SECOND STRUCTURAL SUBMITTAL
DESIGN CALCULATIONS VOLUME 1

PROPOSED BRIDGE REPLACEMENT OF

BRIDGE NO. S-09-003 (40N)
MASKWONICUT STREET OVER MBTA/AMTRAK RAILROAD
SHARON, MASSACHUSETTS

PROJECT FILE NO. 608079

SUBMITTED TO:

Massachusetts Department of Transportation
10 Park Plaza
Boston, MA 02116
Submission Date: August 17, 2020

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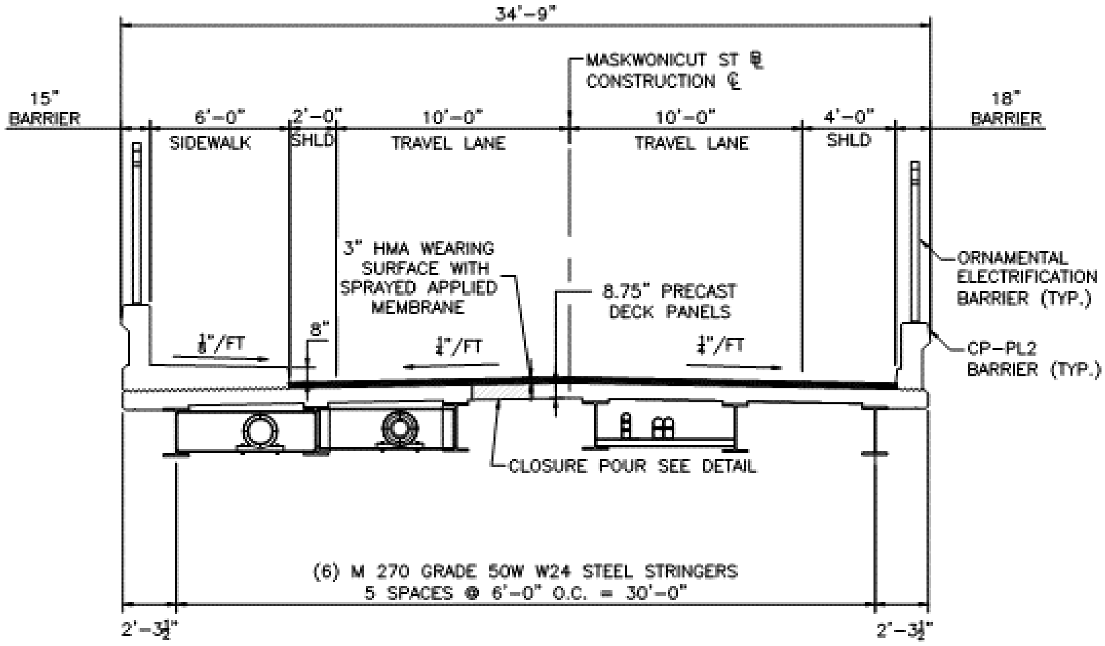
General Plan

Typical Section

Weston & Sampson	PROJECT: MassDOT Sharon S - 09-003 Maskwonicut Street over MBTA/Amtrak Railroad	DATE: BY: CHKD BY: PROJ NO.: PAGE:	2/5/2020 2150851



TRANSVERSE SECTION
SCALE: ¼" = 1'-0"

BRIDGE DECK GEOMETRY

Elevation Calculations

Vertical Profile Grade Information

PT Sta.	1355
Elev.	212.23
PI Sta.	1560
Elev.	220.22
%Grade	3.90

Top of Precast Deck Elevations

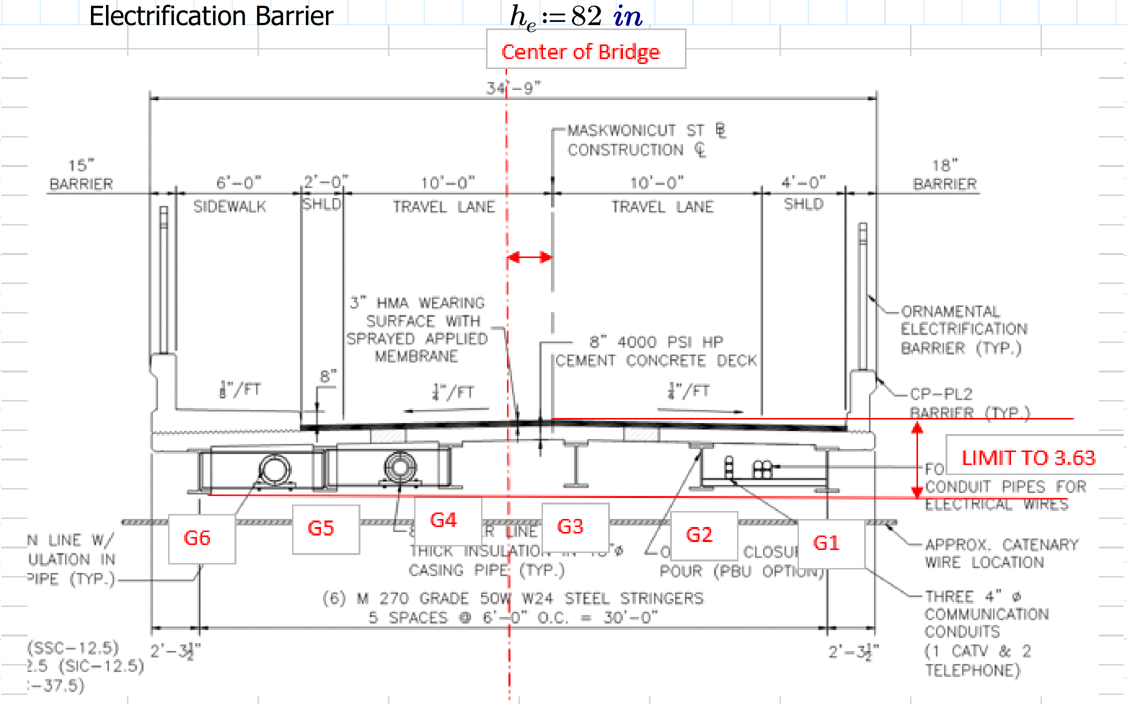
Location	Station	Elevation	Offset	Dist. 1st	X-slope	EL.	EL.	Elev.
E01	1492.32	217.582	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	216.949
W01	1492.32	217.582	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	217.289
E11	1492.32	217.582	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	217.324
W11	1492.32	217.582	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	217.024
E02	1500.32	217.894	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	217.261
W02	1500.32	217.894	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	217.601
E12	1500.32	217.894	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	217.636
W12	1500.32	217.894	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	217.336
E03	1508.32	218.206	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	217.572
W03	1508.32	218.206	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	217.912
E13	1508.32	218.206	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	217.947
W13	1508.32	218.206	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	217.647
E04	1516.32	218.518	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	217.884
W04	1516.32	218.518	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	218.224
E14	1516.32	218.518	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	218.259
W14	1516.32	218.518	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	217.959
E05	1524.32	218.829	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	218.196
W05	1524.32	218.829	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	218.536
E15	1524.32	218.829	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	218.571
W15	1524.32	218.829	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	218.271
E06	1532.23	219.138	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	218.504
W06	1532.23	219.138	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	218.844
E16	1532.23	219.138	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	218.879
W16	1532.23	219.138	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	218.579
E07	1540.32	219.453	19.1667Lt.	19.1667	-0.02	-0.383334	-0.25	218.820
W07	1540.32	219.453	2.1667Lt.	2.1667	-0.02	-0.043334	-0.25	219.160
E17	1540.32	219.453	0.4167 Rt.	0.4167	-0.02	-0.008334	-0.25	219.195
W17	1540.32	219.453	15.4167Rt.	15.4167	-0.02	-0.308334	-0.25	218.895

SUPERSTRUCTURE DESIGN

Beam Seat Elevations

Structure heights

Girder	$h_g := 25\ in$
Haunch	$h_h := 1.5\ in$
Deck	$t_d := 8.75\ in$
Bearing Height	$h_b := 2.5\ in$
Sole Plate at Bearing	$h_{sp} := 1.5\ in$
Bituminous wear surface	$t_{ws} := 3\ in$
Curb	$h_c := 8\ in$
Parapet	$h_p := 24\ in + 8\ in = 32\ in$
Electrification Barrier	$h_e := 82\ in$



Bridge Width	$w_b := 34.75\ ft$
Beam Spacing	$S := 6\ ft$
Beam Overhang	$d_o := 2\ ft + 3.5\ in = 2.292\ ft$
Deck Width	$w_d := 5 \cdot S + 2 \cdot d_o = 34.583\ ft$
Roadway Cross Slope	$s := .02\ \dfrac{in}{ft}$
Half Bridge Width	$.5w_b := \dfrac{w_b}{2} = 17.375\ ft$

Distance between center bridge and CL $x := .5w_b - (1.5\ ft + 4\ ft + 10\ ft) = 1.875\ ft$

Distance between Crown and G1 $x_1 := (3\ ft - x) + 2\ S = 13.125\ ft$

Distance between Crown and G2 $x_2 := (3\ ft - x) + S = 7.125\ ft$

Distance between Crown and G3 $x_3 := (3\ ft - x) = 1.125\ ft$

Distance between Crown and G4 $x_4 := (6\ ft - x_3) = 4.875\ ft$

Distance between Crown and G5 $x_5 := (6\ ft - x_3) + S = 10.875\ ft$

Distance between Crown and G6 $x_6 := (6\ ft - x_3) + 2\ S = 16.875\ ft$

G1 Camber $c_1 := 2.383\ in = 0.199\ ft$

G2 Camber $c_2 := 2.019\ in = 0.168\ ft$

G3 Camber $c_3 := 1.974\ in = 0.165\ ft$

G4 Camber $c_4 := 2.228\ in = 0.186\ ft$

G5 Camber $c_5 := 2.937\ in = 0.245\ ft$

G6 Camber $c_6 := 3.255\ in = 0.271\ ft$

Begin Bridge - STA 14+89.07, Elevation at Crown $EL_{BB} := 217.454\ ft$

Begin Bridge - STA 14+89.07, Elevation at Roadway - G1 $EL_{BBR.G1} := EL_{BB} - s \cdot x_1 = 217.432\ ft$

Begin Bridge - STA 14+89.07, Elevation at Beam Seat - G1 $EL_{BBS.G1} := EL_{BBR.G1} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_1 = 213.713\ ft$

Begin Bridge - STA 14+89.07, Elevation at Roadway - G2 $EL_{BBR.G2} := EL_{BB} - s \cdot x_2 = 217.442\ ft$

Begin Bridge - STA 14+89.07, Elevation at Beam Seat - G2 $EL_{BBS.G2} := EL_{BBR.G2} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_2 = 213.753\ ft$

Begin Bridge - STA 14+89.07, Elevation at Roadway - G3 $EL_{BBR.G3} := EL_{BB} - s \cdot x_3 = 217.452\ ft$

Begin Bridge - STA 14+89.07, Elevation at Beam Seat - G3 $EL_{BBS.G3} := EL_{BBR.G3} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_3 = 213.767\ ft$

Begin Bridge - STA 14+89.07, Elevation at Roadway - G4 $EL_{BBR.G4} := EL_{BB} - s \cdot x_4 = 217.446\ ft$

Begin Bridge - STA 14+89.07, Elevation at Beam Seat - G4 $EL_{BBS.G4} := EL_{BBR.G4} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_4 = 213.739\ ft$

Begin Bridge - STA 14+89.07,
Elevation at Roadway - G5
$EL_{BBR.G5} := EL_{BB} - s \cdot x_5 = 217.436\ ft$

Begin Bridge - STA 14+89.07,
Elevation at Beam Seat - G5
$EL_{BBS.G5} := EL_{BBR.G5} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_5 = 213.67\ ft$

Begin Bridge - STA 14+89.07,
Elevation at Roadway - G6
$EL_{BBR.G6} := EL_{BB} - s \cdot x_6 = 217.426\ ft$

Begin Bridge - STA 14+89.07,
Elevation at Beam Seat - G6
$EL_{BBS.G6} := EL_{BBR.G6} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_6 = 213.634\ ft$

End Bridge - STA 15+43.57,
Elevation at Crown
$EL_{EB} := 219.580\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G1
$EL_{EBR.G1} := EL_{EB} - s \cdot x_1 = 219.558\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G1
$EL_{EBS.G1} := EL_{EBR.G1} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_1 = 215.839\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G2
$EL_{EBR.G2} := EL_{EB} - s \cdot x_2 = 219.568\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G2
$EL_{EBS.G2} := EL_{EBR.G2} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_2 = 215.879\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G3
$EL_{EBR.G3} := EL_{EB} - s \cdot x_3 = 219.578\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G3
$EL_{EBS.G3} := EL_{EBR.G3} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_3 = 215.893\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G4
$EL_{EBR.G4} := EL_{EB} - s \cdot x_4 = 219.572\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G4
$EL_{EBS.G4} := EL_{EBR.G4} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_4 = 215.865\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G5
$EL_{EBR.G5} := EL_{EB} - s \cdot x_5 = 219.562\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G5
$EL_{EBS.G5} := EL_{EBR.G5} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_5 = 215.796\ ft$

End Bridge - STA 15+43.57,
Elevation at Roadway - G6
$EL_{EBR.G6} := EL_{EB} - s \cdot x_6 = 219.552\ ft$

End Bridge - STA 15+43.57,
Elevation at Beam Seat - G6
$EL_{EBS.G6} := EL_{EBR.G6} - t_{ws} - t_d - h_h - h_g - h_b - h_{sp} - c_6 = 215.76\ ft$

Low Chord Computation

STA 15+02.37,
$EL_{CRIT.B} := 217.97\ ft$

Critical Station (7'-0" Horiz. Clearance from RR)
Roadway Elevation

STA 15+02.37, Low Chord Elevation $EL_{CRIT.LC} := EL_{CRIT.R} - t_{ws} - t_d - h_h - h_g = 214.783\ ft$

STA 15+02.37, RR Track Elevation $EL_{RR} := 195\ ft$

Minimum Vertical Clearance @ RR $C_V := 19.33\ ft$

Minimum Vertical Clearance @ RR, Elevation $EL_{RRMIN} := EL_{RR} + C_V = 214.33\ ft$

Supplemental Loads

1. Project parameters

Total bridge length $L := 54.5\ ft$

Total bridge width $W := 34.75\ ft$

Number of lanes loaded $n := \text{floor}\left(\frac{W}{12\ ft}\right) = 2$

Multiple presence factor $m := 1.0$ (Table 3.6.1.1.2-1)

Number of girders $N_g := 6$

Structure heights

Girder	$h_g := 25\ in$
Haunch	$h_h := 4\ in$
Deck	$t_d := 8.5\ in$
Bituminous wear surface	$t_{ws} := 3\ in$
Curb	$h_c := 8\ in$
Parapet	$h_p := 24\ in + 8\ in = 32\ in$
Electrification Barrier	$h_e := 82\ in$

2. Braking force (BR) (3.6.4)

Axle weights of design truck $W_{truck} := 8\ kip + 32\ kip + 32\ kip = 72\ kip$

Axle weights of design tandem $W_{tndm} := 25\ kip + 25\ kip = 50\ kip$

Total lane load $W_{ln} := 0.64\ klf \cdot L = 34.88\ kip$

25% of design truck axle weights $BR_{truck} := 0.25 \cdot W_{truck} = 18\ kip$

25% of design tandem axle weights $BR_{tndm} := 0.25 \cdot W_{tndm} = 12.5\ kip$

5% of design truck + 5% of lane load $BR_{truck\_ln} := 0.05 \cdot (W_{truck} + W_{ln}) = 5.34\ kip$

5% of design tandem + 5% of lane load $BR_{tndm\_ln} := 0.05 \cdot (W_{tndm} + W_{ln}) = 4.24\ kip$

Vehicular braking force $BR_{veh} := \max(BR_{truck}, BR_{tndm}, BR_{truck\_ln}, BR_{tndm\_ln}) = 18\ kip$

Bridge braking force $BR_{bridge} := \frac{n}{2} \cdot m \cdot BR_{veh} = 18\ kip$

Design braking force $BR := \frac{BR_{bridge}}{(N_g \cdot L)} = 0.06\ klf$

Height of application load (from center of girder) $h_{BR} := \frac{h_g}{2} + h_h + t_d + t_{ws} + 6\ ft = 8.33\ ft$

2. Wind load on structure (WS) (3.8.1.2)

Total exposed wind height $h_{wind} := h_g + h_h + h_c + t_d + h_p + h_e = 13.29\ ft$

Wind pressure $P_z = 2.56 \cdot 10^{-6} \cdot V^2 \cdot K_z \cdot G \cdot C_D$

Design 3-second gust wind speed, Strength III $V_{ST3} := 130\ mph$

Design 3-second gust wind speed, Strength V $V_{ST5} := 80\ mph$

Design 3-second gust wind speed, Service I $V_{SV1} := 70\ mph$

Design 3-second gust wind speed, Service IV $V_{SV4} := 0.75 \cdot V_{ST3} = 97.5\ mph$

Ground surface roughness "D"

Wind exposure category "D"

Pressure exposure and elevation coefficient $K_z := 1.15$ (Table C3.8.1.2.1-1)

Gust effect factor $G := 1.0$ (Table 3.8.1.2.1-1)

Drag coefficient $C_D := 1.3$ (Table 3.8.1.2.1-2)

Wind pressure, Strength III $P_{Z\_ST3} := 2.56 \cdot 10^{-6} \cdot \left(\frac{V_{ST3}}{mph}\right)^2 \cdot K_z \cdot G \cdot C_D \cdot ksf = 0.065\ ksf$

Wind pressure, Strength V $P_{Z\_ST5} := 2.56 \cdot 10^{-6} \cdot \left(\frac{V_{ST5}}{mph}\right)^2 \cdot K_z \cdot G \cdot C_D \cdot ksf = 0.024\ ksf$

Wind pressure, Service I $P_{Z\_SV1} := 2.56 \cdot 10^{-6} \cdot \left(\frac{V_{SV1}}{mph}\right)^2 \cdot K_z \cdot G \cdot C_D \cdot ksf = 0.019\ ksf$

Wind pressure, Service IV $P_{Z\_SV4} := 2.56 \cdot 10^{-6} \cdot \left(\frac{V_{SV4}}{mph}\right)^2 \cdot K_z \cdot G \cdot C_D \cdot ksf = 0.036\ ksf$

Wind load, Strength III $w_{WS\_ST3} := P_{Z\_ST3} \cdot h_{wind} = 0.86\ klf$

Wind load, Strength V $w_{WS\_ST5} := P_{Z\_ST5} \cdot h_{wind} = 0.33\ klf$

Wind load, Service I $w_{WS\_SV1} := P_{Z\_SV1} \cdot h_{wind} = 0.25\ klf$

Wind load, Service IV $w_{WS\_SV4} := P_{Z\_SV4} \cdot h_{wind} = 0.48\ klf$

3. Wind on Live Load (WL) (3.8.1.3)

Wind force $WL := 0.10\ klf$

Wind force per girder $w_{WL} := \frac{WL}{N_g} = 0.02\ klf$

Height of application load (from center of girder) $h_{WL} := h_{BR} = 8.33\ ft$

4. Seismic load (EQ) (3.10.2.1)

```
"response": {
  "data": {
    "pga": 0.066,
    "fpga": 1.6,
    "as": 0.106,
    "ss": 0.137,
    "fa": 1.6,
    "sds": 0.22,
    "s1": 0.037,
    "fv": 2.4,
    "sd1": 0.088,
    "sdc": "A",
    "ts": 0.4,
    "t0": 0.08,
```

(USGS Seismic Output - From Geotech)

Site Class	"D"	("Stiff Soil" - Geotech Report)
Peak Ground Acceleration	$PGA := 0.65$	(Figure 3.10.2.1-1)
Short-period spectral acceleration	$S_S := 0.137$	(USGS Seismic Design Map)
Long-period spectral acceleration	$S_1 := 0.037$	(USGS Seismic Design Map)
Site factor at zero-period on acceleration spectrum	$F_{pga} := 1.6$	(USGS Seismic Design Map)
Site factor for short-period range of acceleration spectrum	$F_a := 1.6$	(USGS Seismic Design Map)
Site factor for long-period range of acceleration spectrum	$F_v := 2.4$	(USGS Seismic Design Map)
	$A_S := F_{pga} \cdot PGA = 1.04$	(Eq. 3.10.4.2-2)
	$S_{DS} := F_a \cdot S_S = 0.22$	(Eq. 3.10.4.2-3)
	$S_{D1} := F_v \cdot S_1 = 0.09$	(Eq. 3.10.4.2-6)
Seismic Zone	"1"	(Table 3.10.6-1)
Horizontal design connection force factor	$HDCFF := 0.25$	(3.10.9.2)

