Final 2 (P/S + DL)								
Precast-top	-0.037	-0.102	-0.060	-0.062	0.112	0.236	0.310	0.334
Bottom	0.352	1.995	1.006	1.955	1.781	1.656	1.582	1.558

Span : 1, Beam : 1, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.16 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.359	2.152	1.076	2.152	2.152	2.152	2.152	2.152
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.014	0.031	0.055	0.072	0.082	0.085
Bottom	-0.005	-0.026	-0.014	-0.031	-0.055	-0.072	-0.082	-0.085
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.034	0.187	0.099	0.226	0.382	0.478	0.535	0.547
Bottom	-0.034	-0.187	-0.099	-0.226	-0.382	-0.478	-0.535	-0.547
Final 1 (P/S + DL + LL)								
Precast-top	-0.003	0.085	0.039	0.164	0.494	0.714	0.845	0.882
Bottom	0.318	1.808	0.908	1.729	1.398	1.179	1.048	1.011

Span : 1, Beam : 1, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
F_LL+I(+)									
Precast-top		0.030	0.151	0.080	0.183	0.319	0.412	0.459	0.462
Bottom		-0.030	-0.151	-0.080	-0.183	-0.319	-0.412	-0.459	-0.462
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.012	0.099	0.050	0.152	0.375	0.530	0.615	0.629
Bottom		0.146	0.847	0.423	0.795	0.571	0.417	0.332	0.317

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 1, STRENGTH I
Using General Beta Theta Equation 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									
49.1	12.00	20.86	0.219	0.0	6.00e-3	50.0	37.9	0.440	2.400	0.00
0.0	0.60	20.56	31.5	0.037	16.7	0.87	16.45	0.186	4.096	0.359
Transfer :	3.00									
43.2	12.00	20.86	3.038	0.0	-0.28e-3	28.0	0.0	0.186	0.800	0.00
146.0	3.35	19.18	189.0	0.035	108.0	6.06	15.35	0.186	5.252	2.156
Critical :	2.14									
45.3	12.00	20.86	3.038	0.0	-0.30e-3	28.0	0.0	0.186	0.800	0.00
96.5	2.41	19.65	189.0	0.036	112.7	6.17	15.72	0.186	5.185	1.535
0.1L :	3.74									
41.5	12.00	20.86	3.038	0.0	-0.26e-3	28.1	0.0	0.186	0.800	0.00
183.5	3.62	19.05	189.0	0.034	105.8	5.98	15.24	0.186	5.397	2.342
0.2L :	7.47									
33.1	12.00	20.86	3.038	0.0	-0.21e-3	28.3	0.0	0.186	0.400	0.00
335.1	4.65	18.77	189.0	0.027	99.0	5.68	15.02	0.186	4.584	3.038
0.3L :	11.21									
25.2	12.00	20.86	3.038	0.0	-0.17e-3	28.4	0.0	0.186	0.400	0.00
433.2	4.65	18.77	189.0	0.021	96.1	5.51	15.02	0.186	5.918	3.038
0.4L :	14.95									
17.8	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
492.2	4.65	18.77	189.0	0.015	94.5	5.42	15.02	0.186	8.280	3.038
0.5L :	18.69									
10.5	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
500.5	4.65	18.77	189.0	0.009	94.6	5.43	15.02	0.186	14.008	3.038
0.6L :	22.43									
16.4	12.00	20.86	3.038	0.0	-0.16e-3	28.4	0.0	0.186	0.400	0.00
476.6	4.65	18.77	189.0	0.014	95.1	5.45	15.02	0.186	9.003	3.038
0.7L :	26.16									
24.4	12.00	20.86	3.038	0.0	-0.17e-3	28.4	0.0	0.186	0.400	0.00
437.7	4.65	18.77	189.0	0.020	96.0	5.50	15.02	0.186	6.097	3.038
0.8L :	29.90									
32.3	12.00	20.86	3.038	0.0	-0.20e-3	28.3	0.0	0.186	0.400	0.00
345.8	4.65	18.77	189.0	0.027	98.7	5.66	15.02	0.186	4.688	3.038
0.9L :	33.64									
40.6	12.00	20.86	3.038	0.0	-0.26e-3	28.1	0.0	0.186	0.800	0.00
199.8	3.62	19.05	189.0	0.033	105.3	5.95	15.24	0.186	5.494	2.342
Critical :	35.24									
44.4	12.00	20.86	3.038	0.0	-0.29e-3	28.0	0.0	0.186	0.800	0.00
116.6	2.41	19.65	189.0	0.035	111.9	6.13	15.72	0.186	5.262	1.535
Transfer :	34.38									
42.4	12.00	20.86	3.038	0.0	-0.27e-3	28.1	0.0	0.186	0.800	0.00
163.9	3.35	19.18	189.0	0.034	107.4	6.02	15.35	0.186	5.339	2.156
Bearing :	36.88									

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)
	12.00	20.86	0.219	0.0	6.00e-3	50.0	37.1	0.430	2.406	0.00
24.7	0.60	20.56	31.5	0.036	16.7	0.87	16.45	0.186	4.173	0.359

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

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

At 0.1 x L =	Release 3.24 ft	Mult	Erection	Mult	Final
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.009	3.00	-0.026
DL-Comp. (DW)			-0.003	3.00	-0.008
Live Load					-0.053
Total	0.175		0.293		0.304

At 0.2 x L =	Release 6.97 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.017	3.00	-0.052
DL-Comp. (DW)			-0.005	3.00	-0.016
Live Load					-0.109
Total	0.309		0.511		0.504

At 0.3 x L =	Release 10.71 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.025	3.00	-0.074
DL-Comp. (DW)			-0.007	3.00	-0.022
Live Load					-0.154
Total	0.401		0.660		0.629

At 0.4 x L =	Release 14.45 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.029	3.00	-0.088
DL-Comp. (DW)			-0.009	3.00	-0.026
Live Load					-0.182
Total	0.455		0.746		0.696

At 0.5 x L =	Release 18.19 ft	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.031	3.00	-0.093
DL-Comp. (DW)			-0.009	3.00	-0.028
Live Load					-0.193
Total	0.473		0.774		0.717

At 0.6 x L =	Release 21.92 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.030	3.00	-0.089
DL-Comp. (DW)			-0.009	3.00	-0.027
Live Load					-0.185
Total	0.455		0.745		0.692

At 0.7 x L =	Release 25.66 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.025	3.00	-0.076
DL-Comp. (DW)			-0.008	3.00	-0.023
Live Load					-0.159
Total	0.401		0.659		0.620

At 0.8 x L =	Release 29.40 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.006	3.00	-0.017
Live Load					-0.117
Total	0.309		0.510		0.492

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	33.14 ft				
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.010	3.00	-0.030
DL-Comp. (DW)			-0.003	3.00	-0.009
Live Load					-0.062
Total	0.175		0.291		0.289

ULTIMATE MOMENT

ULTIMATE - Span : 1, Beam : 1, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
145.5	19.6	2.464	249.3	4.4	3.35	920.1	0.012T	1.00	-	-	-	-
H/2	1.00											
61.3	19.2	1.232	257.5	2.3	1.73	485.6	0.026T	1.00	-	-	-	-
0.1L	3.24											
183.5	19.7	2.676	248.5	4.8	3.62	990.1	0.011T	1.00	-	-	-	-
0.2L	6.97											
342.1	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	455.0	1.37	-
0.3L	10.71											
447.1	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	594.7	1.37	-
0.4L	14.45											
513.4	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	682.9	1.37	-
0.5L	18.19											
532.7	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	708.5	1.37	-
0.6L	21.93											
516.9	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	687.4	1.37	-
0.7L	25.66											
457.3	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	608.2	1.37	-
0.8L	29.40											
357.1	19.8	3.472	245.7	6.2	4.65	1239.4	0.008T	1.00	905.7	475.0	1.37	-
0.9L	33.14											
203.3	19.7	2.676	248.5	4.8	3.62	990.1	0.011T	1.00	-	-	-	-
H/2	35.38											
83.2	19.2	1.232	257.5	2.3	1.73	485.6	0.026T	1.00	-	-	-	-
Transfer	33.88											
166.0	19.6	2.464	249.3	4.4	3.35	920.1	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 1, Beam : 1; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.002
		M	2.00	Fb	0.259
2	2	E	21.50	Ft	0.374
		M	21.50	Fb	0.149
3	2	E	6.00	Ft	0.353
		M	6.00	Fb	0.432
4	2	E	4.00	Ft	0.280
		M	4.00	Fb	0.766
5	2	E	4.00	Ft	0.208
		M	4.00	Fb	1.100
6	2	E	2.00	Ft	0.085
		M	2.00	Fb	1.484
7	2	E	2.00	Ft	-0.038
		M	2.00	Fb	1.869
8	2	E	2.00	Ft	-0.161
		M	2.00	Fb	2.253

DESIGN SUMMARY

Span: 1, Beam: 1, Exterior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	37.38
Release Length,	ft	37.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.11 %	
Final losses:	14.16 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.253	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.161	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.37	532.68	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	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	3.600	1.018	Midspan	2.700	0.334	Midspan			
Precast Bot	3.600	1.761	Transfer	2.700	1.995	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	-0.003	Bearing						
Precast Bot	-0.465	0.318	Bearing						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	0.629	Midspan
Precast Bot							2.400	0.847	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 18.19 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.031	3.00	-0.093
DL-Comp. (DW)			-0.009	3.00	-0.028
Live Load					-0.193
Total	0.473		0.774		0.717

Positive values indicate upward deflection.

PROPERTIES
Span:1, Beam:2
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in	
thick	Top	6.000	in	Bot	6.000	in	
Stems	No	0					
	Top	N/A					
	Bot	N/A					
Shear width		12.000	in				

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt./Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	12.71
0.16	23.67

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	37.375	ft
Release length	37.375	ft
Design length	36.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.268	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.261	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.265	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.261	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.268	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.264	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.8165
Use transformed strand and rebar: No

Span:1, Beam:2
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:1, Beam:2
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.504	ft
Dev. Len, debonded	13.008	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.109	in

Span:1, Beam:2
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
598.000	740	442.520	6.131	24831.068	127.960	0.000

Span:1, Beam:2
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4287	ksi

AASHTO LOSSES

Elastic Shortening 10.34 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.555 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.27	ksi	0.01	ksi
due	to Composite Loads	-0.37	ksi	0.02	ksi
due	to Live Loads	-1.71	ksi	0.11	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

	Initial			Final		
Steel relaxation	0.00	ksi		2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi		9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi		8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	10.34	ksi	(5.11 %)	18.43	ksi	(9.10 %)
Total Prestress Losses				28.77	ksi	(14.21 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 173.7 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

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	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.5	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	50.2	21.2	63.1	115.9	149.0	170.6	176.2
	V	50.0	44.6	47.9	43.0	35.9	29.1	23.7	1.9
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	50.0	44.6	47.9	43.0	36.0	29.6	24.7	19.6
	M	0.0	50.4	21.6	63.1	112.1	141.5	159.2	158.9
Total :	M+	0.0	91.5	38.5	115.6	216.3	283.8	326.1	338.7
	V	67.8	60.0	64.7	57.7	46.9	36.5	27.3	2.0
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	67.8	60.0	64.7	57.7	47.0	37.0	28.3	19.6
	M	0.0	91.8	38.8	115.6	212.5	276.4	314.7	321.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
DL-Comp :	M	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	172.2	153.9	123.2	72.7	31.8	60.1	10.9
	V	3.2	3.3	10.1	17.3	33.7	22.7	41.1
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	22.4	28.4	34.7	41.7	46.6	43.3	48.8
	M	150.5	143.4	117.1	70.8	32.0	59.0	12.0
Total :	M+	328.1	289.5	224.7	126.6	50.8	103.1	12.7
	V	6.7	10.6	21.0	31.8	50.4	37.9	58.7
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	25.9	35.7	45.6	56.2	63.3	58.6	66.4
	M	306.4	279.0	218.6	124.7	51.0	101.9	13.8

Bentley			Sheet #	7
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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 III
Shears: kips, Moments: k/ft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	40.1	17.0	50.5	92.7	119.2	136.5	141.0
	V	40.0	35.7	38.3	34.4	28.7	23.3	18.9	1.6
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	40.0	35.7	38.3	34.4	28.8	23.7	19.7	15.7
	M	0.0	40.4	17.2	50.5	89.7	113.2	127.3	127.1
Total :	M+	0.0	81.5	34.3	102.9	193.1	254.0	292.0	303.5
	V	57.8	51.0	55.1	49.1	39.7	30.7	22.6	1.6
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	57.8	51.0	55.1	49.1	39.8	31.1	23.4	15.7
	M	0.0	81.7	34.5	102.9	190.1	248.0	282.9	289.6

Bentley			Sheet #	8
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
DL-Comp :	M	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	137.7	123.1	96.5	58.2	25.4	48.1	8.7
	V	2.5	2.6	8.1	13.8	27.0	18.2	32.9
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	17.9	22.7	27.8	33.4	37.3	34.6	39.0
	M	120.4	114.7	93.7	56.7	25.6	47.2	9.6
Total :	M+	293.6	258.7	200.0	112.1	44.4	91.0	10.6
	V	6.1	10.0	19.0	28.4	43.7	33.4	50.5
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	21.4	30.0	38.7	47.9	54.0	49.9	56.7
	M	276.3	250.3	195.2	110.6	44.6	90.1	11.4

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, STRENGTH I
Shears: kips, Moments: k/ft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	35.2	14.7	44.5	85.2	114.2	131.6	137.4
(Max)	V	15.1	13.0	14.3	12.4	9.3	6.2	3.1	0.0
Self wt. :	M	0.0	25.3	10.6	32.1	61.3	82.2	94.7	98.9
(Min)	V	10.9	9.4	10.3	8.9	6.7	4.5	2.2	0.0
DL-Prec. :	M	0.0	6.5	2.7	8.2	15.7	21.0	24.3	25.3
DC(Max)	V	2.8	2.4	2.6	2.3	1.7	1.1	0.6	0.0
DL-Prec. :	M	0.0	4.7	2.0	5.9	11.3	15.2	17.5	18.2
DC(Min)	V	2.0	1.7	1.9	1.6	1.2	0.8	0.4	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	0.6	1.4	2.1	2.5	2.5
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.5	1.0	1.5	1.8	1.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	7.4	3.1	9.3	17.9	24.0	27.8	29.1
DC(Max)	V	3.2	2.7	3.0	2.6	2.0	1.3	0.7	0.0
DL-Comp :	M	0.0	5.3	2.2	6.7	12.9	17.3	20.0	21.0
DC(Min)	V	2.3	2.0	2.1	1.9	1.4	1.0	0.5	0.0
DL-Comp :	M	0.0	2.7	1.1	3.4	6.4	8.6	10.0	10.5
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
DL-Comp :	M	0.0	1.1	0.5	1.5	2.8	3.7	4.3	4.5
DW(Min)	V	0.5	0.4	0.5	0.4	0.3	0.2	0.1	0.0
LL + I :	M+	0.0	87.8	37.2	110.5	202.8	260.7	298.5	308.4
	V	87.6	78.1	83.8	75.3	62.8	50.9	41.4	3.4
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	87.6	78.1	83.8	75.3	63.0	51.8	43.2	34.2
	M	0.0	88.3	37.7	110.5	196.2	247.6	278.6	278.1
Total :	M+	0.0	140.0	58.9	176.6	329.3	430.7	494.6	513.2
	V	109.9	97.4	104.9	93.8	76.7	60.2	46.0	3.5
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	109.9	97.4	104.9	93.8	76.9	61.1	47.8	34.3
	M	0.0	140.4	59.5	176.6	322.7	417.6	474.7	483.0

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	131.6	114.2	85.2	44.5	14.7	35.2	0.0
(Max)	V	3.1	6.2	9.3	12.4	14.3	13.0	15.1
Self wt. :	M	94.7	82.2	61.3	32.1	10.6	25.3	0.0
(Min)	V	2.2	4.5	6.7	8.9	10.3	9.4	10.9
DL-Prec. :	M	24.3	21.0	15.7	8.2	2.7	6.5	0.0
DC(Max)	V	0.6	1.1	1.7	2.3	2.6	2.4	2.8
DL-Prec. :	M	17.5	15.2	11.3	5.9	2.0	4.7	0.0
DC(Min)	V	0.4	0.8	1.2	1.6	1.9	1.7	2.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.5	2.1	1.4	0.6	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	1.8	1.5	1.0	0.5	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	28.1	24.7	18.9	10.8	4.7	8.9	1.7
DC(Max)	V	0.6	1.2	1.9	2.5	2.9	2.6	3.1
DL-Comp :	M	20.2	17.8	13.6	7.7	3.4	6.4	1.3
DC(Min)	V	0.4	0.9	1.3	1.8	2.1	1.9	2.2
DL-Comp :	M	10.1	8.9	6.8	3.9	1.7	3.2	0.6
DW(Max)	V	0.2	0.4	0.7	0.9	1.0	0.9	1.1
DL-Comp :	M	4.4	3.9	3.0	1.7	0.7	1.4	0.3
DW(Min)	V	0.1	0.2	0.3	0.4	0.5	0.4	0.5
LL + I :	M+	301.3	269.3	215.5	127.2	55.7	105.2	19.1
	V	5.5	5.8	17.7	30.3	59.0	39.7	71.9
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	39.1	49.7	60.8	73.0	81.6	75.8	85.4
	M	263.4	251.0	204.9	124.0	56.1	103.2	21.0
Total :	M+	497.9	440.3	343.5	195.3	79.7	159.4	21.5
	V	10.0	15.0	31.5	48.6	80.1	58.9	94.1
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	43.6	58.9	74.5	91.3	102.6	95.0	107.6
	M	460.0	421.9	332.9	192.0	80.1	157.4	23.4

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	15.1	15.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.8	2.8
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	18.9	18.4
DL-Comp.(DW)	13.6	13.2
Live	114.8	114.8
Pedestrian	0.0	0.0

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.

Bentley			Sheet #	11
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

SHEAR AND MOMENT ENVELOPE : Span : 1, Beam : 2, FATIGUE I
Shears: kips, Moments: k/ft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	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	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	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	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	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	32.1	13.4	40.6	76.8	101.7	115.2	117.5
	V	32.8	29.4	31.4	28.4	25.0	21.5	18.1	13.0
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	32.8	29.4	31.4	28.4	25.0	21.5	18.1	14.6
	M	0.0	32.1	13.4	40.6	76.8	101.7	115.2	117.3
Total :	M+	0.0	73.4	30.7	93.0	177.2	236.5	270.7	280.0
	V	50.5	44.8	48.2	43.1	36.0	29.0	21.7	13.0
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	50.5	44.8	48.2	43.1	36.0	29.0	21.7	14.7
	M	0.0	73.4	30.7	93.0	177.2	236.5	270.7	279.8

Bentley			Sheet #	12
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
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	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	22.5	19.8	15.1	8.6	3.8	7.1	1.4
DC(Max)	V	0.5	1.0	1.5	2.0	2.3	2.1	2.4
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	6.8	5.9	4.5	2.5	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
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+	116.7	104.6	81.2	46.4	20.4	38.3	7.6
	V	9.5	6.1	2.6	27.7	30.7	28.7	32.0
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	17.4	20.8	24.3	27.7	30.7	28.7	32.0
	M	114.8	103.4	80.6	46.4	20.5	38.3	7.6
Total :	M+	272.7	240.2	182.6	100.3	39.4	81.2	9.4
	V	13.1	13.4	13.5	42.2	47.4	43.9	49.7
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	20.9	28.1	35.2	42.2	47.4	43.9	49.7
	M	270.8	239.0	182.1	100.3	39.5	81.3	9.4

POSITIVE ENVELOPE STRESSES

Span : 1, Beam : 2, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.21 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.358	2.150	1.075	2.150	2.150	2.150	2.150	2.150
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.014	0.031	0.055	0.072	0.082	0.085
Bottom	-0.005	-0.026	-0.014	-0.031	-0.055	-0.072	-0.082	-0.085
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.040	0.220	0.116	0.266	0.450	0.562	0.629	0.643
Bottom	-0.040	-0.220	-0.116	-0.266	-0.450	-0.562	-0.629	-0.643
Final 1 (P/S + DL + LL)								
Precast-top	0.003	0.118	0.056	0.204	0.562	0.798	0.939	0.978
Bottom	0.312	1.774	0.890	1.688	1.330	1.093	0.952	0.914
Final 2 (P/S + DL)								
Precast-top	-0.036	-0.102	-0.060	-0.062	0.112	0.236	0.311	0.334
Bottom	0.352	1.994	1.006	1.953	1.780	1.655	1.581	1.557

Span : 1, Beam : 2, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.21 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.358	2.150	1.075	2.150	2.150	2.150	2.150	2.150
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.014	0.031	0.055	0.072	0.082	0.085
Bottom	-0.005	-0.026	-0.014	-0.031	-0.055	-0.072	-0.082	-0.085
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.032	0.176	0.093	0.212	0.360	0.450	0.503	0.515
Bottom	-0.032	-0.176	-0.093	-0.212	-0.360	-0.450	-0.503	-0.515
Final 1 (P/S + DL + LL)								
Precast-top	-0.005	0.074	0.033	0.150	0.472	0.686	0.813	0.849
Bottom	0.320	1.818	0.913	1.741	1.420	1.206	1.078	1.042

Span : 1, Beam : 2, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
F_LL+I(+)									
Precast-top		0.028	0.140	0.075	0.169	0.296	0.382	0.426	0.429
Bottom		-0.028	-0.140	-0.075	-0.169	-0.296	-0.382	-0.426	-0.429
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.009	0.089	0.045	0.138	0.352	0.500	0.582	0.596
Bottom		0.148	0.857	0.428	0.807	0.594	0.446	0.364	0.349

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 2, STRENGTH I
Using General Beta Theta Equation procedure - Art.5.8.3.4.2

Location(ft)	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)
Vu (kips)	a (in)	dv (in)	fpo (ksi)	vu/fc	Vc-com (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
Mcor (kft)										
Bearing : 0.50										
109.9	12.00	20.86	0.220	0.0	6.00e-3	50.0	105.5	1.223	2.400	0.00
0.0	0.60	20.56	31.5	0.083	16.7	0.87	16.45	0.186	1.831	0.359
Transfer : 3.00										
97.4	12.00	20.86	3.038	0.0	-0.24e-3	28.2	4.0	0.186	0.800	0.00
140.4	3.34	19.19	189.0	0.078	104.3	5.85	15.35	0.186	2.287	2.154
Critical : 2.14										
101.8	12.00	20.86	3.038	0.0	-0.23e-3	28.2	6.8	0.186	0.800	0.00
92.8	2.41	19.65	189.0	0.080	106.3	5.82	15.72	0.186	2.238	1.534
0.1L : 3.74										
93.8	12.00	20.86	3.038	0.0	-0.23e-3	28.2	1.2	0.186	0.800	0.00
176.6	3.62	19.05	189.0	0.076	102.9	5.82	15.24	0.186	2.353	2.340
0.2L : 7.47										
76.9	12.00	20.86	3.038	0.0	-0.18e-3	28.4	0.0	0.186	0.400	0.00
322.7	4.65	18.77	189.0	0.063	97.1	5.57	15.02	0.186	1.951	3.038
0.3L : 11.21										
61.1	12.00	20.86	3.038	0.0	-0.16e-3	28.5	0.0	0.186	0.400	0.00
417.6	4.65	18.77	189.0	0.050	94.8	5.43	15.02	0.186	2.416	3.038
0.4L : 14.95										
47.8	12.00	20.86	3.038	0.0	-0.14e-3	28.5	0.0	0.186	0.400	0.00
474.7	4.65	18.77	189.0	0.039	93.6	5.37	15.02	0.186	3.066	3.038
0.5L : 18.69										
34.3	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
483.0	4.65	18.77	189.0	0.028	94.0	5.39	15.02	0.186	4.282	3.038
0.6L : 22.43										
43.6	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
460.0	4.65	18.77	189.0	0.036	94.3	5.41	15.02	0.186	3.375	3.038
0.7L : 26.16										
58.9	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
421.9	4.65	18.77	189.0	0.048	94.7	5.43	15.02	0.186	2.505	3.038
0.8L : 29.90										
74.5	12.00	20.86	3.038	0.0	-0.18e-3	28.4	0.0	0.186	0.400	0.00
332.9	4.65	18.77	189.0	0.061	96.9	5.55	15.02	0.186	2.009	3.038
0.9L : 33.64										
91.3	12.00	20.86	3.038	0.0	-0.23e-3	28.2	0.0	0.186	0.800	0.00
192.0	3.62	19.05	189.0	0.074	102.5	5.79	15.24	0.186	2.412	2.340
Critical : 35.24										
99.4	12.00	20.86	3.038	0.0	-0.24e-3	28.2	3.8	0.186	0.800	0.00
111.9	2.41	19.65	189.0	0.078	106.6	5.84	15.72	0.186	2.295	1.534
Transfer : 34.38										
95.0	12.00	20.86	3.038	0.0	-0.24e-3	28.2	1.2	0.186	0.800	0.00
157.4	3.34	19.19	189.0	0.076	104.4	5.86	15.35	0.186	2.347	2.154
Bearing : 36.68										

Location(ft)	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)
Vu (kips)	a (in)	dv (in)	fpo (ksi)	vu/fc	Vc-com (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
Mcor (kft)										
	12.00	20.86	0.220	0.0	6.00e-3	50.0	102.9	1.193	2.406	0.00
23.4	0.60	20.56	31.5	0.081	16.7	0.87	16.45	0.186	1.874	0.359

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

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

At 0.1 x L =	Release 3.24 ft	Mult	Erection	Mult	Final
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.009	3.00	-0.026
DL-Comp. (DW)			-0.003	3.00	-0.008
Live Load					-0.050
Total	0.175		0.293		0.307

At 0.2 x L =	Release 6.97 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.017	3.00	-0.052
DL-Comp. (DW)			-0.005	3.00	-0.016
Live Load					-0.103
Total	0.309		0.511		0.511

At 0.3 x L =	Release 10.71 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.025	3.00	-0.074
DL-Comp. (DW)			-0.007	3.00	-0.022
Live Load					-0.145
Total	0.401		0.660		0.638

At 0.4 x L =	Release 14.45 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.029	3.00	-0.088
DL-Comp. (DW)			-0.009	3.00	-0.026
Live Load					-0.172
Total	0.455		0.746		0.707

At 0.5 x L =	Release 18.19 ft	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.031	3.00	-0.093
DL-Comp. (DW)			-0.009	3.00	-0.026
Live Load					-0.181
Total	0.473		0.774		0.728

At 0.6 x L =	Release 21.92 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.030	3.00	-0.089
DL-Comp. (DW)			-0.009	3.00	-0.027
Live Load					-0.174
Total	0.455		0.745		0.703

At 0.7 x L =	Release 25.66 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.025	3.00	-0.076
DL-Comp. (DW)			-0.008	3.00	-0.023
Live Load					-0.150
Total	0.401		0.659		0.629

At 0.8 x L =	Release 29.40 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.019	3.00	-0.056
DL-Comp. (DW)			-0.006	3.00	-0.017
Live Load					-0.110
Total	0.309		0.510		0.499

At 0.9 x L =	Release 33.14 ft	Mult	Erection	Mult	Final
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.010	3.00	-0.030
DL-Comp. (DW)			-0.003	3.00	-0.009
Live Load					-0.058
Total	0.175		0.291		0.293

ULTIMATE MOMENT

ULTIMATE - Span : 1, Beam : 2, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
140.0	19.7	2.462	249.3	4.4	3.34	919.6	0.012T	1.00	-	-	-	-
H/2	1.00											
58.9	19.2	1.231	257.5	2.3	1.73	485.4	0.026T	1.00	-	-	-	-
0.1L	3.24											
176.6	19.7	2.675	248.5	4.8	3.62	989.7	0.011T	1.00	-	-	-	-
0.2L	6.97											
329.3	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	438.0	1.37	-
0.3L	10.71											
430.7	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	572.8	1.37	-
0.4L	14.45											
494.6	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	657.8	1.37	-
0.5L	18.19											
513.2	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	682.6	1.37	-
0.6L	21.93											
497.9	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	662.2	1.37	-
0.7L	25.66											
440.3	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	585.6	1.37	-
0.8L	29.40											
343.5	19.8	3.472	245.6	6.2	4.65	1239.4	0.008T	1.00	905.4	456.9	1.37	-
0.9L	33.14											
195.3	19.7	2.675	248.5	4.8	3.62	989.7	0.011T	1.00	-	-	-	-
H/2	35.38											
79.7	19.2	1.231	257.5	2.3	1.73	485.4	0.026T	1.00	-	-	-	-
Transfer	33.88											
159.4	19.7	2.462	249.3	4.4	3.34	919.6	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 1, Beam : 2; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.002
		M	2.00	Fb	0.259
2	2	E	21.50	Ft	0.374
		M	21.50	Fb	0.149
3	2	E	6.00	Ft	0.353
		M	6.00	Fb	0.432
4	2	E	4.00	Ft	0.280
		M	4.00	Fb	0.766
5	2	E	4.00	Ft	0.208
		M	4.00	Fb	1.100
6	2	E	2.00	Ft	0.085
		M	2.00	Fb	1.484
7	2	E	2.00	Ft	-0.038
		M	2.00	Fb	1.869
8	2	E	2.00	Ft	-0.161
		M	2.00	Fb	2.253

DESIGN SUMMARY

Span: 1, Beam: 2, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	37.38
Release Length,	ft	37.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.11 %	
Final losses:	14.21 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.253	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.161	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.37	513.24	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	0.00 %		OK

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

Bentley			Sheet #	27
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

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	3.600	0.978	Midspan	2.700	0.334	Midspan			
Precast Bot	3.600	1.774	Transfer	2.700	1.994	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	-0.005	Bearing						
Precast Bot	-0.465	0.320	Bearing						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	0.596	Midspan
Precast Bot							2.400	0.857	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 18.19 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.031	3.00	-0.093
DL-Comp. (DW)			-0.009	3.00	-0.028
Live Load					-0.181
Total	0.473		0.774		0.728

Positive values indicate upward deflection.

PROPERTIES
Span:1, Beam:4
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in	
thick	Top	6.000	in	Bot	6.000	in	
Stems	No	0					
	Top	N/A					
	Bot	N/A					
Shear width		12.000	in				

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt/Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	36.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	12.71
0.16	23.67

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	37.375	ft
Release length	37.375	ft
Design length	36.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.268	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.261	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.265	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.261	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.268	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.264	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.083	(Calculated)
Comp. DW	0.083	(Calculated)

Dead Loads and Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.8165
Use transformed strand and rebar: No

Span:1, Beam:4
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:1, Beam:4
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.509	ft
Dev. Len, debonded	13.017	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.109	in

Span:1, Beam:4
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
598.000	740	442.520	6.131	24831.068	127.960	0.000

Span:1, Beam:4
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	4.1877	No
2	US#4[M13]	60.0	0.40	12.00	4.1877	33.1877	No
2	US#4[M13]	60.0	0.40	6.00	33.1877	36.6877	No
4	US#4[M13]	60.0	0.80	3.99	36.6877	37.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4287	ksi

AASHTO LOSSES

Elastic Shortening 10.34 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.555 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.27	ksi	0.01	ksi
due	to Composite Loads	-0.23	ksi	0.01	ksi
due	to Live Loads	-1.71	ksi	0.11	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial			Final		
Steel relaxation	0.00	ksi			2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi			9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi			8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	10.34	ksi	(5.11 %)		18.56	ksi	(9.17 %)
Total Prestress Losses					28.90	ksi	(14.27 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 173.6 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	2.9	1.2	3.7	7.1	9.6	11.1	11.7
DC(Max)	V	1.3	1.1	1.2	1.0	0.8	0.5	0.3	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	50.2	21.2	63.1	115.9	149.0	170.6	176.2
	V	50.0	44.6	47.9	43.0	35.9	29.1	23.7	1.9
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	50.0	44.6	47.9	43.0	36.0	29.6	24.7	19.6
	M	0.0	50.4	21.6	63.1	112.1	141.5	159.2	158.9
Total :	M+	0.0	88.6	37.3	111.8	209.1	274.2	315.0	327.1
	V	66.5	58.9	63.5	56.6	46.1	36.0	27.0	2.0
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	66.5	58.9	63.5	56.6	46.2	36.5	28.0	19.6
	M	0.0	88.9	37.6	111.8	205.3	266.8	303.6	309.7

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	11.2	9.9	7.6	4.3	1.9	3.5	0.7
DC(Max)	V	0.2	0.5	0.7	1.0	1.2	1.1	1.2
DL-Comp :	M	6.6	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	172.2	153.9	123.2	72.7	31.8	60.1	10.9
	V	3.2	3.3	10.1	17.3	33.7	22.7	41.1
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	22.4	28.4	34.7	41.7	46.6	43.3	48.8
	M	150.5	143.4	117.1	70.8	32.0	59.0	12.0
Total :	M+	316.8	279.6	217.1	122.3	48.9	99.5	12.0
	V	6.5	10.1	20.3	30.8	49.3	36.9	57.5
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	25.7	35.2	44.9	55.2	62.1	57.5	65.2
	M	295.2	269.1	211.0	120.4	49.1	98.4	13.1

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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 III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	2.9	1.2	3.7	7.1	9.6	11.1	11.7
DC(Max)	V	1.3	1.1	1.2	1.0	0.8	0.5	0.3	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	40.1	17.0	50.5	92.7	119.2	136.5	141.0
	V	40.0	35.7	38.3	34.4	28.7	23.3	18.9	1.6
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	40.0	35.7	38.3	34.4	28.8	23.7	19.7	15.7
	M	0.0	40.4	17.2	50.5	89.7	113.2	127.3	127.1
Total :	M+	0.0	78.6	33.0	99.2	185.9	244.4	280.9	291.8
	V	56.5	50.0	53.9	48.0	38.9	30.2	22.3	1.6
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	56.5	50.0	53.9	48.0	39.0	30.6	23.1	15.7
	M	0.0	78.8	33.3	99.2	182.9	238.4	271.8	278.0

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
DL-Prec. :	M	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	11.2	9.9	7.6	4.3	1.9	3.5	0.7
DC(Max)	V	0.2	0.5	0.7	1.0	1.2	1.1	1.2
DL-Comp :	M	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
LL + I :	M+	137.7	123.1	98.5	58.2	25.4	48.1	8.7
	V	2.5	2.6	8.1	13.8	27.0	18.2	32.9
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	17.9	22.7	27.8	33.4	37.3	34.6	39.0
	M	120.4	114.7	93.7	56.7	25.6	47.2	9.6
Total :	M+	282.4	248.8	192.4	107.8	42.5	87.5	9.9
	V	5.8	9.5	18.3	27.4	42.5	32.4	49.3
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	0.0	0.0
Total :	Vmx	21.2	29.5	38.0	46.9	52.8	48.8	55.5
	M	265.1	240.4	187.6	106.3	42.7	86.6	10.7

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

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	35.2	14.7	44.5	85.2	114.2	131.6	137.4
(Max)	V	15.1	13.0	14.3	12.4	9.3	6.2	3.1	0.0
Self wt. :	M	0.0	25.3	10.6	32.1	61.3	82.2	94.7	98.9
(Min)	V	10.9	9.4	10.3	8.9	6.7	4.5	2.2	0.0
DL-Prec. :	M	0.0	6.5	2.7	8.2	15.7	21.0	24.3	25.3
DC(Max)	V	2.8	2.4	2.6	2.3	1.7	1.1	0.6	0.0
DL-Prec. :	M	0.0	4.7	2.0	5.9	11.3	15.2	17.5	18.2
DC(Min)	V	2.0	1.7	1.9	1.6	1.2	0.8	0.4	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	0.6	1.4	2.1	2.5	2.5
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.5	1.0	1.5	1.8	1.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	3.7	1.5	4.7	8.9	12.0	13.9	14.6
DC(Max)	V	1.6	1.4	1.5	1.3	1.0	0.7	0.3	0.0
DL-Comp :	M	0.0	2.6	1.1	3.4	6.4	8.6	10.0	10.5
DC(Min)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
DL-Comp :	M	0.0	2.7	1.1	3.4	6.4	8.6	10.0	10.5
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
DL-Comp :	M	0.0	1.1	0.5	1.5	2.8	3.7	4.3	4.5
DW(Min)	V	0.5	0.4	0.5	0.4	0.3	0.2	0.1	0.0
LL + I :	M+	0.0	87.8	37.2	110.5	202.8	260.7	298.5	308.4
	V	87.6	78.1	83.8	75.3	62.8	50.9	41.4	3.4
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	87.6	78.1	83.8	75.3	63.0	51.8	43.2	34.2
	M	0.0	88.3	37.7	110.5	196.2	247.6	278.6	278.1
Total :	M+	0.0	136.3	57.4	171.9	320.4	418.7	480.7	498.7
	V	108.4	96.1	103.4	92.5	75.7	59.6	45.7	3.4
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	108.4	96.1	103.4	92.5	75.9	60.4	47.4	34.3
	M	0.0	136.8	58.0	171.9	313.8	405.6	460.8	468.4

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:02 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	131.6	114.2	85.2	44.5	14.7	35.2	0.0
(Max)	V	3.1	6.2	9.3	12.4	14.3	13.0	15.1
Self wt. :	M	94.7	82.2	61.3	32.1	10.6	25.3	0.0
(Min)	V	2.2	4.5	6.7	8.9	10.3	9.4	10.9
DL-Prec. :	M	24.3	21.0	15.7	8.2	2.7	6.5	0.0
DC(Max)	V	0.6	1.1	1.7	2.3	2.6	2.4	2.8
DL-Prec. :	M	17.5	15.2	11.3	5.9	2.0	4.7	0.0
DC(Min)	V	0.4	0.8	1.2	1.6	1.9	1.7	2.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.5	2.1	1.4	0.6	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	1.8	1.5	1.0	0.5	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	14.1	12.4	9.5	5.4	2.4	4.4	0.9
DC(Max)	V	0.3	0.6	0.9	1.3	1.4	1.3	1.5
DL-Comp :	M	10.1	8.9	6.8	3.9	1.7	3.2	0.6
DC(Min)	V	0.2	0.4	0.7	0.9	1.0	0.9	1.1
DL-Comp :	M	10.1	8.9	6.8	3.9	1.7	3.2	0.6
DW(Max)	V	0.2	0.4	0.7	0.9	1.0	0.9	1.1
DL-Comp :	M	4.4	3.9	3.0	1.7	0.7	1.4	0.3
DW(Min)	V	0.1	0.2	0.3	0.4	0.5	0.4	0.5
LL + I :	M+	301.3	269.3	215.5	127.2	55.7	105.2	19.1
	V	5.5	5.8	17.7	30.3	59.0	39.7	71.9
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	39.1	49.7	60.8	73.0	81.6	75.8	85.4
	M	263.4	251.0	204.9	124.0	56.1	103.2	21.0
Total :	M+	483.8	427.9	334.1	189.9	77.3	155.0	20.6
	V	9.7	14.4	30.5	47.3	78.6	57.6	92.6
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	43.3	58.3	73.6	90.0	101.1	93.7	106.1
	M	445.9	409.6	323.4	186.6	77.7	153.0	22.5

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	15.1	15.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.8	2.8
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	18.9	18.4
DL-Comp.(DW)	13.6	13.2
Live	114.8	114.8
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:02 A.M.

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	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	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	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	2.9	1.2	3.7	7.1	9.6	11.1	11.7
DC(Max)	V	1.3	1.1	1.2	1.0	0.8	0.5	0.3	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	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	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	32.1	13.4	40.6	76.8	101.7	115.2	117.5
	V	32.8	29.4	31.4	28.4	25.0	21.5	18.1	13.0
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	32.8	29.4	31.4	28.4	25.0	21.5	18.1	14.6
	M	0.0	32.1	13.4	40.6	76.8	101.7	115.2	117.3
Total :	M+	0.0	70.5	29.5	89.3	170.0	226.9	259.6	268.3
	V	49.3	43.7	47.0	42.0	35.2	28.4	21.5	13.0
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	49.3	43.7	47.0	42.0	35.2	28.4	21.5	14.7
	M	0.0	70.5	29.5	89.3	170.0	226.9	259.6	268.1

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	21.93	25.66	29.40	33.14	35.38	33.87	36.38
Self wt. :	M	105.2	91.3	68.1	35.6	11.8	28.1	0.0
(Max)	V	2.5	5.0	7.4	9.9	11.4	10.4	12.1
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	19.4	16.8	12.6	6.6	2.2	5.2	0.0
DC(Max)	V	0.5	0.9	1.4	1.8	2.1	1.9	2.2
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	2.0	1.7	1.1	0.5	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	11.2	9.9	7.6	4.3	1.9	3.5	0.7
DC(Max)	V	0.2	0.5	0.7	1.0	1.2	1.1	1.2
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	6.8	5.9	4.5	2.6	1.1	2.1	0.4
DW(Max)	V	0.1	0.3	0.4	0.6	0.7	0.6	0.7
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+	116.7	104.6	81.2	46.4	20.4	38.3	7.6
	V	9.5	6.1	2.6	27.7	30.7	28.7	32.0
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	17.4	20.8	24.3	27.7	30.7	28.7	32.0
	M	114.8	103.4	80.6	46.4	20.5	38.3	7.6
Total :	M+	261.4	230.3	175.1	96.0	37.5	77.7	8.7
	V	12.8	12.9	12.8	41.2	46.2	42.9	48.5
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	20.7	27.6	34.4	41.2	46.2	42.9	48.5
	M	259.5	229.1	174.5	96.0	37.6	77.7	8.7

POSITIVE ENVELOPE STRESSES

Span : 1, Beam : 4, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.27 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.358	2.149	1.074	2.149	2.149	2.149	2.149	2.149
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.003	0.013	0.007	0.016	0.028	0.036	0.041	0.043
Bottom	-0.003	-0.013	-0.007	-0.016	-0.028	-0.036	-0.041	-0.043
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.040	0.220	0.116	0.266	0.450	0.562	0.629	0.643
Bottom	-0.040	-0.220	-0.116	-0.266	-0.450	-0.562	-0.629	-0.643
Final 1 (P/S + DL + LL)								
Precast-top	0.001	0.105	0.049	0.188	0.534	0.762	0.898	0.936
Bottom	0.314	1.785	0.896	1.702	1.356	1.128	0.992	0.954
Final 2 (P/S + DL)								
Precast-top	-0.039	-0.115	-0.067	-0.077	0.084	0.200	0.270	0.292
Bottom	0.354	2.065	1.012	1.967	1.806	1.690	1.620	1.598

Span : 1, Beam : 4, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.11 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	3.74	7.48	11.21	14.95	18.69
Beam-Self						
Precast-top	0.125	0.152	0.271	0.356	0.407	0.424
Bottom	-0.125	-0.152	-0.271	-0.356	-0.407	-0.424
Prestress						
Precast-top	-0.286	-0.286	-0.286	-0.286	-0.286	-0.286
Bottom	2.378	2.378	2.378	2.378	2.378	2.378
Total						
Precast-top	-0.161	-0.134	-0.015	0.070	0.120	0.137
Bottom	2.253	2.226	2.107	2.023	1.972	1.955
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 14.27 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Prestress								
Precast-top	-0.043	-0.259	-0.129	-0.259	-0.259	-0.259	-0.259	-0.259
Bottom	0.358	2.149	1.074	2.149	2.149	2.149	2.149	2.149
Self wt.								
Precast-top	-0.000	0.103	0.043	0.130	0.249	0.333	0.384	0.401
Bottom	-0.000	-0.103	-0.043	-0.130	-0.249	-0.333	-0.384	-0.401
DL-Prec (DC)								
Precast-top	-0.000	0.019	0.008	0.024	0.046	0.061	0.071	0.074
Bottom	-0.000	-0.019	-0.008	-0.024	-0.046	-0.061	-0.071	-0.074
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.002	0.004	0.006	0.007	0.007
Bottom	-0.000	-0.001	-0.001	-0.002	-0.004	-0.006	-0.007	-0.007
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.003	0.013	0.007	0.016	0.028	0.036	0.041	0.043
Bottom	-0.003	-0.013	-0.007	-0.016	-0.028	-0.036	-0.041	-0.043
DL-Comp (DW)								
Precast-top	0.002	0.008	0.004	0.009	0.017	0.022	0.025	0.026
Bottom	-0.002	-0.008	-0.004	-0.009	-0.017	-0.022	-0.025	-0.026
LL+I(+)								
Precast-top	0.032	0.176	0.093	0.212	0.360	0.450	0.503	0.515
Bottom	-0.032	-0.176	-0.093	-0.212	-0.360	-0.450	-0.503	-0.515
Final 1 (P/S + DL + LL)								
Precast-top	-0.007	0.061	0.026	0.135	0.444	0.650	0.773	0.807
Bottom	0.322	1.829	0.919	1.755	1.446	1.240	1.117	1.083

Span : 1, Beam : 4, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
F_LL+I(+)									
Precast-top		0.028	0.140	0.075	0.169	0.296	0.382	0.426	0.429
Bottom		-0.028	-0.140	-0.075	-0.169	-0.296	-0.382	-0.426	-0.429
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.008	0.082	0.041	0.131	0.339	0.482	0.561	0.575
Bottom		0.149	0.863	0.431	0.814	0.607	0.463	0.384	0.370

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 1, Beam : 4, STRENGTH I
Using General Bela Theta Equation 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									
108.4	12.00	20.86	0.220	0.0	6.00e-3	50.0	103.7	1.203	2.400	0.00
0.0	0.60	20.56	31.5	0.081	16.7	0.87	16.45	0.186	1.858	0.359
Transfer :	3.00									
96.1	12.00	20.86	3.038	0.0	-0.24e-3	28.2	2.3	0.186	0.800	0.00
136.8	3.34	19.19	189.0	0.077	104.5	5.86	15.35	0.186	2.322	2.153
Critical :	2.14									
100.3	12.00	20.86	3.038	0.0	-0.24e-3	28.2	5.0	0.186	0.800	0.00
90.4	2.41	19.65	189.0	0.079	106.5	5.83	15.72	0.186	2.272	1.533
0.1L :	3.74									
92.5	12.00	20.86	3.038	0.0	-0.24e-3	28.2	0.0	0.186	0.800	0.00
171.9	3.62	19.05	189.0	0.075	103.2	5.83	15.24	0.186	2.389	2.339
0.2L :	7.47									
75.9	12.00	20.86	3.038	0.0	-0.19e-3	28.3	0.0	0.186	0.400	0.00
313.8	4.64	18.77	189.0	0.062	97.5	5.59	15.02	0.186	1.981	3.038
0.3L :	11.21									
60.4	12.00	20.86	3.038	0.0	-0.16e-3	28.4	0.0	0.186	0.400	0.00
405.6	4.64	18.77	189.0	0.050	95.2	5.46	15.02	0.186	2.449	3.038
0.4L :	14.95									
47.4	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
460.8	4.64	18.77	189.0	0.039	94.1	5.39	15.02	0.186	3.098	3.038
0.5L :	18.69									
34.3	12.00	20.86	3.038	0.0	-0.15e-3	28.5	0.0	0.186	0.400	0.00
468.4	4.64	18.77	189.0	0.028	94.5	5.42	15.02	0.186	4.299	3.038
0.6L :	22.43									
43.3	12.00	20.86	3.038	0.0	-0.16e-3	28.5	0.0	0.186	0.400	0.00
445.9	4.64	18.77	189.0	0.036	94.7	5.43	15.02	0.186	3.409	3.038
0.7L :	26.16									
58.3	12.00	20.86	3.038	0.0	-0.16e-3	28.4	0.0	0.186	0.400	0.00
409.6	4.64	18.77	189.0	0.048	95.2	5.46	15.02	0.186	2.539	3.038
0.8L :	29.90									
73.6	12.00	20.86	3.038	0.0	-0.19e-3	28.4	0.0	0.186	0.400	0.00
323.4	4.64	18.77	189.0	0.061	97.2	5.58	15.02	0.186	2.040	3.038
0.9L :	33.64									
90.0	12.00	20.86	3.038	0.0	-0.23e-3	28.2	0.0	0.186	0.800	0.00
186.6	3.62	19.05	189.0	0.073	102.8	5.81	15.24	0.186	2.449	2.339
Critical :	35.24									
98.0	12.00	20.86	3.038	0.0	-0.24e-3	28.2	2.1	0.186	0.800	0.00
108.7	2.41	19.65	189.0	0.077	106.8	5.85	15.72	0.186	2.329	1.533
Transfer :	34.38									
93.7	12.00	20.86	3.038	0.0	-0.24e-3	28.1	0.0	0.186	0.800	0.00
153.0	3.34	19.19	189.0	0.075	104.6	5.87	15.35	0.186	2.383	2.153
Bearing :	36.88									

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)
	12.00	20.86	0.220	0.0	6.00e-3	50.0	101.2	1.174	2.406	0.00
22.5	0.60	20.56	31.5	0.080	16.7	0.87	16.45	0.186	1.901	0.359

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 1, Beam : 4; Units: in)

At 0.1 x L =	Release 3.24 ft	Mult	Erection	Mult	Final
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.004	3.00	-0.013
DL-Comp. (DW)			-0.003	3.00	-0.008
Live Load					-0.050
Total	0.175		0.297		0.320

At 0.2 x L =	Release 6.97 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.009	3.00	-0.026
DL-Comp. (DW)			-0.005	3.00	-0.016
Live Load					-0.103
Total	0.309		0.520		0.537

At 0.3 x L =	Release 10.71 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.012	3.00	-0.037
DL-Comp. (DW)			-0.007	3.00	-0.022
Live Load					-0.145
Total	0.401		0.672		0.675

At 0.4 x L =	Release 14.45 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.015	3.00	-0.044
DL-Comp. (DW)			-0.009	3.00	-0.026
Live Load					-0.172
Total	0.455		0.761		0.751

At 0.5 x L =	Release 18.19 ft	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.015	3.00	-0.046
DL-Comp. (DW)			-0.009	3.00	-0.028
Live Load					-0.181
Total	0.473		0.789		0.774

At 0.6 x L =	Release 21.92 ft	Mult	Erection	Mult	Final
Prestress	0.620	1.80	1.115	2.45	1.518
Self Wt.	-0.164	1.85	-0.304	2.70	-0.444
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.025	3.00	-0.074
Diaphragm			-0.002	3.00	-0.007
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.015	3.00	-0.044
DL-Comp. (DW)			-0.009	3.00	-0.027
Live Load					-0.174
Total	0.455		0.760		0.747

At 0.7 x L =	Release 25.66 ft	Mult	Erection	Mult	Final
Prestress	0.541	1.80	0.975	2.45	1.326
Self Wt.	-0.140	1.85	-0.260	2.70	-0.379
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.021	3.00	-0.063
Diaphragm			-0.002	3.00	-0.006
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.013	3.00	-0.038
DL-Comp. (DW)			-0.008	3.00	-0.023
Live Load					-0.150
Total	0.401		0.672		0.668

At 0.8 x L =	Release 29.40 ft	Mult	Erection	Mult	Final
Prestress	0.411	1.80	0.740	2.45	1.007
Self Wt.	-0.102	1.85	-0.190	2.70	-0.277
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.015	3.00	-0.045
Diaphragm			-0.001	3.00	-0.004
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.009	3.00	-0.028
DL-Comp. (DW)			-0.006	3.00	-0.017
Live Load					-0.110
Total	0.309		0.519		0.527

	Release	Mult	Erection	Mult	Final
At 0.9 x L =	33.14 ft				
Prestress	0.229	1.80	0.412	2.45	0.561
Self Wt.	-0.054	1.85	-0.100	2.70	-0.146
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.007	3.00	-0.022
Diaphragm			-0.001	3.00	-0.002
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.005	3.00	-0.015
DL-Comp. (DW)			-0.003	3.00	-0.009
Live Load					-0.058
Total	0.175		0.296		0.308

ULTIMATE MOMENT

ULTIMATE - Span : 1, Beam : 4, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer 2.50												
136.3	19.7	2.460	249.3	4.4	3.34	919.0	0.012T	1.00	-	-	-	-
H/2 1.00												
57.4	19.2	1.230	257.5	2.3	1.72	485.0	0.026T	1.00	-	-	-	-
0.1L 3.24												
171.9	19.7	2.673	248.4	4.8	3.62	989.1	0.011T	1.00	-	-	-	-
0.2L 6.97												
320.4	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	426.2	1.37	-
0.3L 10.71												
418.7	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	556.9	1.37	-
0.4L 14.45												
480.7	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	639.4	1.37	-
0.5L 18.19												
498.7	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	663.2	1.37	-
0.6L 21.93												
483.8	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	643.5	1.37	-
0.7L 25.66												
427.9	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	569.2	1.37	-
0.8L 29.40												
334.1	19.8	3.472	245.6	6.2	4.64	1239.4	0.008T	1.00	904.9	444.3	1.37	-
0.9L 33.14												
189.9	19.7	2.673	248.4	4.8	3.62	989.1	0.011T	1.00	-	-	-	-
H/2 35.38												
77.3	19.2	1.230	257.5	2.3	1.72	485.0	0.026T	1.00	-	-	-	-
Transfer 33.88												
155.0	19.7	2.460	249.3	4.4	3.34	919.0	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 1, Beam : 4; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.002
		M	2.00	Fb	0.259
2	2	E	21.50	Ft	0.374
		M	21.50	Fb	0.149
3	2	E	6.00	Ft	0.353
		M	6.00	Fb	0.432
4	2	E	4.00	Ft	0.280
		M	4.00	Fb	0.766
5	2	E	4.00	Ft	0.208
		M	4.00	Fb	1.100
6	2	E	2.00	Ft	0.085
		M	2.00	Fb	1.484
7	2	E	2.00	Ft	-0.038
		M	2.00	Fb	1.869
8	2	E	2.00	Ft	-0.161
		M	2.00	Fb	2.253

DESIGN SUMMARY

Span: 1, Beam: 4, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	37.38
Release Length,	ft	37.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.11 %	
Final losses:	14.27 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.253	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.161	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.36	498.68	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	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	3.600	0.936	Midspan	2.700	0.292	Midspan			
Precast Bot	3.600	1.785	Transfer	2.700	2.005	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	-0.007	Bearing						
Precast Bot	-0.465	0.322	Bearing						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	0.575	Midspan
Precast Bot							2.400	0.863	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 18.19 ft

	Release	Mult	Erection	Mult	Final
Prestress	0.646	1.80	1.162	2.45	1.582
Self Wt.	-0.173	1.85	-0.319	2.70	-0.466
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.026	3.00	-0.078
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.015	3.00	-0.046
DL-Comp. (DW)			-0.009	3.00	-0.028
Live Load					-0.181
Total	0.473		0.789		0.774

Positive values indicate upward deflection.

PROPERTIES
Span:3, Beam:1
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab					
Type	Rect. Beams w/ Circular Voids					
Flng width	Top	36.000	in	Bot	36.000	in
thick	Top	6.000	in	Bot	6.000	in
Stems	No	0				
	Top	N/A				
	Bot	N/A				
Shear width		12.000	in			

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt/Rt	1.50/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Exterior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	19.17
0.16	36.21

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	56.375	ft
Release length	56.375	ft
Design length	55.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.258	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.260	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.280	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.281	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.260	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.281	(Calculated)	
Live Shear		(2+ lanes loaded)	0.183	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.183	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ecl/Ec = 0.8165
Use transformed strand and rebar: No

Span:3, Beam:1
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:3, Beam:1
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.362	ft
Dev. Len, debonded	12.724	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.167	in

Span:3, Beam:1
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
902.000	740	667.480	9.248	37454.223	176.966	0.000

Span:3, Beam:1
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Ecl	4287	ksi

AASHTO LOSSES

Elastic Shortening 8.52 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.282 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.61	ksi	0.03	ksi
due	to Composite Loads	-0.84	ksi	0.04	ksi
due	to Live Loads	-3.30	ksi	0.22	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

	Initial			Final		
Steel relaxation	0.00	ksi		2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi		9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi		8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	8.52	ksi	(4.21 %)	16.17	ksi	(7.99 %)
Total Prestress Losses				24.70	ksi	(12.20 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 177.8 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	16.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	64.4	26.6	124.7	227.2	293.7	332.4	340.5
	V	17.9	16.8	17.5	15.6	13.1	10.7	7.8	2.5
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	17.9	16.8	17.5	15.6	13.2	11.0	8.8	6.7
	M	-0.0	65.4	27.2	124.7	218.2	275.8	296.9	283.1
Total :	M+	0.0	128.7	53.1	250.3	461.3	605.5	691.0	714.7
	V	44.8	41.3	43.4	37.5	29.7	21.8	13.3	2.5
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	44.8	41.3	43.4	37.5	29.8	22.1	14.3	6.7
	M	-0.0	129.7	53.7	250.3	452.2	587.7	655.5	657.3

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	336.3	300.3	236.5	136.8	39.3	77.0	12.7
	V	1.3	2.8	5.3	7.7	13.0	11.1	14.3
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	8.2	10.4	12.6	14.9	17.1	16.3	17.6
	M	283.6	269.6	219.1	130.3	39.8	75.1	14.7
Total :	M+	695.4	613.3	472.3	264.6	68.4	143.8	15.5
	V	6.7	13.8	21.7	29.5	38.8	35.5	41.1
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	13.6	21.3	29.0	36.8	42.9	40.7	44.4
	M	642.7	582.6	454.8	258.1	68.9	141.9	17.4

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, Beam : 1, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	51.6	21.3	99.8	181.8	234.9	265.9	272.4
	V	14.3	13.4	14.0	12.5	10.5	8.6	6.3	2.0
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	14.3	13.4	14.0	12.5	10.6	8.8	7.0	5.3
	M	-0.0	52.3	21.8	99.8	174.5	220.7	237.5	226.5
Total :	M+	0.0	115.6	47.7	225.4	415.8	546.8	624.5	646.6
	V	41.2	37.9	39.9	34.4	27.0	19.7	11.7	2.0
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	41.2	37.9	39.9	34.4	27.1	19.9	12.5	5.4
	M	-0.0	116.6	48.2	225.4	408.6	532.5	596.1	600.7

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	269.0	240.3	189.2	109.4	31.5	61.6	10.2
	V	1.1	2.3	4.2	6.1	10.4	8.8	11.4
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	6.5	8.3	10.1	11.9	13.7	13.0	14.1
	M	226.9	215.7	175.3	104.3	31.8	60.1	11.7
Total :	M+	628.1	553.2	425.0	237.2	60.6	128.4	12.9
	V	6.4	13.3	20.6	28.0	36.2	33.3	38.2
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	11.9	19.3	26.5	33.8	39.5	37.5	40.9
	M	586.0	528.7	411.0	232.1	60.9	126.9	14.5

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

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	54.9	22.6	107.2	199.5	265.5	305.1	318.3
(Max)	V	23.0	20.9	22.2	18.7	14.0	9.4	4.7	0.0
Self wt. :	M	0.0	39.5	16.3	77.2	143.7	191.2	219.7	229.2
(Min)	V	16.6	15.1	16.0	13.5	10.1	6.7	3.4	0.0
DL-Prec. :	M	0.0	10.1	4.2	19.8	36.8	49.0	56.3	58.7
DC(Max)	V	4.2	3.9	4.1	3.5	2.6	1.7	0.9	0.0
DL-Prec. :	M	0.0	7.3	3.0	14.2	26.5	35.3	40.5	42.3
DC(Min)	V	3.1	2.8	2.9	2.5	1.9	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	1.0	2.2	3.3	3.8	3.8
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.7	1.6	2.4	2.8	2.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	11.4	4.7	22.3	41.6	55.4	63.8	66.8
DC(Max)	V	4.8	4.4	4.6	3.9	2.9	2.0	1.0	0.0
DL-Comp :	M	0.0	8.2	3.4	16.1	29.9	39.9	46.0	48.1
DC(Min)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	0.0
DL-Comp :	M	0.0	4.1	1.7	8.0	15.0	20.0	23.0	24.1
DW(Max)	V	1.7	1.6	1.7	1.4	1.1	0.7	0.4	0.0
DL-Comp :	M	0.0	1.8	0.7	3.5	6.5	8.7	10.0	10.4
DW(Min)	V	0.7	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	112.8	46.6	218.3	397.6	513.9	581.7	595.9
	V	31.4	29.4	30.6	27.2	23.0	18.8	13.7	4.3
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	31.4	29.4	30.6	27.2	23.2	19.2	15.4	11.7
	M	-0.0	114.5	47.7	218.3	381.8	482.7	519.6	495.4
Total :	M+	0.0	193.8	79.9	376.6	692.7	907.1	1033.7	1067.7
	V	65.3	60.2	63.3	54.9	43.8	32.8	20.6	4.4
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	65.3	60.2	63.3	54.9	44.0	33.2	22.3	11.8
	M	-0.0	195.5	81.0	376.6	676.8	875.8	971.6	967.2

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:03 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	305.1	265.5	199.5	107.2	22.6	54.9	0.0
(Max)	V	4.7	9.4	14.0	18.7	22.2	20.9	23.0
Self wt. :	M	219.7	191.2	143.7	77.2	16.3	39.5	0.0
(Min)	V	3.4	6.7	10.1	13.5	16.0	15.1	16.6
DL-Prec. :	M	56.3	49.0	36.8	19.8	4.2	10.1	0.0
DC(Max)	V	0.9	1.7	2.6	3.5	4.1	3.9	4.2
DL-Prec. :	M	40.5	35.3	26.5	14.2	3.0	7.3	0.0
DC(Min)	V	0.6	1.2	1.9	2.5	2.9	2.8	3.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.8	3.3	2.2	1.0	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	2.8	2.4	1.6	0.7	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	64.4	56.5	43.2	24.5	7.3	13.8	2.7
DC(Max)	V	0.9	1.9	2.8	3.8	4.5	4.3	4.7
DL-Comp :	M	46.3	40.7	31.1	17.6	5.2	10.0	1.9
DC(Min)	V	0.7	1.4	2.0	2.7	3.2	3.1	3.4
DL-Comp :	M	23.2	20.4	15.6	8.8	2.6	5.0	1.0
DW(Max)	V	0.3	0.7	1.0	1.4	1.6	1.5	1.7
DL-Comp :	M	10.1	8.8	6.7	3.8	1.1	2.2	0.4
DW(Min)	V	0.1	0.3	0.4	0.6	0.7	0.7	0.7
LL + I :	M+	588.5	525.6	414.0	239.3	68.8	134.8	22.2
	V	2.3	5.0	9.2	13.4	22.7	19.4	24.9
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	14.3	18.1	22.1	26.1	29.9	28.5	30.8
	M	496.3	471.8	383.4	228.1	69.6	131.4	25.7
Total :	M+	1041.2	920.2	711.2	400.6	105.6	219.1	25.9
	V	9.1	18.8	29.9	41.0	55.3	50.1	58.7
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	21.1	32.0	42.8	53.7	62.5	59.3	64.6
	M	949.0	866.4	680.6	389.3	106.4	215.7	29.3

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	23.0	23.0
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	4.2	4.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.7	28.1
DL-Comp.(DW)	20.7	20.2
Live	136.3	136.3
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:03 A.M.

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	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	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	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	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	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	45.1	18.8	85.7	148.4	189.4	205.3	201.5
	V	12.8	11.9	12.4	10.9	9.0	7.2	5.3	3.7
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	12.8	11.9	12.4	10.9	9.0	7.3	5.8	4.7
	M	0.0	45.1	18.8	85.7	148.4	183.0	195.7	201.0
Total :	M+	0.0	109.4	45.2	211.3	382.5	501.2	563.9	575.7
	V	39.7	36.4	38.4	32.9	25.5	18.3	10.8	3.7
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	39.7	36.4	38.4	32.9	25.5	18.4	11.3	4.8
	M	0.0	109.4	45.2	211.3	382.5	494.9	554.3	575.2

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
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	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
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	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
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+	206.8	193.0	154.2	93.7	28.9	54.4	10.7
	V	3.2	1.3	0.6	2.5	10.0	7.2	11.8
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	5.3	6.6	8.7	10.6	12.2	11.6	12.6
	M	182.5	172.4	151.8	92.9	28.8	54.1	10.7
Total :	M+	565.9	506.0	390.0	221.5	58.0	121.2	13.5
	V	8.5	12.2	17.0	24.3	35.8	31.7	38.6
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	10.7	17.6	25.2	32.5	38.1	36.0	39.4
	M	541.7	485.4	387.5	220.7	57.9	120.9	13.4

POSITIVE ENVELOPE STRESSES

Span : 3, Beam : 1, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.20 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.265	-0.132	-0.265	-0.265	-0.265	-0.265	-0.265
Bottom	0.367	2.201	1.100	2.201	2.201	2.201	2.201	2.201
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.008	0.040	0.021	0.071	0.126	0.165	0.188	0.195
Bottom	-0.008	-0.040	-0.021	-0.071	-0.126	-0.165	-0.188	-0.195
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.046	0.281	0.144	0.499	0.864	1.097	1.228	1.243
Bottom	-0.046	-0.281	-0.144	-0.499	-0.864	-1.097	-1.228	-1.243
Final 1 (P/S + DL + LL)								
Precast-top	0.012	0.260	0.117	0.701	1.460	1.975	2.274	2.345
Bottom	0.310	1.676	0.850	1.235	0.476	-0.039	-0.339	-0.409
Final 2 (P/S + DL)								
Precast-top	-0.034	-0.021	-0.026	0.202	0.596	0.878	1.047	1.101
Bottom	0.357	1.957	0.994	1.734	1.340	1.058	0.889	0.834

Span : 3, Beam : 1, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.20 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.265	-0.132	-0.265	-0.265	-0.265	-0.265	-0.265
Bottom	0.367	2.201	1.100	2.201	2.201	2.201	2.201	2.201
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.008	0.040	0.021	0.071	0.126	0.165	0.188	0.195
Bottom	-0.008	-0.040	-0.021	-0.071	-0.126	-0.165	-0.188	-0.195
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.037	0.225	0.115	0.400	0.691	0.877	0.982	0.995
Bottom	-0.037	-0.225	-0.115	-0.400	-0.691	-0.877	-0.982	-0.995
Final 1 (P/S + DL + LL)								
Precast-top	0.003	0.204	0.089	0.601	1.287	1.755	2.029	2.096
Bottom	0.320	1.732	0.879	1.334	0.649	0.180	-0.093	-0.160

Span : 3, Beam : 1, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
F_LL+I(+)									
Precast-top		0.039	0.199	0.106	0.342	0.563	0.705	0.755	0.736
Bottom		-0.039	-0.199	-0.106	-0.342	-0.563	-0.705	-0.755	-0.736
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.022	0.188	0.093	0.443	0.861	1.144	1.278	1.286
Bottom		0.139	0.780	0.391	0.525	0.107	-0.176	-0.310	-0.319

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 3, Beam : 1, STRENGTH I
Using General Beta Theta Equation 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									
65.3	12.00	20.86	0.211	0.0	6.00e-3	50.0	55.9	0.648	2.400	0.00
0.0	0.61	20.55	31.5	0.049	16.7	0.87	16.44	0.186	3.082	0.367
Transfer :	3.00									
60.2	12.00	20.86	3.038	0.0	-0.25e-3	28.1	0.0	0.186	0.800	0.00
195.5	3.43	19.14	189.0	0.049	104.8	5.89	15.32	0.186	3.705	2.205
Critical :	2.14									
62.0	12.00	20.86	3.038	0.0	-0.27e-3	28.0	0.0	0.186	0.800	0.00
126.3	2.47	19.62	189.0	0.049	110.2	6.04	15.70	0.186	3.740	1.568
0.1L :	5.64									
54.9	12.00	20.86	3.038	0.0	-0.18e-3	28.4	0.0	0.186	0.400	0.00
376.6	4.39	18.77	189.0	0.045	96.4	5.53	15.02	0.186	2.719	2.858
0.2L :	11.28									
44.0	12.00	20.86	3.038	0.0	-0.06e-3	28.8	0.0	0.186	0.400	0.00
676.8	4.66	18.77	189.0	0.036	87.8	5.03	15.02	0.186	3.194	3.038
0.3L :	16.91									
33.2	12.00	20.86	3.038	0.0	0.22e-3	29.8	0.0	0.186	0.400	0.00
875.8	4.66	18.77	189.0	0.027	71.9	4.12	15.02	0.186	3.730	3.038
0.4L :	22.55									
22.3	12.00	20.86	3.038	0.0	0.80e-3	31.8	0.0	0.186	0.400	0.00
971.6	4.66	18.77	189.0	0.018	52.3	3.00	15.02	0.186	4.552	3.038
0.5L :	28.19									
11.8	12.00	20.86	3.038	0.0	0.65e-3	31.3	0.0	0.186	0.400	0.00
967.2	4.66	18.77	189.0	0.010	56.4	3.24	15.02	0.186	9.053	3.038
0.6L :	33.83									
21.1	12.00	20.86	3.038	0.0	0.62e-3	31.2	0.0	0.186	0.400	0.00
949.0	4.66	18.77	189.0	0.017	57.2	3.28	15.02	0.186	5.091	3.038
0.7L :	39.46									
32.0	12.00	20.86	3.038	0.0	0.13e-3	29.5	0.0	0.186	0.400	0.00
866.4	4.66	18.77	189.0	0.026	76.0	4.36	15.02	0.186	4.012	3.038
0.8L :	45.10									
42.8	12.00	20.86	3.038	0.0	-0.06e-3	28.8	0.0	0.186	0.400	0.00
680.6	4.66	18.77	189.0	0.035	87.7	5.03	15.02	0.186	3.284	3.038
0.9L :	50.74									
53.7	12.00	20.86	3.038	0.0	-0.17e-3	28.4	0.0	0.186	0.400	0.00
389.3	4.39	18.77	189.0	0.044	96.1	5.51	15.02	0.186	2.775	2.858
Critical :	54.24									
61.2	12.00	20.86	3.038	0.0	-0.27e-3	28.1	0.0	0.186	0.800	0.00
149.8	2.47	19.62	189.0	0.048	109.3	6.00	15.70	0.186	3.775	1.568
Transfer :	53.38									
59.3	12.00	20.86	3.038	0.0	-0.24e-3	28.2	0.0	0.186	0.800	0.00
215.7	3.43	19.14	189.0	0.048	104.1	5.85	15.32	0.186	3.750	2.205
Bearing :	55.88									

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)
	12.00	20.86	0.211	0.0	6.00e-3	50.0	55.2	0.640	2.406	0.00
29.3	0.61	20.55	31.5	0.049	16.7	0.87	16.44	0.186	3.120	0.367

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

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

At 0.1 x L =	Release 5.14 ft	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.047	3.00	-0.141
DL-Comp. (DW)			-0.014	3.00	-0.042
Live Load					-0.225
Total	0.252		0.336		0.009

At 0.2 x L =	Release 10.77 ft	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.093	3.00	-0.280
DL-Comp. (DW)			-0.028	3.00	-0.084
Live Load					-0.450
Total	0.421		0.523		-0.175

At 0.3 x L =	Release 16.41 ft	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.130	3.00	-0.391
DL-Comp. (DW)			-0.039	3.00	-0.117
Live Load					-0.630
Total	0.524		0.618		-0.395

At 0.4 x L =	Release 22.05 ft	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.154	3.00	-0.462
DL-Comp. (DW)			-0.046	3.00	-0.139
Live Load					-0.743
Total	0.580		0.659		-0.561

At 0.5 x L =	Release 27.69 ft	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.028
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.163	3.00	-0.488
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.785
Total	0.597		0.669		-0.627

At 0.6 x L =	Release 33.33 ft	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.155	3.00	-0.466
DL-Comp. (DW)			-0.047	3.00	-0.140
Live Load					-0.750
Total	0.580		0.657		-0.574

At 0.7 x L =	Release 38.96 ft	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.133	3.00	-0.400
DL-Comp. (DW)			-0.040	3.00	-0.120
Live Load					-0.644
Total	0.524		0.614		-0.422

At 0.8 x L =	Release 44.60 ft	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.098	3.00	-0.293
DL-Comp. (DW)			-0.029	3.00	-0.088
Live Load					-0.471
Total	0.421		0.518		-0.212

At 0.9 x L =	Release 50.24 ft	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.052	3.00	-0.156
DL-Comp. (DW)			-0.016	3.00	-0.047
Live Load					-0.249
Total	0.252		0.329		-0.034

ULTIMATE MOMENT

ULTIMATE - Span : 3, Beam : 1, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
193.8	19.6	2.520	249.6	4.5	3.43	938.8	0.012T	1.00	-	-	-	-
H/2	1.00											
79.9	19.2	1.260	257.7	2.3	1.77	496.1	0.025T	1.00	-	-	-	-
0.1L	5.14											
376.6	19.7	3.267	246.9	5.8	4.39	1177.2	0.008T	1.00	-	-	-	-
0.2L	10.78											
692.7	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.3L	16.41											
907.1	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.4L	22.05											
1033.7	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.5L	27.69											
1067.7	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.6L	33.33											
1041.2	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.7L	38.96											
920.2	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.8L	44.60											
711.2	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	920.5	920.5	1.35	-
0.9L	50.24											
400.6	19.7	3.267	246.9	5.8	4.39	1177.2	0.008T	1.00	-	-	-	-
H/2	54.38											
105.6	19.2	1.260	257.7	2.3	1.77	496.1	0.025T	1.00	-	-	-	-
Transfer	52.88											
219.1	19.6	2.520	249.6	4.5	3.43	938.8	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 3, Beam : 1; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.070
		M	2.00	Fb	0.194
2	2	E	21.50	Ft	0.446
		M	21.50	Fb	0.082
3	2	E	6.00	Ft	0.424
		M	6.00	Fb	0.368
4	2	E	4.00	Ft	0.351
		M	4.00	Fb	0.705
5	2	E	4.00	Ft	0.278
		M	4.00	Fb	1.042
6	2	E	2.00	Ft	0.154
		M	2.00	Fb	1.430
7	2	E	2.00	Ft	0.030
		M	2.00	Fb	1.818
8	2	E	2.00	Ft	-0.094
		M	2.00	Fb	2.206

DESIGN SUMMARY

Span: 3, Beam: 1, Exterior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	56.38
Release Length,	ft	56.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.21 %	
Final losses:	12.20 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.207	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.095	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.53	1067.65	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	0.00 %		OK

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

Bentley			Sheet #	27
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .cs!		Date	Feb/3/2016

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	3.600	2.345	Midspan	2.700	1.101	Midspan			
Precast Bot	3.600	1.676	Transfer	2.700	1.957	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	0.003	Bearing						
Precast Bot	-0.465	-0.160	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	1.286	Midspan
Precast Bot							2.400	0.780	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 27.69 ft

	Release	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.028
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.163	3.00	-0.488
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.785
Total	0.597		0.669		-0.627

Positive values indicate upward deflection.