Controlling seismic bearing loads

Max Dead Load Reaction $R_{DL1} := 74.75\ kip$

Max Seismic Load $R_{EQ1} := HDCFF \cdot R_{DL1} = 18.69\ kip$

Slab Design

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Precast Deck Panel Reinforcement – Steel Stringers

Maximum Beam Spacing	Transverse (Primary) Reinforcement (Top & Bottom)	Longitudinal Reinforcement (Top & Bottom)
5' - 0"	#4 @ 7.0 in	#4 @ 7.0 in
5' - 6"	#4 @ 7.0 in	#4 @ 7.0 in
6' - 0"	#4 @ 7.0 in	#4 @ 7.0 in
6' - 6"	#4 @ 6.0 in	#4 @ 7.0 in
7' - 0"	#4 @ 6.0 in	#4 @ 7.0 in
7' - 6"	#4 @ 6.0 in	#4 @ 7.0 in
8' - 0"	#5 @ 7.0 in	#4 @ 6.5 in
8' - 6"	#5 @ 7.0 in	#4 @ 6.5 in
9' - 0"	#5 @ 7.0 in	#4 @ 6.5 in
9' - 6"	#5 @ 6.0 in	#4 @ 6.0 in
10' - 0"	#5 @ 6.0 in	#4 @ 6.0 in

Applicable reinforcement based on beam spacing

Precast Deck Panel Reinforcement – NEBT's and 36" and 48" Precast Prestressed Concrete Box Beams

Maximum Beam Spacing	Transverse (Primary) Reinforcement (Top & Bottom)	Longitudinal Reinforcement (Top & Bottom)
5' - 0"	#4 @ 7.0 in	#4 @ 7.0 in
5' - 6"	#4 @ 7.0 in	#4 @ 7.0 in
6' - 0"	#4 @ 7.0 in	#4 @ 7.0 in
6' - 6"	#4 @ 7.0 in	#4 @ 7.0 in
7' - 0"	#4 @ 7.0 in	#4 @ 7.0 in
7' - 6"	#4 @ 6.0 in	#4 @ 7.0 in
8' - 0"	#4 @ 6.0 in	#4 @ 7.0 in
8' - 6"	#4 @ 6.0 in	#4 @ 7.0 in
9' - 0"	#5 @ 7.0 in	#4 @ 6.5 in
9' - 6"	#5 @ 7.0 in	#4 @ 6.5 in
10' - 0"	#5 @ 7.0 in	#4 @ 6.5 in

NOTES:

1. For all applicable design assumptions, see Dwg. No. 7.1.4, Part II of this Bridge Manual.
2. See Article 3.7.3, Part I of this Bridge Manual, for other relevant information.

massDOT LRFD BRIDGE MANUAL, PART III	PRECAST DECK PANEL REINFORCEMENT PRECAST CONCRETE DECK PANELS	DATE OF ISSUE JUNE 2013 DRAWING NUMBER **5.1.30**

	PROJECT: MassDOT Sharon S - 09-003 Maskwonicut Street over MBTA/Amtrak Railroad	DATE: 2/5/2020 BY: CHKD BY: PROJ NO.: 2150851 PAGE:

Additional Deck Panel Overhang Reinforcement

CP-PL2 Barrier

Maximum Beam Spacing	Steel Stringers		Prestressed Concrete Beams	
	Additional Overhang Reinforcement	Bar Extension (L_{ext})	Additional Overhang Reinforcement	Bar Extension (L_{ext})
5' - 0"	#5 @ 7.0 in	2' - 6"	#5 @ 7.0 in	3' - 6"
5' - 6"	#5 @ 7.0 in	2' - 6"	#5 @ 7.0 in	3' - 6"
6' - 0"	#5 @ 7.0 in	2' - 6"	#5 @ 7.0 in	3' - 6"
6' - 6"	#5 @ 6.0 in	2' - 3"	#5 @ 7.0 in	3' - 6"
7' - 0"	#5 @ 6.0 in	2' - 3"	#5 @ 7.0 in	3' - 6"
7' - 6"	#5 @ 6.0 in	2' - 3"	#5 @ 6.0 in	3' - 6"
8' - 0"	#5 @ 7.0 in	2' - 0"	#5 @ 6.0 in	3' - 6"
8' - 6"	#5 @ 7.0 in	2' - 0"	#5 @ 6.0 in	3' - 6"
9' - 0"	#5 @ 7.0 in	2' - 0"	#5 @ 7.0 in	3' - 6"
9' - 6"	#5 @ 6.0 in	2' - 0"	#5 @ 7.0 in	3' - 6"
10' - 0"	#5 @ 6.0 in	2' - 0"	#5 @ 7.0 in	3' - 6"

Applicable reinforcement based on beam spacing & overhang (2' 3 1/2")

NOTES:

1. For all applicable design assumptions, see Dwg. No. 7.1.10, Part II of this Bridge Manual.
2. See Article 3.5.2, Part I of this Bridge Manual, for other relevant information.

massDOT LRFD BRIDGE MANUAL, PART III	ADDL. OVERHANG REINF. CP–PL2 BARRIER PRECAST CONCRETE DECK PANELS	DATE OF ISSUE JUNE 2013 DRAWING NUMBER 5.1.33

Slab Post Tensioning

DESIGN OF POST TENSIONING

The purpose of this calculation is to design the post tensioning system for the precast deck panels in accordance with the provisions set forth in the MassDOT 2013 LRFD Bridge Manual and the 8th Edition of AASHTO LRFD Bridge Design Specifications.

References

1) MassDOT 2013 LRFD Bridge Manual
2) AASHTO LRFD Bridge Specifications, 8th Edition

POST TENSIONING

Input

Deck Width =	34.58 ft	= 415.0 in
Deck Thickness =	0.73 ft	= 8.75 in
Transverse Joint Area =	25.22 ft2	= 3631 in2

# Strands / Duct =	4	Ref 1, 3.9.2.4
# Strands Total =	40	
Strand Length =	56.83 ft	= 682.0 in
Diam. (strand) =	0.6 in	Ref 1, 3.9.2.4
A(strand) =	0.217 in2	
Ep =	28500 ksi	(Ref 2 - 5.4.4.2)
f'c =	4 ksi	
Eci =	3640 ksi	(Ref 2 - C5.4.2.4)

Initial Jacking Force (total) =	1050 k
Initial Jacking Force (per strand) =	26.25 k
Initial Strand Stress =	120.97 ksi
Force after Loss (total) =	929.59 k
Force after Loss (per strand) =	23.24 k
Strand Stress after Loss =	107.10 ksi
Joint Stress after Loss =	256 psi

Procedure (Ref 1 - 1-3.9.3)

Following procedure as outlined in the Bridge Manual. Provide minimum stress at transverse joint, Initial Jacking Force, and design the General Anchorage Zone. Design of the Local Zone shall be the responsibility of the contractor.

Minimum Prestress

Minimum Prestress after short term losses: 250 psi (Ref 1 - 3.9.3.3)

Initial Jacking Force

Per (Ref 1 - 1-3.9.3.3) achieve 250psi accounting for short-term losses due to anchorage set, friction, and elastic shortening

Trial Force = 1050 k

Anchorage Set (Ref 2 - 5.9.5.2.1)

Per (Ref 1 - 3-5.1.14) Assume anchorage set of : 0.25 in

$$\sigma = E * \frac{\Delta L}{L} = 28500 \text{ ksi} \ \frac{0.25 \text{ in}}{682.0 \text{ in}} = 10.45 \text{ ksi}$$

$$F = -\sigma * A = -10.45 \text{ ksi x } 0.217 \text{ in2} = -2.267 \text{ k}$$

Friction and Wobble (Ref 2 - 5.9.2.2b)

Wobble coefficient of : 0.0002

$$\Delta F_{pF\ =} \quad F_{pj} (\quad 1 - \quad e\ \hat{} \ (K \quad x \ ) \quad)$$

$$\Delta F_{pF\ =} \quad 26.25 \text{ k} (\quad 1 \quad e\ \hat{} \ 0.0002 \quad 56.83 \text{ ft} \quad)$$

$$\Delta F_{pF\ =} \quad -0.300 \text{ k}$$

Elastic Shortening (Ref 2 - 5.9.3.2.3b)

Assume: Neglect selfweight of member's contribution to fcgp since deck primarily spans perpindicular to post tensioning directio

$$\Delta f_{pES} = \frac{Ep}{Eci} f_{cgp} = \frac{28500 \text{ ksi}}{3640 \text{ ksi}} \ 0.261 = 2.043 \text{ ksi}$$

$$\Delta F_{pES} = -\Delta f_{pES} \text{ x } A(strand) = -2.043 \text{ ksi } 0.217 \text{ in2} = -0.443 \text{ k}$$

Joint Stress After Loss

$$\text{Joint Stress after Loss} = \frac{(\text{ Initial Force - Anchor Set - (Friction+Wobble) - Elastic Shortening }) \text{ x (\# Strands) x (1000)}}{\text{Transverse Joint Area}}$$

$$\text{Joint Stress after Loss} = \frac{26.25 \text{ k} \quad -2.267 \text{ k} \quad -0.300 \text{ k} \quad -0.443 \text{ k} \quad 40 \quad 1000}{3631 \text{ in2}}$$

Joint Stress after Loss = 256 psi >= 250 psi OK

POST TENSIONING (CONT'D)

INPUT

factored tendon force (Pu) =	126.00 k	=	1.2 x	26.25 k x	4			
large lateral dimension ($a = a_{eff}$) =	13.75 in							
small lateral dimension ($b = b_{eff}$) =	4.88 in							
member thickenss (t) =	8.75 in							
anchorage spacing (s) =	42.00 in							
number of anchorages in a row (n) =	8							
long extent of confine reinf (lc) =	15.81 in	=	MAX (	1.15 x	13.75 in	,	1.15 x	4.88 in)
effective brg area (Ab) =	67.03 in2							

GENERAL ANCHORAGE ZONE (Ref 2 - 5.10.9.1)

Allowable Concrete Stress =	0.7 x	Φ x	f'ci
Allowable Concrete Stress =	0.7 x	0.7 x	4 ksi
Allowable Concrete Stress =	1.96 ksi		

COMPRESSIVE STRESSES

Use Approximate Procedure from (Ref 2 - 5.10.9.6.2)

s	>=	2aeff	?
42.00 in	>=	27.5	OK

Therefore : k = 1

$$fca = \frac{0.6 \times Pu \times k}{Ab \left(1 + lc\left(\frac{1}{beff} - \frac{1}{t}\right)\right)}$$

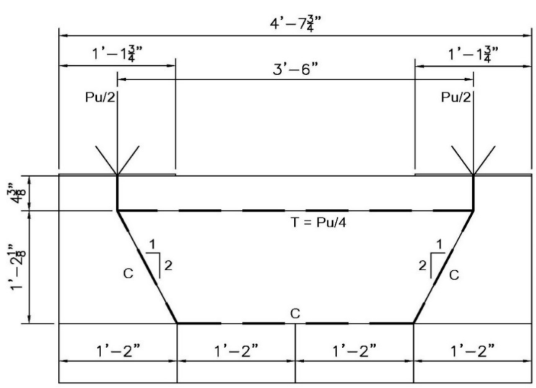
$$fca = \frac{0.6 \times 126.00\text{ k} \times 1}{67.03\text{ in2} \times \left(1 + 15.81\text{ in}\left(\frac{1}{4.88\text{ in}} - \frac{1}{8.75\text{ in}}\right)\right)}$$

fca = 0.19 ksi < 1.96 ksi OK

GENERAL ZONE REINFORCING

Use Strut-and-Tie Model for design

Assumed Strut-and-Tie Model:



Note: Each anchorage would contribute to 2 strut and tie models, one on either side of anchorage therefore each strut and tie sees P/2

T =	Pu /	4 =	126.00 k	/ 4 =	31.50 k	
Reinforcing Strength =	Φ	x fy =	1.00 x	60ksi =	60ksi	
As required =	Force /	Strength =	31.50 k /	60 ksi =	0.53 in2	
Using 2-	#5 bars,	As =	0.62 in2	>=	0.53 in2	OK

Beam Dead Loads

1. Project parameters

Total bridge length $L := 54.5\ ft$

Total bridge width $W := 34.75\ ft$

Number of lanes loaded $n := \text{floor}\left(\frac{W}{12\ ft}\right) = 2$

Multiple presence factor $m := 1.0$ (Table 3.6.1.1.2-1)

Number of girders $N_g := 6$

9. The unit weights of the unmodified railings/barriers are as follows:

CT–TL2 at sidewalk:	369 lb/ft (between pilasters)
CT–TL2 pilaster (16" wide) at sidewalk:	608 lb/each
CT–TL2 at safety curb:	444 lb/ft
CT–TL2 pilaster (16" wide) at safety curb:	682 lb/each
S3–TL4 at sidewalk:	90 lb/ft (assuming 6'–6" rail post spacing)
S3–TL4 at safety curb:	85 lb/ft (assuming 6'–6" rail post spacing)
CP–PL2 at sidewalk:	400 lb/ft
CP–PL2 at safety curb:	459 lb/ft
CF–PL2:	457 lb/ft
CF–PL2 (Modified):	531 lb/ft
CF–PL3:	644 lb/ft
CF–PL3 (Modified):	706 lb/ft
BR–2:	21 lb/ft (assuming 6'–6" rail post spacing)
CM–TL3:	30 lb/ft (assuming 6'–6" rail post spacing)
TYPE I PROTECTIVE SCREEN:	34 lb/ft
TYPE II PROTECTIVE SCREEN:	21 lb/ft
TYPE II ELECTRIFICATION BARRIER:	47 lb/ft

Structure heights

- Girder $h_g := 25\ in$
- Haunch $h_h := 3\ in$
- Deck $t_d := 8.5\ in$
- Bituminous wear surface $t_{ws} := 3\ in$
- Curb $h_c := 8\ in$
- Parapet $h_p := 24\ in + 8\ in = 32\ in$
- Electrification Barrier $h_e := 82\ in$

Concrete Unit Weight $\gamma_{CONC} := 150\ \frac{lb}{ft^3}$

2. Dead Loads (DC)

Left Barrier: CP-PL2 at Sidewalk Compared to published value: 400 lb/ft

Left Barrier Area (from AutoCad) $A_{Barrier.LT} := 393\ in^2 = 2.73\ ft^2$

Left Barrier SelfWeight: $W_{Barrier.LT} := A_{Barrier.LT} \cdot \gamma_{CONC} = 409.38\ \frac{lb}{ft}$

Type II Electrification Barrier: $W_{ELEC.Barrier} := 47\ \frac{lb}{ft}$

Combined Weight: $W_{COMB.LT} := W_{ELEC.Barrier} + W_{Barrier.LT} = 456.38\ \frac{lb}{ft}$

used conservatively

Right Barrier: CP-PL2 at Curb Compared to published value: 459 lb/ft

Right Barrier Area (from AutoCad) $A_{Barrier.RT} := 454\ in^2 = 3.15\ ft^2$

Right Barrier SelfWeight: $W_{Barrier.RT} := A_{Barrier.RT} \cdot \gamma_{CONC} = 472.92\ \frac{lb}{ft}$

Combined Weight: $W_{COMB.RT} := W_{ELEC.Barrier} + W_{Barrier.RT} = 519.92\ \frac{lb}{ft}$

used conservatively

Sidewalk

Curb Height: $h_{curb} := 8\ in = 0.67\ ft$

Depth of Wearing Surface: $h_{WS} := 3\ in = 0.25\ ft$

Sidewalk Width: $w_{SW} := 7.5\ ft$

Sidewalk Slope: $S_{SW} := \frac{3}{8} \frac{in}{ft}$

Minimum Thickness: $t_{curb.min} := h_{curb} + h_{WS} = 0.92\ ft$

Maximum Thickness: $t_{curb.max} := t_{curb.min} + w_{SW} \cdot S_{SW} = 1.15\ ft$

Average Thickness: $t_{curb.avg} := \frac{\left(t_{curb.min} + t_{curb.max}\right)}{2} = 1.03\ ft$

Sidewalk Weight: $W_{SW} := t_{curb.avg} \cdot w_{SW} \cdot \gamma_{CONC} = 1163.09\ \frac{lb}{ft}$

Haunches

Haunch Height: $h_h := 4\ in$

Beam Flange Width: $B_f := 13\ in$

Haunch Weight: $W_h := h_h \cdot B_f \cdot \gamma_{CONC} = 54.17\ \frac{lb}{ft}$

3. Load Distribution

3.5.3.3 Non-Composite Dead Load Distribution (DC1). The non-composite dead loads, in addition to the beam self-weight, shall include the diaphragms or cross frames, utilities and other attachments, the deck and the deck haunch, and the additional concrete of the soffit at the exterior beams, which extends out over the entire overhang. For all beams, the deck slab dead load shall be distributed to each beam directly below based on tributary area. Utility loads can generally be assumed to be non-composite dead loads that are equally distributed to the beams that support them on either side of the utility bay.

3.5.3.4 Superimposed Dead Load Distribution (DC2 & DW)

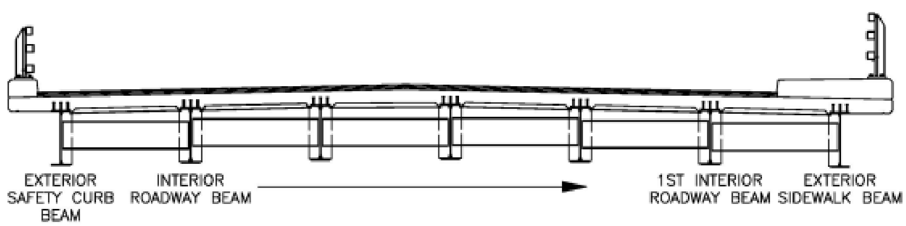
1. For the first interior roadway beam, the wearing surface superimposed dead load shall be distributed to it by dividing this load by the total number of the beams (interior and exterior) in the cross section. The sidewalk slab and barrier/railing superimposed dead loads shall be distributed to the beam using the pile cap analogy (refer to Figure 3.5.3-2 below).
2. For interior beams (other than the interior sidewalk beam), the wearing surface, sidewalks, safety curbs, and barriers/railings superimposed dead loads shall be distributed equally to all

beams, i.e. sum of these loads divided by the total number of beams (interior and exterior) in the cross section (refer to Figure 3.5.3-2 below).

3. For the exterior beam supporting a safety curb or barrier, the wearing surface superimposed dead load shall be distributed dividing this load by the total number of the beams in the cross section (interior and exterior) and the safety curb/barrier/railing shall be distributed to the beam supporting the safety curb using the pile cap analogy (refer to Figure 3.5.3-2 below).

4. For the exterior sidewalk beam, the wearing surface superimposed dead load shall be distributed to it by dividing this load by the total number of the beams (interior and exterior) in the cross section. The sidewalk slab and barrier/railing superimposed dead loads shall be distributed to the beam using the pile cap analogy. If the sidewalk is supported by more than one beam, the superimposed dead loads (wearing surface, sidewalk slab and railing/barrier) shall be distributed to each of these beams as outlined above for the exterior sidewalk beam (refer to Figure 3.5.3-2 below).

3.5.3.5 Pedestrian Load (PL) Distribution. For interior beams and exterior safety curb beams, the distribution of the Pedestrian Live Load shall be similar to that of the superimposed dead loads, i.e. total pedestrian live load divided by the total number of beams in the cross section (interior and exterior). For the exterior sidewalk beam (and interior sidewalk beams) and the first interior roadway beam, the Pedestrian Live Load shall be distributed using the pile cap analogy. The Dynamic Allowance Factor (IM) shall not be applied to Pedestrian Live Loads. When designing continuous beams, the Pedestrian Live Load shall be positioned along the span in such manner, as to produce the maximum load effect in the beam (refer to Figure 3.5.3-2 below).