PROPERTIES
Span:3, Beam:2
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in	
thick	Top	6.000	in	Bot	6.000	in	
Stems	No	0					
	Top	N/A					
	Bot	N/A					
Shear width		12.000	in				

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt./Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	19.17
0.16	35.21

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	56.375	ft
Release length	56.375	ft
Design length	55.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.258	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.260	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.260	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.261	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.260	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.260	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.8165
Use transformed strand and rebar: No

Span:3, Beam:2
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4266.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:3, Beam:2
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.370	ft
Dev. Len, debonded	12.740	ft
Hokddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.167	in

Span:3, Beam:2
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
902.000	740	667.480	9.248	37454.223	176.966	0.000

Span:3, Beam:2
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4287	ksi

AASHTO LOSSES

Elastic Shortening 8.52 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.282 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.61	ksi	0.03	ksi
due	to Composite Loads	-0.84	ksi	0.04	ksi
due	to Live Loads	-3.06	ksi	0.20	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial			Final		
Steel relaxation	0.00	ksi			2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi			9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi			8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	8.52	ksi	(4.21 %)		16.39	ksi	(8.10 %)
Total Prestress Losses					24.92	ksi	(12.31 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 177.6 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	59.8	24.7	115.8	210.9	272.5	308.5	316.0
	V	58.6	54.9	57.1	50.9	43.0	35.1	25.6	8.1
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	58.6	54.9	57.1	50.9	43.3	35.9	28.8	21.9
	M	-0.0	60.7	25.3	115.8	202.5	256.0	275.5	262.7
Total :	M+	0.0	124.1	51.1	241.3	444.9	584.4	667.0	690.2
	V	85.5	79.4	83.1	72.9	59.5	46.2	31.1	8.1
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	85.5	79.4	83.1	72.9	59.8	47.0	34.3	21.9
	M	-0.0	125.0	51.7	241.3	436.5	567.8	634.1	636.9

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	312.1	278.7	219.5	126.9	36.5	71.5	11.8
	V	4.3	9.3	17.2	25.1	42.5	36.2	46.6
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	26.7	33.9	41.3	48.8	55.9	53.4	57.6
	M	263.2	250.2	203.3	120.9	36.9	69.7	13.6
Total :	M+	671.2	591.7	455.2	254.7	65.6	138.3	14.6
	V	9.7	20.3	33.7	47.0	68.3	60.6	73.5
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	32.1	44.9	57.7	70.7	81.8	77.8	84.5
	M	622.3	563.2	439.0	248.8	66.0	136.5	16.4

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	47.8	19.8	92.6	168.7	218.0	246.8	252.8
	V	46.9	43.9	45.7	40.7	34.4	28.1	20.5	6.5
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	46.9	43.9	45.7	40.7	34.6	28.7	23.0	17.5
	M	-0.0	48.6	20.2	92.6	162.0	204.8	220.4	210.2
Total :	M+	0.0	112.1	46.2	218.2	402.7	529.9	605.3	627.0
	V	73.8	68.4	71.6	62.7	50.9	39.2	25.9	6.5
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	73.8	68.4	71.6	62.7	51.2	39.8	28.5	17.5
	M	-0.0	112.8	46.7	218.2	396.0	516.6	579.0	584.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	249.7	223.0	175.6	101.5	29.2	57.2	9.4
	V	3.4	7.5	13.8	20.1	34.0	28.9	37.3
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	21.4	27.1	33.0	39.1	44.7	42.7	46.1
	M	210.5	200.1	162.6	96.8	29.5	55.8	10.9
Total :	M+	608.8	535.9	411.3	229.3	58.3	124.0	12.2
	V	8.8	18.4	30.2	42.0	59.8	53.3	64.1
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	26.8	38.1	49.4	60.9	70.6	67.1	72.9
	M	569.7	513.1	398.4	224.6	58.6	122.5	13.7

SHEAR AND MOMENT ENVELOPE : Span : 3, Beam : 2, STRENGTH I
Shears: kips, Moments: kft

Bentley			Sheet #	9
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	54.9	22.6	107.2	199.5	265.5	305.1	318.3
(Max)	V	23.0	20.9	22.2	18.7	14.0	9.4	4.7	0.0
Self wt. :	M	0.0	39.5	16.3	77.2	143.7	191.2	219.7	229.2
(Min)	V	16.6	15.1	16.0	13.5	10.1	6.7	3.4	0.0
DL-Prec. :	M	0.0	10.1	4.2	19.8	36.8	49.0	56.3	58.7
DC(Max)	V	4.2	3.9	4.1	3.5	2.6	1.7	0.9	0.0
DL-Prec. :	M	0.0	7.3	3.0	14.2	26.5	35.3	40.5	42.3
DC(Min)	V	3.1	2.8	2.9	2.5	1.9	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	1.0	2.2	3.3	3.8	3.8
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.7	1.6	2.4	2.8	2.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	11.4	4.7	22.3	41.6	55.4	63.8	66.8
DC(Max)	V	4.8	4.4	4.6	3.9	2.9	2.0	1.0	0.0
DL-Comp :	M	0.0	8.2	3.4	16.1	29.9	39.9	46.0	48.1
DC(Min)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	0.0
DL-Comp :	M	0.0	4.1	1.7	8.0	15.0	20.0	23.0	24.1
DW(Max)	V	1.7	1.6	1.7	1.4	1.1	0.7	0.4	0.0
DL-Comp :	M	0.0	1.8	0.7	3.5	6.5	8.7	10.0	10.4
DW(Min)	V	0.7	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	104.7	43.2	202.6	369.0	477.0	539.8	553.0
	V	102.6	96.0	99.9	89.1	75.3	61.4	44.7	14.2
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	102.6	96.0	99.9	89.1	75.7	62.9	50.4	38.3
	M	-0.0	106.3	44.2	202.6	354.3	447.9	482.2	459.8
Total :	M+	0.0	185.7	76.6	360.9	664.1	870.1	991.9	1024.8
	V	136.5	126.9	132.7	116.8	96.1	75.4	51.7	14.2
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	136.5	126.9	132.7	116.8	96.6	76.8	57.3	38.3
	M	-0.0	187.3	77.6	360.9	649.3	841.1	934.2	931.5

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:03 A.M.

Bentley			Sheet #	10
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.36
Self wt. :	M	305.1	265.5	199.5	107.2	22.6	54.9	0.0
(Max)	V	4.7	9.4	14.0	18.7	22.2	20.9	23.0
Self wt. :	M	219.7	191.2	143.7	77.2	16.3	39.5	0.0
(Min)	V	3.4	6.7	10.1	13.5	16.0	15.1	16.6
DL-Prec. :	M	56.3	49.0	36.8	19.8	4.2	10.1	0.0
DC(Max)	V	0.9	1.7	2.6	3.5	4.1	3.9	4.2
DL-Prec. :	M	40.5	35.3	26.5	14.2	3.0	7.3	0.0
DC(Min)	V	0.6	1.2	1.9	2.5	2.9	2.8	3.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.8	3.3	2.2	1.0	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	2.8	2.4	1.6	0.7	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	64.4	56.5	43.2	24.5	7.3	13.8	2.7
DC(Max)	V	0.9	1.9	2.8	3.8	4.5	4.3	4.7
DL-Comp :	M	46.3	40.7	31.1	17.6	5.2	10.0	1.9
DC(Min)	V	0.7	1.4	2.0	2.7	3.2	3.1	3.4
DL-Comp :	M	23.2	20.4	15.6	8.8	2.6	5.0	1.0
DW(Max)	V	0.3	0.7	1.0	1.4	1.6	1.5	1.7
DL-Comp :	M	10.1	8.8	6.7	3.8	1.1	2.2	0.4
DW(Min)	V	0.1	0.3	0.4	0.6	0.7	0.7	0.7
LL + I :	M+	546.1	487.7	384.2	222.1	63.9	125.1	20.6
	V	7.5	16.3	30.1	44.0	74.3	63.3	81.6
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	46.8	59.3	72.2	85.5	97.9	93.4	100.9
	M	460.5	437.8	355.8	211.7	64.6	122.0	23.8
Total :	M+	998.9	882.4	681.4	383.3	100.7	209.4	24.3
	V	14.3	30.2	50.8	71.5	106.9	94.1	115.4
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	53.5	73.1	92.9	113.0	130.5	124.1	134.7
	M	913.3	832.4	653.0	372.9	101.4	206.3	27.5

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	23.0	23.0
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	4.2	4.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.7	28.1
DL-Comp.(DW)	20.7	20.2
Live	136.3	136.3
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:03 A.M.

SHEAR AND MOMENT ENVELOPE : Span : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	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	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	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	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	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	41.9	17.5	79.5	137.8	175.7	190.5	187.0
	V	41.9	38.8	40.7	35.7	29.5	23.5	17.3	12.1
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	41.9	38.8	40.7	35.7	29.5	23.8	19.0	15.5
	M	0.0	41.9	17.5	79.5	137.8	169.8	181.6	186.6
Total :	M+	0.0	106.1	43.9	205.1	371.8	487.6	549.1	561.2
	V	68.8	63.4	66.6	57.6	46.0	34.6	22.8	12.1
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	68.8	63.4	66.6	57.6	46.0	34.9	24.5	15.6
	M	0.0	106.1	43.9	205.1	371.8	481.7	540.2	560.7

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
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	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	51.5	45.2	34.6	19.6	5.8	11.1	2.1
DC(Max)	V	0.7	1.5	2.3	3.0	3.6	3.4	3.7
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	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
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+	191.9	179.1	143.1	87.0	26.9	50.5	9.9
	V	10.3	4.1	1.9	8.1	32.6	23.7	38.5
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	17.3	21.7	28.6	34.8	39.9	38.1	41.2
	M	169.4	160.0	140.8	86.2	26.7	50.2	9.9
Total :	M+	551.0	492.1	378.9	214.8	56.0	117.3	12.7
	V	15.7	15.1	18.3	29.9	58.5	48.1	65.4
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	22.6	32.7	45.0	56.7	65.8	62.5	68.0
	M	528.5	473.0	376.6	214.0	55.8	117.0	12.7

POSITIVE ENVELOPE STRESSES

Span : 3, Beam : 2, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.31 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.265	-0.132	-0.265	-0.265	-0.265	-0.265	-0.265
Bottom	0.366	2.198	1.099	2.198	2.198	2.198	2.198	2.198
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.008	0.040	0.021	0.071	0.126	0.165	0.188	0.195
Bottom	-0.008	-0.040	-0.021	-0.071	-0.126	-0.165	-0.188	-0.195
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.043	0.261	0.133	0.463	0.802	1.018	1.139	1.154
Bottom	-0.043	-0.261	-0.133	-0.463	-0.802	-1.018	-1.139	-1.154
Final 1 (P/S + DL + LL)								
Precast-top	0.009	0.240	0.107	0.666	1.398	1.896	2.186	2.256
Bottom	0.313	1.693	0.859	1.268	0.536	0.037	-0.253	-0.322
Final 2 (P/S + DL)								
Precast-top	-0.034	-0.021	-0.026	0.202	0.596	0.878	1.047	1.102
Bottom	0.356	1.954	0.993	1.731	1.337	1.055	0.887	0.832

Span : 3, Beam : 2, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.31 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.265	-0.132	-0.265	-0.265	-0.265	-0.265	-0.265
Bottom	0.366	2.198	1.099	2.198	2.198	2.198	2.198	2.198
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.008	0.040	0.021	0.071	0.126	0.165	0.188	0.195
Bottom	-0.008	-0.040	-0.021	-0.071	-0.126	-0.165	-0.188	-0.195
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.034	0.209	0.107	0.371	0.641	0.814	0.912	0.923
Bottom	-0.034	-0.209	-0.107	-0.371	-0.641	-0.814	-0.912	-0.923
Final 1 (P/S + DL + LL)								
Precast-top	0.000	0.188	0.081	0.573	1.238	1.692	1.958	2.025
Bottom	0.322	1.745	0.886	1.360	0.696	0.241	-0.025	-0.092

Span : 3, Beam : 2, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
F_LL+I(+)									
Precast-top		0.036	0.184	0.098	0.318	0.523	0.654	0.701	0.683
Bottom		-0.036	-0.184	-0.098	-0.318	-0.523	-0.654	-0.701	-0.683
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.019	0.174	0.085	0.419	0.821	1.093	1.224	1.234
Bottom		0.142	0.793	0.398	0.548	0.146	-0.127	-0.257	-0.267

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 3, Beam : 2, STRENGTH I
Using General Beta Theta Equation 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									
136.5	12.00	20.86	0.212	0.0	6.00e-3	50.0	135.0	1.566	2.400	0.00
0.0	0.61	20.55	31.5	0.103	16.7	0.87	16.44	0.186	1.474	0.367
Transfer :	3.00									
126.9	12.00	20.86	3.038	0.0	-0.20e-3	28.3	40.4	0.227	0.800	0.00
187.3	3.42	19.15	189.0	0.102	100.7	5.66	15.32	0.186	1.723	2.202
Critical :	2.14									
130.2	12.00	20.86	3.038	0.0	-0.20e-3	28.3	41.9	0.230	0.800	0.00
121.0	2.47	19.62	189.0	0.102	102.8	5.64	15.70	0.186	1.718	1.566
0.1L :	5.64									
116.8	12.00	20.86	3.038	0.0	-0.14e-3	28.5	36.0	0.208	0.400	0.00
360.9	4.39	18.77	189.0	0.096	93.8	5.38	15.02	0.186	1.255	2.856
0.2L :	11.28									
96.6	12.00	20.86	3.038	0.0	-0.04e-3	28.9	21.0	0.186	0.400	0.00
649.3	4.66	18.77	189.0	0.079	86.3	4.95	15.02	0.186	1.439	3.038
0.3L :	16.91									
76.8	12.00	20.86	3.038	0.0	0.47e-3	30.6	23.4	0.186	0.400	0.00
841.1	4.66	18.77	189.0	0.063	62.0	3.56	15.02	0.186	1.469	3.038
0.4L :	22.55									
57.3	12.00	20.86	3.038	0.0	0.93e-3	32.2	14.3	0.186	0.400	0.00
934.2	4.66	18.77	189.0	0.047	49.4	2.83	15.02	0.186	1.710	3.038
0.5L :	28.19									
38.3	12.00	20.86	3.038	0.0	0.69e-3	31.4	0.0	0.186	0.400	0.00
931.5	4.66	18.77	189.0	0.032	55.2	3.17	15.02	0.186	2.741	3.038
0.6L :	33.83									
53.5	12.00	20.86	3.038	0.0	0.73e-3	31.6	5.4	0.186	0.400	0.00
913.3	4.66	18.77	189.0	0.044	54.1	3.10	15.02	0.186	1.937	3.038
0.7L :	39.46									
73.1	12.00	20.86	3.038	0.0	0.36e-3	30.3	15.3	0.186	0.400	0.00
832.4	4.66	18.77	189.0	0.060	65.9	3.78	15.02	0.186	1.604	3.038
0.8L :	45.10									
92.9	12.00	20.86	3.038	0.0	-0.04e-3	28.9	16.9	0.186	0.400	0.00
653.0	4.66	18.77	189.0	0.076	86.3	4.95	15.02	0.186	1.496	3.038
0.9L :	50.74									
113.0	12.00	20.86	3.038	0.0	-0.14e-3	28.5	32.0	0.186	0.400	0.00
372.9	4.39	18.77	189.0	0.093	93.6	5.37	15.02	0.186	1.296	2.856
Critical :	54.24									
127.8	12.00	20.86	3.038	0.0	-0.20e-3	28.3	38.9	0.214	0.800	0.00
143.0	2.47	19.62	189.0	0.100	103.1	5.65	15.70	0.186	1.753	1.566
Transfer :	53.38									
124.1	12.00	20.86	3.038	0.0	-0.20e-3	28.3	37.3	0.209	0.800	0.00
206.3	3.42	19.15	189.0	0.100	100.7	5.66	15.32	0.186	1.761	2.202
Bearing :	55.88									

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)
	12.00	20.86	0.212	0.0	6.00e-3	50.0	133.0	1.542	2.406	0.00
27.5	0.61	20.55	31.5	0.101	16.7	0.87	16.44	0.186	1.498	0.367

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 3, Beam : 2

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 3, Beam : 2; Units: in)

At 0.1 x L =	Release 5.14 ft	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.047	3.00	-0.141
DL-Comp. (DW)			-0.014	3.00	-0.042
Live Load					-0.209
Total	0.252		0.336		0.026

At 0.2 x L =	Release 10.77 ft	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.093	3.00	-0.280
DL-Comp. (DW)			-0.028	3.00	-0.084
Live Load					-0.418
Total	0.421		0.523		-0.143

At 0.3 x L =	Release 16.41 ft	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.130	3.00	-0.391
DL-Comp. (DW)			-0.039	3.00	-0.117
Live Load					-0.585
Total	0.524		0.618		-0.350

At 0.4 x L =	Release 22.05 ft	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.154	3.00	-0.462
DL-Comp. (DW)			-0.046	3.00	-0.139
Live Load					-0.689
Total	0.580		0.659		-0.508

At 0.5 x L =	Release 27.69 ft	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.028
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.163	3.00	-0.488
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.728
Total	0.597		0.669		-0.571

At 0.6 x L =	Release 33.33 ft	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.155	3.00	-0.466
DL-Comp. (DW)			-0.047	3.00	-0.140
Live Load					-0.696
Total	0.580		0.657		-0.520

At 0.7 x L =	Release 38.96 ft	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.133	3.00	-0.400
DL-Comp. (DW)			-0.040	3.00	-0.120
Live Load					-0.598
Total	0.524		0.614		-0.375

At 0.8 x L =	Release 44.60 ft	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.098	3.00	-0.293
DL-Comp. (DW)			-0.029	3.00	-0.088
Live Load					-0.437
Total	0.421		0.518		-0.178

At 0.9 x L =	Release 50.24 ft	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.052	3.00	-0.156
DL-Comp. (DW)			-0.016	3.00	-0.047
Live Load					-0.231
Total	0.252		0.329		-0.016

ULTIMATE MOMENT

ULTIMATE - Span : 3, Beam : 2, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer 2.50 185.7	19.6	2.517	249.6	4.5	3.42	937.8	0.012T	1.00	-	-	-	-
H/2 1.00 76.6	19.2	1.258	257.6	2.3	1.77	495.5	0.025T	1.00	-	-	-	-
0.1L 5.14 360.9	19.7	3.264	246.9	5.8	4.39	1176.5	0.008T	1.00	-	-	-	-
0.2L 10.78 664.1	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	883.2	1.35	-
0.3L 16.41 870.1	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	919.7	1.35	-
0.4L 22.05 991.9	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	919.7	1.35	-
0.5L 27.69 1024.8	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	919.7	1.35	-
0.6L 33.33 998.9	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	919.7	1.35	-
0.7L 38.96 882.4	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	919.7	1.35	-
0.8L 44.60 681.4	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	919.7	906.3	1.35	-
0.9L 50.24 383.3	19.7	3.264	246.9	5.8	4.39	1176.5	0.008T	1.00	-	-	-	-
H/2 54.38 100.7	19.2	1.258	257.6	2.3	1.77	495.5	0.025T	1.00	-	-	-	-
Transfer 52.88 209.4	19.6	2.517	249.6	4.5	3.42	937.8	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : Ir used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 3, Beam : 2; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.070
		M	2.00	Fb	0.194
2	2	E	21.50	Ft	0.446
		M	21.50	Fb	0.082
3	2	E	6.00	Ft	0.424
		M	6.00	Fb	0.368
4	2	E	4.00	Ft	0.351
		M	4.00	Fb	0.705
5	2	E	4.00	Ft	0.278
		M	4.00	Fb	1.042
6	2	E	2.00	Ft	0.154
		M	2.00	Fb	1.430
7	2	E	2.00	Ft	0.030
		M	2.00	Fb	1.818
8	2	E	2.00	Ft	-0.094
		M	2.00	Fb	2.206

DESIGN SUMMARY

Span: 3, Beam: 2, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	56.38
Release Length,	ft	56.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.21 %	
Final losses:	12.31 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.207	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.095	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.52	1024.76	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	0.00 %		OK

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

Bentley			Sheet #	27
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

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	3.600	2.256	Midspan	2.700	1.102	Midspan			
Precast Bot	3.600	1.693	Transfer	2.700	1.954	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	0.000	Bearing						
Precast Bot	-0.465	-0.092	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	1.234	Midspan
Precast Bot							2.400	0.793	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 27.69 ft

	Release	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.028
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.163	3.00	-0.488
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.728
Total	0.597		0.669		-0.571

Positive values indicate upward deflection.

PROPERTIES
Span:3, Beam:4
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in
thick	Top	6.000	in	Bot	6.000	in
Stems	No	0				
	Top	N/A				
	Bot	N/A				
Shear width		12.000	in			

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt./Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.123	0.000	0.123	55.375	Asphalt Overlay (3.5" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	19.17
0.16	36.21

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	56.375	ft
Release length	56.375	ft
Design length	55.375	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.258	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.260	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.260	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.261	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.260	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.260	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.083	(Calculated)
Comp. DW	0.083	(Calculated)

Dead Loads and Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.8165
Use transformed strand and rebar: No

Span:3, Beam:4
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		5.00	ksi
Elasticity		4286.8	ksi
Max comp		3.00	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.54	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	6.00	ksi	4.00	ksi
Elasticity	4695.98	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	3.60	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	2.70	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	2.40	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.47	ksi	-0.38	ksi

Span:3, Beam:4
PRESTRESSED STEEL:
16 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 5.44 in):

8 @ 2.000 in	4 @ 4.000 in	2 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	3.472	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.381	ft
Dev. Len, debonded	12.761	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	703.1	kips
Beam Shrtng (PL/AE)	0.167	in

Span:3, Beam:4
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
902.000	740	667.480	9.248	37454.223	176.966	0.000

Span:3, Beam:4
REINFORCING STEEL:

Tension	steel:	
fy	60.0	ksi
Es	29000	ksi

Stirrups:

# legs	Size	fy (ksi)	Area (in2)	Spacing (in)	Start (ft)	End (ft)	Extends into Deck
4	US#4[M13]	60.0	0.80	4.00	0.3543	0.6877	No
2	US#4[M13]	60.0	0.40	6.00	0.6877	3.6877	No
2	US#4[M13]	60.0	0.40	12.00	3.6877	52.6877	No
2	US#4[M13]	60.0	0.40	6.00	52.6877	55.6877	No
4	US#4[M13]	60.0	0.80	3.99	55.6877	56.0207	No

LOSSES
Note: Values are calculated at Midspan

Str. area	3.4720	in2
Ycg	5.44	in
P_init	703.1	kips
Ecc	6.56	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4287	ksi

AASHTO LOSSES

Elastic Shortening 8.52 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.282 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.61	ksi	0.03	ksi
due	to Composite Loads	-0.52	ksi	0.03	ksi
due	to Live Loads	-3.06	ksi	0.20	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial			Final		
Steel relaxation	0.00	ksi			2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi			9.50	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi			8.73	ksi	(Eq 5.9.5.3-1)
Sub-total	8.52	ksi	(4.21 %)		16.70	ksi	(8.25 %)
Total Prestress Losses					25.23	ksi	(12.46 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 177.3 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 3, Beam : 4, SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	4.6	1.9	8.9	16.6	22.2	25.5	26.7
DC(Max)	V	1.9	1.7	1.8	1.6	1.2	0.8	0.4	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	59.8	24.7	115.8	210.9	272.5	308.5	316.0
	V	58.6	54.9	57.1	50.9	43.0	35.1	25.6	8.1
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	58.6	54.9	57.1	50.9	43.3	35.9	28.8	21.9
	M	-0.0	60.7	25.3	115.8	202.5	256.0	275.5	262.7
Total :	M+	0.0	119.5	49.3	232.4	428.3	562.2	641.5	663.5
	V	83.6	77.6	81.2	71.3	58.4	45.4	30.7	8.1
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	83.6	77.6	81.2	71.3	58.6	46.2	33.9	21.9
	M	-0.0	120.4	49.8	232.4	419.9	545.7	608.6	610.2

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	25.7	22.6	17.3	9.8	2.9	5.5	1.1
DC(Max)	V	0.4	0.8	1.1	1.5	1.8	1.7	1.9
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	312.1	278.7	219.5	126.9	36.5	71.5	11.8
	V	4.3	9.3	17.2	25.1	42.5	36.2	46.6
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	26.7	33.9	41.3	48.8	55.9	53.4	57.6
	M	263.2	250.2	203.3	120.9	36.9	69.7	13.6
Total :	M+	645.4	569.1	438.0	244.9	62.7	132.7	13.5
	V	9.3	19.6	32.5	45.5	66.5	58.9	71.6
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	31.7	44.1	56.5	69.2	80.0	76.1	82.6
	M	596.5	540.6	421.8	239.0	63.1	131.0	15.3

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, Beam : 4, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	4.6	1.9	8.9	16.6	22.2	25.5	26.7
DC(Max)	V	1.9	1.7	1.6	1.6	1.2	0.8	0.4	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	47.8	19.6	92.6	168.7	218.0	246.8	252.8
	V	46.9	43.9	45.7	40.7	34.4	28.1	20.5	6.5
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	46.9	43.9	45.7	40.7	34.6	28.7	23.0	17.5
	M	-0.0	48.6	20.2	92.6	162.0	204.8	220.4	210.2
Total :	M+	0.0	107.6	44.3	209.3	386.1	507.7	579.8	600.3
	V	71.9	66.7	69.8	61.1	49.8	38.4	25.5	6.5
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	71.9	66.7	69.8	61.1	50.0	39.0	28.1	17.5
	M	-0.0	108.3	44.8	209.3	379.4	494.5	553.5	557.6

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
DL-Prec. :	M	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	25.7	22.6	17.3	9.8	2.9	5.5	1.1
DC(Max)	V	0.4	0.8	1.1	1.5	1.8	1.7	1.9
DL-Comp :	M	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
LL + I :	M+	249.7	223.0	175.6	101.5	29.2	57.2	9.4
	V	3.4	7.5	13.8	20.1	34.0	28.9	37.3
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	21.4	27.1	33.0	39.1	44.7	42.7	46.1
	M	210.5	200.1	162.6	96.8	29.5	55.8	10.9
Total :	M+	583.0	513.4	394.1	219.6	55.4	118.4	11.1
	V	8.5	17.7	29.1	40.5	58.0	51.6	62.3
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	0.0	0.0
Total :	Vmx	26.4	37.3	48.3	59.4	68.8	65.4	71.1
	M	543.9	490.5	381.1	214.8	55.7	117.0	12.6

SHEAR AND MOMENT ENVELOPE : Span : 3, Beam : 4, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	54.9	22.6	107.2	199.5	265.5	305.1	318.3
(Max)	V	23.0	20.9	22.2	18.7	14.0	9.4	4.7	0.0
Self wt. :	M	0.0	39.5	16.3	77.2	143.7	191.2	219.7	229.2
(Min)	V	16.6	15.1	16.0	13.5	10.1	6.7	3.4	0.0
DL-Prec. :	M	0.0	10.1	4.2	19.8	36.8	49.0	56.3	58.7
DC(Max)	V	4.2	3.9	4.1	3.5	2.6	1.7	0.9	0.0
DL-Prec. :	M	0.0	7.3	3.0	14.2	26.5	35.3	40.5	42.3
DC(Min)	V	3.1	2.8	2.9	2.5	1.9	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.5	0.2	1.0	2.2	3.3	3.8	3.8
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
Diaphragm :	M	0.0	0.4	0.1	0.7	1.6	2.4	2.8	2.8
(Min)	V	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
DL-Comp :	M	0.0	5.7	2.3	11.1	20.8	27.7	31.9	33.4
DC(Max)	V	2.4	2.2	2.3	2.0	1.5	1.0	0.5	0.0
DL-Comp :	M	0.0	4.1	1.7	8.0	15.0	19.9	23.0	24.1
DC(Min)	V	1.7	1.6	1.7	1.4	1.1	0.7	0.4	0.0
DL-Comp :	M	0.0	4.1	1.7	8.0	15.0	20.0	23.0	24.1
DW(Max)	V	1.7	1.6	1.7	1.4	1.1	0.7	0.4	0.0
DL-Comp :	M	0.0	1.8	0.7	3.5	6.5	8.7	10.0	10.4
DW(Min)	V	0.7	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	104.7	43.2	202.6	369.0	477.0	539.8	553.0
	V	102.6	96.0	99.9	89.1	75.3	61.4	44.7	14.2
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	102.6	96.0	99.9	89.1	75.7	62.9	50.4	38.3
	M	-0.0	106.3	44.2	202.6	354.3	447.9	482.2	459.8
Total :	M+	0.0	180.0	74.2	349.7	643.3	842.4	960.0	991.4
	V	134.1	124.7	130.4	114.9	94.6	74.4	51.2	14.2
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	134.1	124.7	130.4	114.9	95.1	75.9	56.8	38.3
	M	-0.0	181.6	75.2	349.7	628.6	813.4	902.3	898.1

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:05 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	305.1	265.5	199.5	107.2	22.6	54.9	0.0
(Max)	V	4.7	9.4	14.0	18.7	22.2	20.9	23.0
Self wt. :	M	219.7	191.2	143.7	77.2	16.3	39.5	0.0
(Min)	V	3.4	6.7	10.1	13.5	16.0	15.1	16.6
DL-Prec. :	M	56.3	49.0	36.8	19.8	4.2	10.1	0.0
DC(Max)	V	0.9	1.7	2.6	3.5	4.1	3.9	4.2
DL-Prec. :	M	40.5	35.3	26.5	14.2	3.0	7.3	0.0
DC(Min)	V	0.6	1.2	1.9	2.5	2.9	2.8	3.1
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.8	3.3	2.2	1.0	0.2	0.5	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
Diaphragm :	M	2.8	2.4	1.6	0.7	0.1	0.4	0.0
(Min)	V	0.0	0.1	0.1	0.1	0.1	0.1	0.1
DL-Comp :	M	32.2	28.2	21.6	12.2	3.6	6.9	1.3
DC(Max)	V	0.5	0.9	1.4	1.9	2.3	2.1	2.3
DL-Comp :	M	23.2	20.3	15.5	8.8	2.6	5.0	1.0
DC(Min)	V	0.3	0.7	1.0	1.4	1.6	1.5	1.7
DL-Comp :	M	23.2	20.4	15.6	8.8	2.6	5.0	1.0
DW(Max)	V	0.3	0.7	1.0	1.4	1.6	1.5	1.7
DL-Comp :	M	10.1	8.8	6.7	3.8	1.1	2.2	0.4
DW(Min)	V	0.1	0.3	0.4	0.6	0.7	0.7	0.7
LL + I :	M+	546.1	487.7	384.2	222.1	63.9	125.1	20.6
	V	7.5	16.3	30.1	44.0	74.3	63.3	81.6
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	46.8	59.3	72.2	85.5	97.9	93.4	100.9
	M	460.5	437.8	355.8	211.7	64.6	122.0	23.8
Total :	M+	966.7	854.1	659.8	371.1	97.1	202.5	22.9
	V	13.9	29.2	49.4	69.6	104.6	91.9	113.1
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	53.1	72.2	91.5	111.1	128.2	122.0	132.3
	M	881.1	804.2	631.4	360.7	97.8	199.4	26.1

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	23.0	23.0
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	4.2	4.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.7	28.1
DL-Comp.(DW)	20.7	20.2
Live	136.3	136.3
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:05 A.M.

Bentley			Sheet #	11
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

SHEAR AND MOMENT ENVELOPE : Span : 3, Beam : 4, FATIGUE I
Shears: kips, Moments: k/ft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	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	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
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	4.6	1.9	8.9	16.6	22.2	25.5	26.7
DC(Max)	V	1.9	1.7	1.8	1.6	1.2	0.8	0.4	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	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	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	41.9	17.5	79.5	137.8	175.7	190.5	187.0
	V	41.9	38.8	40.7	35.7	29.5	23.5	17.3	12.1
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	41.9	38.8	40.7	35.7	29.5	23.8	19.0	15.5
	M	0.0	41.9	17.5	79.5	137.8	169.8	181.6	186.6
Total :	M+	0.0	101.6	42.0	196.2	355.2	465.4	523.6	534.4
	V	66.9	61.6	64.8	56.1	44.8	33.8	22.4	12.1
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	66.9	61.6	64.8	56.1	44.8	34.1	24.1	15.6
	M	0.0	101.6	42.0	196.2	355.2	459.5	514.6	534.0

Bentley			Sheet #	12
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	33.33	38.96	44.60	50.24	54.38	52.87	55.38
Self wt. :	M	244.1	212.4	159.6	85.7	18.1	43.9	0.0
(Max)	V	3.7	7.5	11.2	15.0	17.7	16.7	18.4
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	45.0	39.2	29.4	15.8	3.3	8.1	0.0
DC(Max)	V	0.7	1.4	2.1	2.8	3.3	3.1	3.4
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	3.1	2.6	1.7	0.8	0.2	0.4	0.0
(Max)	V	0.0	0.2	0.2	0.2	0.2	0.2	0.2
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	25.7	22.6	17.3	9.8	2.9	5.5	1.1
DC(Max)	V	0.4	0.8	1.1	1.5	1.8	1.7	1.9
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	15.5	13.6	10.4	5.9	1.7	3.3	0.6
DW(Max)	V	0.2	0.5	0.7	0.9	1.1	1.0	1.1
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+	191.9	179.1	143.1	87.0	26.9	50.5	9.9
	V	10.3	4.1	1.9	8.1	32.6	23.7	38.5
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	17.3	21.7	26.6	34.8	39.9	38.1	41.2
	M	169.4	160.0	140.8	86.2	26.7	50.2	9.9
Total :	M+	525.3	469.5	361.6	205.0	53.1	111.8	11.6
	V	15.3	14.3	17.1	28.4	56.6	46.4	63.5
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	22.3	31.9	43.9	55.2	64.0	60.8	66.1
	M	502.8	450.4	359.3	204.2	52.9	111.4	11.6

POSITIVE ENVELOPE STRESSES

Span : 3, Beam : 4, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.46 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.264	-0.132	-0.264	-0.264	-0.264	-0.264	-0.264
Bottom	0.366	2.194	1.097	2.194	2.194	2.194	2.194	2.194
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.004	0.020	0.011	0.036	0.063	0.083	0.094	0.098
Bottom	-0.004	-0.020	-0.011	-0.036	-0.063	-0.083	-0.094	-0.098
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.043	0.261	0.133	0.463	0.802	1.018	1.139	1.154
Bottom	-0.043	-0.261	-0.133	-0.463	-0.802	-1.018	-1.139	-1.154
Final 1 (P/S + DL + LL)								
Precast-top	0.005	0.221	0.097	0.630	1.335	1.814	2.093	2.159
Bottom	0.316	1.709	0.868	1.300	0.595	0.116	-0.163	-0.229
Final 2 (P/S + DL)								
Precast-top	-0.038	-0.040	-0.036	0.167	0.534	0.796	0.953	1.005
Bottom	0.359	1.970	1.001	1.763	1.396	1.134	0.977	0.925

Span : 3, Beam : 4, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 4.21 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	5.64	11.28	16.91	22.55	28.19
Beam-Self						
Precast-top	0.194	0.347	0.617	0.810	0.925	0.964
Bottom	-0.194	-0.347	-0.617	-0.810	-0.925	-0.964
Prestress						
Precast-top	-0.289	-0.289	-0.289	-0.289	-0.289	-0.289
Bottom	2.401	2.401	2.401	2.401	2.401	2.401
Total						
Precast-top	-0.095	0.058	0.328	0.521	0.636	0.675
Bottom	2.207	2.054	1.784	1.591	1.476	1.437
As_top, in2	0.000	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 12.46 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Prestress								
Precast-top	-0.044	-0.264	-0.132	-0.264	-0.264	-0.264	-0.264	-0.264
Bottom	0.366	2.194	1.097	2.194	2.194	2.194	2.194	2.194
Self wt.								
Precast-top	-0.000	0.160	0.066	0.313	0.583	0.776	0.891	0.930
Bottom	-0.000	-0.160	-0.066	-0.313	-0.583	-0.776	-0.891	-0.930
DL-Prec (DC)								
Precast-top	-0.000	0.030	0.012	0.058	0.107	0.143	0.164	0.171
Bottom	-0.000	-0.030	-0.012	-0.058	-0.107	-0.143	-0.164	-0.171
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.001	0.001	0.003	0.006	0.010	0.011	0.011
Bottom	-0.000	-0.001	-0.001	-0.003	-0.006	-0.010	-0.011	-0.011
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.004	0.020	0.011	0.036	0.063	0.083	0.094	0.098
Bottom	-0.004	-0.020	-0.011	-0.036	-0.063	-0.083	-0.094	-0.098
DL-Comp (DW)								
Precast-top	0.002	0.012	0.006	0.021	0.038	0.050	0.056	0.059
Bottom	-0.002	-0.012	-0.006	-0.021	-0.038	-0.050	-0.056	-0.059
LL+I(+)								
Precast-top	0.034	0.209	0.107	0.371	0.641	0.814	0.912	0.923
Bottom	-0.034	-0.209	-0.107	-0.371	-0.641	-0.814	-0.912	-0.923
Final 1 (P/S + DL + LL)								
Precast-top	-0.003	0.168	0.070	0.538	1.175	1.610	1.865	1.928
Bottom	0.325	1.762	0.895	1.392	0.755	0.320	0.065	0.002

Span : 3, Beam : 4, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
F_LL+I(+)									
Precast-top		0.036	0.184	0.098	0.318	0.523	0.654	0.701	0.683
Bottom		-0.036	-0.184	-0.098	-0.318	-0.523	-0.654	-0.701	-0.683
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.017	0.164	0.080	0.401	0.790	1.052	1.177	1.185
Bottom		0.143	0.801	0.403	0.564	0.176	-0.087	-0.212	-0.220

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 3, Beam : 4, STRENGTH I
Using General Beta Theta Equation 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									
134.1	12.00	20.86	0.212	0.0	6.00e-3	50.0	132.3	1.535	2.400	0.00
0.0	0.61	20.55	31.5	0.101	16.7	0.87	16.44	0.186	1.501	0.366
Transfer :	3.00									
124.7	12.00	20.86	3.038	0.0	-0.20e-3	28.3	37.7	0.212	0.800	0.00
181.6	3.41	19.15	189.0	0.101	100.9	5.67	15.32	0.186	1.755	2.198
Critical :	2.14									
128.0	12.00	20.86	3.038	0.0	-0.20e-3	28.3	39.1	0.215	0.800	0.00
117.3	2.46	19.63	189.0	0.101	103.1	5.65	15.70	0.186	1.750	1.564
0.1L :	5.64									
114.9	12.00	20.86	3.038	0.0	-0.15e-3	28.5	33.4	0.193	0.400	0.00
349.7	4.38	18.77	189.0	0.094	94.2	5.40	15.02	0.186	1.281	2.853
0.2L :	11.28									
95.1	12.00	20.86	3.038	0.0	-0.05e-3	28.8	18.8	0.186	0.400	0.00
628.6	4.66	18.77	189.0	0.078	86.9	4.98	15.02	0.186	1.468	3.038
0.3L :	16.91									
75.9	12.00	20.86	3.038	0.0	0.25e-3	29.9	13.8	0.186	0.400	0.00
813.4	4.66	18.77	189.0	0.062	70.5	4.04	15.02	0.186	1.612	3.038
0.4L :	22.55									
56.8	12.00	20.86	3.038	0.0	0.69e-3	31.4	7.8	0.186	0.400	0.00
902.3	4.66	18.77	189.0	0.047	55.3	3.17	15.02	0.186	1.851	3.038
0.5L :	28.19									
38.3	12.00	20.86	3.038	0.0	0.44e-3	30.5	0.0	0.186	0.400	0.00
898.1	4.66	18.77	189.0	0.031	62.9	3.61	15.02	0.186	2.973	3.038
0.6L :	33.83									
53.1	12.00	20.86	3.038	0.0	0.49e-3	30.7	0.0	0.186	0.400	0.00
881.1	4.66	18.77	189.0	0.044	61.3	3.52	15.02	0.186	2.111	3.038
0.7L :	39.46									
72.2	12.00	20.86	3.038	0.0	0.14e-3	29.5	4.4	0.186	0.400	0.00
804.2	4.66	18.77	189.0	0.059	75.8	4.34	15.02	0.186	1.772	3.038
0.8L :	45.10									
91.5	12.00	20.86	3.038	0.0	-0.05e-3	28.8	14.7	0.186	0.400	0.00
631.4	4.66	18.77	189.0	0.075	87.0	4.99	15.02	0.186	1.527	3.038
0.9L :	50.74									
111.1	12.00	20.86	3.038	0.0	-0.15e-3	28.5	29.4	0.186	0.400	0.00
360.7	4.38	18.77	189.0	0.091	94.1	5.39	15.02	0.186	1.322	2.853
Critical :	54.24									
125.6	12.00	20.86	3.038	0.0	-0.20e-3	28.3	36.2	0.199	0.800	0.00
138.1	2.46	19.63	189.0	0.099	103.3	5.67	15.70	0.186	1.786	1.564
Transfer :	53.38									
122.0	12.00	20.86	3.038	0.0	-0.21e-3	28.3	34.5	0.194	0.800	0.00
199.4	3.41	19.15	189.0	0.098	101.1	5.68	15.32	0.186	1.796	2.198
Bearing :	55.88									

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)
	12.00	20.86	0.212	0.0	6.00e-3	50.0	130.4	1.512	2.406	0.00
26.1	0.61	20.55	31.5	0.099	16.7	0.87	16.44	0.186	1.524	0.366

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 3, Beam : 4

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
703.08	20.00	9.00	1.41

CAMBER/DEFLECTION

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 3, Beam : 4; Units: in)

At 0.1 x L = 5.14 ft	Release	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.024	3.00	-0.071
DL-Comp. (DW)			-0.014	3.00	-0.042
Live Load					-0.209
Total	0.252		0.359		0.096

At 0.2 x L = 10.77 ft	Release	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.047	3.00	-0.140
DL-Comp. (DW)			-0.028	3.00	-0.084
Live Load					-0.418
Total	0.421		0.570		-0.003

At 0.3 x L = 16.41 ft	Release	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.065	3.00	-0.195
DL-Comp. (DW)			-0.039	3.00	-0.117
Live Load					-0.585
Total	0.524		0.683		-0.155

At 0.4 x L = 22.05 ft	Release	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.077	3.00	-0.231
DL-Comp. (DW)			-0.046	3.00	-0.139
Live Load					-0.689
Total	0.580		0.736		-0.277

At 0.5 x L = 27.69 ft	Release	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.081	3.00	-0.244
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.728
Total	0.597		0.750		-0.327

At 0.6 x L = 33.33 ft	Release	Mult	Erection	Mult	Final
Prestress	1.430	1.80	2.574	2.45	3.504
Self Wt.	-0.851	1.85	-1.574	2.70	-2.296
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.399
Diaphragm			-0.009	3.00	-0.026
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.078	3.00	-0.233
DL-Comp. (DW)			-0.047	3.00	-0.140
Live Load					-0.896
Total	0.580		0.735		-0.287

At 0.7 x L = 38.96 ft	Release	Mult	Erection	Mult	Final
Prestress	1.251	1.80	2.251	2.45	3.064
Self Wt.	-0.726	1.85	-1.344	2.70	-1.961
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.113	3.00	-0.339
Diaphragm			-0.007	3.00	-0.022
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.067	3.00	-0.200
DL-Comp. (DW)			-0.040	3.00	-0.120
Live Load					-0.598
Total	0.524		0.681		-0.175

At 0.8 x L = 44.60 ft	Release	Mult	Erection	Mult	Final
Prestress	0.952	1.80	1.713	2.45	2.331
Self Wt.	-0.530	1.85	-0.981	2.70	-1.432
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.081	3.00	-0.244
Diaphragm			-0.005	3.00	-0.016
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.049	3.00	-0.146
DL-Comp. (DW)			-0.029	3.00	-0.088
Live Load					-0.437
Total	0.421		0.567		-0.032

At 0.9 x L =	Release 50.24 ft	Mult	Erection	Mult	Final
Prestress	0.533	1.80	0.959	2.45	1.305
Self Wt.	-0.280	1.85	-0.519	2.70	-0.757
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.041	3.00	-0.123
Diaphragm			-0.003	3.00	-0.008
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.026	3.00	-0.078
DL-Comp. (DW)			-0.016	3.00	-0.047
Live Load					-0.231
Total	0.252		0.355		0.062

ULTIMATE MOMENT

ULTIMATE - Span : 3, Beam : 4, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
180.0	19.6	2.512	249.6	4.5	3.41	936.3	0.012T	1.00	-	-	-	-
H/2	1.00											
74.2	19.2	1.256	257.6	2.3	1.76	494.7	0.025T	1.00	-	-	-	-
0.1L	5.14											
349.7	19.7	3.261	246.9	5.8	4.38	1175.4	0.008T	1.00	-	-	-	-
0.2L	10.78											
643.3	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	855.6	1.35	-
0.3L	16.41											
842.4	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	918.6	1.35	-
0.4L	22.05											
960.0	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	918.6	1.35	-
0.5L	27.69											
991.4	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	918.6	1.35	-
0.6L	33.33											
966.7	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	918.6	1.35	-
0.7L	38.96											
854.1	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	918.6	1.35	-
0.8L	44.60											
659.8	19.7	3.472	246.2	6.2	4.66	1239.5	0.008T	1.00	918.6	877.6	1.35	-
0.9L	50.24											
371.1	19.7	3.261	246.9	5.8	4.38	1175.4	0.008T	1.00	-	-	-	-
H/2	54.38											
97.1	19.2	1.256	257.6	2.3	1.76	494.7	0.025T	1.00	-	-	-	-
Transfer	52.88											
202.5	19.6	2.512	249.6	4.5	3.41	936.3	0.012T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 3, Beam : 4; Groups 1-8; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.070
		M	2.00	Fb	0.194
2	2	E	21.50	Ft	0.446
		M	21.50	Fb	0.082
3	2	E	6.00	Ft	0.424
		M	6.00	Fb	0.368
4	2	E	4.00	Ft	0.351
		M	4.00	Fb	0.705
5	2	E	4.00	Ft	0.278
		M	4.00	Fb	1.042
6	2	E	2.00	Ft	0.154
		M	2.00	Fb	1.430
7	2	E	2.00	Ft	0.030
		M	2.00	Fb	1.818
8	2	E	2.00	Ft	-0.094
		M	2.00	Fb	2.206

DESIGN SUMMARY

Span: 3, Beam: 4, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	56.38
Release Length,	ft	56.38
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	16	
	Draped:	0
	Straight:	16
Concrete Strength:		
	f'ci:	5.0 ksi
	f'c:	6.0 ksi
	f'ct:	4.0 ksi
Initial losses:	4.21 %	
Final losses:	12.46 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.000	2.207	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.095	Trans	
Precast Top w/ reinf. (tension)	-0.537			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1239.51	991.35	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	0.00 %		OK

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

Bentley			Sheet #	27
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	CSB
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	DKY
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span A... .csl		Date	Feb/3/2016

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	3.600	2.159	Midspan	2.700	1.005	Midspan			
Precast Bot	3.600	1.709	Transfer	2.700	1.970	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.465	-0.003	Bearing						
Precast Bot	-0.465	0.002	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							2.400	1.185	Midspan
Precast Bot							2.400	0.801	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 27.69 ft

	Release	Mult	Erection	Mult	Final
Prestress	1.490	1.80	2.682	2.45	3.650
Self Wt.	-0.893	1.85	-1.652	2.70	-2.411
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.140	3.00	-0.420
Diaphragm			-0.009	3.00	-0.028
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.081	3.00	-0.244
DL-Comp. (DW)			-0.049	3.00	-0.146
Live Load					-0.728
Total	0.597		0.750		-0.327

Positive values indicate upward deflection.

S-45-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Beam Design
Span B

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

Columbia,
South Carolina

Span B - Back Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevation [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Cl Bearing at Cl Alignment	B	67+99.060	28.158					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	67+99.060	28.158	16.4167	0.032000	28.683		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	67+99.060	28.158	-16.4167	0.032000	27.633		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032 SLOPE			
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								4.00
Top of cored slab at left gutter	E					28.350		
Top of cored slab at CL	F					27.825		
Top of cored slab at right gutter	G					27.299		
Asphalt thickness Left Gutter	A-E							4.00 OK > Min Thick
Asphalt thickness CL	B-F							4.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							4.00 OK > Min Thick

Span B - Mid Span

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevatior [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Mid Span at Cl Alignment	B	68+33.500	28.223					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	68+33.500	28.223	16.4167	0.032000	28.748		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	68+33.500	28.223	-16.4167	0.032000	27.698		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032	SLOPE		
Min asphalt thick set by Engr								2.00

AVG Top of cored slab at left gutter	E	{ interpolated between back bearing and ahead bearing}	28.384	2.44 OK > Min Thick
AVG Top of cored slab at CL	F	{ interpolated between back bearing and ahead bearing}	27.859	2.44 OK > Min Thick
AVG Top of cored slab at right gutter	G	{ interpolated between back bearing and ahead bearing}	27.334	2.44 OK > Min Thick
Asphalt thickness Left Gutter	A-E			
Asphalt thickness CL	B-F			
Asphalt thickness Right Gutter	C-G			
Girder Camber from design [in]	1.930	[in]		

Span B - Ahead Bearing

DKY 2/3/16
CSB 2/4/16

VPI sta.=	68+50.000	[ft]
VPI el.=	28.490	[ft]
L=	200.000	[ft]
g1=	0.0053	[ft/ft]
g2=	-0.005	[ft/ft]
VPC sta.=	67+50.000	[ft]
VPC el.=	27.9600	[ft]
VPT sta.=	69+50.000	[ft]
VPT el.=	27.9900	[ft]
(g2-g1)/2/L=	-0.0000258	[ft/ft^2]
skew β=	1.5707963	[rad] (+cw)
γ=	0.0000000	[rad] (+ccw)

deg	min	sec	dec deg
90	0	0	90.0000
			0.0000

		Sta.	PGL	offset [ft] (lt to rt)	super elevation [FT/FT] (lt to rt)	Fin Grade	along skew offset [ft] (lt to rt)	Asphalt Thickness [in]
Cl Bearing at Cl Alignment	B	68+67.940	28.227					
OGL gutter offset left				16.4167			16.41667	
SEL superelevation left					0.032000			
Cl Bearing at left gutter	A	68+67.940	28.227	16.4167	0.032000	28.752		
OGL gutter offset right				-16.4167			-16.41667	
SEL superelevation right					0.032000			
Cl Bearing at right gutter	C	68+67.940	28.227	-16.4167	0.032000	27.702		
SD slope dist along cl brg gutter to gutter							-32.83334	
CSC cap slope calc along cl cap gutr to gutr					0.032			
CSS cap slope SET along cl cap gutr to gutr					0.032	SLOPE		
Min asphalt thick set by Engr								2.00
Asphalt thick set by Engr LEFT GUTTER								4.00
Top of cored slab at left gutter	E					**28.419**		
Top of cored slab at CL	F					**27.894**		
Top of cored slab at right gutter	G					**27.368**		
Asphalt thickness Left Gutter	A-E							4.00 OK > Min Thick
Asphalt thickness CL	B-F							4.00 OK > Min Thick
Asphalt thickness Right Gutter	C-G							4.00 OK > Min Thick

Bentley			Sheet #	1
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	**Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl**		Date	Feb/3/2016

PROJECT DATA

Project:	S-51 over Black Mingo
Designer:	DKY
Date:	Feb/3/2016
Checked By:	CSB
Date Checked:	Feb/3/2016
User job number:	
State:	SC, State Job #:
State Specification:	None
Design Code:	AASHTO LRFD - [6th Edition, with 2013 Interim Revisions]
Units:	US
Span Type:	Multi-Span (Non-Continuous)
Flared Girder:	
Comments:	70'-0" Span B 37'-6" - 70'-0" - 56'-6" Cored Slab No Skew
File Name:	Z:\Projects\15-42 Emerg Bridge Replace PKG 4\S-51 Battery Park Rd\Structures\Final Design\Superstructure\Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B Model_020316.csl

Bentley			Sheet #	2
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	**Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl**		Date	Feb/3/2016

GEOMETRY DATA

BRIDGE LAYOUT

Overall Width (ft)	36.000
Left curb (ft)	1.583
Right curb (ft)	1.583
Curb-to-curb width (ft)	32.834
Number of spans	3
Number of lanes	2
Lane width (ft)	12.000
Eff Deck thick (in)	0.000
Sacrificial thick (in)	0.000
Haunch thickness (in)	0.000
Haunch width (in)	36.000

SPAN DATA

Span	Pier-to-pier ft	Precast ft	Brg-to-brg ft	Pier CL ft	Release ft	StartSkew	EndSkew	Bridge c/s M.I. in4
1	36.938	37.375	36.375	-0.500	37.375	0.00	0.00	473232.00
2	70.000	69.875	68.875	0.063	69.875	0.00	0.00	473232.00
3	55.938	56.375	55.375	-0.500	56.375	0.00	0.00	473232.00

BEAM DATA

Span: 1

No	ID	Loc-prev ft	Area in2	MI(bxx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

Span: 2

No	ID	Loc-prev ft	Area in2	MI(bxx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

Span: 3

No	ID	Loc-prev ft	Area in2	MI(Ixx) in4	Height in	Yb in	B-topg in	B-trib ft
1	SCDOT 36" x 24" Core	1.500	637.8	39436.0	24.00	12.00	36.00	3.000
2	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
3	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
4	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
5	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
6	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
7	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
8	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
9	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
10	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
11	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000
12	SCDOT 36" x 24" Core	3.000	637.8	39436.0	24.00	12.00	36.00	3.000

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)	6.400	8.000	4.000
Wc (pcf)	150.000	150.000	150.000
Ec (ksi)	4849.990	5422.450	3834.250
K1	1.000	1.000	1.000
Thermal coeff.(1/°F)	0.00000600		

STRAND AND REBAR PROPERTIES

PRESTRESSED STEEL:
6/10-270K-LL, Low relaxation strands
Straight Pattern
Strand Diameter = 0.600 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

LOADS DATA

DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

Span	Beam	DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
1	1	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	2	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	3	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	4	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	5	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	6	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	7	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	8	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	9	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	10	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	11	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
1	12	DC	Line	0.122	0.000	0.122	36.375	Asphalt Overlay (3.5" Avg.)
2	1	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	2	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	3	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	4	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	5	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	6	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	7	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	8	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	9	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	10	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	11	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
2	12	DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)
3	1	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	2	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	3	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	4	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	5	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	6	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	7	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	8	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	9	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	10	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	11	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)
3	12	DC	Line	0.122	0.000	0.122	55.375	Asphalt Overlay (3.5" Avg.)

DIAPHRAGM LOADS

Span	Beam	Load (kips)	Location (ft)
1	1	0.160	12.708
1	1	0.160	23.667
1	2	0.160	12.708
1	2	0.160	23.667
1	3	0.160	12.708
1	3	0.160	23.667
1	4	0.160	12.708
1	4	0.160	23.667
1	5	0.160	12.708
1	5	0.160	23.667
1	6	0.160	12.708
1	6	0.160	23.667
1	7	0.160	12.708
1	7	0.160	23.667
1	8	0.160	12.708
1	8	0.160	23.667
1	9	0.160	12.708
1	9	0.160	23.667
1	10	0.160	12.708
1	10	0.160	23.667
1	11	0.160	12.708
1	11	0.160	23.667
1	12	0.160	12.708
1	12	0.160	23.667
2	1	0.160	18.271
2	1	0.160	34.438
2	1	0.160	50.604
2	2	0.160	18.271
2	2	0.160	34.438
2	2	0.160	50.604
2	3	0.160	18.271
2	3	0.160	34.438
2	3	0.160	50.604
2	4	0.160	18.271
2	4	0.160	34.438
2	4	0.160	50.604
2	5	0.160	18.271
2	5	0.160	34.438
2	5	0.160	50.604
2	6	0.160	18.271
2	6	0.160	34.438
2	6	0.160	50.604
2	7	0.160	18.271
2	7	0.160	34.438
2	7	0.160	50.604
2	8	0.160	18.271
2	8	0.160	34.438
2	8	0.160	50.604
2	9	0.160	18.271
2	9	0.160	34.438
2	9	0.160	50.604
2	10	0.160	18.271
2	10	0.160	34.438
2	10	0.160	50.604
2	11	0.160	18.271
2	11	0.160	34.438
2	11	0.160	50.604
2	12	0.160	18.271
2	12	0.160	34.438
2	12	0.160	50.604
3	1	0.160	19.167
3	1	0.160	36.208
3	2	0.160	19.167

Span	Beam	Load (kips)	Location (ft)
	2	0.160	36.208
3	3	0.160	19.167
3	3	0.160	36.208
3	4	0.160	19.167
3	4	0.160	36.208
3	5	0.160	19.167
3	5	0.160	36.208
3	6	0.160	19.167
3	6	0.160	36.208
3	7	0.160	19.167
3	7	0.160	36.208
3	8	0.160	19.167
3	8	0.160	36.208
3	9	0.160	19.167
3	9	0.160	36.208
3	10	0.160	19.167
3	10	0.160	36.208
3	11	0.160	19.167
3	11	0.160	36.208
3	12	0.160	19.167
3	12	0.160	36.208

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	0.410	0.000	0.410	36.375	Right Barrier
1	DC	Line	0.410	0.000	0.410	36.375	Left Barrier
1	DW	Area	0.015	32.833	-	-	FWS
2	DC	Line	0.410	0.000	0.410	68.875	Right Barrier
2	DC	Line	0.410	0.000	0.410	68.875	Left Barrier
2	DW	Area	0.015	32.833	-	-	FWS
3	DC	Line	0.410	0.000	0.410	55.375	Right Barrier
3	DC	Line	0.410	0.000	0.410	55.375	Left Barrier
3	DW	Area	0.015	32.833	-	-	FWS

TEMPERATURE LOADS - NONE

LIVE LOADS
Live load deflection: included.

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

Pedestrian Load - NONE

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)
Service I:	1.00	1.00	-	1.00	-
Service III:	0.80	1.00	-	1.00	-
Strength I:	1.75	1.25	0.90	1.50	0.65
Fatigue I:	1.50	-	-	-	-

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	1.00
	Debonded	2.00

Camber & Deflection Multiplier (PCI ref.)

	Erection	Final
Prestress:	1.80	2.45
Self. Wt:	1.85	2.70
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:	Strain Compatibility method.
Ultimate Concrete Strain:	0.0030
Horizontal Shear, Beam and Slab effects in Vu:	EXCLUDED

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

		PRECAST	
Strength		6.40	ksi
Elasticity		4850.0	ksi
Max comp		3.84	ksi
Max tens		-0.20	ksi
Max tens	w/rebar	-0.64	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	8.00	ksi	4.00	ksi
Elasticity	5422.45	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	4.80	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	3.60	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	3.20	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.54	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	1.00

PRESTRESS LOSSES:

Time Dependent Losses, Approximate Method (Art.5.9.5.3)
Days to release = 0.75
Rel. Humid.(RH) = 75.0 %

BEAM REINFORCEMENT
BEAM SPECIFIC MATERIAL PROPERTIES:

Span#, Beam#	Tendon-ID	Girder-f'ci ksi	Girder-f'c ksi	Deck-f'c ksi
Span:1, Beam:1	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:2	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:3	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:4	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:5	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:6	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:7	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:8	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:9	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:10	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:11	6/10-270K-LL	6.40	8.00	4.00
Span:1, Beam:12	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:1	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:2	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:3	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:4	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:5	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:6	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:7	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:8	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:9	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:10	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:11	6/10-270K-LL	6.40	8.00	4.00
Span:2, Beam:12	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:1	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:2	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:3	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:4	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:5	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:6	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:7	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:8	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:9	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:10	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:11	6/10-270K-LL	6.40	8.00	4.00
Span:3, Beam:12	6/10-270K-LL	6.40	8.00	4.00

Span:1, Beam:1

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:2

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:3

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:4

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:5

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:6

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:7

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:8

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:9

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:10

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:11

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:1, Beam:12

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:1

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:2

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:3

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:4

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:5

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:6

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:7

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:8

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:9

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:10

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:11

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:2, Beam:12

PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:1

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:2

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:3

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:4

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:5

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:6

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:7

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:8

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:9

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:10

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:11

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

Span:3, Beam:12

PRESTRESSED STEEL:
No strands, 6/10-270K-LL, Low relaxation

REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

PROPERTIES
Span:2, Beam:1
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in	
thick	Top	6.000	in	Bot	6.000	in	
Stems	No	0					
	Top	N/A					
	Bot	N/A					
Shear width		12.000	in				

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt./Rt	1.50/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Exterior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	18.27
0.16	34.44
0.16	50.60

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	69.875	ft
Release length	69.875	ft
Design length	68.875	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.261	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.258	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.281	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.280	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.257	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.279	(Calculated)	
Live Shear		(2+ lanes loaded)	0.183	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.183	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.7071
Use transformed strand and rebar: No

Span:2, Beam:1
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		6.40	ksi
Elasticity		4850.0	ksi
Max comp		3.84	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.61	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	8.00	ksi	4.00	ksi
Elasticity	5422.45	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	4.80	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	3.60	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	3.20	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.54	ksi	-0.38	ksi

Span:2, Beam:1
PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	5.208	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.142	ft
Dev. Len, debonded	12.283	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	1054.6	kips
Beam Shrtng (PL/AE)	0.270	in

Span:2, Beam:1
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
1677.000	740	1240.980	11.463	46423.305	0.000	0.000

Span:2, Beam:1
REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

LOSSES
Note: Values are calculated at Midspan

Str. area	5.2080	in2
Ycg	4.96	in
P_init	1054.6	kips
Ecc	7.04	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4850	ksi

AASHTO LOSSES

Elastic Shortening 11.54 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.965 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.71	ksi	0.05	ksi
due	to Composite Loads	-1.23	ksi	0.09	ksi
due	to Live Loads	-4.26	ksi	0.38	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial		Final		
Steel relaxation	0.00	ksi		2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi		7.70	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi		10.61	ksi	(Eq 5.9.5.3-1)
Sub-total	11.54	ksi	(5.70 %)	15.04	ksi	(7.43 %)
Total Prestress Losses				26.59	ksi	(13.13 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 175.9 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	13.5	83.9	42.4	183.4	319.7	409.9	462.4	473.0
	V	15.3	12.9	14.3	8.9	6.4	3.8	1.2	5.7
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	19.0	17.8	18.5	15.7	13.2	10.9	8.6	7.5
	M	15.4	79.7	41.9	168.4	282.9	347.9	365.9	397.5
Total :	M+	17.0	165.8	78.0	378.3	676.6	882.7	1004.5	1038.5
	V	47.9	43.1	45.9	35.4	26.3	17.0	7.8	5.7
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	51.6	48.0	50.1	42.2	33.2	24.1	15.2	7.5
	M	18.9	161.6	77.5	363.3	639.9	820.7	908.0	963.1

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	462.4	409.9	319.7	183.4	42.4	83.9	13.5
	V	1.2	3.8	6.4	8.9	14.3	12.9	15.3
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	8.6	10.9	13.2	15.7	18.5	17.8	19.0
	M	365.9	347.9	282.9	168.4	41.9	79.7	15.4
Total :	M+	1004.5	882.7	676.6	378.3	78.0	165.8	17.0
	V	7.8	17.0	26.3	35.4	45.9	43.1	47.9
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	15.2	24.1	33.2	42.2	50.1	48.0	51.6
	M	908.0	820.7	639.9	363.3	77.5	161.6	18.9

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	22.9	22.9
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.3	3.3
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.2	28.2
DL-Comp.(DW)	17.0	17.0
Live	83.5	83.5
Pedestrian	0.0	0.0

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 : 2, Beam : 1, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	10.8	67.1	33.9	146.7	255.8	327.9	369.9	378.4
	V	12.2	10.3	11.5	7.2	5.1	3.0	1.0	4.5
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	15.2	14.2	14.8	12.6	10.6	8.7	6.9	6.0
	M	12.3	63.8	33.5	134.7	226.4	278.3	292.8	318.0
Total :	M+	14.3	149.1	69.5	341.7	612.7	800.7	912.0	943.9
	V	44.8	40.5	43.1	33.6	25.0	16.2	7.6	4.6
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	47.8	44.4	46.4	39.0	30.5	21.9	13.5	6.1
	M	15.8	145.7	69.1	329.7	583.3	751.1	834.8	883.6

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	369.9	327.9	255.8	146.7	33.9	67.1	10.8
	V	1.0	3.0	5.1	7.2	11.5	10.3	12.2
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	6.9	8.7	10.6	12.6	14.8	14.2	15.2
	M	292.8	278.3	226.4	134.7	33.5	63.8	12.3
Total :	M+	912.0	800.7	612.7	341.7	69.5	149.1	14.3
	V	7.6	16.2	25.0	33.6	43.1	40.5	44.8
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	13.5	21.9	30.5	39.0	46.4	44.4	47.8
	M	834.8	751.1	583.3	329.7	69.1	145.7	15.8

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

Bentley			Sheet #	9
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	68.9	28.2	168.1	310.0	411.3	472.2	492.4
(Max)	V	28.6	26.5	27.8	23.2	17.4	11.6	5.8	0.0
Self wt. :	M	0.0	49.6	20.3	121.0	223.2	296.2	340.0	354.6
(Min)	V	20.6	19.1	20.0	16.7	12.5	8.4	4.2	0.0
DL-Prec. :	M	0.0	10.0	4.1	24.3	44.9	59.6	68.4	71.3
DC(Max)	V	4.1	3.8	4.0	3.4	2.5	1.7	0.8	0.0
DL-Prec. :	M	0.0	7.2	2.9	17.5	32.3	42.9	49.2	51.3
DC(Min)	V	3.0	2.8	2.9	2.4	1.8	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.7	0.3	1.9	4.0	5.7	6.4	7.1
(Max)	V	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1
Diaphragm :	M	0.0	0.5	0.2	1.4	2.9	4.1	4.6	5.1
(Min)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	3.3	17.5	9.1	37.9	67.1	88.0	100.5	104.7
DC(Max)	V	5.9	5.5	5.7	4.8	3.6	2.4	1.2	0.0
DL-Comp :	M	2.4	12.6	6.6	27.3	48.3	63.3	72.3	75.4
DC(Min)	V	4.2	3.9	4.1	3.4	2.6	1.7	0.9	0.0
DL-Comp :	M	1.2	6.3	3.3	13.7	24.2	31.7	36.2	37.7
DW(Max)	V	2.1	2.0	2.1	1.7	1.3	0.9	0.4	0.0
DL-Comp :	M	0.5	2.7	1.4	5.9	10.5	13.7	15.7	16.3
DW(Min)	V	0.9	0.9	0.9	0.7	0.6	0.4	0.2	0.0
LL + I :	M+	23.6	146.9	74.2	321.0	559.5	717.4	809.2	827.8
	V	26.8	22.5	25.1	15.6	11.1	6.6	2.1	9.9
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	33.3	31.1	32.4	27.5	23.2	19.0	15.0	13.1
	M	26.9	139.5	73.3	294.7	495.2	608.8	640.4	695.7
Total :	M+	28.1	250.3	119.2	566.9	1009.7	1313.7	1492.8	1541.0
	V	67.8	60.6	64.9	49.0	36.2	23.3	10.5	10.0
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	74.4	69.2	72.3	60.8	48.3	35.7	23.4	13.2
	M	31.5	242.9	118.3	540.7	945.4	1205.1	1324.0	1408.9

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

Bentley			Sheet #	10
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	472.2	411.3	310.0	168.1	28.2	68.9	0.0
(Max)	V	5.8	11.6	17.4	23.2	27.8	26.5	28.6
Self wt. :	M	340.0	296.2	223.2	121.0	20.3	49.6	0.0
(Min)	V	4.2	8.4	12.5	16.7	20.0	19.1	20.6
DL-Prec. :	M	68.4	59.6	44.9	24.3	4.1	10.0	0.0
DC(Max)	V	0.8	1.7	2.5	3.4	4.0	3.8	4.1
DL-Prec. :	M	49.2	42.9	32.3	17.5	2.9	7.2	0.0
DC(Min)	V	0.6	1.2	1.8	2.4	2.9	2.8	3.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	6.4	5.7	4.0	1.9	0.3	0.7	0.0
(Max)	V	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Diaphragm :	M	4.6	4.1	2.9	1.4	0.2	0.5	0.0
(Min)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	100.5	88.0	67.1	37.9	9.1	17.5	3.3
DC(Max)	V	1.2	2.4	3.6	4.8	5.7	5.5	5.9
DL-Comp :	M	72.3	63.3	48.3	27.3	6.6	12.6	2.4
DC(Min)	V	0.9	1.7	2.6	3.4	4.1	3.9	4.2
DL-Comp :	M	36.2	31.7	24.2	13.7	3.3	6.3	1.2
DW(Max)	V	0.4	0.9	1.3	1.7	2.1	2.0	2.1
DL-Comp :	M	15.7	13.7	10.5	5.9	1.4	2.7	0.5
DW(Min)	V	0.2	0.4	0.6	0.7	0.9	0.9	0.9
LL + I :	M+	809.2	717.4	559.5	321.0	74.2	146.9	23.6
	V	2.1	6.6	11.1	15.6	25.1	22.5	26.8
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	15.0	19.0	23.2	27.5	32.4	31.1	33.3
	M	640.4	608.8	495.2	294.7	73.3	139.5	26.9
Total :	M+	1492.8	1313.7	1009.7	566.9	119.2	250.3	28.1
	V	10.5	23.3	36.2	49.0	64.9	60.6	67.8
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	23.4	35.7	48.3	60.8	72.3	69.2	74.4
	M	1324.0	1205.1	945.4	540.7	118.3	242.9	31.5

REACTIONS (klps), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	28.6	28.6
Deck+Haunch	0.0	0.0
Diaphragm	0.3	0.3
DL-Prec.(DC)	4.1	4.1
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	35.3	35.3
DL-Comp.(DW)	25.4	25.4
Live	146.2	146.2
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	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	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
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	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	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	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	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+	11.8	61.2	32.2	129.6	218.3	277.5	304.1	290.4
	V	13.2	9.6	11.8	3.7	1.8	0.5	2.4	4.2
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	13.8	12.6	13.3	10.8	8.9	7.0	5.6	4.9
	M	10.7	55.3	29.2	115.7	189.8	223.6	240.4	258.3
Total :	M+	15.3	143.2	67.7	324.5	575.2	750.3	846.2	855.9
	V	45.8	39.8	43.4	30.2	21.7	13.6	9.0	4.3
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	46.3	42.8	44.9	37.3	28.8	20.2	12.3	4.9
	M	14.2	137.2	64.7	310.6	546.7	696.4	782.5	823.8

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
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	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
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	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
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	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
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+	304.1	277.5	218.3	129.6	32.2	61.2	11.8
	V	2.4	0.5	1.8	3.7	11.8	9.6	13.2
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	6.1	7.0	8.9	11.2	13.4	12.8	13.8
	M	259.9	223.6	189.8	120.4	31.1	58.5	11.5
Total :	M+	846.2	750.3	575.2	324.5	67.7	143.2	15.3
	V	9.0	13.6	21.7	30.2	43.4	39.8	45.8
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	12.7	20.2	28.8	37.7	45.0	43.0	46.4
	M	802.0	696.4	546.7	315.4	66.6	140.5	14.9

POSITIVE ENVELOPE STRESSES

Span : 2, Beam : 1, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.13 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.088	-0.527	-0.263	-0.527	-0.527	-0.527	-0.527	-0.527
Bottom	0.567	3.399	1.700	3.399	3.399	3.399	3.399	3.399
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.010	0.051	0.027	0.111	0.196	0.257	0.294	0.306
Bottom	-0.010	-0.051	-0.027	-0.111	-0.196	-0.257	-0.294	-0.306
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.049	0.306	0.155	0.670	1.167	1.497	1.688	1.727
Bottom	-0.049	-0.306	-0.155	-0.670	-1.167	-1.497	-1.688	-1.727
Final 1 (P/S + DL + LL)								
Precast-top	-0.026	0.079	0.021	0.855	1.944	2.697	3.141	3.266
Bottom	0.505	2.794	1.415	2.018	0.929	0.176	-0.268	-0.393
Final 2 (P/S + DL)								
Precast-top	-0.075	-0.227	-0.133	0.185	0.777	1.200	1.453	1.538
Bottom	0.554	3.100	1.570	2.688	2.096	1.673	1.420	1.334

Span : 2, Beam : 1, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210
As_top, in2	0.411	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000*	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.13 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.088	-0.527	-0.263	-0.527	-0.527	-0.527	-0.527	-0.527
Bottom	0.567	3.399	1.700	3.399	3.399	3.399	3.399	3.399
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.010	0.051	0.027	0.111	0.196	0.257	0.294	0.306
Bottom	-0.010	-0.051	-0.027	-0.111	-0.196	-0.257	-0.294	-0.306
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.039	0.245	0.124	0.536	0.934	1.197	1.351	1.382
Bottom	-0.039	-0.245	-0.124	-0.536	-0.934	-1.197	-1.351	-1.382
Final 1 (P/S + DL + LL)								
Precast-top	-0.036	0.018	-0.010	0.721	1.711	2.397	2.804	2.920
Bottom	0.514	2.855	1.446	2.152	1.162	0.476	0.069	-0.047

Span : 2, Beam : 1, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
F_LL+I(+)									
Precast-top		0.043	0.224	0.118	0.473	0.797	1.013	1.110	1.060
Bottom		-0.043	-0.224	-0.118	-0.473	-0.797	-1.013	-1.110	-1.060
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.006	0.110	0.051	0.566	1.185	1.613	1.837	1.829
Bottom		0.234	1.327	0.667	0.871	0.251	-0.177	-0.400	-0.393

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 2, Beam : 1, STRENGTH I
Using General Beta Theta Equation 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									
74.4	12.00	20.55	0.283	0.0	6.00e-3	50.0	63.7	0.752	0.000	0.00
31.5	0.70	20.20	31.5	0.043	18.9	0.87	16.16	0.215	0.229*	0.585
Transfer :	3.00									
69.2	12.00	20.55	4.774	0.0	-0.36e-3	27.7	0.0	0.215	0.000	0.00
242.9	3.94	18.57	189.0	0.043	131.4	6.59	14.86	0.215	1.710	3.511
Critical :	2.10									
71.0	12.00	20.55	4.774	0.0	-0.39e-3	27.6	0.0	0.215	0.000	0.00
164.1	2.78	19.16	189.0	0.043	139.5	6.79	15.32	0.215	1.767	2.451
0.1L :	6.99									
60.8	12.00	20.55	4.774	0.0	-0.26e-3	28.1	0.0	0.215	0.000	0.00
540.7	5.28	18.49	189.0	0.038	118.6	5.98	14.79	0.215	1.755	4.774
0.2L :	13.98									
48.3	12.00	20.55	4.774	0.0	-0.13e-3	28.5	0.0	0.215	0.000	0.00
945.4	5.28	18.49	189.0	0.030	105.4	5.31	14.79	0.215	1.965	4.774
0.3L :	20.96									
35.7	12.00	20.55	4.774	0.0	-0.05e-3	28.8	0.0	0.215	0.000	0.00
1205.1	5.28	18.49	189.0	0.022	98.6	4.97	14.79	0.215	2.487	4.774
0.4L :	27.95									
23.4	12.00	20.55	4.774	0.0	-0.01e-3	29.0	0.0	0.215	0.000	0.00
1324.0	5.28	18.49	189.0	0.015	96.0	4.84	14.79	0.215	3.693	4.774
0.5L :	34.94									
13.2	12.00	20.55	4.774	0.0	0.19e-3	29.6	0.0	0.215	0.000	0.00
1408.9	5.28	18.49	189.0	0.008	83.6	4.21	14.79	0.215	5.715	4.774
0.6L :	41.92									
23.4	12.00	20.55	4.774	0.0	-0.01e-3	29.0	0.0	0.215	0.000	0.00
1324.0	5.28	18.49	189.0	0.015	96.0	4.84	14.79	0.215	3.693	4.774
0.7L :	48.91									
35.7	12.00	20.55	4.774	0.0	-0.05e-3	28.8	0.0	0.215	0.000	0.00
1205.1	5.28	18.49	189.0	0.022	98.6	4.97	14.79	0.215	2.487	4.774
0.8L :	55.90									
48.3	12.00	20.55	4.774	0.0	-0.13e-3	28.5	0.0	0.215	0.000	0.00
945.4	5.28	18.49	189.0	0.030	105.4	5.31	14.79	0.215	1.965	4.774
0.9L :	62.89									
60.8	12.00	20.55	4.774	0.0	-0.26e-3	28.1	0.0	0.215	0.000	0.00
540.7	5.28	18.49	189.0	0.038	118.6	5.98	14.79	0.215	1.755	4.774
Critical :	67.78									
71.0	12.00	20.55	4.774	0.0	-0.39e-3	27.6	0.0	0.215	0.000	0.00
164.1	2.78	19.16	189.0	0.043	139.5	6.79	15.32	0.215	1.767	2.451
Transfer :	66.88									
69.2	12.00	20.55	4.774	0.0	-0.36e-3	27.7	0.0	0.215	0.000	0.00
242.9	3.94	18.57	189.0	0.043	131.4	6.59	14.86	0.215	1.710	3.511
Bearing :	69.38									

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)
74.4	12.00	20.55	0.283	0.0	6.00e-3	50.0	63.7	0.752	0.000	0.00
31.5	0.70	20.20	31.5	0.043	18.9	0.87	16.16	0.215	0.229*	0.585

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
1054.62	20.00	9.00	2.11

CAMBER/DEFLECTION

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

At 0.1 x L =	Release 6.49 ft	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.067	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.109	3.00	-0.327
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.435
Total	0.566		0.773		0.158

At 0.2 x L =	Release 13.48 ft	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.206	3.00	-0.617
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.824
Total	0.945		1.233		-0.023

At 0.3 x L =	Release 20.46 ft	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.281	3.00	-0.843
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.129
Total	1.180		1.482		-0.317

At 0.4 x L =	Release 27.45 ft	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.329	3.00	-0.987
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.328
Total	1.307		1.599		-0.563

At 0.5 x L =	Release 34.44 ft	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.345	3.00	-1.036
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.392
Total	1.347		1.633		-0.653

At 0.6 x L =	Release 41.42 ft	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.329	3.00	-0.987
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.328
Total	1.307		1.599		-0.563

At 0.7 x L =	Release 48.41 ft	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.281	3.00	-0.843
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.129
Total	1.180		1.482		-0.317

At 0.8 x L =	Release 55.40 ft	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.206	3.00	-0.617
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.824
Total	0.945		1.233		-0.023

At 0.9 x L =	Release 62.39 ft	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.067	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.109	3.00	-0.327
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.435
Total	0.566		0.773		0.158

ULTIMATE MOMENT

ULTIMATE - Span : 2, Beam : 1, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
250.3	19.8	3.830	251.9	6.0	3.94	1437.0	0.008T	1.00	-	-	-	-
H/2	1.00											
119.2	19.7	1.915	258.0	3.1	2.02	767.7	0.018T	1.00	-	-	-	-
0.1L	6.49											
566.9	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	754.0	1.41	-
0.2L	13.48											
1009.7	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.3L	20.46											
1313.7	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.4L	27.45											
1492.8	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.5L	34.44											
1541.0	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.6L	41.43											
1492.8	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.7L	48.41											
1313.7	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.8L	55.40											
1009.7	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	1321.5	1.41	-
0.9L	62.39											
566.9	19.9	5.208	248.0	8.0	5.28	1857.1	0.005T	1.00	1321.5	754.0	1.41	-
H/2	67.88											
119.2	19.7	1.915	258.0	3.1	2.02	767.7	0.018T	1.00	-	-	-	-
Transfer	66.38											
250.3	19.8	3.830	251.9	6.0	3.94	1437.0	0.008T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 2, Beam : 1; Groups 1-12; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.121
		M	2.00	Fb	0.138
2	2	E	21.50	Ft	0.491
		M	21.50	Fb	0.029
3	2	E	6.00	Ft	0.470
		M	6.00	Fb	0.310
4	2	E	6.00	Ft	0.448
		M	6.00	Fb	0.591
5	2	E	4.00	Ft	0.376
		M	4.00	Fb	0.923
6	2	E	4.00	Ft	0.305
		M	4.00	Fb	1.255
7	2	E	4.00	Ft	0.233
		M	4.00	Fb	1.586
8	2	E	4.00	Ft	0.161
		M	4.00	Fb	1.918
9	2	E	2.00	Ft	0.039
		M	2.00	Fb	2.300
10	2	E	2.00	Ft	-0.084
		M	2.00	Fb	2.682
11	2	E	2.00	Ft	-0.206
		M	2.00	Fb	3.064
12	2	E	2.00	Ft	-0.328
		M	2.00	Fb	3.447

DESIGN SUMMARY

Span: 2, Beam: 1, Exterior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	69.88
Release Length,	ft	69.88
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	24	
	Draped:	0
	Straight:	24
Concrete Strength:		
	f'ci:	6.4 ksi
	f'c:	8.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.70 %	
Final losses:	13.13 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.840	3.447	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.328	Trans	
Precast Top w/ reinf. (tension)	-0.607			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1857.06	1540.96	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	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	4.800	3.266	Midspan	3.600	1.538	Midspan			
Precast Bot	4.800	2.794	Transfer	3.600	3.100	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.537	-0.036	Bearing						
Precast Bot	-0.537	-0.047	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							3.200	1.837	0.4L/0.6L
Precast Bot							3.200	1.327	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 34.44 ft

	Release	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.345	3.00	-1.036
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.392
Total	1.347		1.633		-0.653

Positive values indicate upward deflection.

PROPERTIES
Span:2, Beam:2
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab					
Type	Rect. Beams w/ Circular Voids					
Flng width	Top	36.000	in	Bot	36.000	in
thick	Top	6.000	in	Bot	6.000	in
Stems	No	0				
	Top	N/A				
	Bot	N/A				
Shear width		12.000	in			

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt./Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	18.27
0.16	34.44
0.16	50.60

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	69.875	ft
Release length	69.875	ft
Design length	68.875	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.261	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.258	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.261	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.260	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.257	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.259	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.167	(Manual input)
Comp. DW	0.083	(Manual input)

Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.7071
Use transformed strand and rebar: No

Span:2, Beam:2
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		6.40	ksi
Elasticity		4850.0	ksi
Max comp		3.84	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.61	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	8.00	ksi	4.00	ksi
Elasticity	5422.45	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	4.80	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	3.60	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	3.20	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.54	ksi	-0.38	ksi

Span:2, Beam:2
PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	5.208	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.151	ft
Dev. Len, debonded	12.303	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	1054.6	kips
Beam Shrtng (PL/AE)	0.270	in

Span:2, Beam:2
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
1677.000	740	1240.980	11.463	46423.305	0.000	0.000

Span:2, Beam:2
REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

LOSSES
Note: Values are calculated at Midspan

Str. area	5.2080	in2
Ycg	4.96	in
P_init	1054.6	kips
Ecc	7.04	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4850	ksi

AASHTO LOSSES

Elastic Shortening 11.54 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.965 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.71	ksi	0.05	ksi
due	to Composite Loads	-1.23	ksi	0.09	ksi
due	to Live Loads	-3.95	ksi	0.35	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial		Final		
Steel relaxation	0.00	ksi		2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi		7.70	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi		10.61	ksi	(Eq 5.9.5.3-1)
Sub-total	11.54	ksi	(5.70 %)	15.32	ksi	(7.57 %)
Total Prestress Losses				26.87	ksi	(13.27 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 175.6 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	12.5	77.9	39.4	170.2	296.7	380.4	429.1	439.0
	V	50.1	42.0	46.9	29.2	20.8	12.4	4.0	18.5
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	62.3	58.1	60.6	51.4	43.3	35.6	28.1	24.4
	M	14.3	74.0	38.9	156.3	262.6	322.9	339.6	368.9
Total :	M+	16.0	159.8	74.9	365.1	653.6	853.2	971.2	1004.5
	V	82.6	72.3	78.5	55.7	40.7	25.6	10.6	18.6
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	94.8	88.3	92.2	77.8	63.2	48.8	34.7	24.5
	M	17.8	155.9	74.4	351.2	619.5	795.7	881.7	934.5

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	429.1	380.4	296.7	170.2	39.4	77.9	12.5
	V	4.0	12.4	20.8	29.2	46.9	42.0	50.1
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	28.1	35.6	43.3	51.4	60.6	58.1	62.3
	M	339.6	322.9	262.6	156.3	38.9	74.0	14.3
Total :	M+	971.2	853.2	653.6	365.1	74.9	159.8	16.0
	V	10.6	25.6	40.7	55.7	78.5	72.3	82.6
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	34.7	48.8	63.2	77.8	92.2	88.3	94.8
	M	881.7	795.7	619.5	351.2	74.4	155.9	17.8

Bentley			Sheet #	7
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	22.9	22.9
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.3	3.3
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.2	28.2
DL-Comp.(DW)	17.0	17.0
Live	83.5	83.5
Pedestrian	0.0	0.0

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 : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	10.0	62.3	31.5	136.2	237.4	304.3	343.3	351.2
	V	40.1	33.6	37.5	23.4	16.7	9.9	3.2	14.8
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	49.8	46.5	48.5	41.1	34.7	28.5	22.5	19.5
	M	11.4	59.2	31.1	125.0	210.1	258.3	271.7	295.1
Total :	M+	13.5	144.2	67.0	331.1	594.3	777.1	885.4	916.7
	V	72.6	63.8	69.1	49.9	36.6	23.1	9.8	14.9
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	82.4	76.7	80.1	67.6	54.6	41.7	29.1	19.6
	M	14.9	141.1	66.7	320.0	567.0	731.1	813.8	860.7

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

Bentley			Sheet #	8
			Job #	
Program:	LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version:	14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
		www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name:	Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	343.3	304.3	237.4	136.2	31.5	62.3	10.0
	V	3.2	9.9	16.7	23.4	37.5	33.6	40.1
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	22.5	28.5	34.7	41.1	48.5	46.5	49.8
	M	271.7	258.3	210.1	125.0	31.1	59.2	11.4
Total :	M+	885.4	777.1	594.3	331.1	67.0	144.2	13.5
	V	9.8	23.1	36.6	49.9	69.1	63.8	72.6
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	29.1	41.7	54.6	67.6	80.1	76.7	82.4
	M	813.8	731.1	567.0	320.0	66.7	141.1	14.9

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

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	68.9	28.2	168.1	310.0	411.3	472.2	492.4
(Max)	V	28.6	26.5	27.8	23.2	17.4	11.6	5.8	0.0
Self wt. :	M	0.0	49.6	20.3	121.0	223.2	296.2	340.0	354.6
(Min)	V	20.6	19.1	20.0	16.7	12.5	8.4	4.2	0.0
DL-Prec. :	M	0.0	10.0	4.1	24.3	44.9	59.6	68.4	71.3
DC(Max)	V	4.1	3.8	4.0	3.4	2.5	1.7	0.8	0.0
DL-Prec. :	M	0.0	7.2	2.9	17.5	32.3	42.9	49.2	51.3
DC(Min)	V	3.0	2.8	2.9	2.4	1.8	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.7	0.3	1.9	4.0	5.7	6.4	7.1
(Max)	V	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1
Diaphragm :	M	0.0	0.5	0.2	1.4	2.9	4.1	4.6	5.1
(Min)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	3.3	17.5	9.1	37.9	67.1	88.0	100.5	104.7
DC(Max)	V	5.9	5.5	5.7	4.8	3.6	2.4	1.2	0.0
DL-Comp :	M	2.4	12.6	6.6	27.3	48.3	63.3	72.3	75.4
DC(Min)	V	4.2	3.9	4.1	3.4	2.6	1.7	0.9	0.0
DL-Comp :	M	1.2	6.3	3.3	13.7	24.2	31.7	36.2	37.7
DW(Max)	V	2.1	2.0	2.1	1.7	1.3	0.9	0.4	0.0
DL-Comp :	M	0.5	2.7	1.4	5.9	10.5	13.7	15.7	16.3
DW(Min)	V	0.9	0.9	0.9	0.7	0.6	0.4	0.2	0.0
LL + I :	M+	21.9	136.3	68.9	297.9	519.2	665.7	751.0	768.2
	V	87.6	73.6	82.0	51.2	36.4	21.7	6.9	32.4
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	109.0	101.6	106.1	89.9	75.8	62.3	49.2	42.7
	M	25.0	129.4	68.1	273.5	459.5	565.0	594.3	645.6
Total :	M+	26.5	239.8	113.9	543.8	969.4	1262.0	1434.6	1481.4
	V	128.7	111.7	121.9	84.6	61.5	38.3	15.3	32.5
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	150.0	139.7	145.9	123.2	100.9	78.9	57.5	42.8
	M	29.5	232.9	113.1	519.5	909.7	1161.3	1277.9	1358.8

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	472.2	411.3	310.0	168.1	28.2	68.9	0.0
(Max)	V	5.8	11.6	17.4	23.2	27.8	26.5	28.6
Self wt. :	M	340.0	296.2	223.2	121.0	20.3	49.6	0.0
(Min)	V	4.2	8.4	12.5	16.7	20.0	19.1	20.6
DL-Prec. :	M	68.4	59.6	44.9	24.3	4.1	10.0	0.0
DC(Max)	V	0.8	1.7	2.5	3.4	4.0	3.8	4.1
DL-Prec. :	M	49.2	42.9	32.3	17.5	2.9	7.2	0.0
DC(Min)	V	0.6	1.2	1.8	2.4	2.9	2.8	3.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	6.4	5.7	4.0	1.9	0.3	0.7	0.0
(Max)	V	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Diaphragm :	M	4.6	4.1	2.9	1.4	0.2	0.5	0.0
(Min)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	100.5	88.0	67.1	37.9	9.1	17.5	3.3
DC(Max)	V	1.2	2.4	3.6	4.8	5.7	5.5	5.9
DL-Comp :	M	72.3	63.3	48.3	27.3	6.6	12.6	2.4
DC(Min)	V	0.9	1.7	2.6	3.4	4.1	3.9	4.2
DL-Comp :	M	36.2	31.7	24.2	13.7	3.3	6.3	1.2
DW(Max)	V	0.4	0.9	1.3	1.7	2.1	2.0	2.1
DL-Comp :	M	15.7	13.7	10.5	5.9	1.4	2.7	0.5
DW(Min)	V	0.2	0.4	0.6	0.7	0.9	0.9	0.9
LL + I :	M+	751.0	665.7	519.2	297.9	68.9	136.3	21.9
	V	6.9	21.7	36.4	51.2	82.0	73.6	87.6
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	49.2	62.3	75.8	89.9	106.1	101.6	109.0
	M	594.3	565.0	459.5	273.5	68.1	129.4	25.0
Total :	M+	1434.6	1262.0	969.4	543.8	113.9	239.8	26.5
	V	15.3	38.3	61.5	84.6	121.9	111.7	128.7
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	57.5	78.9	100.9	123.2	145.9	139.7	150.0
	M	1277.9	1161.3	909.7	519.5	113.1	232.9	29.5

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	28.6	28.6
Deck+Haunch	0.0	0.0
Diaphragm	0.3	0.3
DL-Prec.(DC)	4.1	4.1
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	35.3	35.3
DL-Comp.(DW)	25.4	25.4
Live	146.2	146.2
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:06 A.M.

SHEAR AND MOMENT ENVELOPE : Span : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	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	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
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	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	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	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	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+	11.0	56.8	29.9	120.3	202.6	257.5	282.2	269.5
	V	43.2	31.2	38.4	12.1	5.9	1.5	7.7	13.9
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	45.1	41.3	43.6	35.3	29.1	22.9	18.5	15.9
	M	10.0	51.3	27.1	107.4	176.1	207.5	223.1	239.7
Total :	M+	14.4	138.8	65.4	315.2	559.5	730.3	824.3	835.0
	V	75.8	61.5	70.1	38.6	25.8	14.7	14.3	14.0
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	77.6	71.5	75.2	61.8	49.0	36.1	25.1	15.9
	M	13.4	133.2	62.6	302.3	533.1	680.3	765.2	805.2

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
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	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
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	80.4	70.4	53.7	30.3	7.3	14.0	2.7
DC(Max)	V	1.0	1.9	2.9	3.8	4.6	4.4	4.7
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	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
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+	282.2	257.5	202.6	120.3	29.9	56.8	11.0
	V	7.7	1.5	5.9	12.1	38.4	31.2	43.2
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	20.0	22.9	29.1	36.7	43.9	41.9	45.2
	M	241.2	207.5	176.1	111.8	28.8	54.3	10.6
Total :	M+	824.3	730.3	559.5	315.2	65.4	138.8	14.4
	V	14.3	14.7	25.8	38.6	70.1	61.5	75.8
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	26.6	36.1	49.0	63.2	75.5	72.1	77.8
	M	783.3	680.3	533.1	306.7	64.4	136.3	14.1

POSITIVE ENVELOPE STRESSES

Span : 2, Beam : 2, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.27 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.088	-0.526	-0.263	-0.526	-0.526	-0.526	-0.526	-0.526
Bottom	0.566	3.394	1.697	3.394	3.394	3.394	3.394	3.394
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.010	0.051	0.027	0.111	0.196	0.257	0.294	0.306
Bottom	-0.010	-0.051	-0.027	-0.111	-0.196	-0.257	-0.294	-0.306
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.046	0.284	0.144	0.622	1.083	1.389	1.567	1.603
Bottom	-0.046	-0.284	-0.144	-0.622	-1.083	-1.389	-1.567	-1.603
Final 1 (P/S + DL + LL)								
Precast-top	-0.029	0.058	0.011	0.808	1.861	2.590	3.021	3.142
Bottom	0.507	2.811	1.423	2.061	1.007	0.279	-0.152	-0.274
Final 2 (P/S + DL)								
Precast-top	-0.075	-0.227	-0.133	0.186	0.778	1.201	1.454	1.539
Bottom	0.553	3.095	1.567	2.682	2.091	1.668	1.415	1.329

Span : 2, Beam : 2, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210
As_top, in2	0.411	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000*	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.27 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.088	-0.526	-0.263	-0.526	-0.526	-0.526	-0.526	-0.526
Bottom	0.566	3.394	1.697	3.394	3.394	3.394	3.394	3.394
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.010	0.051	0.027	0.111	0.196	0.257	0.294	0.306
Bottom	-0.010	-0.051	-0.027	-0.111	-0.196	-0.257	-0.294	-0.306
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.037	0.228	0.115	0.497	0.867	1.111	1.254	1.282
Bottom	-0.037	-0.228	-0.115	-0.497	-0.867	-1.111	-1.254	-1.282
Final 1 (P/S + DL + LL)								
Precast-top	-0.038	0.001	-0.018	0.683	1.644	2.312	2.707	2.822
Bottom	0.516	2.867	1.452	2.185	1.224	0.556	0.161	0.047

Span : 2, Beam : 2, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
F_LL+I(+)									
Precast-top		0.040	0.208	0.109	0.439	0.740	0.940	1.031	0.984
Bottom		-0.040	-0.208	-0.109	-0.439	-0.740	-0.940	-1.031	-0.984
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.003	0.094	0.043	0.532	1.128	1.541	1.757	1.754
Bottom		0.236	1.340	0.675	0.902	0.306	-0.107	-0.323	-0.319

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 2, Beam : 2, STRENGTH I
Using General Beta Theta Equation 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									
150.0	12.00	20.55	0.284	0.0	6.00e-3	50.0	147.8	1.744	0.000	0.00
29.5	0.70	20.20	31.5	0.086	18.9	0.87	16.16	0.215	0.113*	0.584
Transfer :	3.00									
139.7	12.00	20.55	4.774	0.0	-0.33e-3	27.9	28.3	0.215	0.000	0.00
232.9	3.94	18.58	189.0	0.087	126.9	6.37	14.86	0.215	0.817*	3.505
Critical :	2.10									
143.5	12.00	20.55	4.774	0.0	-0.33e-3	27.8	28.3	0.215	0.000	0.00
157.1	2.78	19.16	189.0	0.087	131.1	6.38	15.33	0.215	0.822*	2.447
0.1L :	6.99									
123.2	12.00	20.55	4.774	0.0	-0.24e-3	28.2	21.1	0.215	0.000	0.00
519.5	5.28	18.49	189.0	0.077	115.8	5.84	14.79	0.215	0.846*	4.774
0.2L :	13.98									
100.9	12.00	20.55	4.774	0.0	-0.11e-3	28.6	8.1	0.215	0.000	0.00
909.7	5.28	18.49	189.0	0.063	104.1	5.24	14.79	0.215	0.928*	4.774
0.3L :	20.96									
78.9	12.00	20.55	4.774	0.0	-0.04e-3	28.9	0.0	0.215	0.000	0.00
1161.3	5.28	18.49	189.0	0.049	98.0	4.94	14.79	0.215	1.118	4.774
0.4L :	27.95									
57.5	12.00	20.55	4.774	0.0	-0.01e-3	29.0	0.0	0.215	0.000	0.00
1277.9	5.28	18.49	189.0	0.036	95.8	4.83	14.79	0.215	1.499	4.774
0.5L :	34.94									
42.8	12.00	20.55	4.774	0.0	0.16e-3	29.6	0.0	0.215	0.000	0.00
1358.8	5.28	18.49	189.0	0.027	84.8	4.27	14.79	0.215	1.780	4.774
0.6L :	41.92									
57.5	12.00	20.55	4.774	0.0	-0.01e-3	29.0	0.0	0.215	0.000	0.00
1277.9	5.28	18.49	189.0	0.036	95.8	4.83	14.79	0.215	1.499	4.774
0.7L :	48.91									
78.9	12.00	20.55	4.774	0.0	-0.04e-3	28.9	0.0	0.215	0.000	0.00
1161.3	5.28	18.49	189.0	0.049	98.0	4.94	14.79	0.215	1.118	4.774
0.8L :	55.90									
100.9	12.00	20.55	4.774	0.0	-0.11e-3	28.6	8.1	0.215	0.000	0.00
909.7	5.28	18.49	189.0	0.063	104.1	5.24	14.79	0.215	0.928*	4.774
0.9L :	62.89									
123.2	12.00	20.55	4.774	0.0	-0.24e-3	28.2	21.1	0.215	0.000	0.00
519.5	5.28	18.49	189.0	0.077	115.8	5.84	14.79	0.215	0.846*	4.774
Critical :	67.78									
143.5	12.00	20.55	4.774	0.0	-0.33e-3	27.8	28.3	0.215	0.000	0.00
157.1	2.78	19.16	189.0	0.087	131.1	6.38	15.33	0.215	0.822*	2.447
Transfer :	66.88									
139.7	12.00	20.55	4.774	0.0	-0.33e-3	27.9	28.3	0.215	0.000	0.00
232.9	3.94	18.58	189.0	0.087	126.9	6.37	14.86	0.215	0.817*	3.505
Bearing :	69.38									

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)
150.0	12.00	20.55	0.284	0.0	6.00e-3	50.0	147.8	1.744	0.000	0.00
29.5	0.70	20.20	31.5	0.086	18.9	0.87	16.16	0.215	0.113*	0.584

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

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
1054.62	20.00	9.00	2.11

CAMBER/DEFLECTION

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

At 0.1 x L = 6.49 ft	Release	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.067	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.109	3.00	-0.327
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.404
Total	0.566		0.773		0.189

At 0.2 x L = 13.48 ft	Release	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.206	3.00	-0.617
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.765
Total	0.945		1.233		0.036

At 0.3 x L = 20.46 ft	Release	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.281	3.00	-0.843
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.048
Total	1.180		1.482		-0.235

At 0.4 x L = 27.45 ft	Release	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.329	3.00	-0.987
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.232
Total	1.307		1.599		-0.468

At 0.5 x L = 34.44 ft	Release	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.345	3.00	-1.036
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.292
Total	1.347		1.633		-0.553

At 0.6 x L = 41.42 ft	Release	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.329	3.00	-0.987
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.232
Total	1.307		1.599		-0.468

At 0.7 x L = 48.41 ft	Release	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.281	3.00	-0.843
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.048
Total	1.180		1.482		-0.235

At 0.8 x L = 55.40 ft	Release	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.206	3.00	-0.617
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.765
Total	0.945		1.233		0.036

At 0.9 x L =	Release 62.39 ft	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.067	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.109	3.00	-0.327
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.404
Total	0.566		0.773		0.189

ULTIMATE MOMENT

ULTIMATE - Span : 2, Beam : 2, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
239.8	19.8	3.824	251.9	6.0	3.94	1435.0	0.008T	1.00	-	-	-	-
H/2	1.00											
113.9	19.7	1.912	258.0	3.1	2.01	766.5	0.018T	1.00	-	-	-	-
0.1L	6.49											
543.8	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	723.3	1.41	-
0.2L	13.48											
969.4	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1289.3	1.41	-
0.3L	20.46											
1262.0	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1319.9	1.41	-
0.4L	27.45											
1434.6	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1319.9	1.41	-
0.5L	34.44											
1481.4	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1319.9	1.41	-
0.6L	41.43											
1434.6	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1319.9	1.41	-
0.7L	48.41											
1262.0	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1319.9	1.41	-
0.8L	55.40											
969.4	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	1289.3	1.41	-
0.9L	62.39											
543.8	19.9	5.208	248.0	8.0	5.28	1857.0	0.005T	1.00	1319.9	723.3	1.41	-
H/2	67.88											
113.9	19.7	1.912	258.0	3.1	2.01	766.5	0.018T	1.00	-	-	-	-
Transfer	66.38											
239.8	19.8	3.824	251.9	6.0	3.94	1435.0	0.008T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 2, Beam : 2; Groups 1-12; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.121
		M	2.00	Fb	0.138
2	2	E	21.50	Ft	0.491
		M	21.50	Fb	0.029
3	2	E	6.00	Ft	0.470
		M	6.00	Fb	0.310
4	2	E	6.00	Ft	0.448
		M	6.00	Fb	0.591
5	2	E	4.00	Ft	0.376
		M	4.00	Fb	0.923
6	2	E	4.00	Ft	0.305
		M	4.00	Fb	1.255
7	2	E	4.00	Ft	0.233
		M	4.00	Fb	1.586
8	2	E	4.00	Ft	0.161
		M	4.00	Fb	1.918
9	2	E	2.00	Ft	0.039
		M	2.00	Fb	2.300
10	2	E	2.00	Ft	-0.084
		M	2.00	Fb	2.682
11	2	E	2.00	Ft	-0.206
		M	2.00	Fb	3.064
12	2	E	2.00	Ft	-0.328
		M	2.00	Fb	3.447

DESIGN SUMMARY

Span: 2, Beam: 2, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	69.88
Release Length,	ft	69.88
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	24	
	Draped:	0
	Straight:	24
Concrete Strength:		
	f'ci:	6.4 ksi
	f'c:	8.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.70 %	
Final losses:	13.27 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.840	3.447	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.328	Trans	
Precast Top w/ reinf. (tension)	-0.607			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1856.97	1481.38	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	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	4.800	3.142	Midspan	3.600	1.539	Midspan			
Precast Bot	4.800	2.811	Transfer	3.600	3.095	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.537	-0.038	Bearing						
Precast Bot	-0.537	0.047	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							3.200	1.757	0.4L/0.6L
Precast Bot							3.200	1.340	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 34.44 ft

	Release	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.345	3.00	-1.036
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.292
Total	1.347		1.633		-0.553

Positive values indicate upward deflection.

PROPERTIES
Span:2, Beam:4
PRECAST DATA:

Section Id	SCDOT 36" x 24" Cored Slab						
Type	Rect. Beams w/ Circular Voids						
Flng width	Top	36.000	in	Bot	36.000	in	
thick	Top	6.000	in	Bot	6.000	in	
Stems	No	0					
	Top	N/A					
	Bot	N/A					
Shear width		12.000	in				

Minimum Thickness Criteria, Article 5.14.1.2.2 checked: OK.

GENERAL BRIDGE DATA:

Bridge Width	36.00	ft
Curb-to-curb	32.83	ft
Beam Spac. Lt/Rt	3.00/ 3.00	ft
Lane width	12.00	ft
Number of lanes	2	
Interior/Exterior	Interior	
Start Skew Angle	0.00	degrees
End Skew Angle	0.00	degrees

TOPPING DATA:

Effective Deck	Thickness	0.000	in	
Sacrificial Deck	Thickness	0.000	in	
Haunch:				
	Thickness	0.000	in	
	Width	36.000	in	
Effective	width	36.000	in	(Art. 4.6.2.6.1)

GENERAL LOAD DATA:
DEAD LOADS ON PRECAST
UNITS: (Point: kips, Location: ft, Line: klf, Trapez: klf)

DC/DW	Type	Mag.1	Loc.1	Mag.2	Loc.2	Description
DC	Line	0.096	0.000	0.096	68.875	Asphalt Overlay (2.75" Avg.)

Diaphragm loads:
(kips, ft)

Mag.	Loc.
0.16	18.27
0.16	34.44
0.16	50.60

Dead loads on composite: See Project info for composite loads

GENERAL SPAN DATA:

Overall length	69.875	ft
Release length	69.875	ft
Design length	68.875	ft

KERN POINTS:

Upper	17.15	in
Lower	6.85	in

DISTRIBUTION FACTORS (Art. 4.6.2.2):
Type g, connected only enough to prevent relative vertical displacement

Live Negative Moment	Left Side	(2+ lanes loaded)	0.261	(Calculated)	
Live Negative Moment	Right Side	(2+ lanes loaded)	0.258	(Calculated)	(#)
Live Negative Moment	Left Side	(1 lane loaded)	0.261	(Calculated)	
Live Negative Moment	Right Side	(1 lane loaded)	0.260	(Calculated)	(#)
Live Positive Moment		(2+ lanes loaded)	0.257	(Calculated)	
Live Positive Moment		(1 lane loaded)	0.259	(Calculated)	
Live Shear		(2+ lanes loaded)	0.600	(Calculated)	(#)
Live Shear		(1 lane loaded)	0.600	(Calculated)	(#)

(#) Lever rule (C4.6.2.2.1)
The LL distribution computation is using the effective slab depth (ts = 0.00in).
The LL distribution computation is using the effective slab depth (ts = 0.00in).

Pedestrian	0.083	(Calculated)
Comp. DC	0.083	(Calculated)
Comp. DW	0.083	(Calculated)

Dead Loads and Pedestrian Load distributed equally to all beams (Art. 4.6.2.2.1)
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	1.00
Shear	0.90

SECTION PROPERTIES:

	PRECAST		COMPOSITE		
Area	637.8	in2	637.8	in2	#
Total Height	24.00	in	24.00	in	
Mom. of Inertia (Ixx)	39436	in4	39436	in4	#
Ht. of c.g.	12.00	in	12.00	in	#
Density	150.00	pcf	150.00	pcf	
Self-weight	664.4	plf	664.4	plf	
Mom. of Inertia (Iyy)	76800.0	in4			
Poisson's Ratio	0.2				
Thermal Coeff.	0.000006000	1/°F			

(#) Of Total Section using Ect/Ec = 0.7071
Use transformed strand and rebar: No

Span:2, Beam:4
STRESS LIMITS (Art. 5.9.4):
STRESS LIMITS AT RELEASE BEFORE LOSSES:

		PRECAST	
Strength		6.40	ksi
Elasticity		4850.0	ksi
Max comp		3.84	ksi
Max tens		-0.20	ksi
Max tens,	w/reinf	-0.61	ksi

STRESS LIMITS AT FINAL AFTER LOSSES:

	PRECAST		DECK	
Strength	8.00	ksi	4.00	ksi
Elasticity	5422.45	ksi	3834.25	ksi

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

	PRECAST		DECK	
Max comp	4.80	ksi	2.40	ksi

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

	PRECAST		DECK	
Max comp	3.60	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	3.20	ksi	-	ksi

SERVICE III (Tension):

	PRECAST		DECK	
Max tens	-0.54	ksi	-0.38	ksi

Span:2, Beam:4
PRESTRESSED STEEL:
24 strands, 6/10-270K-LL, Low relaxation strands
Straight Pattern

END PATTERN (Ycg = 4.96 in):

10 @ 2.000 in	8 @ 4.000 in	4 @ 6.000 in	2 @ 21.500 in

Strand Diameter	0.600	in
Strand Area	0.217	in2
Total Strand Area	5.208	in2
Trans. Len,bonded	3.000	ft
Trans. Len,debonded	3.000	ft
Dev. Len, bonded	6.167	ft
Dev. Len, debonded	12.333	ft
Holddown Force	0.000	kips
Tensile Strength(fpu)	270.0	ksi
Initial Prestress = 0.75fpu	202.5	ksi
Initial Pull	1054.6	kips
Beam Shrtng (PL/AE)	0.270	in

Span:2, Beam:4
ESTIMATED QUANTITIES

Prestressing (linear ft)	Strands (LB/1000ft)	(LB)	Beam Vol(C.Y.)	Concrete Wt(LB)	Stirrups (LB)	Longitudinal Bars (LB)
1677.000	740	1240.980	11.463	46423.305	0.000	0.000

Span:2, Beam:4
REINFORCING STEEL:

Tension	/Shear	steel:
fy	60.0	ksi
Es	29000	ksi

LOSSES
Note: Values are calculated at Midspan

Str. area	5.2080	in2
Ycg	4.96	in
P_init	1054.6	kips
Ecc	7.04	in
Days to release	0.75	
Rel. Humid.(RH)	75.0	%
Es	28500.0	ksi
Eci	4850	ksi

AASHTO LOSSES

Elastic Shortening 11.54 ksi (Eq 5.9.5.2.3a-1), (fcgp= 1.965 ksi)

	Elastic Gains	Gains		Adjustment	
due	to Precast Loads	-0.71	ksi	0.05	ksi
due	to Composite Loads	-0.75	ksi	0.05	ksi
due	to Live Loads	-3.95	ksi	0.35	ksi

Time Dependent Losses (Approximate Method (Art.5.9.5.3))

		Initial			Final		
Steel relaxation	0.00	ksi			2.40	ksi	(Eq 5.9.5.3-1)
Concrete shrinkage	0.00	ksi			7.70	ksi	(Eq 5.9.5.3-1)
Concrete creep	0.00	ksi			10.61	ksi	(Eq 5.9.5.3-1)
Sub-total	11.54	ksi	(5.70 %)		15.76	ksi	(7.78 %)
Total Prestress Losses					27.30	ksi	(13.48 %)

Prestressing Stress Limit Check (Table 5.9.3.1)
initial fpi = 202.5 ksi < 0.75 fpu, OK
initial fpe = 175.2 ksi < 0.80 fpy, OK

SHEAR/MOMENT ENVELOPE (&REACTIONS)

SHEAR AND MOMENT ENVELOPE : Span : 2, Beam : 4, SERVICE I
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	1.3	7.0	3.7	15.2	26.8	35.2	40.2	41.9
DC(Max)	V	2.4	2.2	2.3	1.9	1.4	1.0	0.5	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	12.5	77.9	39.4	170.2	296.7	380.4	429.1	439.0
	V	50.1	42.0	46.9	29.2	20.8	12.4	4.0	18.5
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	62.3	58.1	60.6	51.4	43.3	35.6	28.1	24.4
	M	14.3	74.0	38.9	156.3	262.6	322.9	339.6	368.9
Total :	M+	14.7	152.8	71.3	350.0	626.8	818.0	931.0	962.6
	V	80.3	70.1	76.2	53.8	39.3	24.6	10.1	18.6
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	92.5	86.1	89.9	75.9	61.8	47.8	34.2	24.5
	M	16.4	148.9	70.8	336.0	592.7	760.5	841.5	892.6

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	40.2	35.2	26.8	15.2	3.7	7.0	1.3
DC(Max)	V	0.5	1.0	1.4	1.9	2.3	2.2	2.4
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	429.1	380.4	296.7	170.2	39.4	77.9	12.5
	V	4.0	12.4	20.8	29.2	46.9	42.0	50.1
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	28.1	35.6	43.3	51.4	60.6	58.1	62.3
	M	339.6	322.9	262.6	156.3	38.9	74.0	14.3
Total :	M+	931.0	818.0	626.8	350.0	71.3	152.8	14.7
	V	10.1	24.6	39.3	53.8	76.2	70.1	80.3
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	0.0	0.0
Total :	Vmx	34.2	47.8	61.8	75.9	89.9	86.1	92.5
	M	841.5	760.5	592.7	336.0	70.8	148.9	16.4

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	22.9	22.9
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.3	3.3
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.2	28.2
DL-Comp.(DW)	17.0	17.0
Live	83.5	83.5
Pedestrian	0.0	0.0

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 : 2, Beam : 4, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	1.3	7.0	3.7	15.2	26.8	35.2	40.2	41.9
DC(Max)	V	2.4	2.2	2.3	1.9	1.4	1.0	0.5	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	10.0	62.3	31.5	136.2	237.4	304.3	343.3	351.2
	V	40.1	33.6	37.5	23.4	16.7	9.9	3.2	14.8
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	49.8	45.5	48.5	41.1	34.7	28.5	22.5	19.5
	M	11.4	59.2	31.1	125.0	210.1	258.3	271.7	295.1
Total :	M+	12.2	137.2	63.4	315.9	567.4	741.9	845.2	874.8
	V	70.3	61.7	66.8	48.0	35.1	22.1	9.3	14.9
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	80.0	74.5	77.8	65.6	53.1	40.7	28.6	19.6
	M	13.6	134.1	63.0	304.8	540.1	695.9	773.6	818.8

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.86
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
DL-Prec. :	M	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	40.2	35.2	26.8	15.2	3.7	7.0	1.3
DC(Max)	V	0.5	1.0	1.4	1.9	2.3	2.2	2.4
DL-Comp :	M	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
LL + I :	M+	343.3	304.3	237.4	136.2	31.5	62.3	10.0
	V	3.2	9.9	16.7	23.4	37.5	33.6	40.1
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	22.5	28.5	34.7	41.1	48.5	46.5	49.8
	M	271.7	258.3	210.1	125.0	31.1	59.2	11.4
Total :	M+	845.2	741.9	567.4	315.9	63.4	137.2	12.2
	V	9.3	22.1	35.1	48.0	66.8	61.7	70.3
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	0.0	0.0
Total :	Vmx	28.6	40.7	53.1	65.6	77.8	74.5	80.0
	M	773.6	695.9	540.1	304.8	63.0	134.1	13.6

SHEAR AND MOMENT ENVELOPE : Span : 2, Beam : 4, STRENGTH I
Shears: kips, Moments: kft

Bentley		Sheet #	9
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	68.9	28.2	168.1	310.0	411.3	472.2	492.4
(Max)	V	28.6	26.5	27.8	23.2	17.4	11.6	5.8	0.0
Self wt. :	M	0.0	49.6	20.3	121.0	223.2	296.2	340.0	354.6
(Min)	V	20.6	19.1	20.0	16.7	12.5	8.4	4.2	0.0
DL-Prec. :	M	0.0	10.0	4.1	24.3	44.9	59.6	68.4	71.3
DC(Max)	V	4.1	3.8	4.0	3.4	2.5	1.7	0.8	0.0
DL-Prec. :	M	0.0	7.2	2.9	17.5	32.3	42.9	49.2	51.3
DC(Min)	V	3.0	2.8	2.9	2.4	1.8	1.2	0.6	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.7	0.3	1.9	4.0	5.7	6.4	7.1
(Max)	V	0.3	0.3	0.3	0.3	0.3	0.1	0.1	0.1
Diaphragm :	M	0.0	0.5	0.2	1.4	2.9	4.1	4.6	5.1
(Min)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	1.7	8.8	4.6	19.0	33.6	44.0	50.2	52.3
DC(Max)	V	2.9	2.7	2.9	2.4	1.8	1.2	0.6	0.0
DL-Comp :	M	1.2	6.3	3.3	13.6	24.2	31.7	36.2	37.7
DC(Min)	V	2.1	2.0	2.1	1.7	1.3	0.9	0.4	0.0
DL-Comp :	M	1.2	6.3	3.3	13.7	24.2	31.7	36.2	37.7
DW(Max)	V	2.1	2.0	2.1	1.7	1.3	0.9	0.4	0.0
DL-Comp :	M	0.5	2.7	1.4	5.9	10.5	13.7	15.7	16.3
DW(Min)	V	0.9	0.9	0.9	0.7	0.6	0.4	0.2	0.0
LL + I :	M+	21.9	136.3	68.9	297.9	519.2	665.7	751.0	768.2
	V	87.6	73.6	82.0	51.2	36.4	21.7	6.9	32.4
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	109.0	101.6	106.1	89.9	75.8	62.3	49.2	42.7
	M	25.0	129.4	68.1	273.5	459.5	565.0	594.3	645.6
Total :	M+	24.8	231.0	109.3	524.9	935.9	1218.0	1384.3	1429.0
	V	125.7	108.9	119.0	82.2	59.7	37.1	14.7	32.5
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	147.1	137.0	143.1	120.9	99.1	77.7	56.9	42.8
	M	27.9	224.1	108.5	500.5	876.2	1117.3	1227.7	1306.5

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:07 A.M.

Bentley		Sheet #	10
		Job #	
Program: LEAP® CONSPAN® V8i (SELECTseries 7)	I.C.E.	Designed	DKY
Version: 14.00.00.19	Copyright © Bentley Systems, Inc. 2014	Date	Feb/3/2016
	www.bentley.com Phone: 1-800-778-4277	Checked	CSB
File Name: Black Mingo_Cored Slab_37.5' - 70' - 56.5' Spans_Span B... .csl		Date	Feb/3/2016

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	472.2	411.3	310.0	168.1	28.2	68.9	0.0
(Max)	V	5.8	11.6	17.4	23.2	27.8	26.5	28.6
Self wt. :	M	340.0	296.2	223.2	121.0	20.3	49.6	0.0
(Min)	V	4.2	8.4	12.5	16.7	20.0	19.1	20.6
DL-Prec. :	M	68.4	59.6	44.9	24.3	4.1	10.0	0.0
DC(Max)	V	0.8	1.7	2.5	3.4	4.0	3.8	4.1
DL-Prec. :	M	49.2	42.9	32.3	17.5	2.9	7.2	0.0
DC(Min)	V	0.6	1.2	1.8	2.4	2.9	2.8	3.0
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	6.4	5.7	4.0	1.9	0.3	0.7	0.0
(Max)	V	0.1	0.1	0.3	0.3	0.3	0.3	0.3
Diaphragm :	M	4.6	4.1	2.9	1.4	0.2	0.5	0.0
(Min)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
DL-Comp :	M	50.2	44.0	33.6	19.0	4.6	8.8	1.7
DC(Max)	V	0.6	1.2	1.8	2.4	2.9	2.7	2.9
DL-Comp :	M	36.2	31.7	24.2	13.6	3.3	6.3	1.2
DC(Min)	V	0.4	0.9	1.3	1.7	2.1	2.0	2.1
DL-Comp :	M	36.2	31.7	24.2	13.7	3.3	6.3	1.2
DW(Max)	V	0.4	0.9	1.3	1.7	2.1	2.0	2.1
DL-Comp :	M	15.7	13.7	10.5	5.9	1.4	2.7	0.5
DW(Min)	V	0.2	0.4	0.6	0.7	0.9	0.9	0.9
LL + I :	M+	751.0	665.7	519.2	297.9	68.9	136.3	21.9
	V	6.9	21.7	36.4	51.2	82.0	73.6	87.6
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	49.2	62.3	75.8	89.9	106.1	101.6	109.0
	M	594.3	565.0	459.5	273.5	68.1	129.4	25.0
Total :	M+	1384.3	1218.0	935.9	524.9	109.3	231.0	24.8
	V	14.7	37.1	59.7	82.2	119.0	108.9	125.7
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	56.9	77.7	99.1	120.9	143.1	137.0	147.1
	M	1227.7	1117.3	876.2	500.5	108.5	224.1	27.9

REACTIONS (kips), STRENGTH I

Load Type	Left Support	Right Support
Self Wt.	28.6	28.6
Deck+Haunch	0.0	0.0
Diaphragm	0.3	0.3
DL-Prec.(DC)	4.1	4.1
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	35.3	35.3
DL-Comp.(DW)	25.4	25.4
Live	146.2	146.2
Pedestrian	0.0	0.0

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.

Units: U.S. Units Design Code: AASHTO LRFD Printed on: February 11, 2016 @ 11:07 A.M.

SHEAR AND MOMENT ENVELOPE : Span : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	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	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
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	1.3	7.0	3.7	15.2	26.8	35.2	40.2	41.9
DC(Max)	V	2.4	2.2	2.3	1.9	1.4	1.0	0.5	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	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	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+	11.0	56.8	29.9	120.3	202.6	257.5	282.2	269.5
	V	43.2	31.2	38.4	12.1	5.9	1.5	7.7	13.9
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	45.1	41.3	43.6	35.3	29.1	22.9	18.5	15.9
	M	10.0	51.3	27.1	107.4	176.1	207.5	223.1	239.7
Total :	M+	13.1	131.7	61.8	300.0	532.6	695.1	784.1	793.1
	V	73.4	59.3	67.8	36.7	24.4	13.7	13.8	14.0
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	75.3	69.3	72.9	59.8	47.6	35.1	24.6	15.9
	M	12.1	126.2	59.0	287.1	506.2	645.1	725.0	763.4

		0.60L	0.70L	0.80L	0.90L	H/2	Trans	Bearing
Location,	ft	41.43	48.41	55.40	62.39	67.88	66.37	68.88
Self wt. :	M	377.7	329.1	248.0	134.4	22.5	55.1	0.0
(Max)	V	4.6	9.3	13.9	18.6	22.2	21.2	22.9
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	54.7	47.6	35.9	19.5	3.3	8.0	0.0
DC(Max)	V	0.7	1.3	2.0	2.7	3.2	3.1	3.3
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	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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	5.1	4.6	3.2	1.6	0.2	0.6	0.0
(Max)	V	0.1	0.1	0.2	0.2	0.2	0.2	0.2
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	40.2	35.2	26.8	15.2	3.7	7.0	1.3
DC(Max)	V	0.5	1.0	1.4	1.9	2.3	2.2	2.4
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	24.1	21.1	16.1	9.1	2.2	4.2	0.8
DW(Max)	V	0.3	0.6	0.9	1.1	1.4	1.3	1.4
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+	282.2	257.5	202.6	120.3	29.9	56.8	11.0
	V	7.7	1.5	5.9	12.1	38.4	31.2	43.2
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	20.0	22.9	29.1	36.7	43.9	41.9	45.2
	M	241.2	207.5	176.1	111.8	28.8	54.3	10.6
Total :	M+	784.1	695.1	532.6	300.0	61.8	131.7	13.1
	V	13.8	13.7	24.4	36.7	67.8	59.3	73.4
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	26.1	35.1	47.6	61.3	73.2	70.0	75.4
	M	743.1	645.1	506.2	291.5	60.7	129.2	12.8

POSITIVE ENVELOPE STRESSES

Span : 2, Beam : 4, SERVICE I

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210

SERVICE I

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.48 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.087	-0.524	-0.262	-0.524	-0.524	-0.524	-0.524	-0.524
Bottom	0.564	3.386	1.693	3.386	3.386	3.386	3.386	3.386
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.013	0.055	0.098	0.128	0.147	0.153
Bottom	-0.005	-0.026	-0.013	-0.055	-0.098	-0.128	-0.147	-0.153
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.046	0.284	0.144	0.622	1.083	1.389	1.567	1.603
Bottom	-0.046	-0.284	-0.144	-0.622	-1.083	-1.389	-1.567	-1.603
Final 1 (P/S + DL + LL)								
Precast-top	-0.034	0.033	-0.002	0.753	1.764	2.463	2.875	2.991
Bottom	0.511	2.828	1.433	2.108	1.097	0.399	-0.014	-0.129
Final 2 (P/S + DL)								
Precast-top	-0.080	-0.251	-0.146	0.132	0.681	1.073	1.308	1.388
Bottom	0.556	3.112	1.576	2.729	2.180	1.768	1.553	1.473

Span : 2, Beam : 4, SERVICE III

RELEASE STRESSES, (ksi) (LOSS = 5.70 %)

	Trans	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	3.00	6.99	13.98	20.96	27.95	34.94
Beam-Self						
Precast-top	0.243	0.533	0.948	1.244	1.421	1.481
Bottom	-0.243	-0.533	-0.948	-1.244	-1.421	-1.481
Prestress						
Precast-top	-0.572	-0.572	-0.572	-0.572	-0.572	-0.572
Bottom	3.690	3.690	3.690	3.690	3.690	3.690
Total						
Precast-top	-0.328	-0.039	0.376	0.672	0.850	0.909
Bottom	3.447	3.157	2.743	2.446	2.269	2.210
As_top, in2	0.411	0.000	0.000	0.000	0.000	0.000
Ast_prvd, in2	0.000*	0.000	0.000	0.000	0.000	0.000

SERVICE III

POSITIVE ENVELOPE STRESSES, (ksi) (LOSS = 13.48 %)

	Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Prestress								
Precast-top	-0.087	-0.524	-0.262	-0.524	-0.524	-0.524	-0.524	-0.524
Bottom	0.564	3.386	1.693	3.386	3.386	3.386	3.386	3.386
Self wt.								
Precast-top	-0.000	0.201	0.082	0.491	0.906	1.202	1.379	1.439
Bottom	-0.000	-0.201	-0.082	-0.491	-0.906	-1.202	-1.379	-1.439
DL-Prec (DC)								
Precast-top	-0.000	0.029	0.012	0.071	0.131	0.174	0.200	0.208
Bottom	-0.000	-0.029	-0.012	-0.071	-0.131	-0.174	-0.200	-0.208
DL-Prec (DW)								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Diaphragm								
Precast-top	-0.000	0.002	0.001	0.006	0.012	0.017	0.019	0.021
Bottom	-0.000	-0.002	-0.001	-0.006	-0.012	-0.017	-0.019	-0.021
Deck + Haunch								
Precast-top	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Bottom	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
DL-Comp (DC)								
Precast-top	0.005	0.026	0.013	0.055	0.098	0.128	0.147	0.153
Bottom	-0.005	-0.026	-0.013	-0.055	-0.098	-0.128	-0.147	-0.153
DL-Comp (DW)								
Precast-top	0.003	0.015	0.008	0.033	0.059	0.077	0.088	0.092
Bottom	-0.003	-0.015	-0.008	-0.033	-0.059	-0.077	-0.088	-0.092
LL+I(+)								
Precast-top	0.037	0.228	0.115	0.497	0.867	1.111	1.254	1.282
Bottom	-0.037	-0.228	-0.115	-0.497	-0.867	-1.111	-1.254	-1.282
Final 1 (P/S + DL + LL)								
Precast-top	-0.043	-0.023	-0.031	0.629	1.548	2.185	2.562	2.670
Bottom	0.520	2.885	1.461	2.232	1.314	0.676	0.300	0.191

Span : 2, Beam : 4, FATIGUE I
POSITIVE ENVELOPE STRESSES, (ksi)

		Bearing	Trans	H/2	0.10L /0.90L	0.20L /0.80L	0.30L /0.70L	0.40L /0.60L	Midspan
Location, ft		0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
F_LL+I(+)									
Precast-top		0.040	0.208	0.109	0.439	0.740	0.940	1.031	0.984
Bottom		-0.040	-0.208	-0.109	-0.439	-0.740	-0.940	-1.031	-0.984
Final 3 (50% P/S	+ 50%	DL + F_LL)							
Precast-top		0.000	0.082	0.036	0.505	1.080	1.477	1.685	1.678
Bottom		0.238	1.349	0.679	0.926	0.351	-0.047	-0.254	-0.247

VERTICAL/HORIZONTAL SHEAR

VERTICAL SHEAR (Art. 5.8) - Span : 2, Beam : 4, STRENGTH I
Using General Beta Theta Equation 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-corn (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
Bearing :	0.50									
147.1	12.00	20.55	0.285	0.0	6.00e-3	50.0	144.5	1.706	0.000	0.00
27.9	0.70	20.20	31.5	0.084	18.9	0.67	16.16	0.215	0.116*	0.583
Transfer :	3.00									
137.0	12.00	20.55	4.774	0.0	-0.33e-3	27.8	24.7	0.215	0.000	0.00
224.1	3.93	18.58	189.0	0.085	127.5	6.40	14.87	0.215	0.838*	3.497
Critical :	2.10									
140.7	12.00	20.55	4.774	0.0	-0.33e-3	27.8	24.8	0.215	0.000	0.00
151.0	2.77	19.16	189.0	0.085	131.5	6.40	15.33	0.215	0.841*	2.442
0.1L :	6.99									
120.9	12.00	20.55	4.774	0.0	-0.24e-3	28.1	17.7	0.215	0.000	0.00
500.5	5.27	18.49	189.0	0.076	116.6	5.88	14.79	0.215	0.869*	4.774
0.2L :	13.98									
99.1	12.00	20.55	4.774	0.0	-0.13e-3	28.6	5.0	0.215	0.000	0.00
876.2	5.27	18.49	189.0	0.062	105.1	5.30	14.79	0.215	0.954*	4.774
0.3L :	20.96									
77.7	12.00	20.55	4.774	0.0	-0.05e-3	28.8	0.0	0.215	0.000	0.00
1117.3	5.27	18.49	189.0	0.049	99.2	5.00	14.79	0.215	1.149	4.774
0.4L :	27.95									
56.9	12.00	20.55	4.774	0.0	-0.03e-3	28.9	0.0	0.215	0.000	0.00
1227.7	5.27	18.49	189.0	0.036	97.1	4.90	14.79	0.215	1.535	4.774
0.5L :	34.94									
42.8	12.00	20.55	4.774	0.0	-0.01e-3	29.0	0.0	0.215	0.000	0.00
1306.5	5.27	18.49	189.0	0.027	95.7	4.82	14.79	0.215	2.009	4.774
0.6L :	41.92									
56.9	12.00	20.55	4.774	0.0	-0.03e-3	28.9	0.0	0.215	0.000	0.00
1227.7	5.27	18.49	189.0	0.036	97.1	4.90	14.79	0.215	1.535	4.774
0.7L :	48.91									
77.7	12.00	20.55	4.774	0.0	-0.05e-3	28.8	0.0	0.215	0.000	0.00
1117.3	5.27	18.49	189.0	0.049	99.2	5.00	14.79	0.215	1.149	4.774
0.8L :	55.90									
99.1	12.00	20.55	4.774	0.0	-0.13e-3	28.6	5.0	0.215	0.000	0.00
876.2	5.27	18.49	189.0	0.062	105.1	5.30	14.79	0.215	0.954*	4.774
0.9L :	62.89									
120.9	12.00	20.55	4.774	0.0	-0.24e-3	28.1	17.7	0.215	0.000	0.00
500.5	5.27	18.49	189.0	0.076	116.6	5.88	14.79	0.215	0.869*	4.774
Critical :	67.78									
140.7	12.00	20.55	4.774	0.0	-0.33e-3	27.8	24.8	0.215	0.000	0.00
151.0	2.77	19.16	189.0	0.085	131.5	6.40	15.33	0.215	0.841*	2.442
Transfer :	66.88									
137.0	12.00	20.55	4.774	0.0	-0.33e-3	27.8	24.7	0.215	0.000	0.00
224.1	3.93	18.58	189.0	0.085	127.5	6.40	14.87	0.215	0.838*	3.497
Bearing :	69.38									

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-corn (kips)	Beta	Max.spc. (in)	min.Av/s (in2/ft)	pVn/Vu	Aps* (in2)
147.1	12.00	20.55	0.285	0.0	6.00e-3	50.0	144.5	1.706	0.000	0.00
27.9	0.70	20.20	31.5	0.084	18.9	0.67	16.16	0.215	0.116*	0.583

ANCHORAGE ZONE REINFORCEMENT (Art. 5.10.10)
Span : 2, Beam : 4

Fpi (kips)	fs (ksi)	h/4 (in)	Abrst_rqrd (in2)
1054.62	20.00	9.00	2.11

CAMBER/DEFLECTION

CAMBER AND DEFLECTIONS: SERVICE I
(Span : 2, Beam : 4; Units: In)

At 0.1 x L = 6.49 ft	Release	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.067	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.055	3.00	-0.164
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.404
Total	0.566		0.828		0.353

At 0.2 x L = 13.48 ft	Release	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.103	3.00	-0.308
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.765
Total	0.945		1.336		0.345

At 0.3 x L = 20.46 ft	Release	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.140	3.00	-0.421
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.048
Total	1.180		1.622		0.186

At 0.4 x L = 27.45 ft	Release	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.164	3.00	-0.493
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.232
Total	1.307		1.763		0.026

At 0.5 x L = 34.44 ft	Release	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.173	3.00	-0.518
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.292
Total	1.347		1.805		-0.035

At 0.6 x L = 41.42 ft	Release	Mult	Erection	Mult	Final
Prestress	3.081	1.80	5.546	2.45	7.549
Self Wt.	-1.774	1.85	-3.282	2.70	-4.791
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.217	3.00	-0.650
Diaphragm			-0.020	3.00	-0.061
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.164	3.00	-0.493
DL-Comp. (DW)			-0.099	3.00	-0.296
Live Load					-1.232
Total	1.307		1.763		0.026

At 0.7 x L = 48.41 ft	Release	Mult	Erection	Mult	Final
Prestress	2.695	1.80	4.851	2.45	6.603
Self Wt.	-1.515	1.85	-2.803	2.70	-4.090
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.184	3.00	-0.552
Diaphragm			-0.017	3.00	-0.052
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.140	3.00	-0.421
DL-Comp. (DW)			-0.084	3.00	-0.253
Live Load					-1.048
Total	1.180		1.622		0.186

At 0.8 x L = 55.40 ft	Release	Mult	Erection	Mult	Final
Prestress	2.051	1.80	3.693	2.45	5.026
Self Wt.	-1.107	1.85	-2.047	2.70	-2.988
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.133	3.00	-0.398
Diaphragm			-0.012	3.00	-0.037
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.103	3.00	-0.308
DL-Comp. (DW)			-0.062	3.00	-0.185
Live Load					-0.765
Total	0.945		1.336		0.345

At 0.9 x L =	Release 62.39 ft	Mult	Erection	Mult	Final
Prestress	1.151	1.80	2.071	2.45	2.819
Self Wt.	-0.585	1.85	-1.082	2.70	-1.579
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.057	3.00	-0.202
Diaphragm			-0.006	3.00	-0.019
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.055	3.00	-0.164
DL-Comp. (DW)			-0.033	3.00	-0.098
Live Load					-0.404
Total	0.566		0.828		0.353

ULTIMATE MOMENT

ULTIMATE - Span : 2, Beam : 4, STRENGTH I
(Mr-prvd computed by Strain Compatibility method. Ult. Conc. Strain = 0.00300)

Location (ft) Mu k.ft	dp in	Aps in2	fps ksi	c in	a in	Mr-prvd k.ft	eps_t	Phi	Mcr k.ft	min Mr k.ft	Crkg Ratio	Mu-p/r Ratio
Transfer	2.50											
231.0	19.8	3.814	251.9	6.0	3.93	1431.8	0.008T	1.00	-	-	-	-
H/2	1.00											
109.3	19.7	1.907	258.0	3.1	2.01	764.7	0.019T	1.00	-	-	-	-
0.1L	6.49											
524.9	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	698.1	1.41	-
0.2L	13.48											
935.9	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1244.7	1.41	-
0.3L	20.46											
1218.0	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1317.4	1.41	-
0.4L	27.45											
1384.3	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1317.4	1.41	-
0.5L	34.44											
1429.0	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1317.4	1.41	-
0.6L	41.43											
1384.3	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1317.4	1.41	-
0.7L	48.41											
1218.0	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1317.4	1.41	-
0.8L	55.40											
935.9	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	1244.7	1.41	-
0.9L	62.39											
524.9	19.9	5.208	247.9	8.0	5.27	1856.8	0.005T	1.00	1317.4	698.1	1.41	-
H/2	67.88											
109.3	19.7	1.907	258.0	3.1	2.01	764.7	0.019T	1.00	-	-	-	-
Transfer	66.38											
231.0	19.8	3.814	251.9	6.0	3.93	1431.8	0.008T	1.00	-	-	-	-

Legend: C = Compression-Controlled (0 < eps_t < 0.0020)
I = In-Transition (0.0020 <= eps_t < 0.0050)
T = Tension-Controlled (eps_t <= 0 or eps_t >= 0.0050)
Note : fr used for calculating Mcr is computed using AASHTO method (Art.5.4.2.6.)
Consider Bottom Tension Steel Contribution : NO

DETENSIONING

Span : 2, Beam : 4; Groups 1-12; Units: ksi

Grp	Str		Ys,in		3.00ft
1	2	E	2.00	Ft	0.121
		M	2.00	Fb	0.138
2	2	E	21.50	Ft	0.491
		M	21.50	Fb	0.029
3	2	E	6.00	Ft	0.470
		M	6.00	Fb	0.310
4	2	E	6.00	Ft	0.448
		M	6.00	Fb	0.591
5	2	E	4.00	Ft	0.376
		M	4.00	Fb	0.923
6	2	E	4.00	Ft	0.305
		M	4.00	Fb	1.255
7	2	E	4.00	Ft	0.233
		M	4.00	Fb	1.586
8	2	E	4.00	Ft	0.161
		M	4.00	Fb	1.918
9	2	E	2.00	Ft	0.039
		M	2.00	Fb	2.300
10	2	E	2.00	Ft	-0.084
		M	2.00	Fb	2.682
11	2	E	2.00	Ft	-0.206
		M	2.00	Fb	3.064
12	2	E	2.00	Ft	-0.328
		M	2.00	Fb	3.447

DESIGN SUMMARY

Span: 2, Beam: 4, Interior beam

Beam type:	Rect. Beams w/ Circular Voids,	SCDOT 36" x 24" Cored Slab
Precast Length,	ft	69.88
Release Length,	ft	69.88
Strand Pattern:	Straight	
Strand:	6/10-270K-LL	
Strand Es,	ksi:	28500.0
No. of strands:	24	
	Draped:	0
	Straight:	24
Concrete Strength:		
	f'ci:	6.4 ksi
	f'c:	8.0 ksi
	f'ct:	4.0 ksi
Initial losses:	5.70 %	
Final losses:	13.46 %	

Specification	Allowable	Computed	Location	Status
Release Stresses (ksi) (Art. 5.9.4.1)				
Precast Bot (compression)	3.840	3.447	Trans	OK
Precast Top w/ no reinf. (tension)	-0.200	-0.328	Trans	
Precast Top w/ reinf. (tension)	-0.607			
Strength I (Art. 3.4.1, 5.7.3.1.1)	Provided	Required	Location	Status
Ult. Moment (k.ft)	1856.81	1429.04	Midspan	OK
Debonding Limits (Art. 5.11.4.3)	Allowable	Computed		Status
Max. Debond per Row	40.00 %	0.00 %		OK
Max. Debond Total	25.00 %	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	4.800	2.991	Midspan	3.600	1.388	Midspan			
Precast Bot	4.800	2.828	Transfer	3.600	3.112	Transfer			
Service III Limit State - Tensile	Stresses	Only							
Precast Top	-0.537	-0.043	Bearing						
Precast Bot	-0.537	0.191	Midspan						
Fatigue I Limit State - Compressive	Stresses	Only							
Precast Top							3.200	1.685	0.4L/0.6L
Precast Bot							3.200	1.349	Transfer

CAMBER / DEFLECTION: (PCI Design Handbook - 7th Ed.- Table 5.8.2)
0.5 x L = 34.44 ft

	Release	Mult	Erection	Mult	Final
Prestress	3.210	1.80	5.778	2.45	7.864
Self Wt.	-1.863	1.85	-3.447	2.70	-5.031
Deck + Haunch			0.000	2.30	0.000
DL-Prec. (DC)			-0.228	3.00	-0.683
Diaphragm			-0.021	3.00	-0.064
DL-Prec. (DW)			0.000	3.00	0.000
DL-Comp. (DC)			-0.173	3.00	-0.518
DL-Comp. (DW)			-0.104	3.00	-0.311
Live Load					-1.292
Total	1.347		1.805		-0.035

Positive values indicate upward deflection.

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Interior Bent

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE
CONSULTING & ENGINEERING

Columbia,
South Carolina

BLACK MINGO

INFRASTRUCTURE CONSULTING & ENGINEERING

www.ice-eng.com

~~S-69~~ S-51

PROJECT ~~JUMPING RUN CREEK~~

FILE INTERIOR BENT DESIGN

CALC'D BY DKY DATE ~~1/14/16~~ 2/5/16

RAJ 2/16/16

CHEK'D BY _____ DATE _____

Sheet 1 of 4

BRIDGE GEOMETRY

SPAN ARRANGEMENT = ~~70'-0"~~ 37'-6" - ~~44'-0"~~ 70'-0" - 56'-6"

BRIDGE WIDTH = 36'-0"

SKEW = 0°

SUPERSTRUCTURE

LANES = [32.833' - 2(1.5833')]/12 = 2.47

∴ 2 LANES

CORED SLABS USED :

	3'-0" x 2'-0" UNIT (~~SPAN A~~ ALL SPANS)	~~3'-0" x 1'-9" UNIT (SPAN B)~~
H	24"	~~21"~~
A	637.8 IN^2	~~529.8 IN^2~~
I_{xx}	39,436 IN^4	~~25,747 IN^4~~
I_{yy}	76,800 IN^4	~~65,136 IN^4~~
$\bar{y}$ BOT	12"	~~10 1/2"~~

BARRIER / RAILING HEIGHT = 32"

DEPTH OF SLAB = 0", OVERLAY ONLY (4")

CURB TO CURB DISTANCE = 32'-10"

CAP

LENGTH = ~~38'-7"~~ 39'-0"

DEPTH = 3'-0"

WIDTH = 3'-2"

BLACK MINGO

INFRASTRUCTURE CONSULTING & ENGINEERING

www.ice-eng.com

~~S 69~~ S-51

PROJECT ~~JUMPING RUN CREEK~~

FILE INTERIOR BENT DESIGN

CALC'D BY DKY DATE ~~1/15/16~~ 2/5/16

RAJ 2/16/16

CHEK'D BY _____ DATE _____

Sheet 2 of 4

ELEVATIONS : 26.4 TO 25.1 IB 2
26.4 TO 25.2 IB 3

TOP OF CAP = ~~184.0~~ TO ~~184.8~~
~~LEFT~~ RIGHT SIDE IS LOW SIDE

PILES

18" SQUARE P/S CONCRETE PILES

LOCATIONS :

1	~~3.042'~~	3'	6	~~30.125~~ 30.5'
2	~~8.458'~~	8.5'	7	~~35.542~~ 36'
3	~~13.875'~~	14'		
4	~~19.292'~~	19.5'		
5	~~24.708'~~	25		

MIN OVERHANG = 2 × PILE WIDTH = 36" OR 3'-0"

BEARINGS

OFFSET FROM ℄ : + 0.5625' SPAN (BACK)
− 0.5625' SPAN (AHEAD)

BRG.	LINE # 1 OR # 2	
1	~~2.7917'~~	3'
2	~~5.7917'~~	6'
3	~~8.7917'~~	9'
4	~~11.7917'~~	12'
5	~~14.7917'~~	15'
6	~~17.7917'~~	18'
7	~~20.7917'~~	21'
8	~~23.7917'~~	24'
9	~~26.7917'~~	27'
10	~~29.7917'~~	30'
11	~~32.7917'~~	33'
12	~~35.7917'~~	36'

LOADS

APPLICABLE LIMIT STATES : (BDM 13.1.4)

- STRENGTH I
- STRENGTH III
- STRENGTH V
- SERVICE I

* SEISMIC LOADS AND DETAILING SHALL FOLLOW 2008 SCDOT SDM VERSION 2.0

APPLICABLE LOADS :

- DC
- DW
- LL
- BR
- WS
- WL
- TU

} COMPUTED AUTOMATICALLY

- WA

GROUNDLINE ELEVATION ~ ~~178.0~~ 13.5 IB2, ASSUME 5' SCOUR
∴ ELEV. ~~173.0~~ 7.0 IB3

DC LOADS

ATTACHED

DW LOADS

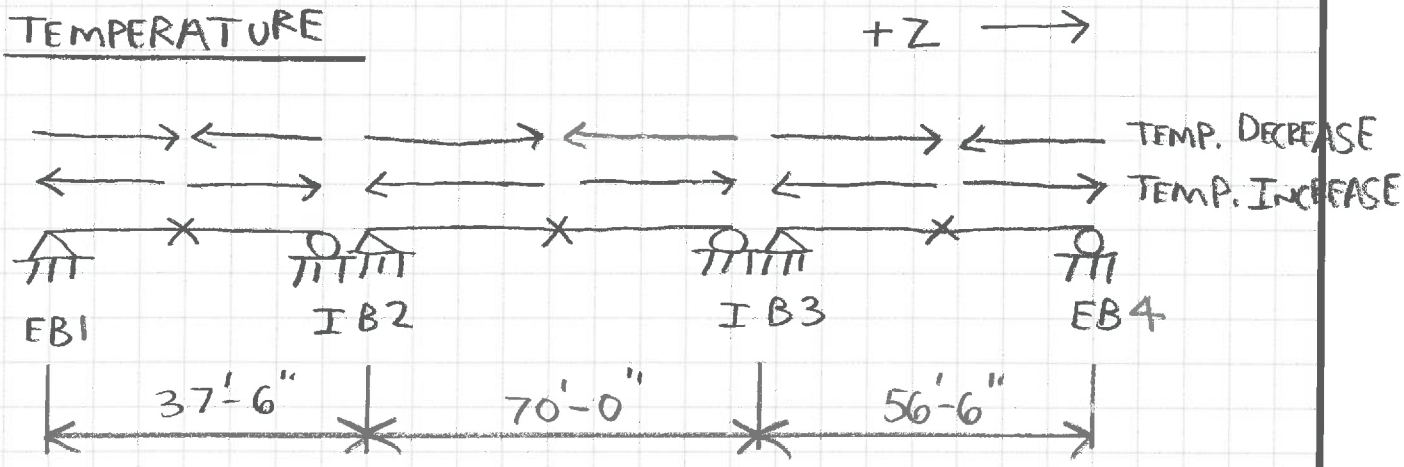
ATTACHED

SCOUR ELEVATIONS :

	IB 2	IB 3
100 YR.	1.5	-5 *
500 YR.	-1.5	-8 *

* NOTE : VALUES SHALL BE LIMITED TO ELEV. 0.5. SEE BORING B-4 ATTACHED.

TEMPERATURE



NOTE: SINCE LOADS AT IB 2 FROM SPAN A AND B ARE IN OPPOSITE DIRECTIONS, THE RESULTANT WILL BE USED. SIMILAR FOR IB 3.