SAFETY CURB	INTERIOR		1ST INTERIOR	SIDEWALK
TRIBUTARY	TRIBUTARY	DECK:	TRIBUTARY	TRIBUTARY
EQUAL	EQUAL	WEARING SURFACE:	EQUAL	EQUAL
NA	EQUAL	SIDEWALK:	PILE CAP	PILE CAP
NA	EQUAL	SIDEWALK BARRIER:	PILE CAP	PILE CAP
PILE CAP	EQUAL	SAFETY CURB:	NA	NA
EQUAL	EQUAL	PEDESTRIAN LL:	PILE CAP	PILE CAP

Figure 3.5.3-2

3.1 Dead Load Distribution

DC 2 -
Left Exterior Beam = Exterior Sidewalk Beam
Sidewalk Distributed by Pile Cap Analogy
Left Barrier Distributed by Pile Cap Analogy
Left 1st Interior Beam = 1st Interior Roadway Beam
Sidewalk Distributed by Pile Cap Analogy
Left Barrier Distributed by Pile Cap Analogy
Left Interior Beam = Interior Roadway Beam
Loads divided by number of beams

$$R = \frac{N_L}{N_b} + \frac{X_{ext}\sum^{N_L} e}{\sum^{N_b} x^2} \quad \text{(C4.6.2.2.2d-1)}$$

where:

R = reaction on exterior beam in terms of lanes
N_L = number of loaded lanes under consideration
e = eccentricity of a design truck or a design lane load from the center of gravity of the pattern of girders (ft)
x = horizontal distance from the center of gravity of the pattern of girders to each girder (ft)
X_{ext} = horizontal distance from the center of gravity of the pattern of girders to the exterior girder (ft)
N_b = number of beams or girders

Number of Loaded Lanes under consideration (Barrier): $N_L := 1$

Number of Beams: $N_b := 6$

Horizontal distance from the c.g. of pattern of girders to each girder

exterior girder to c.g. $x_1 := 15\ ft$

1st interior girder to c.g. $x_2 := 9\ ft$

interior girder to c.g. $x_3 := 3\ ft$

Left Barrier on Exterior

Horizontal distance from the c.g. of pattern of girders to girder in question $X_{EXT.1} := 15\ ft$

Sum of eccentricities of the c.g.s. of loaded lane (barrier) to c.g. of the pattern of girders $e_1 := 16.54\ ft$

Reaction of Left Barrier on Exterior Beam $R_1 := \frac{N_L}{N_b} + \frac{X_{EXT.1} \cdot e_1}{\left(x_1{}^2 + x_2{}^2 + x_3{}^2\right)} = 0.95$

Weight of Left Barrier on Exterior Beam $W_{LT.EXT} := W_{COMB.LT} \cdot R_1 = 435.51\ \frac{lb}{ft}$

Left Barrier on 1st Interior

Horizontal distance from the c.g. of pattern of girders to girder in question $X_{EXT.2} := 9\ ft$

Reaction of Left Barrier on Exterior Beam $R_2 := \frac{N_L}{N_b} + \frac{X_{EXT.2} \cdot e_1}{\left(x_1{}^2 + x_2{}^2 + x_3{}^2\right)} = 0.64$

$W_{LT.1INT} := W_{COMB.LT} \cdot R_2 = 291.73\ \frac{lb}{ft}$

Left Barrier on Interior $W_{LT.INT} := \frac{W_{COMB.LT}}{N_b} = 76.06\ \frac{lb}{ft}$

Sidewalk on Exterior

Horizontal distance from the c.g. of pattern of girders to girder in question $X_{EXT.1} := 15\ ft$

Sum of eccentricities of the c.g.s. of loaded lane (sidewalk) to c.g. of the pattern of girders $e_2 := 13.79\ ft$

Reaction of Sidewalk on Exterior Beam $R_3 := \frac{N_L}{N_b} + \frac{X_{EXT.1} \cdot e_2}{\left(x_1^{\ 2} + x_2^{\ 2} + x_3^{\ 2}\right)} = 0.82$

Weight of Sidewalk on Exterior Beam $W_{SW.EXT} := W_{SW} \cdot R_3 = 957.61\ \frac{lb}{ft}$

Sidewalk on 1st Interior

Horizontal distance from the c.g. of pattern of girders to girder in question $X_{EXT.2} := 9\ ft$

Reaction of Left Barrier on Exterior Beam $R_4 := \frac{N_L}{N_b} + \frac{X_{EXT.2} \cdot e_2}{\left(x_1^{\ 2} + x_2^{\ 2} + x_3^{\ 2}\right)} = 0.56$

$W_{SW.1INT} := W_{SW} \cdot R_2 = 743.49\ \frac{lb}{ft}$

Sidewalk on Interior $W_{SW.INT} := \frac{W_{SW}}{N_b} = 193.85\ \frac{lb}{ft}$

DC 2 -
Right Exterior Beam = Exterior Beam
Sidewalk Distributed by Pile Cap Analogy
Right Barrier Distributed by Pile Cap Analogy
Right 1st Interior Beam = Interior Beam
Loads divided by number of beams
Right Interior Beam = Interior Beam
Loads divided by number of beams

Right Barrier on Exterior

Sum of eccentricities of the c.g.s. of loaded lane (barrier) to c.g. of the pattern of girders $e_3 := 16.625\ ft$

Reaction of Right Barrier on Exterior Beam $R_5 := \frac{N_L}{N_b} + \frac{X_{EXT.1} \cdot e_3}{\left(x_1^{\ 2} + x_2^{\ 2} + x_3^{\ 2}\right)} = 0.96$

Weight of Right Barrier on Exterior Beam $W_{RT.EXT} := W_{COMB.RT} \cdot R_5 = 498.25 \ \frac{lb}{ft}$

Right Barrier on First Interior $W_{RT.1INT} := \frac{W_{COMB.RT}}{N_b} = 86.65 \ \frac{lb}{ft}$

Right Barrier on Interior $W_{RT.INT} := \frac{W_{COMB.RT}}{N_b} = 86.65 \ \frac{lb}{ft}$

3.2 Live Load Distribution

PL -

Distributed by Pile Cap analogy to Exterior and 1st Interior beam.
Interior beam receive equal distribution of load.

Pedestrian LL, pressure $LL_{PED.P} := 75 \ \frac{lb}{ft^2}$

Pedestrian LL, line load $LL_{PED.L} := LL_{PED.P} \cdot w_{SW} = 562.5 \ \frac{lb}{ft}$

Pedestrian LL on Exterior Beam

Sum of eccentricities of the c.g.s. of loaded lane (sidewalk) to c.g. of the pattern of girders

$e_2 := 13.25 \ ft$

$$R_6 := \frac{N_L}{N_b} + \frac{X_{EXT.1} \cdot e_2}{\left(x_1{}^2 + x_2{}^2 + x_3{}^2\right)} = 0.8$$

$$W_{PED.EXT} := R_6 \cdot LL_{PED.L} = 448.66 \ \frac{lb}{ft}$$

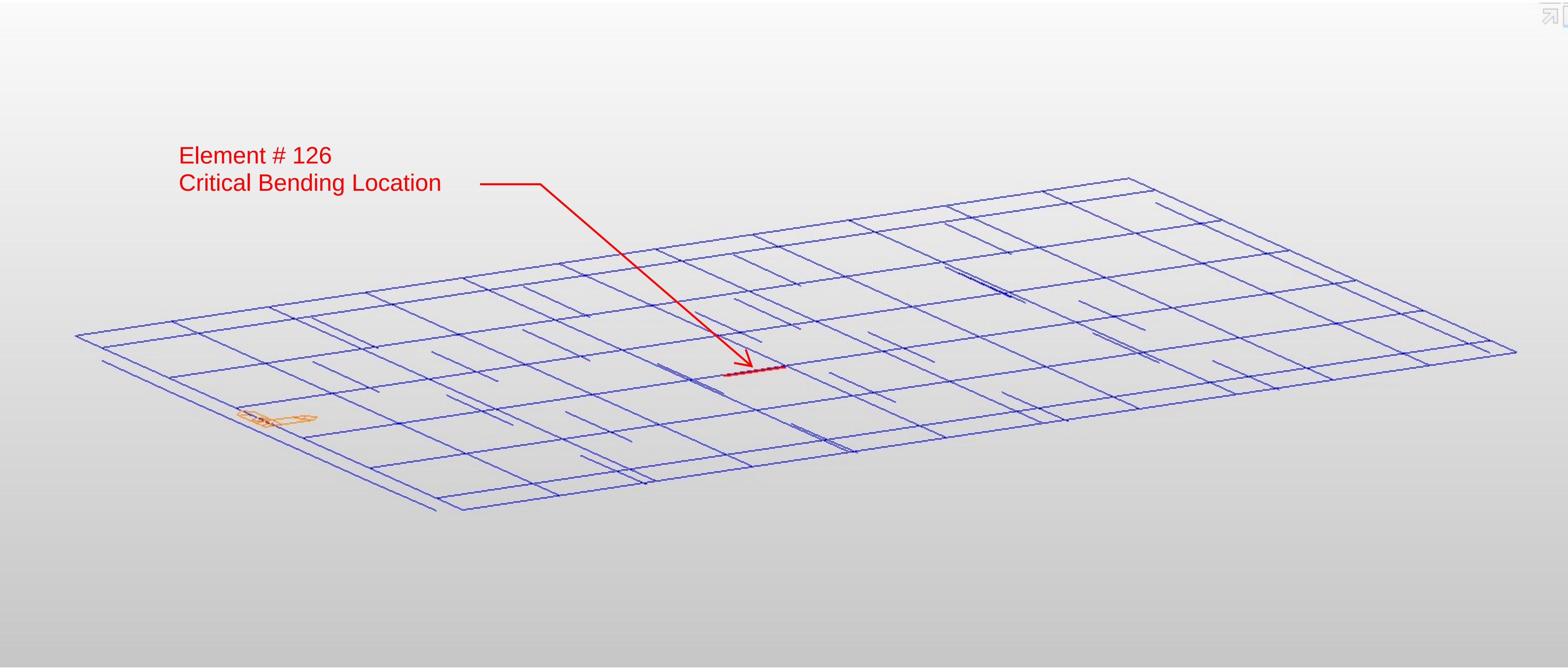
Pedestrian LL on 1st Interior

$$R_7 := \frac{N_L}{N_b} + \frac{X_{EXT.2} \cdot e_2}{\left(x_1{}^2 + x_2{}^2 + x_3{}^2\right)} = 0.55$$

$$W_{PED.1INT} := R_7 \cdot LL_{PED.L} = 306.7 \ \frac{lb}{ft}$$

Pedestrian LL on Interior $W_{PED.INT} := \frac{LL_{PED.L}}{N_b} = 93.75 \ \frac{lb}{ft}$

Beam Design

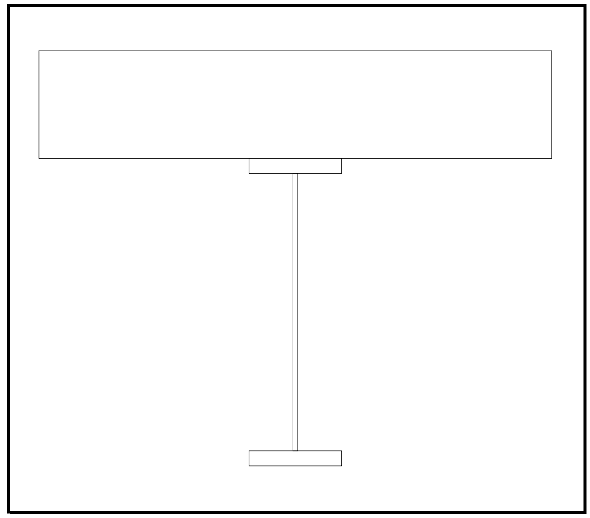

Element # 126
Critical Bending Location

Code	ASHTO-LRFD 20
Element	126
Position	I
Moment Type	Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties



B_s = 72.000 in

t_s = 8.750 in

t_h = 1.220 in

f_c' = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi

2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in

t_{fc} = 1.220 in t_{ft} = 1.220 in

D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)

E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(3n)}$ (in^2)	126.790	$I_{y(3n)}$ (in^4)	14135.527	$I_{z(3n)}$ (in^4)	34647.035
$d_{Top(3n)}$ (in)	1.963	$d_{Bot(3n)}$ (in)	23.037		
$S_{Top(3n)}$ (in^3)	7199.259	$S_{Bot(3n)}$(in^3)	613.613		
$S_{L(3n)}$ (in^3)	5330.477	$S_{R(3n)}$ (in^3)	5330.477		

II. Strength Limit State - Flexural Resistance

1. Flexure

■ **Positive moment**

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MAX

Component		M_u (kips·in)				V_u	T
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum	(kips)	(kips·in)
Forces	(+)	4706.110	5280.467	9541.020	19527.598	11.377	19.909

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-11.394	-0.733	-1.325	-13.453
	Bot	11.394	8.606	15.549	35.549

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-3.748	-1.838	279.299	273.713

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.054	0.000	0.052	-0.002
	Right	0.054	0.000	-0.052	0.002

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Forces	(+)	4865.053	5462.889	10072.270	20400.212

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-11.779	-0.759	-1.399	-13.937
	Bot	11.779	8.903	16.415	37.097

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-1.200	-4.568	281.900	276.132

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.017	-0.001	0.053	0.035
	Right	0.017	0.001	-0.053	-0.035

2) Cross-section Proportions

① Web Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.1)

$\dfrac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

② Flange Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.2)

$\dfrac{b_f}{2t_f}$ = 5.328 ≤ 12 ...... **OK**

b_f = 13.000 ≥ D/6 = 3.760 ...... **OK**

t_f = 1.220 ≥ $1.1t_w$ = 0.776 ...... **OK**

$I_{yc} = \dfrac{t_{fc} \cdot b_{fc}^3}{12}$ = 223.342 in^4

$I_{yt} = \dfrac{t_{ft} \cdot b_{ft}^3}{12}$ = 223.342 in^4

$0.1 \leq \dfrac{I_{yc}}{I_{yt}}$ = 1.000 ≤ 10.0 ...... **OK**

3) Flexural Strength Limit State in positive flexure

▪ Section Classification (AASHTO LRFD Bridge, 2016, 6.10.6.2)

min (F_{yc} , F_{yt}) = 50.000 ksi ≤ 70.0 ksi ...... **OK**

$\dfrac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

$\dfrac{2 \cdot D_{cp}}{t_w}$ = 0.000 ≤ $3.76 \sqrt{\dfrac{E_s}{F_{yc}}}$ = 90.553 ...... **OK**

in which :

D_{cp} = 0.000 in

∴ Compact section.

▪ Hybrid Factor, Rh (AASHTO LRFD Bridge, 2016, 6.10.1.10.1)

R_h = 1.000 (homogeneous section)

▪ Plastic Moment(Mp) (AASHTO LRFD Bridge, 2016, D6.1)

① Plastic Forces

- Plastic Forces

$P_{rt} = F_{yr} A_{rt}$ = 0.000 kips

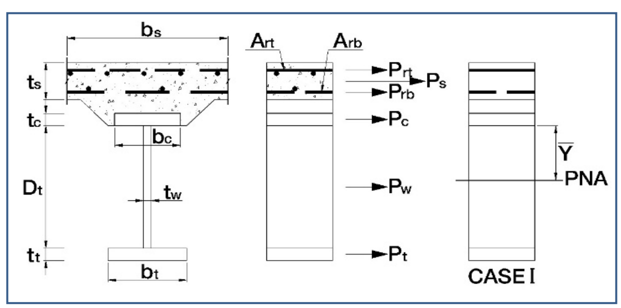
$P_{rb} = F_{yr} A_{rb}$ = 0.000 kips

$P_t = b_{ft} \cdot t_{ft} \cdot F_{yt}$ = 792.978 kips

$P_w = D \cdot t_w \cdot F_{yw}$ = 795.240 kips

$P_c = b_{fc} \cdot t_{fc} \cdot F_{yc}$ = 792.978 kips

$P_s = 0.85\, f_{ck} \cdot B_s \cdot t_s$ = 2677.501 kips



- Distance from the plastic neutral axis

d_{rt} = 7.782 in (distance from the PNA to the centerline of the top layer of reinforcement)

d_{rb} = 7.782 in (distance from the PNA to the centerline of the bottom layer of reinforcement)

d_t = 25.358 in (distance from the plastic neutral axis to midthickness of the tension flange)

d_w = 13.468 in (distance from the plastic neutral axis to middepth of the web)

d_c = 1.578 in (distance from the plastic neutral axis to midthickness of the compression flange)

d_s = 3.407 in (distance from the plastic neutral axis to midthickness of the concrete deck)

② Plastic moment

- Check the case of the plastic neutral axis

C_{rb} = 0.000 in

$P_t + P_w + P_c$ = 2381.196 kips ≥ $\left(\frac{C_{rb}}{t_s}\right) \cdot P_s + P_{rb} + P_{rt}$ = 0.000 kips ...... **OK**

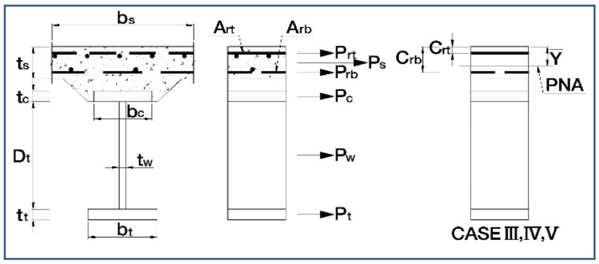
∴ PNA Below Prb in Concrete Deck

- Distance of the plastic neutral axis

$$Y = t_s \cdot \left(\frac{P_c+P_w+P_t - P_{rt} - P_{rb}}{P_s} \right) = 7.782 \text{ in}$$

- Plastic Moment

$$M_p = \frac{Y^2 \cdot P_s}{2t_s} + [\ P_{rt} \cdot d_{rt} + P_{rb} \cdot d_{rb} + P_c \cdot d_c + P_w \cdot d_w + P_t \cdot d_t\ ] = 41335.579 \text{ kips·in}$$



▪ Yield Moment(My) (AASHTO LRFD Bridge, 2016, D6.2.2)

① Yield Moment of Top Flange

$$F_y = \frac{M_{D1}}{S_{Top}} + \frac{M_{D2}}{S_{Top(3n)}} + \frac{M_{AD}}{S_{Top(n)}} = \frac{4.706E+03}{4.130E+02} + \frac{5.280E+03}{7.199E+03} + \frac{M_{AD}}{7.199E+03} = 50.000 \text{ ksi}$$

M_{AD} = 2.727E+05 kips·in

$M_{yTop} = M_{D1} + M_{D2} + M_{AD}$ = 2.826E+05 kips·in

② Yield Moment of Bottom Flange

$$F_y = \frac{M_{D1}}{S_{Bot}} + \frac{M_{D2}}{S_{Bot(3n)}} + \frac{M_{AD}}{S_{Bot(n)}} = \frac{4.706E+03}{4.130E+02} + \frac{5.280E+03}{6.136E+02} + \frac{M_{AD}}{6.136E+02} = 50.000 \text{ ksi}$$

M_{AD} = 1.841E+04 kips·in

$M_{yBot} = M_{D1} + M_{D2} + M_{AD}$ = 2.839E+04 kips·in

∴ M_y = min (M_{yTop}, M_{yBot}) = 2.839E+04 kips·in

in which :

S : noncomposite section modulus (in^3)

S_{3n} : long-term composite section modulus (in^3)

S_n : short-term composite section modulus (in^3)

M_{D1} : moment of noncomposite section (kips·in)

M_{D2} : moment of long-term composite section (kips·in)

M_{AD} : additional yield moment of short-term composite section (kips·in)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = -0.002 \text{ ksi}$$

f_l = -0.002 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

▪ Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1.2)

ⅰ. Nominal Flexural Resistance in a continuous span

$M_{n1} = 1.3\ R_h \cdot M_y = 36913.450$ kips·in

ⅱ. Nominal Flexural Resistance by D_p

$D_p > 0.1D_t$ therefore,

$$M_{n2} = M_p \left(1.07 - 0.7 \frac{D_p}{D_t} \right) = 37557.594 \text{ kips·in}$$