$T_{MAX} = 110°F$ [LRFD FIG. 3.12.2.2-1]

$T_{MIN} = 20°F$ [LRFD FIG. 3.12.2.2-2]

$T_{SET} = 70°F$

TRIBUTARY LENGTHS:

EB 1 = 18.75'
IB 2 = 35 - 18.75' = 16.25'
IB 3 = 35 - 28.25' = 6.75'
EB 4 = 28.25'

STREAM PRESSURE

100 YR. WSE = 23.56
500 YR. WSE =

$V_{DESIGN} = 4$ FT/S ASSUMED

$C_D = 1.4$, $P = C_D V^2/1000$ (LRFD 3.7.3.1-1)
$= 0.0224$ KSF

$W = 0.0224$ KSF $(1.5') = 0.0336$ KLF

S-51 over Black Mingo Creek

DKY 2/5/16
RAJ 2/16/16

Bearings

1	3
2	6
3	9
4	12
5	15
6	18
7	21
8	24
9	27
10	30
11	33
12	36

Piles

39	Cap Length		
36	Slab Width		
5.5	Pile Spacing		
3	Overhang	OK	
3	Min Overhang		
1.5	Exterior Pile to Edge of Slab	OK	0.272727

1	3.000
2	8.500
3	14.000
4	19.500
5	25.000
6	30.500
7	36.000

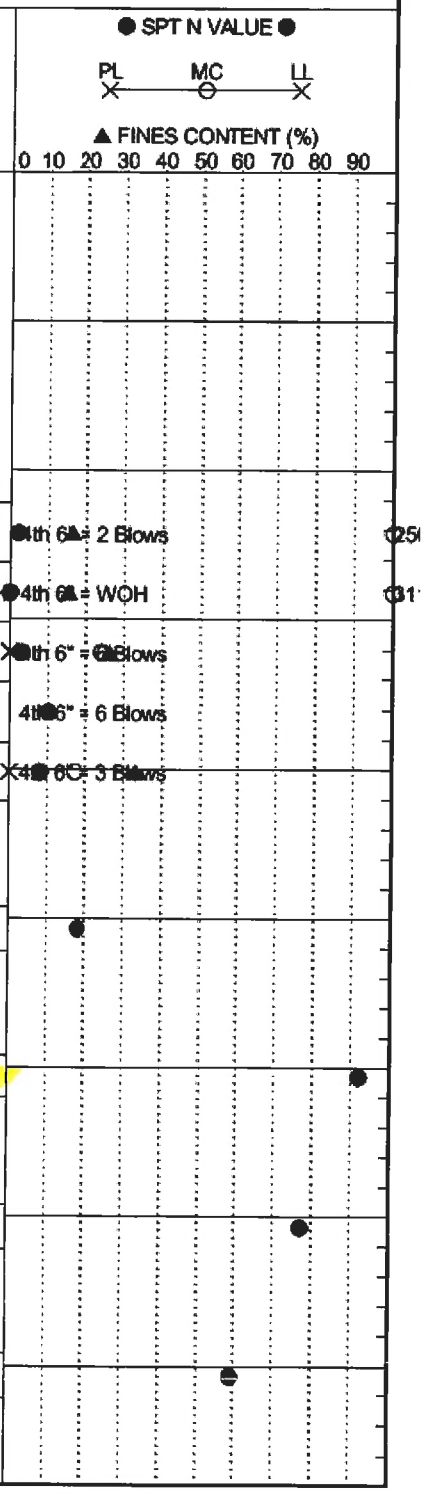
SCDOT Soil Test Log

IB 2

Project ID:	P029461			County:	Williamsburg	Boring No.:	B-3
Site Description:	S-51 (Battery Park Road) RBO Black Mingo Creek					Route:	S-51
Eng./Geo.:	D. Harris	Boring Location:	67+84	Offset:	1'-LT	Alignment:	Mainline
Elev.:	26.3 ft	Latitude:	33.7107438	Longitude:	79.5754541	Date Started:	1/18/2016
Total Depth:	86.1 ft	Soil Depth:	75 ft	Core Depth:	0 ft	Date Completed:	1/18/2016
Bore Hole Diameter (in):	6	Sampler Configuration		Liner Required:	Y (N)	Liner Used:	Y (N)
Drill Machine:	CME 550	Drill Method:	HSA/RW	Hammer Type:	Automatic	Energy Ratio:	74%
Core Size:	N/A	Driller:	Ameridrill	Groundwater:	TOB 9.2 ft	24HR	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log
	0.0	Concrete Bridge Deck	
	0.8	CONCRETE (8.25")	
		AIR GAP	
21.3			
	9.2	▽	
16.3	11.1	ELEV. 15.2 (ELEV. 13.5 IN PLANS)	
		Very Loose to Loose, Wet, Black, Non to Low Plasticity, Organic Silty SAND (SM/A-2-4), with Traces of Wood, Munsell=2.5Y 2.5/1, NMC=250%, %#200=15.7	
11.3		@SS-2 => NMC=311%, %#200=15.1	
		@SS-3 => NMC=23.9%, LL=NP, PL=NP, PI=NP, %#200=26.1	
		@SS-4 => Dark Gray, Low Plasticity, Munsell=2.5Y 4/1	
6.3		@SS-5 => NMC=16.7%, LL=NP, PL=NP, PI=NP, %#200=32.9	
		ELEV. 1.5 100 YR. SCOUR	
1.3		=> Medium Dense, Yellowish Brown, Munsell=10YR 5/6	
		ELEV. -1.5 500 YR. SCOUR	
	29.6		
-3.7		Very Dense, Moist to Wet, Light Yellowish Brown, Non-Plastic, Fine SAND (SP/A-3), Munsell=2.5Y 6/3	
-8.7			
	39.6		
-13.7		Very Dense, Moist to Wet, Gray, Low Plasticity, Silty Fine SAND (SM/A-2-4), Munsell=2.5Y 5/1	

Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value
11.1	SS-1	WOH/12"		2	2
13.1	SS-2	WOH/18"			WOH
15.1	SS-3	WOH	1	2	3
17.1	SS-4	8	5	5	10
19.1	SS-5	4	5	3	8
24.6	SS-6	14	11	7	18
29.6	SS-7	24	42	50/5"	92+
34.6	SS-8	19	27	50/5.5"	77+
39.6	SS-9	5	9	50/5.5"	59+



* COORDINATE W/ HYDRO

SCDOT Soil Test Log

IB 3

Project ID:	P029461	**County:**	Williamsburg	**Boring No.:**	B-4		
Site Description:	S-51 (Battery Park Road) RBO Black Mingo Creek			**Route:**	S-51		
Eng./Geo.:	D. Harris	**Boring Location:**	68+68	**Offset:**	CL	**Alignment:**	Mainline
Elev.:	26.4 ft	**Latitude:**	33.7105548	**Longitude:**	79.5754955	**Date Started:**	1/19/2016
Total Depth:	92.9 ft	**Soil Depth:**	75 ft	**Core Depth:**	0 ft	**Date Completed:**	1/20/2016
Bore Hole Diameter (in):	6	**Sampler Configuration**		**Liner Required:**	Y (N)	**Liner Used:**	Y (N)
Drill Machine:	CME 550	**Drill Method:**	HSA/RW	**Hammer Type:**	Automatic	**Energy Ratio:**	74%
Core Size:	N/A	**Driller:**	Ameridrill	**Groundwater:**	TOB 7.6 ft	**24HR**	N/A

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION
	0.0	Concrete Bridge Deck
	0.3	ASPHALT (3.5")
	1.0	CONCRETE (9")
		AIR VOID
21.4		
	7.6	▽
16.4		
11.4		
	17.9	ELEV. 8.5 (ELEV. 7.0 IN PLANS)
6.4		Loose, Wet, Gray, Non-Plastic, Clayey Fine to Medium SAND (SC/A-2-6), with Wood Fragments, Munsell=5Y 5/1, NMC=25.0%, %#200=34.0
		@SS-2 => Medium Dense, Olive Brown, with Clay and Wood Fragments, Munsell=2.5Y 4/3, NMC=28.2%, LL=31, PL=20, PI=11, %#200=35.3
	23.9	
1.4		Medium Dense to Very Dense, Wet, Light Olive Brown Low Plasticity, Fine SAND (SP/A-3), with Clay and Wood Fragments, Munsell=5Y 5/1
-3.6		ELEV. -5 100 YR. SCOUR
		ELEV. -8 500 YR. SCOUR
-8.6		=> Gray, Munsell=2.5Y 6/1
-13.6		
	41.4	
-18.6		Medium Dense, Wet, Dark Gray, Low Plasticity, Fine Sandy SILT (ML/A-4(7)), Munsell=2.5Y 4/1, NMC=34.8%, LL=39, PL=29, PI=10, %#200=68.7

Sample Depth (ft)	Sample No./Type	1st 6"	2nd 6"	3rd 6"	N Value	SPT N VALUE / FINES CONTENT (%)
17.9						
19.9	SS-1	3	3	3	6	4th 6" = 3 Blows
21.9	SS-2	2	5	6	11	4th 6" = 9 Blows
23.9	SS-3	5	8	10	18	4th 6" = 10 Blows
25.9	SS-4	8	11	14	25	4th 6" = 27 Blows
	SS-5	9	30	50/5.5"	80+	
31.4	SS-6	27	31	32	63	
36.4	SS-7	20	31	50/5.5"	81+	
41.4	SS-8	4	6	8	14	
46.4	SS-9	7	10	10	20	

SCOUR ELEVATIONS SHOW ARE BASED ON HYDRO DATA PROVIDED. SCOUR FOR BOTH 100 YR. AND 500 YR. SHALL BE LIMITED TO ELEV. 0.5 (DEPTH 25.9) DUE TO VERY LARGE BLOW COUNTS AND PRESENCE OF ROCK MATERIAL.

IB 2

REACTIONS (kips), SERVICE I

DC = 15.8 K

DW = 0.8 K

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	42.7	18.1	53.7	98.6	126.7	145.1	149.9
	V	12.2	10.9	11.7	10.5	8.8	7.1	5.8	0.5
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	12.2	10.9	11.7	10.5	8.8	7.2	6.0	4.8
	M	0.0	42.9	18.3	53.7	95.3	120.3	135.4	135.2
Total :	M+	0.0	84.0	35.3	106.1	198.9	261.5	300.6	312.3
	V	30.0	26.3	28.5	25.2	19.8	14.5	9.4	0.5
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	30.0	26.3	28.5	25.2	19.8	14.7	9.7	4.8
	M	0.0	84.3	35.6	106.1	195.7	255.2	290.9	297.6

IB 2

DC = 15.8 K

DW = 0.8 K

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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 III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	40.1	17.0	50.5	92.7	119.2	136.5	141.0
	V	40.0	35.7	38.3	34.4	28.7	23.3	18.9	1.6
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	40.0	35.7	38.3	34.4	28.8	23.7	19.7	15.7
	M	0.0	40.4	17.2	50.5	89.7	113.2	127.3	127.1
Total :	M+	0.0	81.5	34.3	102.9	193.1	254.0	292.0	303.5
	V	57.8	51.0	55.1	49.1	39.7	30.7	22.6	1.6
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	57.8	51.0	55.1	49.1	39.8	31.1	23.4	15.7
	M	0.0	81.7	34.5	102.9	190.1	248.1	282.9	289.6

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	22.9	22.9
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.3	3.3
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.2	28.2
DL-Comp.(DW)	17.0	17.0
Live	83.5	83.5
Pedestrian	0.0	0.0

	IB 2	IB 3
DC =	28.8 K	" "
DW =	1.4 K	" "

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 : 2, Beam : 1, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.7	54.7	57.1
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	10.8	67.1	33.9	146.7	255.8	327.9	369.9	378.4
	V	12.2	10.3	11.5	7.2	5.1	3.0	1.0	4.5
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	15.2	14.2	14.8	12.6	10.6	8.7	6.9	6.0
	M	12.3	63.8	33.5	134.7	226.4	278.3	292.8	318.0
Total :	M+	14.3	149.1	69.5	341.7	612.7	800.8	912.0	944.0
	V	44.8	40.5	43.1	33.6	25.0	16.2	7.6	4.6
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	47.8	44.4	46.4	39.0	30.5	21.9	13.5	6.1
	M	15.8	145.7	69.1	329.7	583.3	751.1	834.9	883.6

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	22.9	22.9
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.3	3.3
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	28.2	28.2
DL-Comp.(DW)	17.0	17.0
Live	83.5	83.5
Pedestrian	0.0	0.0

	IB 2	IB 3
DC :	28.8 K	" "
DW :	1.4 K	

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 : 2, 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	2.50	1.00	6.49	13.48	20.46	27.45	34.44
Self wt. :	M	0.0	55.1	22.5	134.4	248.0	329.1	377.7	394.0
(Max)	V	22.9	21.2	22.2	18.6	13.9	9.3	4.6	0.0
DL-Prec. :	M	0.0	8.0	3.3	19.5	35.9	47.6	54.7	57.0
DC(Max)	V	3.3	3.1	3.2	2.7	2.0	1.3	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.6	0.2	1.6	3.2	4.6	5.1	5.7
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1
DL-Comp :	M	2.7	14.0	7.3	30.3	53.7	70.4	80.4	83.7
DC(Max)	V	4.7	4.4	4.6	3.8	2.9	1.9	1.0	0.0
DL-Comp :	M	0.8	4.2	2.2	9.1	16.1	21.1	24.1	25.1
DW(Max)	V	1.4	1.3	1.4	1.1	0.9	0.6	0.3	0.0
LL + I :	M+	10.0	62.3	31.5	136.2	237.4	304.3	343.3	351.2
	V	40.1	33.6	37.5	23.4	16.7	9.9	3.2	14.8
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	49.8	46.5	48.5	41.1	34.7	28.5	22.5	19.5
	M	11.4	59.2	31.1	125.0	210.1	258.3	271.7	295.1
Total :	M+	13.5	144.2	67.0	331.1	594.3	777.1	885.4	916.7
	V	72.6	63.8	69.1	49.9	36.6	23.1	9.8	14.9
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	82.4	76.7	80.1	67.6	54.6	41.7	29.1	19.6
	M	14.9	141.1	66.7	320.0	567.0	731.1	813.8	860.7

IB 3

DC = 23.9 K

DW = 1.2 K

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, Beam : 1, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.5
DC(Max)	V	3.8	3.5	3.7	3.1	2.4	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	51.6	21.3	99.8	181.8	234.9	265.9	272.4
	V	14.3	13.4	14.0	12.5	10.5	8.6	6.3	2.0
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	14.3	13.4	14.0	12.5	10.6	8.8	7.0	5.3
	M	-0.0	52.3	21.8	99.8	174.5	220.7	237.5	226.5
Total :	M+	0.0	115.8	47.7	225.4	415.8	546.8	624.5	646.6
	V	41.2	37.9	39.9	34.4	27.0	19.7	11.7	2.0
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	41.2	37.9	39.9	34.4	27.1	19.9	12.5	5.4
	M	-0.0	116.6	48.2	225.4	408.6	532.5	596.1	600.7

REACTIONS (kips), SERVICE I

IB 3

DC = 23.9 K

DW = 1.2 K

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	47.8	19.8	92.6	168.7	218.0	246.8	252.8
	V	46.9	43.9	45.7	40.7	34.4	28.1	20.5	6.5
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	46.9	43.9	45.7	40.7	34.6	28.7	23.0	17.5
	M	-0.0	48.6	20.2	92.6	162.0	204.8	220.4	210.2
Total :	M+	0.0	112.1	46.2	218.2	402.7	529.9	605.3	627.0
	V	73.8	68.4	71.6	62.7	50.9	39.2	25.9	6.5
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	73.8	68.4	71.6	62.7	51.2	39.8	28.5	17.5
	M	-0.0	112.8	46.7	218.2	396.0	516.6	579.0	584.4

Rolled steel beams are available in depths up to 3 ft, with beams more than 3 ft rolled less frequently. Before beginning final design, verify with one or more potential fabricators that the section size and length are available.

12.3.2.5 Cored Slabs (Prestressed Concrete Cored Slabs)

Prestressed concrete cored slabs ("cored slabs") are an alternative to flat slabs when the bridge designer anticipates the necessity of an accelerated construction schedule. Cored slab bridges consist of longitudinal, precast voided concrete slab members placed against each other to form a self-supported bridge deck. Cored slab details are available in span lengths of 30 ft, 40 ft, 50 ft, and 60 ft. See the *SCDOT Bridge Drawings and Details*, available at the SCDOT website.

The use of cored slabs is limited because of durability concerns due to the longitudinal and transverse joints. Voided concrete slabs are not allowed on any National Highway System (NHS) route nor on any facility with an ADT that equals or exceeds 3000 vpd.

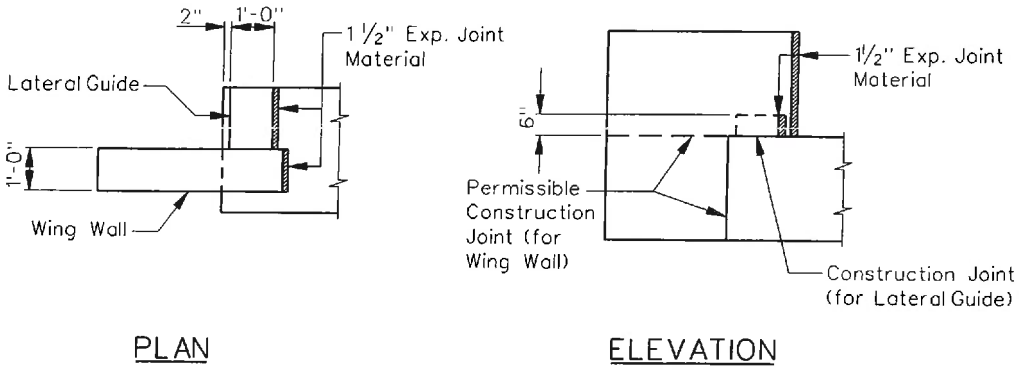
In addition to permanent installations, cored slabs may be used for temporary bridges (i.e., a design life less than 5 years).

For Contractor-designed projects, such as design/build, cored slabs will only be allowed if the bid documents specifically allow their use. The substitution of a cored slab is not a valid Value Engineering proposal.

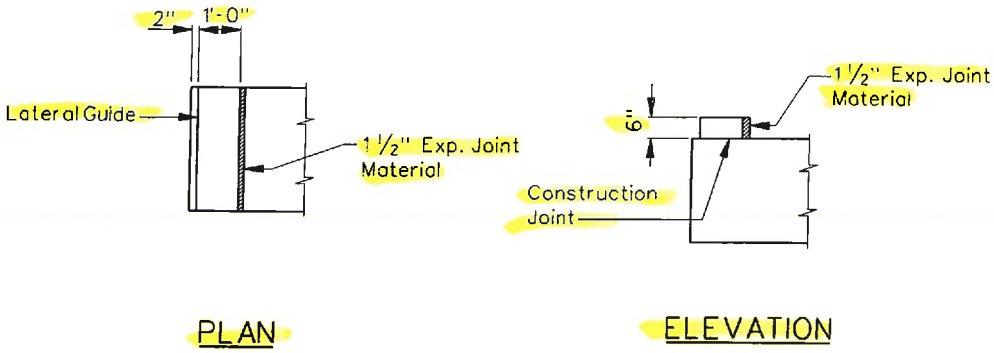
The maximum allowable skew is 15°, and the bridge designer must ensure a proper fit on the bent caps where the bridge is on a longitudinal grade or on a skew. In addition, other geometric elements may merit special consideration in the design of a cored slab.

12.3.3 Other Structure Types

Structures types other than those specified herein may be used. Their acceptability may be based upon other owner's successful experiences. The State Bridge Design Engineer must provide written approval for the selection of other structure types.



END BENT DETAILS



INTERIOR BENT DETAILS

LATERAL GUIDE FOR CORED SLAB BRIDGES

Figure 20.1-3

Type of Pile	Minimum Cap Width (Single Row of Vertical Piles)
HP 12 x 53	2′-6″
HP 14 x 73	2′-8″
18-in square prestressed concrete	3′-0″
20-in square prestressed concrete	3′-2″ 3'-4" DM03 12
24-in square prestressed concrete	3′-6″ 4'-0" DM03 12

MINIMUM CAP WIDTHS FOR PILE-SUPPORTED BENTS

Figure 20.1-1

Type of Pile	Minimum Cap Depth
Single Row of Piles	2′-6″ 3'-0" USED
Double Row of Piles	3′-0″

MINIMUM CAP DEPTHS FOR PILE-SUPPORTED BENTS

Figure 20.1-2

For bents, the width of caps shall project beyond the sides of the columns. The added width of the cap shall be a minimum of 3 in on each side of the column. This width reduces the reinforcement interference between the column and cap. The cap width shall be adequate to accommodate the joint shear requirements of the *SCDOT Seismic Design Specifications* for *Highway Bridges*.

20.1.3.2 Bent-Cap Length

The length of interior bent caps should provide a minimum of 9 in from the centerline of the anchor bolt to the end of the bent cap. The length of interior bent caps should also provide a minimum of 9 in from the edge or corner of the elastomeric bearing or masonry plate to the end of the bent cap.

For cored slab structures, bent caps shall be detailed with a concrete lateral guide at the outside face of the exterior slab units; see Figure 20.1-3. Provide 1½-in expansion joint material between the cored slab and lateral guide and, if approach slabs are detailed, provide 1½-in expansion joint material between the approach slab and wing wall.

South Carolina
Department of Transportation

BRIDGE DESIGN MEMORANDUM – DM0312

TO: RPG Structural Engineers
Design Consultants

DATE: November 28, 2012

RE: Prestressed Concrete Pile Connection Details
Revisions to Section 19.2.6.3, Section 20.1.2, Figure 20.1-1, and Section 20.2.7.1 of the *SCDOT Bridge Design Manual*

The University of South Carolina recently completed a research project that investigated the behavior of SCDOT's typical detail for the connection of prestressed concrete piles to cast-in-place bent caps. The final report for this research project, Project 672 – Behavior of Pile to Bent Cap Connections Subjected to Seismic Forces, can be viewed at http://www.clemson.edu/t3s/scdot/completed%20test.htm.

Findings of the research indicate that modifications are needed to SCDOT's current pile cap connection details for prestressed concrete piles. *SCDOT Bridge Drawings and Details* Drawings 704-01 and 704-02 have been updated to incorporate the recommended embedment requirements. In addition, please update your copy of the *SCDOT Bridge Design Manual* as noted below.

Delete Item 3 in Section 19.2.6.3 of the *SCDOT Bridge Design Manual* and replace with the following:

3. Prestressed Concrete Piles. The piles should be connected to the caps or footings by embedding the piles an equivalent of 1.3 pile widths. No roughening of the pile is required. However, the pile surface to be embedded shall be clean and free of any laitance prior to placement of the cap or footing concrete.

   1.3 (20") = 26" +/- 3"
   1.3 (18") = 23" +/- 3"

   The pile should be oriented in the caps or footings such that the "top side" of the pile experiences the smaller moment demand. The "top side" is the top surface of the pile when it was poured in the casting bed.

   To allow for constructability, the pile embedment length should have a tolerance of ±3 in. Unless approved otherwise by the Regional Production Engineer, the pile embedment into the cap shall not be less than 12 in.

Post Office Box 191
Columbia, South Carolina 29202-0191

Phone: (803) 737-2314
TTY: (803) 737-3870

Delete the last sentence in Section 20.1.2 of the *Manual* and replace with the following sentence:

> The minimum depths shall be increased as necessary to accommodate the pile embedment.

Add the following three paragraphs to Section 20.1.2 of the *Manual*:

> For pile bents, the end and side clearances from piles to the surface of the cap should be considered during design to ensure that design forces will not cause the pile to break out of the sides or ends of the pile cap.
>
> For pile bents supporting slab superstructures, the minimum bent cap depth should be 32 in for 18-in square prestressed concrete piles. For pile bents with piles larger than 18-in square, maximum pile embedment may dictate that deeper pile caps be used for constructability and due to the effects of punching shear. For pile bents supporting beams, regardless of pile size, the effects of punching shear shall be investigated.
>
> The length of prestressed concrete pile bent caps should be set to provide a minimum overhang that is the equivalent of 2 pile widths.

Revise Figure 20.1-1 of the *Manual* to require a minimum cap width of 3'-4" for 20-in square prestressed concrete piles and a minimum cap width of 4'-0" for 24-in square prestressed concrete piles.

Delete Item 4 in Section 20.2.7.1 of the *Manual*.

These revisions apply to all projects where design has not advanced beyond the preliminary design phase.

James W. Kendall Jr.

James W. Kendall, Jr., P.E.
Preconstruction Support Engineer

JWK:afg
ec: Bridge Construction Engineer
Bridge Maintenance Engineer
FHWA Structural Engineer
Materials and Research Engineer
File:PC/BWB

Preconstruction Support Managers
Regional Production Engineers
RPG Design Managers

20.1.4 Construction Joints

In general, use a construction joint where the cap length exceeds 70 ft. Locate this construction joint near the middle of the cap at the one-quarter point between supporting elements.

20.1.5 Beam Seat Elevations

If the elevation difference between any two adjacent beam seats is:

- less than 3/16 in, detail the build-up level and use the lower elevation for both beam seats;
- 3/16 in to less than 1 in, use the lower elevation for both beam seats, detail a booster plate with the bearing plate, and allow the Contractor the option to combine the booster plate with the bearing plate; or
- 1 in or greater, detail a split level build-up.

20.1.6 Cap Reinforcement

20.1.6.1 Longitudinal Reinforcement

The minimum number and size of main reinforcing bars for both top and bottom mats of the bent cap shall be as shown in Figure 20.1-4. The main reinforcing bars shall be designed or detailed in no more than two layers. The designer shall not use bundled reinforcing bars. In addition to these detailing requirements, the longitudinal reinforcement shall also meet the design requirements of Chapter 15 and LRFD Section 5.

Cap Width	Reinforcing Steel
≤ 3′-0″	4 #9 bars or equivalent
3′-0″ - 4′-0″	5 #9 bars or equivalent
4′-0″ - 5′-0″	6 #9 bars or equivalent
5′-0″ - 5′-8″	7 #9 bars or equivalent

MINIMUM LONGITUDINAL REINFORCEMENT

Figure 20.1-4

USE 4 - # 10 BARS

EXHIBIT 4b

STRUCTURES DESIGN CRITERIA

1.0 GENERAL

Exhibit 4b contains structural design requirements for the replacement of the Road S-36 Bridge over Twenty-Five Mile Creek (Asset ID 8359) in Kershaw County, the replacement of the Road S-69 Bridge over Jumping Run Creek (Tributary to Colonel's Creek) (Asset ID 7290) and the Road S-827 Bridge over Spring Lake (Asset ID 8036) in Richland County, and the replacement of the Road S-51 Bridge over Black Mingo Creek (Asset ID 3999) in Williamsburg County.

2.0 CRITERIA

2.1 Bridges

2.1.1 Bridge Design

Design the new bridges in accordance with the requirements of the AASHTO LRFD Bridge Design Specifications. Use the HL-93 design live loading.

2.1.2 Seismic Design

In accordance with the SCDOT Seismic Design Specifications for Highway Bridges, the Bridge Operational Classification (OC) for each bridge is "II."

2.1.3 Dimensions

Construct the new bridges with the following dimensions:

Bridge Location	Minimum Outside Deck Width	Minimum Clear Roadway Width (Gutter Line to Gutter Line)
S-36	43'-3"	40'-0"
S-69	36'-0"	32'-10"
S-827	40'-0"	26'-10"
S-51	36'-0"	32'-10"

BLACK MINGO

With the exception of the S-827 Bridge, along each edge of deck, provide a 1'-6" wide barrier parapet and a 1½" slab extension for slip forming barriers. A 1" slab extension is permitted for cored slab spans.

For the S-827 Bridge, along each side of roadway, provide a 5'-6" sidewalk, a 10" wide railing wall, and a 2" slab extension.

2.1.4 Removal and Disposal of Existing Bridges

Remove and dispose of the existing bridges and appurtenances in accordance with the Standard Specifications for Highway Construction and all applicable laws and regulations.

2.1.5 Superstructure Types

For this project, Section 12.3.3 of the SCDOT Bridge Design Manual does not apply. Allowable superstructure types are outlined in Sections 12.3.2.1, 12.3.2.2, 12.3.2.3, and 12.3.2.4 of the SCDOT Bridge Design Manual. For the S-69 and S-51 Bridges only, the superstructure type outlined in Section 12.3.2.5 of the SCDOT Bridge Design Manual is also allowed.

For prestressed concrete girder superstructures, use prestressed concrete girders that are either I-beams or modified bulb-tee beams. Design prestressed concrete girders so that the algebraic sum of the beam camber at prestress transfer due to prestress force, the beam dead load deflections due to non-composite dead load, and superimposed dead load deflections due to applied superimposed dead loads results in a positive (upward) camber. Include the dead load from the future wearing surface in the determination of camber.

For steel welded plate girder superstructures, use structural steel girders that are "I" shaped. For steel welded plate girder and steel rolled beam superstructures, use structural steel that conforms to the requirements of AASHTO M 270 and paint the steel in accordance with Section 710 of the Standard Specifications.

At each support of prestressed concrete girder, steel welded plate girder, and steel rolled beam superstructures, connect all beams and girders to the substructure using anchor bolts.

Detail all construction stages for girder and beam bridges to consist of a minimum of two lines of girders.

2.1.6 Concrete Strengths

In prestressed concrete piles and beams, concrete design strengths are not allowed to exceed 8,000 and 10,000 psi maximum, respectively. Construct all cast-in-place concrete bridge components with Class 4000 concrete. Construct all precast concrete bridge components with concrete having a minimum compressive strength of 5000 psi.

2.1.7 Final Finish of Exposed Concrete Surfaces

Final surface finish is not required on this project.

2.1.8 Lightweight Concrete

Lightweight Concrete is not permitted for this project.

2.1.9 Post-Tensioning

Post-tensioning is not permitted for this project.

2.1.10 Bridge Decks

For girder and beam spans, construct bridge decks with reinforced cast-in-place concrete.

Apply a transverse Grooved Surface Finish to cast-in-place decks in accordance with Subsection 702.4.16 of the Standard Specifications for Highway Construction.

Asphalt overlays are only permitted on cored slab spans. Apply a waterproofing system to the bridge deck prior to overlaying a deck with asphalt.

2.1.11 Stay-in-Place Bridge Deck Forms

The Contractor may use permanent stay-in-place bridge deck forms for concrete deck slabs between new beams and girders. Fabricate permanent stay-in-place bridge deck forms and supports from steel conforming to ASTM A 446/A 653, Grades 40 or 50, and having a coating class of G165 in accordance with ASTM A 525. Do not use fillers in the flutes of the stay-in-place forms. Fill form flutes with concrete as the deck slab is placed. Do not use permanent stay-in-place steel bridge deck forms in bays in which longitudinal deck construction joints are located and in bays between stages.

2.1.12 Barriers, Sidewalks, and Pedestrian Railing Walls

With the exception of the S-827 Bridge, use the concrete bridge barrier parapet (Jersey shape) and barrier transition details shown on the Bridge Drawings and Details.

For the S-827 Bridge, use the sidewalk, pedestrian railing wall (with indentations) and pedestrian railing wall transition details shown on the Bridge Drawings and Details.

2.1.13 Bridge Drainage

Design and construct the bridge deck drainage and bridge end drainage to ensure that the minimum requirements of the SCDOT Bridge Design

Manual are met and that erosion of the end fill slopes is prevented due to excessive run off at the bridge ends.

2.1.14 Pile Sizes and Types

Minimum pile sizes and acceptable pile types are listed below. No other pile types are permitted.

PILE TYPE	MINIMUM SIZE
Steel H-Piles	HP12x53
Steel Pipe Piles	12" Diam. (min. wall thickness equal to ½")
Solid Prestressed Concrete Piles	18" Square
Prestressed Concrete Pile Points	W8x58

2.1.15 Steel Pipe Pile Connection Details

The pile connection detail described in Item 2 of Section 19.2.6.3 of the SCDOT Bridge Design Manual does not apply for this project. Terminate steel pipe piles at the bottom of the end bent cap and footing. Connect the piles to the cap and footing using a reinforced concrete infill, with the reinforcing extending into the cap or footing.

2.1.16 Drilled Shaft Diameters

SCDOT Bridge Design Memorandum DM0111 contains a requirement to detail the portion of shaft below the construction casing with a diameter that is six inches smaller than the diameter of the casing. This six-inch reduction requirement does not apply to this project. For this project, detail the portion of the shaft below the bottom of the construction casing, whether in soil or rock, with a diameter that is at least two inches smaller than the diameter of the casing.

2.1.17 Crosshole Sonic Logging (CSL) Testing

Install Crosshole Sonic Logging (CSL) access tubes in all drilled shafts in accordance with the SCDOT Standard Specifications for Highway Construction, 2007 Edition. SCDOT will conduct CSL testing on all shafts.

2.1.18 Substructures

Construct Interior Single and Multi-Column Bents using cast-in-place reinforced concrete bent caps and cast-in-place reinforced concrete columns supported by cast-in-place reinforced concrete drilled shafts. If any portion of the bent cap is lower than the 100-year water elevation, detail rounded cap ends using a radius equal to half of the cap width. If a

APPLY TO PLAN SHEETS

drilled shaft is extended above ground, above the scour line, or through liquefiable soil, structurally design the shaft as a column and detail the longitudinal reinforcing steel with a maximum spacing of 8 inches center-to-center.

Construct Interior Pile Bents using cast-in-place reinforced concrete bent caps and a single row of vertical prestressed concrete piles (with or without prestressed concrete pile points). For protection of the pile, ensure concrete portions of piles with points extend a minimum of 2 feet below final ground line or predicted scour line, whichever is deeper. Do not use Interior Pile Bents to support a span having a length that exceeds 70 feet.

Interior Pile Bents are not allowed for the S-36 Bridge. Use Interior Single or Multi-Column Bents for the S-36 Bridge.

Construct end abutments as spill through type abutments (2:1 maximum slope). In addition to the requirements of Section 20.2.8 of the SCDOT Bridge Design Manual, set the elevation of the berm so that the top of the berm (embankment fill) is no greater than 4 feet below the superstructure.

The following applies to bent cap cantilevers for Interior Pile Bents and end bents:

- For a cap supported by prestressed concrete piles, provide a minimum of the equivalent of 2 pile widths of distance from the centerline of the exterior pile to the end of the cap.
- Do not detail the intersection of the centerlines of bent and exterior beam/girder on the bent cap cantilever.
- Provide a distance from the centerline of exterior pile to the edge of a slab superstructure, measured along the bent cap centerline, that is less than or equal to 30 percent of the average pile spacing of the bent.

2.1.19 Integral Interior Bent Caps

If integral interior bent caps are used on this Project, construct the caps using cast-in-place concrete.

2.1.20 Slope Protection

Protect the bridge end fills with rip rap in accordance with Standard Drawing 804-105-00.

2.1.21 Culverts

Culverts will not be permitted as substitutes for bridges.

David Yoder

From: John Hamilton <jhamilton@fmecol.com>
Sent: Wednesday, February 03, 2016 2:20 PM
To: David Yoder
Subject: RE: S-51 over Black Mingo Creek - Site Class

TOP OF PILE = ELEV. 23 FOR IB 2 AND 3
GROUNDLINE ELEV. = 13.5 IB 2, 7 IB 3

Here's what I came up with.

Bent ID	Top Depth	Bot. Depth	p-y Curve Model	Eff. Unit Wt (pcf)	Friction Angle (deg)	Cohesion (psf)	K (pci)	E50
EB1	0	4	Sand	120	34	--	90	--
	4	11	Soft Clay	43	--	300	--	0.02
	11	14	Soft Clay	43	--	500	--	0.01
	14	36	Sand	53	40	--	125	--
	36	100	St. Clay w/o Free Water	53	--	2500	--	0.005
IB2	9.5	13.5	Sand	43	28	--	20	--
	13.5	26	Sand	48	32	--	30	--
	26	36	Sand	53	40	--	125	--
	36	100	St. Clay w/o Free Water	53	--	2500	--	0.005
IB3	16	22	Sand	53	32	--	60	--
	22	38	Sand	53	40	--	125	--
	38	100	St. Clay w/o Free Water	53	--	2500	--	0.005
EB4	0	3	Sand	115	30	--	25	--
	3	6	Sand	53	30	--	20	--
	6	17	Sand	53	32	--	40	--
	17	32	Sand	53	40	--	125	--
	32	100	St. Clay w/o Free Water	53	--	2500	--	0.005

From: David Yoder [mailto:david.yoder@ice-eng.com]
Sent: Wednesday, February 03, 2016 11:34 AM
To: John Hamilton
Subject: RE: S-51 over Black Mingo Creek - Site Class

Thanks John.

Can you also send me the LPile soil data when it is available for the interior bent and end bents?

From: John Hamilton [mailto:jhamilton@fmecol.com]
Sent: Wednesday, February 03, 2016 10:16 AM
To: David Yoder <david.yoder@ice-eng.com>
Subject: RE: S-51 over Black Mingo Creek - Site Class

Let's go with a Site Class C for the bridge foundations and a Site Class D for the embankments. Boring logs are attached. Thanks.

John H.

From: David Yoder [mailto:david.yoder@ice-eng.com]
Sent: Wednesday, February 03, 2016 9:34 AM
To: John Hamilton
Subject: S-51 over Black Mingo Creek - Site Class

John,

What is the site class for Black Mingo Creek?

Thanks,

David Yoder, P.E. | *Structural Engineer*
david.yoder@ice-eng.com | 803-807-3075 (C)

INFRASTRUCTURE
CONSULTING & ENGINEERING

1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3161 (W) | 803-822-0034 (F)

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Interior Bent 2

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

PROJECT DATA
==========

Project : S-51 over Black Mingo Creek
User Job No.:
Designer : DKY
Date : 2/15/16
Checker : RAJ 2/16/16 Pages 1 thru 28
Checked Date:
State : SC State Job No. :
Structure type: Pier.
Pier View : Upstation.
Code : AASHTO LRFD (2013-Interims)
Comments : S-51 over Black Mingo Creek

Interior Bent 2

100 yr Scour

Cap Length = 39'-0"

12 - Adjacent Cored Slab Units

7 - 18" square prestressed piles at 5'-6" spacing

```
PIER GEOMETRY
=============

Pier Type: Multi Column

Pier View    : Upstation.
Cap Shape: Straight   Top Elevations: start = 26.40 ft   end = 25.10 ft
   Depth(Z) = 38.00 in   Skew angle = 0.00   Reduction of I = 1.000
   Length(X) = 39.00 ft   Height(Y) = 36.00 in

Column Shape : Rectangular
   Number of columns: 7


   Column number 1:

   Location from the left edge of the cap(X): 3.00 ft
   Elevations: bottom  = -4.00 ft   top = 24.80 ft   Reduction of I = 1.000

   Column Bottom is Fixed

   Column section dimensions:
         Width(X) = 18.00 in   Depth(Z) = 18.00 in

   Column number 2:

   Location from the left edge of the cap(X): 8.50 ft
   Elevations: bottom  = -4.00 ft   top = 24.62 ft   Reduction of I = 1.000

   Column Bottom is Fixed

   Column section dimensions:
         Width(X) = 18.00 in   Depth(Z) = 18.00 in

   Column number 3:

   Location from the left edge of the cap(X): 14.00 ft
   Elevations: bottom  = -4.00 ft   top = 24.43 ft   Reduction of I = 1.000

   Column Bottom is Fixed

   Column section dimensions:
         Width(X) = 18.00 in   Depth(Z) = 18.00 in

   Column number 4:

   Location from the left edge of the cap(X): 19.50 ft
   Elevations: bottom  = -4.00 ft   top = 24.25 ft   Reduction of I = 1.000

   Column Bottom is Fixed

   Column section dimensions:
         Width(X) = 18.00 in   Depth(Z) = 18.00 in

   Column number 5:

   Location from the left edge of the cap(X): 25.00 ft
   Elevations: bottom  = -4.00 ft   top = 24.07 ft   Reduction of I = 1.000

   Column Bottom is Fixed

   Column section dimensions:
         Width(X) = 18.00 in   Depth(Z) = 18.00 in

   Column number 6:

   Location from the left edge of the cap(X): 30.50 ft
   Elevations: bottom  = -4.00 ft   top = 23.88 ft   Reduction of I = 1.000
```

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 7:

Location from the left edge of the cap(X): 36.00 ft
Elevations: bottom = -4.00 ft top = 23.70 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

SUPERSTRUCTURE INFO

Total number of spans: 3 Span number rear to current pier: 1
Number of traffic lanes: 2

Beam: height : 24.00 in section area : 637.80 in^2
Beam Inertia (Ixx): 39436.00 in^4 Beam inertia (Iyy): 76800.00 in^4
Beam CG:12.00 in Barrier height : 32.00 in Depth of slab : 2.00 in
Curb to curb distance: 32.833 ft

Span #	Span length	Bridge Width
1	37.500 ft	36.000 ft
2	70.000 ft	36.000 ft
3	56.500 ft	36.000 ft
		36.000 ft

BEARING POINTS

Number of bearing lines: 2

First bearing line Eccentricity = 0.56 ft

Point	Distance ft
1	3.00
2	6.00
3	9.00
4	12.00
5	15.00
6	18.00
7	21.00
8	24.00
9	27.00
10	30.00
11	33.00
12	36.00

Second bearing line Eccentricity = -0.56 ft

Point	Distance ft
1	3.00
2	6.00
3	9.00
4	12.00
5	15.00
6	18.00
7	21.00
8	24.00
9	27.00
10	30.00
11	33.00

12 36.00

MATERIAL PROPERTIES

	Cap	Column	Footing
Concrete Type	normal	normal	normal
Concrete Strength (psi)	4000.00	6000.00	4000.00
Concrete Density (lb/ft3)	150.00	150.00	150.00
Concrete Modulus Ec (ksi)	3834.30	4695.98	3834.30
Steel Strength Fy (ksi)	60.00	60.00	60.00

DESIGN PARAMETERS

AASHTO LRFD Code

Resistance factors for reinf. concrete:

Flexure and tension	0.90
Shear and torsion (normal)	0.90
(lightweight)	0.70
Axial compression (ties)	0.75
Axial compression (spiral)	0.75
Compression in STM	0.70

Multi presence factors for live load:

1 Lanes	1.20
2 Lanes	1.00
3 Lanes	0.85
4 Lanes	0.65
5 Lanes	0.65
6 Lanes	0.65

Dynamic load allowance IM:

	Truck	Lane	Fatigue
Cap	0.33	0.00	0.15
Column	0.33	0.00	0.15
Footing	0.00	0.00	0.00

	Exposure factors	Clear cover in	Clear side cover in
Cap	1.00	2.00	2.00
Column	1.00	2.00	
Footing	1.00	3.00	3.00

Degree of fixity in foundations for Moment Magnify Method: Ga = 5.00

SEISMIC DESIGN PARAMETERS

Strength Reduction factors for reinf. Concrete Seismic Design:

Tension controlled	: 0.90
Shear and torsion (normal)	: 0.90
(lightweight)	: 0.70
Compression Controlled (ties)	: 0.75
Compression Controlled (spiral)	: 0.75

Seismic Overstrength

Flexure and tension	: 1.30
Axial compression (ties)	: 1.30
Axial compression (spiral)	: 1.30

Response Modification Factor : 1.00

Use core area for plastic hinging calculations.

Design Factors

Cap Design Factor	: 1.20
Footing Design Factor	: 1.20

Plastic Hinge Moment

Use actual computed Plastic Hinging Moment for each column in all combinations.

LOADS
=====

Pier View : Upstation.
Load Cases: 127

Loadcase ID: DC1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Force	Y	0.00	-0.25	0.00	----	----
Force	Y	0.00	-0.25	1.00	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-15.80
1	2	Y	-15.80
1	3	Y	-15.80
1	4	Y	-15.80
1	5	Y	-15.80
1	6	Y	-15.80
1	7	Y	-15.80
1	8	Y	-15.80
1	9	Y	-15.80
1	10	Y	-15.80
1	11	Y	-15.80
1	12	Y	-15.80
2	1	Y	-28.80
2	2	Y	-28.80
2	3	Y	-28.80
2	4	Y	-28.80
2	5	Y	-28.80
2	6	Y	-28.80
2	7	Y	-28.80
2	8	Y	-28.80
2	9	Y	-28.80
2	10	Y	-28.80
2	11	Y	-28.80
2	12	Y	-28.80

Loadcase ID: DW1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-0.80
1	2	Y	-0.80
1	3	Y	-0.80
1	4	Y	-0.80
1	5	Y	-0.80
1	6	Y	-0.80
1	7	Y	-0.80
1	8	Y	-0.80
1	9	Y	-0.80
1	10	Y	-0.80
1	11	Y	-0.80
1	12	Y	-0.80
2	1	Y	-1.40
2	2	Y	-1.40
2	3	Y	-1.40
2	4	Y	-1.40

2	5	Y	-1.40
2	6	Y	-1.40
2	7	Y	-1.40
2	8	Y	-1.40
2	9	Y	-1.40
2	10	Y	-1.40
2	11	Y	-1.40
2	12	Y	-1.40

Loadcase ID: WA1 Name:
Multiplier = 1.000

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
1	UDL	X	-0.050	klf	0.20	----	0.98
2	UDL	X	-0.050	klf	0.20	----	0.98
3	UDL	X	-0.050	klf	0.20	----	0.98
4	UDL	X	-0.050	klf	0.20	----	0.98
5	UDL	X	-0.050	klf	0.20	----	0.98
6	UDL	X	-0.050	klf	0.20	----	0.98
7	UDL	X	-0.050	klf	0.20	----	0.98

Loadcase ID: WS1 Name: Angle: 0
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Force	X	0.00	-0.38	0.50	----	----

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
7	UDL	X	-0.060	klf	0.99	----	0.95
6	UDL	X	-0.060	klf	0.99	----	0.95
5	UDL	X	-0.060	klf	0.98	----	0.95
4	UDL	X	-0.060	klf	0.97	----	0.95
3	UDL	X	-0.060	klf	0.97	----	0.95
2	UDL	X	-0.060	klf	0.96	----	0.95
1	UDL	X	-0.060	klf	0.95	----	0.95

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	Y	-2.89
1	1	X	-0.38
1	2	X	-0.38
1	2	Z	0.00
1	2	Y	1.13
1	3	Z	0.00
1	3	Y	1.13
1	3	X	-0.38
1	4	Z	0.00
1	4	Y	1.13
1	4	X	-0.38
1	5	Z	0.00
1	5	Y	1.13
1	5	X	-0.38
1	6	X	-0.38
1	6	Y	1.13
1	6	Z	-0.00
1	7	Z	0.00
1	7	Y	1.13
1	7	X	-0.38
1	8	Z	0.00

1	8	Y	1.13
1	8	X	-0.38
1	9	Z	0.00
1	9	Y	1.13
1	9	X	-0.38
1	10	Z	0.00
1	10	Y	1.13
1	10	X	-0.38
1	11	Z	0.00
1	11	Y	1.13
1	11	X	-0.38
1	12	Y	5.14
1	12	Z	0.00
1	12	X	-0.38
2	1	Z	0.00
2	1	Y	-5.39
2	1	X	-0.70
2	2	X	-0.70
2	2	Z	0.00
2	2	Y	2.10
2	3	Z	0.00
2	3	Y	2.10
2	3	X	-0.70
2	4	Z	0.00
2	4	Y	2.10
2	4	X	-0.70
2	5	Z	0.00
2	5	Y	2.10
2	5	X	-0.70
2	6	X	-0.70
2	6	Y	2.10
2	6	Z	-0.00
2	7	Z	0.00
2	7	Y	2.10
2	7	X	-0.70
2	8	Z	0.00
2	8	Y	2.10
2	8	X	-0.70
2	9	Z	0.00
2	9	Y	2.10
2	9	X	-0.70
2	10	Z	0.00
2	10	Y	2.10
2	10	X	-0.70
2	11	Z	0.00
2	11	Y	2.10
2	11	X	-0.70
2	12	Y	9.59
2	12	Z	0.00
2	12	X	-0.70

Auto generation details
Generated Wind Load on Structure
Angle of wind = 0.00 deg Elevation above which wind load acts = 23.50 ft
Default wind pressure

Wind pressure for superstructure:		Wind pressure for substructure:	
Transverse	50.000 psf	Cap	40.000 psf
Longitudinal	0.000 psf	Column	40.000 psf
Overturning	20.000 psf		

Loadcase ID: WL1 Name: Angle: 0
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	X	-0.16
1	1	Y	-0.46

1	2	Y	-0.00
1	2	X	-0.16
1	2	Z	0.00
1	3	Z	0.00
1	3	Y	-0.00
1	3	X	-0.16
1	4	Z	0.00
1	4	Y	-0.00
1	4	X	-0.16
1	5	Z	0.00
1	5	Y	-0.00
1	5	X	-0.16
1	6	Z	-0.00
1	6	Y	-0.00
1	6	X	-0.16
1	7	X	-0.16
1	7	Y	-0.00
1	7	Z	0.00
1	8	Z	0.00
1	8	Y	-0.00
1	8	X	-0.16
1	9	Z	0.00
1	9	Y	-0.00
1	9	X	-0.16
1	10	Z	0.00
1	10	Y	-0.00
1	10	X	-0.16
1	11	Y	-0.00
1	11	X	-0.16
1	11	Z	0.00
1	12	Z	0.00
1	12	Y	0.46
1	12	X	-0.16
2	1	Z	0.00
2	1	X	-0.29
2	1	Y	-0.87
2	2	Y	-0.00
2	2	X	-0.29
2	2	Z	0.00
2	3	Z	0.00
2	3	Y	-0.00
2	3	X	-0.29
2	4	Z	0.00
2	4	Y	-0.00
2	4	X	-0.29
2	5	Z	0.00
2	5	Y	-0.00
2	5	X	-0.29
2	6	Z	-0.00
2	6	Y	-0.00
2	6	X	-0.29
2	7	X	-0.29
2	7	Y	-0.00
2	7	Z	0.00
2	8	Z	0.00
2	8	Y	-0.00
2	8	X	-0.29
2	9	Z	0.00
2	9	Y	-0.00
2	9	X	-0.29
2	10	Z	0.00
2	10	Y	-0.00
2	10	X	-0.29
2	11	Y	-0.00
2	11	X	-0.29
2	11	Z	0.00
2	12	Z	0.00
2	12	Y	0.87
2	12	X	-0.29

Auto generation details
Generated Wind Load on Live Load
Angle of wind = 0.00 deg Live load length = 53.75 ft

Loadcase ID: TU1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	-0.00
1	1	Z	-0.04
1	2	X	-0.00
1	2	Z	-0.04
1	3	X	-0.00
1	3	Z	-0.04
1	4	X	-0.00
1	4	Z	-0.04
1	5	X	-0.00
1	5	Z	-0.04
1	6	X	-0.00
1	6	Z	-0.04
1	7	X	-0.00
1	7	Z	-0.04
1	8	X	-0.00
1	8	Z	-0.04
1	9	X	-0.00
1	9	Z	-0.04
1	10	X	-0.00
1	10	Z	-0.04
1	11	X	-0.00
1	11	Z	-0.04
1	12	X	-0.00
1	12	Z	-0.04
2	1	X	-0.00
2	1	Z	-0.04
2	2	X	-0.00
2	2	Z	-0.04
2	3	X	-0.00
2	3	Z	-0.04
2	4	X	-0.00
2	4	Z	-0.04
2	5	X	-0.00
2	5	Z	-0.04
2	6	X	-0.00
2	6	Z	-0.04
2	7	X	-0.00
2	7	Z	-0.04
2	8	X	-0.00
2	8	Z	-0.04
2	9	X	-0.00
2	9	Z	-0.04
2	10	X	-0.00
2	10	Z	-0.04
2	11	X	-0.00
2	11	Z	-0.04
2	12	X	-0.00
2	12	Z	-0.04

Auto generation details

Bearing type: Fixed Bearings.

Direction of thermal force: +(Z)

Length of Superstructure Contributing, L: 16.250 ft
Change in temperature: 40.000 °F

Coefficient of thermal expansion: 6.0e-006 ft/°F

Loadcase ID: TU2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	0.00
1	1	Z	0.05
1	2	X	0.00
1	2	Z	0.05
1	3	X	0.00
1	3	Z	0.05
1	4	X	0.00
1	4	Z	0.05
1	5	X	0.00
1	5	Z	0.05
1	6	X	0.00
1	6	Z	0.05
1	7	X	0.00
1	7	Z	0.05
1	8	X	0.00
1	8	Z	0.05
1	9	X	0.00
1	9	Z	0.05
1	10	X	0.00
1	10	Z	0.05
1	11	X	0.00
1	11	Z	0.05
1	12	X	0.00
1	12	Z	0.05
2	1	X	0.00
2	1	Z	0.05
2	2	X	0.00
2	2	Z	0.05
2	3	X	0.00
2	3	Z	0.05
2	4	X	0.00
2	4	Z	0.05
2	5	X	0.00
2	5	Z	0.05
2	6	X	0.00
2	6	Z	0.05
2	7	X	0.00
2	7	Z	0.05
2	8	X	0.00
2	8	Z	0.05
2	9	X	0.00
2	9	Z	0.05
2	10	X	0.00
2	10	Z	0.05
2	11	X	0.00
2	11	Z	0.05
2	12	X	0.00
2	12	Z	0.05

Auto generation details

Bearing type: Fixed Bearings.

Direction of thermal force: -(Z)

Length of Superstructure Contributing, L: 16.250 ft
Change in temperature: 50.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

5 LL Cases shown for Brevity

Loadcase ID: LL1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	-15.42
1	10	Y	-6.79
1	11	Y	-15.42
1	12	Y	-6.79
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	-10.88
2	10	Y	-4.79
2	11	Y	-10.88
2	12	Y	-4.79
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	-0.28
1	9	Y	-3.44
1	10	Y	-4.32
1	11	Y	-4.32
1	12	Y	-2.04
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	-0.53
2	9	Y	-6.42
2	10	Y	-8.06
2	11	Y	-8.06
2	12	Y	-3.81

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-9.01
1	5	Y	-18.03
1	6	Y	-9.01
1	7	Y	-18.03
1	8	Y	-27.04
1	9	Y	0.00
1	10	Y	-27.04
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-1.80
1	5	Y	-3.60
1	6	Y	-3.60
1	7	Y	-3.60
1	8	Y	-3.60
1	9	Y	-3.60
1	10	Y	-3.40
1	11	Y	-0.80
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL3 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-22.21
1	3	Y	0.00
1	4	Y	-22.21
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	-15.67
2	3	Y	0.00
2	4	Y	-15.67
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	-0.96
1	2	Y	-4.08
1	3	Y	-4.32
1	4	Y	-4.08
1	5	Y	-0.96
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	-1.79
2	2	Y	-7.62
2	3	Y	-8.06
2	4	Y	-7.62
2	5	Y	-1.79
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00

2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL4 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-6.17
1	3	Y	-12.34
1	4	Y	-6.17
1	5	Y	-12.34
1	6	Y	-18.51
1	7	Y	0.00
1	8	Y	-18.51
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	-4.35
2	3	Y	-8.70
2	4	Y	-4.35
2	5	Y	-8.70
2	6	Y	-13.06
2	7	Y	0.00
2	8	Y	-13.06
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	-1.80
1	3	Y	-3.60
1	4	Y	-3.60
1	5	Y	-3.60
1	6	Y	-3.60
1	7	Y	-3.60
1	8	Y	-3.40
1	9	Y	-0.80
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00

2	2	Y	-3.36
2	3	Y	-6.72
2	4	Y	-6.72
2	5	Y	-6.72
2	6	Y	-6.72
2	7	Y	-6.72
2	8	Y	-6.35
2	9	Y	-1.49
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL5 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	-10.40
2	5	Y	-20.80
2	6	Y	-10.40
2	7	Y	-20.80
2	8	Y	-31.20
2	9	Y	0.00
2	10	Y	-31.20
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00

1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	-3.36
2	5	Y	-6.72
2	6	Y	-6.72
2	7	Y	-6.72
2	8	Y	-6.72
2	9	Y	-6.72
2	10	Y	-6.35
2	11	Y	-1.49
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

5 BR cases shown for Brevity

Loadcase ID: BR1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.23
1	2	Z	-0.23
1	3	Z	-0.23
1	4	Z	-0.23
1	5	Z	-0.23
1	6	Z	-0.23
1	7	Z	-0.23
1	8	Z	-0.23
1	9	Z	-0.23
1	10	Z	-0.23
1	11	Z	-0.23
1	12	Z	-0.23
2	1	Z	-0.23

2	2	Z	-0.23
2	3	Z	-0.23
2	4	Z	-0.23
2	5	Z	-0.23
2	6	Z	-0.23
2	7	Z	-0.23
2	8	Z	-0.23
2	9	Z	-0.23
2	10	Z	-0.23
2	11	Z	-0.23
2	12	Z	-0.23

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR2 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38
2	9	Z	-0.38
2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR3 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L

Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.23
1	2	Z	-0.23
1	3	Z	-0.23
1	4	Z	-0.23
1	5	Z	-0.23
1	6	Z	-0.23
1	7	Z	-0.23
1	8	Z	-0.23
1	9	Z	-0.23
1	10	Z	-0.23
1	11	Z	-0.23
1	12	Z	-0.23
2	1	Z	-0.23
2	2	Z	-0.23
2	3	Z	-0.23
2	4	Z	-0.23
2	5	Z	-0.23
2	6	Z	-0.23
2	7	Z	-0.23
2	8	Z	-0.23
2	9	Z	-0.23
2	10	Z	-0.23
2	11	Z	-0.23
2	12	Z	-0.23

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR4 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38
2	9	Z	-0.38

2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR5 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38
2	9	Z	-0.38
2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Selected load groups:

STRENGTH GROUP I
STRENGTH GROUP III
STRENGTH GROUP V
SERVICE GROUP I

CAP DESIGN
==========

Code: AASHTO LRFD (2013-Interims)
Units: US
Pier View : Upstation.

DESIGN PARAMETERS:
==========

f'c = 4000.0 psi
Fy flex = 60000.0 psi Fy shear = 60000.0 psi
phi tens = 0.90 phi comp = 0.75 phi shear = 0.90
Tens above = 0.005 Comp below = 0.002
Ec = 3834.3 ksi Es = 29000.0 ksi
Crack check as per current LRFD
Crack control Exposure = 1.00
Concrete Type : Normal Weight.
Design : face of column.

CAP GEOMETRY:
==========

Straight Cap : Length(X) = 39.00 ft Depth(Z) = 38.00 in

Cap Section Properties:
==========

Sec.	Area ft ^2	Iz in ^4	Iy in ^4
1	9.50	147744.00	164616.00

MAIN REINFORCEMENT:
==========

	Bar size	Quantity	Bar dist. in	As total in^2	From ft	To ft	Hook
TOP	US#10[M32]	4	3.26	5.080	0.17	38.83	None
BOTTOM	US#10[M32]	4	3.26	5.080	0.17	38.83	None

STIRRUPS:
==========

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft	Bar Type
0.25	38.75	US#5[M16]	2	6.00	1.24	Stirrup

Clear Cover on Sides = 2.00 in

FLEXURE DESIGN:
==========

Span 1: From 0.00 ft To 3.00 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2

2.3	2.3	36	0.0	400.3	0	T	2.65	32.74	0.034	0.90	0.63	5.08	2.67	0.63	5.08	5.08	
			-5.2	-298.1	1	T	2.51	32.74	0.036	0.90	0.63	5.08	5.08	0.63	5.08	1.90	

Span 2: From 3.00 ft To 8.50 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.8	3.8	36	56.2	657.0	2195	T	2.91	32.74	0.031	0.90	0.63	5.08	4.59	0.63	5.08	5.08
			-31.7	-481.2	1945	T	2.65	32.74	0.034	0.90	0.63	5.08	5.08	0.63	5.08	3.28
3.0	6.0	36	253.8	723.3	3	T	3.05	32.74	0.029	0.90	2.33	5.08	5.08	0.63	5.08	5.08
			0.0	-723.3	0	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08
4.8	7.8	36	119.0	723.3	58	T	3.05	32.74	0.029	0.90	1.08	5.08	5.08	0.63	5.08	5.08
			-38.4	-723.3	1497	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08

Span 3: From 8.50 ft To 14.00 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.8	9.3	36	183.9	723.3	20	T	3.05	32.74	0.029	0.90	1.68	5.08	5.08	0.63	5.08	5.08
			-51.7	-723.3	4856	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08
3.5	12.0	36	247.9	723.3	40	T	3.05	32.74	0.029	0.90	2.27	5.08	5.08	0.63	5.08	5.08
			-22.1	-723.3	1478	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08
4.8	13.3	36	121.5	723.3	1480	T	3.05	32.74	0.029	0.90	1.11	5.08	5.08	0.63	5.08	5.08
			-73.5	-723.3	38	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.67	5.08	5.08

Span 4: From 14.00 ft To 19.50 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.8	14.8	36	144.6	723.3	20	T	3.05	32.74	0.029	0.90	1.32	5.08	5.08	0.63	5.08	5.08
			-66.7	-723.3	1459	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08

```
 1.0  15.0   36   181.0   723.3    18  T   3.05  32.74  0.029  0.90      1.65     5.08     5.08
0.63     5.08     5.08
                  -54.0  -723.3  1459  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.0  18.0   36   204.0   723.3    40  T   3.05  32.74  0.029  0.90      1.87     5.08     5.08
0.63     5.08     5.08
                  -73.8  -723.3  1487  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.67     5.08     5.08
 4.8  18.8   36   119.0   723.3  1464  T   3.05  32.74  0.029  0.90      1.08     5.08     5.08
0.63     5.08     5.08
                 -121.7  -723.3    47  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
1.11     5.08     5.08
```

Span 5: From 19.50 ft To 25.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr    Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr    Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  20.3   36   114.1   723.3  1458  T   3.05  32.74  0.029  0.90      1.04     5.08     5.08
0.63     5.08     5.08
                 -128.3  -723.3    14  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
1.17     5.08     5.08
 1.5  21.0   36   201.6   723.3    38  T   3.05  32.74  0.029  0.90      1.84     5.08     5.08
0.63     5.08     5.08
                  -81.9  -723.3  1454  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.74     5.08     5.08
 4.5  24.0   36   184.5   723.3    24  T   3.05  32.74  0.029  0.90      1.69     5.08     5.08
0.63     5.08     5.08
                  -57.5  -723.3  1482  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  24.3   36   149.6   723.3    19  T   3.05  32.74  0.029  0.90      1.36     5.08     5.08
0.63     5.08     5.08
                  -67.5  -723.3  1482  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
```

Span 6: From 25.00 ft To 30.50 ft

```
 Loc  AbsLoc  H    Mmax     Mr    Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr    Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  25.8   36   116.8   723.3  1478  T   3.05  32.74  0.029  0.90      1.06     5.08     5.08
0.63     5.08     5.08
                  -77.9  -723.3    40  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.71     5.08     5.08
 2.0  27.0   36   246.4   723.3    38  T   3.05  32.74  0.029  0.90      2.26     5.08     5.08
0.63     5.08     5.08
                  -22.7  -723.3  1480  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  29.8   36   189.8   723.3    19  T   3.05  32.74  0.029  0.90      1.73     5.08     5.08
0.63     5.08     5.08
                  -44.1  -723.3  5090  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
```

Span 7: From 30.50 ft To 36.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr    Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
```

			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.8	31.3	36	117.4	723.3	37	T	3.05	32.74	0.029	0.90	1.07	5.08	5.08	0.63	5.08	5.08
			-41.7	-723.3	1444	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08
2.5	33.0	36	240.6	723.3	16	T	3.05	32.74	0.029	0.90	2.21	5.08	5.08	0.63	5.08	5.08
			0.0	-723.3	0	T	3.05	32.74	0.029	0.90	0.63	5.08	5.08	0.63	5.08	5.08
4.8	35.3	36	63.1	657.0	1968	T	2.91	32.74	0.031	0.90	0.63	5.08	4.59	0.63	5.08	5.08
			-21.6	-481.2	1947	T	2.65	32.74	0.034	0.90	0.63	5.08	5.08	0.63	5.08	3.28

Span 8: From 36.00 ft To 39.00 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.8	36.8	36	0.0	400.3	0	T	2.65	32.74	0.034	0.90	0.63	5.08	2.67	0.63	5.08	5.08
			-5.2	-298.1	1	T	2.51	32.74	0.036	0.90	0.63	5.08	5.08	0.63	5.08	1.90

Note:
CL: Section classification as per LRFD 2006 interims for provided reinforcement.
C = Compression controlled, I = In-Transition, T = Tension controlled.

SHEAR AND TORSION DESIGN:
==========
Simplified Method used for design.

Span 1: From 0.00 ft To 3.00 ft

Loc	AbsLoc	Pos	Vu	Comb	Tu	Comb	phi*Vn	T-lim	Avs/s	2Ats/s	Av/s	Aprv/s	Alx
ft	ft		kips		kips-ft		kips	kips-ft	<--------- in^2/ft			-------->	in^2
2.25	2.25	L	4.3	1	0.0	0	313.2	59.3	0.00	0.00	0.00	1.24	0.00

Loc	AbsLoc	Pos	Vc	Vs	Beta	Theta	b	dv	Esp_s
ft	ft		kips	kips		deg	in	in	
2.25	2.25	L	151.96	196.01	2.00	45.00	38.00	31.62	0.0000

Span 2: From 3.00 ft To 8.50 ft

Loc	AbsLoc	Pos	Vu	Comb	Tu	Comb	phi*Vn	T-lim	Avs/s	2Ats/s	Av/s	Aprv/s	Alx
ft	ft		kips		kips-ft		kips	kips-ft	<--------- in^2/ft			-------->	in^2
0.75	3.75	R	94.0	3	50.7	60	312.1	59.3	0.48	0.00	0.48	1.24	0.00
3.00	6.00	L	90.0	3	50.7	60	311.5	59.3	0.48	0.00	0.48	1.24	0.00
		R	77.6	63	50.3	172	311.5	59.3	0.48	0.00	0.48	1.24	0.00
4.75	7.75	L	80.7	63	50.3	172	311.5	59.3	0.48	0.00	0.48	1.24	0.00

Loc	AbsLoc	Pos	Vc	Vs	Beta	Theta	b	dv	Esp_s
ft	ft		kips	kips		deg	in	in	

0.75	3.75	R	151.42	195.32	2.00	45.00	38.00	31.50	0.0000
3.00	6.00	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
		R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
4.75	7.75	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000

Span 3: From 8.50 ft To 14.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	9.25	R	70.7	100	87.5	116	292.9	59.3	0.22	0.26	0.48	1.24	0.00
3.50	12.00	L	65.8	100	87.5	116	292.9	59.3	0.22	0.26	0.48	1.24	0.00
		R	129.8	123	106.2	172	289.0	59.3	0.16	0.32	0.48	1.24	0.00
4.75	13.25	L	132.1	123	106.2	172	289.0	59.3	0.16	0.32	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	9.25	R	151.13	174.33	2.00	45.00	38.00	31.44	0.0000
3.50	12.00	L	151.13	174.33	2.00	45.00	38.00	31.44	0.0000
		R	151.13	169.93	2.00	45.00	38.00	31.44	0.0000
4.75	13.25	L	151.13	169.93	2.00	45.00	38.00	31.44	0.0000

Span 4: From 14.00 ft To 19.50 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	14.75	R	164.4	78	141.2	89	281.6	59.3	0.20	0.42	0.62	1.24	0.00
1.00	15.00	L	164.0	78	141.2	89	281.6	59.3	0.20	0.42	0.62	1.24	0.00
		R	59.1	144	111.9	67	287.7	59.3	0.15	0.34	0.48	1.24	0.00
4.00	18.00	L	53.7	144	111.9	67	287.7	59.3	0.15	0.34	0.48	1.24	0.00
		R	148.6	160	120.6	145	285.9	59.3	0.12	0.36	0.48	1.24	0.00
4.75	18.75	L	149.9	160	120.6	145	285.9	59.3	0.12	0.36	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	14.75	R	151.13	161.70	2.00	45.00	38.00	31.44	0.0000
1.00	15.00	L	151.13	161.70	2.00	45.00	38.00	31.44	0.0000
		R	151.13	168.58	2.00	45.00	38.00	31.44	0.0000
4.00	18.00	L	151.13	168.58	2.00	45.00	38.00	31.44	0.0000
		R	151.13	166.54	2.00	45.00	38.00	31.44	0.0000
4.75	18.75	L	151.13	166.54	2.00	45.00	38.00	31.44	0.0000

Span 5: From 19.50 ft To 25.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	20.25	R	152.0	218	121.1	187	285.8	59.3	0.12	0.36	0.48	1.24	0.00
1.50	21.00	L	150.7	218	121.1	187	285.8	59.3	0.12	0.36	0.48	1.24	0.00
		R	51.5	198	125.3	25	284.9	59.3	0.11	0.38	0.48	1.24	0.00
4.50	24.00	L	56.8	198	125.3	25	284.9	59.3	0.11	0.38	0.48	1.24	0.00
		R	161.8	24	154.8	12	278.7	59.3	0.18	0.46	0.65	1.24	0.00
4.75	24.25	L	162.3	24	154.8	12	278.7	59.3	0.19	0.46	0.65	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	20.25	R	151.13	166.43	2.00	45.00	38.00	31.44	0.0000
1.50	21.00	L	151.13	166.43	2.00	45.00	38.00	31.44	0.0000
		R	151.13	165.44	2.00	45.00	38.00	31.44	0.0000
4.50	24.00	L	151.13	165.44	2.00	45.00	38.00	31.44	0.0000
		R	151.13	158.50	2.00	45.00	38.00	31.44	0.0000
4.75	24.25	L	151.13	158.50	2.00	45.00	38.00	31.44	0.0000

Span 6: From 25.00 ft To 30.50 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.75	25.75	R	126.2	196	106.2	216	289.0	59.3	0.16	0.32	0.48	1.24	0.00
2.00	27.00	L	124.0	196	106.2	216	289.0	59.3	0.16	0.32	0.48	1.24	0.00
		R	63.1	38	98.6	21	290.6	59.3	0.19	0.30	0.48	1.24	0.00
4.75	29.75	L	68.0	38	98.6	21	290.6	59.3	0.19	0.30	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	25.75	R	151.13	169.93	2.00	45.00	38.00	31.44	0.0000
2.00	27.00	L	151.13	169.93	2.00	45.00	38.00	31.44	0.0000
		R	151.13	171.71	2.00	45.00	38.00	31.44	0.0000
4.75	29.75	L	151.13	171.71	2.00	45.00	38.00	31.44	0.0000

Span 7: From 30.50 ft To 36.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.75	31.25	R	74.5	215	51.8	216	311.5	59.3	0.48	0.00	0.48	1.24	0.00
2.50	33.00	L	71.4	215	51.8	216	311.5	59.3	0.48	0.00	0.48	1.24	0.00
		R	81.8	16	57.4	29	311.5	59.3	0.48	0.00	0.48	1.24	0.00
4.75	35.25	L	85.8	16	57.4	29	312.1	59.3	0.48	0.00	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	31.25	R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
2.50	33.00	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
		R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
4.75	35.25	L	151.42	195.32	2.00	45.00	38.00	31.50	0.0000

Span 8: From 36.00 ft To 39.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.75	36.75	R	4.3	1	0.0	0	313.2	59.3	0.00	0.00	0.00	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	36.75	R	151.96	196.01	2.00	45.00	38.00	31.62	0.0000

Note:

- Pos is the design position. L suggests the calculation is done at immediate left of "Loc" and R suggests at immediate right of it.
- T-lim is the limiting value of torsion for the concrete section. If actual torsion is higher than this value, torsional steel has to be provided.
- Avs/s is the required area of steel per unit length for shear force.
- 2Ats/s is the required area of steel per unit length for two legs of torsional reinforcement.
- Av/s is the total required area of steel per unit length due to shear plus torsion.
- Aprvs/s is the total provided area of transverse steel reinforcement.
- Alx is the EFFECTIVE longitudinal steel required in addition to the PROVIDED EFFECTIVE flexural steel.
- Vc is the nominal shear resistence of concrete.
- Vs is the nominal shear resistence of transverse reinforcement.
- Beta is the factor indicating ability of diagonally cracked concrete to transmit tension and shear.
- Theta is the angle of inclination of diagonal compressive stress.
- # Vu is greater tha phi*Vn.

CRACKING/FATIGUE CHECK:
==========

Cracking check as per AASHTO LRFD (6th Edition, 2012)

Span 1: From 0.00 ft To 3.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
2.25	2.3	36.05793		0.8	3.3	38.0	10.5	0.0	0.00	0
		0		0.0	3.3	38.0	10.5	0.0	0.00	0

Span 2: From 3.00 ft To 8.50 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	3.8	36.05801		2.3	3.3	38.0	10.5	0.0	0.00	0
		6035		3.7	3.3	38.0	10.5	0.0	0.00	0
3.00	6.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		6035		13.3	3.3	38.0	10.5	0.0	0.00	0
4.75	7.8	36.05849		1.8	3.3	38.0	10.5	0.0	0.00	0
		6090		5.8	3.3	38.0	10.5	0.0	0.00	0

Span 3: From 8.50 ft To 14.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	9.3	36.05816		2.8	3.3	38.0	10.5	0.0	0.00	0
		6052		9.8	3.3	38.0	10.5	0.0	0.00	0
3.50	12.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		6072		12.5	3.3	38.0	10.5	0.0	0.00	0
4.75	13.3	36.06070		3.4	3.3	38.0	10.5	0.0	0.00	0
		5832		5.3	3.3	38.0	10.5	0.0	0.00	0

Span 4: From 14.00 ft To 19.50 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	14.8	36.05811		3.8	3.3	38.0	10.5	0.0	0.00	0
		6052		7.2	3.3	38.0	10.5	0.0	0.00	0
1.00	15.0	36.05811		2.8	3.3	38.0	10.5	0.0	0.00	0
		6050		9.2	3.3	38.0	10.5	0.0	0.00	0
4.00	18.0	36.06079		2.6	3.3	38.0	10.5	0.0	0.00	0
		5832		9.9	3.3	38.0	10.5	0.0	0.00	0
4.75	18.8	36.06079		6.1	3.3	38.0	10.5	0.0	0.00	0
		5816		5.4	3.3	38.0	10.5	0.0	0.00	0

Span 5: From 19.50 ft To 25.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	20.3	36.05806		6.5	3.3	38.0	10.5	0.0	0.00	0
		6050		5.0	3.3	38.0	10.5	0.0	0.00	0
1.50	21.0	36.05806		3.1	3.3	38.0	10.5	0.0	0.00	0

		6070	9.8	3.3	38.0	10.5	0.0	0.00	0
4.50	24.0	36.06074	2.7	3.3	38.0	10.5	0.0	0.00	0
		5816	9.4	3.3	38.0	10.5	0.0	0.00	0
4.75	24.3	36.06074	3.7	3.3	38.0	10.5	0.0	0.00	0
		5811	7.6	3.3	38.0	10.5	0.0	0.00	0

Span 6: From 25.00 ft To 30.50 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	25.8	36.05832		3.7	3.3	38.0	10.5	0.0	0.00	0
		6070		5.0	3.3	38.0	10.5	0.0	0.00	0
2.00	27.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		5830		12.3	3.3	38.0	10.5	0.0	0.00	0
4.75	29.8	36.06050		2.2	3.3	38.0	10.5	0.0	0.00	0
		5811		10.4	3.3	38.0	10.5	0.0	0.00	0

Span 7: From 30.50 ft To 36.00 ft

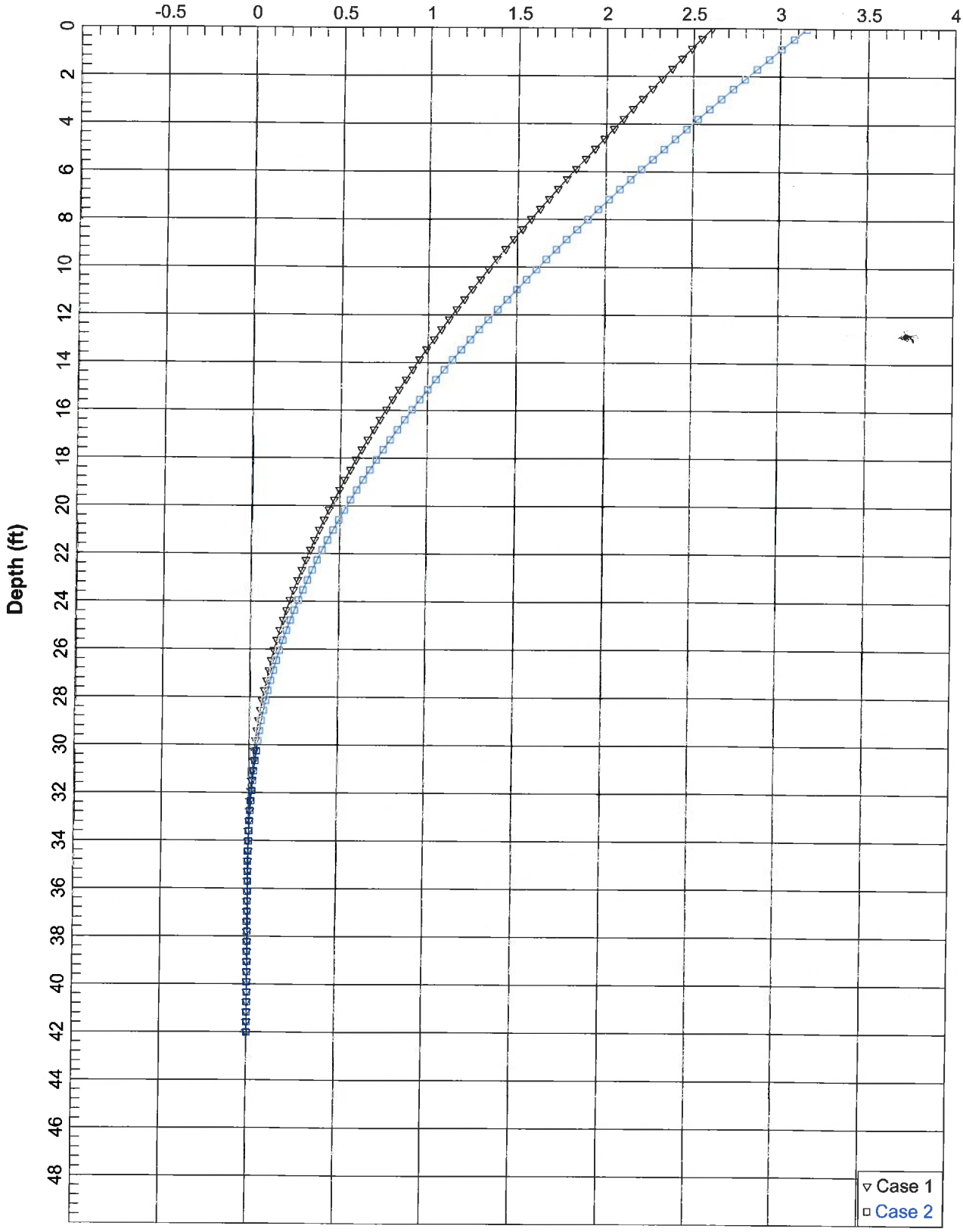
			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	31.3	36.06036		1.9	3.3	38.0	10.5	0.0	0.00	0
		5829		5.7	3.3	38.0	10.5	0.0	0.00	0
2.50	33.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		5808		12.8	3.3	38.0	10.5	0.0	0.00	0
4.75	35.3	36.06036		1.2	3.3	38.0	10.5	0.0	0.00	0
		5808		4.4	3.3	38.0	10.5	0.0	0.00	0

Span 8: From 36.00 ft To 39.00 ft

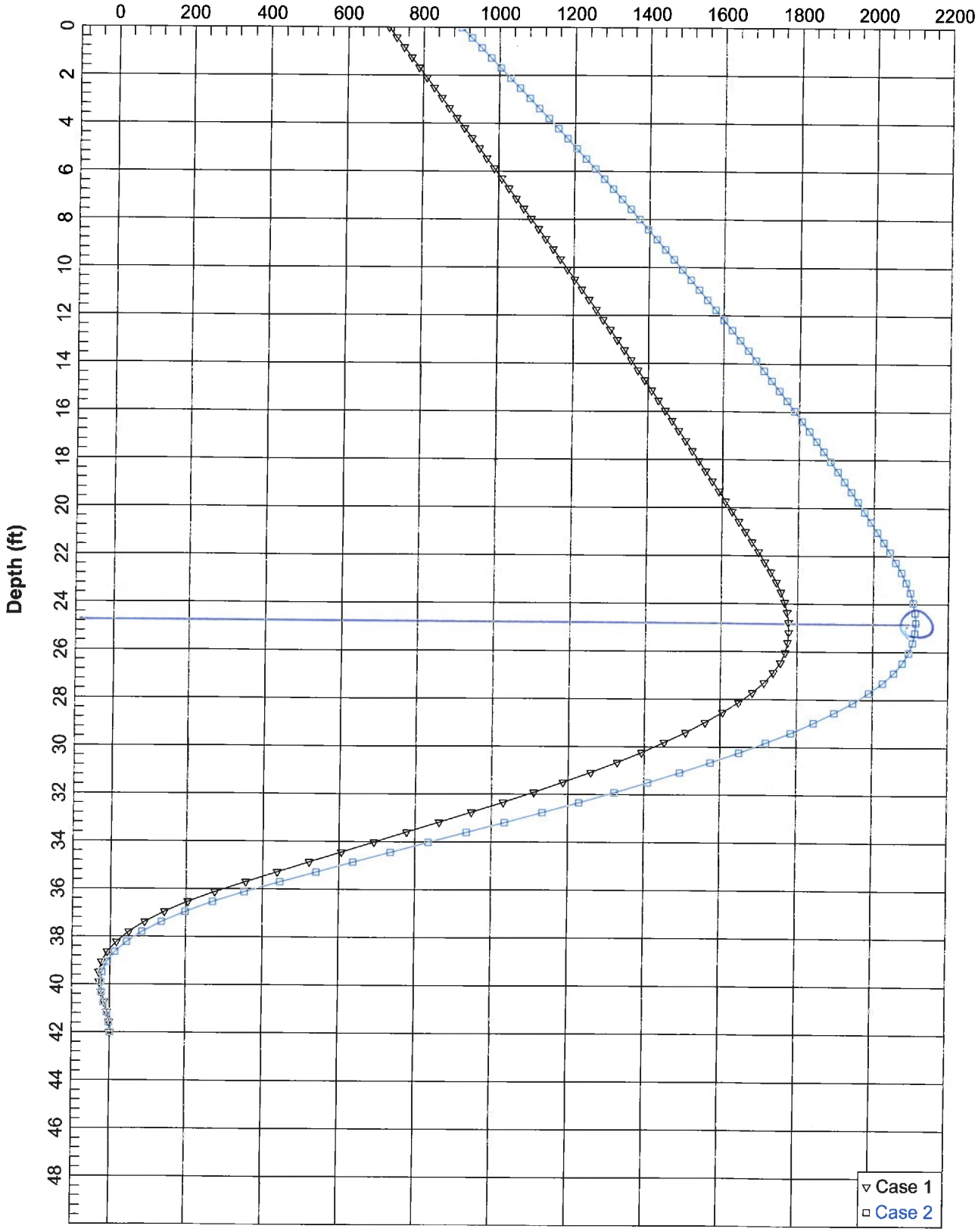
			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	36.8	36.05793		0.8	3.3	38.0	10.5	0.0	0.00	0
		0		0.0	3.3	38.0	10.5	0.0	0.00	0

Interior Bent 2 - 100 yr Scour - Strength - Max Longitudinal

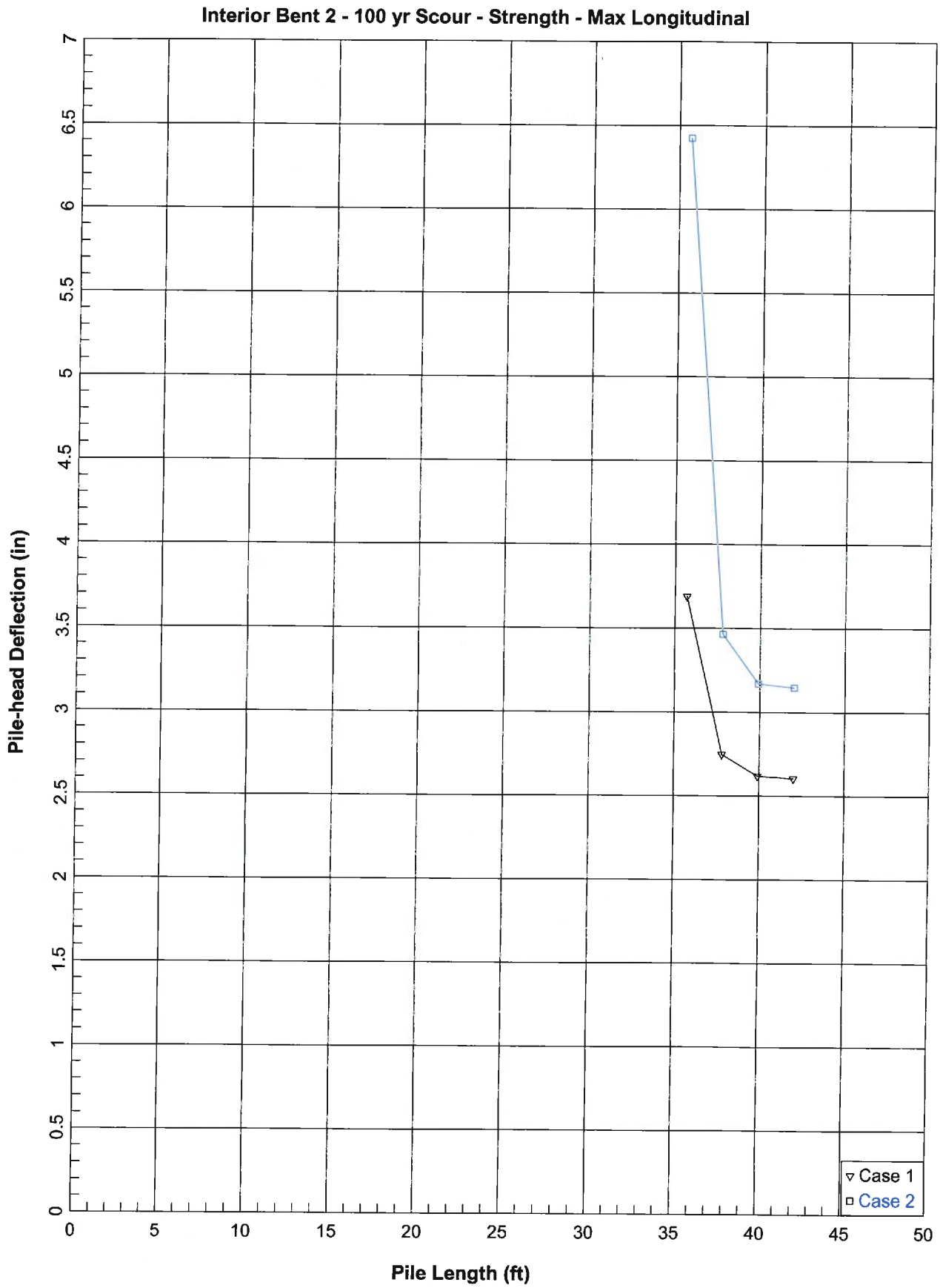
Lateral Deflection (inches)

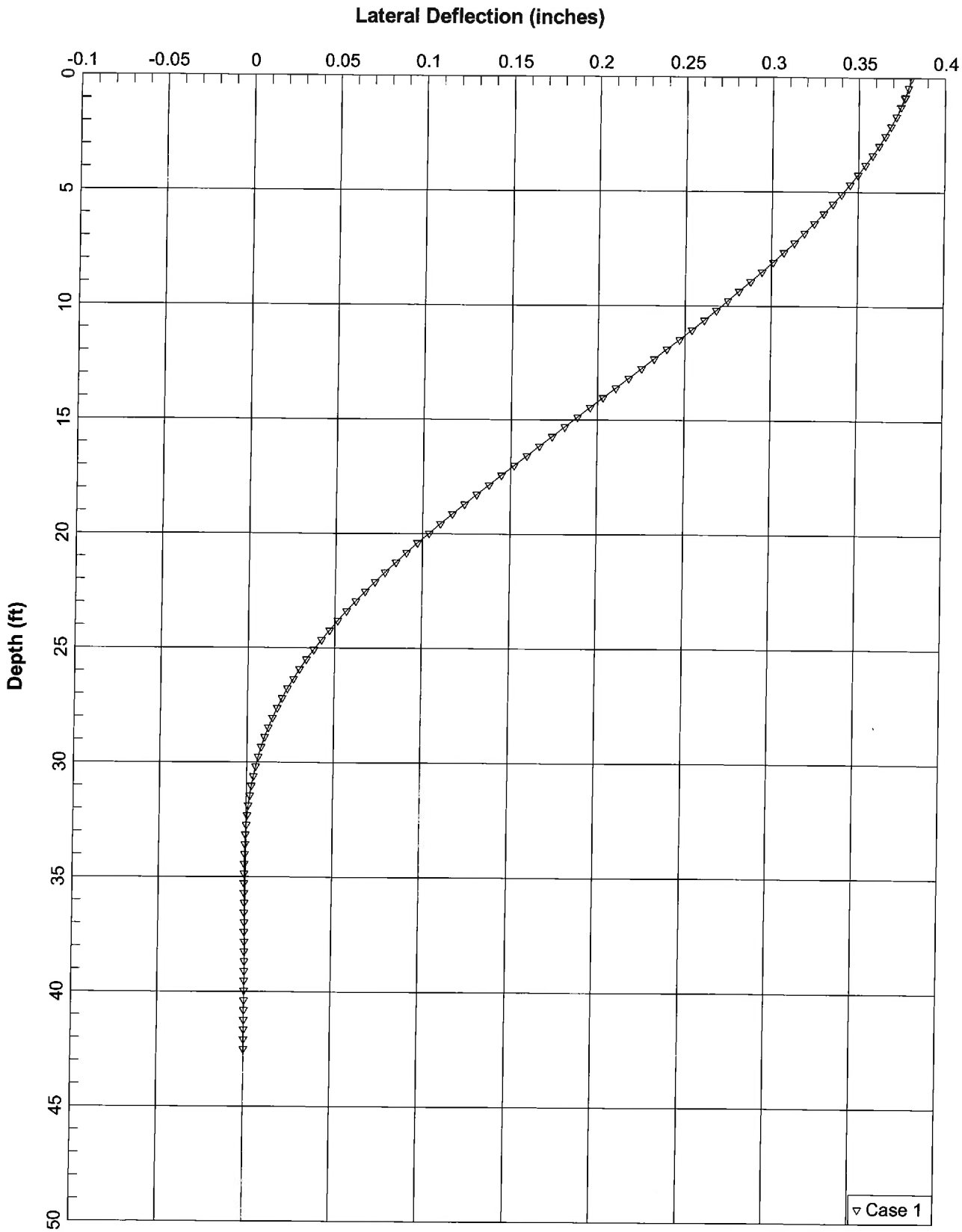


Interior Bent 2 - 100 yr Scour - Strength - Max Longitudinal Bending Moment (in-kips)

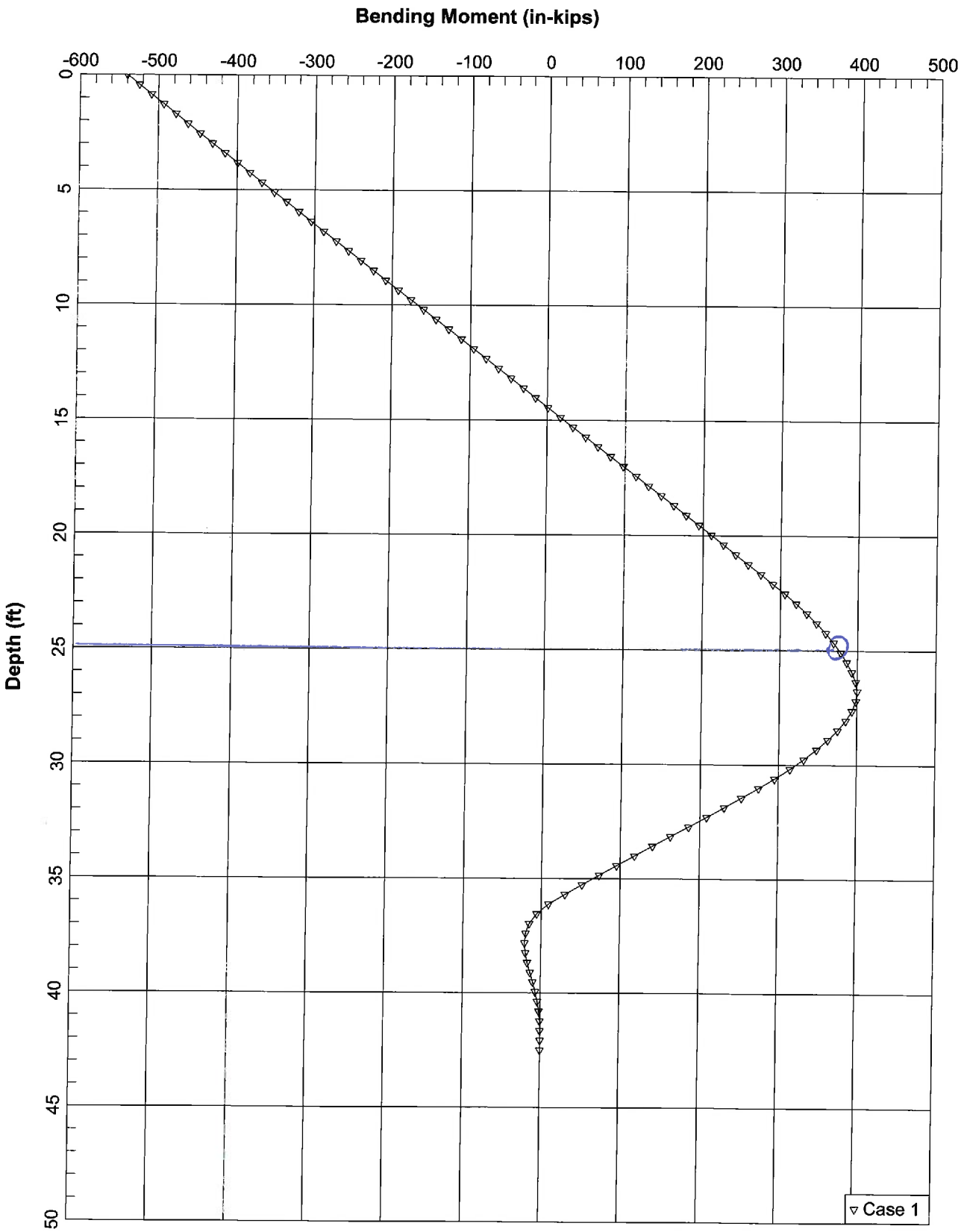


MOMENT = 176 K-FT


Interior Bent 2 - 100 yr Scour - Strength - Max Longitudinal
Pile-head Deflection (in)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
Pile Length (ft)
0
5
10
15
20
25
30
35
40
45
50
Case 1
Case 2



Interior Bent 2 - 100 yr Scour - Strength - Max Transverse



Interior Bent 2 - 100 yr Scour - Strength - Max Transverse

MOMENT = 31.5 K-FT

Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

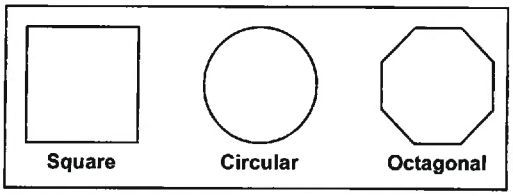
JOB: BLACK MINGO
SUBJECT: IB2
DES. BY: DKY DATE:D 2/15/16
CHK. BY: RAJ 2/16/16 ATE:

SHEET
OF

Prestressed Concrete Piling Design - Input

Pile Information:

Use Library Section or Enter Custom Properties



Section Type:	Square		
Solid/Hollow:	Solid		
Pile Size:	18.00	in.	
Void Diameter:		in.	
Chamfer:	0.75	in.	
Unsupported Length, ℓ =	21.5	ft	Unsupported Length of Pile for Slenderness Evaluation
k =	1.20		Effective Length Factor
Applied Dead Load =	111.0	kips	Applied Dead Load on Pile from Structure

Reinforcement:

Pretensioned Strands:

Diameter of Pretensioned Strands	=	0.5	in.	Typically, 0.5 in. dia.
Area of Strand, A_{ps}	=	0.153	in^2	
Strand Layout	=	Circular		
Number of Strands	=	9		
Strand Modulus, E_{ps}	=	28,000	ksi	
Strength of Strand, f_{pu}	=	270.0	ksi	Stress-Strain Information for 270 ksi only
Fraction of f_{pu} used for Initial Stress	=	0.75		
Initial Strand Stress, f_{po}	=	202.5	ksi	

Mild Reinforcement (Spiral/Ties):

Spiral or Ties	=	Spiral	
Wire or Bar Size	=	W6.0	
Wire or Bar Diameter	=	0.276	in.
Minimum Cover to Face of Spiral/Tie	=	2.25	in.

Concrete Properties:

Concrete Strength at Transfer, f'_{ci}	=	5.60	ksi	
Specified Concrete Strength f'_c	=	8.00	ksi	
Concrete Unit Weight, w_c	=	0.150	kcf	
Ambient Relative Humidity, H	=	75	%	(Used for Shrinkage Loss)
Concrete Ultimate Strain, ε_{cu}	=	0.003	in./in.	

Resistance Factors & Slenderness:

Resistance Factor for Flexure, ϕ_{Flex}	=	1.00
Resistance Factor for Compression, ϕ_{Comp}	=	0.75
Method used for Slenderness Calculations	=	Secant

Design Points (Optional):

P_u (kips)	225					
M_u (k-ft)	179					

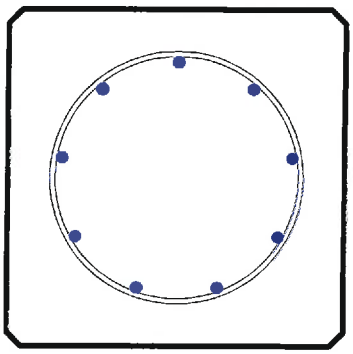
Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

JOB:
SUBJECT:
DES. BY: DATE:D
CHK. BY: ATE:

SHEET
OF

Prestressed Concrete Piling Design - Output

18 in. Solid Square Pile
9 - 0.5 in. Dia Strands with W6.0 Spiral



Gross Area, A	=	322.9 in^2	
Moment of Inertia, I	=	8,662 in^4	
Radius of Gyration, r	=	5.18 in.	
Unsupported Length, ℓ	=	21.5 ft	(Input)
Effective Length Factor,k	=	1.20	(Input)
$k\ell/r$	=	59.8	
Applied Dead Load	=	111.0 kips	(Input)
Concrete Unit Weight, w_c	=	0.150 kcf	(Input)
Ambient Relative Humidity, H	=	75 %	(Input)
Concrete Ultimate Strain, ε_{cu}	=	0.003 in./in.	(Input)
Concrete Strength at Transfer, f'_{ci}	=	5.60 ksi	(Input)
Specified Concrete Strength f'_c	=	8.00 ksi	(Input)
Strand Modulus, E_{ps}	=	28,000 ksi	(Input)
Area of Strand, A_{ps}	=	0.153 in^2	(Input)
Strength of Strand, f_{pu}	=	270 ksi	(Input)

Prestress Loss and Effective Stresses:

Initial Strand Stress, f_{po}	=	202.5 ksi	(Input)
Initial Loss, Δf_{pIL}	=	3.7 ksi	
Effective Stress in Strands after Transfer, f_{pi}	=	198.8 ksi	
Effective Prestress Force in Strands after Transfer, F_{pi}	=	273.7 kips	
Total Loss, Δf_{pTL}	=	26.0 ksi	
Effective Stress in Strands after All Losses, f_{pe}	=	176.5 ksi	
Effective Prestress Force in Strands after All Losses, F_{pe}	=	243.0 kips	

Effective Prestress in Concrete:

Effective Prestress in Concrete Pile, f_{pc}	=	0.753 ksi	= F_{pe}/A

FOR PLANS

Concrete Cover:

Concrete Cover to Spiral	=	2.25 in.	(Input)
Concrete Cover to Strands	=	2.53 in.	

Design Points as Input:

	Axial Load (kips)	Moment (k-ft)	Max. Moment w/ Slenderness (k-ft)
1	225	179	183.3
2	0	0	215.6
3	0	0	215.6
4	0	0	215.6
5	0	0	215.6
6	0	0	215.6

Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

JOB:
SUBJECT:
DES. BY: DATE:D
CHK. BY: ATE:

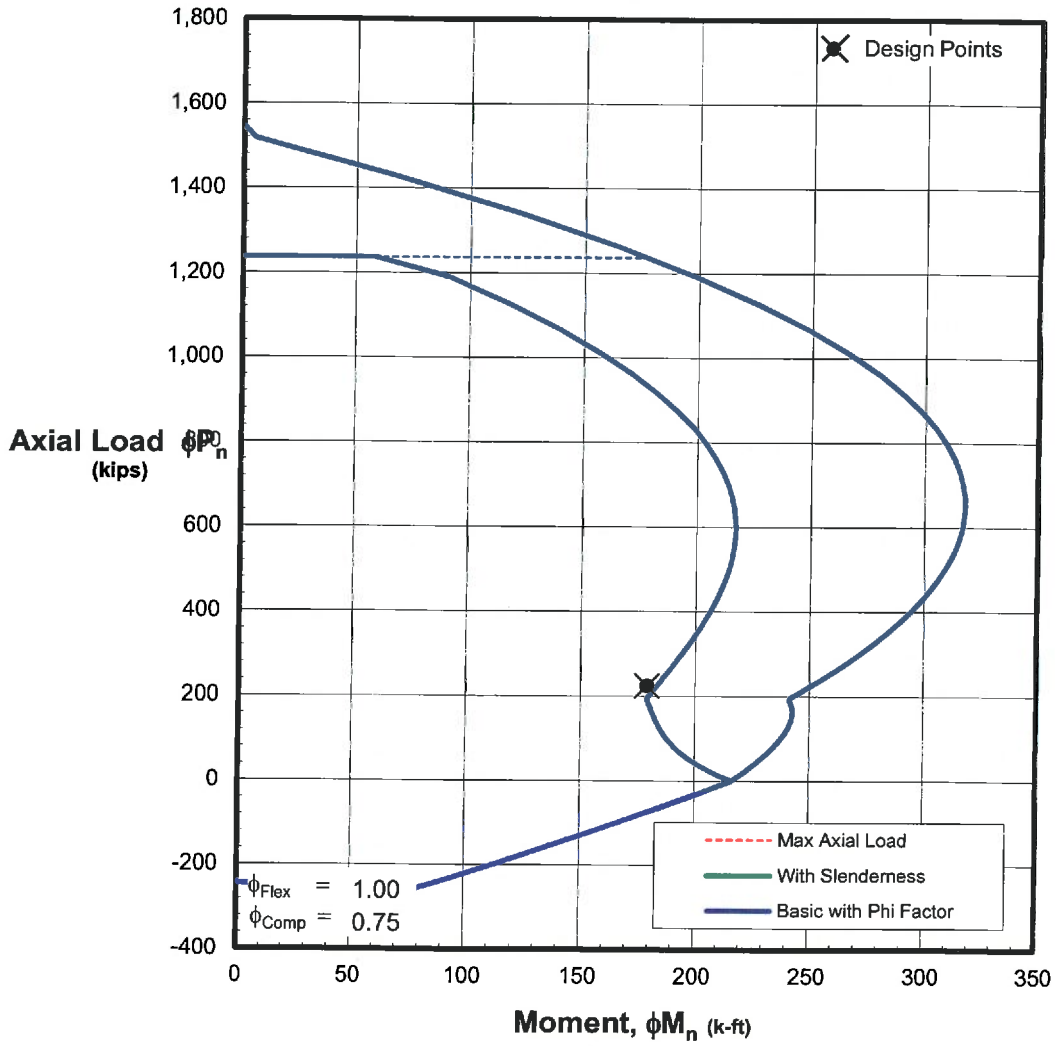
SHEET
OF

Prestressed Concrete Piling Interaction Diagram

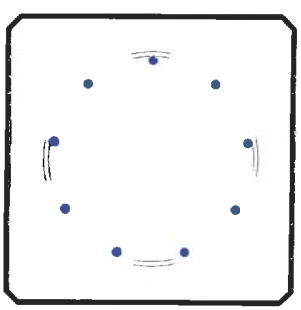
18 in. Solid Square Pile

9 - 0.5 in. Dia. Strands f'c= 8 ksi

Secant Method for Slenderness, kl/r = 59.8



Cross-Section



Key Points on Basic Interaction Diagram including ϕ Factors:

	Axial Load, ϕP_n (kips)	Moment, ϕM_n (k-ft)
Pure Compression	1545.4	0.0
Maximum Axial Load	1236.3	176.7
Maximum Moment*	643.6	317.6
ϕ Break Point	193.7	240.6
Pure Bending	0.0	216.3
Maximum Tension	-263.5	74.2
Pure Tension	-243.0	0.0

* Based on point of maximum moment before ϕ factors are applied

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Interior Bent 3

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

PROJECT DATA
==========

Project : S-51 over Black Mingo Creek
User Job No.:
Designer : DKY
Date : 2/15/16
Checker : RAJ 2/16/16 Pages 1 thru 28
Checked Date:
State : SC State Job No. :
Structure type: Pier.
Pier View : Upstation.
Code : AASHTO LRFD (2013-Interims)
Comments : S-51 over Black Mingo Creek

Interior Bent 3

100 yr Scour

Cap Length = 39'-0"

12 - Adjacent Cored Slab Units

7 - 18" square prestressed piles at 5'-6" spacing

PIER GEOMETRY
==========

Pier Type: Multi Column

Pier View : Upstation.
Cap Shape: Straight Top Elevations: start = 26.40 ft end = 25.10 ft
Depth(Z) = 38.00 in Skew angle = 0.00 Reduction of I = 1.000
Length(X) = 39.00 ft Height(Y) = 36.00 in

Column Shape : Rectangular
Number of columns: 7

Column number 1:

Location from the left edge of the cap(X): 3.00 ft
Elevations: bottom = -3.00 ft top = 24.80 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 2:

Location from the left edge of the cap(X): 8.50 ft
Elevations: bottom = -3.00 ft top = 24.62 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 3:

Location from the left edge of the cap(X): 14.00 ft
Elevations: bottom = -3.00 ft top = 24.43 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 4:

Location from the left edge of the cap(X): 19.50 ft
Elevations: bottom = -3.00 ft top = 24.25 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 5:

Location from the left edge of the cap(X): 25.00 ft
Elevations: bottom = -3.00 ft top = 24.07 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 6:

Location from the left edge of the cap(X): 30.50 ft
Elevations: bottom = -3.00 ft top = 23.88 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

Column number 7:

Location from the left edge of the cap(X): 36.00 ft
Elevations: bottom = -3.00 ft top = 23.70 ft Reduction of I = 1.000

Column Bottom is Fixed

Column section dimensions:
Width(X) = 18.00 in Depth(Z) = 18.00 in

SUPERSTRUCTURE INFO

Total number of spans: 3 Span number rear to current pier: 2
Number of traffic lanes: 2

Beam: height : 24.00 in section area : 637.80 in^2
Beam Inertia (Ixx): 39436.00 in^4 Beam inertia (Iyy): 76800.00 in^4
Beam CG:12.00 in Barrier height : 32.00 in Depth of slab : 2.00 in
Curb to curb distance: 32.833 ft

Span #	Span length	Bridge Width
1	37.500 ft	36.000 ft
2	70.000 ft	36.000 ft
3	56.500 ft	36.000 ft
		36.000 ft

BEARING POINTS

Number of bearing lines: 2

First bearing line Eccentricity = 0.56 ft

Point	Distance ft
1	3.00
2	6.00
3	9.00
4	12.00
5	15.00
6	18.00
7	21.00
8	24.00
9	27.00
10	30.00
11	33.00
12	36.00

Second bearing line Eccentricity = -0.56 ft

Point	Distance ft
1	3.00
2	6.00
3	9.00
4	12.00
5	15.00
6	18.00
7	21.00
8	24.00
9	27.00
10	30.00
11	33.00

```
                 12            36.00


MATERIAL PROPERTIES
===================

                                 Cap          Column      Footing
                          ----------------------------------------
   Concrete Type                 normal       normal       normal
   Concrete Strength  (psi)     4000.00      6000.00      4000.00
   Concrete Density (lb/ft3)     150.00       150.00       150.00
   Concrete Modulus Ec  (ksi)   3834.30      4695.98      3834.30
   Steel Strength Fy  (ksi)       60.00        60.00        60.00


DESIGN PARAMETERS
=================

   AASHTO LRFD Code
      Resistance factors for reinf. concrete:
         Flexure and tension           0.90
         Shear and torsion (normal)    0.90
                     (lightweight)     0.70
         Axial compression (ties)      0.75
         Axial compression (spiral)    0.75
         Compression in STM            0.70

      Multi presence factors for live load:
                           1  Lanes         1.20
                           2  Lanes         1.00
                           3  Lanes         0.85
                           4  Lanes         0.65
                           5  Lanes         0.65
                           6  Lanes         0.65
      Dynamic load allowance IM:
                     Truck     Lane    Fatigue
         ------------------------------------
         Cap          0.33     0.00      0.15
         Column       0.33     0.00      0.15
         Footing      0.00     0.00      0.00

                   Exposure factors      Clear cover      Clear side cover
                                           in                  in
         ------------------------------------------------------------------
         Cap              1.00              2.00                   2.00
         Column           1.00              2.00
         Footing          1.00              3.00                   3.00

      Degree of fixity in foundations for Moment Magnify Method: Ga =  5.00


SEISMIC DESIGN PARAMETERS
=========================

      Strength Reduction factors for reinf. Concrete Seismic Design:
         Tension controlled                :   0.90
         Shear and torsion (normal)        :   0.90
                     (lightweight)         :   0.70
         Compression Controlled ( ties   ):   0.75
         Compression Controlled ( spiral  ) :   0.75
      Seismic Overstrength
         Flexure and tension          :   1.30
         Axial compression ( ties   ):   1.30
         Axial compression ( spiral ):   1.30
      Response Modification Factor    :   1.00
      Use core area for plastic hinging calculations.
      Design Factors
         Cap Design Factor            :   1.20
         Footing Design Factor        :   1.20
      Plastic Hinge Moment
```

Use actual computed Plastic Hinging Moment for each column in all combinations.

LOADS
=====

Pier View : Upstation.
Load Cases: 133

Loadcase ID: DC1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Force	Y	0.00	-0.25	0.00	----	----
Force	Y	0.00	-0.25	1.00	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-28.80
1	2	Y	-28.80
1	3	Y	-28.80
1	4	Y	-28.80
1	5	Y	-28.80
1	6	Y	-28.80
1	7	Y	-28.80
1	8	Y	-28.80
1	9	Y	-28.80
1	10	Y	-28.80
1	11	Y	-28.80
1	12	Y	-28.80
2	1	Y	-23.90
2	2	Y	-23.90
2	3	Y	-23.90
2	4	Y	-23.90
2	5	Y	-23.90
2	6	Y	-23.90
2	7	Y	-23.90
2	8	Y	-23.90
2	9	Y	-23.90
2	10	Y	-23.90
2	11	Y	-23.90
2	12	Y	-23.90

Loadcase ID: DW1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-1.40
1	2	Y	-1.40
1	3	Y	-1.40
1	4	Y	-1.40
1	5	Y	-1.40
1	6	Y	-1.40
1	7	Y	-1.40
1	8	Y	-1.40
1	9	Y	-1.40
1	10	Y	-1.40
1	11	Y	-1.40
1	12	Y	-1.40
2	1	Y	-1.20
2	2	Y	-1.20
2	3	Y	-1.20
2	4	Y	-1.20

2	5	Y	-1.20
2	6	Y	-1.20
2	7	Y	-1.20
2	8	Y	-1.20
2	9	Y	-1.20
2	10	Y	-1.20
2	11	Y	-1.20
2	12	Y	-1.20

Loadcase ID: WA1 Name:
Multiplier = 1.000

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
1	UDL	X	-0.050	klf	0.13	----	0.98
2	UDL	X	-0.050	klf	0.13	----	0.98
3	UDL	X	-0.050	klf	0.13	----	0.98
4	UDL	X	-0.050	klf	0.13	----	0.98
5	UDL	X	-0.050	klf	0.13	----	0.98
6	UDL	X	-0.050	klf	0.13	----	0.98
7	UDL	X	-0.050	klf	0.13	----	0.98

Loadcase ID: WS1 Name: Angle: 0
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Force	X	0.00	-0.38	0.50	----	----

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
7	UDL	X	-0.060	klf	0.99	----	0.94
6	UDL	X	-0.060	klf	0.99	----	0.94
5	UDL	X	-0.060	klf	0.98	----	0.94
4	UDL	X	-0.060	klf	0.97	----	0.94
3	UDL	X	-0.060	klf	0.97	----	0.95
2	UDL	X	-0.060	klf	0.96	----	0.95
1	UDL	X	-0.060	klf	0.95	----	0.95

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	Y	-5.39
1	1	X	-0.70
1	2	X	-0.70
1	2	Z	0.00
1	2	Y	2.10
1	3	Z	0.00
1	3	Y	2.10
1	3	X	-0.70
1	4	Z	0.00
1	4	Y	2.10
1	4	X	-0.70
1	5	Z	0.00
1	5	Y	2.10
1	5	X	-0.70
1	6	X	-0.70
1	6	Y	2.10
1	6	Z	-0.00
1	7	Z	0.00
1	7	Y	2.10
1	7	X	-0.70
1	8	Z	0.00

1	8	Y	2.10
1	8	X	-0.70
1	9	Z	0.00
1	9	Y	2.10
1	9	X	-0.70
1	10	Z	0.00
1	10	Y	2.10
1	10	X	-0.70
1	11	Z	0.00
1	11	Y	2.10
1	11	X	-0.70
1	12	Y	9.59
1	12	Z	0.00
1	12	X	-0.70
2	1	Z	0.00
2	1	Y	-4.35
2	1	X	-0.57
2	2	X	-0.57
2	2	Z	0.00
2	2	Y	1.70
2	3	Z	0.00
2	3	Y	1.70
2	3	X	-0.57
2	4	Z	0.00
2	4	Y	1.70
2	4	X	-0.57
2	5	Z	0.00
2	5	Y	1.70
2	5	X	-0.57
2	6	X	-0.57
2	6	Y	1.70
2	6	Z	-0.00
2	7	Z	0.00
2	7	Y	1.70
2	7	X	-0.57
2	8	Z	0.00
2	8	Y	1.70
2	8	X	-0.57
2	9	Z	0.00
2	9	Y	1.70
2	9	X	-0.57
2	10	Z	0.00
2	10	Y	1.70
2	10	X	-0.57
2	11	Z	0.00
2	11	Y	1.70
2	11	X	-0.57
2	12	Y	7.74
2	12	Z	0.00
2	12	X	-0.57

Auto generation details
Generated Wind Load on Structure
Angle of wind = 0.00 deg Elevation above which wind load acts = 23.50 ft
Default wind pressure

Wind pressure for superstructure:		Wind pressure for substructure:	
Transverse	50.000 psf	Cap	40.000 psf
Longitudinal	0.000 psf	Column	40.000 psf
Overturning	20.000 psf		

Loadcase ID: WL1 Name: Angle: 0
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	X	-0.29
1	1	Y	-0.87

1	2	Y	-0.00
1	2	X	-0.29
1	2	Z	0.00
1	3	Z	0.00
1	3	Y	-0.00
1	3	X	-0.29
1	4	Z	0.00
1	4	Y	-0.00
1	4	X	-0.29
1	5	Z	0.00
1	5	Y	-0.00
1	5	X	-0.29
1	6	Z	-0.00
1	6	Y	-0.00
1	6	X	-0.29
1	7	X	-0.29
1	7	Y	-0.00
1	7	Z	0.00
1	8	Z	0.00
1	8	Y	-0.00
1	8	X	-0.29
1	9	Z	0.00
1	9	Y	-0.00
1	9	X	-0.29
1	10	Z	0.00
1	10	Y	-0.00
1	10	X	-0.29
1	11	Y	-0.00
1	11	X	-0.29
1	11	Z	0.00
1	12	Z	0.00
1	12	Y	0.87
1	12	X	-0.29
2	1	Z	0.00
2	1	X	-0.24
2	1	Y	-0.70
2	2	Y	-0.00
2	2	X	-0.24
2	2	Z	0.00
2	3	Z	0.00
2	3	Y	-0.00
2	3	X	-0.24
2	4	Z	0.00
2	4	Y	-0.00
2	4	X	-0.24
2	5	Z	0.00
2	5	Y	-0.00
2	5	X	-0.24
2	6	Z	-0.00
2	6	Y	-0.00
2	6	X	-0.24
2	7	X	-0.24
2	7	Y	-0.00
2	7	Z	0.00
2	8	Z	0.00
2	8	Y	-0.00
2	8	X	-0.24
2	9	Z	0.00
2	9	Y	-0.00
2	9	X	-0.24
2	10	Z	0.00
2	10	Y	-0.00
2	10	X	-0.24
2	11	Y	-0.00
2	11	X	-0.24
2	11	Z	0.00
2	12	Z	0.00
2	12	Y	0.70
2	12	X	-0.24

Auto generation details
Generated Wind Load on Live Load
Angle of wind = 0.00 deg Live load length = 63.25 ft

Loadcase ID: TU1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	-0.00
1	1	Z	-0.02
1	2	X	-0.00
1	2	Z	-0.02
1	3	X	-0.00
1	3	Z	-0.02
1	4	X	-0.00
1	4	Z	-0.02
1	5	X	-0.00
1	5	Z	-0.02
1	6	X	-0.00
1	6	Z	-0.02
1	7	X	-0.00
1	7	Z	-0.02
1	8	X	-0.00
1	8	Z	-0.02
1	9	X	-0.00
1	9	Z	-0.02
1	10	X	-0.00
1	10	Z	-0.02
1	11	X	-0.00
1	11	Z	-0.02
1	12	X	-0.00
1	12	Z	-0.02
2	1	X	-0.00
2	1	Z	-0.02
2	2	X	-0.00
2	2	Z	-0.02
2	3	X	-0.00
2	3	Z	-0.02
2	4	X	-0.00
2	4	Z	-0.02
2	5	X	-0.00
2	5	Z	-0.02
2	6	X	-0.00
2	6	Z	-0.02
2	7	X	-0.00
2	7	Z	-0.02
2	8	X	-0.00
2	8	Z	-0.02
2	9	X	-0.00
2	9	Z	-0.02
2	10	X	-0.00
2	10	Z	-0.02
2	11	X	-0.00
2	11	Z	-0.02
2	12	X	-0.00
2	12	Z	-0.02

Auto generation details

Bearing type: Fixed Bearings.

Direction of thermal force: +(Z)

Length of Superstructure Contributing, L: 6.750 ft
Change in temperature: 40.000 °F

Coefficient of thermal expansion: 6.0e-006 ft/°F

Loadcase ID: TU2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	0.00
1	1	Z	0.02
1	2	X	0.00
1	2	Z	0.02
1	3	X	0.00
1	3	Z	0.02
1	4	X	0.00
1	4	Z	0.02
1	5	X	0.00
1	5	Z	0.02
1	6	X	0.00
1	6	Z	0.02
1	7	X	0.00
1	7	Z	0.02
1	8	X	0.00
1	8	Z	0.02
1	9	X	0.00
1	9	Z	0.02
1	10	X	0.00
1	10	Z	0.02
1	11	X	0.00
1	11	Z	0.02
1	12	X	0.00
1	12	Z	0.02
2	1	X	0.00
2	1	Z	0.02
2	2	X	0.00
2	2	Z	0.02
2	3	X	0.00
2	3	Z	0.02
2	4	X	0.00
2	4	Z	0.02
2	5	X	0.00
2	5	Z	0.02
2	6	X	0.00
2	6	Z	0.02
2	7	X	0.00
2	7	Z	0.02
2	8	X	0.00
2	8	Z	0.02
2	9	X	0.00
2	9	Z	0.02
2	10	X	0.00
2	10	Z	0.02
2	11	X	0.00
2	11	Z	0.02
2	12	X	0.00
2	12	Z	0.02

Auto generation details

Bearing type: Fixed Bearings.

Direction of thermal force: -(Z)

Length of Superstructure Contributing, L: 6.750 ft
Change in temperature: 50.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

5 LL Cases shown for Brevity

Loadcase ID: LL1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	-10.88
1	10	Y	-4.79
1	11	Y	-10.88
1	12	Y	-4.79
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	-15.84
2	10	Y	-6.97
2	11	Y	-15.84
2	12	Y	-6.97
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	-0.53
1	9	Y	-6.42
1	10	Y	-8.06
1	11	Y	-8.06
1	12	Y	-3.81
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	-0.42
2	9	Y	-5.18
2	10	Y	-6.51
2	11	Y	-6.51
2	12	Y	-3.08

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-10.40
1	5	Y	-20.80
1	6	Y	-10.40
1	7	Y	-20.80
1	8	Y	-31.20
1	9	Y	0.00
1	10	Y	-31.20
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-3.36
1	5	Y	-6.72
1	6	Y	-6.72
1	7	Y	-6.72
1	8	Y	-6.72
1	9	Y	-6.72
1	10	Y	-6.35
1	11	Y	-1.49
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	0.00
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL3 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-15.67
1	3	Y	0.00
1	4	Y	-15.67
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	-22.81
2	3	Y	0.00
2	4	Y	-22.81
2	5	Y	0.00
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	-1.79
1	2	Y	-7.62
1	3	Y	-8.06
1	4	Y	-7.62
1	5	Y	-1.79
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	-1.45
2	2	Y	-6.15
2	3	Y	-6.51
2	4	Y	-6.15
2	5	Y	-1.45
2	6	Y	0.00
2	7	Y	0.00
2	8	Y	0.00
2	9	Y	0.00

2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL4 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-4.35
1	3	Y	-8.70
1	4	Y	-4.35
1	5	Y	-8.70
1	6	Y	-13.06
1	7	Y	0.00
1	8	Y	-13.06
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	-6.34
2	3	Y	-12.67
2	4	Y	-6.34
2	5	Y	-12.67
2	6	Y	-19.01
2	7	Y	0.00
2	8	Y	-19.01
2	9	Y	0.00
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	-3.36
1	3	Y	-6.72
1	4	Y	-6.72
1	5	Y	-6.72
1	6	Y	-6.72
1	7	Y	-6.72
1	8	Y	-6.35
1	9	Y	-1.49
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00

2	2	Y	-2.71
2	3	Y	-5.42
2	4	Y	-5.42
2	5	Y	-5.42
2	6	Y	-5.42
2	7	Y	-5.42
2	8	Y	-5.12
2	9	Y	-1.21
2	10	Y	0.00
2	11	Y	0.00
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

Loadcase ID: LL5 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	-10.02
2	5	Y	-20.04
2	6	Y	-10.02
2	7	Y	-20.04
2	8	Y	-30.05
2	9	Y	0.00
2	10	Y	-30.05
2	11	Y	0.00
2	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00

1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
2	1	Y	0.00
2	2	Y	0.00
2	3	Y	0.00
2	4	Y	-2.71
2	5	Y	-5.42
2	6	Y	-5.42
2	7	Y	-5.42
2	8	Y	-5.42
2	9	Y	-5.42
2	10	Y	-5.12
2	11	Y	-1.21
2	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 36
Total number of Possible Combination = 512

5 BR cases shown for Brevity

Loadcase ID: BR1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.23
1	2	Z	-0.23
1	3	Z	-0.23
1	4	Z	-0.23
1	5	Z	-0.23
1	6	Z	-0.23
1	7	Z	-0.23
1	8	Z	-0.23
1	9	Z	-0.23
1	10	Z	-0.23
1	11	Z	-0.23
1	12	Z	-0.23

2	1	Z	-0.23
2	2	Z	-0.23
2	3	Z	-0.23
2	4	Z	-0.23
2	5	Z	-0.23
2	6	Z	-0.23
2	7	Z	-0.23
2	8	Z	-0.23
2	9	Z	-0.23
2	10	Z	-0.23
2	11	Z	-0.23
2	12	Z	-0.23

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR2 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38
2	9	Z	-0.38
2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR3 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L

Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.23
1	2	Z	-0.23
1	3	Z	-0.23
1	4	Z	-0.23
1	5	Z	-0.23
1	6	Z	-0.23
1	7	Z	-0.23
1	8	Z	-0.23
1	9	Z	-0.23
1	10	Z	-0.23
1	11	Z	-0.23
1	12	Z	-0.23
2	1	Z	-0.23
2	2	Z	-0.23
2	3	Z	-0.23
2	4	Z	-0.23
2	5	Z	-0.23
2	6	Z	-0.23
2	7	Z	-0.23
2	8	Z	-0.23
2	9	Z	-0.23
2	10	Z	-0.23
2	11	Z	-0.23
2	12	Z	-0.23

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR4 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38

2	9	Z	-0.38
2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR5 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.38
1	2	Z	-0.38
1	3	Z	-0.38
1	4	Z	-0.38
1	5	Z	-0.38
1	6	Z	-0.38
1	7	Z	-0.38
1	8	Z	-0.38
1	9	Z	-0.38
1	10	Z	-0.38
1	11	Z	-0.38
1	12	Z	-0.38
2	1	Z	-0.38
2	2	Z	-0.38
2	3	Z	-0.38
2	4	Z	-0.38
2	5	Z	-0.38
2	6	Z	-0.38
2	7	Z	-0.38
2	8	Z	-0.38
2	9	Z	-0.38
2	10	Z	-0.38
2	11	Z	-0.38
2	12	Z	-0.38

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Selected load groups:

STRENGTH GROUP I
STRENGTH GROUP III
STRENGTH GROUP V
SERVICE GROUP I

CAP DESIGN
==========

Code: AASHTO LRFD (2013-Interims)
Units: US
Pier View : Upstation.

DESIGN PARAMETERS:
==========

f'c = 4000.0 psi
Fy flex = 60000.0 psi Fy shear = 60000.0 psi
phi tens = 0.90 phi comp = 0.75 phi shear = 0.90
Tens above = 0.005 Comp below = 0.002
Ec = 3834.3 ksi Es = 29000.0 ksi
Crack check as per current LRFD
Crack control Exposure = 1.00
Concrete Type : Normal Weight.
Design : face of column.

CAP GEOMETRY:
==========

Straight Cap : Length(X) = 39.00 ft Depth(Z) = 38.00 in

Cap Section Properties:
==========

Sec.	Area ft ^2	Iz in ^4	Iy in ^4
1	9.50	147744.00	164616.00

MAIN REINFORCEMENT:
==========

	Bar size	Quantity	Bar dist. in	As total in^2	From ft	To ft	Hook
TOP							
	US#10 [M32]	4	3.26	5.080	0.17	38.83	None
BOTTOM							
	US#10 [M32]	4	3.26	5.080	0.17	38.83	None

STIRRUPS:
==========

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft	Bar Type
0.25	38.75	US#5 [M16]	2	6.00	1.24	Stirrup

Clear Cover on Sides = 2.00 in

FLEXURE DESIGN:
==========

Span 1: From 0.00 ft To 3.00 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2

```
-----------------------------------------------------------------------------------------------------------------------------------
-------------------------
 2.3   2.3   36     0.0   400.3     0  T   2.65  32.74  0.034  0.90      0.63     5.08     2.67
0.63     5.08     5.08
                   -5.2  -298.1     1  T   2.51  32.74  0.036  0.90      0.63     5.08     5.08
0.63     5.08     1.90
```

Span 2: From 3.00 ft To 8.50 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.8   3.8   36    63.1   657.0  2303  T   2.91  32.74  0.031  0.90      0.63     5.08     4.59
0.63     5.08     5.08
                  -33.9  -481.2  2041  T   2.65  32.74  0.034  0.90      0.63     5.08     5.08
0.63     5.08     3.28
 3.0   6.0   36   275.5   723.3     3  T   3.05  32.74  0.029  0.90      2.53     5.08     5.08
0.63     5.08     5.08
                    0.0  -723.3     0  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8   7.8   36   126.2   723.3    61  T   3.05  32.74  0.029  0.90      1.15     5.08     5.08
0.63     5.08     5.08
                  -39.6  -723.3  1571  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
```

Span 3: From 8.50 ft To 14.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.8   9.3   36   194.4   723.3    20  T   3.05  32.74  0.029  0.90      1.78     5.08     5.08
0.63     5.08     5.08
                  -53.9  -723.3  5097  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 3.5  12.0   36   264.9   723.3    42  T   3.05  32.74  0.029  0.90      2.43     5.08     5.08
0.63     5.08     5.08
                  -18.6  -723.3  1552  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  13.3   36   124.9   723.3  1554  T   3.05  32.74  0.029  0.90      1.14     5.08     5.08
0.63     5.08     5.08
                  -78.7  -723.3    40  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.71     5.08     5.08
```

Span 4: From 14.00 ft To 19.50 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.8  14.8   36   150.1   723.3    20  T   3.05  32.74  0.029  0.90      1.37     5.08     5.08
0.63     5.08     5.08
                  -69.4  -723.3  1534  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
```

```
 1.0  15.0   36   190.3   723.3    18  T   3.05  32.74  0.029  0.90      1.74     5.08     5.08
0.63     5.08     5.08
                  -54.6  -723.3  1534  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.0  18.0   36   215.6   723.3    42  T   3.05  32.74  0.029  0.90      1.97     5.08     5.08
0.63     5.08     5.08
                  -75.5  -723.3  1561  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.68     5.08     5.08
 4.8  18.8   36   121.5   723.3  1537  T   3.05  32.74  0.029  0.90      1.11     5.08     5.08
0.63     5.08     5.08
                 -130.4  -723.3    49  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
1.19     5.08     5.08
```

Span 5: From 19.50 ft To 25.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  20.3   36   116.8   723.3  1530  T   3.05  32.74  0.029  0.90      1.06     5.08     5.08
0.63     5.08     5.08
                 -136.4  -723.3    14  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
1.24     5.08     5.08
 1.5  21.0   36   213.2   723.3    40  T   3.05  32.74  0.029  0.90      1.95     5.08     5.08
0.63     5.08     5.08
                  -83.4  -723.3  1526  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.76     5.08     5.08
 4.5  24.0   36   193.2   723.3    25  T   3.05  32.74  0.029  0.90      1.77     5.08     5.08
0.63     5.08     5.08
                  -59.6  -723.3  1556  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  24.3   36   154.5   723.3    22  T   3.05  32.74  0.029  0.90      1.41     5.08     5.08
0.63     5.08     5.08
                  -71.6  -723.3  1556  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.65     5.08     5.08
```

Span 6: From 25.00 ft To 30.50 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  25.8   36   120.1   723.3  1552  T   3.05  32.74  0.029  0.90      1.09     5.08     5.08
0.63     5.08     5.08
                  -83.2  -723.3    42  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.76     5.08     5.08
 2.0  27.0   36   262.9   723.3    40  T   3.05  32.74  0.029  0.90      2.41     5.08     5.08
0.63     5.08     5.08
                  -19.5  -723.3  1554  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  29.8   36   199.3   723.3    22  T   3.05  32.74  0.029  0.90      1.82     5.08     5.08
0.63     5.08     5.08
                  -47.0  -723.3  5342  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
```

Span 7: From 30.50 ft To 36.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
```

```
                    Mmin     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                 in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  31.3   36   123.9    723.3    39  T   3.05  32.74  0.029  0.90      1.13     5.08     5.08
0.63     5.08     5.08
                  -43.1   -723.3  1516  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 2.5  33.0   36   261.2    723.3    16  T   3.05  32.74  0.029  0.90      2.40     5.08     5.08
0.63     5.08     5.08
                    0.0   -723.3     0  T   3.05  32.74  0.029  0.90      0.63     5.08     5.08
0.63     5.08     5.08
 4.8  35.3   36    69.2    657.0  2064  T   2.91  32.74  0.031  0.90      0.63     5.08     4.59
0.63     5.08     5.08
                  -24.6   -481.2  2043  T   2.65  32.74  0.034  0.90      0.63     5.08     5.08
0.63     5.08     3.28
```

Span 8: From 36.00 ft To 39.00 ft

```
 Loc  AbsLoc  H    Mmax     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                    Mmin     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                 in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.8  36.8   36     0.0    400.3     0  T   2.65  32.74  0.034  0.90      0.63     5.08     2.67
0.63     5.08     5.08
                    -5.2   -298.1     1  T   2.51  32.74  0.036  0.90      0.63     5.08     5.08
0.63     5.08     1.90
```

Note:
CL: Section classification as per LRFD 2006 interims for provided reinforcement.
C = Compression controlled, I = In-Transition, T = Tension controlled.

SHEAR AND TORSION DESIGN:
==========
Simplified Method used for design.

Span 1: From 0.00 ft To 3.00 ft

```
  Loc  AbsLoc Pos   Vu   Comb    Tu   Comb phi*Vn   T-lim   Avs/s 2Ats/s  Av/s    Aprv/s   Alx
   ft     ft       kips       kips-ft       kips   kips-ft <--------- in^2/ft -------->    in^2
-------------------------------------------------------------------------------------------------
  2.25   2.25 L     4.3    1     0.0    0   313.2     59.3   0.00   0.00   0.00     1.24     0.00

  Loc  AbsLoc Pos    Vc      Vs    Beta   Theta      b   dv   Esp_s
   ft     ft        kips    kips          deg       in   in
-------------------------------------------------------------------
  2.25   2.25 L    151.96  196.01   2.00  45.00  38.00  31.62  0.0000
```

Span 2: From 3.00 ft To 8.50 ft

```
  Loc  AbsLoc Pos   Vu   Comb    Tu   Comb phi*Vn   T-lim   Avs/s 2Ats/s  Av/s    Aprv/s   Alx
   ft     ft       kips       kips-ft       kips   kips-ft <--------- in^2/ft -------->    in^2
-------------------------------------------------------------------------------------------------
  0.75   3.75 R   101.5    3    46.7  251   312.1     59.3   0.48   0.00   0.48     1.24     0.00
  3.00   6.00 L    97.5    3    46.7  251   311.5     59.3   0.48   0.00   0.48     1.24     0.00
               R    85.8  186    48.0  118   311.5     59.3   0.48   0.00   0.48     1.24     0.00
  4.75   7.75 L    89.0  186    48.0  118   311.5     59.3   0.48   0.00   0.48     1.24     0.00

  Loc  AbsLoc Pos    Vc      Vs    Beta   Theta      b   dv   Esp_s
   ft     ft        kips    kips          deg       in   in
```

0.75	3.75	R	151.42	195.32	2.00	45.00	38.00	31.50	0.0000
3.00	6.00	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
		R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
4.75	7.75	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000

Span 3: From 8.50 ft To 14.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	9.25	R	75.1	105	85.3	183	293.4	59.3	0.23	0.26	0.48	1.24	0.00
3.50	12.00	L	70.2	105	85.3	183	293.4	59.3	0.23	0.26	0.48	1.24	0.00
		R	143.1	129	101.9	118	289.9	59.3	0.18	0.31	0.48	1.24	0.00
4.75	13.25	L	145.3	129	101.9	118	289.9	59.3	0.18	0.31	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	9.25	R	151.13	174.85	2.00	45.00	38.00	31.44	0.0000
3.50	12.00	L	151.13	174.85	2.00	45.00	38.00	31.44	0.0000
		R	151.13	170.95	2.00	45.00	38.00	31.44	0.0000
4.75	13.25	L	151.13	170.95	2.00	45.00	38.00	31.44	0.0000

Span 4: From 14.00 ft To 19.50 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	14.75	R	181.1	81	134.8	154	282.9	59.3	0.32	0.40	0.72	1.24	0.00
1.00	15.00	L	180.7	81	134.8	154	282.9	59.3	0.32	0.40	0.72	1.24	0.00
		R	61.9	88	111.5	134	287.8	59.3	0.15	0.33	0.48	1.24	0.00
4.00	18.00	L	56.6	88	111.5	134	287.8	59.3	0.15	0.33	0.48	1.24	0.00
		R	163.7	168	114.5	90	287.2	59.3	0.20	0.34	0.54	1.24	0.00
4.75	18.75	L	165.1	168	114.5	90	287.2	59.3	0.21	0.34	0.55	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	14.75	R	151.13	163.21	2.00	45.00	38.00	31.44	0.0000
1.00	15.00	L	151.13	163.21	2.00	45.00	38.00	31.44	0.0000
		R	151.13	168.70	2.00	45.00	38.00	31.44	0.0000
4.00	18.00	L	151.13	168.70	2.00	45.00	38.00	31.44	0.0000
		R	151.13	167.98	2.00	45.00	38.00	31.44	0.0000
4.75	18.75	L	151.13	167.98	2.00	45.00	38.00	31.44	0.0000

Span 5: From 19.50 ft To 25.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	20.25	R	166.9	229	116.4	8	286.8	59.3	0.22	0.35	0.57	1.24	0.00
1.50	21.00	L	165.6	229	116.4	8	286.8	59.3	0.21	0.35	0.56	1.24	0.00
		R	54.5	18	123.5	216	285.3	59.3	0.11	0.37	0.48	1.24	0.00
4.50	24.00	L	59.9	18	123.5	216	285.3	59.3	0.11	0.37	0.48	1.24	0.00
		R	178.7	25	147.0	200	280.3	59.3	0.30	0.44	0.74	1.24	0.00
4.75	24.25	L	179.2	25	147.0	200	280.3	59.3	0.31	0.44	0.75	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	20.25	R	151.13	167.54	2.00	45.00	38.00	31.44	0.0000
1.50	21.00	L	151.13	167.54	2.00	45.00	38.00	31.44	0.0000
		R	151.13	165.85	2.00	45.00	38.00	31.44	0.0000
4.50	24.00	L	151.13	165.85	2.00	45.00	38.00	31.44	0.0000
		R	151.13	160.33	2.00	45.00	38.00	31.44	0.0000
4.75	24.25	L	151.13	160.33	2.00	45.00	38.00	31.44	0.0000

Span 6: From 25.00 ft To 30.50 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	25.75	R	139.1	205	103.1	36	289.6	59.3	0.17	0.31	0.48	1.24	0.00
2.00	27.00	L	136.9	205	103.1	36	289.6	59.3	0.17	0.31	0.48	1.24	0.00
		R	67.8	40	95.3	212	291.3	59.3	0.20	0.29	0.48	1.24	0.00
4.75	29.75	L	72.7	40	95.3	212	291.3	59.3	0.20	0.29	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	25.75	R	151.13	170.68	2.00	45.00	38.00	31.44	0.0000
2.00	27.00	L	151.13	170.68	2.00	45.00	38.00	31.44	0.0000
		R	151.13	172.49	2.00	45.00	38.00	31.44	0.0000
4.75	29.75	L	151.13	172.49	2.00	45.00	38.00	31.44	0.0000

Span 7: From 30.50 ft To 36.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	31.25	R	82.5	226	50.2	36	311.5	59.3	0.48	0.00	0.48	1.24	0.00
2.50	33.00	L	79.4	226	50.2	36	311.5	59.3	0.48	0.00	0.48	1.24	0.00
		R	89.3	205	52.7	224	311.5	59.3	0.48	0.00	0.48	1.24	0.00
4.75	35.25	L	93.3	205	52.7	224	312.1	59.3	0.48	0.00	0.48	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	31.25	R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
2.50	33.00	L	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
		R	151.13	194.94	2.00	45.00	38.00	31.44	0.0000
4.75	35.25	L	151.42	195.32	2.00	45.00	38.00	31.50	0.0000

Span 8: From 36.00 ft To 39.00 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.75	36.75	R	4.3	1	0.0	0	313.2	59.3	0.00	0.00	0.00	1.24	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.75	36.75	R	151.96	196.01	2.00	45.00	38.00	31.62	0.0000

Note:

- Pos is the design position. L suggests the calculation is done at immediate left of "Loc" and R suggests at immediate right of it.
- T-lim is the limiting value of torsion for the concrete section. If actual torsion is higher than this value, torsional steel has to be provided.
- Avs/s is the required area of steel per unit length for shear force.
- 2Ats/s is the required area of steel per unit length for two legs of torsional reinforcement.
- Av/s is the total required area of steel per unit length due to shear plus torsion.
- Aprvs/s is the total provided area of transverse steel reinforcement.
- Alx is the EFFECTIVE longitudinal steel required in addition to the PROVIDED EFFECTIVE flexural steel.
- Vc is the nominal shear resistence of concrete.
- Vs is the nominal shear resistence of transverse reinforcement.
- Beta is the factor indicating ability of diagonally cracked concrete to transmit tension and shear.
- Theta is the angle of inclination of diagonal compressive stress.
- # Vu is greater tha phi*Vn.