$\therefore M_n = \min(M_{n1}, M_{n2}) = 36913.450$ kips·in

▪ Check Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1)

$$M_{uy} + \frac{1}{3} f_l \cdot S_{xt} = 19528.053 \leq \Phi_f \cdot M_n = 36913.450 \text{ kips·in}$$ ...... **OK**

in which :

M_{uy} = 19527.598 kips·in

S_{xt} = 567.899 in^3 ($= M_{yt}/F_{yt}$)

Φ_f = 1.000

▪ Ductility Requirement (AASHTO LRFD Bridge, 2016, 6.10.7.3)

$D_p = 7.782 \leq 0.42D_t = 14.175$ in ...... **OK**

in which :

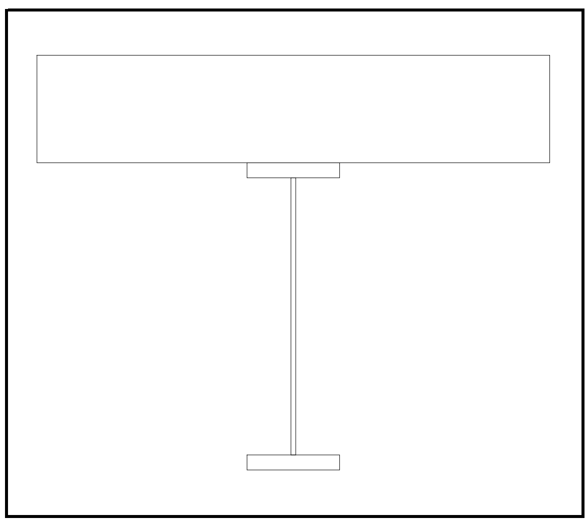
D_p = 7.782 in (distance from the top of the concrete deck to the neutral axis of the composite section at the plastic moment)

D_t = 33.750 in (total depth of the composite section)

III. Design Condition (Negative Flexure)

1. Section Properties

1) Slab Properties



B_s = 72.000 in

t_s = 8.750 in

t_h = 1.220 in

f_{ck} = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi

2) Girder Properties

[Section]

b_{fc} = 13.000 in　　b_{ft} = 13.000 in

t_{fc} = 1.220 in　　t_{ft} = 1.220 in

D = 22.560 in　　t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)
E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

4) Short-term Composite Section(Long. Reinforcement)

$A_{(R)}$ (in^2)	47.624	$I_{y(R)}$ (in^4)	5162.703	$I_{z(R)}$ (in^4)	447.342
$d_{Top(R)}$ (in)	12.500	$d_{Bot(R)}$ (in)	12.500		
$S_{Top(R)}$ (in^3)	413.016	$S_{Bot(R)}$ (in^3)	413.016		
$S_{L(R)}$ (in^3)	68.824	$S_{R(R)}$ (in^3)	68.824		

5) Long-term Composite Section(Long. Reinforcement/3)

$A_{\mathbf{(R3)}}$ (in^2)	47.624	$I_{y(R3)}$ (in^4)	5162.703	$I_{z(R3)}$ (in^4)	447.342
$d_{Top(R3)}$ (in)	12.500	$d_{Bot(R3)}$ (in)	12.500		
$S_{Top(R3)}$ (in^3)	413.016	$S_{Bot(R3)}$(in^3)	413.016		
$S_{L(R3)}$ (in^3)	68.824	$S_{R(R3)}$(in^3)	68.824		

IV. Strength Limit State - Flexural Resistance

1. Flexure

■ **Negative moment**

1) Design Forces and Stresses

Negative load combination does not exist. Skip this check.

V. Strength Limit State - Shear Resistance

1. Shear

■ **Max**

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MIN

Component	Vu (kips)			
	Steel	Long-term	Short-term	Sum
Forces	-5.892	-6.742	-34.300	-46.934

2) Shear Resistance (AASHTO LRFD Bridge, 2016, 6.10.9)

▪ Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

▪ Web Classification

Longitudinal Stiffener : Not Exist

Transverse Stiffener : Not Exist

Transverse Spacing = 0.0 in < 3 D = 67.7 in

So, this web is considered unstiffened web

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \leq 1.12 \sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

▪ Nominal Resistance of Unstiffened interior Webs or End panel (AASHTO LRFD Bridge, 2016, 6.10.9.3.3)

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = -46.934 \leq \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VI. Service Limit State

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MAX

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	3764.888	3981.114	7087.615	14833.618
Stresses	Top	-9.116	-0.553	-0.984	-10.653
	Bot	9.116	6.488	11.551	27.154

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = -0.005 \text{ ksi}$$

f_l = -0.005 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

- Top Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

  f_f = -10.653 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

- Bottom Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

  $f_f + f_l / 2$ = 27.157 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

  in which :

  f_f = flange stress due to the Service II loads calculated without consideration of flange lateral bending

  F_{yf} = specified minimum yield strength of a flange (ksi)

- Postive Flexure and $\frac{D}{t_w}$ < proportion limit, skip Nominal Bend-buckling Resistance for webs check.

■ **Positive/Negative moment**

1) Design Forces and Stresses

There is no service load combination. Skip this check.

VII. Constructibility

1. Flexure

■ **Positive moment**

1) Design Forces and Stresses

Construction Stage : Stage2-1

Step : 2

Component		M_u (kips·in) / $f_{c,t}$ (ksi)	T
		Steel Section Only	(kips·in)
Force	(+)	5647.333	7.157
Stress	Top	-13.673	-
(f_{bu})	Bot	13.673	

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in) / $f_{c,t}$ (ksi)
		Steel Section Only
Force	(+)	5838.063
Stress	Top	-14.135
(f_{bu})	Bot	14.135

2) Check slenderness of web (AASHTO LRFD Bridge, 2016, 6.10.6.2.3-1)

$\frac{2 \cdot D_c}{t_w}$ = 32.000 ≤ $5.7\sqrt{\frac{E_s}{F_{yc}}}$ = 137.274 .... **Compact or noncompact Web**

in which :

D_c = 11.280 in

3) Discretely Braced Flanges in Compression (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

- Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

  In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

  R_b = 1.000

- Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Moment Gradient Modifer, Cb (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

Calculation of Stress (C6.4.10)

f_0 = 13.673 ksi

f_2 = 14.135 ksi

f_{mid} = 13.953 ksi

$f_1 = \max(2f_{mid} - f_2 \,,\, f_0) = 13.771$ ksi

$$C_b = \min\left(1.75 - 1.05\left(\frac{f_1}{f_2}\right) + 0.3\left(\frac{f_1}{f_2}\right)^2 ,\ 2\right)$$

$$= \min\left(1.75 - 1.05\left(\frac{13.771}{14.135}\right) + 0.3\left(\frac{13.771}{14.135}\right)^2 ,\ 2\right) = 1.012$$

▪ Second-order elastic compression-flange Lateral bending stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

i. Because of discretely braced flange

$$f_l = \frac{M_{uz}}{S_l} = \frac{-1.440}{68.824} = -0.021 \text{ ksi}$$

ii. check L_b

L_b = 120.000 in

$$L_b' = \min\left(1.2L_p\sqrt{\frac{C_b \cdot R_b}{f_{bu}/F_{yc}}} ,\ 1.2L_p\sqrt{\frac{C_b \cdot R_b}{M_u/M_{yc}}}\right) = \min(189.912 ,\ 683.091) = 189.912 \text{ in}$$

$L_b \le L_b'$

$f_l = f_{l1} = -0.021$ ksi

$f_l = -0.021 \le 0.6F_{yf} = 30.000$ ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l = -14.156 \le \Phi_f \cdot R_h \cdot F_{yc} = 50.000$ kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

② Check flexural resistance

$f_{bu} + f_l/3 = -14.142 \le \Phi_f \cdot F_{nc} = 48.196$ ksi ...... **OK**

in which :

Φ_f = 1.000

F_{nc} = 48.196 ksi

▪ Local Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.10.8.2.2)

$\lambda_f = b_{fc} / 2t_{fc} = 5.328$

$\lambda_{pf} = 0.38\sqrt{(E/F_{yc})} = 9.152$

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

R_b = 1.000

$\lambda_f \leq \lambda_{pf}$ Therefore,

$F_{nc(FLB)} = R_b \cdot R_h \cdot F_{yc} =$ 50.000 ksi

in which :

R_b = 1.000

R_h = 1.000

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Lateral-Torsional Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.1(

$$L_r = \pi\, r_t \sqrt{\frac{E}{F_{yr}}} = 314.118 \text{ in}$$

$L_p < L_b \leq L_r$ Therefore, noncompact unbraced length

$$F_{nc1(LTB)} = C_b\left[1 - \left(1 - \frac{F_{yr}}{R_h \cdot F_{yc}}\right)\left(\frac{L_b - L_p}{L_r - L_p}\right)\right] R_b \cdot R_h \cdot F_{yc} = 48.196 \text{ ksi}$$

$$F_{nc(LTB)} = \min(F_{nc1(LTB)}, R_b \cdot R_h \cdot F_{yc}) = 48.196 \text{ ksi}$$

in which :

R_b = 1.000

R_h = 1.000

$F_{nc} = \min(F_{nc(FLB)}, F_{nc(LTB)}) =$ 48.196 ksi

③ Check web bend buckling

For sections with compact or noncompact webs, shall not be checked.

4) Discretely Braced Flanges in Tension (AASHTO LRFD Bridge, 2016, 6.10.3.2.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{uz}}{S_l} = \frac{-1.440}{68.824} = -0.021 \text{ ksi}$$

f_l = -0.021 $\leq$ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l$ = 14.156 $\leq$ $\Phi_f \cdot R_h \cdot F_{yt}$ = 50.000 kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

2. Shear

■ **Max**

1) Design Forces

Construction Stage : Stage2-1

Step : 2

Component	V_u (kips)
	Steel Section Only
Force	-7.071

2) Shear requirement for webs (AASHTO LRFD Bridge, 2016, 6.10.3.3)

- Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \le 1.12\sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

- Nominal Resistance of Unstiffened interior Webs or End panel

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = -7.071 \le \varphi_v \cdot V_{cr} = \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VIII. Fatigue Limit State

■ **Fatigue moment**

1) Design Forces and Stresses

Loadcombination Name : scLCB102

Component		LCB	M_u (kips·in) / $f_{c,t}$ (ksi)			
			Steel	Long-term	Short-term	Sum
Forces	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	3764.888	3981.114	4089.010	4089.010
	Bot(Tens.)	-	3764.888	3981.114	4089.010	4089.010
	Bot(Comp.)	-	0.000	0.000	0.000	0.000
Stresses	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	-8.226	-0.209	-0.215	-0.215
	Bot(Tens.)	-	0.000	0.000	6.311	6.311
	Bot(Comp.)	-	0.000	0.000	0.000	0.000

Loadcombination Name : scLCB98

Component	V_u

Component	(kips)
Shear Force	0.000

2) Load-Induced Fatigue (AASHTO LRFD Bridge, 2016, 6.6.1.2)

■ **Top Flange**

The stress from unfactored DL = -8.435 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

Skip this check. [(The compressive stress from unfactored DL) > (The tensile stress from fatigue LCB)]

■ **Bottom Flange**

The stress from unfactored DL = 14.370 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

Check Load-Induced Fatigue. [The stress from unfactored DL is the tensile stress.]

No	Category	$(ADTT)_{SL}$	Number of stress (n)
1	A	129.000	1.000

$(ADTT)_{SL}$(= 129.00) ≤ $(ADTT)_{SL}$ Equivalent to Infinite Life Table. 6.6.1.2.3-2 (= 530.00)
=> Check for fatigue II

For Fatigue II,
N = (365) · (75) · n · $(ADTT)_{SL}$ = 3.531E+06
∴ $(\Delta F)_n$ = $(A / N)^{1/3}$ = 19.201 ksi
in which :
A = 2.500E+10 ksi^3 (Table 6.6.1.2.5-1)

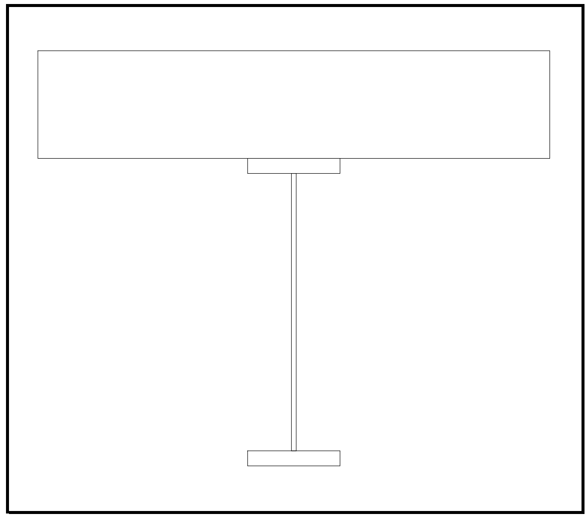
$\gamma(\Delta f)$ = 6.311 ksi < $(\Delta F)_n$ = 19.201 ksi (warping stress = 0.000 ksi) **...... OK**

Code	ASHTO-LRFD 20
Element	126
Position	J
Moment Type	Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties



B_s = 72.000 in

t_s = 8.750 in

t_h = 1.220 in

f_c' = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi

2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in

t_{fc} = 1.220 in t_{ft} = 1.220 in

D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)

E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(3n)}$ (in^2)	126.790	$I_{y(3n)}$ (in^4)	14135.527	$I_{z(3n)}$ (in^4)	34647.035
$d_{Top(3n)}$ (in)	1.963	$d_{Bot(3n)}$ (in)	23.037		
$S_{Top(3n)}$ (in^3)	7199.259	$S_{Bot(3n)}$(in^3)	613.613		
$S_{L(3n)}$ (in^3)	5330.477	$S_{R(3n)}$ (in^3)	5330.477		

II. Strength Limit State - Flexural Resistance

1. Flexure

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MAX

Component		M_u (kips·in)				V_u	T
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum	(kips)	(kips·in)
Forces	(+)	4865.053	5462.889	10072.270	20400.212	19.286	19.909

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-11.779	-0.759	-1.399	-13.937
	Bot	11.779	8.903	16.415	37.097

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-1.200	-4.568	281.900	276.132

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.017	-0.001	0.053	0.035
	Right	0.017	0.001	-0.053	-0.035

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Forces	(+)	4865.053	5462.889	10072.270	20400.212

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-11.779	-0.759	-1.399	-13.937
	Bot	11.779	8.903	16.415	37.097

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-1.200	-4.568	281.900	276.132

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.017	-0.001	0.053	0.035
	Right	0.017	0.001	-0.053	-0.035

2) Cross-section Proportions

① Web Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.1)

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

② Flange Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.2)

$\frac{b_f}{2t_f}$ = 5.328 ≤ 12 ...... **OK**

b_f = 13.000 ≥ D/6 = 3.760 ...... **OK**

t_f = 1.220 ≥ $1.1t_w$ = 0.776 ...... **OK**

$I_{yc} = \frac{t_{fc} \cdot b_{fc}^3}{12}$ = 223.342 in^4

$I_{yt} = \frac{t_{ft} \cdot b_{ft}^3}{12}$ = 223.342 in^4

0.1 ≤ $\frac{I_{yc}}{I_{yt}}$ = 1.000 ≤ 10.0 ...... **OK**

3) Flexural Strength Limit State in positive flexure

- Section Classification (AASHTO LRFD Bridge, 2016, 6.10.6.2)

min (F_{yc} , F_{yt}) = 50.000 ksi ≤ 70.0 ksi ...... **OK**

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

$\frac{2 \cdot D_{cp}}{t_w}$ = 0.000 ≤ $3.76 \sqrt{\frac{E_s}{F_{yc}}}$ = 90.553 ...... **OK**

in which :

D_{cp} = 0.000 in

∴ Compact section.

- Hybrid Factor, Rh (AASHTO LRFD Bridge, 2016, 6.10.1.10.1)

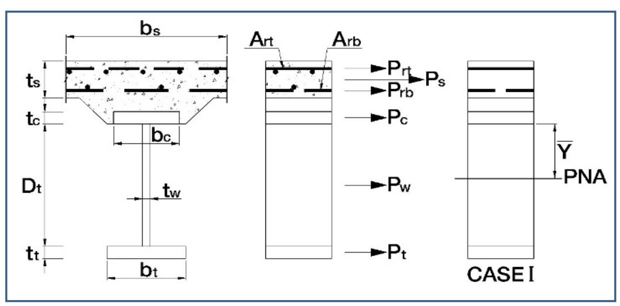
R_h = 1.000 (homogeneous section)

- Plastic Moment(Mp) (AASHTO LRFD Bridge, 2016, D6.1)

① Plastic Forces

- Plastic Forces

P_{rt}	= $F_{yr} A_{rt}$	=	0.000	kips
P_{rb}	= $F_{yr} A_{rb}$	=	0.000	kips
P_t	= $b_{ft} \cdot t_{ft} \cdot F_{yt}$	=	792.978	kips
P_w	= $D \cdot t_w \cdot F_{yw}$	=	795.240	kips
P_c	= $b_{fc} \cdot t_{fc} \cdot F_{yc}$	=	792.978	kips
P_s	= $0.85 f_{ck} \cdot B_s \cdot t_s$	=	2677.501	kips



- Distance from the plastic neutral axis

d_{rt}	=	7.782	in	(distance from the PNA to the centerline of the top layer of reinforcement)
d_{rb}	=	7.782	in	(distance from the PNA to the centerline of the bottom layer of reinforcement)
d_t	=	25.358	in	(distance from the plastic neutral axis to midthickness of the tension flange)
d_w	=	13.468	in	(distance from the plastic neutral axis to middepth of the web)
d_c	=	1.578	in	(distance from the plastic neutral axis to midthickness of the compression flange)
d_s	=	3.407	in	(distance from the plastic neutral axis to midthickness of the concrete deck)

② Plastic moment

- Check the case of the plastic neutral axis

C_{rb} = 0.000 in

$P_t + P_w + P_c$ = 2381.196 kips ≥ $\left(\dfrac{C_{rb}}{t_s}\right) \cdot P_s + P_{rb} + P_{rt}$ = 0.000 kips **...... OK**

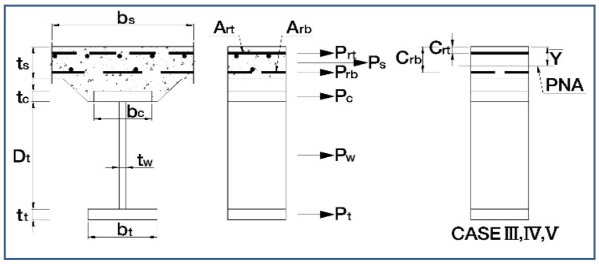
∴ PNA Below Prb in Concrete Deck

- Distance of the plastic neutral axis

$$Y = t_s \cdot \left(\frac{P_c + P_w + P_t - P_{rt} - P_{rb}}{P_s} \right) = 7.782 \text{ in}$$

- Plastic Moment

$$M_p = \frac{Y^2 \cdot P_s}{2t_s} + [\ P_{rt} \cdot d_{rt} + P_{rb} \cdot d_{rb} + P_c \cdot d_c + P_w \cdot d_w + P_t \cdot d_t\ ] = 41335.579 \text{ kips·in}$$



▪ Yield Moment(My) (AASHTO LRFD Bridge, 2016, D6.2.2)

① Yield Moment of Top Flange

$$F_y = \frac{M_{D1}}{S_{Top}} + \frac{M_{D2}}{S_{Top(3n)}} + \frac{M_{AD}}{S_{Top(n)}} = \frac{4.865E+03}{4.130E+02} + \frac{5.463E+03}{7.199E+03} + \frac{M_{AD}}{7.199E+03} = 50.000 \text{ ksi}$$

M_{AD} = 2.697E+05 kips·in

$M_{yTop} = M_{D1} + M_{D2} + M_{AD}$ = 2.800E+05 kips·in

② Yield Moment of Bottom Flange

$$F_y = \frac{M_{D1}}{S_{Bot}} + \frac{M_{D2}}{S_{Bot(3n)}} + \frac{M_{AD}}{S_{Bot(n)}} = \frac{4.865E+03}{4.130E+02} + \frac{5.463E+03}{6.136E+02} + \frac{M_{AD}}{6.136E+02} = 50.000 \text{ ksi}$$