CRACKING/FATIGUE CHECK:
==========

Cracking check as per AASHTO LRFD (6th Edition, 2012)

Span 1: From 0.00 ft To 3.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
2.25	2.3	36.06081		0.8	3.3	38.0	10.5	0.0	0.00	0
			0	0.0	3.3	38.0	10.5	0.0	0.00	0

Span 2: From 3.00 ft To 8.50 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	3.8	36.06089		2.3	3.3	38.0	10.5	0.0	0.00	0
			6335	4.2	3.3	38.0	10.5	0.0	0.00	0
3.00	6.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
			6335	14.7	3.3	35.3	10.5	0.0	0.00	0
4.75	7.8	36.06139		1.8	3.3	38.0	10.5	0.0	0.00	0
			6393	6.3	3.3	38.0	10.5	0.0	0.00	0

Span 3: From 8.50 ft To 14.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	9.3	36.06105		2.9	3.3	38.0	10.5	0.0	0.00	0
			6352	10.6	3.3	38.0	10.5	0.0	0.00	0
3.50	12.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
			6374	13.4	3.3	38.0	10.5	0.0	0.00	0
4.75	13.3	36.06372		3.7	3.3	38.0	10.5	0.0	0.00	0
			6122	5.4	3.3	38.0	10.5	0.0	0.00	0

Span 4: From 14.00 ft To 19.50 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	14.8	36.06102		4.1	3.3	38.0	10.5	0.0	0.00	0
			6352	7.6	3.3	38.0	10.5	0.0	0.00	0
1.00	15.0	36.06102		2.8	3.3	38.0	10.5	0.0	0.00	0
			6350	9.7	3.3	38.0	10.5	0.0	0.00	0
4.00	18.0	36.06381		2.5	3.3	38.0	10.5	0.0	0.00	0
			6122	10.5	3.3	38.0	10.5	0.0	0.00	0
4.75	18.8	36.06381		6.6	3.3	38.0	10.5	0.0	0.00	0
			6105	5.5	3.3	38.0	10.5	0.0	0.00	0

Span 5: From 19.50 ft To 25.00 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.75	20.3	36.06094		6.9	3.3	38.0	10.5	0.0	0.00	0
			6350	5.1	3.3	38.0	10.5	0.0	0.00	0
1.50	21.0	36.06094		3.1	3.3	38.0	10.5	0.0	0.00	0

		6372	10.4	3.3	38.0	10.5	0.0	0.00	0
4.50	24.0	36.06376	2.9	3.3	38.0	10.5	0.0	0.00	0
		6105	10.0	3.3	38.0	10.5	0.0	0.00	0
4.75	24.3	36.06376	4.0	3.3	38.0	10.5	0.0	0.00	0
		6102	8.0	3.3	38.0	10.5	0.0	0.00	0

Span 6: From 25.00 ft To 30.50 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	25.8	36.06122		4.0	3.3	38.0	10.5	0.0	0.00	0
		6372		5.1	3.3	38.0	10.5	0.0	0.00	0
2.00	27.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		6120		13.2	3.3	38.0	10.5	0.0	0.00	0
4.75	29.8	36.06350		2.3	3.3	38.0	10.5	0.0	0.00	0
		6102		11.0	3.3	38.0	10.5	0.0	0.00	0

Span 7: From 30.50 ft To 36.00 ft

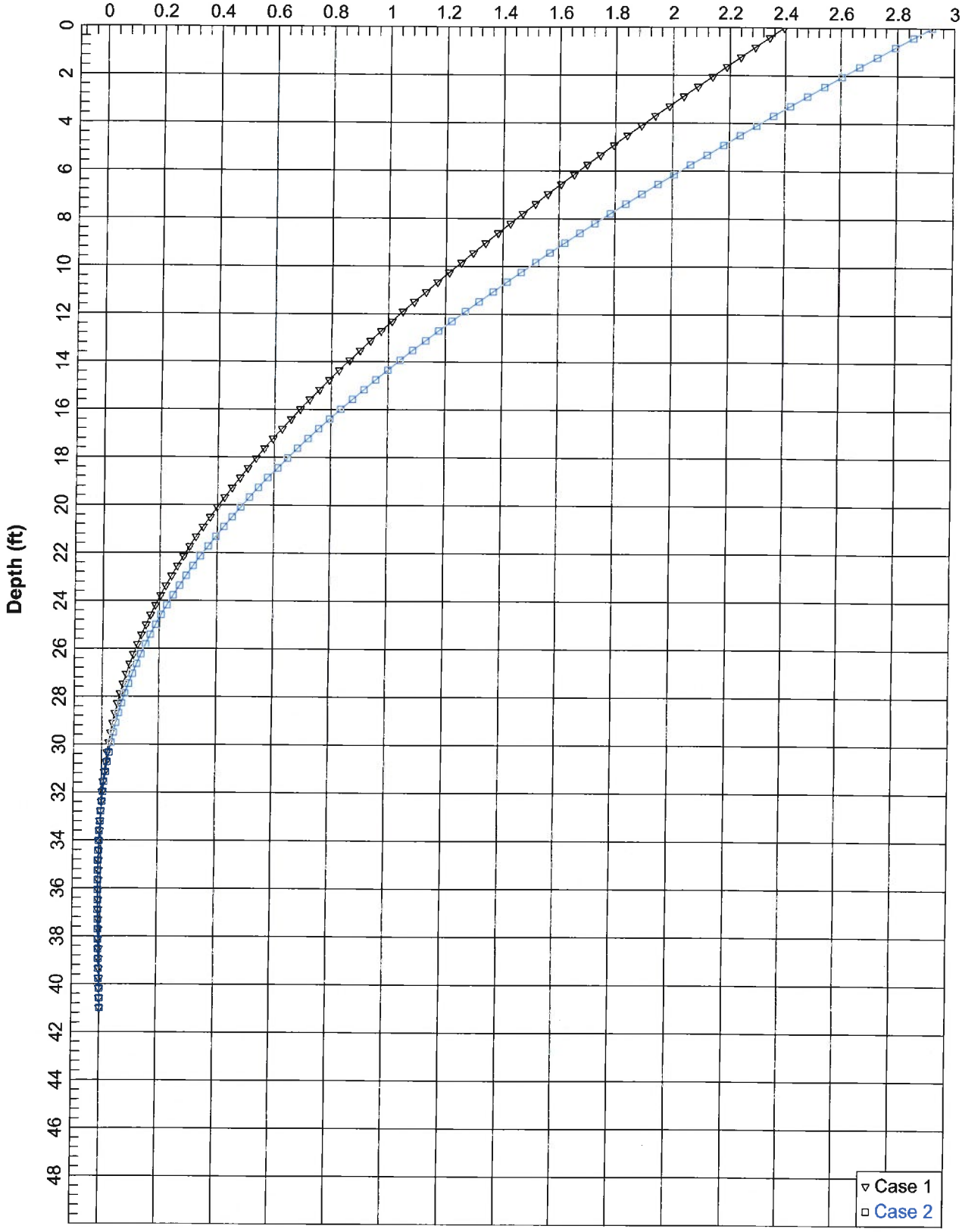
			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	31.3	36.06336		2.0	3.3	38.0	10.5	0.0	0.00	0
		6119		6.1	3.3	38.0	10.5	0.0	0.00	0
2.50	33.0	36.0	0	0.0	3.3	38.0	10.5	0.0	0.00	0
		6096		14.0	3.3	37.3	10.5	0.0	0.00	0
4.75	35.3	36.06336		1.3	3.3	38.0	10.5	0.0	0.00	0
		6096		4.8	3.3	38.0	10.5	0.0	0.00	0

Span 8: From 36.00 ft To 39.00 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.75	36.8	36.06081		0.8	3.3	38.0	10.5	0.0	0.00	0
		0		0.0	3.3	38.0	10.5	0.0	0.00	0

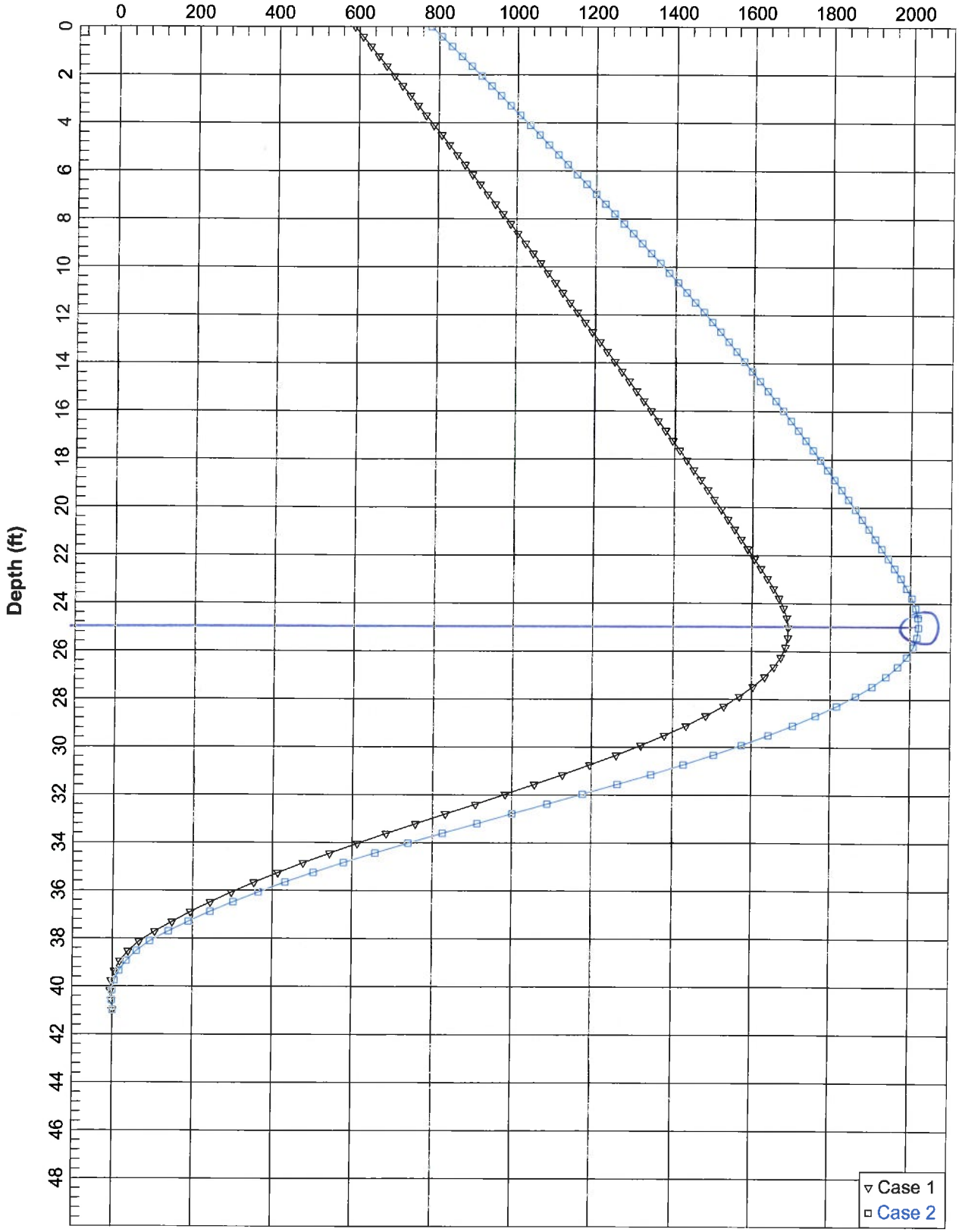
Interior Bent 3 - 100 yr Scour - Strength - Max Longitudinal

Lateral Deflection (inches)

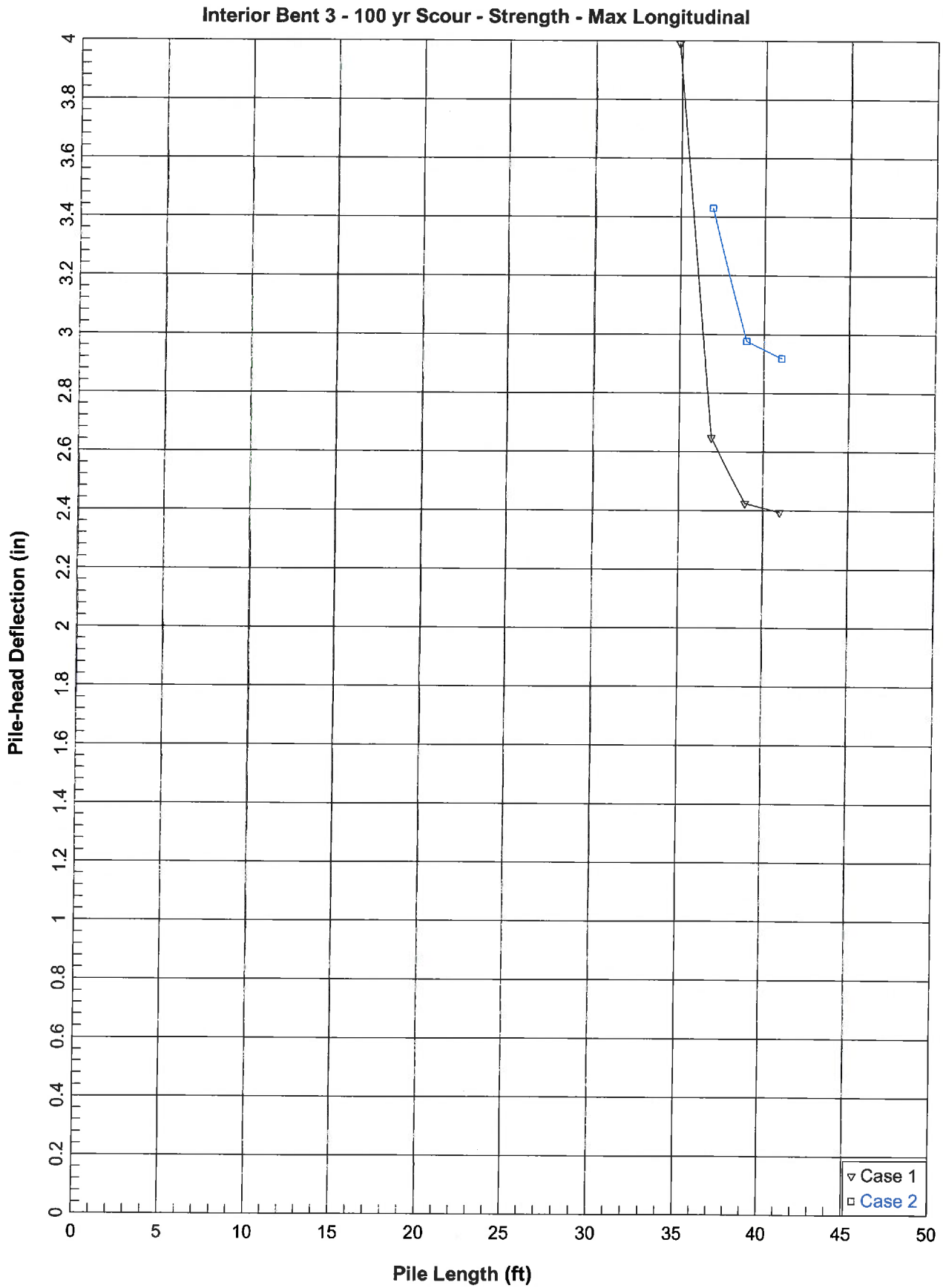


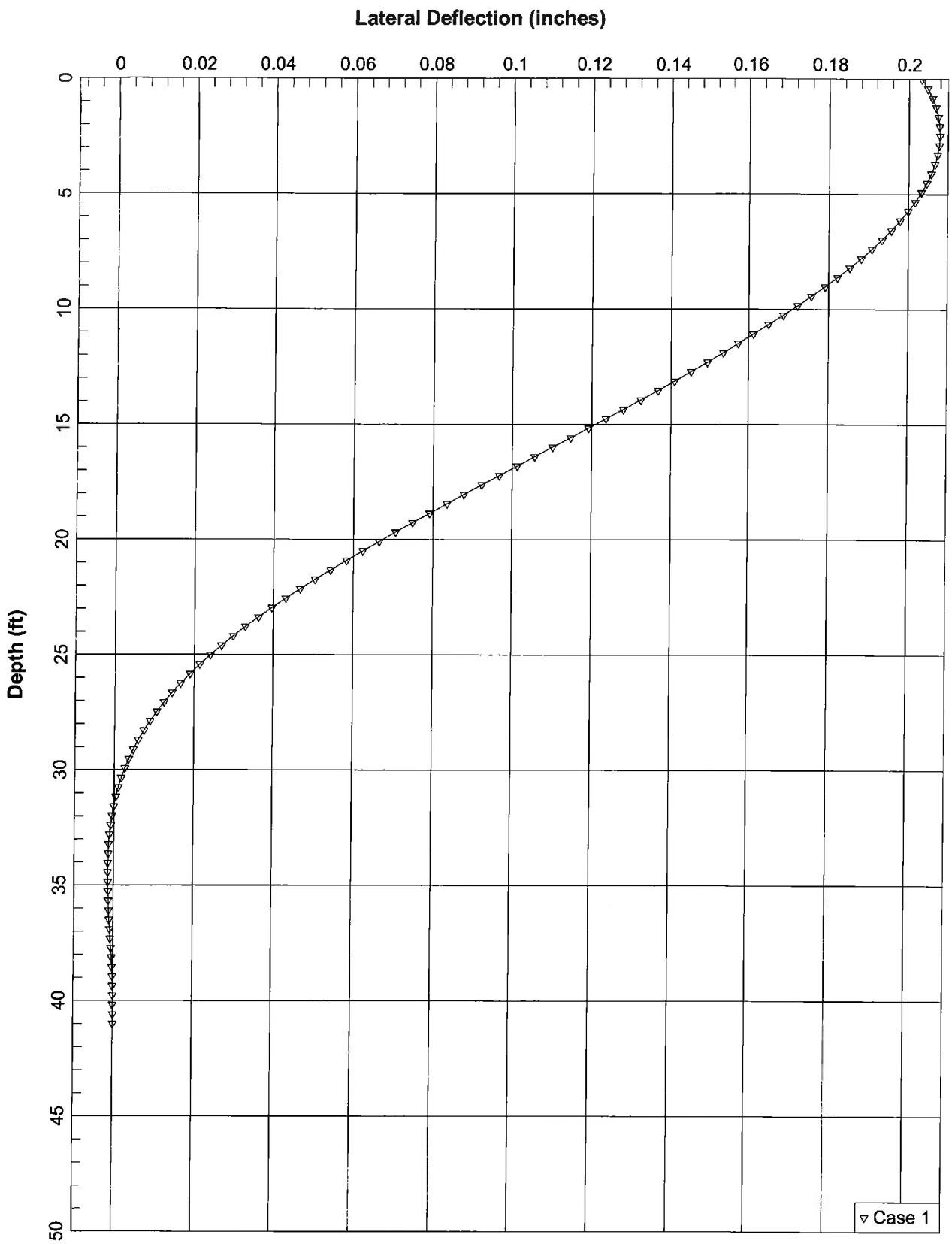
Interior Bent 3 - 100 yr Scour - Strength - Max Longitudinal

Bending Moment (in-kips)

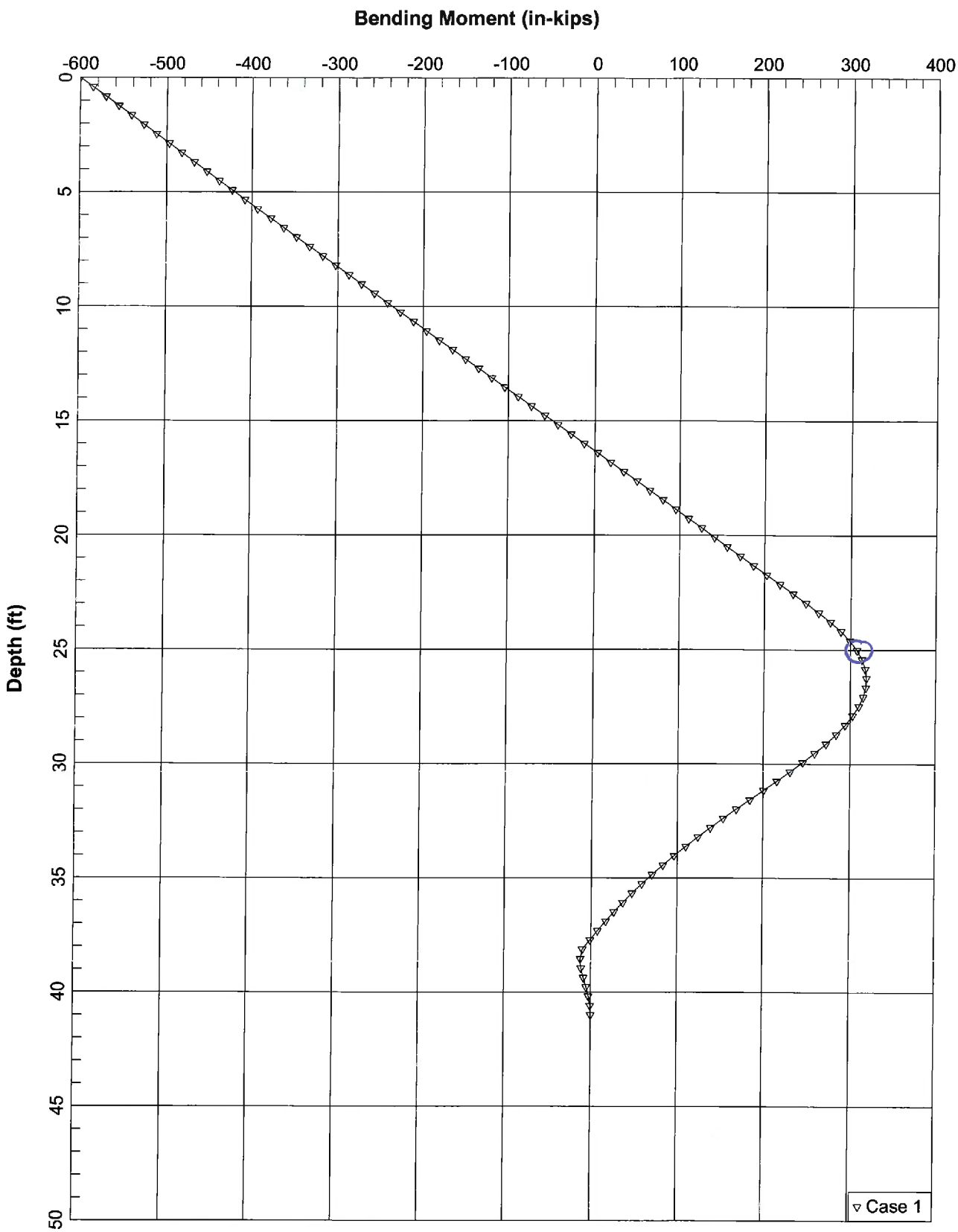


MOMENT = 168 K-FT


Interior Bent 3 - 100 yr Scour - Strength - Max Longitudinal
Pile-head Deflection (in)
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
2.2
2.4
2.6
2.8
3
3.2
3.4
3.6
3.8
4
Pile Length (ft)
0
5
10
15
20
25
30
35
40
45
50
Case 1
Case 2



Interior Bent 3 - 100 yr Scour - Strength - Max Transverse



Interior Bent 3 - 100 yr Scour - Strength - Max Transverse

MOMENT = 26 K-FT

Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

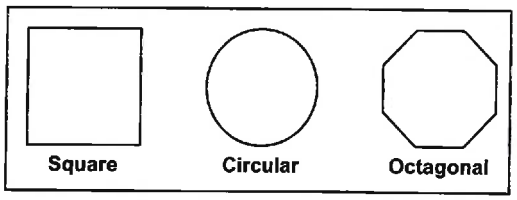
JOB: BLACK MINGO
SUBJECT: JB 3
DES. BY: DKY
CHK. BY: RAJ 2/16/16
DATE:D ATE: 2/15/16

SHEET
OF

Prestressed Concrete Piling Design - Input

Pile Information:

Use Library Section or Enter Custom Properties



Section Type:	Square		
Solid/Hollow:	Solid		
Pile Size:	18.00	in.	
Void Diameter:		in.	
Chamfer:	0.75	in.	
Unsupported Length, ℓ =	22.5	ft	Unsupported Length of Pile for Slenderness Evaluation
k =	1.20		Effective Length Factor
Applied Dead Load =	131.0	kips	Applied Dead Load on Pile from Structure

Reinforcement:

Pretensioned Strands:

Diameter of Pretensioned Strands	=	0.5	in.	Typically, 0.5 in. dia.
Area of Strand, A_{ps}	=	0.153	in^2	
Strand Layout	=	Circular		
Number of Strands	=	9		
Strand Modulus, E_{ps}	=	28,000	ksi	
Strength of Strand, f_{pu}	=	270.0	ksi	Stress-Strain Information for 270 ksi only
Fraction of f_{pu} used for Initial Stress	=	0.75		
Initial Strand Stress, f_{po}	=	202.5	ksi	

Mild Reinforcement (Spiral/Ties):

Spiral or Ties	=	Spiral	
Wire or Bar Size	=	W6.0	
Wire or Bar Diameter	=	0.276	in.
Minimum Cover to Face of Spiral/Tie	=	2.25	in.

Concrete Properties:

Concrete Strength at Transfer, f'_{ci}	=	5.60	ksi	
Specified Concrete Strength f'_c	=	8.00	ksi	
Concrete Unit Weight, w_c	=	0.150	kcf	
Ambient Relative Humidity, H	=	75	%	(Used for Shrinkage Loss)
Concrete Ultimate Strain, ε_{cu}	=	0.003	in./in.	

Resistance Factors & Slenderness:

Resistance Factor for Flexure, ϕ_{Flex}	=	1.00
Resistance Factor for Compression, ϕ_{Comp}	=	0.75
Method used for Slenderness Calculations	=	Secant

Design Points (Optional):

P_u (kips)	245					
M_u (k-ft)	170					

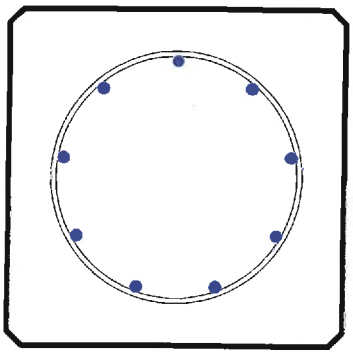
Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

JOB:
SUBJECT:
DES. BY:
CHK. BY:
DATE:D
ATE:

SHEET
OF

Prestressed Concrete Piling Design - Output

18 in. Solid Square Pile
9 - 0.5 in. Dia Strands with W6.0 Spiral



Gross Area, A	=	322.9 in^2	
Moment of Inertia, I	=	8,662 in^4	
Radius of Gyration, r	=	5.18 in.	
Unsupported Length, ℓ	=	22.5 ft	(Input)
Effective Length Factor,k	=	1.20	(Input)
$k\ell/r$	=	62.6	
Applied Dead Load	=	131.0 kips	(Input)
Concrete Unit Weight, w_c	=	0.150 kcf	(Input)
Ambient Relative Humidity, H	=	75 %	(Input)
Concrete Ultimate Strain, ε_{cu}	=	0.003 in./in.	(Input)
Concrete Strength at Transfer, f'_{ci}	=	5.60 ksi	(Input)
Specified Concrete Strength f'_c	=	8.00 ksi	(Input)
Strand Modulus, E_{ps}	=	28,000 ksi	(Input)
Area of Strand, A_{ps}	=	0.153 in^2	(Input)
Strength of Strand, f_{pu}	=	270 ksi	(Input)

Prestress Loss and Effective Stresses:

Initial Strand Stress, f_{po}	=	202.5 ksi	(Input)
Initial Loss, Δf_{pIL}	=	3.7 ksi	
Effective Stress in Strands after Transfer, f_{pi}	=	198.8 ksi	
Effective Prestress Force in Strands after Transfer, F_{pi}	=	273.7 kips	
Total Loss, Δf_{pTL}	=	26.5 ksi	
Effective Stress in Strands after All Losses, f_{pe}	=	176.0 ksi	
Effective Prestress Force in Strands after All Losses, F_{pe}	=	242.4 kips	

Effective Prestress in Concrete:

Effective Prestress in Concrete Pile, f_{pc}	=	0.751 ksi	= F_{pe}/A

Concrete Cover:

Concrete Cover to Spiral	=	2.25 in.	(Input)
Concrete Cover to Strands	=	2.53 in.	

Design Points as Input:

	Axial Load (kips)	Moment (k-ft)	Max. Moment w/ Slenderness (k-ft)
1	245	170	179.7
2	0	0	215.5
3	0	0	215.5
4	0	0	215.5
5	0	0	215.5
6	0	0	215.5

Precast/Prestressed Concrete Inst.
209 West Jackson Blvd. Ph. 312.786.0300
Chicago, IL 60606 Fax 312.786.0353
Email: info@pci.org Web www.pci.org

JOB:
SUBJECT:
DES. BY:
CHK. BY:
DATE:D
ATE:

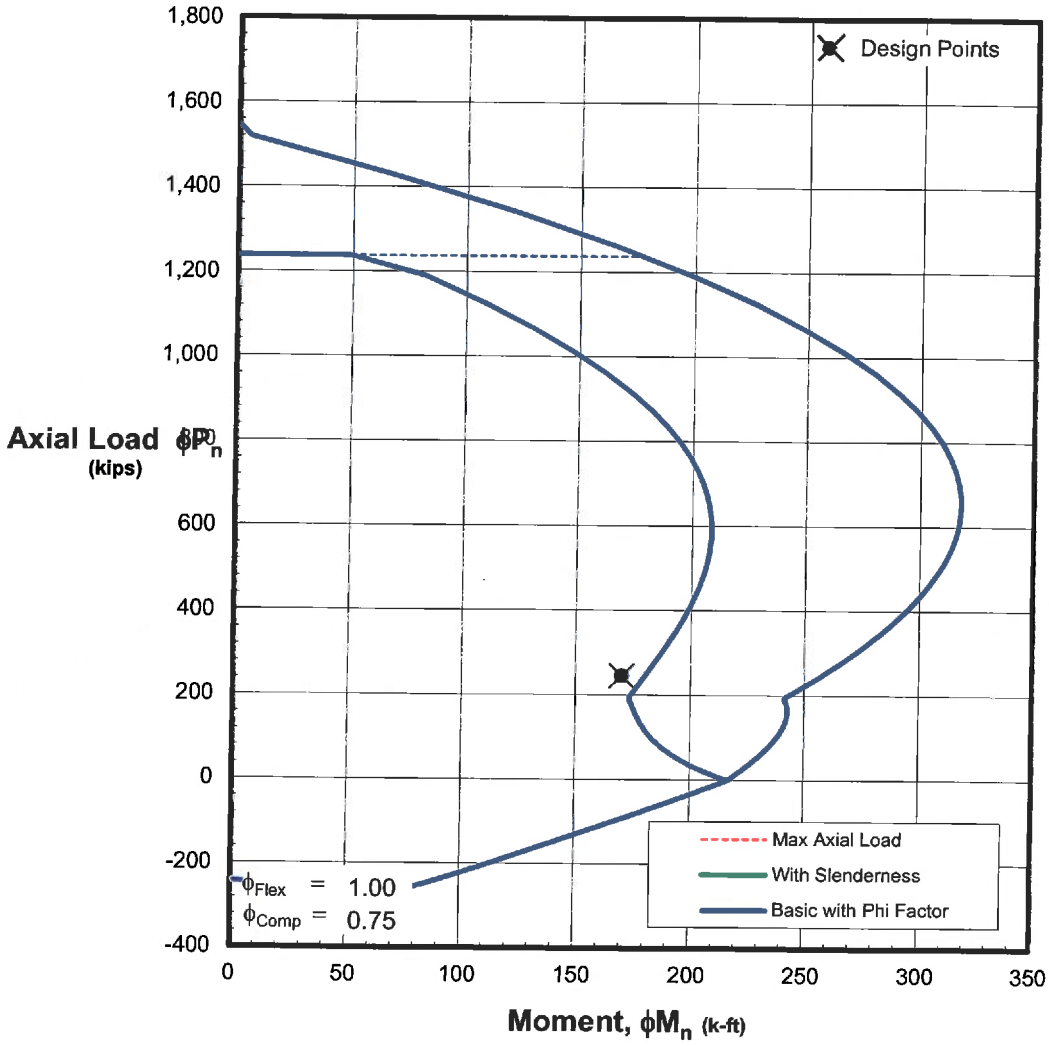
SHEET
OF

Prestressed Concrete Piling Interaction Diagram

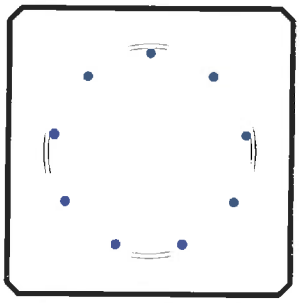
18 in. Solid Square Pile

9 - 0.5 in. Dia. Strands f'c= 8 ksi

Secant Method for Slenderness, kl/r = 62.6



Cross-Section



Key Points on Basic Interaction Diagram including ϕ Factors:

	Axial Load, ϕP_n (kips)	Moment, ϕM_n (k-ft)
Pure Compression	1545.8	0.0
Maximum Axial Load	1236.6	176.7
Maximum Moment*	644.0	317.6
ϕ Break Point	193.7	240.5
Pure Bending	0.0	216.3
Maximum Tension	-263.8	74.0
Pure Tension	-242.4	0.0

* Based on point of maximum moment before ϕ factors are applied

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Lateral Stability - SEE

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

David Yoder

From: Preston Felkel
Sent: Saturday, February 13, 2016 10:33 AM
To: John Hamilton
Cc: David Yoder; Rafi Jamaluddin
Subject: S-51 over Black Mingo Creek - Seismic Design

John,

The seismic design for S-51 over Black Mingo Creek has been completed. Governing top of pile deflections are as follows:

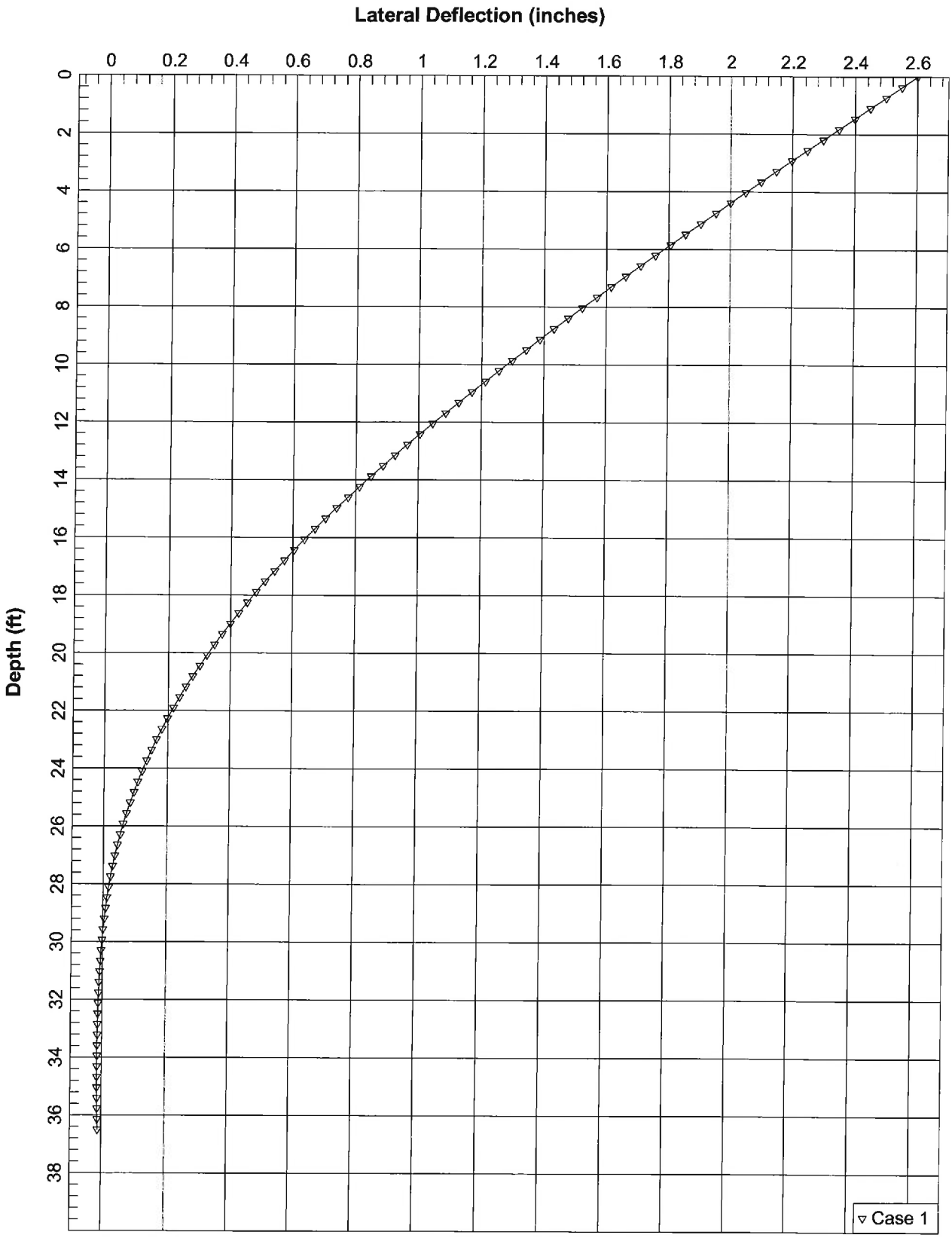
EB 1: 2.7" (Long.) 2.2" (Trans.)
IB 2: 2.6" (Long.) 2.2" (Trans.)
IB 3: 2.6" (Long.) 2.2" (Trans.)
EB 4: 2.7" (Long.) 2.2" (Trans.)

If you have any questions or need anything else, please let me know.

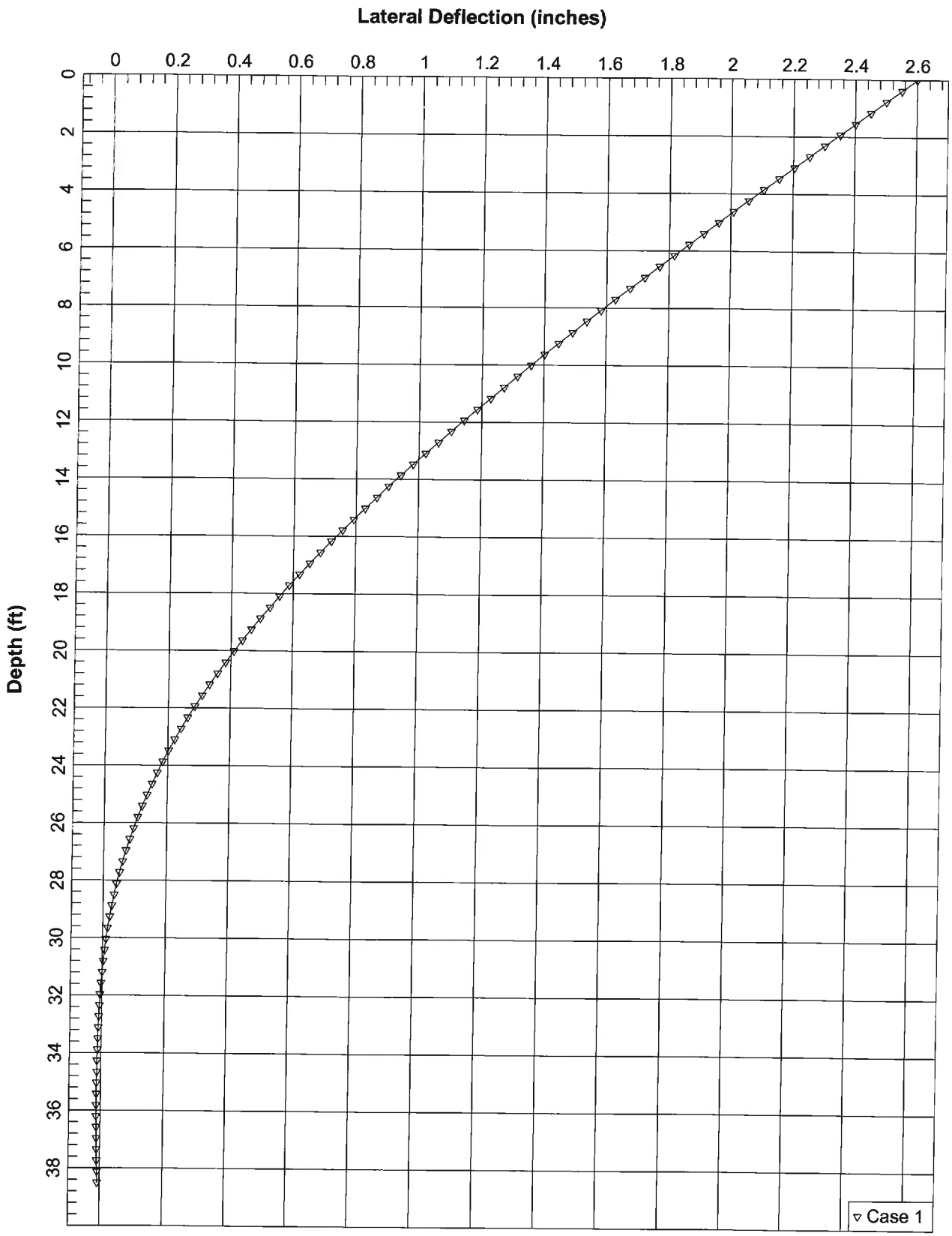
Thanks,

J. Preston Felkel, PE | *SC Structures Group Manager*
preston.felkel@ice-eng.com | 803-201-9196 (C)

INFRASTRUCTURE
CONSULTING & ENGINEERING
1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3032 (W) | 803-822-0034 (F)
www.ice-eng.com



Interior Bent 2 - SEE Displacement - Longitudinal



Interior Bent 3 - SEE Displacement - Longitudinal

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Loads to Geotech

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/15/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for Interior Bent 2 (100 Yr Scour Case)

STRENGTH REACTIONS - (7) 18" Square Concrete Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	36.000	**3**	-122	0	-19	34

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.500	0	**-237**	2	-42	-6

Max Longitudinal (global Fz)

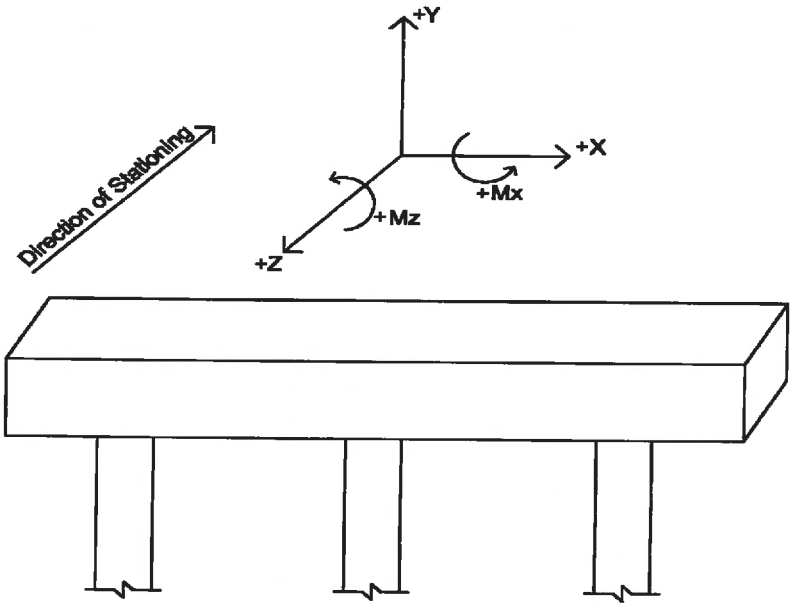
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	3.000	0	-89	**-3**	-59	-12

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
4	19.500	0	-225	-2	**-75**	-6

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
4	19.500	-3	-113	0	-16	**-45**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/15/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for Interior Bent 2 (100 Yr Scour Case)

SERVICE REACTIONS - (7) 18" Square Concrete Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	36.000	**2**	-92	2	-26	20

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.500	1	**-164**	1	-28	13

Max Longitudinal (global Fz)

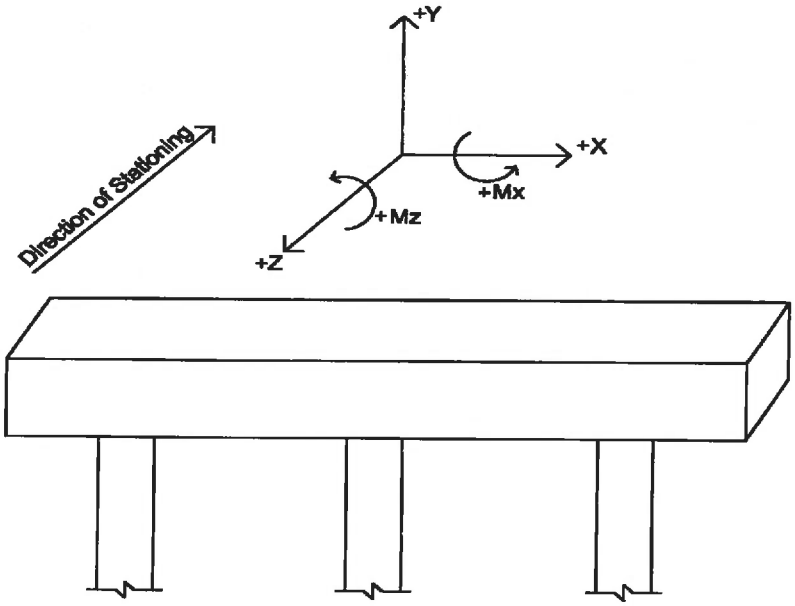
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	3.000	1	-66	**-2**	-38	7

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
4	19.500	1	-157	-1	**-47**	13

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
1	3.000	-2	-105	2	-22	**-31**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/15/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for Interior Bent 3 (100 Yr Scour Case)

STRENGTH REACTIONS - (7) 18" Square Concrete Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	36.000	**3**	-142	0	7	40

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.500	0	**-265**	2	29	-6

Max Longitudinal (global Fz)

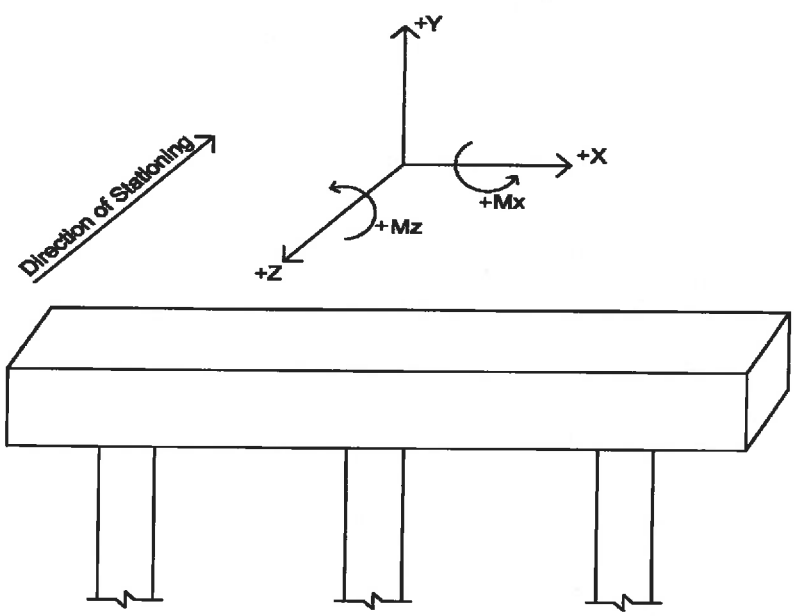
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	3.000	0	-104	**3**	49	-12

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
4	19.500	0	-245	2	**65**	-6

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
4	19.500	-3	-132	0	6	**-50**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/15/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for Interior Bent 3 (100 Yr Scour Case)

SERVICE REACTIONS - (7) 18" Square Concrete Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	36.000	**2**	-106	1	16	24

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.500	2	**-185**	1	18	16

Max Longitudinal (global Fz)

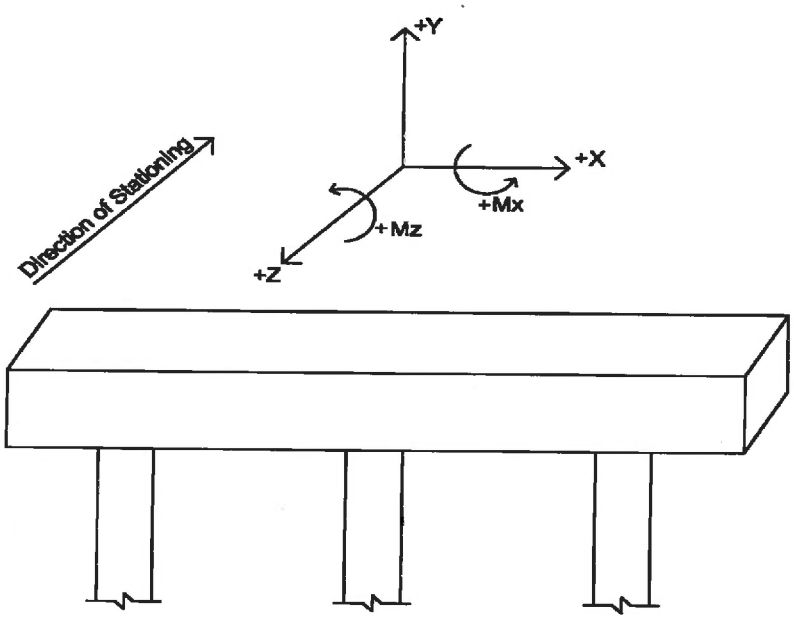
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	3.000	1	-77	**2**	30	10

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
4	19.500	2	-173	1	**39**	16

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
1	3.000	-2	-119	1	13	**-33**



S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

End Bent

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

BRIDGE GEOMETRY

37'-6" - 70'-0" - 56'-6"

SPAN ARRANGEMENT =
BRIDGE WIDTH = 36'-0"
SKEW = 0°

SUPERSTRUCTURE

LANES = [32.833' - 2(1.5833')]/12 = 2.47

∴ 2 LANES

CORED SLABS USED : 3'-0" x 2'-0" UNIT (~~SPAN A~~ ALL SPANS)

H	24
A	637.8 IN^2
I_{xx}	39,436 IN^4
I_{yy}	76,800 IN^4
$\bar{y}$ BOT	12"

BARRIER / RAILING HEIGHT = 32"

DEPTH OF SLAB = 0", OVERLAY ONLY

CURB TO CURB DISTANCE = 32'-10"

CAP

LENGTH = 38'-7"

DEPTH = ~~3'-0"~~ 5'-0"

WIDTH = ~~3'-2"~~ 3'-0"

BLACK MINGO

INFRASTRUCTURE CONSULTING & ENGINEERING

S-51 www.ice-eng.com

PROJECT ~~JUMPING RUN~~ CREEK

FILE ~~INTERIOR~~ END BENT DESIGN

CALC'D BY DKY DATE ~~1/15/16~~ 2/8/16

CHEK'D BY RAJ 2/16/16 DATE

Sheet 2 of 4

ELEVATIONS : FB1 21.2 TO 20.0

FB4 21.3 TO 20.1

TOP OF CAP = ~~184.0~~ TO ~~184.8~~

LEFT SIDE IS HIGH SIDE

PILES

HP14 x 73 PILES

LOCATIONS :

1	~~3.042'~~, 2.792	6	~~30.125~~	30.292
2	~~8.458~~, 8.292	7	~~35.542~~	35.792
3	~~13.875~~, 13.792			
4	~~19.292~~, 19.292			
5	~~24.708~~ 24.792			

MIN OVERHANG = 2 x PILE WIDTH = ~~36"~~ 28" OR ~~3'-0"~~ 2'-4"

BEARINGS

OFFSET FROM ℄ : 0'

BRG.	LINE # 1
1	2.7917'
2	5.7917'
3	8.7917'
4	11.7917'
5	14.7917'
6	17.7917'
7	20.7917'
8	23.7917'
9	26.7917'
10	29.7917'
11	32.7917'
12	35.7917'

LOADS

APPLICABLE LIMIT STATES : (BDM 13.1.4)

- STRENGTH I
- STRENGTH III
- STRENGTH V
- SERVICE I

* SEISMIC LOADS AND DETAILING SHALL FOLLOW 2008 SCDOT SDM VERSION 2.0

APPLICABLE LOADS :

- DC
- DW
- LL
- BR
- WS
- WL
- TU

} COMPUTED AUTOMATICALLY

- WA

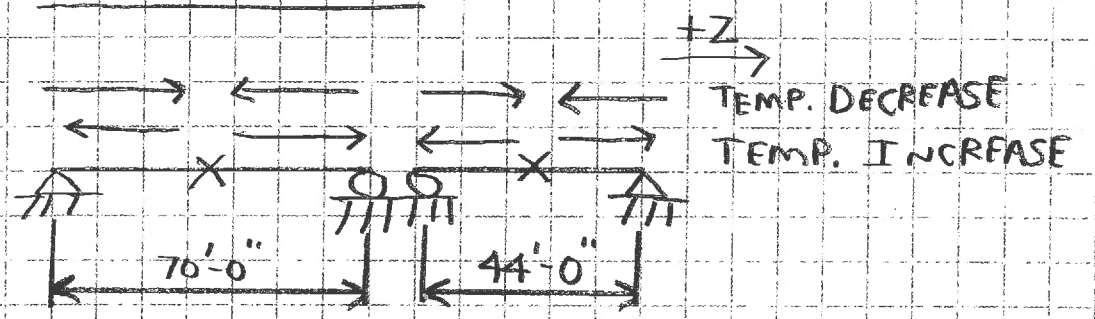
DC LOADS

ATTACHED

DW LOADS

ATTACHED

TEMPERATURE



NOTE: SINCE LOADS AT IB 2 FROM SPAN A AND B ARE IN OPPOSITE DIRECTIONS, THE RESULTANT WILL BE USED.

$T_{MAX} = 110°F$ [LRFD FIG. 3.12.2.2-1]

$T_{MIN} = 20°F$ [LRFD FIG. 3.12.2.2-2]

$T_{SET} = 70°F$

TRIBUTARY LENGTHS:

EB 1 = ~~35'~~ 18.75'
IB 2 = ~~35'~~ - ~~22'~~ = ~~13'~~
IB 3
EB 3 = ~~22'~~ 28.25'

IB 2 = 35' - 18.75' = 16.25'
IB 3 = 35' - 28.25' = 6.75'

STREAM PRESSURE

(NOT APPLICABLE TO END BENT)

$V_{DESIGN} = 4^{FT/S}$ ASSUMED

$C_D = 1.4$, $P = C_D V^2/1000$ (LRFD 3.7.3.1-1)

$= 0.0224^{KSF}$

$W = 0.0224^{KSF}(1.5') = 0.0336^{KLF}$

S-51 over Black Mingo Creek

DKY 2/8/16
RAJ 2/16/16

Bearings

1	2.7917
2	5.7917
3	8.7917
4	11.7917
5	14.7917
6	17.7917
7	20.7917
8	23.7917
9	26.7917
10	29.7917
11	32.7917
12	35.7917

Piles

38.58333	Cap Length		
36	Slab Width		
5.5	Pile Spacing		
2.791665	Overhang	OK	
2.333333	Min Overhang		
1.5	Exterior Pile to Edge of Slab	OK	0.272727

1	2.792
2	8.292
3	13.792
4	19.292
5	24.792
6	30.292
7	35.792

DKY 2/8/16
RAJ 2/16/16

Project: _____

Calc: _____ Date: _____

Check: _____ Date: _____

Equivalent Pile

Pile Size: HP14x73

The substructure design program, RCPier, does not have the capability to define steel piles. This sheet computes the dimensions and moment of inertia reduction factor necessary in order to define a concrete pile with an equivalent stiffness within the program.

Input:

$I_{xx} := 729in^4$ Stong Axis Moment of Inertia of HP Pile

$I_{yy} := 261in^4$ Weak Axis Moment of Inertia of HP Pile

$A_p := 21.4in^2$ Area of HP Pile

$E_s := 29000ksi$ Steel Modulus of Elasticity

$f_c := 1ksi$ Concrete Compressive Strength

Calculations:

Calculate Parameters

$E_c := 33000 \cdot 0.150^{1.5} \cdot \sqrt{f_c \cdot ksi} = 1917.1 \cdot ksi$ Concrete Modulus of Elasticity

$n := \frac{E_s}{E_c} = 15.127$ Modular Ratio

$A_n := n \cdot A_p = 323.714 \cdot in^2$ Transformed Area

$ratio_{pile} := \frac{I_{yy}}{I_{xx}} = 0.358$ HP Pile Strong Axis to Weak Axis Stiffness Ratio

Determine Dimensions

$b := 1in \quad d := 1in$ Initial guess of pile dimensions

Given

Define Constraints

$ratio_{pile} - \frac{b^2}{d^2} = 0$ The stiffness ratio must be equal between the steel and equivalent concrete pile

$d \cdot b = A_n$ The area of the equivalent pile must be equal to the transformed area.

$b \geq 12in$

$d \geq 12in$ The mimimum dimension that can be input into RC Pier is 12".

$dims := Find(b, d)$

$$dims = \begin{pmatrix} 13.917 \\ 23.26 \end{pmatrix} \cdot in$$

DKY 2/8/16
RAJ 2/16/16

Project: _____

Calc: _____ Date: _____

Check: _____ Date: _____

Check Calculated Dimesions Meet Constraints

$b := dims_0 = 13.917 \cdot in$ $\quad$ $d := dims_1 = 23.26 \cdot in$

$I_{xxn} := \frac{b \cdot d^3}{12} = 14594.3 \cdot in^4$ Strong Axis Moment of Inertia of Equivalent Pile

$I_{yyn} := \frac{d \cdot b^3}{12} = 5225.1 \cdot in^4$ Weak Axis Moment of Inertia of Equivalent Pile

$ratio_n := \frac{I_{yyn}}{I_{xxn}} = 0.358$ Equivalent Pile Strong Axis to Weak Axis Stiffness Ratio

$check_{area} := if\left(\left|b \cdot d - n \cdot A_p\right| > 0.001 in^2, "NG", "OK"\right)$

$check_{area} = "OK"$

$check_{diff} := if\left(\left|ratio_{pile} - ratio_n\right| > 0.001, "NG", "OK"\right)$

$check_{diff} = "OK"$

Equivalent Pile Properties

$b = 13.917 \cdot in$ Equivalent Pile Weak Axis Dimesion

$d = 23.26 \cdot in$ Equivalent Pile Strong Axis Dimension

$factor := \frac{I_{xx}}{I_{xxn}} \cdot n$

$factor = 0.756$ Reduction Factor for Equivalent Pile

Note: The above reduction value must be between 0 and 1. If it is greater than 1 then reduce the concrete compressive strength.

REACTIONS (kips), SERVICE I

DC = 15.8 K

DW = 0.8 K

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

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

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	42.7	18.1	53.7	98.6	126.7	145.1	149.9
	V	12.2	10.9	11.7	10.5	8.8	7.1	5.8	0.5
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	12.2	10.9	11.7	10.5	8.8	7.2	6.0	4.8
	M	0.0	42.9	18.3	53.7	95.3	120.3	135.4	135.2
Total :	M+	0.0	84.0	35.3	106.1	198.9	261.5	300.6	312.3
	V	30.0	26.3	28.5	25.2	19.8	14.5	9.4	0.5
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	30.0	26.3	28.5	25.2	19.8	14.7	9.7	4.8
	M	0.0	84.3	35.6	106.1	195.7	255.2	290.9	297.6

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	12.1	12.1
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	2.2	2.2
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	15.1	14.7
DL-Comp.(DW)	9.1	8.8
Live	65.6	65.6
Pedestrian	0.0	0.0

DC = 15.8 K

DW = 0.8 K

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 III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	3.24	6.98	10.71	14.45	18.19
Self wt. :	M	0.0	28.1	11.8	35.6	68.1	91.3	105.2	109.9
(Max)	V	12.1	10.4	11.4	9.9	7.4	5.0	2.5	0.0
DL-Prec. :	M	0.0	5.2	2.2	6.6	12.6	16.8	19.4	20.3
DC(Max)	V	2.2	1.9	2.1	1.8	1.4	0.9	0.5	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.5	1.1	1.7	2.0	2.0
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	5.9	2.5	7.5	14.3	19.2	22.2	23.3
DC(Max)	V	2.5	2.2	2.4	2.1	1.6	1.1	0.5	0.0
DL-Comp :	M	0.0	1.8	0.7	2.2	4.3	5.8	6.7	7.0
DW(Max)	V	0.8	0.7	0.7	0.6	0.5	0.3	0.2	0.0
LL + I :	M+	0.0	40.1	17.0	50.5	92.7	119.2	136.5	141.0
	V	40.0	35.7	38.3	34.4	28.7	23.3	18.9	1.6
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	40.0	35.7	38.3	34.4	28.8	23.7	19.7	15.7
	M	0.0	40.4	17.2	50.5	89.7	113.2	127.3	127.1
Total :	M+	0.0	81.5	34.3	102.9	193.1	254.0	292.0	303.5
	V	57.8	51.0	55.1	49.1	39.7	30.7	22.6	1.6
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	57.8	51.0	55.1	49.1	39.8	31.1	23.4	15.7
	M	0.0	81.7	34.5	102.9	190.1	248.0	282.9	289.6

REACTIONS (kips), SERVICE I

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

DC = 23.9 K
DW = 1.2 K

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 : 3, Beam : 1, SERVICE III
Shears: kips, Moments: kft

		Bearing	Trans	H/2	0.10L	0.20L	0.30L	0.40L	Midspan
Location,	ft	0.00	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	51.6	21.3	99.8	181.8	234.9	265.9	272.4
	V	14.3	13.4	14.0	12.5	10.5	8.6	6.3	2.0
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	14.3	13.4	14.0	12.5	10.6	8.8	7.0	5.3
	M	-0.0	52.3	21.8	99.8	174.5	220.7	237.5	226.5
Total :	M+	0.0	115.8	47.7	225.4	415.8	546.8	624.5	646.6
	V	41.2	37.9	39.9	34.4	27.0	19.7	11.7	2.0
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	41.2	37.9	39.9	34.4	27.1	19.9	12.5	5.4
	M	-0.0	116.6	48.2	225.4	408.6	532.5	596.1	600.7

REACTIONS (kips), SERVICE I

DC = 23.9 K
DW = 1.2 K

Load Type	Left Support	Right Support
Self Wt.	18.4	18.4
Deck+Haunch	0.0	0.0
Diaphragm	0.2	0.2
DL-Prec.(DC)	3.4	3.4
DL-Prec.(DW)	0.0	0.0
DL-Comp.(DC)	22.9	22.5
DL-Comp.(DW)	13.8	13.5
Live	77.9	77.9
Pedestrian	0.0	0.0

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 : 3, 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	2.50	1.00	5.14	10.78	16.41	22.05	27.69
Self wt. :	M	0.0	43.9	18.1	85.7	159.6	212.4	244.1	254.7
(Max)	V	18.4	16.7	17.7	15.0	11.2	7.5	3.7	0.0
DL-Prec. :	M	0.0	8.1	3.3	15.8	29.4	39.2	45.0	47.0
DC(Max)	V	3.4	3.1	3.3	2.8	2.1	1.4	0.7	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	0.0	0.0	0.0	0.0	0.0	0.0
Haunch (Max)	V	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Diaphragm :	M	0.0	0.4	0.2	0.8	1.7	2.6	3.1	3.1
(Max)	V	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
DL-Comp :	M	0.0	9.1	3.8	17.8	33.3	44.3	51.1	53.4
DC(Max)	V	3.8	3.5	3.7	3.1	2.3	1.6	0.8	0.0
DL-Comp :	M	0.0	2.7	1.1	5.4	10.0	13.3	15.3	16.1
DW(Max)	V	1.1	1.0	1.1	0.9	0.7	0.5	0.2	0.0
LL + I :	M+	0.0	47.8	19.8	92.6	168.7	218.0	246.8	252.8
	V	46.9	43.9	45.7	40.7	34.4	28.1	20.5	6.5
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	46.9	43.9	45.7	40.7	34.6	28.7	23.0	17.5
	M	-0.0	48.6	20.2	92.6	162.0	204.8	220.4	210.2
Total :	M+	0.0	112.1	46.2	218.2	402.7	529.9	605.3	627.0
	V	73.8	68.4	71.6	62.7	50.9	39.2	25.9	6.5
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	73.8	68.4	71.6	62.7	51.2	39.8	28.5	17.5
	M	-0.0	112.8	46.7	218.2	396.0	516.6	579.0	584.4

Rolled steel beams are available in depths up to 3 ft, with beams more than 3 ft rolled less frequently. Before beginning final design, verify with one or more potential fabricators that the section size and length are available.

12.3.2.5 Cored Slabs (Prestressed Concrete Cored Slabs)

Prestressed concrete cored slabs ("cored slabs") are an alternative to flat slabs when the bridge designer anticipates the necessity of an accelerated construction schedule. Cored slab bridges consist of longitudinal, precast voided concrete slab members placed against each other to form a self-supported bridge deck. Cored slab details are available in span lengths of 30 ft, 40 ft, 50 ft, and 60 ft. See the *SCDOT Bridge Drawings and Details*, available at the SCDOT website.

The use of cored slabs is limited because of durability concerns due to the longitudinal and transverse joints. Voided concrete slabs are not allowed on any National Highway System (NHS) route nor on any facility with an ADT that equals or exceeds 3000 vpd.

In addition to permanent installations, cored slabs may be used for temporary bridges (i.e., a design life less than 5 years).

For Contractor-designed projects, such as design/build, cored slabs will only be allowed if the bid documents specifically allow their use. The substitution of a cored slab is not a valid Value Engineering proposal.

The maximum allowable skew is 15°, and the bridge designer must ensure a proper fit on the bent caps where the bridge is on a longitudinal grade or on a skew. In addition, other geometric elements may merit special consideration in the design of a cored slab.

12.3.3 Other Structure Types

Structures types other than those specified herein may be used. Their acceptability may be based upon other owner's successful experiences. The State Bridge Design Engineer must provide written approval for the selection of other structure types.

Seismic Design Specifications for Highway Bridges, which should be referenced for additional information.

12.2.7 Approach Slabs

Approach slabs are required on projects that meet one of the following conditions:

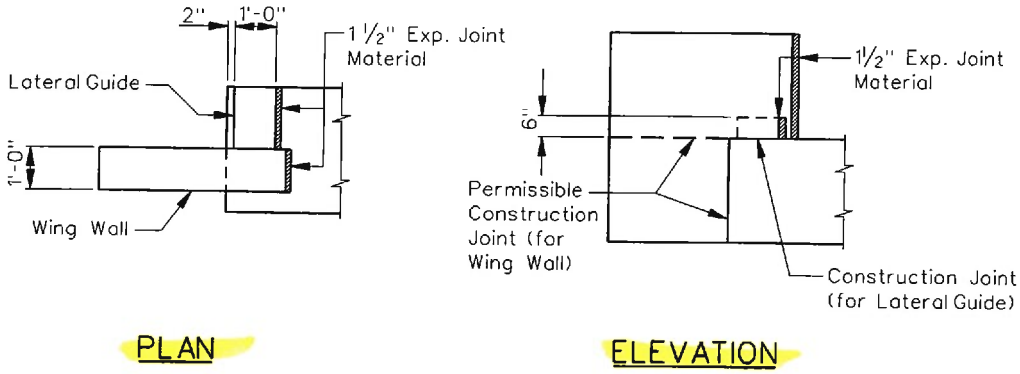
- any bridge that is located on an Interstate, US, or SC route;
- any bridge that is located on a Secondary Road that has a current ADT greater than 400 vpd or that has a new approach fill height that exceeds 10 ft; or
- any bridge having parallel wing walls (wing walls parallel to the centerline of the bridge).

12.2.8 Sleeper Slabs

A sleeper slab is a foundation slab, inverted tee-beam or L-beam placed transversely supporting the end of the approach slab away from the bridge. Sleeper slabs should be used to provide an off-bridge joint at the end of the approach slab, where:

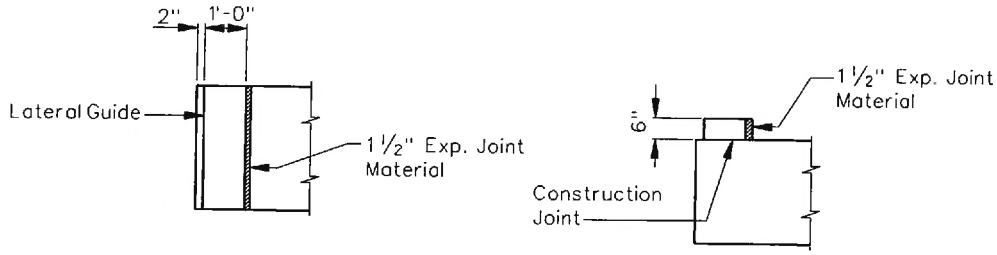
- a jointless bridge exceeds 240 ft total length for steel girder bridges or 300 ft total length for prestressed concrete beam bridges, or
- the distance from an integral or semi-integral end bent to the nearest expansion joint exceeded 240 ft for steel girder bridges or 300 ft for prestressed concrete beam bridges.

The embankment beneath the sleeper slab shall be designed to prevent differential settlement along the length of the sleeper slab.



PLAN ELEVATION

END BENT DETAILS



PLAN ELEVATION

INTERIOR BENT DETAILS

LATERAL GUIDE FOR CORED SLAB BRIDGES

Figure 20.1-3

Type of Pile	Minimum Cap Width (Single Row of Vertical Piles)
HP 12 x 53	2′-6″
HP 14 x 73	2′-8″ 3′-0″ USED
18-in square prestressed concrete	3′-0″
20-in square prestressed concrete	3′-2″
24-in square prestressed concrete	3′-6″

MINIMUM CAP WIDTHS FOR PILE-SUPPORTED BENTS

Figure 20.1-1

Type of Pile	Minimum Cap Depth
Single Row of Piles	2′-6″ ~~3′-0″~~ USED
Double Row of Piles	3′-0″ 5′-0″

MINIMUM CAP DEPTHS FOR PILE-SUPPORTED BENTS

Figure 20.1-2

For bents, the width of caps shall project beyond the sides of the columns. The added width of the cap shall be a minimum of 3 in on each side of the column. This width reduces the reinforcement interference between the column and cap. The cap width shall be adequate to accommodate the joint shear requirements of the *SCDOT Seismic Design Specifications* for *Highway Bridges*.

20.1.3.2 Bent-Cap Length

The length of interior bent caps should provide a minimum of 9 in from the centerline of the anchor bolt to the end of the bent cap. The length of interior bent caps should also provide a minimum of 9 in from the edge or corner of the elastomeric bearing or masonry plate to the end of the bent cap.

For cored slab structures, bent caps shall be detailed with a concrete lateral guide at the outside face of the exterior slab units; see Figure 20.1-3. Provide 1½-in expansion joint material between the cored slab and lateral guide and, if approach slabs are detailed, provide 1½-in expansion joint material between the approach slab and wing wall.

20.1.4 Construction Joints

In general, use a construction joint where the cap length exceeds 70 ft. Locate this construction joint near the middle of the cap at the one-quarter point between supporting elements.

20.1.5 Beam Seat Elevations

If the elevation difference between any two adjacent beam seats is:

- less than $^{3}/_{16}$ in, detail the build-up level and use the lower elevation for both beam seats;
- $^{3}/_{16}$ in to less than 1 in, use the lower elevation for both beam seats, detail a booster plate with the bearing plate, and allow the Contractor the option to combine the booster plate with the bearing plate; or
- 1 in or greater, detail a split level build-up.

20.1.6 Cap Reinforcement

20.1.6.1 Longitudinal Reinforcement

The minimum number and size of main reinforcing bars for both top and bottom mats of the bent cap shall be as shown in Figure 20.1-4. The main reinforcing bars shall be designed or detailed in no more than two layers. The designer shall not use bundled reinforcing bars. In addition to these detailing requirements, the longitudinal reinforcement shall also meet the design requirements of Chapter 15 and LRFD Section 5.

Cap Width	Reinforcing Steel
≤ 3′-0″	4 #9 bars or equivalent
3′-0″ - 4′-0″	5 #9 bars or equivalent
4′-0″ - 5′-0″	6 #9 bars or equivalent
5′-0″ - 5′-8″	7 #9 bars or equivalent

MINIMUM LONGITUDINAL REINFORCEMENT

Figure 20.1-4

PROJECT DATA
==========

Project : S-69 over Jumping Run Creek
User Job No.:
Designer : DKY
Date : 2/12/16
Checker : RAJ 2/16/16 Pages 1 thru 23
Checked Date:
State : State Job No. :
Structure type: Pier.
Pier View : Upstation.
Code : AASHTO LRFD (2013-Interims)
Comments : End Bent 1

37'-6" - 70'-0" - 56'-6"

No Skew

12 - 3'-0" x 2'-0" Cored Slabs

7 - HP14x73 Piles @ 5'-6"

PIER GEOMETRY
==========

Pier Type: Multi Column

Pier View : Upstation.
Cap Shape: Straight Top Elevations: start = 21.20 ft end = 20.00 ft
Depth(Z) = 36.00 in Skew angle = 0.00 Reduction of I = 1.000
Length(X) = 38.58 ft Height(Y) = 60.00 in

Column Shape : Rectangular
Number of columns: 7

Column number 1:

Location from the left edge of the cap(X): 2.79 ft
Elevations: bottom = 5.00 ft top = 18.61 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 2:

Location from the left edge of the cap(X): 8.29 ft
Elevations: bottom = 5.00 ft top = 18.44 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 3:

Location from the left edge of the cap(X): 13.79 ft
Elevations: bottom = 5.00 ft top = 18.27 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 4:

Location from the left edge of the cap(X): 19.29 ft
Elevations: bottom = 5.00 ft top = 18.10 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 5:

Location from the left edge of the cap(X): 24.79 ft
Elevations: bottom = 5.00 ft top = 17.93 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 6:

Location from the left edge of the cap(X): 30.29 ft
Elevations: bottom = 5.00 ft top = 17.76 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 7:

Location from the left edge of the cap(X): 35.79 ft
Elevations: bottom = 5.00 ft top = 17.59 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

SUPERSTRUCTURE INFO

Total number of spans: 3 Span number rear to current pier: 0
Number of traffic lanes: 2

Beam: height : 24.00 in section area : 637.80 in^2
Beam Inertia (Ixx): 39436.00 in^4 Beam inertia (Iyy): 76800.00 in^4
Beam CG:12.00 in Barrier height : 32.00 in Depth of slab : 2.00 in
Curb to curb distance: 32.833 ft

Span #	Span length	Bridge Width
1	37.500 ft	36.000 ft
2	70.000 ft	36.000 ft
3	56.500 ft	36.000 ft
		36.000 ft

BEARING POINTS

Number of bearing lines: 1
First bearing line Eccentricity = 0.00 ft

Point	Distance ft
1	2.79
2	5.79
3	8.79
4	11.79
5	14.79
6	17.79
7	20.79
8	23.79
9	26.79
10	29.79
11	32.79
12	35.79

MATERIAL PROPERTIES

	Cap	Column	Footing
Concrete Type	normal	normal	normal
Concrete Strength (psi)	4000.00	1000.00	4000.00
Concrete Density (lb/ft3)	150.00	150.00	150.00
Concrete Modulus Ec (ksi)	3834.30	1917.13	3834.30
Steel Strength Fy (ksi)	60.00	60.00	60.00

DESIGN PARAMETERS

==========

AASHTO LRFD Code

Resistance factors for reinf. concrete:

Flexure and tension	0.90
Shear and torsion (normal)	0.90
(lightweight)	0.70
Axial compression (ties)	0.75
Axial compression (spiral)	0.75
Compression in STM	0.70

Multi presence factors for live load:

1	Lanes	1.20
2	Lanes	1.00
3	Lanes	0.85
4	Lanes	0.65
5	Lanes	0.65
6	Lanes	0.65

Dynamic load allowance IM:

	Truck	Lane	Fatigue
Cap	0.33	0.00	0.15
Column	0.33	0.00	0.15
Footing	0.00	0.00	0.00

	Exposure factors	Clear cover in	Clear side cover in
Cap	1.00	2.50	2.50
Column	1.00	2.00	
Footing	1.00	3.00	3.00

Degree of fixity in foundations for Moment Magnify Method: Ga = 5.00

SEISMIC DESIGN PARAMETERS
==========

Strength Reduction factors for reinf. Concrete Seismic Design:

Tension controlled	: 0.90
Shear and torsion (normal)	: 0.90
(lightweight)	: 0.70
Compression Controlled (ties)	: 0.75
Compression Controlled (spiral)	: 0.75

Seismic Overstrength

Flexure and tension	: 1.30
Axial compression (ties)	: 1.30
Axial compression (spiral)	: 1.30

Response Modification Factor : 1.00

Use core area for plastic hinging calculations.

Design Factors

Cap Design Factor	: 1.20
Footing Design Factor	: 1.20

Plastic Hinge Moment

Use actual computed Plastic Hinging Moment for each column in all combinations.

LOADS
=====

ier View : Upstation.
Load Cases: 50

Loadcase ID: DC1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
UDL	Y	----	-4.50	0.00	----	1.00
Force	Y	0.00	-3.30	0.00	----	----
Force	Y	0.00	-3.30	1.00	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-15.80
1	2	Y	-15.80
1	3	Y	-15.80
1	4	Y	-15.80
1	5	Y	-15.80
1	6	Y	-15.80
1	7	Y	-15.80
1	8	Y	-15.80
1	9	Y	-15.80
1	10	Y	-15.80
1	11	Y	-15.80
1	12	Y	-15.80

Loadcase ID: DW1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
UDL	Y	----	-0.15	0.00	----	1.00

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-0.80
1	2	Y	-0.80
1	3	Y	-0.80
1	4	Y	-0.80
1	5	Y	-0.80
1	6	Y	-0.80
1	7	Y	-0.80
1	8	Y	-0.80
1	9	Y	-0.80
1	10	Y	-0.80
1	11	Y	-0.80
1	12	Y	-0.80

Loadcase ID: WS1 Name: Angle: 0
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L

Force	X	0.00	-0.60	0.50	----	----

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
7	UDL	X	-0.078	klf	0.79	----	0.80
6	UDL	X	-0.078	klf	0.78	----	0.80
5	UDL	X	-0.078	klf	0.77	----	0.81
4	UDL	X	-0.078	klf	0.76	----	0.81
3	UDL	X	-0.078	klf	0.75	----	0.81
2	UDL	X	-0.078	klf	0.74	----	0.81
1	UDL	X	-0.078	klf	0.73	----	0.82

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	Y	-2.89
1	1	X	-0.38
1	2	X	-0.38
1	2	Z	0.00
1	2	Y	1.13
1	3	Z	0.00
1	3	Y	1.13
1	3	X	-0.38
1	4	Z	0.00
1	4	Y	1.13
1	4	X	-0.38
1	5	Z	0.00
1	5	Y	1.13
1	5	X	-0.38
1	6	X	-0.38
1	6	Y	1.13
1	6	Z	0.00
1	7	Z	0.00
1	7	Y	1.13
1	7	X	-0.38
1	8	Z	0.00
1	8	Y	1.13
1	8	X	-0.38
1	9	Z	0.00
1	9	Y	1.13
1	9	X	-0.38
1	10	Z	0.00
1	10	Y	1.13
1	10	X	-0.38
1	11	Z	0.00
1	11	Y	1.13
1	11	X	-0.38
1	12	Y	5.14
1	12	Z	0.00
1	12	X	-0.38

Auto generation details

Generated Wind Load on Structure

Angle of wind = 0.00 deg Elevation above which wind load acts = 15.00 ft

Default wind pressure

Wind pressure for superstructure:		Wind pressure for substructure:	
Transverse	50.000 psf	Cap	40.000 psf
Longitudinal	0.000 psf	Column	40.000 psf
Overturning	20.000 psf		

Loadcase ID: WL1 Name: Angle: 0

Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00

1	1	X	-0.16
1	1	Y	-0.46
1	2	Y	-0.00
1	2	X	-0.16
1	2	Z	0.00
1	3	Z	0.00
1	3	Y	-0.00
1	3	X	-0.16
1	4	Z	0.00
1	4	Y	-0.00
1	4	X	-0.16
1	5	Z	0.00
1	5	Y	-0.00
1	5	X	-0.16
1	6	Z	0.00
1	6	Y	-0.00
1	6	X	-0.16
1	7	X	-0.16
1	7	Y	-0.00
1	7	Z	0.00
1	8	Z	0.00
1	8	Y	-0.00
1	8	X	-0.16
1	9	Z	0.00
1	9	Y	-0.00
1	9	X	-0.16
1	10	Z	0.00
1	10	Y	-0.00
1	10	X	-0.16
1	11	Y	-0.00
1	11	X	-0.16
1	11	Z	0.00
1	12	Z	0.00
1	12	Y	0.46
1	12	X	-0.16

Auto generation details
Generated Wind Load on Live Load
Angle of wind = 0.00 deg Live load length = 18.75 ft

Loadcase ID: TU1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	0.00
1	1	Z	-0.35
1	2	X	0.00
1	2	Z	-0.35
1	3	X	0.00
1	3	Z	-0.35
1	4	X	0.00
1	4	Z	-0.35
1	5	X	0.00
1	5	Z	-0.35
1	6	X	0.00
1	6	Z	-0.35
1	7	X	0.00
1	7	Z	-0.35
1	8	X	0.00
1	8	Z	-0.35
1	9	X	0.00
1	9	Z	-0.35
1	10	X	0.00
1	10	Z	-0.35
1	11	X	0.00
1	11	Z	-0.35
1	12	X	0.00

1	12	Z	-0.35

Auto generation details

Bearing type: Elastomeric Bearings

Direction of thermal force: +(Z)

Length of Superstructure Contributing, L: 18.750 ft
Change in temperature: 40.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

Area of bearing: 204.00 in^2
Shear modulus of Elastomer: 0.17 kips
Total Elastomer Thickness: 0.75 in

Loadcase ID: TU2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	-0.00
1	1	Z	0.43
1	2	X	-0.00
1	2	Z	0.43
1	3	X	-0.00
1	3	Z	0.43
1	4	X	-0.00
1	4	Z	0.43
1	5	X	-0.00
1	5	Z	0.43
1	6	X	-0.00
1	6	Z	0.43
1	7	X	-0.00
1	7	Z	0.43
1	8	X	-0.00
1	8	Z	0.43
1	9	X	-0.00
1	9	Z	0.43
1	10	X	-0.00
1	10	Z	0.43
1	11	X	-0.00
1	11	Z	0.43
1	12	X	-0.00
1	12	Z	0.43

Auto generation details

Bearing type: Elastomeric Bearings

Direction of thermal force: -(Z)

Length of Superstructure Contributing, L: 18.750 ft
Change in temperature: 50.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

Area of bearing: 204.00 in^2
Shear modulus of Elastomer: 0.17 kips
Total Elastomer Thickness: 0.75 in

5 LL Cases Shown for Brevity

Loadcase ID: LL1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	-22.53
1	10	Y	-9.91
1	11	Y	-22.53
1	12	Y	-9.91
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	-0.28
1	9	Y	-3.44
1	10	Y	-4.32
1	11	Y	-4.32
1	12	Y	-2.04

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-32.45
1	3	Y	0.00
1	4	Y	-32.45
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00

1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	-0.96
1	2	Y	-4.08
1	3	Y	-4.32
1	4	Y	-4.08
1	5	Y	-0.96
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL3 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	-32.45
1	4	Y	0.00
1	5	Y	-32.45
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	0.00
1	2	Y	-0.96
1	3	Y	-4.08
1	4	Y	-4.32
1	5	Y	-4.08
1	6	Y	-0.96
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL4 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-9.01
1	5	Y	-18.03
1	6	Y	-9.01
1	7	Y	-18.03
1	8	Y	-27.04
1	9	Y	0.00
1	10	Y	-27.04
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-1.80
1	5	Y	-3.60
1	6	Y	-3.60
1	7	Y	-3.60
1	8	Y	-3.60
1	9	Y	-3.60
1	10	Y	-3.40
1	11	Y	-0.80
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL5 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	-9.01
1	6	Y	-18.03
1	7	Y	-9.01
1	8	Y	-18.03
1	9	Y	-18.78
1	10	Y	-8.26
1	11	Y	-18.78
1	12	Y	-8.26
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-0.00
1	5	Y	-1.80
1	6	Y	-3.60
1	7	Y	-3.60
1	8	Y	-3.03
1	9	Y	-3.07
1	10	Y	-3.60
1	11	Y	-3.60
1	12	Y	-1.70

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

5 BR Cases for Brevity

Loadcase ID: BR1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR2 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR3 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR4 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.75
1	2	Z	-0.75
1	3	Z	-0.75
1	4	Z	-0.75
1	5	Z	-0.75
1	6	Z	-0.75
1	7	Z	-0.75
1	8	Z	-0.75
1	9	Z	-0.75
1	10	Z	-0.75
1	11	Z	-0.75
1	12	Z	-0.75

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR5 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.75
1	2	Z	-0.75
1	3	Z	-0.75
1	4	Z	-0.75
1	5	Z	-0.75
1	6	Z	-0.75
1	7	Z	-0.75
1	8	Z	-0.75
1	9	Z	-0.75
1	10	Z	-0.75
1	11	Z	-0.75
1	12	Z	-0.75

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Selected load groups:

STRENGTH GROUP I
STRENGTH GROUP III
STRENGTH GROUP V
SERVICE GROUP I

CAP DESIGN
==========

Code: AASHTO LRFD (2013-Interims)
Units: US
Pier View : Upstation.