M_{AD} = 1.799E+04 kips·in

$M_{yBot} = M_{D1} + M_{D2} + M_{AD}$ = 2.832E+04 kips·in

∴ $M_y = \min(M_{yTop}, M_{yBot})$ = 2.832E+04 kips·in

in which :

- S : noncomposite section modulus (in^3)
- S_{3n} : long-term composite section modulus (in^3)
- S_n : short-term composite section modulus (in^3)
- M_{D1} : moment of noncomposite section (kips·in)
- M_{D2} : moment of long-term composite section (kips·in)
- M_{AD} : additional yield moment of short-term composite section (kips·in)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.035 \text{ ksi}$$

f_l = 0.035 ≤ $0.6F_{yf}$ = 30.000 ksi **...... OK**

▪ Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1.2)

ⅰ. Nominal Flexural Resistance in a continuous span

$M_{n1} = 1.3\, R_h \cdot M_y = 36813.095$ kips·in

ⅱ. Nominal Flexural Resistance by D_p

$D_p > 0.1D_t$ therefore,

$$M_{n2} = M_p \left(1.07 - 0.7 \frac{D_p}{D_t} \right) = 37557.594 \text{ kips·in}$$

∴ $M_n = \min(M_{n1}, M_{n2}) = 36813.095$ kips·in

▪ Check Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1)

$$M_{uy} + \frac{1}{3} f_l \cdot S_{xt} = 20406.742 \leq \Phi_f \cdot M_n = 36813.095 \text{ kips·in}$$ ...... **OK**

in which :

M_{uy} = 20400.212 kips·in

S_{xt} = 566.355 in^3 ($= M_{yt}/F_{yt}$)

Φ_f = 1.000

▪ Ductility Requirement (AASHTO LRFD Bridge, 2016, 6.10.7.3)

D_p = 7.782 ≤ $0.42D_t$ = 14.175 in ...... **OK**

in which :

D_p = 7.782 in (distance from the top of the concrete deck to the neutral axis of the composite section at the plastic moment)

D_t = 33.750 in (total depth of the composite section)

III. Design Condition (Negative Flexure)

1. Section Properties

1) Slab Properties

B_s = 72.000 in

t_s = 8.750 in

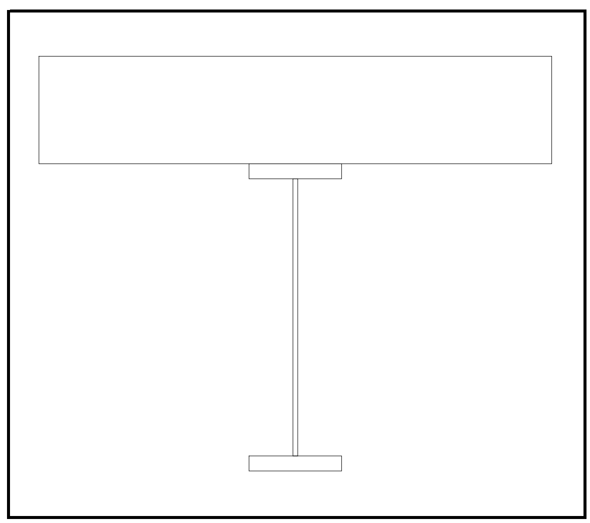
t_h = 1.220 in

f_{ck} = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi



2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in

t_{fc} = 1.220 in t_{ft} = 1.220 in

D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)
E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

4) Short-term Composite Section(Long. Reinforcement)

$A_{(R)}$ (in^2)	47.624	$I_{y(R)}$ (in^4)	5162.703	$I_{z(R)}$ (in^4)	447.342
$d_{Top(R)}$ (in)	12.500	$d_{Bot(R)}$ (in)	12.500		
$S_{Top(R)}$ (in^3)	413.016	$S_{Bot(R)}$ (in^3)	413.016		
$S_{L(R)}$ (in^3)	68.824	$S_{R(R)}$ (in^3)	68.824		

5) Long-term Composite Section(Long. Reinforcement/3)

$A_{(R3)}$ (in^2)	47.624	$I_{y(R3)}$ (in^4)	5162.703	$I_{z(R3)}$ (in^4)	447.342
$d_{Top(R3)}$ (in)	12.500	$d_{Bot(R3)}$ (in)	12.500		
$S_{Top(R3)}$ (in^3)	413.016	$S_{Bot(R3)}$(in^3)	413.016		
$S_{L(R3)}$ (in^3)	68.824	$S_{R(R3)}$(in^3)	68.824		

IV. Strength Limit State - Flexural Resistance

1. Flexure

■ Negative moment

1) Design Forces and Stresses

Negative load combination does not exist. Skip this check.

V. Strength Limit State - Shear Resistance

1. Shear

■ Max

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MIN

Component	Vu (kips)			
	Steel	Long-term	Short-term	Sum
Forces	-2.386	-2.760	-33.880	-39.026

2) Shear Resistance (AASHTO LRFD Bridge, 2016, 6.10.9)

▪ Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

▪ Web Classification

Longitudinal Stiffener : Not Exist

Transverse Stiffener : Not Exist

Transverse Spacing = 0.0 in < 3 D = 67.7 in

So, this web is considered unstiffened web

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \leq 1.12\sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

▪ Nominal Resistance of Unstiffened interior Webs or End panel (AASHTO LRFD Bridge, 2016, 6.10.9.3.3)

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = -39.026 \leq \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VI. Service Limit State

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MAX

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	3892.042	4118.640	7482.258	15492.941
Stresses	Top	-9.423	-0.572	-1.039	-11.035
	Bot	9.423	6.712	12.194	28.329

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.025 \text{ ksi}$$

f_l = 0.025 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

- Top Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

  f_f = -11.035 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

- Bottom Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

  $f_f + f_l / 2$ = 28.342 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

  in which :

  f_f = flange stress due to the Service II loads calculated without consideration of flange lateral bending

  F_{yf} = specified minimum yield strength of a flange (ksi)

- Postive Flexure and $\frac{D}{t_w}$ < proportion limit, skip Nominal Bend-buckling Resistance for webs check.

■ Positive/Negative moment

1) Design Forces and Stresses

   There is no service load combination. Skip this check.

VII. Constructibility

1. Flexure

■ Positive moment

1) Design Forces and Stresses

   Construction Stage : Stage2-1

   Step : 2

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only	T (kips·in)
Force	(+)	5838.063	7.157
Stress (f_{bu})	Top	-14.135	-
	Bot	14.135	

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only
Force	(+)	5838.063
Stress (f_{bu})	Top	-14.135
	Bot	14.135

2) Check slenderness of web (AASHTO LRFD Bridge, 2016, 6.10.6.2.3-1)

$$\frac{2 \cdot D_c}{t_w} = 32.000 \leq 5.7\sqrt{\frac{E_s}{F_{yc}}} = 137.274$$ .... **Compact or noncompact Web**

   in which :

   D_c = 11.280 in

3) Discretely Braced Flanges in Compression (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

- Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

  In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

  R_b = 1.000

- Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Moment Gradient Modifer, Cb (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

Calculation of Stress (C6.4.10)

f_0 = 13.673 ksi

f_2 = 14.135 ksi

f_{mid} = 13.953 ksi

f_1 = $\max(2f_{mid}-f_2, f_0)$ = 13.771 ksi

$$C_b = \min\left(1.75 - 1.05\left(\frac{f_1}{f_2}\right) + 0.3\left(\frac{f_1}{f_2}\right)^2, \quad 2\right)$$

$$= \min\left(1.75 - 1.05\left(\frac{13.771}{14.135}\right) + 0.3\left(\frac{13.771}{14.135}\right)^2, \quad 2\right) = 1.012$$

▪ Second-order elastic compression-flange Lateral bending stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

i. Because of discretely braced flange

$$f_l = \frac{M_{uz}}{S_l} = \frac{-1.440}{68.824} = -0.021 \text{ ksi}$$

ii. check L_b

L_b = 120.000 in

$$L_b' = \min\left(1.2L_p\sqrt{\frac{C_b \cdot R_b}{f_{bu}/F_{yc}}}, \quad 1.2L_p\sqrt{\frac{C_b \cdot R_b}{M_u/M_{yc}}}\right) = \min(189.912, \quad 679.073) = 189.912 \text{ in}$$

$L_b \le L_b'$

f_l = f_{l1} = -0.021 ksi

f_l = -0.021 $\le$ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l$ = -14.156 $\le$ $\Phi_f \cdot R_h \cdot F_{yc}$ = 50.000 kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

② Check flexural resistance

$f_{bu} + f_l/3$ = -14.142 $\le$ $\Phi_f \cdot F_{nc}$ = 48.196 ksi ...... **OK**

in which :

Φ_f = 1.000

F_{nc} = 48.196 ksi

▪ Local Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.10.8.2.2)

λ_f = $b_{fc} / 2t_{fc}$ = 5.328

λ_{pf} = $0.38\sqrt{(E/F_{yc})}$ = 9.152

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)
In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)
R_b = 1.000

$\lambda_f \leq \lambda_{pf}$ Therefore,
$F_{nc(FLB)} = R_b \cdot R_h \cdot F_{yc}$ = 50.000 ksi
in which :
R_b = 1.000
R_h = 1.000

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :
r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Lateral-Torsional Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.1(

$$L_r = \pi\, r_t \sqrt{\frac{E}{F_{yr}}} = 314.118 \text{ in}$$

$L_p < L_b \leq L_r$ Therefore, noncompact unbraced length

$$F_{nc1(LTB)} = C_b\left[1 - \left(1 - \frac{F_{yr}}{R_h \cdot F_{yc}}\right)\left(\frac{L_b - L_p}{L_r - L_p}\right)\right] R_b \cdot R_h \cdot F_{yc} = 48.196 \text{ ksi}$$

$$F_{nc(LTB)} = \min(F_{nc1(LTB)}, R_b \cdot R_h \cdot F_{yc}) = 48.196 \text{ ksi}$$

in which :
R_b = 1.000
R_h = 1.000

$$F_{nc} = \min(F_{nc(FLB)}, F_{nc(LTB)}) = 48.196 \text{ ksi}$$

③ Check web bend buckling
For sections with compact or noncompact webs, shall not be checked.

4) Discretely Braced Flanges in Tension (AASHTO LRFD Bridge, 2016, 6.10.3.2.2)
▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)
Because of discretely braced tension flange.

$$f_l = \frac{M_{uz}}{S_l} = \frac{-1.440}{68.824} = -0.021 \text{ ksi}$$

f_l = -0.021 ≤ $0.6F_{yf}$ = 30.000 ksi **...... OK**

① Check flange nominal yielding
$f_{bu} + f_l$ = 14.156 ≤ $\Phi_f \cdot R_h \cdot F_{yt}$ = 50.000 kips **...... OK**
in which :
Φ_f = 1.000
R_h = 1.000

2. Shear

■ Max

1) Design Forces

Construction Stage : Stage2-1

Step : 2

Component	V_u (kips)
	Steel Section Only
Force	-2.863

2) Shear requirement for webs (AASHTO LRFD Bridge, 2016, 6.10.3.3)

▪ Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \le 1.12\sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

▪ Nominal Resistance of Unstiffened interior Webs or End panel

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = -2.863 \le \varphi_v \cdot V_{cr} = \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VIII. Fatigue Limit State

■ Fatigue moment

1) Design Forces and Stresses

Loadcombination Name : scLCB102

Component		LCB	M_u (kips·in) / $f_{c,t}$ (ksi)			
			Steel	Long-term	Short-term	Sum
Forces	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	3892.042	4118.640	4316.679	4316.679
	Bot(Tens.)	-	3892.042	4118.640	4316.679	4316.679
	Bot(Comp.)	-	0.000	0.000	0.000	0.000
Stresses	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	-8.504	-0.217	-0.227	-0.227
	Bot(Tens.)	-	0.000	0.000	6.662	6.662
	Bot(Comp.)	-	0.000	0.000	0.000	0.000

Loadcombination Name : scLCB98

Component	V_u

Component	(kips)
Shear Force	0.000

2) Load-Induced Fatigue (AASHTO LRFD Bridge, 2016, 6.6.1.2)

■ **Top Flange**

The stress from unfactored DL = -8.720 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

Skip this check. [(The compressive stress from unfactored DL) > (The tensile stress from fatigue LCB)]

■ **Bottom Flange**

The stress from unfactored DL = 14.860 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

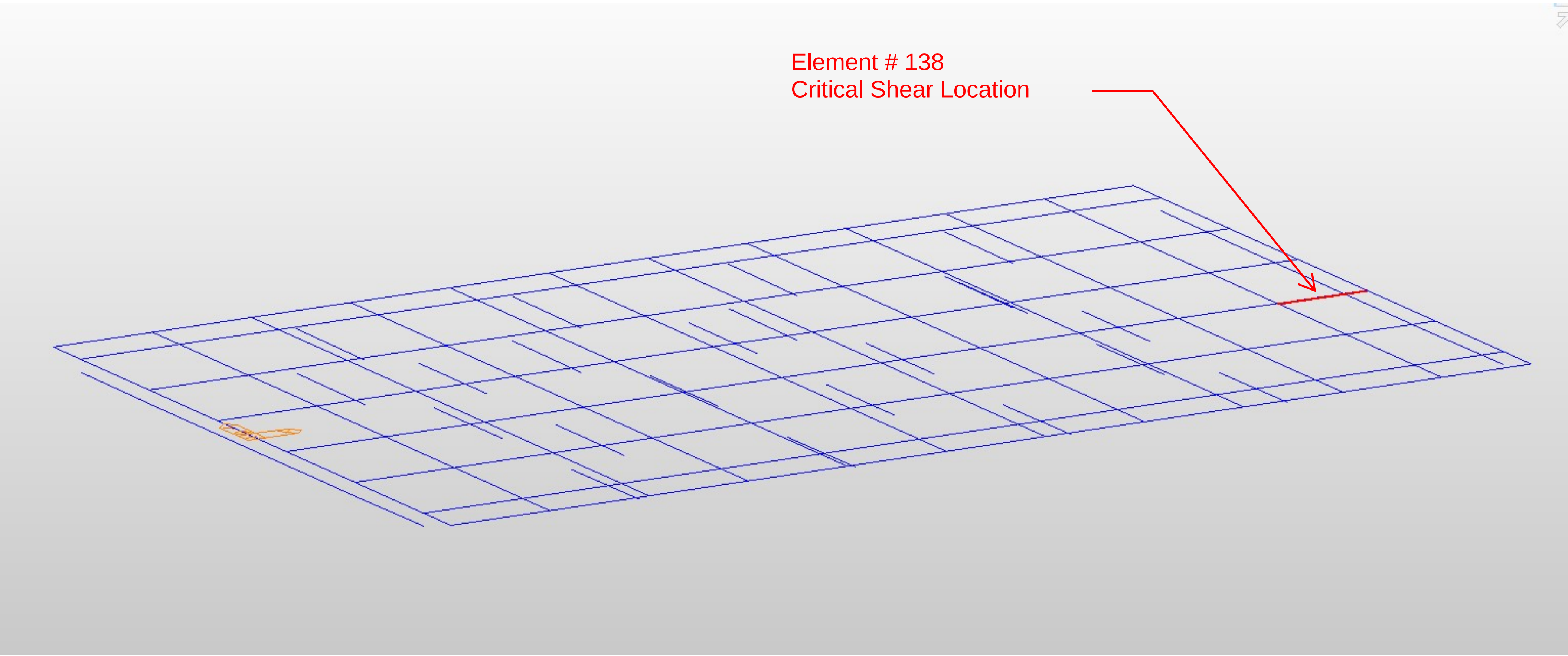
Check Load-Induced Fatigue. [The stress from unfactored DL is the tensile stress.]

No	Category	$(ADTT)_{SL}$	Number of stress (n)
1	A	129.000	1.000

$(ADTT)_{SL}$(= 129.00) ≤ $(ADTT)_{SL}$ Equivalent to Infinite Life Table. 6.6.1.2.3-2 (= 530.00)
=> Check for fatigue II

For Fatigue II,
N = $(365) \cdot (75) \cdot n \cdot (ADTT)_{SL}$ = 3.531E+06
∴ $(\Delta F)_n$ = $(A / N)^{1/3}$ = 19.201 ksi
in which :
A = 2.500E+10 ksi^3 (Table 6.6.1.2.5-1)

$\gamma(\Delta f)$ = 6.662 ksi < $(\Delta F)_n$ = 19.201 ksi (warping stress = 0.000 ksi) **...... OK**

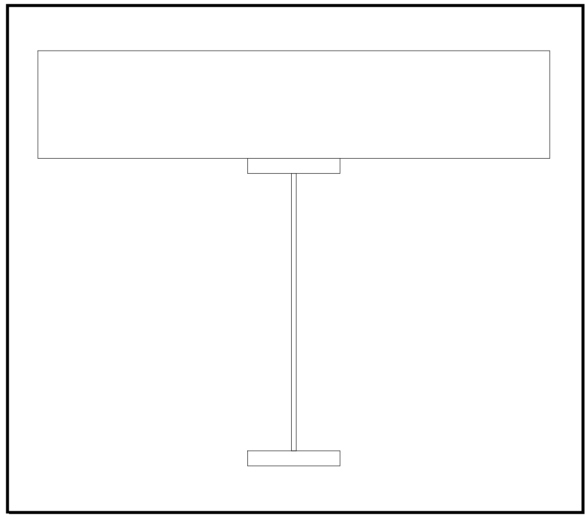

Element # 138
Critical Shear Location

Code	ASHTO-LRFD 20
Element	138
Position	I
Moment Type	Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties



B_s	=	72.000	in
t_s	=	8.750	in
t_h	=	1.220	in
f_c'	=	5.000	ksi
E_c	=	4074.280	ksi
A_r	=	0.000	in^2
F_{yr}	=	60.000	ksi

2) Girder Properties

[Section]

b_{fc}	=	13.000	in	b_{ft}	=	13.000	in
t_{fc}	=	1.220	in	t_{ft}	=	1.220	in
D	=	22.560	in	t_w	=	0.705	in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc}	=	50.000	ksi	(Compression Flange Yield Strength)
F_{yw}	=	50.000	ksi	(Web Yield Strength)
F_{yt}	=	50.000	ksi	(Tension Flange Yield Strength)
E_s	=	29000.000	ksi	(Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(3n)}$ (in^2)	126.790	$I_{y(3n)}$ (in^4)	14135.527	$I_{z(3n)}$ (in^4)	34647.035
$d_{Top(3n)}$ (in)	1.963	$d_{Bot(3n)}$ (in)	23.037		
$S_{Top(3n)}$ (in^3)	7199.259	$S_{Bot(3n)}$(in^3)	613.613		
$S_{L(3n)}$ (in^3)	5330.477	$S_{R(3n)}$ (in^3)	5330.477		

II. Strength Limit State - Flexural Resistance

1. Flexure

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MAX

Component		M_u (kips·in)				V_u	T
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum	(kips)	(kips·in)
Forces	(+)	1484.264	1669.018	3771.774	6925.056	126.597	188.182

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-3.594	-0.232	-0.524	-4.349
	Bot	3.594	2.720	6.147	12.461

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.626	-0.183	329.288	328.480

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.009	0.000	0.062	0.053
	Right	0.009	0.000	-0.062	-0.053

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Forces	(+)	1484.264	1669.018	3771.774	6925.056

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-3.594	-0.232	-0.524	-4.349
	Bot	3.594	2.720	6.147	12.461

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.626	-0.183	329.288	328.480

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.009	0.000	0.062	0.053
	Right	0.009	0.000	-0.062	-0.053

2) Cross-section Proportions

① Web Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.1)

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

② Flange Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.2)

$\frac{b_f}{2t_f}$ = 5.328 ≤ 12 ...... **OK**

b_f = 13.000 ≥ D/6 = 3.760 ...... **OK**

t_f = 1.220 ≥ $1.1t_w$ = 0.776 ...... **OK**

$I_{yc} = \frac{t_{fc} \cdot b_{fc}^3}{12}$ = 223.342 in^4

$I_{yt} = \frac{t_{ft} \cdot b_{ft}^3}{12}$ = 223.342 in^4

0.1 ≤ $\frac{I_{yc}}{I_{yt}}$ = 1.000 ≤ 10.0 ...... **OK**

3) Flexural Strength Limit State in positive flexure

▪ Section Classification (AASHTO LRFD Bridge, 2016, 6.10.6.2)

min (F_{yc} , F_{yt}) = 50.000 ksi ≤ 70.0 ksi ...... **OK**

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

$\frac{2 \cdot D_{cp}}{t_w}$ = 0.000 ≤ $3.76 \sqrt{\frac{E_s}{F_{yc}}}$ = 90.553 ...... **OK**

in which :

D_{cp} = 0.000 in

∴ Compact section.