DESIGN PARAMETERS:
==========

f'c = 4000.0 psi
Fy flex = 60000.0 psi Fy shear = 60000.0 psi
phi tens = 0.90 phi comp = 0.75 phi shear = 0.90
Tens above = 0.005 Comp below = 0.002
Ec = 3834.3 ksi Es = 29000.0 ksi
Crack check as per current LRFD
Crack control Exposure = 1.00
Concrete Type : Normal Weight.
Design : face of column.

CAP GEOMETRY:
==========

Straight Cap : Length(X) = 38.58 ft Depth(Z) = 36.00 in

Cap Section Properties:
==========

Sec.	Area ft ^2	Iz in ^4	Iy in ^4
1	15.00	648000.00	233280.00

MAIN REINFORCEMENT:
==========

	Bar size	Quantity	Bar dist. in	As total in^2	From ft	To ft	Hook
TOP	US#9 [M29]	4	3.19	4.000	0.17	38.42	None
BOTTOM	US#9 [M29]	4	4.19	4.000	0.17	38.42	None

STIRRUPS:
==========

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft	Bar Type
0.25	38.33	US#5 [M16]	2	12.00	0.62	Stirrup

Clear Cover on Sides = 2.50 in

FLEXURE DESIGN:
==========

Span 1: From 0.00 ft To 2.79 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2

```
-----------------------------------------------------------------------------------------------------------------------------
-------------------------
 2.2   2.2   60      0.0   661.3     0  T   2.48  55.81  0.064  0.90      0.73     4.00     2.62
0.73     4.00     4.00
                    -30.3  -508.2     1  T   2.78  56.81  0.058  0.90      0.73     4.00     4.00
.73      4.00     1.87
```

Span 2: From 2.79 ft To 8.29 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.6   3.4   60     12.7   990.6   530  T   2.76  55.81  0.058  0.90      0.73     4.00     4.00
0.73     4.00     4.00
                   -34.8  -761.7   705  T   2.98  56.81  0.054  0.90      0.73     4.00     4.00
0.73     4.00     2.93
 3.0   5.8   60   186.2   990.6     2  T   2.76  55.81  0.058  0.90      0.99     4.00     4.00
0.73     4.00     4.00
                    -7.6 -1018.6  1804  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9   7.7   60   144.6   990.6   355  T   2.76  55.81  0.058  0.90      0.77     4.00     4.00
0.73     4.00     4.00
                   -53.9 -1018.6   188  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 3: From 8.29 ft To 13.79 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
st-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.6   8.9   60   206.9   990.6   355  T   2.76  55.81  0.058  0.90      1.10     4.00     4.00
0.73     4.00     4.00
                   -52.6 -1018.6   188  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 3.5  11.8   60   285.3   990.6    21  T   2.76  55.81  0.058  0.90      1.52     4.00     4.00
0.73     4.00     4.00
                   -41.8 -1018.6   529  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  13.2   60   204.9   990.6   373  T   2.76  55.81  0.058  0.90      1.09     4.00     4.00
0.73     4.00     4.00
                   -84.5 -1018.6   177  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 4: From 13.79 ft To 19.29 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------------------------------
-------------------------
 0.6  14.4   60   214.1   990.6   361  T   2.76  55.81  0.058  0.90      1.14     4.00     4.00
0.73     4.00     4.00
                   -85.8 -1018.6   177  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

```
 1.0  14.8   60   258.8   990.6     9  T   2.76  55.81  0.058  0.90      1.38     4.00     4.00
0.73     4.00     4.00
                  -72.1 -1018.6   529  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.0  17.8   60   273.3   990.6    17  T   2.76  55.81  0.058  0.90      1.46     4.00     4.00
0.73     4.00     4.00
                  -92.4 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  18.7   60   211.5   990.6   366  T   2.76  55.81  0.058  0.90      1.13     4.00     4.00
0.73     4.00     4.00
                 -137.2 -1018.6   191  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 5: From 19.29 ft To 24.79 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.6  19.9   60   210.4   990.6   361  T   2.76  55.81  0.058  0.90      1.12     4.00     4.00
0.73     4.00     4.00
                 -141.8 -1018.6   191  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.74     4.00     4.00
 1.5  20.8   60   271.6   990.6     6  T   2.76  55.81  0.058  0.90      1.45     4.00     4.00
0.73     4.00     4.00
                 -104.4 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.5  23.8   60   256.5   990.6    14  T   2.76  55.81  0.058  0.90      1.37     4.00     4.00
0.73     4.00     4.00
                  -74.3 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  24.2   60   211.4   990.6   366  T   2.76  55.81  0.058  0.90      1.13     4.00     4.00
0.73     4.00     4.00
                  -89.0 -1018.6   178  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 6: From 24.79 ft To 30.29 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
-------------------------
 0.6  25.4   60   203.3   990.6   363  T   2.76  55.81  0.058  0.90      1.08     4.00     4.00
0.73     4.00     4.00
                  -89.0 -1018.6   178  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 2.0  26.8   60   283.3   990.6    11  T   2.76  55.81  0.058  0.90      1.51     4.00     4.00
0.73     4.00     4.00
                  -46.4 -1018.6   530  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  29.7   60   206.1   990.6   364  T   2.76  55.81  0.058  0.90      1.10     4.00     4.00
0.73     4.00     4.00
                  -55.5 -1018.6   179  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 7: From 30.29 ft To 35.79 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
```

```
                    Mmin     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------
-----------------------
 0.6  30.9   60   143.6   990.6   364  T   2.76  55.81  0.058  0.90      0.76     4.00     4.00
0.73     4.00     4.00
                  -56.3 -1018.6   179  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 2.5  32.8   60   176.7   990.6    18  T   2.76  55.81  0.058  0.90      0.94     4.00     4.00
0.73     4.00     4.00
                   -8.7 -1018.6   531  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  35.2   60    10.7   990.6   546  T   2.76  55.81  0.058  0.90      0.73     4.00     4.00
0.73     4.00     4.00
                  -35.1  -761.6   707  T   2.98  56.81  0.054  0.90      0.73     4.00     4.00
0.73     4.00     2.93
```

Span 8: From 35.79 ft To 38.58 ft

```
 Loc  AbsLoc  H    Mmax     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                    Mmin     Mr    Comb  CL    c     dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft     ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-----------------------------------------------------------------------------------------------------
-----------------------
 0.6  36.4   60     0.0   661.1     0  T   2.48  55.81  0.064  0.90      0.73     4.00     2.62
0.73     4.00     4.00
                  -30.3  -508.1     1  T   2.78  56.81  0.058  0.90      0.73     4.00     4.00
0.73     4.00     1.87
```

Note:
CL: Section classification as per LRFD 2006 interims for provided reinforcement.
C = Compression controlled, I = In-Transition, T = Tension controlled.

SHEAR AND TORSION DESIGN:
==========
Beta-Theta Method used for design.

Span 1: From 0.00 ft To 2.79 ft

```
  Loc  AbsLoc Pos   Vu   Comb    Tu   Comb phi*Vn   T-lim   Avs/s 2Ats/s  Av/s    Aprv/s   Alx
   ft     ft       kips       kips-ft       kips   kips-ft  <--------- in^2/ft -------->    in^2
-----------------------------------------------------------------------------------------------
  2.21   2.21 L    23.3    1     0.0    0   582.0    113.9   0.00   0.00   0.00     0.62     0.00

  Loc  AbsLoc Pos    Vc      Vs    Beta   Theta      b   dv   Esp_s
   ft     ft        kips    kips          deg       in   in
-------------------------------------------------------------------
  2.21   2.21 L    370.59  276.09   2.93  31.99  36.00  55.63  0.0009
```

Span 2: From 2.79 ft To 8.29 ft

```
  Loc  AbsLoc Pos   Vu   Comb    Tu   Comb phi*Vn   T-lim   Avs/s 2Ats/s  Av/s    Aprv/s   Alx
   ft     ft       kips       kips-ft       kips   kips-ft  <--------- in^2/ft -------->    in^2
-----------------------------------------------------------------------------------------------
  0.58   3.37 R    85.3   68    18.4   79   479.4    113.9   0.00   0.00   0.00     0.62     0.00
  3.00   5.79 L    64.3   68    18.4   79   527.3    113.9   0.00   0.00   0.00     0.62     0.00
             R    40.5   42    15.5   42   598.1    113.9   0.00   0.00   0.00     0.62     0.00
  4.92   7.71 L    57.1   42    15.5   42   546.5    113.9   0.00   0.00   0.00     0.62     0.00

  Loc  AbsLoc Pos    Vc      Vs    Beta   Theta      b   dv   Esp_s
   ft     ft        kips    kips          deg       in   in
```

0.58	3.37	R	283.39	249.28	2.28	34.15	36.00	54.55	0.0015
3.00	5.79	L	324.84	261.01	2.62	32.88	36.00	54.42	0.0011
		R	388.94	275.64	3.14	31.47	36.00	54.42	0.0007
4.92	7.71	L	341.91	265.32	2.76	32.45	36.00	54.42	0.0010

Span 3: From 8.29 ft To 13.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	8.87	R	75.5	43	33.7	39	499.6	113.9	0.00	0.00	0.00	0.62	0.00
3.50	11.79	L	50.4	395	33.7	391	548.4	113.9	0.00	0.00	0.00	0.62	0.00
		R	84.0	24	31.7	37	480.9	113.9	0.00	0.00	0.00	0.62	0.00
4.92	13.21	L	96.4	24	31.7	37	456.7	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	8.87	R	300.81	254.31	2.43	33.56	36.00	54.42	0.0013
3.50	11.79	L	343.59	265.72	2.77	32.41	36.00	54.42	0.0010
		R	284.90	249.41	2.30	34.08	36.00	54.42	0.0015
4.92	13.21	L	264.83	242.61	2.14	34.81	36.00	54.42	0.0017

Span 4: From 13.79 ft To 19.29 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	14.37	R	115.1	75	54.1	82	424.4	113.9	0.46	0.00	0.46	0.62	0.00
1.00	14.79	L	111.5	75	54.1	82	430.3	113.9	0.46	0.00	0.46	0.62	0.00
		R	65.7	36	51.3	39	524.4	113.9	0.00	0.00	0.00	0.62	0.00
4.00	17.79	L	54.8	25	51.3	41	544.8	113.9	0.00	0.00	0.00	0.62	0.00
		R	102.4	43	49.3	32	445.6	113.9	0.00	0.00	0.00	0.62	0.00
4.92	18.71	L	110.4	43	49.3	32	432.1	113.9	0.46	0.00	0.46	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	14.37	R	238.94	232.64	1.93	35.95	36.00	54.42	0.0020
1.00	14.79	L	243.56	234.53	1.97	35.73	36.00	54.42	0.0019
		R	322.35	260.35	2.60	32.94	36.00	54.42	0.0011
4.00	17.79	L	340.42	264.96	2.75	32.49	36.00	54.42	0.0010
		R	255.83	239.31	2.06	35.18	36.00	54.42	0.0018
4.92	18.71	L	245.02	235.12	1.98	35.66	36.00	54.42	0.0019

Span 5: From 19.29 ft To 24.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	19.87	R	109.7	33	55.9	26	433.3	113.9	0.00	0.00	0.00	0.62	0.00
1.50	20.79	L	101.8	33	55.9	26	447.1	113.9	0.00	0.00	0.00	0.62	0.00
		R	54.3	78	60.5	86	548.0	113.9	0.00	0.00	0.00	0.62	0.00
4.50	23.79	L	66.2	75	60.5	72	521.6	113.9	0.00	0.00	0.00	0.62	0.00
		R	112.2	80	65.1	76	429.0	113.9	0.46	0.00	0.46	0.62	0.00
4.92	24.21	L	115.8	80	65.1	76	423.2	113.9	0.46	0.00	0.46	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	19.87	R	245.99	235.50	1.99	35.62	36.00	54.42	0.0019
1.50	20.79	L	257.00	239.75	2.07	35.13	36.00	54.42	0.0018
		R	343.25	265.64	2.77	32.42	36.00	54.42	0.0010
4.50	23.79	L	319.88	259.69	2.58	33.01	36.00	54.42	0.0011
		R	242.53	234.11	1.96	35.78	36.00	54.42	0.0019
4.92	24.21	L	237.98	232.24	1.92	36.00	36.00	54.42	0.0020

Span 6: From 24.79 ft To 30.29 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	25.37	R	87.6	84	37.8	74	473.9	113.9	0.00	0.00	0.00	0.62	0.00
2.00	26.79	L	75.3	84	37.8	74	500.6	113.9	0.00	0.00	0.00	0.62	0.00
		R	50.6	429	42.3	424	547.8	113.9	0.00	0.00	0.00	0.62	0.00
4.92	29.71	L	75.7	77	42.3	72	499.1	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	25.37	R	279.06	247.51	2.25	34.28	36.00	54.42	0.0015
2.00	26.79	L	301.70	254.57	2.43	33.53	36.00	54.42	0.0013
		R	343.07	265.60	2.77	32.42	36.00	54.42	0.0010
4.92	29.71	L	300.37	254.18	2.42	33.57	36.00	54.42	0.0013

Span 7: From 30.29 ft To 35.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	30.87	R	51.5	85	19.3	85	563.6	113.9	0.00	0.00	0.00	0.62	0.00
2.50	32.79	L	34.9	85	19.3	85	613.5	113.9	0.00	0.00	0.00	0.62	0.00
		R	61.2	84	23.9	73	535.0	113.9	0.00	0.00	0.00	0.62	0.00
4.92	35.21	L	82.2	84	23.9	73	486.1	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	30.87	R	357.28	268.92	2.88	32.10	36.00	54.42	0.0009
2.50	32.79	L	403.29	278.40	3.25	31.22	36.00	54.42	0.0006
		R	331.70	262.78	2.68	32.70	36.00	54.42	0.0011
4.92	35.21	L	289.00	251.07	2.33	33.96	36.00	54.55	0.0014

Span 8: From 35.79 ft To 38.58 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	36.37	R	23.3	1	0.0	0	580.2	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	36.37	R	368.97	275.73	2.91	32.02	36.00	55.63	0.0009

Note:

- Pos is the design position. L suggests the calculation is done at immediate left of "Loc" and R suggests at immediate right of it.
- T-lim is the limiting value of torsion for the concrete section. If actual torsion is higher than this value, torsional steel has to be provided.
- Avs/s is the required area of steel per unit length for shear force.
- 2Ats/s is the required area of steel per unit length for two legs of torsional reinforcement.
- Av/s is the total required area of steel per unit length due to shear plus torsion.
- Aprvs/s is the total provided area of transverse steel reinforcement.
- Alx is the EFFECTIVE longitudinal steel required in addition to the PROVIDED EFFECTIVE flexural steel.
- Vc is the nominal shear resistence of concrete.
- Vs is the nominal shear resistence of transverse reinforcement.
- Beta is the factor indicating ability of diagonally cracked concrete to transmit tension and shear.
- Theta is the angle of inclination of diagonal compressive stress.
  # Vu is greater tha phi*Vn.

CRACKING/FATIGUE CHECK:
==========

Cracking check as per AASHTO LRFD (6th Edition, 2012)

Span 1: From 0.00 ft To 2.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	<------ Cracking ------> Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	<------ Fatigue ------> fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
2.21	2.2	60.02145		2.8	3.2	36.0	9.5	0.0	0.00	0
			0	0.0	4.2	36.0	9.5	0.0	0.00	0

Span 2: From 2.79 ft To 8.29 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	<------ Cracking ------> Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	<------ Fatigue ------> fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	3.4	60.02156		2.1	3.2	36.0	9.5	0.0	0.00	0
			2234	0.0	4.2	36.0	9.5	0.0	0.00	0
3.00	5.8	60.02156		0.0	3.2	36.0	9.5	0.0	0.00	0
			2234	6.5	4.2	36.0	9.5	0.0	0.00	0
4.92	7.7	60.02156		2.2	3.2	36.0	9.5	0.0	0.00	0
			2235	4.5	4.2	36.0	9.5	0.0	0.00	0

Span 3: From 8.29 ft To 13.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	<------ Cracking ------> Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	<------ Fatigue ------> fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	8.9	60.02156		2.2	3.2	36.0	9.5	0.0	0.00	0
			2235	6.8	4.2	36.0	9.5	0.0	0.00	0
3.50	11.8	60.02145		1.0	3.2	36.0	9.5	0.0	0.00	0
			2253	9.8	4.2	36.0	9.5	0.0	0.00	0
4.92	13.2	60.02145		3.0	3.2	36.0	9.5	0.0	0.00	0
			2253	6.5	4.2	36.0	9.5	0.0	0.00	0

Span 4: From 13.79 ft To 19.29 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	<------ Cracking ------> Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	<------ Fatigue ------> fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	14.4	60.02145		3.1	3.2	36.0	9.5	0.0	0.00	0
			2241	6.9	4.2	36.0	9.5	0.0	0.00	0
1.00	14.8	60.02145		2.4	3.2	36.0	9.5	0.0	0.00	0
			2241	8.7	4.2	36.0	9.5	0.0	0.00	0
4.00	17.8	60.02159		2.6	3.2	36.0	9.5	0.0	0.00	0
			2249	9.1	4.2	36.0	9.5	0.0	0.00	0
4.92	18.7	60.02247		4.6	3.2	36.0	9.5	0.0	0.00	0
			2158	6.6	4.2	36.0	9.5	0.0	0.00	0

Span 5: From 19.29 ft To 24.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	<------ Cracking ------> Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	<------ Fatigue ------> fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	19.9	60.02159		4.7	3.2	36.0	9.5	0.0	0.00	0
			2241	6.6	4.2	36.0	9.5	0.0	0.00	0
1.50	20.8	60.02159		2.9	3.2	36.0	9.5	0.0	0.00	0

		2238	9.0	4.2	36.0	9.5	0.0	0.00	0
4.50	23.8	60.02247	2.4	3.2	36.0	9.5	0.0	0.00	0
		2158	8.6	4.2	36.0	9.5	0.0	0.00	0
4.92	24.2	60.02234	3.2	3.2	36.0	9.5	0.0	0.00	0
		2158	6.8	4.2	36.0	9.5	0.0	0.00	0

Span 6: From 24.79 ft To 30.29 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	25.4	60.02234		3.1	3.2	36.0	9.5	0.0	0.00	0
		2155		6.4	4.2	36.0	9.5	0.0	0.00	0
2.00	26.8	60.02234		1.1	3.2	36.0	9.5	0.0	0.00	0
		2155		9.7	4.2	36.0	9.5	0.0	0.00	0
4.92	29.7	60.02235		2.3	3.2	36.0	9.5	0.0	0.00	0
		2156		6.8	4.2	36.0	9.5	0.0	0.00	0

Span 7: From 30.29 ft To 35.79 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	30.9	60.02235		2.2	3.2	36.0	9.5	0.0	0.00	0
		2156		4.4	4.2	36.0	9.5	0.0	0.00	0
2.50	32.8	60.02235		0.0	3.2	36.0	9.5	0.0	0.00	0
		2162		6.2	4.2	36.0	9.5	0.0	0.00	0
4.92	35.2	60.02245		2.1	3.2	36.0	9.5	0.0	0.00	0
		0		0.0	4.2	36.0	9.5	0.0	0.00	0

Span 8: From 35.79 ft To 38.58 ft

			<------ Cracking ------>					<------ Fatigue ------>		
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	36.4	60.02145		2.8	3.2	36.0	9.5	0.0	0.00	0
		0		0.0	4.2	36.0	9.5	0.0	0.00	0

PROJECT DATA
==========

Project : S-69 over Jumping Run Creek
User Job No.:
Designer : DKY
Date : 2/12/16
Checker :
Checked Date: RAJ 2/16/16 Pages 1 thru 23
State : State Job No. :
Structure type: Pier.
Pier View : Upstation.
Code : AASHTO LRFD (2013-Interims)
Comments : End Bent 4

37'-6" - 70'-0" - 56'-6"

No Skew

12 - 3'-0" x 2'-0" Cored Slabs

7 - HP14x73 Piles @ 5'-6"

PIER GEOMETRY
==========

Pier Type: Multi Column

Pier View : Upstation.
Cap Shape: Straight Top Elevations: start = 21.20 ft end = 20.00 ft
Depth(Z) = 36.00 in Skew angle = 0.00 Reduction of I = 1.000
Length(X) = 38.58 ft Height(Y) = 60.00 in

Column Shape : Rectangular
Number of columns: 7

Column number 1:

Location from the left edge of the cap(X): 2.79 ft
Elevations: bottom = 5.00 ft top = 18.61 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 2:

Location from the left edge of the cap(X): 8.29 ft
Elevations: bottom = 5.00 ft top = 18.44 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 3:

Location from the left edge of the cap(X): 13.79 ft
Elevations: bottom = 5.00 ft top = 18.27 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 4:

Location from the left edge of the cap(X): 19.29 ft
Elevations: bottom = 5.00 ft top = 18.10 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 5:

Location from the left edge of the cap(X): 24.79 ft
Elevations: bottom = 5.00 ft top = 17.93 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 6:

Location from the left edge of the cap(X): 30.29 ft
Elevations: bottom = 5.00 ft top = 17.76 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

Column number 7:

Location from the left edge of the cap(X): 35.79 ft
Elevations: bottom = 5.00 ft top = 17.59 ft Reduction of I = 0.756

Column Bottom is Fixed

Column section dimensions:
Width(X) = 13.92 in Depth(Z) = 23.26 in

SUPERSTRUCTURE INFO

Total number of spans: 3 Span number rear to current pier: 3
Number of traffic lanes: 2

Beam: height : 24.00 in section area : 637.80 in^2
Beam Inertia (Ixx): 39436.00 in^4 Beam inertia (Iyy): 76800.00 in^4
Beam CG:12.00 in Barrier height : 32.00 in Depth of slab : 2.00 in
Curb to curb distance: 32.833 ft

Span #	Span length	Bridge Width
1	37.500 ft	36.000 ft
2	70.000 ft	36.000 ft
3	56.500 ft	36.000 ft
		36.000 ft

BEARING POINTS

Number of bearing lines: 1
First bearing line Eccentricity = 0.00 ft

Point	Distance ft
1	2.79
2	5.79
3	8.79
4	11.79
5	14.79
6	17.79
7	20.79
8	23.79
9	26.79
10	29.79
11	32.79
12	35.79

MATERIAL PROPERTIES

	Cap	Column	Footing
Concrete Type	normal	normal	normal
Concrete Strength (psi)	4000.00	1000.00	4000.00
Concrete Density (lb/ft3)	150.00	150.00	150.00
Concrete Modulus Ec (ksi)	3834.30	1917.13	3834.30
Steel Strength Fy (ksi)	60.00	60.00	60.00

DESIGN PARAMETERS

==========

AASHTO LRFD Code

Resistance factors for reinf. concrete:

Flexure and tension	0.90
Shear and torsion (normal)	0.90
(lightweight)	0.70
Axial compression (ties)	0.75
Axial compression (spiral)	0.75
Compression in STM	0.70

Multi presence factors for live load:

1	Lanes	1.20
2	Lanes	1.00
3	Lanes	0.85
4	Lanes	0.65
5	Lanes	0.65
6	Lanes	0.65

Dynamic load allowance IM:

	Truck	Lane	Fatigue
Cap	0.33	0.00	0.15
Column	0.33	0.00	0.15
Footing	0.00	0.00	0.00

	Exposure factors	Clear cover in	Clear side cover in
Cap	1.00	2.50	2.50
Column	1.00	2.00	
Footing	1.00	3.00	3.00

Degree of fixity in foundations for Moment Magnify Method: Ga = 5.00

SEISMIC DESIGN PARAMETERS
==========

Strength Reduction factors for reinf. Concrete Seismic Design:

Tension controlled	: 0.90
Shear and torsion (normal)	: 0.90
(lightweight)	: 0.70
Compression Controlled (ties)	: 0.75
Compression Controlled (spiral)	: 0.75

Seismic Overstrength

Flexure and tension	: 1.30
Axial compression (ties)	: 1.30
Axial compression (spiral)	: 1.30

Response Modification Factor : 1.00

Use core area for plastic hinging calculations.

Design Factors

Cap Design Factor	: 1.20
Footing Design Factor	: 1.20

Plastic Hinge Moment

Use actual computed Plastic Hinging Moment for each column in all combinations.

LOADS
=====

.ier View : Upstation.
Load Cases: 50

Loadcase ID: DC1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
UDL	Y	----	-4.50	0.00	----	1.00
Force	Y	0.00	-3.30	0.00	----	----
Force	Y	0.00	-3.30	1.00	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-23.90
1	2	Y	-23.90
1	3	Y	-23.90
1	4	Y	-23.90
1	5	Y	-23.90
1	6	Y	-23.90
1	7	Y	-23.90
1	8	Y	-23.90
1	9	Y	-23.90
1	10	Y	-23.90
1	11	Y	-23.90
1	12	Y	-23.90

Loadcase ID: DW1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
UDL	Y	----	-0.15	0.00	----	1.00

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	-1.20
1	2	Y	-1.20
1	3	Y	-1.20
1	4	Y	-1.20
1	5	Y	-1.20
1	6	Y	-1.20
1	7	Y	-1.20
1	8	Y	-1.20
1	9	Y	-1.20
1	10	Y	-1.20
1	11	Y	-1.20
1	12	Y	-1.20

Loadcase ID: WS1 Name: Angle: 0
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L

Force	X	0.00	-0.60	0.50	----	----

Column loads:

Col #	Type	Dir	Mag1		y1/L	Mag2	y2/L
7	UDL	X	-0.078	klf	0.79	----	0.80
6	UDL	X	-0.078	klf	0.78	----	0.80
5	UDL	X	-0.078	klf	0.77	----	0.81
4	UDL	X	-0.078	klf	0.76	----	0.81
3	UDL	X	-0.078	klf	0.75	----	0.81
2	UDL	X	-0.078	klf	0.74	----	0.81
1	UDL	X	-0.078	klf	0.73	----	0.82

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00
1	1	Y	-2.89
1	1	X	-0.38
1	2	Y	1.13
1	2	X	-0.38
1	2	Z	0.00
1	3	Z	0.00
1	3	Y	1.13
1	3	X	-0.38
1	4	Z	0.00
1	4	Y	1.13
1	4	X	-0.38
1	5	Z	0.00
1	5	Y	1.13
1	5	X	-0.38
1	6	X	-0.38
1	6	Y	1.13
1	6	Z	0.00
1	7	Z	0.00
1	7	Y	1.13
1	7	X	-0.38
1	8	Z	0.00
1	8	Y	1.13
1	8	X	-0.38
1	9	Z	0.00
1	9	Y	1.13
1	9	X	-0.38
1	10	Z	0.00
1	10	Y	1.13
1	10	X	-0.38
1	11	Y	1.13
1	11	X	-0.38
1	11	Z	0.00
1	12	Y	5.14
1	12	Z	0.00
1	12	X	-0.38

Auto generation details

Generated Wind Load on Structure

Angle of wind = 0.00 deg Elevation above which wind load acts = 15.00 ft

Default wind pressure

Wind pressure for superstructure:		Wind pressure for substructure:	
Transverse	50.000 psf	Cap	40.000 psf
Longitudinal	0.000 psf	Column	40.000 psf
Overturning	20.000 psf		

Loadcase ID: WL1 Name: Angle: 0

Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	0.00

1	1	X	-0.24
1	1	Y	-0.70
1	2	Y	-0.00
1	2	X	-0.24
1	2	Z	0.00
1	3	Z	0.00
1	3	Y	-0.00
1	3	X	-0.24
1	4	Z	0.00
1	4	Y	-0.00
1	4	X	-0.24
1	5	Z	0.00
1	5	Y	-0.00
1	5	X	-0.24
1	6	Z	0.00
1	6	Y	-0.00
1	6	X	-0.24
1	7	X	-0.24
1	7	Y	-0.00
1	7	Z	0.00
1	8	Z	0.00
1	8	Y	-0.00
1	8	X	-0.24
1	9	Z	0.00
1	9	Y	-0.00
1	9	X	-0.24
1	10	Z	0.00
1	10	Y	-0.00
1	10	X	-0.24
1	11	Y	-0.00
1	11	X	-0.24
1	11	Z	0.00
1	12	Z	0.00
1	12	Y	0.70
1	12	X	-0.24

Auto generation details
Generated Wind Load on Live Load
Angle of wind = 0.00 deg Live load length = 28.25 ft

Loadcase ID: TU1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	0.00
1	1	Z	-0.52
1	2	X	0.00
1	2	Z	-0.52
1	3	X	0.00
1	3	Z	-0.52
1	4	X	0.00
1	4	Z	-0.52
1	5	X	0.00
1	5	Z	-0.52
1	6	X	0.00
1	6	Z	-0.52
1	7	X	0.00
1	7	Z	-0.52
1	8	X	0.00
1	8	Z	-0.52
1	9	X	0.00
1	9	Z	-0.52
1	10	X	0.00
1	10	Z	-0.52
1	11	X	0.00
1	11	Z	-0.52
1	12	X	0.00

1	12	Z	-0.52

Auto generation details

Bearing type: Elastomeric Bearings

Direction of thermal force: +(Z)

Length of Superstructure Contributing, L: 28.250 ft
Change in temperature: 40.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

Area of bearing: 204.00 in^2
Shear modulus of Elastomer: 0.17 kips
Total Elastomer Thickness: 0.75 in

Loadcase ID: TU2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	X	-0.00
1	1	Z	0.66
1	2	X	-0.00
1	2	Z	0.66
1	3	X	-0.00
1	3	Z	0.66
1	4	X	-0.00
1	4	Z	0.66
1	5	X	-0.00
1	5	Z	0.66
1	6	X	-0.00
1	6	Z	0.66
1	7	X	-0.00
1	7	Z	0.66
1	8	X	-0.00
1	8	Z	0.66
1	9	X	-0.00
1	9	Z	0.66
1	10	X	-0.00
1	10	Z	0.66
1	11	X	-0.00
1	11	Z	0.66
1	12	X	-0.00
1	12	Z	0.66

Auto generation details

Bearing type: Elastomeric Bearings

Direction of thermal force: -(Z)

Length of Superstructure Contributing, L: 28.250 ft
Change in temperature: 50.000 °F
Coefficient of thermal expansion: 6.0e-006 ft/°F

Area of bearing: 204.00 in^2
Shear modulus of Elastomer: 0.17 kips
Total Elastomer Thickness: 0.75 in

5 LL Cases shown for Brevity

Loadcase ID: LL1 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	-25.05
1	10	Y	-11.02
1	11	Y	-25.05
1	12	Y	-11.02
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	-0.42
1	9	Y	-5.18
1	10	Y	-6.51
1	11	Y	-6.51
1	12	Y	-3.08

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL2 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	-36.06
1	3	Y	0.00
1	4	Y	-36.06
1	5	Y	0.00
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00

1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	-1.45
1	2	Y	-6.15
1	3	Y	-6.51
1	4	Y	-6.15
1	5	Y	-1.45
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL3 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	-36.06
1	4	Y	0.00
1	5	Y	-36.06
1	6	Y	0.00
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	0.00
1	2	Y	-1.45
1	3	Y	-6.15
1	4	Y	-6.51
1	5	Y	-6.15
1	6	Y	-1.45
1	7	Y	0.00
1	8	Y	0.00
1	9	Y	0.00
1	10	Y	0.00
1	11	Y	0.00
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL4 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-10.02
1	5	Y	-20.04
1	6	Y	-10.02
1	7	Y	-20.04
1	8	Y	-30.05
1	9	Y	0.00
1	10	Y	-30.05
1	11	Y	0.00
1	12	Y	0.00
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-2.71
1	5	Y	-5.42
1	6	Y	-5.42
1	7	Y	-5.42
1	8	Y	-5.42
1	9	Y	-5.42
1	10	Y	-5.12
1	11	Y	-1.21
1	12	Y	0.00

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

Loadcase ID: LL5 Name:
Multiplier = 1.000

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	0.00
1	5	Y	-10.02
1	6	Y	-20.04
1	7	Y	-10.02
1	8	Y	-20.04
1	9	Y	-20.87
1	10	Y	-9.18
1	11	Y	-20.87
1	12	Y	-9.18
1	1	Y	0.00
1	2	Y	0.00
1	3	Y	0.00
1	4	Y	-0.00
1	5	Y	-2.71
1	6	Y	-5.42
1	7	Y	-5.42
1	8	Y	-4.57
1	9	Y	-4.62
1	10	Y	-5.42
1	11	Y	-5.42
1	12	Y	-2.56

Auto generation details

Generated Live Load

Longitudinal Reaction: Simple Span Distribution

Selected Vehicles:
Design Truck
Design Truck + Lane Load
Design Tandem + Lane Load
Transverse Positioning
Number of loaded lanes = all combinations

Live Load Positions = Variable Spacing
Minimum Spacing Between Positions = 1.00 ft

Generate Braking/Longitudinal Force = Selected
Generate Centrifugal Force = Not Selected

Total number of Considered Truck Positions = 18
Total number of Possible Combination = 73

5 BR Cases shown for Brevity

Loadcase ID: BR1 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR2 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR3 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-44.10	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.45
1	2	Z	-0.45
1	3	Z	-0.45
1	4	Z	-0.45
1	5	Z	-0.45
1	6	Z	-0.45
1	7	Z	-0.45
1	8	Z	-0.45
1	9	Z	-0.45
1	10	Z	-0.45
1	11	Z	-0.45
1	12	Z	-0.45

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 1

Loadcase ID: BR4 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.75
1	2	Z	-0.75
1	3	Z	-0.75
1	4	Z	-0.75
1	5	Z	-0.75
1	6	Z	-0.75
1	7	Z	-0.75
1	8	Z	-0.75
1	9	Z	-0.75
1	10	Z	-0.75
1	11	Z	-0.75
1	12	Z	-0.75

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Loadcase ID: BR5 Name:
Multiplier = 1.000

Cap loads:

Type	Dir	Arm ft	Mag1 kips, klf,k-ft	x1/L	Mag2 kips, klf,k-ft	x2/L
Moment	X	----	-73.50	0.50	----	----

Bearing loads:

Line #	Bearing #	Dir.	Load, kips
1	1	Z	-0.75
1	2	Z	-0.75
1	3	Z	-0.75
1	4	Z	-0.75
1	5	Z	-0.75
1	6	Z	-0.75
1	7	Z	-0.75
1	8	Z	-0.75
1	9	Z	-0.75
1	10	Z	-0.75
1	11	Z	-0.75
1	12	Z	-0.75

Auto generation details

Manual input
Maximum truck load = 18.00 kips
Maximum lane load = 0.00 kips
Number of loaded lanes = 2

Selected load groups:

STRENGTH GROUP I
STRENGTH GROUP III
STRENGTH GROUP V
SERVICE GROUP I

CAP DESIGN
==========

Code: AASHTO LRFD (2013-Interims)
Units: US
Pier View : Upstation.

DESIGN PARAMETERS:
==========

f'c = 4000.0 psi
Fy flex = 60000.0 psi Fy shear = 60000.0 psi
phi tens = 0.90 phi comp = 0.75 phi shear = 0.90
Tens above = 0.005 Comp below = 0.002
Ec = 3834.3 ksi Es = 29000.0 ksi
Crack check as per current LRFD
Crack control Exposure = 1.00
Concrete Type : Normal Weight.
Design : face of column.

CAP GEOMETRY:
==========

Straight Cap : Length(X) = 38.58 ft Depth(Z) = 36.00 in

Cap Section Properties:
==========

Sec.	Area ft ^2	Iz in ^4	Iy in ^4
1	15.00	648000.00	233280.00

MAIN REINFORCEMENT:
==========

	Bar size	Quantity	Bar dist. in	As total in^2	From ft	To ft	Hook
TOP	US#9 [M29]	4	3.19	4.000	0.17	38.42	None
BOTTOM	US#9 [M29]	4	4.19	4.000	0.17	38.42	None

STIRRUPS:
==========

From ft	To ft	Stirrup Size	n legs	Spacing in	Aprv/s in^2 / ft	Bar Type
0.25	38.33	US#5 [M16]	2	12.00	0.62	Stirrup

Clear Cover on Sides = 2.50 in

FLEXURE DESIGN:
==========

Span 1: From 0.00 ft To 2.79 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2

2.2	2.2	60	0.0	661.3	0	T	2.48	55.81	0.064	0.90	0.73	4.00	2.62	0.73	4.00	4.00	
			-30.3	-508.2	1	T	2.78	56.81	0.058	0.90	0.73	4.00	4.00	.73	4.00	1.87	

Span 2: From 2.79 ft To 8.29 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.6	3.4	60	19.8	990.6	530	T	2.76	55.81	0.058	0.90	0.73	4.00	4.00	0.73	4.00	4.00
			-32.6	-761.7	748	T	2.98	56.81	0.054	0.90	0.73	4.00	4.00	0.73	4.00	2.93
3.0	5.8	60	228.9	990.6	2	T	2.76	55.81	0.058	0.90	1.22	4.00	4.00	0.73	4.00	4.00
			0.0	-1018.6	0	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00
4.9	7.7	60	174.9	990.6	355	T	2.76	55.81	0.058	0.90	0.93	4.00	4.00	0.73	4.00	4.00
			-53.4	-1018.6	188	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00

Span 3: From 8.29 ft To 13.79 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.6	8.9	60	248.9	990.6	355	T	2.76	55.81	0.058	0.90	1.33	4.00	4.00	0.73	4.00	4.00
			-49.6	-1018.6	188	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00
3.5	11.8	60	344.7	990.6	21	T	2.76	55.81	0.058	0.90	1.84	4.00	4.00	0.73	4.00	4.00
			-39.5	-1018.6	529	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00
4.9	13.2	60	245.3	990.6	373	T	2.76	55.81	0.058	0.90	1.31	4.00	4.00	0.73	4.00	4.00
			-90.8	-1018.6	177	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00

Span 4: From 13.79 ft To 19.29 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff	Ast-req	Ast-prv	Ast-eff
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2	in^2	in^2	in^2
0.6	14.4	60	255.3	990.6	361	T	2.76	55.81	0.058	0.90	1.36	4.00	4.00	0.73	4.00	4.00
			-91.5	-1018.6	177	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00	0.73	4.00	4.00

```
 1.0  14.8   60   311.7   990.6     9  T   2.76  55.81  0.058  0.90      1.66     4.00     4.00
0.73     4.00     4.00
                  -76.5 -1018.6   529  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.0  17.8   60   328.7   990.6    17  T   2.76  55.81  0.058  0.90      1.75     4.00     4.00
0.73     4.00     4.00
                 -100.2 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  18.7   60   251.6   990.6   366  T   2.76  55.81  0.058  0.90      1.34     4.00     4.00
0.73     4.00     4.00
                 -153.5 -1018.6   191  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.80     4.00     4.00
```

Span 5: From 19.29 ft To 24.79 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
------------------------
 0.6  19.9   60   250.3   990.6   361  T   2.76  55.81  0.058  0.90      1.33     4.00     4.00
0.73     4.00     4.00
                 -158.9 -1018.6   191  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.83     4.00     4.00
 1.5  20.8   60   326.6   990.6     6  T   2.76  55.81  0.058  0.90      1.74     4.00     4.00
0.73     4.00     4.00
                 -114.4 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.5  23.8   60   308.7   990.6    14  T   2.76  55.81  0.058  0.90      1.65     4.00     4.00
0.73     4.00     4.00
                  -79.2 -1018.6   543  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  24.2   60   252.0   990.6   366  T   2.76  55.81  0.058  0.90      1.34     4.00     4.00
0.73     4.00     4.00
                  -95.3 -1018.6   178  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 6: From 24.79 ft To 30.29 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
                   Mmin     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
  ft    ft   in  kips-ft  kips-ft                in                     in^2     in^2     in^2
in^2     in^2     in^2
-------------------------------------------------------------------------------------------------
------------------------
 0.6  25.4   60   243.3   990.6   363  T   2.76  55.81  0.058  0.90      1.30     4.00     4.00
0.73     4.00     4.00
                  -96.3 -1018.6   178  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 2.0  26.8   60   342.2   990.6    11  T   2.76  55.81  0.058  0.90      1.83     4.00     4.00
0.73     4.00     4.00
                  -45.1 -1018.6   530  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
 4.9  29.7   60   247.8   990.6   364  T   2.76  55.81  0.058  0.90      1.32     4.00     4.00
0.73     4.00     4.00
                  -53.3 -1018.6   179  T   3.27  56.81  0.049  0.90      0.73     4.00     4.00
0.73     4.00     4.00
```

Span 7: From 30.29 ft To 35.79 ft

```
 Loc  AbsLoc  H    Mmax     Mr   Comb  CL    c    dt     eps_t  Phi     Asb-req  Asb-prv  Asb-eff
Ast-req  Ast-prv  Ast-eff
```

	Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff
Ast-req ft in^2	Ast-prv ft in^2	Ast-eff kips-ft in^2	kips-ft			in			in^2	in^2	in^2
0.6	30.9 60	173.6	990.6	364	T	2.76	55.81	0.058	0.90	0.92	4.00	4.00
0.73	4.00	4.00										
		-56.5	-1018.6	179	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00
0.73	4.00	4.00										
2.5	32.8 60	218.4	990.6	18	T	2.76	55.81	0.058	0.90	1.16	4.00	4.00
0.73	4.00	4.00										
		-1.1	-1018.6	531	T	3.27	56.81	0.049	0.90	0.73	4.00	4.00
0.73	4.00	4.00										
4.9	35.2 60	17.6	990.6	546	T	2.76	55.81	0.058	0.90	0.73	4.00	4.00
0.73	4.00	4.00										
		-33.6	-761.6	837	T	2.98	56.81	0.054	0.90	0.73	4.00	4.00
0.73	4.00	2.93										

Span 8: From 35.79 ft To 38.58 ft

Loc	AbsLoc	H	Mmax	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff
Ast-req	Ast-prv	Ast-eff											
			Mmin	Mr	Comb	CL	c	dt	eps_t	Phi	Asb-req	Asb-prv	Asb-eff
Ast-req	Ast-prv	Ast-eff											
ft	ft	in	kips-ft	kips-ft				in			in^2	in^2	in^2
in^2	in^2	in^2											
0.6	36.4	60	0.0	661.1	0	T	2.48	55.81	0.064	0.90	0.73	4.00	2.62
0.73	4.00	4.00											
			-30.3	-508.1	1	T	2.78	56.81	0.058	0.90	0.73	4.00	4.00
0.73	4.00	1.87											

Note:
CL: Section classification as per LRFD 2006 interims for provided reinforcement.
C = Compression controlled, I = In-Transition, T = Tension controlled.

SHEAR AND TORSION DESIGN:
==========
Beta-Theta Method used for design.

Span 1: From 0.00 ft To 2.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
2.21	2.21	L	23.3	1	0.0	0	582.0	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
2.21	2.21	L	370.59	276.09	2.93	31.99	36.00	55.63	0.0009

Span 2: From 2.79 ft To 8.29 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	3.37	R	99.6	68	18.7	79	451.7	113.9	0.00	0.00	0.00	0.62	0.00
3.00	5.79	L	78.6	68	18.7	79	492.9	113.9	0.00	0.00	0.00	0.62	0.00
		R	49.4	42	15.9	42	567.7	113.9	0.00	0.00	0.00	0.62	0.00
4.92	7.71	L	66.0	42	15.9	42	522.6	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s

0.58	3.37	R	260.49	241.37	2.10	35.01	36.00	54.55	0.0017
3.00	5.79	L	295.04	252.58	2.38	33.74	36.00	54.42	0.0014
		R	361.03	269.77	2.91	32.02	36.00	54.42	0.0009
4.92	7.71	L	320.75	259.92	2.59	32.99	36.00	54.42	0.0011

Span 3: From 8.29 ft To 13.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	8.87	R	85.9	43	33.8	39	477.0	113.9	0.00	0.00	0.00	0.62	0.00
3.50	11.79	L	60.7	43	33.8	39	517.2	113.9	0.00	0.00	0.00	0.62	0.00
		R	102.3	24	32.5	37	445.9	113.9	0.00	0.00	0.00	0.62	0.00
4.92	13.21	L	114.6	24	32.5	37	425.4	113.9	0.46	0.00	0.46	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	8.87	R	281.65	248.36	2.27	34.19	36.00	54.42	0.0015
3.50	11.79	L	316.01	258.63	2.55	33.12	36.00	54.42	0.0012
		R	256.04	239.39	2.07	35.17	36.00	54.42	0.0018
4.92	13.21	L	239.71	232.96	1.93	35.91	36.00	54.42	0.0020

Span 4: From 13.79 ft To 19.29 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	14.37	R	138.3	75	54.4	82	390.9	113.9	0.46	0.00	0.46	0.62	0.00
1.00	14.79	L	134.6	75	54.4	82	395.8	113.9	0.46	0.00	0.46	0.62	0.00
		R	73.9	36	51.7	39	504.3	113.9	0.00	0.00	0.00	0.62	0.00
4.00	17.79	L	61.3	25	51.7	41	519.8	113.9	0.00	0.00	0.00	0.62	0.00
		R	124.1	43	50.4	32	410.8	113.9	0.46	0.00	0.46	0.62	0.00
4.92	18.71	L	132.1	43	50.4	32	399.4	113.9	0.46	0.00	0.46	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	14.37	R	213.26	221.08	1.72	37.35	36.00	54.42	0.0024
1.00	14.79	L	216.94	222.85	1.75	37.13	36.00	54.42	0.0023
		R	304.86	255.49	2.46	33.44	36.00	54.42	0.0013
4.00	17.79	L	318.31	259.26	2.57	33.05	36.00	54.42	0.0012
		R	228.32	228.08	1.84	36.49	36.00	54.42	0.0021
4.92	18.71	L	219.68	224.14	1.77	36.97	36.00	54.42	0.0023

Span 5: From 19.29 ft To 24.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s	Aprv/s -------->	Alx in^2
0.58	19.87	R	131.3	33	55.9	26	400.7	113.9	0.46	0.00	0.46	0.62	0.00
1.50	20.79	L	123.3	33	55.9	26	412.2	113.9	0.46	0.00	0.46	0.62	0.00
		R	60.7	78	61.2	86	523.2	113.9	0.00	0.00	0.00	0.62	0.00
4.50	23.79	L	74.6	75	61.2	72	501.2	113.9	0.00	0.00	0.00	0.62	0.00
		R	135.5	80	66.4	76	394.6	113.9	0.46	0.00	0.46	0.62	0.00
4.92	24.21	L	139.1	80	66.4	76	389.8	113.9	0.46	0.00	0.46	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	19.87	R	220.60	224.57	1.78	36.92	36.00	54.42	0.0023
1.50	20.79	L	229.41	228.56	1.85	36.43	36.00	54.42	0.0021
		R	321.32	260.07	2.59	32.97	36.00	54.42	0.0011
4.50	23.79	L	302.15	254.70	2.44	33.52	36.00	54.42	0.0013
		R	216.05	222.43	1.74	37.18	36.00	54.42	0.0023
4.92	24.21	L	212.44	220.67	1.71	37.40	36.00	54.42	0.0024

Span 6: From 24.79 ft To 30.29 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	25.37	R	104.8	84	37.9	74	441.8	113.9	0.00	0.00	0.00	0.62	0.00
2.00	26.79	L	92.5	84	37.9	74	464.5	113.9	0.00	0.00	0.00	0.62	0.00
		R	60.9	77	43.1	72	516.8	113.9	0.00	0.00	0.00	0.62	0.00
4.92	29.71	L	86.2	77	43.1	72	476.5	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	25.37	R	252.77	238.15	2.04	35.31	36.00	54.42	0.0018
2.00	26.79	L	271.21	244.85	2.19	34.57	36.00	54.42	0.0016
		R	315.72	258.56	2.55	33.12	36.00	54.42	0.0012
4.92	29.71	L	281.24	248.23	2.27	34.20	36.00	54.42	0.0015

Span 7: From 30.29 ft To 35.79 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	30.87	R	60.2	85	19.5	85	538.5	113.9	0.00	0.00	0.00	0.62	0.00
2.50	32.79	L	43.6	85	19.5	85	582.0	113.9	0.00	0.00	0.00	0.62	0.00
		R	75.2	84	24.7	73	500.3	113.9	0.00	0.00	0.00	0.62	0.00
4.92	35.21	L	96.1	84	24.7	73	458.2	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	30.87	R	334.81	263.57	2.70	32.62	36.00	54.42	0.0010
2.50	32.79	L	374.10	272.60	3.02	31.75	36.00	54.42	0.0008
		R	301.45	254.50	2.43	33.54	36.00	54.42	0.0013
4.92	35.21	L	265.80	243.30	2.14	34.80	36.00	54.55	0.0017

Span 8: From 35.79 ft To 38.58 ft

Loc ft	AbsLoc ft	Pos	Vu kips	Comb	Tu kips-ft	Comb	phi*Vn kips	T-lim kips-ft	Avs/s <---------	2Ats/s in^2/ft	Av/s --------	Aprv/s ------->	Alx in^2
0.58	36.37	R	23.3	1	0.0	0	580.2	113.9	0.00	0.00	0.00	0.62	0.00

Loc ft	AbsLoc ft	Pos	Vc kips	Vs kips	Beta	Theta deg	b in	dv in	Esp_s
0.58	36.37	R	368.97	275.73	2.91	32.02	36.00	55.63	0.0009

Note:

- Pos is the design position. L suggests the calculation is done at immediate left of "Loc" and R suggests at immediate right of it.
- T-lim is the limiting value of torsion for the concrete section. If actual torsion is higher than this value, torsional steel has to be provided.
- Avs/s is the required area of steel per unit length for shear force.
- 2Ats/s is the required area of steel per unit length for two legs of torsional reinforcement.
- Av/s is the total required area of steel per unit length due to shear plus torsion.
- Aprvs/s is the total provided area of transverse steel reinforcement.
- Alx is the EFFECTIVE longitudinal steel required in addition to the PROVIDED EFFECTIVE flexural steel.
- Vc is the nominal shear resistence of concrete.
- Vs is the nominal shear resistence of transverse reinforcement.
- Beta is the factor indicating ability of diagonally cracked concrete to transmit tension and shear.
- Theta is the angle of inclination of diagonal compressive stress.
  # Vu is greater tha phi*Vn.

CRACKING/FATIGUE CHECK:
==========

Cracking check as per AASHTO LRFD (6th Edition, 2012)

Span 1: From 0.00 ft To 2.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
2.21	2.2	60.02145		2.8	3.2	36.0	9.5	0.0	0.00	0
			0	0.0	4.2	36.0	9.5	0.0	0.00	0

Span 2: From 2.79 ft To 8.29 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.58	3.4	60.02156		2.0	3.2	36.0	9.5	0.0	0.00	0
			2234	0.4	4.2	36.0	9.5	0.0	0.00	0
3.00	5.8	60.0	0	0.0	3.2	36.0	9.5	0.0	0.00	0
			2234	8.1	4.2	36.0	9.5	0.0	0.00	0
4.92	7.7	60.02156		2.1	3.2	36.0	9.5	0.0	0.00	0
			2235	5.6	4.2	36.0	9.5	0.0	0.00	0

Span 3: From 8.29 ft To 13.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.58	8.9	60.02156		2.0	3.2	36.0	9.5	0.0	0.00	0
			2235	8.5	4.2	36.0	9.5	0.0	0.00	0
3.50	11.8	60.02145		0.6	3.2	36.0	9.5	0.0	0.00	0
			2253	12.0	4.2	36.0	9.5	0.0	0.00	0
4.92	13.2	60.02145		3.2	3.2	36.0	9.5	0.0	0.00	0
			2253	7.9	4.2	36.0	9.5	0.0	0.00	0

Span 4: From 13.79 ft To 19.29 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.58	14.4	60.02145		3.2	3.2	36.0	9.5	0.0	0.00	0
			2241	8.5	4.2	36.0	9.5	0.0	0.00	0
1.00	14.8	60.02145		2.3	3.2	36.0	9.5	0.0	0.00	0
			2241	10.6	4.2	36.0	9.5	0.0	0.00	0
4.00	17.8	60.02159		2.5	3.2	36.0	9.5	0.0	0.00	0
			2249	11.1	4.2	36.0	9.5	0.0	0.00	0
4.92	18.7	60.02247		5.0	3.2	36.0	9.5	0.0	0.00	0
			2158	8.0	4.2	36.0	9.5	0.0	0.00	0

Span 5: From 19.29 ft To 24.79 ft

Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
			<------ Cracking ------>					<------ Fatigue ------>		
0.58	19.9	60.02159		5.2	3.2	36.0	9.5	0.0	0.00	0
			2241	8.0	4.2	36.0	9.5	0.0	0.00	0
1.50	20.8	60.02159		3.0	3.2	36.0	9.5	0.0	0.00	0

		2238	11.0	4.2	36.0	9.5	0.0	0.00	0
4.50	23.8	60.02247	2.4	3.2	36.0	9.5	0.0	0.00	0
		2158	10.5	4.2	36.0	9.5	0.0	0.00	0
4.92	24.2	60.02234	3.3	3.2	36.0	9.5	0.0	0.00	0
		2158	8.3	4.2	36.0	9.5	0.0	0.00	0

Span 6: From 24.79 ft To 30.29 ft

			<------ Cracking ------>					<------ Fatigue ------>	
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	25.4	60.02234		3.3	3.2	36.0	9.5	0.0	0.00	0
		2155		7.8	4.2	36.0	9.5	0.0	0.00	0
2.00	26.8	60.02234		0.8	3.2	36.0	9.5	0.0	0.00	0
		2155		11.8	4.2	36.0	9.5	0.0	0.00	0
4.92	29.7	60.02235		2.2	3.2	36.0	9.5	0.0	0.00	0
		2156		8.4	4.2	36.0	9.5	0.0	0.00	0

Span 7: From 30.29 ft To 35.79 ft

			<------ Cracking ------>					<------ Fatigue ------>	
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	30.9	60.02235		2.2	3.2	36.0	9.5	0.0	0.00	0
		2156		5.5	4.2	36.0	9.5	0.0	0.00	0
2.50	32.8	60.0	0	0.0	3.2	36.0	9.5	0.0	0.00	0
		2162		7.8	4.2	36.0	9.5	0.0	0.00	0
4.92	35.2	60.02245		2.1	3.2	36.0	9.5	0.0	0.00	0
		2162		0.3	4.2	36.0	9.5	0.0	0.00	0

Span 8: From 35.79 ft To 38.58 ft

			<------ Cracking ------>					<------ Fatigue ------>	
Loc Loc ft	AbsLoc AbsLoc ft	H H in	Comb Comb	fs-t fs-b ksi	dc dc in	Srqt Srqb in	Sprt Sprb in	fs-t fs-b ksi	ratio fs-t ratio fs-b	Comb Comb
0.58	36.4	60.02145		2.8	3.2	36.0	9.5	0.0	0.00	0
		0		0.0	4.2	36.0	9.5	0.0	0.00	0

ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/12/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for End Bent 1

STRENGTH REACTIONS - (7) HP14x73 Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	35.792	**1**	-55	1	3	8

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.292	-1	**-146**	1	2	-7

Max Longitudinal (global Fz)

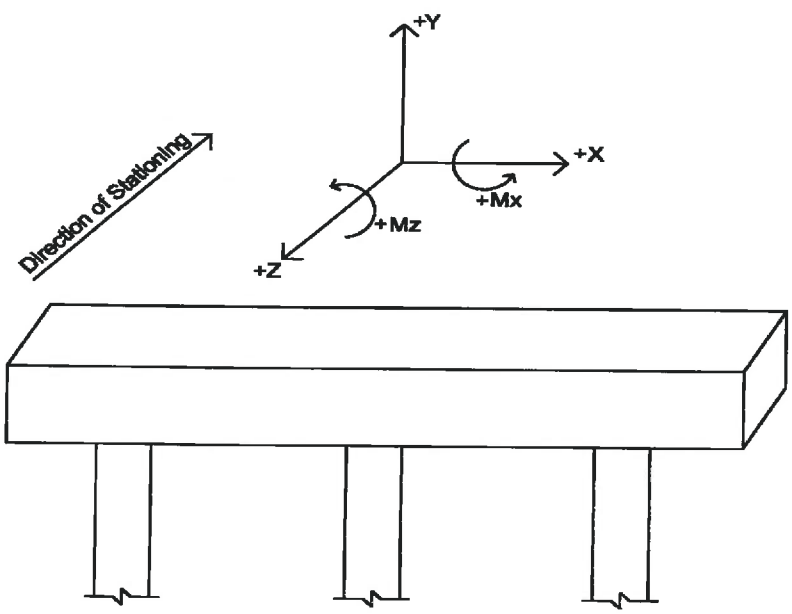
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	2.792	0	-127	**3**	23	-2

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
7	35.792	0	-133	3	**29**	2

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
7	35.792	1	-72	1	3	**8**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

Top of Pile Reactions for End Bent 1

SERVICE REACTIONS - (7) HP14x73 Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	35.792	**1**	-65	2	18	5

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.292	-1	**-104**	2	11	-4

Max Longitudinal (global Fz)

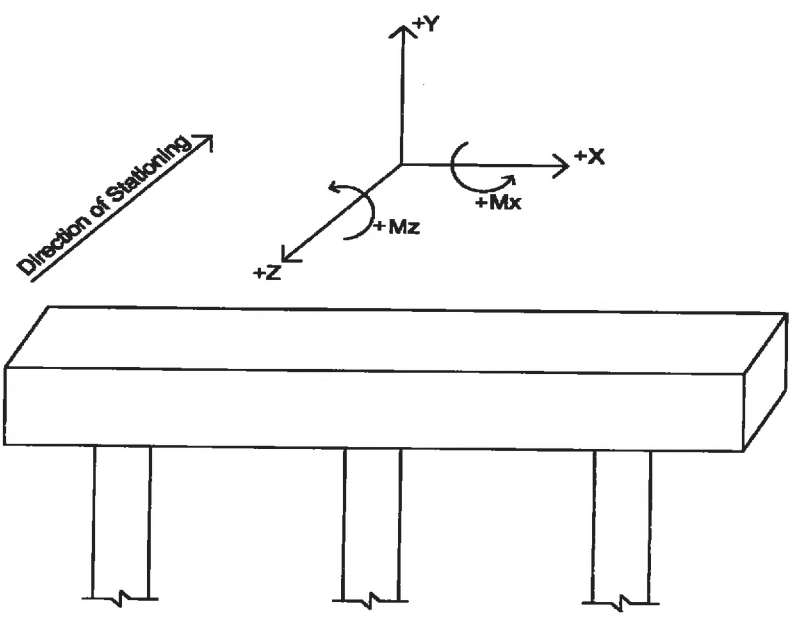
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	2.792	-1	-94	**2**	14	-4

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
7	35.792	1	-98	2	**18**	5

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
7	35.792	1	-83	2	18	**5**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/12/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for End Bent 4

STRENGTH REACTIONS - (7) HP14x73 Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	35.792	**1**	-66	1	4	8

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.292	-1	**-177**	1	3	-7

Max Longitudinal (global Fz)

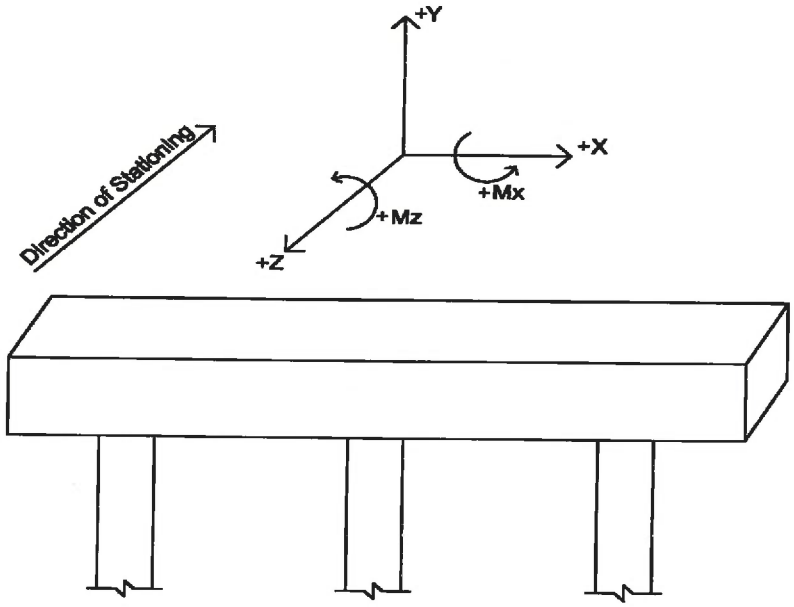
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	2.792	0	-151	**4**	24	-2

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
7	35.792	0	-157	4	**30**	3

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
7	35.792	1	-112	1	4	**8**



ICE
1021 Briargate Circle
Columbia, SC 29210
PH:(803) 822-0333

JOB: S-51 over Black Mingo Creek
SHEET NO. 1 OF 1
CALCULATED BY: DKY DATE: 2/12/2016
CHECKED BY: RAJ 2/16/16 DATE:

Top of Pile Reactions for End Bent 4

SERVICE REACTIONS - (7) HP14x73 Piles

Max Transverse (global Fx)

Pile Number	Distance from left end	**Fx kips**	Fy kips	Fz kips	Mx ft-k	Mz ft-k
7	35.792	**1**	-77	3	19	6

Max Axial (global Fy)

Pile Number	Distance from left end	Fx kips	**Fy kips**	Fz kips	Mx ft-k	Mz ft-k
4	19.292	-1	**-126**	2	12	-4

Max Longitudinal (global Fz)

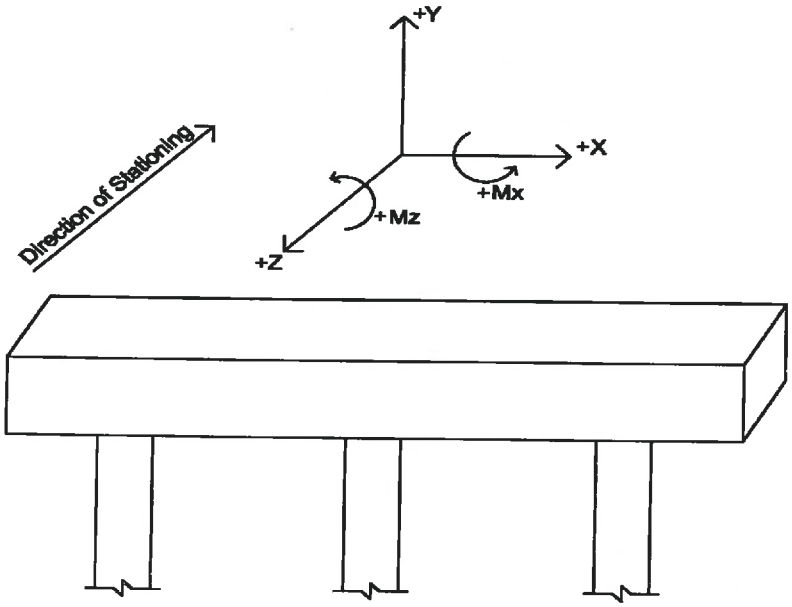
Pile Number	Distance from left end	Fx kips	Fy kips	**Fz kips**	Mx ft-k	Mz ft-k
1	2.792	-1	-111	**3**	15	-5

Max Moment From Long. Load (global Mx)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	**Mx ft-k**	Mz ft-k
7	35.792	1	-116	3	**19**	6

Max Moment from Transverse load (global Mz)

Pile Number	Distance from left end	Fx kips	Fy kips	Fz kips	Mx ft-k	**Mz ft-k**
7	35.792	1	-98	3	19	**6**



S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Seismic

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

Project: S-51 (Battery Park Rd.) over Black Mingo Creek
Subject: Seismic Design - ADRS Curves
By: P. Felkel **Chk'd By:** R. Jamaluddin
Date: 2/13/2016 **Date:** 2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Acceleration Design Response Spectrum (ADRS) Curves:

As provided by SCDOT. Damping = 5%.

	FEE		SEE	
	T	Sa	T	Sa
	0.00	0.11	0.00	0.39
	0.02	0.13	0.02	0.45
	0.03	0.14	0.04	0.52
	0.05	0.16	0.05	0.59
	0.06	0.18	0.07	0.66
	0.08	0.19	0.09	0.73
T_0	0.10	0.21	0.10	0.80
	0.13	0.21	0.14	0.80
	0.16	0.21	0.17	0.80
	0.19	0.21	0.21	0.80
	0.23	0.21	0.24	0.80
	0.26	0.21	0.28	0.80
	0.29	0.21	0.31	0.80
	0.32	0.21	0.35	0.80
	0.35	0.21	0.38	0.80
	0.39	0.21	0.42	0.80
	0.42	0.21	0.45	0.80
	0.45	0.21	0.49	0.80
T_s	0.48	0.21	0.52	0.80
	0.63	0.16	0.67	0.62
	0.78	0.13	0.81	0.51
	0.93	0.11	0.96	0.43
	1.08	0.09	1.10	0.38
	1.22	0.08	1.25	0.33
	1.37	0.07	1.40	0.30
	1.52	0.07	1.54	0.27
	1.67	0.06	1.69	0.25
	1.82	0.05	1.83	0.23
	1.96	0.05	1.98	0.21
	2.11	0.05	2.12	0.20
	2.26	0.04	2.27	0.18
	2.41	0.04	2.42	0.17
	2.56	0.04	2.56	0.16
	2.70	0.04	2.71	0.15
	2.85	0.04	2.86	0.15
	3.00	0.03	3.00	0.14

Operational Classification (OC)	II

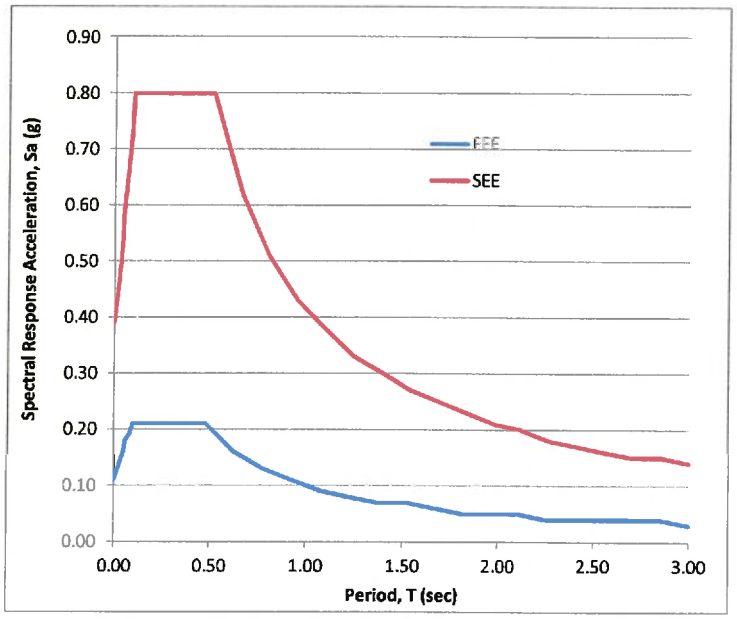
From Table 3.1, SCDOT Seismic Design Spec.

Site Class	C

Seismic Design Category (SDC)	B

From Table 3.5, SCDOT Seismic Design Spec.

Seismic design req'd. See SCDOT Seismic Spec Figure 3.3 for design flowchart.



Displacement Magnification for Short Period Structures:

If bridge is considered a 'short period structure', displacements obtaind from elastic analysis shall be multiplied by R_T in accordance with Section 5.2.4 of the SCDOT Seismic Design Specification.

If req'd, displacement magnification applied as post-processing of model output.

Model 3: SEE, Scoured Condition

Fundamental Period, T (sec) =	0.67	
T* (sec) =	0.65	
T* / T =	0.97	**Displacement Magnification not Req'd.**

	Bent 2	Bent 3
Applied Moment (in-k) =	2,463	2,460
Plastic Capacity (in-k) =	2,205	2,205
Force Reduction Factor, R =	1.12	1.12
Magnification Factor, R_T =	1.00	1.00

Model 4: FEE, Scoured Condition

Fundamental Period, T (sec) =	0.66	
T* (sec) =	0.60	
T* / T =	0.91	**Displacement Magnification not Req'd.**

	Bent 2	Bent 3
Applied Moment (in-k) =	249	265
Plastic Capacity (in-k) =	2,205	2,205
Force Reduction Factor, R =	0.11	0.12
Magnification Factor, R_T =	1.00	1.00

Project: S-51 (Battery Park Rd.) over Black Mingo Creek
Subject: Seismic Design - Performance Summary & Report Tables (SDC "B")
By: P. Felkel **Chk'd By:** R. Jamaluddin
Date: 2/13/2016 **Date:** 2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Preliminary Seismic Design Summary Report Table:

From Section 7.1, SCDOT Seismic Design Spec.

Structural Component	Maximum Ductility Demand, μ_d		Minimum Ductility Capacity, μ_c
	FEE	SEE	
Superstructure	1.0	1.0	N/A
P/S Concrete Pile Interior Bents	4.0	8.0	3.0

Displacement Capacity for SDC "B":

Simplified method for SDC "B" bridges per Section 6.5.3 of SCDOT Seismic Specifications.

Λ = Fixity factor (1 for fixed-free & 2 for fixed-fixed end conditions)
D = Column diameter or pile width in direction of bending (ft)
h = Clear height of column (to point of fixity) (ft)
*X = Λ*D/h*

$$\Delta_c = 0.12h(-1.27\ln(X) - 0.32) \geq 0.12h$$

Δ_c - Longitudinal Direction:

Λ = 1
D (ft) = 1.5

Bent No.	h (ft)	X	Δ_c (in)
2	30.00	0.05	12.54
3	30.00	0.05	12.54

Δ_c - Transverse Direction:

Λ = 2
D (ft) = 1.5

Bent No.	h (ft)	X	Δ_c (in)
2	30.00	0.10	9.38
3	30.00	0.10	9.38

Yield Displacement for SDC "B":

Simplified method for SDC "B" bridges per Section 6.5.4 of SCDOT Seismic Specifications.

M_p = Plastic moment capacity of member (k-in); from 'Plastic Hinge' spreadsheet.
L_y = Distance, top of column or pile to point of fixity (in)
Ψ = Fixity factor (6 for fixed-fixed & 3 for fixed-free end conditions)
E = Modulus of elasticity of column or pile using expected material properties (ksi)
I = Moment of inertia of column or pile (in^4); $I_g/2$ to account for cracked section properties.

$$\Delta_y = \frac{M_p L_Y^2}{\Psi E I}$$

Δ_y - Longitudinal Direction:

M_p (k-in) = 2,205.1
Ψ = 3
E (ksi) = 5,142
I (in^4) = 4,374

Bent No.	L_y (in)	Δ_y (in)
2	360	4.24
3	360	4.24

Δ_y - Transverse Direction:

M_p = 2,205.1
Ψ = 6
E (ksi) = 5,142
I (in^4) = 4,374

Bent No.	L_y (in)	Δ_y (in)
2	360	2.12
3	360	2.12

Performance Summary & Final Seismic Design Summary Report Tables:

Performance checks are in accordance with Section 7 of the SCDOT Seismic Design Specificaiton (Eqs. 7-1, 7-2, and 7-3).

Plastic hinge formation in longitudinal direction is assumed to occur when $\mu_d > 2.0$

Plastic hinges in transverse direction, if applicable, will occur above ground based on location of maximum moment from L-pile moment vs. depth graphs.

Model 3: SEE Event, Scoured Condition (POF = 30')

Assumes scour depth equivalent to 50% of 100 year scour at piers.

	Longitudinal Direction												
Bent No.	Δ_d (in)	Δ_c (in)	Δ_d/Δ_c	Check	Δ_y (in)	μ_d	$\mu_{d,max}$	Check	μ_c	$\mu_{c,min}$	Check	Does Pile Yield?	Hinge Below Ground?
2	2.55	12.54	0.20	OK	4.24	0.60	8.0	OK	3.0	3.0	OK	No	No
3	2.55	12.54	0.20	OK	4.24	0.60	8.0	OK	3.0	3.0	OK	No	No

	Transverse Direction												
Bent No.	Δ_d (in)	Δ_c (in)	Δ_d/Δ_c	Check	Δ_y (in)	μ_d	$\mu_{d,max}$	Check	μ_c	$\mu_{c,min}$	Check	Does Pile Yield?	Hinge Below Ground?
2	2.23	9.38	0.24	OK	2.12	1.05	8.0	OK	4.4	3.0	OK	Yes	No
3	2.23	9.38	0.24	OK	2.12	1.05	8.0	OK	4.4	3.0	OK	Yes	No

Note: Tabulated Δd values include magnification factor, RT = 1

P-Delta Effects:

Per Section 7.2 of the SCDOT Seismic Design Specification, P-Δ effects can only be accurately captured with a non-linear time history or pushover analysis. In lieu of such analysis, P-Δ effects can be ignored if the following relationship is satisfied:

$$P_{dl}\Delta_r \leq 0.25M_p$$

P_{dl} = *Axial dead load in member (k)... Use average axial load of all members in bent.*

Δ_r = *Relative lateral offset between point of contraflexure and end of plastic hinge (in)... Use Δ_d in longitudinal direction; $\Delta_d/2$ in transverse direction.*

M_p = *Plastic moment capacity of member (k-in); from 'Plastic Hinge' spreadsheet.*

$M_{p,long}$ = 2205.1 k-in

	Longitudinal Direction				
Bent No.	P_{dl} (k)	Δ_r (in)	$P_{dl}\Delta_r$	$0.25M_p$	Check
2	90	2.55	229.5	551.3	OK
3	80	2.55	204.0	551.3	OK

Check = "OK" if P-Δ effects can be ignored.

$M_{p,trans}$ = 2205.1 k-in

	Transverse Direction				
Bent No.	P_{dl} (k)	Δ_r (in)	$P_{dl}\Delta_r$	$0.25M_p$	Check
2	90	1.12	100.4	551.3	OK
3	80	1.12	89.2	551.3	OK

Check = "OK" if P-Δ effects can be ignored.

Project: S-51 (Battery Park Rd.) over Black Mingo Creek
Subject: Seismic Design - Performance Summary & Report Tables (SDC "B")
By: P. Felkel **Chk'd By:** R. Jamaluddin
Date: 2/13/2016 **Date:** 2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Preliminary Seismic Design Summary Report Table:

From Section 7.1, SCDOT Seismic Design Spec.

Structural Component	Maximum Ductility Demand, μ_d		Minimum Ductility Capacity, μ_c
	FEE	SEE	
Superstructure	1.0	1.0	N/A
P/S Concrete Pile Interior Bents	4.0	8.0	3.0

Displacement Capacity for SDC "B":

Simplified method for SDC "B" bridges per Section 6.5.3 of SCDOT Seismic Specifications.

Λ = Fixity factor (1 for fixed-free & 2 for fixed-fixed end conditions)
D = Column diameter or pile width in direction of bending (ft)
h = Clear height of column (to point of fixity) (ft)
*X = Λ*D/h*

$$\Delta_c = 0.12h(-1.27\ln(X) - 0.32) \geq 0.12h$$

Δ_c - Longitudinal Direction:

Λ = 1
D (ft) = 1.5

Bent No.	h (ft)	X	Δ_c (in)
2	30.00	0.05	12.54
3	30.00	0.05	12.54

Δ_c - Transverse Direction:

Λ = 2
D (ft) = 1.5

Bent No.	h (ft)	X	Δ_c (in)
2	30.00	0.10	9.38
3	30.00	0.10	9.38

Yield Displacement for SDC "B":

Simplified method for SDC "B" bridges per Section 6.5.4 of SCDOT Seismic Specifications.

M_p = Plastic moment capacity of member (k-in); from 'Plastic Hinge' spreadsheet.
L_y = Distance, top of column or pile to point of fixity (in)
Ψ = Fixity factor (6 for fixed-fixed & 3 for fixed-free end conditions)
E = Modulus of elasticity of column or pile using expected material properties (ksi)
I = Moment of inertia of column or pile (in^4); $I_g/2$ to account for cracked section properties.

$$\Delta_y = \frac{M_p L_y^2}{\Psi E I}$$

Δ_y - Longitudinal Direction:

M_p (k-in) = 2,205.1
Ψ = 3
E (ksi) = 5,142
I (in^4) = 4,374

Bent No.	L_y (in)	Δ_y (in)
2	360	4.24
3	360	4.24

Δ_y - Transverse Direction:

M_p = 2,205.1
Ψ = 6
E (ksi) = 5,142
I (in^4) = 4,374

Bent No.	L_y (in)	Δ_y (in)
2	360	2.12
3	360	2.12

Performance Summary & Final Seismic Design Summary Report Tables:

Performance checks are in accordance with Section 7 of the SCDOT Seismic Design Specificaiton (Eqs. 7-1, 7-2, and 7-3).

Plastic hinge formation in longitudinal direction is assumed to occur when $\mu_d > 2.0$

Plastic hinges in transverse direction, if applicable, will occur above ground based on location of maximum moment from L-pile moment vs. depth graphs.

Model 4: FEE Event, Scoured Condition (POF = 30")

Assumes scour depth equivalent to 100% of 100 year scour at piers.

	Longitudinal Direction												
Bent No.	Δ_d (in)	Δ_c (in)	Δ_d/Δ_c	Check	Δ_y (in)	μ_d	$\mu_{d,max}$	Check	μ_c	$\mu_{c,min}$	Check	Does Pile Yield?	Hinge Below Ground?
2	0.53	12.54	0.04	OK	4.24	0.13	4.0	OK	3.0	3.0	OK	No	No
3	0.53	12.54	0.04	OK	4.24	0.13	4.0	OK	3.0	3.0	OK	No	No

	Transverse Direction												
Bent No.	Δ_d (in)	Δ_c (in)	Δ_d/Δ_c	Check	Δ_y (in)	μ_d	$\mu_{d,max}$	Check	μ_c	$\mu_{c,min}$	Check	Does Pile Yield?	Hinge Below Ground?
2	0.54	9.38	0.06	OK	2.12	0.25	4.0	OK	4.4	3.0	OK	No	No
3	0.54	9.38	0.06	OK	2.12	0.25	4.0	OK	4.4	3.0	OK	No	No

Note: Tabulated Δd values include magnification factor, RT = 1 (Bent 2).

P-Delta Effects:

Per Section 7.2 of the SCDOT Seismic Design Specification, P-Δ effects can only be accurately captured with a non-linear time history or pushover analysis. In lieu of such analysis, P-Δ effects can be ignored if the following relationship is satisfied:

$$P_{dl}\Delta_r \leq 0.25 M_p$$

P_{dl} = *Axial dead load in member (k)... Use average axial load of all members in bent.*

Δ_r = *Relative lateral offset between point of contraflexure and end of plastic hinge (in)... Use Δ_d in longitudinal direction; $\Delta_d/2$ in transverse direction.*

M_p = *Plastic moment capacity of member (k-in); from 'Plastic Hinge' spreadsheet.*

$M_{p,long}$ = 2205.1 k-in

	Longitudinal Direction				
Bent No.	P_{dl} (k)	Δ_r (in)	$P_{dl}\Delta_r$	$0.25M_p$	Check
2	90	0.53	47.7	551.3	OK
3	80	0.53	42.4	551.3	OK

Check = "OK" if P-Δ effects can be ignored.

$M_{p,trans}$ = 2205.1 k-in

	Transverse Direction				
Bent No.	P_{dl} (k)	Δ_r (in)	$P_{dl}\Delta_r$	$0.25M_p$	Check
2	90	0.27	24.3	551.3	OK
3	80	0.27	21.6	551.3	OK

Check = "OK" if P-Δ effects can be ignored.

Project: S-51 (Battery Park Rd.) over Black Mingo Creek
Subject: Seismic Design - Displacement Limits
By: P. Felkel **Chk'd By:** R. Jamaluddin
Date: 2/13/2016 **Date:** 2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Seismic Displacement Limits (Scoured Models):

Displacement demand obtained from the Multi-Modal Spectral Analysis must satisfy the performance limits defined in Table 3.6 of the SCDOT Seismic Design Specifications for all applicable bridge components.

Operational Classification (OC) = II

	SEE	FEE	
Int. Bent Height - T/Cap to POF, H (ft) =	33.00	33.00	Use Shortest Bent (Governing Case)
Total Expansion Length, L (ft) =	N/A ft		If Exp. Joints are used; Otherwise "N/A"

Bridge System	Applicable?	Bent Location & Design Earthquake	Displacement Limit (in)	MSA Model Displacement Demands, Δ_d (in)	Check
Integral/Semi-Integral End Bents (Longitudinal Displacement)	Yes	FEE	4.0	0.6	OK
		SEE	8.0	2.7	OK
Integral/Semi-Integral End Bents Transverse Displacement)	Yes	FEE	4.0	0.5	OK
		SEE	8.0	2.2	OK
Interior Bents - Fixed Bearings (Longitudinal Displacement)	Yes	IB2 & 3 - FEE	3.3	0.5	OK
		IB2 & 3 - SEE	13.2	2.6	OK
Interior Bents (Transverse Displacement)	Yes	IB2 & 3 - FEE	3.3	0.5	OK
		IB2 & 3 - SEE	13.2	2.2	OK

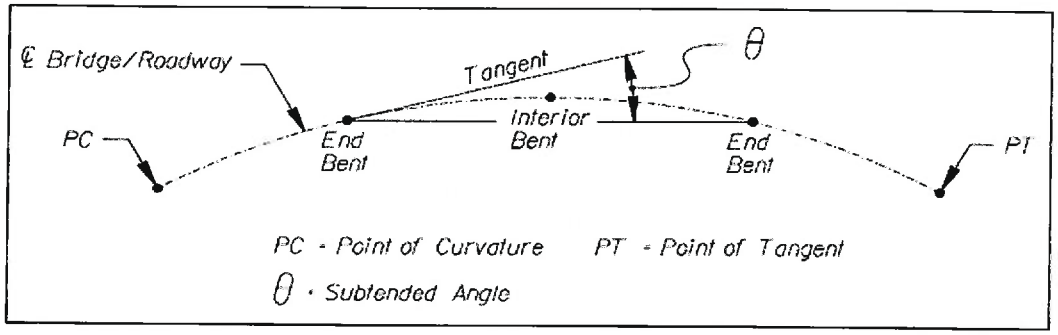
Project:	S-51 (Battery Park Rd.) over Black Mingo Creek		
Subject:	Seismic Design - Modeling Requirements		
By:	P. Felkel	**Chk'd By:**	R. Jamaluddin
Date:	2/13/2016	**Date:**	2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Modeling Requirements for Curved Bridges:

SCDOT Seismic Design Spec. Section 5.2.1

Number of Spans =	3	
Smaller Adjacent Span Length =	37.5	ft
Larger Adjacent Span Length =	70.0	ft
Subtended Angle, θ =	0	deg.



~~Max Subtended Angle =~~	~~30.00 deg~~	~~OK~~
~~Gov. Adjacent Span Length Ratio =~~	~~1.87~~	
~~Max Adjacent Span Length Ratio =~~	~~2.00~~	~~OK~~

Not Applicable - Straight Bridge with Tangent Roadway Alignment

Bridge can be analyzed as straight with span lengths equal to arc lengths of the curved bridge.
End Bent stiffness ratio must be less than or equal to 4.

Mode Shapes & Mass Participation:

Min. Number of Mode Shapes =	9	SCDOT Seismic Design Spec. Section 5.5.1
Min. Mass Participation =	90 %	In Transverse & Longitudinal Directions

Dead Load Modeling:

According to CSI Bridge technical support staff, v15.2.0 of the software does not properly run a push-over analysis if additional dead loads (FWS, barriers, etc.) are defined as area and line loads in the model.

To accurately model the actual mass of the structure without applying additional loads, the weight & mass property modifiers for the material chosen to represent the deck are scaled to account for the missing loads.

The following calculation modifies the section properties (weight & mass) for hollow cored slabs modeled as regular flat slabs. It also accounts for additional dead loads in the section proerties of the slab.

Total Bridge Length =	164.0	ft
Deck Width =	36.0	ft
Deck Thickness =	2.0	ft
Unmodified Deck Weight =	0.150	kcf
No. of Voids =	24	
Void Diamters =	1.0	ft
No. of Barriers =	2	

Weight per Barrier =	0.392	k/ft
Future Wearing Surface =	0.015	ksf
Width of FWS =	32.8	ft
Weight of Barriers =	128.6	k
+ Weight of FWS =	80.8	k
Total Additional DL =	209.3	k
Weight of Deck w/out Voids =	1,771	k
- Weight of Voids =	464	k
Weight of Deck =	1,308	k
Total Superstructure DL =	1,517	k
Ratio =	0.856	

Weight per Unit Volume =	0.1285	kcf
Mass per Unit Volume =	3.989E-03	

Use as property modifers in Model

Project:	S-51 (Battery Park Rd.) over Black Mingo Creek		
Subject:	Seismic Design - Material Properties		
By:	P. Felkel	**Chk'd By:**	R. Jamaluddin
Date:	2/13/2016	**Date:**	2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

Material Properties:

Reinforcing Steel:

Min. Yield Strength, f_y =	60.0 ksi		
Expected Yield Strength, f_{ye} =	66.0 ksi		SCDOT Seismic Design Spec. Eq. 6-22
Ultimate Tensile Strength, f_{ue} =	92.4 ksi		SCDOT Seismic Design Spec. Eq. 6-23

Concrete for Mild Reinforced Sections:

Specified Comp. Strength, f'_c =	4.0 ksi	*Bent Cap*	
Expected Comp. Strength, f'_{ce} =	5.2 ksi		SCDOT Seismic Design Spec. Eq. 6-30
Weight of Concrete, w_c =	0.145 kcf		
Expected Modulus, E_{ce} =	4,155 ksi		SCDOT Seismic Design Spec. Eq. 6-49

Concrete for Prestressed Sections:

Specified Comp. Strength, f'_c =	6.0 ksi	*P/S Piles*	
Expected Comp. Strength, f'_{ce} =	7.8 ksi		SCDOT Seismic Design Spec. Eq. 6-30
Weight of Concrete, w_c =	0.146 kcf		
Expected Modulus, E_{ce} =	5,142 ksi		SCDOT Seismic Design Spec. Eq. 6-49
Specified Comp. Strength, f'_c =	8.0 ksi	*HC Slabs*	
Expected Comp. Strength, f'_{ce} =	10.4 ksi		SCDOT Seismic Design Spec. Eq. 6-30
Weight of Concrete, w_c =	0.148 kcf		
Expected Modulus, E_{ce} =	6,059 ksi		SCDOT Seismic Design Spec. Eq. 6-49

Project:	S-51 (Battery Park Rd.) over Black Mingo Creek		
Subject:	Seismic Design - End Bent Springs		
By:	P. Felkel	**Chk'd By:**	R. Jamaluddin
Date:	2/13/2016	**Date:**	2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

End Bent Spring Calculation (Model 3):

Geometry:

No. Springs per End Bent =	2		
No. of Piles per End Bent =	7	*HP14x73*	
Effective End Bent Height =	5.0	ft	
Effective End Bent Length =	38.6	ft	If skewed, use transverse dim. (Caltrans, Fig. 7.14C)
Wall Type =	Wingwalls	*(Technically, Ear Walls)*	Wingwall or Intermediate Wall
No. of Walls =	0		If wingwalls, spreadsheet assumes 2.
Effective Wall Height =	0.0	ft	
Effective Wall Length =	0.0	ft	
Wall Thickness =	0.0	ft	
Distance Between Wingwalls =	38.6	ft	In transverse direction (if applicable).
Passive Pressure =	1.1	ksf	Per GDM... $P_{wall} = 0.5*K_{PE}*\gamma_{backfill}*h_{wall} = 0.5*3.5*125pcf*h_{wall}$

Desplacement Demands from Structural Model:

Longitudinal Displacement =	2.7	in	Begin with assumed value, then iterate to convergence.
Transverse Displacement =	2.2	in	"

Stiffness Values for Structural Model (per Spring):

$K_{vertical}$ (u1) =	1,948	k/ft	$2*K_{long}$ per SCDOT Seismic Spec, Sect. 5.6.1
$K_{transverse}$ (u2) =	1,336	k/ft	See calculations below.
$K_{longitudinal}$ (u3) =	974	k/ft	"

Backwall Contribution:

Disp. Req'd for Full Pressure, ΔF_{max} =	1.2	in	SCDOT Seismic Design Spec. Eq. 5-21
Full Backwall Pressure Developed?	Yes		
Max Backwall Force, F_{max} =	211	k	
Elastic Stiffness, $K_{bw,e}$ =	2,110	k/ft	
Secant Stiffness, $K_{bw,s}$ =	938	k/ft	
Stiffness for Model, K_{bw} =	469	k/ft per End Bent	SCDOT Seismic Spec, Sect. 5.6
=	234	k/ft per End Bent Spring	Total backwall stiffness divided by 2 for model.

Wingwall (or Intermediate Wall) Contribution:

Disp. Req'd for Full Pressure, ΔF_{max} =	0.0	in	SCDOT Seismic Design Spec. Eq. 5-21
Full Wall Pressure Developed?	Yes		
Max Wall Force, F_{max} =	0	k	
Elastic Stiffness, $K_{ww,e}$ =	0	k/ft	
Secant Stiffness, $K_{ww,s}$ =	0	k/ft	
Stiffness for Model, K_{ww} =	0	k/ft per End Bent	SCDOT Seismic Spec, Sect. 5.6.2
=	0	k/ft per End Bent Spring	Stiffness of one wingwall plus 1/3 of additional wing if distance between wings is less than 40'.

Pile Contribution, Longitudinal Direction:

From SSI Model (L-PILE):

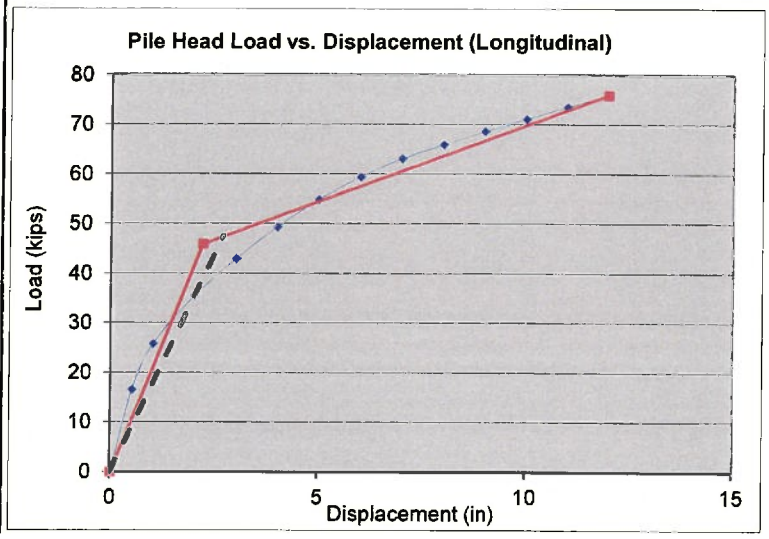
Load (k)	Displ. (in)	K_{pile} (k/ft)
0.0	0.000	0
16.7	0.500	400
25.9	1.000	221
35.5	2.000	116
43.1	3.000	91
49.5	4.000	77
55.0	5.000	67
59.6	6.000	55
63.3	7.000	44
66.1	8.000	34
68.8	9.000	32
71.3	10.000	30
73.7	11.000	29
76.1	12.000	28

Bi-Linear Model:

Displ. (in)	Load (k)	K_{pile} (k/ft)	
0	0	0	
2.2	46	251	<-- *User Defined Pt.*
12.000	76.1	37	

Actual Modeled (Secant) Stiffness:

Displ. (in)	Load (k)	K_{pile} (k/ft)
0	0	0
2.7	48	211



Stiffness for Model, $K_{pile,Long.}$ =	1,479	k/ft per End Bent
=	739	k/ft per End Bent Spring

Pile Contribution, Transverse Direction:

From SSI Model (L-PILE):

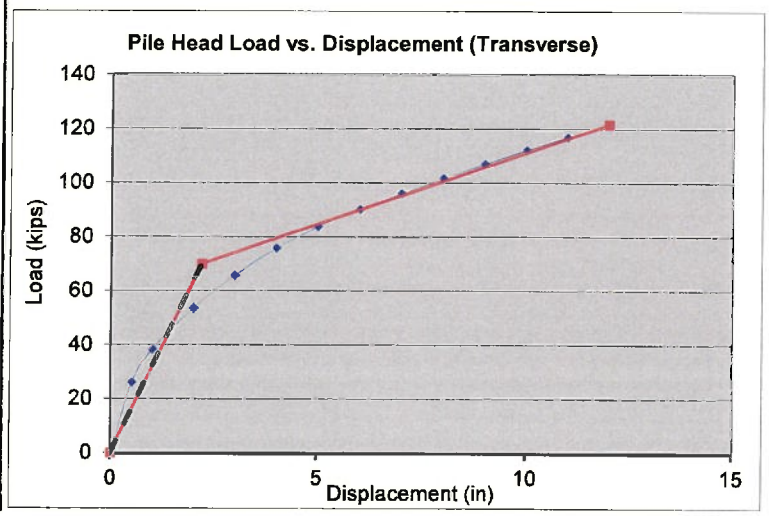
Load (k)	Displ. (in)	K_{pile} (k/ft)
0.0	0.000	0
26.1	0.500	625
38.4	1.000	296
53.6	2.000	182
65.9	3.000	147
75.9	4.000	120
83.8	5.000	95
90.4	6.000	79
96.2	7.000	70
101.8	8.000	67
107.1	9.000	64
112.3	10.000	62
117.2	11.000	59
121.8	12.000	55

Bi-Linear Model:

Displ. (in)	Load (k)	K_{pile} (k/ft)	
0	0	0	
2.2	70	382	<-- *User Defined Pt.*
12.000	121.8	63	

Actual Modeled (Secant) Stiffness:

Displ. (in)	Load (k)	K_{pile} (k/ft)
0	0	0
2.2	70	382



Stiffness for Model, $K_{pile,Trans.}$ =	2,673	k/ft per End Bent
=	1,336	k/ft per End Bent Spring

Project:	S-51 (Battery Park Rd.) over Black Mingo Creek		
Subject:	Seismic Design - End Bent Springs		
By:	P. Felkel	**Chk'd By:**	R. Jamaluddin
Date:	2/13/2016	**Date:**	2/16/2016

INFRASTRUCTURE CONSULTING & ENGINEERING

End Bent Spring Calculation (Model 4):

Geometry:

No. Springs per End Bent =	2		
No. of Piles per End Bent =	7	*HP14x73*	
Effective End Bent Height =	5.0	ft	
Effective End Bent Length =	38.6	ft	If skewed, use transverse dim. (Caltrans, Fig. 7.14C)
Wall Type =	Wingwalls	*(Technically, Ear Walls)*	Wingwall or Intermediate Wall
No. of Walls =	0		If wingwalls, spreadsheet assumes 2.
Effective Wall Height =	0.0	ft	
Effective Wall Length =	0.0	ft	
Wall Thickness =	0.0	ft	
Distance Between Wingwalls =	38.6	ft	In transverse direction (if applicable).
Passive Pressure =	1.1	ksf	Per GDM... $P_{wall} = 0.5*K_{PE}*\gamma_{backfill}*h_{wall} = 0.5*3.5*125pcf*h_{wall}$

Desplacement Demands from Structural Model:

Longitudinal Displacement =	0.6	in	Begin with assumed value, then iterate to convergence.
Transverse Displacement =	0.5	in	"

Stiffness Values for Structural Model (per Spring):

$K_{vertical}$ (u1) =	2,811	k/ft	$2*K_{long}$ per SCDOT Seismic Spec, Sect. 5.6.1
$K_{transverse}$ (u2) =	1,336	k/ft	See calculations below.
$K_{longitudinal}$ (u3) =	1,406	k/ft	"

Backwall Contribution:

Disp. Req'd for Full Pressure, ΔF_{max} =	1.2	in	SCDOT Seismic Design Spec. Eq. 5-21
Full Backwall Pressure Developed?	No		
Max Backwall Force, F_{max} =	211	k	
Elastic Stiffness, $K_{bw,e}$ =	2,110	k/ft	
Secant Stiffness, $K_{bw,s}$ =	2,110	k/ft	
Stiffness for Model, K_{bw} =	1,055	k/ft per End Bent	SCDOT Seismic Spec, Sect. 5.6
=	528	k/ft per End Bent Spring	Total backwall stiffness divided by 2 for model.

Wingwall (or Intermediate Wall) Contribution:

Disp. Req'd for Full Pressure, ΔF_{max} =	0.0	in	SCDOT Seismic Design Spec. Eq. 5-21
Full Wall Pressure Developed?	Yes		
Max Wall Force, F_{max} =	0	k	
Elastic Stiffness, $K_{ww,e}$ =	0	k/ft	
Secant Stiffness, $K_{ww,s}$ =	0	k/ft	
Stiffness for Model, K_{ww} =	0	k/ft per End Bent	SCDOT Seismic Spec, Sect. 5.6.2
=	0	k/ft per End Bent Spring	Stiffness of one wingwall plus 1/3 of additional wing if distance between wings is less than 40'.

Pile Contribution, Longitudinal Direction:

From SSI Model (L-PILE):

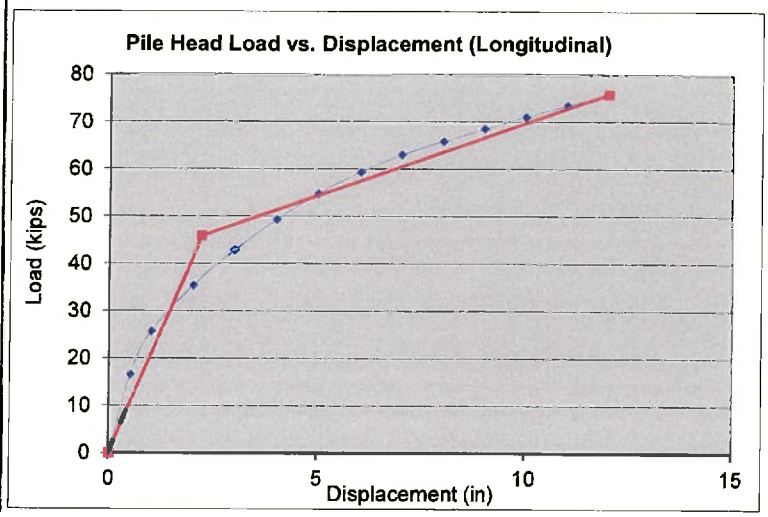
Load (k)	Displ. (in)	K_{pile} (k/ft)
0.0	0.000	0
16.7	0.500	400
25.9	1.000	221
35.5	2.000	116
43.1	3.000	91
49.5	4.000	77
55.0	5.000	67
59.6	6.000	55
63.3	7.000	44
66.1	8.000	34
68.8	9.000	32
71.3	10.000	30
73.7	11.000	29
76.1	12.000	28

Bi-Linear Model:

Displ. (in)	Load (k)	K_{pile} (k/ft)	
0	0	0	
2.2	46	251	<-- *User Defined Pt.*
12.000	76.1	37	

Actual Modeled (Secant) Stiffness:

Displ. (in)	Load (k)	K_{pile} (k/ft)
0	0	0
0.6	13	251



Stiffness for Model, $K_{pile,Long.}$ =	1,756	k/ft per End Bent
=	878	k/ft per End Bent Spring

Pile Contribution, Transverse Direction:

From SSI Model (L-PILE):

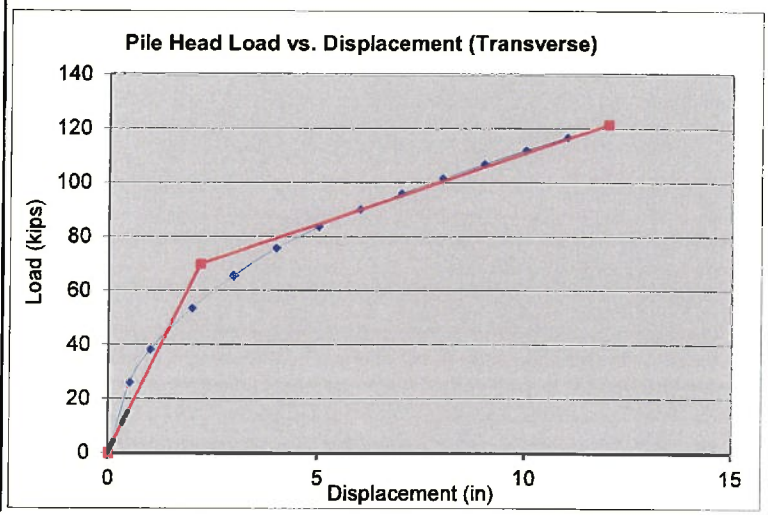
Load (k)	Displ. (in)	K_{pile} (k/ft)
0.0	0.000	0
26.1	0.500	625
38.4	1.000	296
53.6	2.000	182
65.9	3.000	147
75.9	4.000	120
83.8	5.000	95
90.4	6.000	79
96.2	7.000	70
101.8	8.000	67
107.1	9.000	64
112.3	10.000	62
117.2	11.000	59
121.8	12.000	55

Bi-Linear Model:

Displ. (in)	Load (k)	K_{pile} (k/ft)	
0	0	0	
2.2	70	382	<-- *User Defined Pt.*
12.000	121.8	63	

Actual Modeled (Secant) Stiffness:

Displ. (in)	Load (k)	K_{pile} (k/ft)
0	0	0
0.5	16	382



Stiffness for Model, $K_{pile,Trans.}$ =	2,673	k/ft per End Bent
=	1,336	k/ft per End Bent Spring

End Bent Pile Capacity Check: *By Inspection, SEE cases will govern pile capacity check.*

Model 3: SEE Event, Scoured Condition

Expected Yield Strength, f_{ye} =	66.0	ksi		Z = Plastic Moment of Inertia
$Z_{long.}$ =	54.6	in^3	*HP 14x73 Piles*	"
$Z_{trans.}$ =	118.0	in^3		Plastic Moment Capacity = $M_p = f_{ye}*Z$
$M_{p,long.}$ =	300	ft-k		
$M_{p,trans.}$ =	649	ft-k		
				From L-Pile Graphs
$M_{max,long.}$ =	283	ft-k	**OK**	

Project:	S-51 (Battery Park Rd.) over Black Mingo Creek		
Subject:	Seismic Design - Misc. Detailing		
By:	P. Felkel	**Chk'd By:**	R. Jamaluddin
Date:	2/13/2016	**Date:**	2/16/2016

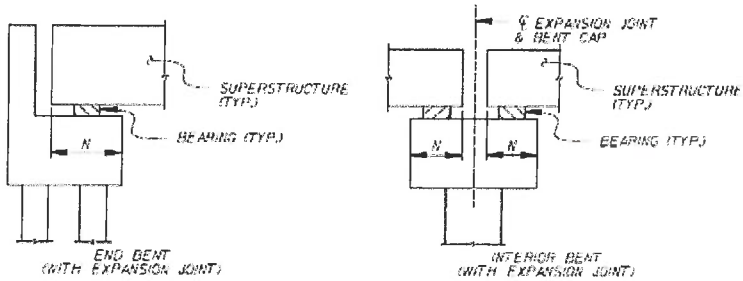
INFRASTRUCTURE CONSULTING & ENGINEERING

Seismic Detailing:

The following miscellaneous seismic detailing checks are performedper Section 9 of the *SCDOT Seismic Design Specifications*.

Minimum Support Length:

Seismic Design Category =	B		
Skew Angle, S =	0.0	deg.	0 deg. = no skew
Length Between Exp. Joints =	164.0	ft	
Seismic Displacement Demand, Δ_{eq} =	2.7	in	
Height, H_s =	N/A	ft	See description (Eq. 9-1)
Movement, Δ_{ot} =	1.6	in	1" per 100' between joints
Min. Support Length, N =	14	in	



Superstructure to Substructure Connection:

Long. Shear Force, $V_{u,long}$ =	105.0	k	Smaller of elastic shear force or
Trans. Shear Force, $V_{u,trans}$ =	105.0	k	overstrength plastic hinge force.

Anchor Bolt or Dowel Rod Contribution:

No. of Bolts or Dowels =	24		
Cross Sectional Area, A_b =	0.79	in^2 / bolt or dowel	
Tensile Strength, F_{ub} =	80	ksi	For ASTM A706 Dowels, F_u = 80 ksi
Shear Strength, V_{ab} =	728.1	k	

Shear Key Contribution:

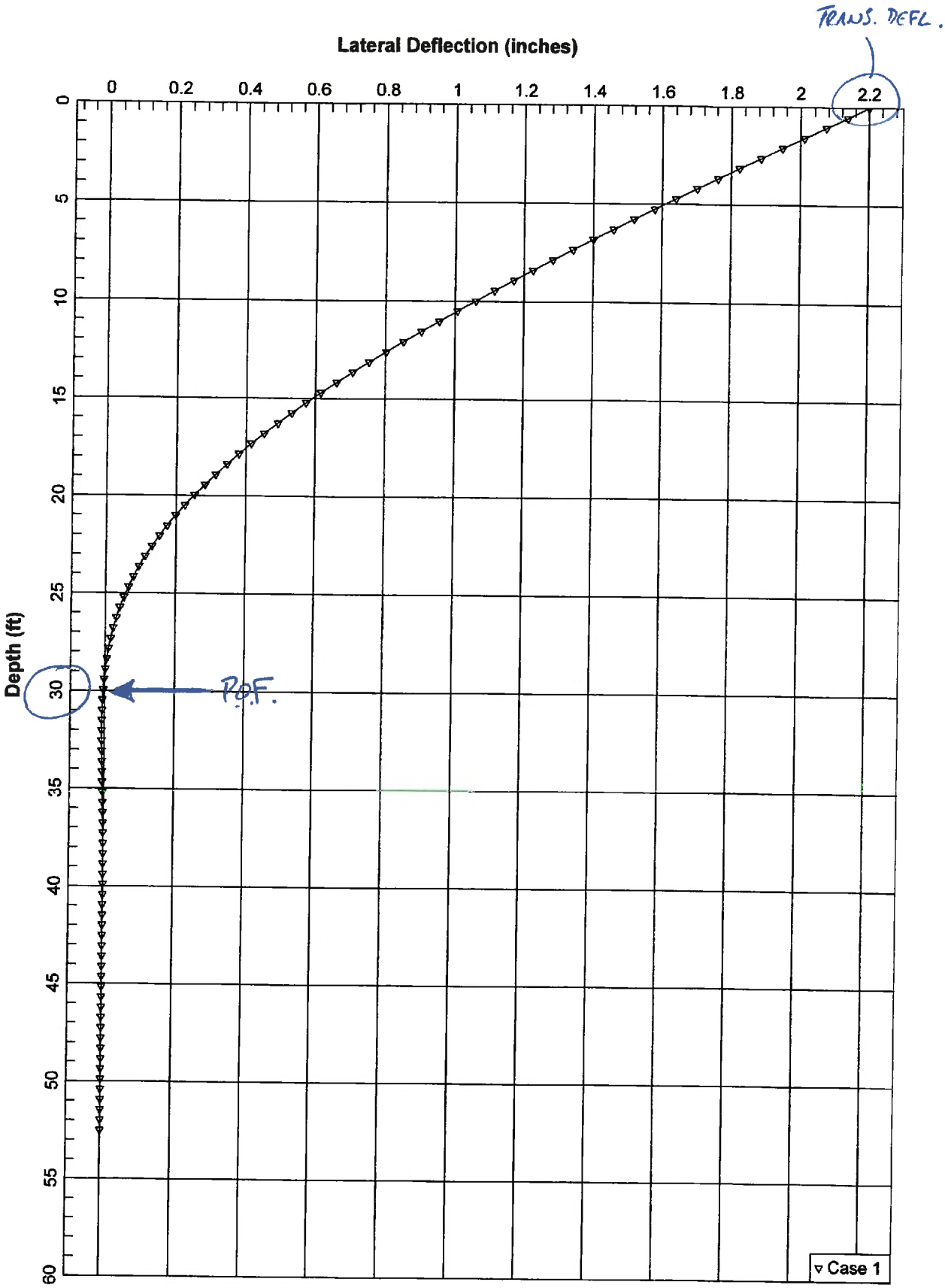
No. of Shear Keys =	0		
A_s^{sk} =	0	in^2	Area of Reinforcement Crossing Shear Plane
f_y =	60	ksi	
A_{cv} =	0	in^2	Area of Concrete in Shear Plane
f'_c =	4	ksi	
Shear Strength, V_{sk} =	0.0	k	

Backwall Contribution (for Integral End Bents Only):

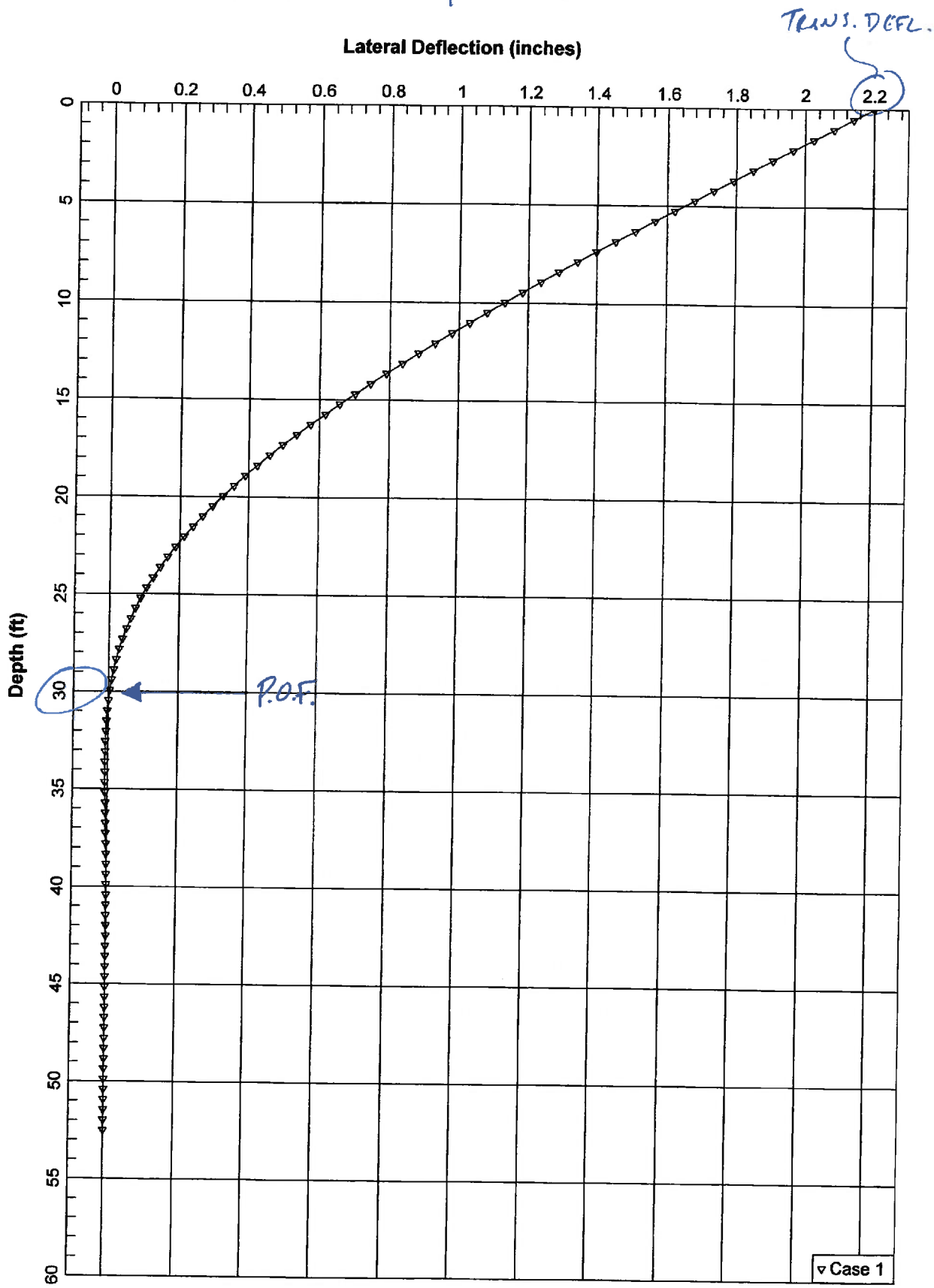
A_s^{bw} =	0	in^2	Area of Reinforcement Crossing Shear Plane
f_y =	60	ksi	
A_{cv} =	0	in^2	Area of Concrete in Shear Plane
Shear Strength, V_{bw} =	0.0	k	

ϕ_v =	0.85		
Long. Shear Capacity, $\varphi_v V_{long}$ =	618.9	k	OK
Trans. Shear Capacity, $\varphi_v V_{trans}$ =	618.9	k	OK

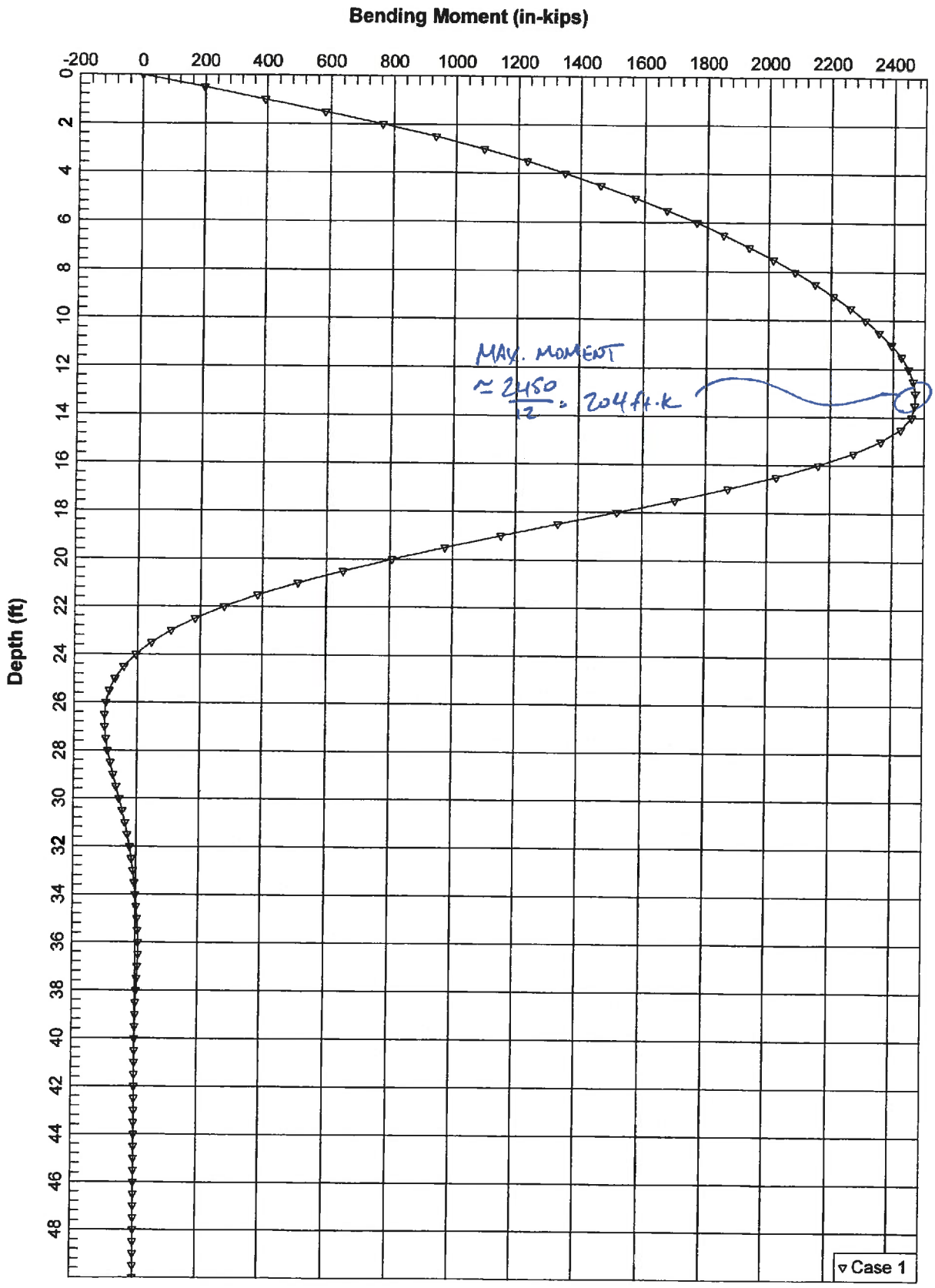
IB 2 - SEE, 50% 100yr scour



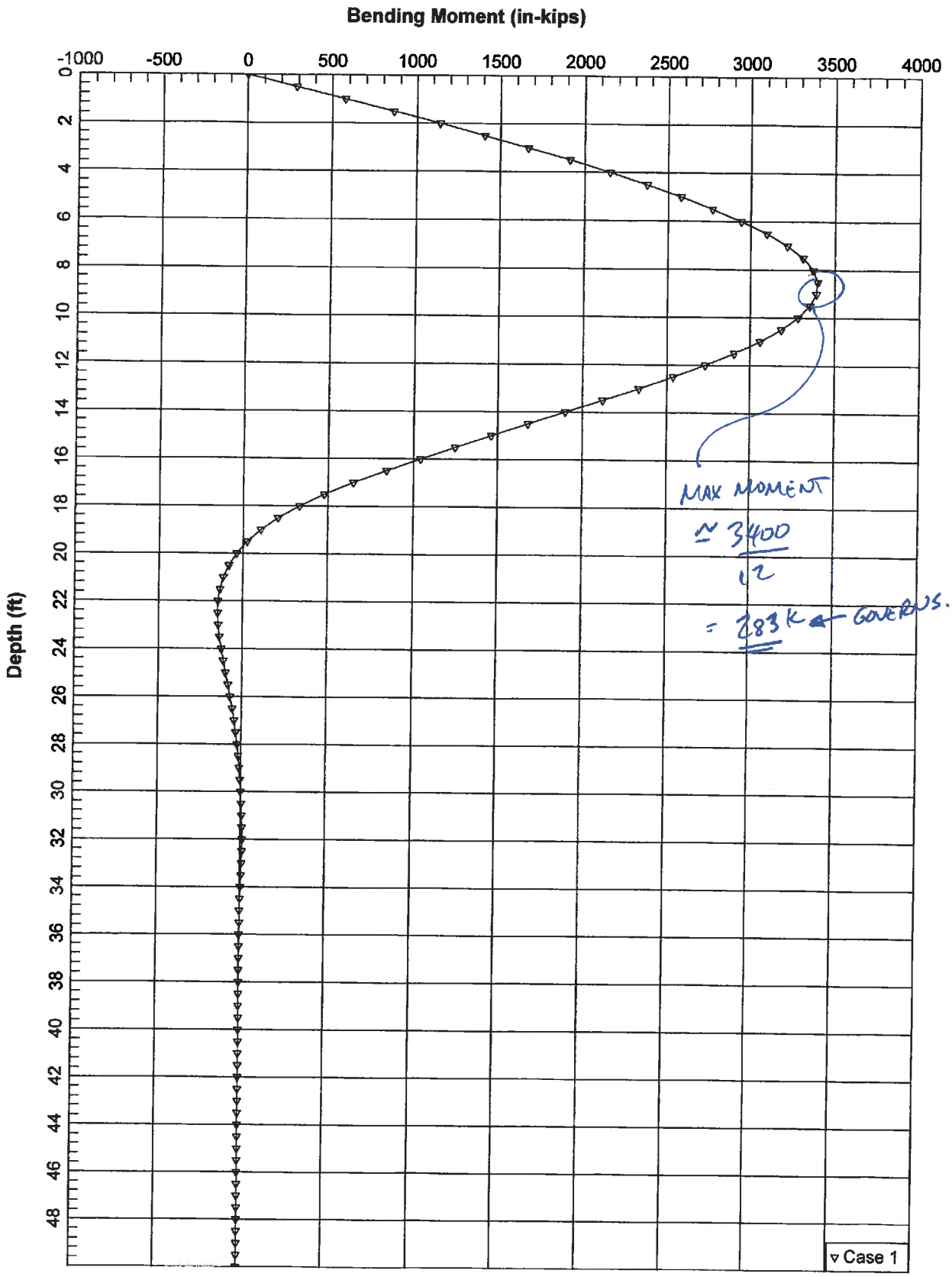
IB3 - SEE, 50% 100yr SCOUR.



EB1 - SEE, SCOUR MODEL - LONG. PILE CAPACITY CHECK



EB 4 - SEE, SCOUR MODEL - LONG. PILE CAPACITY CHECK



Preston Felkel

From: John Hamilton <jhamilton@fmecol.com>
Sent: Thursday, February 11, 2016 2:05 PM
To: Preston Felkel
Cc: David Yoder; Rafi Jamaluddin
Subject: RE: Emergency Bridge Pkg 4 - Black Mingo Seismic Design

BY INSPECTION, SCOUR MODELS WILL CONTROL SEISMIC DESIGN.

Preston,

See below. Thanks.

1. Do you anticipate any liquefaction at this site? If so, roughly what range of elevations would the liquefaction occur?
   a. Yes, liquefaction is in the 13-18 ft range referenced from the top of the existing embankment.
2. Can you provide load vs. displacement values in both the long. and trans. directions for the end bent piles?

EB1 - Long		EB1 - Trans		EB4 - Long		EB4 - Trans	
Load (kips)	Δ (in)	Load (kips)	Δ (in)	Load (kips)	Δ (in)	Load (kips)	Δ (in)
0	0	0	0	0	0	0	0
18.4	0.5	28	0.5	14.9	0.5	24.1	0.5
27.9	1	38.9	1	23.8	1	37.9	1
35.3	2	50.6	2	35.7	2	56.6	2
41.6	3	61.7	3	44.5	3	70	3
47.6	4	71.2	4	51.3	4	80.5	4
53.2	5	79	5	56.8	5	88.6	5
58	6	86	6	61.1	6	94.7	6
62.3	7	92.8	7	64.2	7	99.6	7
66.2	8	99.4	8	66	8	104.2	8
69.9	9	105.8	9	67.6	9	108.4	9
73.6	10	112.1	10	68.9	10	112.5	10
77.3	11	118.2	11	70.1	11	116.2	11
80.8	12	124.1	12	71.3	12	119.5	12

AVERAGE OF VALUES AT EACH END BENT USED FOR ANALYSIS.

3. What passive pressure should I use for the end bents (in ksf, per GDM methodology)?
   a. $p_{wall} = (0.2125)h_{wall}$ ksf

From: Preston Felkel [mailto:preston.felkel@ice-eng.com]
Sent: Thursday, February 11, 2016 12:53 PM
To: John Hamilton
Cc: David Yoder; Rafi Jamaluddin
Subject: Emergency Bridge Pkg 4 - Black Mingo Seismic Design

John,

I will be launching into the seismic design for Black Mingo Creek very soon. I'll need the same info you pulled together for me on Jumping Run previously...

1. Do you anticipate any liquefaction at this site? If so, roughly what range of elevations would the liquefaction occur?
2. Can you provide load vs. displacement values in both the long. and trans. directions for the end bent piles?
3. What passive pressure should I use for the end bents (in ksf, per GDM methodology)?

Thanks!

J. Preston Felkel, PE | *SC Structures Group Manager*
preston.felkel@ice-eng.com | 803-201-9196 (C)

INFRASTRUCTURE
CONSULTING & ENGINEERING
1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3032 (W) | 803-822-0034 (F)
www.ice-eng.com

David Yoder

From: John Hamilton <jhamilton@fmecol.com>
Sent: Wednesday, February 03, 2016 10:16 AM
To: David Yoder
Subject: RE: S-51 over Black Mingo Creek - Site Class
Attachments: b-03.pdf; b-04.pdf; STB-1.pdf; STB-4.pdf; CPT-2.pdf; CPT-3.pdf

Let's go with a Site Class C for the bridge foundations and a Site Class D for the embankments. Boring logs are attached. Thanks.

John H.

From: David Yoder [mailto:david.yoder@ice-eng.com]
Sent: Wednesday, February 03, 2016 9:34 AM
To: John Hamilton
Subject: S-51 over Black Mingo Creek - Site Class

John,

What is the site class for Black Mingo Creek?

Thanks,

David Yoder, P.E. | *Structural Engineer*
david.yoder@ice-eng.com | 803-807-3075 (C)

INFRASTRUCTURE
CONSULTING & ENGINEERING

1021 Briargate Circle | Columbia, SC 29210
803-822-0333 Ext. 3161 (W) | 803-822-0034 (F)

S-827 - Site Class D

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.18	0.33	0.15
SEE	0.37	0.73	0.38

S-36 - Site Class C

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.13	0.23	0.11
SEE	0.33	0.62	0.30

S-36 - Site Class D

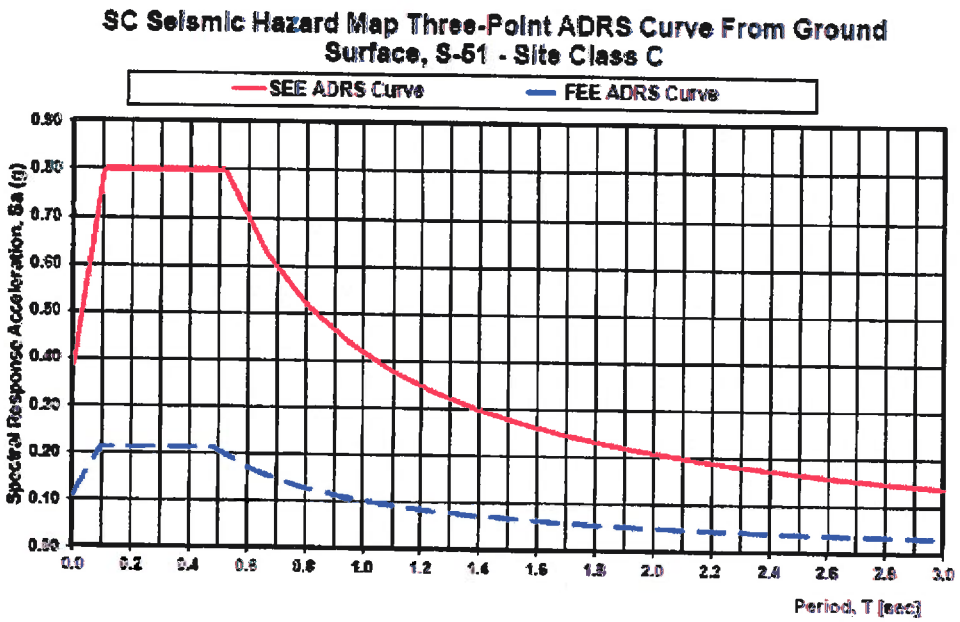
Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.17	0.31	0.16
SEE	0.36	0.72	0.39

S-51 - Site Class C

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.11	0.21	0.10
SEE	0.39	0.80	0.41

S-51 - Site Class D

Design EQ	PGA	S_{DS}	S_{D1}
FEE	0.14	0.28	0.14
SEE	0.42	0.88	0.50



FEE ADRS Curve
Three-Point Method

	T	S_a
	0.00	0.11
	0.02	0.13
	0.03	0.14
	0.05	0.15
	0.06	0.16
	0.08	0.19
To	0.10	0.21
	0.13	0.21
	0.16	0.21
	0.19	0.21
	0.23	0.21
	0.26	0.21
	0.29	0.21
	0.32	0.21
	0.35	0.21
	0.39	0.21
	0.42	0.21
	0.45	0.21
Ts	0.48	0.21
	0.63	0.16
	0.78	0.13
	0.93	0.11
	1.08	0.09
	1.22	0.08
	1.37	0.07
	1.52	0.07
	1.67	0.06
	1.82	0.06
	1.96	0.05
	2.11	0.05
	2.26	0.05
	2.41	0.04
	2.56	0.04
	2.70	0.04
	2.85	0.04
	3.00	0.03

SEE ADRS Curve
Three-Point Method

	T	Sa
	0.00	0.39
	0.02	0.45
	0.03	0.52
	0.05	0.59
	0.07	0.66
	0.08	0.73
To	0.10	0.80
	0.14	0.80
	0.17	0.80
	0.21	0.80
	0.24	0.80
	0.28	0.80
	0.31	0.80
	0.35	0.80
	0.38	0.80
	0.42	0.80
	0.45	0.80
	0.49	0.80
Ts	0.52	0.80
	0.67	0.62
	0.81	0.51
	0.96	0.43
	1.10	0.38
	1.25	0.33
	1.40	0.30
	1.54	0.27
	1.69	0.25
	1.83	0.23
	1.98	0.21
	2.12	0.20
	2.27	0.18
	2.42	0.17
	2.56	0.16
	2.71	0.15
	2.85	0.15
	3.00	0.14

Table 3.1 Bridge Operational Classification (OC)

Operational Classification (OC)	Description
I	All bridges that are located on the Interstate system or along the following roads: • US 17, US 378 from SC 441 east to I-95 • I-20 Spur from I-95 east to US 76 • US 76 from I-20 Spur east to North Carolina Additionally all bridges that meet any of the following criteria: • Structures that do not have detours • Structures with detours greater or equal to 15 miles • Structures with a design life greater than 75 years
II	All bridges that do not have a bridge OC = I and meet any of the following criteria: • A projected (20 years) ADT ≥ 500 • A projected (20 years) ADT < 500, with bridge length longer than 180' or individual span length larger than 60'
III	All bridges that do not have an OC = I or II classification.

Table 3.2 Bridge Seismic Analysis Requirements

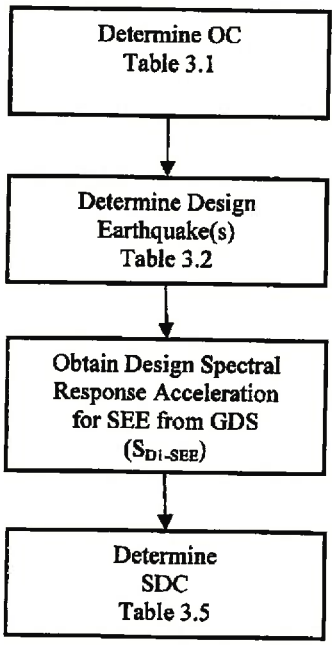
Operational Classification (OC)	Analysis Description ♦
I, II	Seismic analysis shall be performed for the following design earthquakes: • Functional Evaluation Earthquake (FEE) only when potential liquefiable soil or slope instability (see Geotechnical Design Manual for more information) exists and no geotechnical mitigation is performed. • Safety Evaluation Earthquake (SEE)
III	Seismic analysis required for Safety Evaluation Earthquake (SEE) only.

♦ For design requirements of temporary bridges and staged construction, see Section 3.11. For design requirements for pedestrian bridges, see Section 3.12.

Detailed seismic analysis is not required for SDC A or Single Span bridges, however minimum detailing shall be provided, see Section 3.13.1.

3.5 SEISMIC DESIGN CATEGORY (SDC)

Bridges are assigned a Seismic Design Category (SDC) based on the operational classification and the design SEE acceleration coefficient at one-second period ($S_{D1\text{-}SEE}$). There are four Seismic Design Categories, SDC A through SDC D. Table 3.5 lists the SDC based on the OC and $S_{D1\text{-}SEE}$. Use the flow chart in Figure 3.2 to determine the SDC for a structure.



(GDS Stands for Regional Production Group Geotechnical Design Squad)

Figure 3.1 Flow Chart to Determine SDC

Table 3.5 Seismic Design Category (SDC)

Value of $S_{D1\text{-}SEE}$	Operational Classification (OC)		
	I	II	III
$S_{D1\text{-}SEE} < 0.30g$	B	A	A
$0.30g \le S_{D1\text{-}SEE} < 0.45g$	C	B	A
$0.45g \le S_{D1\text{-}SEE} < 0.60g$	C	C	B
$S_{D1\text{-}SEE} \ge 0.60g$	D	C	B

3.6 SEISMIC DEMAND

Seismic demand includes displacement demand and force demand.

Displacement demand can be obtained from a Multimode Spectral Analysis (MSA). This procedure is described in Section 5.2. Section 5 covers displacement demand modeling and computations. Upper limits of the displacement demand are given in Table 3.6. If displacement performance limits are exceeded, the designer shall consider other types of substructure configurations or change bridge geometry.

The design force demand is obtained from the MSA or the overstrength capacity of the ductile components, depending on the displacement demand of the structure.

If the displacement demand of the structure is less than the yield displacement, the force demand can be directly obtained from the MSA.

If the displacement demand is greater than the yield displacement, the MSA should not be used to obtain force demand. The force demand from the MSA in this situation does not recognize the force limit state associated with yield and computes unrealistic moment and shear demand. In this situation, the force demand is computed from the overstrength capacity of the ductile components as described in Section 6.7.5.

S-51 over Black Mingo Creek
Williamsburg County
Emergency Package 4
SCDOT

Reinforcement Schedules

Prepared for

SCDOT

Prepared by

Infrastructure Consulting & Engineering

INFRASTRUCTURE CONSULTING & ENGINEERING

Columbia, South Carolina

Project: BLACK MINGO
SPAN A, INTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span A (37'-6" Cored Slab) - Interior Slab										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	2	37'-1"						37'-1"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	92	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	510	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
SPAN A, EXTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span A (37'-6" Cored Slab) - Exterior Slab

BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS a	b	c	d	e	f	LENGTH
A1601	CORED SLAB	16	2	37'-1"						37'-1"
C1601	BARRIER	16	13	3'-8"	10"					4'-6"
A1602	BARRIER (GB1601)	16	23	5'-7"						5'-7"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	92	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"
L1601	BARRIER	16	36	10"	4'-2"	4 3/4"	3'-10"			9'-3"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	1052	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
SPAN B, INTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span B (70' Cored Slab) - Interior Slab										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	4	35'-9"						35'-9"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	156	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	832	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
SPAN B, EXTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span B (70'-0" Cored Slab) - Exterior Slab										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	4	35'-9"						35'-9"
A1601	BARRIER (GB1601)	16	71	5'-7"						5'-7"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	156	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	1245	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*

*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
SPAN C, INTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span C (56'-6" Cored Slab) - Interior Slab										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	2	56'-1"						56'-1"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	128	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	691	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
SPAN C, EXTERIOR SLAB

Calc: DKY 2/16/16
Check: BFS 2/17/16

Span C (56'-6" Cored Slab) - Exterior Slab										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	2	56'-1"						56'-1"
C1601	BARRIER	16	13	3'-8"	10"					4'-6"
A1602	BARRIER (GB1601)	16	42	5'-7"						5'-7"
J1301	CORED SLAB	13	8	1'-9"	1'-7"					4'-11"
J1302	CORED SLAB	13	128	2'-8"	1'-7"					5'-10"
J1303	CORED SLAB	13	4	1'-8 1/2"	2'-8"					7'-1"
J1601	CORED SLAB	16	8	2'-7"	6"					3'-7"
L1601	BARRIER	16	36	10"	4'-2"	4 3/4"	3'-10"			9'-3"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	1344	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO BARRIER - SPAN A

Calc: DKY 2/16/16

Check: BFS 2/17/16

Span A Barriers

BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CORED SLAB	16	14	37'-1"						37'-1"
H1601	CORED SLAB	16	46	2'-4"	2'-4"	7 3/8"				5'-2"
U1601	CORED SLAB	16	2	2'-0"	5"					4'-2"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	798	lbs.	Anchor Bolts:	0 lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods:	0 lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*

*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO BARRIER - SPAN B

Calc: DKY 2/16/16

Check: BFS 2/17/16

Span B Barriers

BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1602	CORED SLAB	16	28	36'-4"						36'-4"
H1601	CORED SLAB	16	142	2'-4"	2'-4"	7 3/8"				5'-2"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	1826	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO BARRIER - SPAN C

Calc: DKY 2/16/16

Check: BFS 2/17/16

Span C Barriers

BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1603	CORED SLAB	16	14	56'-1"						56'-1"
H1601	CORED SLAB	16	84	2'-4"	2'-4"	7 3/8"				5'-2"
U1601	CORED SLAB	16	2	2'-0"	5"					4'-2"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	1281	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*

*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: S-51 OVER BLACK MINGO END BENT

Calc: DKY 2/17/16

Check: BFS 2/17/16

End Bent 1 or 4

BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS a	b	c	d	e	f	LENGTH
A1301	EARWALL	13	12	4'-1"						4'-1"
A1601	CAP	16	12	38'-3"						38'-3"
A1901	CAP	19	36	2'-0"						2'-0"
A2501	CAP	25	24	1'-6"						1'-6"
A2901	CAP	29	8	38'-3"						38'-3"
C1301	EARWALL	13	24	3'-10"	8"					4'-6"
J1301	EARWALL	13	8	5 1/2"	7'-0"					14'-6"
J1302	EARWALL	13	4	5 1/2"	2'-1"					4'-8"
J1601	CAP	16	6	4'-5 1/2"	1'-3"					7'-0"
J1602	CAP	16	8	8"	1'-7"					3'-10"
J1603	CAP	16	4	1'-9 1/2"	1'-7"					5'-0"
J1604	CAP	16	8	2'-6 1/2"	1'-3"					5'-1"
S1601	CAP	16	36	2'-8"	4'-7"	8"				15'-10"
SB1601	CAP	16	7	2'-8"	4'-7"	8"				13'-2"
V1901	CAP	19	14	2'-2"						4'-4"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement:	2838	lbs.	Anchor Bolts: 0	lbs.
Hoop Reinforcement:	0	lbs.		
Spiral Reinforcement:	0	lbs.	Tie Rods: 0	lbs.
Epoxy Coated Reinforcement:	0	lbs.		
Galvanized Reinforcement:	0	lbs.		

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

Project: BLACK MINGO
INTERIOR BENT 2 OR 3

Calc: DKY 2/17/16
Check: BFS 2/17/16

Interior Bent 2 or 3										
BAR MARK	LOCATION	SIZE	NO. REQ'D.	BENDING DIMENSIONS						LENGTH
				a	b	c	d	e	f	
A1601	CAP	16	4	38'-8"						38'-8"
A2501	CAP	25	48	1'-6"						1'-6"
A3201	CAP	32	8	38'-8"						38'-8"
J1601	CAP	16	4	2'-8 1/2"	1'-3"					5'-3"
J1602	CAP	16	4	2'-6 1/2"	1'-10"					6'-3"
J1603	CAP	16	8	8"	1'-7"					3'-10"
J1604	CAP	16	4	2'-10"	1'-7"					6'-0"
J1605	CAP	16	6	3'-5"	1'-3"					5'-11"
S1601	CAP	16	58	2'-10"	2'-8"	8"				12'-4"
SB1601	CAP	16	28	2'-10"	2'-8"	8"				9'-6"

Project: _____ Calc: _____

_____ Check: _____

Summary of Weights:

Standard Reinforcement: 2849 lbs.
Hoop Reinforcement: 0 lbs.
Spiral Reinforcement: 0 lbs.
Epoxy Coated Reinforcement: 0 lbs.
Galvanized Reinforcement: 0 lbs.

Anchor Bolts: 0 lbs.

Tie Rods: 0 lbs.

CRSI & SCDOT Information:

Rebar Data				Development Lengths*			Splice Lengths* **	
Bar Size	Diamter (in)	Area (in^2)	Weight (lbs/ft)	l_{db} - Top (in)	l_{db} - Other (in)	l_{hb} (in)	Top (in)	Other (in)
10	0.375	0.11	0.376	13	12	8	22	16
13	0.500	0.20	0.668	17	12	10	29	21
16	0.625	0.31	1.043	21	15	12	36	26
19	0.750	0.44	1.502	26	18	15	43	31
22	0.875	0.60	2.044	32	23	17	54	39
25	1.000	0.79	2.670	42	30	19	71	51
29	1.128	1.00	3.400	53	38	22	90	64
32	1.270	1.27	4.303	67	48	25	114	81
36	1.410	1.26	5.313	82	59	27	140	100
43	1.693	2.25	7.650	114	81	33	193	138
57	2.257	4.00	13.600	147	105	43	250	179

** Development & Splice Lengths shown are for Grade 60 Uncoated Bars with f'_c = 4ksi and Normal Weight Concrete*
*** Splice Lenghts are Class C*

	End Hooks			
		180°		90°
Bar	D	A or G	J	A or G
10	2 1/4"	5"	3"	6"
13	3"	6"	4"	8"
16	3 3/4"	7"	5"	10"
19	4 1/2"	8"	6"	1'-0"
22	5 1/4"	10"	7"	1'-2"
25	6"	11"	8"	1'-4"
29	9 1/2"	1'-3"	11 3/4"	1'-7"
32	10 3/4"	1'-5"	1'-1 1/4"	1'-10"
36	1'-0"	1'-7"	1'-2 3/4"	2'-0"
43	1'-6 1/4"	2'-3"	1'-9 3/4"	2'-7"
57	2'-0"	3'-0"	2'-4 1/2"	3'-5"

Stirrup and Tie Hooks				Seismic Hooks		
	90°	135°			135°	
D	A or G	A or G	H (appr.)	D	A or G	H (appr.)
1 1/2"	4"	4"	2 1/2"	1 1/2"	4 1/4"	3"
2"	4 1/2"	4 1/2"	3"	2"	7 1/2"	5"
2 1/2"	6"	5 1/2"	3 3/4"	2 1/2"	8"	5 1/2"
4 1/2"	1'-0"	8"	4 1/2"	4 1/2"	11"	6 1/2"
5 1/4"	1'-2"	9"	5 1/4"	5 1/4"	9"	5 1/4"
6"	1'-4"	10 1/2"	6"	6"	10 1/2"	6"

Note: All dimensions are in inches

End Bent 1

Bottom of Cap - Low Side	21.239
Bottom of Cap - High Side	20.005
Cap Length	38.58333
Slope	-0.0320

For Plans

Pile #	Location	Bottom of Cap Elev.	Cut-off Elevation	Estimated H-Pile Tip Elevation	Length (ft)
1	2.791667	21.150	22.150	-5	27.150
2	8.291667	20.974	21.974	-5	26.974
3	13.79167	20.798	21.798	-5	26.798
4	19.29167	20.622	21.622	-5	26.622
5	24.79167	20.446	21.446	-5	26.446
6	30.29167	20.270	21.270	-5	26.270
7	35.79167	20.094	21.094	-5	26.094
				Total	186.4

End Bent 4

Bottom of Cap - Low Side	21.322
Bottom of Cap - High Side	20.088
Cap Length	38.58333
Slope	-0.0320

For Plans

Pile #	Location	Bottom of Cap Elev.	Cut-off Elevation	Estimated H-Pile Tip Elevation	Length (ft)
1	2.791667	21.233	22.233	-11	33.233
2	8.291667	21.057	22.057	-11	33.057
3	13.79167	20.881	21.881	-11	32.881
4	19.29167	20.705	21.705	-11	32.705
5	24.79167	20.529	21.529	-11	32.529
6	30.29167	20.353	21.353	-11	32.353
7	35.79167	20.177	21.177	-11	32.177
				Total	228.9

Interior Bent 2

Bottom of Cap - Left Side	23.383
Bottom of Cap - Right Side	22.135
Cap Length	39
Slope	-0.0320

For Plans

Pile #	Location	Bottom of Cap Elev.	Cut-off Elevation	Minimum Concrete Tip Elev.	Estimated H-Pile Tip Elevation	Concrete Pile Length	H-Pile Length
1	3.0000	23.287	25.204	-28	-30.5	53.204	8.5
2	8.5000	23.111	25.028	-28	-30.5	53.028	8.5
3	14.0000	22.935	24.852	-28	-30.5	52.852	8.5
4	19.5000	22.759	24.676	-28	-30.5	52.676	8.5
5	25.0000	22.583	24.500	-28	-30.5	52.500	8.5
6	30.5000	22.407	24.324	-28	-30.5	52.324	8.5
7	36.0000	22.231	24.148	-28	-30.5	52.148	8.5
						368.7	59.5

Interior Bent 3

Bottom of Cap - Left Side	23.454
Bottom of Cap - Right Side	22.206
Cap Length	39
Slope	-0.0320

For Plans

Pile #	Location	Bottom of Cap Elev.	Cut-off Elevation	Minimum Concrete Tip Elev.	Estimated H-Pile Tip Elevation	Concrete Pile Length	H-Pile Length
1	3.0000	23.358	25.275	-30	-32.5	55.275	8.5
2	8.5000	23.182	25.099	-30	-32.5	55.099	8.5
3	14.0000	23.006	24.923	-30	-32.5	54.923	8.5
4	19.5000	22.830	24.747	-30	-32.5	54.747	8.5
5	25.0000	22.654	24.571	-30	-32.5	54.571	8.5
6	30.5000	22.478	24.395	-30	-32.5	54.395	8.5
7	36.0000	22.302	24.219	-30	-32.5	54.219	8.5
						383.2	59.5