▪ Hybrid Factor, Rh (AASHTO LRFD Bridge, 2016, 6.10.1.10.1)

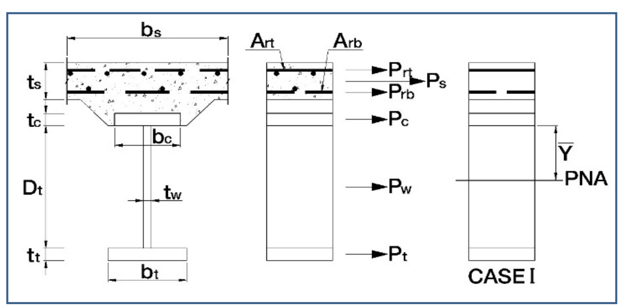
R_h = 1.000 (homogeneous section)

▪ Plastic Moment(Mp) (AASHTO LRFD Bridge, 2016, D6.1)

① Plastic Forces

- Plastic Forces

P_{rt}	= $F_{yr}\ A_{rt}$	=	0.000	kips
P_{rb}	= $F_{yr}\ A_{rb}$	=	0.000	kips
P_t	= $b_{ft} \cdot t_{ft} \cdot F_{yt}$	=	792.978	kips
P_w	= $D \cdot t_w \cdot F_{yw}$	=	795.240	kips
P_c	= $b_{fc} \cdot t_{fc} \cdot F_{yc}$	=	792.978	kips
P_s	= $0.85\ f_{ck} \cdot B_s \cdot t_s$	=	2677.501	kips



- Distance from the plastic neutral axis

d_{rt}	=	7.782	in	(distance from the PNA to the centerline of the top layer of reinforcement)
d_{rb}	=	7.782	in	(distance from the PNA to the centerline of the bottom layer of reinforcement)
d_t	=	25.358	in	(distance from the plastic neutral axis to midthickness of the tension flange)
d_w	=	13.468	in	(distance from the plastic neutral axis to middepth of the web)
d_c	=	1.578	in	(distance from the plastic neutral axis to midthickness of the compression flange)
d_s	=	3.407	in	(distance from the plastic neutral axis to midthickness of the concrete deck)

② Plastic moment

- Check the case of the plastic neutral axis

C_{rb} = 0.000 in

$P_t + P_w + P_c$ = 2381.196 kips ≥ $\left(\frac{C_{rb}}{t_s}\right) \cdot P_s + P_{rb} + P_{rt}$ = 0.000 kips ...... **OK**

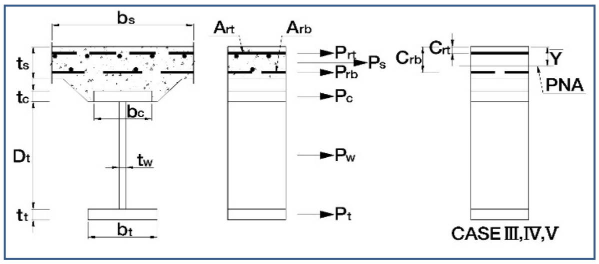
∴ PNA Below Prb in Concrete Deck

- Distance of the plastic neutral axis

$$Y = t_s \cdot \left(\frac{P_c + P_w + P_t - P_{rt} - P_{rb}}{P_s} \right) = 7.782 \text{ in}$$

- Plastic Moment

$$M_p = \frac{Y^2 \cdot P_s}{2t_s} + [\, P_{rt} \cdot d_{rt} + P_{rb} \cdot d_{rb} + P_c \cdot d_c + P_w \cdot d_w + P_t \cdot d_t \,] = 41335.579 \text{ kips·in}$$



▪ Yield Moment(My) (AASHTO LRFD Bridge, 2016, D6.2.2)

① Yield Moment of Top Flange

$$F_y = \frac{M_{D1}}{S_{Top}} + \frac{M_{D2}}{S_{Top(3n)}} + \frac{M_{AD}}{S_{Top(n)}} = \frac{1.484E+03}{4.130E+02} + \frac{1.669E+03}{7.199E+03} + \frac{M_{AD}}{7.199E+03} = 50.000 \text{ ksi}$$

M_{AD} = 3.324E+05 kips·in

$M_{yTop} = M_{D1} + M_{D2} + M_{AD}$ = 3.356E+05 kips·in

② Yield Moment of Bottom Flange

$$F_y = \frac{M_{D1}}{S_{Bot}} + \frac{M_{D2}}{S_{Bot(3n)}} + \frac{M_{AD}}{S_{Bot(n)}} = \frac{1.484E+03}{4.130E+02} + \frac{1.669E+03}{6.136E+02} + \frac{M_{AD}}{6.136E+02} = 50.000 \text{ ksi}$$

M_{AD} = 2.681E+04 kips·in

$M_{yBot} = M_{D1} + M_{D2} + M_{AD}$ = 2.996E+04 kips·in

∴ M_y = min (M_{yTop}, M_{yBot}) = 2.996E+04 kips·in

in which :

- S : noncomposite section modulus (in^3)
- S_{3n} : long-term composite section modulus (in^3)
- S_n : short-term composite section modulus (in^3)
- M_{D1} : moment of noncomposite section (kips·in)
- M_{D2} : moment of long-term composite section (kips·in)
- M_{AD} : additional yield moment of short-term composite section (kips·in)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.053 \text{ ksi}$$

f_l = 0.053 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

▪ Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1.2)

i . Nominal Flexural Resistance in a continuous span

M_{n1} = $1.3\ R_h \cdot M_y$ = 38947.709 kips·in

ii. Nominal Flexural Resistance by D_p

$D_p > 0.1D_t$ therefore,

$$M_{n2} = M_p \left(1.07 - 0.7 \frac{D_p}{D_t} \right) = 37557.594 \text{ kips·in}$$

∴ M_n = min (M_{n1}, M_{n2}) = 37557.594 kips·in

▪ Check Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1)

$$M_{uy} + \frac{1}{3} f_l \cdot S_{xt} = 6935.571 \le \Phi_f \cdot M_n = 37557.594 \text{ kips·in}$$ ...... **OK**

in which :

M_{uy} = 6925.056 kips·in

S_{xt} = 599.196 in^3 (= M_{yt}/F_{yt})

Φ_f = 1.000

▪ Ductility Requirement (AASHTO LRFD Bridge, 2016, 6.10.7.3)

D_p = 7.782 ≤ $0.42D_t$ = 14.175 in ...... **OK**

in which :

D_p = 7.782 in (distance from the top of the concrete deck to the neutral axis of the composite section at the plastic moment)

D_t = 33.750 in (total depth of the composite section)

III. Design Condition (Negative Flexure)

1. Section Properties

1) Slab Properties

B_s = 72.000 in

t_s = 8.750 in

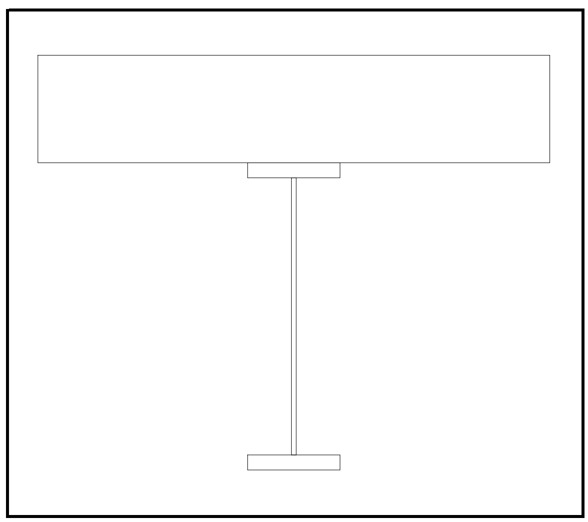
t_h = 1.220 in

f_{ck} = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi



2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in

t_{fc} = 1.220 in t_{ft} = 1.220 in

D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)
E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

4) Short-term Composite Section(Long. Reinforcement)

$A_{(R)}$ (in^2)	47.624	$I_{y(R)}$ (in^4)	5162.703	$I_{z(R)}$ (in^4)	447.342
$d_{Top(R)}$ (in)	12.500	$d_{Bot(R)}$ (in)	12.500		
$S_{Top(R)}$ (in^3)	413.016	$S_{Bot(R)}$ (in^3)	413.016		
$S_{L(R)}$ (in^3)	68.824	$S_{R(R)}$ (in^3)	68.824		

5) Long-term Composite Section(Long. Reinforcement/3)

$A_{(R3)}$ (in^2)	47.624	$I_{y(R3)}$ (in^4)	5162.703	$I_{z(R3)}$ (in^4)	447.342
$d_{Top(R3)}$ (in)	12.500	$d_{Bot(R3)}$ (in)	12.500		
$S_{Top(R3)}$ (in^3)	413.016	$S_{Bot(R3)}$(in^3)	413.016		
$S_{L(R3)}$ (in^3)	68.824	$S_{R(R3)}$(in^3)	68.824		

IV. Strength Limit State - Flexural Resistance

1. Flexure

■ Negative moment

1) Design Forces and Stresses

Negative load combination does not exist. Skip this check.

V. Strength Limit State - Shear Resistance

1. Shear

■ Max

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MAX

Component	Vu (kips)			
	Steel	Long-term	Short-term	Sum
Forces	25.018	28.173	73.406	126.597

2) Shear Resistance (AASHTO LRFD Bridge, 2016, 6.10.9)

▪ Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

▪ Web Classification

Longitudinal Stiffener : Not Exist

Transverse Stiffener : Not Exist

Transverse Spacing = 0.0 in < 3 D = 67.7 in

So, this web is considered unstiffened web

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \le 1.12\sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

▪ Nominal Resistance of Unstiffened interior Webs or End panel (AASHTO LRFD Bridge, 2016, 6.10.9.3.3)

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = 126.597 \le \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VI. Service Limit State

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MAX

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	1187.411	1258.513	2801.889	5247.813
Stresses	Top	-2.875	-0.175	-0.389	-3.439
	Bot	2.875	2.051	4.566	9.492

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.039 \text{ ksi}$$

f_l = 0.039 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

▪ Top Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

f_f = -3.439 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

▪ Bottom Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

$f_f + f_l / 2$ = 9.511 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

in which :

f_f = flange stress due to the Service II loads calculated without consideration of flange lateral bending

F_{yf} = specified minimum yield strength of a flange (ksi)

▪ Postive Flexure and $\frac{D}{t_w}$ < proportion limit, skip Nominal Bend-buckling Resistance for webs check.

■ **Positive moment**

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MAX

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	1187.411	1258.513	2801.889	5247.813
Stresses	Top	-2.875	-0.175	-0.389	-3.439
	Bot	2.875	2.051	4.566	9.492

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.039 \text{ ksi}$$

f_l = 0.039 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

▪ Top Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

f_f = -3.439 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

▪ Bottom Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

$f_f + f_l / 2$ = 9.511 ksi ≤ $0.95\ R_h\ F_{yf}$ = 47.500 ksi ...... **OK**

in which :

f_f = flange stress due to the Service II loads calculated without consideration of flange lateral bending

F_{yf} = specified minimum yield strength of a flange (ksi)

▪ Postive Flexure and $\frac{D}{t_w}$ < proportion limit, skip Nominal Bend-buckling Resistance for webs check.

VII. Constructibility

1. Flexure

■ **Positive moment**

1) Design Forces and Stresses

Construction Stage : Stage2-1

Step : 2

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only	T (kips·in)
Force	(+)	1781.117	0.804
Stress (f_{bu})	Top	-4.312	-
	Bot	4.312	

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only
Force	(+)	1781.117
Stress (f_{bu})	Top	-4.312
	Bot	4.312

2) Check slenderness of web (AASHTO LRFD Bridge, 2016, 6.10.6.2.3-1)

$$\frac{2 \cdot D_c}{t_w} = 32.000 \leq 5.7 \sqrt{\frac{E_s}{F_{yc}}} = 137.274$$ **.... Compact or noncompact Web**

in which :

D_c = 11.280 in

3) Discretely Braced Flanges in Compression (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

R_b = 1.000

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\ r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Moment Gradient Modifer, Cb (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

Calculation of Stress (C6.4.10)

f_0 = 0.000 ksi

f_2 = 4.312 ksi

f_{mid} = 2.253 ksi

f_1 = max($2f_{mid}$-f_2 , f_0) = 0.194 ksi

$$C_b = \min\left(1.75 - 1.05\left(\frac{f_1}{f_2}\right) + 0.3\left(\frac{f_1}{f_2}\right)^2,\ 2\right)$$

$$= \min\left(1.75 - 1.05\left(\frac{0.194}{4.312}\right) + 0.3\left(\frac{0.194}{4.312}\right)^2,\ 2\right) = 1.703$$

▪ Second-order elastic compression-flange Lateral bending stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

i. Because of discretely braced flange

$$f_l = \frac{M_{uz}}{S_l} = \frac{-0.751}{68.824} = -0.011 \text{ ksi}$$

ii. check L_b

L_b = 120.000 in

$L_b' = \min\left(1.2L_p\sqrt{\dfrac{C_b \cdot R_b}{f_{bu}/F_{yc}}}\ ,\ 1.2L_p\sqrt{\dfrac{C_b \cdot R_b}{M_u/M_{yc}}}\right) = \min(\ 446.123\ ,\ 1785.259\ ) = 446.123$ in

$L_b \le L_b'$

$f_l = f_{l1} = -0.011$ ksi

$f_l = -0.011 \le 0.6F_{yf} = 30.000$ ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l = -4.323 \le \Phi_f \cdot R_h \cdot F_{yc} = 50.000$ kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

② Check flexural resistance

$f_{bu} + f_l/3 = -4.316 \le \Phi_f \cdot F_{nc} = 50.000$ ksi ...... **OK**

in which :

Φ_f = 1.000

F_{nc} = 50.000 ksi

▪ Local Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.10.8.2.2)

$\lambda_f = b_{fc} / 2t_{fc} = 5.328$

$\lambda_{pf} = 0.38\sqrt{(E/F_{yc})} = 9.152$

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

R_b = 1.000

$\lambda_f \le \lambda_{pf}$ Therefore,

$F_{nc(FLB)} = R_b \cdot R_h \cdot F_{yc} = 50.000$ ksi

in which :

R_b = 1.000

R_h = 1.000

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$L_p = 1.0\ r_t \sqrt{\dfrac{E}{F_{yc}}} = 83.655$ in

in which :

r_t = effective radius of gyration for lateral torsional buckling

$= \dfrac{b_{fc}}{\sqrt{12\left(1 + \dfrac{1}{3}\dfrac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474$ in

▪ Lateral-Torsional Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.1(

$L_r = \pi\ r_t \sqrt{\dfrac{E}{F_{yr}}} = 314.118$ in

L_p < L_b ≤ L_r Therefore, noncompact unbraced length

$$F_{nc1(LTB)} = C_b[1 - (1 - \frac{F_{yr}}{R_h \cdot F_{yc}})(\frac{L_b - L_p}{L_r - L_p})] R_b \cdot R_h \cdot F_{yc} = 81.141 \text{ ksi}$$

$$F_{nc(LTB)} = \min(F_{nc1(LTB)}, R_b \cdot R_h \cdot F_{yc}) = 50.000 \text{ ksi}$$

in which :

R_b = 1.000

R_h = 1.000

F_{nc} = min($F_{nc(FLB)}$, $F_{nc(LTB)}$) = 50.000 ksi

③ Check web bend buckling

For sections with compact or noncompact webs, shall not be checked.

4) Discretely Braced Flanges in Tension (AASHTO LRFD Bridge, 2016, 6.10.3.2.2)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{uz}}{S_l} = \frac{-0.751}{68.824} = -0.011 \text{ ksi}$$

f_l = -0.011 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l$ = 4.323 ≤ $\Phi_f \cdot R_h \cdot F_{yt}$ = 50.000 kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

2. Shear

■ Max

1) Design Forces

Construction Stage : Stage2-1

Step : 2

Component	V_u (kips)
	Steel Section Only
Force	30.022

2) Shear requirement for webs (AASHTO LRFD Bridge, 2016, 6.10.3.3)

▪ Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

shear-buckling coefficient of unstiffened Webs

k = 5.000

$$\frac{D}{t_w} = 32.000 \le 1.12 \sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

C = 1.000

▪ Nominal Resistance of Unstiffened interior Webs or End panel

V_p = $0.58F_{yw} \cdot D \cdot t_w$ = 461.239 kips

V_n = V_{cr} = $C \cdot V_p$ = 461.239 kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength
= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

V_u = 30.022 ≤ $\varphi_v \cdot V_{cr}$ = $\Phi_v \cdot V_n$ = 461.239 kips ...... **OK**

in which :

Φ_v = 1.000

VIII. Fatigue Limit State

■ **Fatigue moment**

1) Design Forces and Stresses

Loadcombination Name : scLCB102

Component		LCB	M_u (kips·in) / $f_{c,t}$ (ksi)			
			Steel	Long-term	Short-term	Sum
Forces	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	1187.411	1258.513	1616.477	1616.477
	Bot(Tens.)	-	1187.411	1258.513	1616.477	1616.477
	Bot(Comp.)	-	0.000	0.000	0.000	0.000
Stresses	Top(Tens.)	-	0.000	0.000	0.000	0.000
	Top(Comp.)	-	-2.594	-0.066	-0.085	-0.085
	Bot(Tens.)	-	0.000	0.000	2.495	2.495
	Bot(Comp.)	-	0.000	0.000	0.000	0.000

Loadcombination Name : scLCB98

Component	V_u (kips)
Shear Force	0.000

2) Load-Induced Fatigue (AASHTO LRFD Bridge, 2016, 6.6.1.2)

■ **Top Flange**

The stress from unfactored DL = -2.661 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

Skip this check. [(The compressive stress from unfactored DL) > (The tensile stress from fatigue LCB)]

■ **Bottom Flange**

The stress from unfactored DL = 4.537 ksi (- : Compression)
The stress from fatigue LCB = 0.000 ksi

Check Load-Induced Fatigue. [The stress from unfactored DL is the tensile stress.]

No	Category	$(ADTT)_{SL}$	Number of stress (n)
1	A	129.000	1.000

$(ADTT)_{SL}$(= 129.00) ≤ $(ADTT)_{SL}$ Equivalent to Infinite Life Table. 6.6.1.2.3-2 (= 530.00)
=> Check for fatigue II

For Fatigue II,

$N = (365) \cdot (75) \cdot n \cdot (ADTT)_{SL} = 3.531E+06$

$\therefore (\Delta F)_n = (A / N)^{1/3} = 19.201$ ksi

in which :

$A = 2.500E+10$ ksi^3 (Table 6.6.1.2.5-1)

$\gamma(\Delta f) = 2.495$ ksi $< (\Delta F)_n = 19.201$ ksi (warping stress = 0.000 ksi) **...... OK**

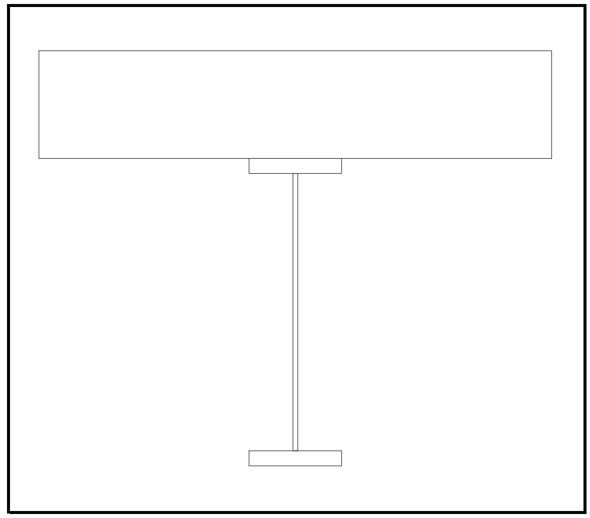
Code	ASHTO-LRFD 20
Element	138
Position	J
Moment Type	Beam

I. Design Condition (Positive Flexure)

1. Section Properties

1) Slab Properties

B_s = 72.000 in
t_s = 8.750 in
t_h = 1.220 in
f_c' = 5.000 ksi
E_c = 4074.280 ksi
A_r = 0.000 in^2
F_{yr} = 60.000 ksi



2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in
t_{fc} = 1.220 in t_{ft} = 1.220 in
D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)
F_{yw} = 50.000 ksi (Web Yield Strength)
F_{yt} = 50.000 ksi (Tension Flange Yield Strength)
E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section

(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(3n)}$ (in^2)	126.790	$I_{y(3n)}$ (in^4)	14135.527	$I_{z(3n)}$ (in^4)	34647.035
$d_{Top(3n)}$ (in)	1.963	$d_{Bot(3n)}$ (in)	23.037		
$S_{Top(3n)}$ (in^3)	7199.259	$S_{Bot(3n)}$(in^3)	613.613		
$S_{L(3n)}$ (in^3)	5330.477	$S_{R(3n)}$ (in^3)	5330.477		

II. Strength Limit State - Flexural Resistance

1. Flexure

■ **Positive moment**

1) Design Forces and Stresses

Loadcombination Name : scLCB17

Loadcombination Type : FX-MAX

Component		M_u (kips·in)				V_u	T
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum	(kips)	(kips·in)
Forces	(+)	0.153	-3.534	19.234	15.854	120.485	147.579

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	0.000	0.000	-0.003	-0.003
	Bot	0.000	-0.006	0.031	0.026

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.300	-1.802	33.562	31.460

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.004	0.000	0.006	0.002
	Right	0.004	0.000	-0.006	-0.002

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Forces	(+)	1484.264	1669.018	2897.112	6050.394

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	-3.594	-0.232	-0.402	-4.228
	Bot	3.594	2.720	4.721	11.035

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.626	-0.183	313.561	312.752

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.009	0.000	0.059	0.050
	Right	0.009	0.000	-0.059	-0.050

2) Cross-section Proportions

① Web Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.1)

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

② Flange Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.2)

$\frac{b_f}{2t_f}$ = 5.328 ≤ 12 ...... **OK**

b_f = 13.000 ≥ D/6 = 3.760 ...... **OK**

t_f = 1.220 ≥ $1.1t_w$ = 0.776 ...... **OK**

$I_{yc} = \frac{t_{fc} \cdot b_{fc}^3}{12}$ = 223.342 in^4

$I_{yt} = \frac{t_{ft} \cdot b_{ft}^3}{12}$ = 223.342 in^4

0.1 ≤ $\frac{I_{yc}}{I_{yt}}$ = 1.000 ≤ 10.0 ...... **OK**

3) Flexural Strength Limit State in positive flexure

▪ Section Classification (AASHTO LRFD Bridge, 2016, 6.10.6.2)

min (F_{yc} , F_{yt}) = 50.000 ksi ≤ 70.0 ksi ...... **OK**

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

$\frac{2 \cdot D_{cp}}{t_w}$ = 0.000 ≤ $3.76 \sqrt{\frac{E_s}{F_{yc}}}$ = 90.553 ...... **OK**

in which :

D_{cp} = 0.000 in

∴ Compact section.

▪ Hybrid Factor, Rh (AASHTO LRFD Bridge, 2016, 6.10.1.10.1)

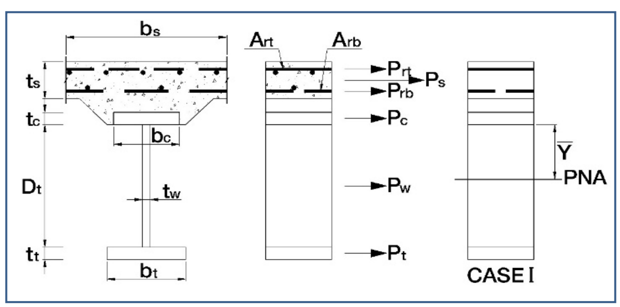
R_h = 1.000 (homogeneous section)

▪ Plastic Moment(Mp) (AASHTO LRFD Bridge, 2016, D6.1)

① Plastic Forces

- Plastic Forces

P_{rt}	= $F_{yr}\ A_{rt}$	=	0.000	kips
P_{rb}	= $F_{yr}\ A_{rb}$	=	0.000	kips
P_t	= $b_{ft} \cdot t_{ft} \cdot F_{yt}$	=	792.978	kips
P_w	= $D \cdot t_w \cdot F_{yw}$	=	795.240	kips
P_c	= $b_{fc} \cdot t_{fc} \cdot F_{yc}$	=	792.978	kips
P_s	= $0.85\ f_{ck} \cdot B_s \cdot t_s$	=	2677.501	kips



- Distance from the plastic neutral axis

d_{rt}	=	7.782	in	(distance from the PNA to the centerline of the top layer of reinforcement)
d_{rb}	=	7.782	in	(distance from the PNA to the centerline of the bottom layer of reinforcement)
d_t	=	25.358	in	(distance from the plastic neutral axis to midthickness of the tension flange)
d_w	=	13.468	in	(distance from the plastic neutral axis to middepth of the web)
d_c	=	1.578	in	(distance from the plastic neutral axis to midthickness of the compression flange)
d_s	=	3.407	in	(distance from the plastic neutral axis to midthickness of the concrete deck)

② Plastic moment

- Check the case of the plastic neutral axis

C_{rb} = 0.000 in

$P_t + P_w + P_c$ = 2381.196 kips $\geq$ $\left(\dfrac{C_{rb}}{t_s}\right) \cdot P_s + P_{rb} + P_{rt}$ = 0.000 kips ...... **OK**

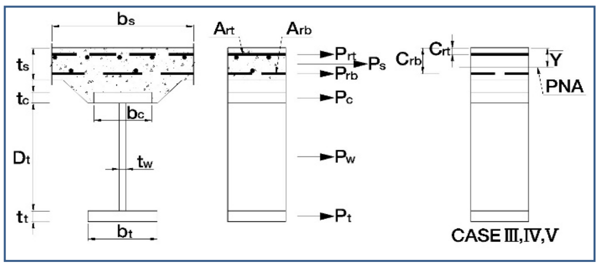
∴ PNA Below Prb in Concrete Deck

- Distance of the plastic neutral axis

$$Y = t_s \cdot \left(\frac{P_c+P_w+P_t - P_{rt} - P_{rb}}{P_s}\right) = 7.782 \text{ in}$$

- Plastic Moment

$$M_p = \frac{Y^2 \cdot P_s}{2t_s} + [\ P_{rt} \cdot d_{rt} + P_{rb} \cdot d_{rb} + P_c \cdot d_c + P_w \cdot d_w + P_t \cdot d_t\ ] = 41335.579 \text{ kips·in}$$



▪ Yield Moment(My) (AASHTO LRFD Bridge, 2016, D6.2.2)

① Yield Moment of Top Flange

$$F_y = \frac{M_{D1}}{S_{Top}} + \frac{M_{D2}}{S_{Top(3n)}} + \frac{M_{AD}}{S_{Top(n)}} = \frac{1.533E-01}{4.130E+02} + \frac{-3.534E+00}{7.199E+03} + \frac{M_{AD}}{7.199E+03} = 50.000 \text{ ksi}$$

M_{AD} = 3.600E+05 kips·in

$M_{yTop} = M_{D1} + M_{D2} + M_{AD}$ = 3.600E+05 kips·in

② Yield Moment of Bottom Flange

$$F_y = \frac{M_{D1}}{S_{Bot}} + \frac{M_{D2}}{S_{Bot(3n)}} + \frac{M_{AD}}{S_{Bot(n)}} = \frac{1.533E-01}{4.130E+02} + \frac{-3.534E+00}{6.136E+02} + \frac{M_{AD}}{6.136E+02} = 50.000 \text{ ksi}$$

M_{AD} = 3.068E+04 kips·in

$M_{yBot} = M_{D1} + M_{D2} + M_{AD}$ = 3.068E+04 kips·in

∴ M_y = min (M_{yTop}, M_{yBot}) = 3.068E+04 kips·in

in which :

S : noncomposite section modulus (in^3)
S_{3n} : long-term composite section modulus (in^3)
S_n : short-term composite section modulus (in^3)
M_{D1} : moment of noncomposite section (kips·in)
M_{D2} : moment of long-term composite section (kips·in)
M_{AD} : additional yield moment of short-term composite section (kips·in)

▪ Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.002 \text{ ksi}$$

f_l = 0.002 $\leq$ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

- Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1.2)

  i . Nominal Flexural Resistance in a continuous span

  $M_{n1} = 1.3\ R_h \cdot M_y = 39884.770$ kips·in

  ii. Nominal Flexural Resistance by D_p

  $D_p > 0.1D_t$ therefore,

  $$M_{n2} = M_p \left(1.07 - 0.7 \frac{D_p}{D_t} \right) = 37557.594 \text{ kips·in}$$

$\therefore M_n = \min(M_{n1}, M_{n2}) = 37557.594$ kips·in

- Check Flexural Resistance of Composite compact section (AASHTO LRFD Bridge, 2016, 6.10.7.1)

  $$M_{uy} + \frac{1}{3} f_l \cdot S_{xt} = 16.180 \le \Phi_f \cdot M_n = 37557.594 \text{ kips·in}$$ ...... **OK**

  in which :

  M_{uy} = 15.854 kips·in

  S_{xt} = 613.612 in^3 (= M_{yt}/F_{yt})

  Φ_f = 1.000

- Ductility Requirement (AASHTO LRFD Bridge, 2016, 6.10.7.3)

  $D_p = 7.782 \le 0.42D_t = 14.175$ in ...... **OK**

  in which :

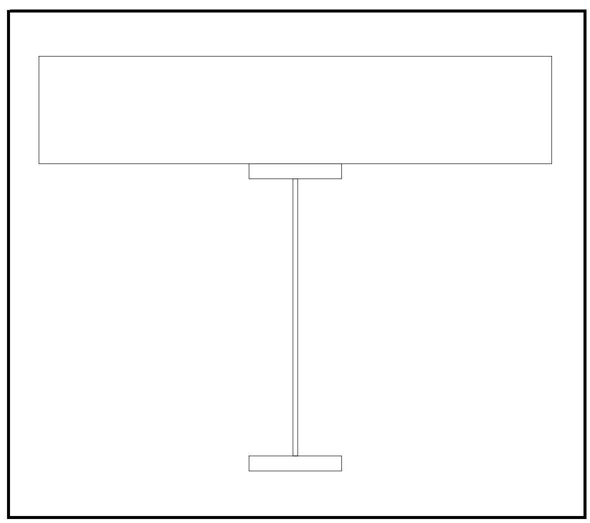
  D_p = 7.782 in (distance from the top of the concrete deck to the neutral axis of the composite section at the plastic moment)

  D_t = 33.750 in (total depth of the composite section)

III. Design Condition (Negative Flexure)

1. Section Properties

1) Slab Properties



B_s = 72.000 in

t_s = 8.750 in

t_h = 1.220 in

f_{ck} = 5.000 ksi

E_c = 4074.280 ksi

A_r = 0.000 in^2

F_{yr} = 60.000 ksi

2) Girder Properties

[Section]

b_{fc} = 13.000 in b_{ft} = 13.000 in

t_{fc} = 1.220 in t_{ft} = 1.220 in

D = 22.560 in t_w = 0.705 in

Position	Material	Thick (in)	f_y (ksi)	f_u (ksi)	Note
Compression Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Tension Flange	A709-50W	1.220	50.000	70.000	less than 2 in.
Web	A709-50W	0.705	50.000	70.000	less than 2 in.

[Design Strength]

F_{yc} = 50.000 ksi (Compression Flange Yield Strength)

F_{yw} = 50.000 ksi (Web Yield Strength)

F_{yt} = 50.000 ksi (Tension Flange Yield Strength)
E_s = 29000.000 ksi (Elastic Modulus of Steel)

3) Transverse Stiffener Properties

Position	Type	F_y (ksi)	H (in)	B (in)	t_w(in)	t_f(in)	d_0 (in)
Web	1Side	0.000	0.000	0.000	-	-	0.000

2. Elastic Section Properties

1) Steel Section

A (in^2)	47.624	I_y (in^4)	5162.703	I_z (in^4)	447.342
d_{Top} (in)	12.500	d_{Bot} (in)	12.500		
S_{Top} (in^3)	413.016	S_{Bot} (in^3)	413.016		
S_L (in^3)	68.824	S_R (in^3)	68.824		

2) Short-term Composite Section

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

3) Long-term Composite Section
(Es/Ec = 3n (or n for time dependent material properties defined since the analysis results take into account the long

$A_{(n)}$ (in^2)	126.790	$I_{y(n)}$ (in^4)	14135.527	$I_{z(n)}$ (in^4)	34647.035
$d_{Top(n)}$ (in)	1.963	$d_{Bot(n)}$ (in)	23.037		
$S_{Top(n)}$ (in^3)	7199.259	$S_{Bot(n)}$ (in^3)	613.613		
$S_{L(n)}$ (in^3)	5330.477	$S_{R(n)}$ (in^3)	5330.477		

4) Short-term Composite Section(Long. Reinforcement)

$A_{(R)}$ (in^2)	47.624	$I_{y(R)}$ (in^4)	5162.703	$I_{z(R)}$ (in^4)	447.342
$d_{Top(R)}$ (in)	12.500	$d_{Bot(R)}$ (in)	12.500		
$S_{Top(R)}$ (in^3)	413.016	$S_{Bot(R)}$ (in^3)	413.016		
$S_{L(R)}$ (in^3)	68.824	$S_{R(R)}$ (in^3)	68.824		

5) Long-term Composite Section(Long. Reinforcement/3)

$A_{\mathbf{(R3)}}$ (in^2)	47.624	$I_{y(R3)}$ (in^4)	5162.703	$I_{z(R3)}$ (in^4)	447.342
$d_{Top(R3)}$ (in)	12.500	$d_{Bot(R3)}$ (in)	12.500		
$S_{Top(R3)}$ (in^3)	413.016	$S_{Bot(R3)}$(in^3)	413.016		
$S_{L(R3)}$ (in^3)	68.824	$S_{R(R3)}$(in^3)	68.824		

IV. Strength Limit State - Flexural Resistance

1. Flexure

■ Negative moment

1) Design Forces and Stresses

Loadcombination Name : scLCB1
Loadcombination Type : FX-MIN

Component		M_u (kips·in)				V_u	T
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum	(kips)	(kips·in)
Forces	(-)	0.153	-3.534	-182.044	-185.424	68.699	-133.396

Component	$f_{c,t}$ (ksi)

Component		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	0.000	0.009	0.441	0.449
	Bot	0.000	-0.009	-0.441	-0.449

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.300	-1.802	-264.369	-266.471

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.004	-0.026	-3.841	-3.872
	Right	0.004	0.026	3.841	3.872

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Forces	(+)	0.153	-3.534	-182.044	-185.424

Component		$f_{c,t}$ (ksi)			
		Steel (M_{D1})	Long-term (M_{D2})	Short-term	Sum
Stresses	Top	0.000	0.009	0.441	0.449
	Bot	0.000	-0.009	-0.441	-0.449

Component		M_{uz} (kips·in)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Forces		-0.300	-1.802	-264.369	-266.471

Component		f_l (ksi)			
		Steel (M_{Dz1})	Long-term (M_{Dz2})	Short-term(M_{Dz3})	Sum
Stresses	Left	-0.004	-0.026	-3.841	-3.872
	Right	0.004	0.026	3.841	3.872

2) Cross-section Proportions

① Web Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.1)

$\frac{D}{t_w}$ = 32.000 ≤ 150 ...... **OK**

② Flange Proportions (AASHTO LRFD Bridge, 2016, 6.10.2.2)

$\frac{b_f}{2t_f}$ = 5.328 ≤ 12 ...... **OK**

b_f = 13.000 ≥ D/6 = 3.760 ...... **OK**

t_f = 1.220 ≥ $1.1t_w$ = 0.776 ...... **OK**

$I_{yc} = \frac{t_{fc} \cdot b_{fc}^3}{12} = 223.342 \ in^4$

$I_{yt} = \frac{t_{ft} \cdot b_{ft}^3}{12} = 223.342 \ in^4$

$0.1 \le \frac{I_{yc}}{I_{yt}} = 1.000 \le 10.0$ ...... **OK**

③ Minimum Negative Flexure Concrete Deck Reinforcement (AASHTO LRFD Bridge, 2016, 6.10.1.7)

A_{rs} = 0.000 < $0.01A_{deck}$ = 6.300 in^2 ...... **NG**

in which :

A_{dec} = 630.000 in^2

3) Flexural Strength Limit State in negative flexure

- Section Classification (AASHTO LRFD Bridge, 2016 6.10.6.2.3)

min (F_{yc}, F_{yt}) = 50.000 ≤ 70.0 ksi ...... **OK**

$$\frac{I_{yc}}{I_{yt}} = 1.00 \geq 0.3$$ ...... **OK**

$$\frac{2\,D_c}{t_w} = 32.000 \leq 5.7\sqrt{\frac{E_s}{F_{yc}}} = 137.274$$ ...... **OK**

in which :

I_{yc} = 223.342 in^4

I_{yt} = 223.342 in^4

D_c = 11.280 in

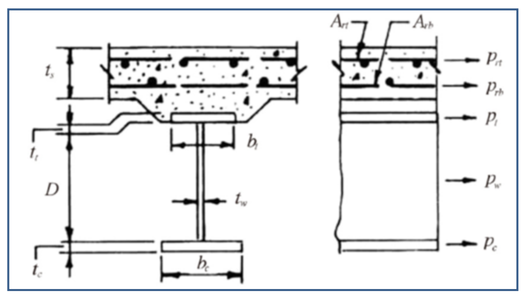
∴ Compact or Noncompact section.

- Hybrid Factor, Rh (AASHTO LRFD Bridge, 2016, 6.10.1.10.1)

R_h = 1.000 (homogeneous section)

- Plastic Moment(Mp) (AASHTO LRFD Bridge, 2016, D6.1)

① Plastic Forces



- Plastic Forces

P_{rt} = $F_{yr}\,A_{rt}$ = 0.000 kips

P_{rb} = $F_{yr}\,A_{rb}$ = 0.000 kips

P_t = $b_{ft} \cdot t_{ft} \cdot F_{yt}$ = 792.978 kips

P_w = $D \cdot t_w \cdot F_{yw}$ = 795.240 kips

P_c = $b_{fc} \cdot t_{fc} \cdot F_{yc}$ = 792.978 kips

- Distance from the plastic neutral axis

d_{rt} = 21.250 in (distance from the PNA to the centerline of the top layer of reinforcement)

d_{rb} = 21.250 in (distance from the PNA to the centerline of the bottom layer of reinforcement)

d_t = 11.890 in (distance from the plastic neutral axis to midthickness of the tension flange)

d_w = 0.000 in (distance from the plastic neutral axis to middepth of the web)

d_c = 11.890 in (distance from the plastic neutral axis to midthickness of the compression flange)

② Plastic Moment

- Check the case of the plastic neutral axis

$P_c + P_w$ = 1588.218 kips ≥ $P_t + P_{rb} + P_{rt}$ = 792.978 kips ...... **OK**

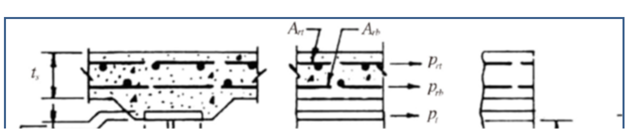
∴ PNA In Web

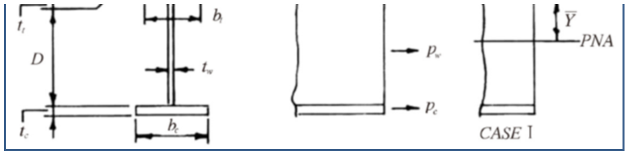
- Distance of the plastic neutral axis

$$Y = \frac{D}{2} \cdot \left(\frac{P_c - P_t - P_{rt} - P_{rb}}{P_w} + 1 \right) = 11.280 \text{ in}$$

- Plastic Moment

$$M_p = \frac{P_w}{2D} \cdot [\, Y^2 + (D - Y)^2 \,] + [\, P_{rt} \cdot d_{rt} + P_{rb} \cdot d_{rb} + P_t \cdot d_t + P_c \cdot d_c] = 23342.178 \text{ kips·in}$$





▪ Yield Moment(My) (AASHTO LRFD Bridge, 2016, D6.2.2)

① Yield Moment of Top Flange

$$F_y = \frac{M_{D1}}{S_{Top}} + \frac{M_{D2}}{S_{Top(R)}} + \frac{M_{AD}}{S_{Top(R)}} = \frac{1.533E\text{-}01}{4.130E+02} + \frac{-3.534E+00}{4.130E+02} + \frac{M_{AD}}{4.130E+02} = 50.000 \text{ ksi}$$

M_{AD} = 20647.423 kips·in

$M_{yTop} = M_{D1} + M_{D2} + M_{AD}$ = 20650.804 kips·in

② Yield Moment of Bottom Flange

$$F_y = \frac{M_{D1}}{S_{Bot}} + \frac{M_{D2}}{S_{Bot(R)}} + \frac{M_{AD}}{S_{Bot(R)}} = \frac{1.533E\text{-}01}{4.130E+02} + \frac{-3.534E+00}{4.130E+02} + \frac{M_{AD}}{4.130E+02} = 50.000 \text{ ksi}$$

M_{AD} = 20647.423 kips·in

$M_{yBot} = M_{D1} + M_{D2} + M_{AD}$ = 20650.804 kips·in

∴ $M_y = \min(M_{yTop}, M_{yBot})$ = 20650.804 kips·in

in which :

- S : noncomposite section modulus (in^3)
- S_n : long-term composite section modulus with longitudinal reinforcements (in^3)
- M_{D1} : moment of noncomposite section (kips·in)
- M_{AD} : additional yield moment of short-term composite section (kips·in)

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

$$\frac{2\,D_c}{t_w} = 32.000 \quad \le \quad \lambda_{rw} = 5.7\sqrt{\frac{E_s}{f_{yc}}} = 137.274$$

in which :

f_{yc} = 50.000 ksi (specified minimum yield strength of a compression flange)

R_b = 1.000

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

▪ Moment Gradient Modifer, Cb (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

Calculation of Stress (C6.4.10)

f_0 = -6.859 ksi

f_2 = 0.446 ksi

f_{mid} = -3.602 ksi

$f_1 \;=\; \max(\;2f_{mid}\text{-}f_2\;,\;f_0\;) \;=\; -6.859\;\text{ksi}$

For $f_{mid}/f_2 > 1.0$

$C_b \;=\; 1.000$

▪ Second-order elastic compression-flange Lateral bending stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

i. Because of discretely braced flange

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = -3.872\;\text{ksi}$$

ii. check L_b

$L_b \;=\; 120.000\;\text{in}$

$$L_b' = \min\left(1.2L_p\sqrt{\frac{C_b\cdot R_b}{f_{bu}/F_{yc}}}\;,\;1.2L_p\sqrt{\frac{C_b\cdot R_b}{M_u/M_{yc}}}\right) = \min(\;1059.395\;,\;1059.395\;) = 1059.395\;\text{in}$$

$L_b \le L_b'$

$f_l \;=\; f_{l1} \;=\; -3.872\;\text{ksi}$

$f_l \;=\; -3.872 \;\le\; 0.6F_{yf} \;=\; 30.000\;\text{ksi}$ ...... **OK**

▪ Web Plastification Factor, Rpc and Rpt (AASHTO LRFD Bridge, 2016, A6.2)

$$\lambda_{pw(Dcp)} = \frac{\sqrt{\dfrac{E}{F_{yc}}}}{\left(0.54\dfrac{M_p}{R_h\cdot M_y} - 0.09\right)^2} = 88.936 \;\le\; \lambda_{rw}\left(\frac{D_{cp}}{D_c}\right) = 137.274$$

in which :

$R_h \;=\; 1.000$

$\lambda_{rw} \;=\; 5.7\sqrt{\dfrac{E}{F_{yc}}} \;=\; 137.274$

$D_{cp} \;=\; 11.280\;\text{in}$

$D_c \;=\; 11.280\;\text{in}$

$\therefore\;\lambda_{pw(Dcp)} \;=\; 88.936$

$\dfrac{2\,D_{cp}}{t_w} \;=\; 32.000 \;\le\; \lambda_{pw(Dcp)}$ Therefore, Compact Web Section

$R_{pc} \;=\; \dfrac{M_p}{M_{yc}} \;=\; 1.130$

$R_{pt} \;=\; \dfrac{M_p}{M_{yt}} \;=\; 1.130$

▪ Flexural Resistance in Continuously Braced Tension Flange (AASHTO LRFD Bridge, 2016, A6.1.4)

$M_u \;=\; 185.424 \;\le\; \Phi_f\cdot R_{pt}\cdot M_{yt} \;=\; 23342.178\;\text{kips·in}$ ...... **OK**

in which :

$\Phi_f \;=\; 1.000$

▪ Local Buckling Resistance base on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, A6.3.2)

$\lambda_f \;=\; \dfrac{b_{fc}}{2\,t_{fc}} \;=\; 5.328$

$\lambda_{pf} \;=\; 0.38\sqrt{\dfrac{E}{F_{yc}}} \;=\; 9.152$

λ_{pf} = 0.38 √ $\frac{E}{F_{yc}}$ = 9.152

λ_f ≤ λ_{pf} Therefore, compact flange

$M_{nc(FLB)} = R_{pc} \cdot M_{yc} =$ 23342.178 kips·in

- Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\ r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

- Lateral-Torsional Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, A6..

F_{yr} = max[min(0.7F_{yc} , $R_h \cdot F_{yt} \cdot S_{xt}/S_{xc}$, F_{yw}) , 0.5F_{yc}] = 35.000 ksi

$$J = \frac{D \cdot t_w^3}{3} + \frac{b_{fc} \cdot t_{fc}^3}{3}\left(1 - 0.63\frac{t_{fc}}{b_{fc}}\right) + \frac{b_{ft} \cdot t_{ft}^3}{3}\left(1 - 0.63\frac{t_{ft}}{b_{ft}}\right) = 17.442 \text{ in}^4$$

$$L_r = 1.95\ r_t \frac{E}{F_{yr}} \sqrt{\left(\frac{J}{S_{xc} \cdot h}\right)} \sqrt{\left[1 + \sqrt{\left(1 + 6.76\left(\frac{F_{yr}}{E}\frac{S_{xc} \cdot h}{J}\right)^2\right)}\right]} = 411.710 \text{ in}$$

L_p < L_b ≤ L_r Therefore, noncompact unbraced length

$$M_{nc1(LTB)} = C_b\left[1 - \left(1 - \frac{F_{yr} \cdot S_{xc}}{R_{pc} \cdot M_{yc}}\right)\left(\frac{L_b - L_p}{L_r - L_p}\right)\right] R_{pc} \cdot M_{yc} = 22357.634 \text{ kips·in}$$

$$M_{nc(LTB)} = \min(M_{nc1(LTB)}, R_{pc} \cdot M_{yc}) = 22357.634 \text{ kips·in}$$

M_{nc} = min($M_{nc(FLB)}$, $M_{nc(LTB)}$) = 22357.634 ksi

- Flexural Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, A6.1.1)

$$M_{uy} + \frac{1}{3} f_l \cdot S_{xc} = 718.459 \quad \leq \quad \Phi_f \cdot M_{nc} = 22357.634 \text{ kips·in}$$

...... **OK**

in which :

S_{xc} = M_{yc} / F_{yc} = 413.016 in^3

Φ_f = 1.000

V. Strength Limit State - Shear Resistance

1. Shear

■ Max

1) Design Forces and Stresses

Loadcombination Name : scLCB1

Loadcombination Type : FX-MAX

Component	Vu (kips)			
	Steel	Long-term	Short-term	Sum
Forces	29.949	33.773	73.997	137.719

2) Shear Resistance (AASHTO LRFD Bridge, 2016, 6.10.9)

- Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)
- Web Classification

Longitudinal Stiffener : Not Exist

Transverse Stiffener : Not Exist

Transverse Spacing = 0.0 in < 3 D = 67.7 in
So, this web is considered unstiffened web

shear-buckling coefficient of unstiffened Webs
$k = 5.000$

$$\frac{D}{t_w} = 32.000 \le 1.12 \sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,
$C = 1.000$

- Nominal Resistance of Unstiffened interior Webs or End panel (AASHTO LRFD Bridge, 2016, 6.10.9.3.3)

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength
= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = 137.719 \le \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VI. Service Limit State

■ Positive moment

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MAX

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	0.123	-2.945	13.964	11.142
Stresses	Top	0.000	0.000	-0.002	-0.002
	Bot	0.000	-0.005	0.023	0.018

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

- Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{Dz1}}{S_g} + \frac{M_{Dz2}}{S_{LT}} + \frac{M_{Dz3}}{S_{ST}} = 0.021 \text{ ksi}$$

$f_l = 0.021 \le 0.6F_{yf} = 30.000$ ksi ...... **OK**

- Top Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

$f_f = -0.002$ ksi $\le 0.95\ R_h\ F_{yf} = 47.500$ ksi ...... **OK**

- Bottom Flange (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

$f_f + f_l / 2 = 0.029$ ksi $\le 0.95\ R_h\ F_{yf} = 47.500$ ksi ...... **OK**

in which :

f_f = flange stress due to the Service II loads calculated without consideration of flange lateral bending

F_{yf} = specified minimum yield strength of a flange (ksi)

▪ Postive Flexure and $\frac{D}{t_w}$ < proportion limit, skip Nominal Bend-buckling Resistance for webs check.

■ Negative moment

▪ Concrete Deck Effectiveness Check

f_r, modulus of rupture = 0.537 ksi

Service II factored longitudinal tensile stress in deck = 0.000 ksi

∴ Concrete deck is effective in tension

1) Design Forces and Stresses

Loadcombination Name : scLCB78

Loadcombination Type : FX-MIN

Component		M_s (kips·in) / $f_{c,t}$ (ksi)			
		Steel	Long-term	Short-term	Sum
Forces	(+)	0.123	-2.945	-135.232	-138.054
Stresses	Top	0.000	0.000	0.019	0.019
	Bot	0.000	-0.005	-0.220	-0.225

▪ Check stress of the concrete deck (AASHTO LRFD Bridge, 2016, 6.10.4.2)

f_{deck} = 0.015 ≤ 2 x 0.24 Φ x √ f_c' = 0.966 ksi **The concrete deck is effective**

in which :

$$f_{deck} = \frac{M \cdot y}{I \cdot n} = \frac{(\ -138.177\ ) \cdot (\ 10.713\ )}{(\ 14135.527\ ) \cdot (\ 7.118\ )} = 0.015 \text{ ksi}$$

$n = E_s / E_c = 7.118$

$\Phi = 0.900$

$f_c' = 5.000$ ksi

2) Permanent deformation (AASHTO LRFD Bridge, 2016, 6.10.4.2)

▪ This section is not a compact section in positive flexure, skip top and bottom flange stress check.

▪ Nominal Bend-buckling Resistance for webs (AASHTO LRFD Bridge, 2016, 6.10.4.2.2)

$$F_{crw} = \frac{0.9\ E \cdot k}{(\ D / t_w\ )^2} = 244.720 \text{ ksi} \quad \leq \quad \min(\ R_h \cdot F_{yc},\ F_{yw}/0.7\ ) = 50.000 \text{ ksi}$$

∴ F_{crw} = 50.000 ksi

in which :

D_c = 21.842 in

$k = 9 / (\ D_C / D\ )^2 = 9.601$

f_c = -0.225 ksi ≤ F_{crw} = 50.000 ksi **...... OK**

in which :

f_c = compression-flange stress at the section under consideration due to the Service II loads.

▪ Check minimum negative flexure concrete deck reinforcement (AASHTO LRFD Bridge, 2016, 6.10.1.7)

f_{deck} = 0.015 ≤ 0.24 Φ x √ f_c' = 0.483 ksi

in which :

$$f_{deck} = \frac{M \cdot y}{I \cdot n} = \frac{(\ -138.177\ ) \cdot (\ 10.713\ )}{(\ 14135.527\ ) \cdot (\ 7.118\ )} = 0.015 \text{ ksi}$$

$n = E_s / E_c = 7.118$

Φ = 0.900

f_c' = 5.000 ksi

$f_{deck} < 0.24\Phi\sqrt{f_c'}$

So, minimum negative flexure concrete deck reinforcement is not needed. ...... **OK**

VII. Constructibility

1. Flexure

■ Positive moment

1) Design Forces and Stresses

Construction Stage : Stage2-1

Step : 2

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only	T (kips·in)
Force	(+)	0.184	0.804
Stress (f_{bu})	Top	0.000	-
	Bot	0.000	

- Design Forces and Stresses(Unbraced Length)

Component		M_u (kips·in) / $f_{c,t}$ (ksi) Steel Section Only
Force	(+)	1781.117
Stress (f_{bu})	Top	-4.312
	Bot	4.312

2) Check slenderness of web (AASHTO LRFD Bridge, 2016, 6.10.6.2.3-1)

$$\frac{2 \cdot D_c}{t_w} = 32.000 \le 5.7\sqrt{\frac{E_s}{F_{yc}}} = 137.274$$ **.... Compact or noncompact Web**

in which :

D_c = 11.280 in

3) Discretely Braced Flanges in Compression (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

- Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

R_b = 1.000

- Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$$L_p = 1.0\, r_t \sqrt{\frac{E}{F_{yc}}} = 83.655 \text{ in}$$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474 \text{ in}$$

- Moment Gradient Modifer, Cb (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

Calculation of Stress (C6.4.10)

f_0 = 0.000 ksi

f_2 = 4.312 ksi

f_{mid} = 2.253 ksi

$f_1 \quad = \quad \max(\ 2f_{mid}\text{-}f_2\ ,\ f_0\ ) \quad = \quad 0.194$ ksi

$$C_b \quad = \quad \min(\quad 1.75 - 1.05(\frac{f_1}{f_2}) + 0.3(\frac{f_1}{f_2})^2\ ,\quad 2\ )$$

$$= \quad \min(\quad 1.75 - 1.05(\frac{0.194}{4.312}) + 0.3(\frac{0.194}{4.312})^2\ ,\quad 2\ ) = \quad 1.703$$

▪ Second-order elastic compression-flange Lateral bending stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

i. Because of discretely braced flange

$$f_l \quad = \quad \frac{M_{uz}}{S_l} \quad = \quad \frac{-0.751}{68.824} \quad = \quad -0.011 \text{ ksi}$$

ii. check L_b

$L_b \quad = \quad 120.000$ in

$$L_b' \quad = \quad \min(\ 1.2L_p\sqrt{\frac{C_b \cdot R_b}{f_{bu}/F_{yc}}}\ ,\quad 1.2L_p\sqrt{\frac{C_b \cdot R_b}{M_u/M_{yc}}}\ ) = \quad \min(\quad 446.123\quad ,\quad 1862.571\ ) = \quad 446.123 \text{ in}$$

$L_b \leq L_b'$

$f_l \quad = \quad f_{l1} \quad = \quad -0.011$ ksi

$f_l \quad = \quad -0.011 \quad \leq \quad 0.6F_{yf} \quad = \quad 30.000$ ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l \quad = \quad -4.323 \quad \leq \quad \Phi_f \cdot R_h \cdot F_{yc} \quad = \quad 50.000$ kips ...... **OK**

in which :

$\Phi_f \quad = \quad 1.000$

$R_h \quad = \quad 1.000$

② Check flexural resistance

$f_{bu} + f_l/3 \quad = \quad -4.316 \quad \leq \quad \Phi_f \cdot F_{nc} \quad = \quad 50.000$ ksi ...... **OK**

in which :

$\Phi_f \quad = \quad 1.000$

$F_{nc} \quad = \quad 50.000$ ksi

▪ Local Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.10.8.2.2)

$\lambda_f \quad = \quad b_{fc}\ /\ 2t_{fc} \quad = \quad 5.328$

$\lambda_{pf} \quad = \quad 0.38\sqrt{(E/F_{yc})} \quad = \quad 9.152$

▪ Web Load-Shedding Factor, Rb (AASHTO LRFD Bridge, 2016, 6.10.1.10.2)

In constructibility (AASHTO LRFD Bridge, 2016, 6.10.3.2.1)

$R_b \quad = \quad 1.000$

$\lambda_f \quad \leq \quad \lambda_{pf}$ Therefore,

$F_{nc(FLB)} \quad = \quad R_b \cdot R_h \cdot F_{yc} \quad = \quad 50.000$ ksi

in which :

$R_b \quad = \quad 1.000$

$R_h \quad = \quad 1.000$

▪ Limiting Unbraced Length, Lp (AASHTO LRFD Bridge, 2016, 6.10.8.2.3)

$L_p \quad = \quad 1.0\ r_t \sqrt{\frac{E}{\ }} \quad = \quad 83.655$ in

$L_p = 1.0\ r_t \sqrt{\frac{E}{F_{yc}}} = 83.653\ in$

in which :

r_t = effective radius of gyration for lateral torsional buckling

$$= \frac{b_{fc}}{\sqrt{12\left(1 + \frac{1}{3}\frac{D_c \cdot t_w}{b_{fc} \cdot t_{fc}}\right)}} = 3.474\ \text{in}$$

- Lateral-Torsional Buckling Resistance based on Discretely Braced Compression Flange (AASHTO LRFD Bridge, 2016, 6.1(

$$L_r = \pi\ r_t \sqrt{\frac{E}{F_{yr}}} = 314.118\ \text{in}$$

$L_p < L_b \leq L_r$ Therefore, noncompact unbraced length

$$F_{nc1(LTB)} = C_b\left[1 - \left(1 - \frac{F_{yr}}{R_h \cdot F_{yc}}\right)\left(\frac{L_b - L_p}{L_r - L_p}\right)\right] R_b \cdot R_h \cdot F_{yc} = 81.141\ \text{ksi}$$

$$F_{nc(LTB)} = \min(F_{nc1(LTB)}, R_b \cdot R_h \cdot F_{yc}) = 50.000\ \text{ksi}$$

in which :

R_b = 1.000

R_h = 1.000

$$F_{nc} = \min(F_{nc(FLB)}, F_{nc(LTB)}) = 50.000\ \text{ksi}$$

③ Check web bend buckling

For sections with compact or noncompact webs, shall not be checked.

4) Discretely Braced Flanges in Tension (AASHTO LRFD Bridge, 2016, 6.10.3.2.2)

- Flange Lateral bending Stress (AASHTO LRFD Bridge, 2016, 6.10.1.6)

Because of discretely braced tension flange.

$$f_l = \frac{M_{uz}}{S_l} = \frac{-0.751}{68.824} = -0.011\ \text{ksi}$$

f_l = -0.011 ≤ $0.6F_{yf}$ = 30.000 ksi ...... **OK**

① Check flange nominal yielding

$f_{bu} + f_l$ = 4.323 ≤ $\Phi_f \cdot R_h \cdot F_{yt}$ = 50.000 kips ...... **OK**

in which :

Φ_f = 1.000

R_h = 1.000

2. Shear

■ Max

1) Design Forces

Construction Stage : Stage2-1

Step : 2

Component	V_u (kips)
	Steel Section Only
Force	35.939

2) Shear requirement for webs (AASHTO LRFD Bridge, 2016, 6.10.3.3)

- Ratio of the shear-buckling resistance to the shear yield strength, C (AASHTO LRFD Bridge, 2016, 6.10.9.3.2)

shear-buckling coefficient of unstiffened Webs

$k = 5.000$

$$\frac{D}{t_w} = 32.000 \leq 1.12\sqrt{\frac{E \cdot k}{F_{yw}}} = 60.314$$

therefore,

$C = 1.000$

▪ Nominal Resistance of Unstiffened interior Webs or End panel

$V_p = 0.58F_{yw} \cdot D \cdot t_w = 461.239$ kips

$V_n = V_{cr} = C \cdot V_p = 461.239$ kips

in which :

C = ratio of the shear-buckling resistance to the shear yield strength

= 1.000

Transverse Spacing = 0.0 in < 1.5 D = 33.8 in ...... **OK**

$V_u = 35.939 \leq \varphi_v \cdot V_{cr} = \Phi_v \cdot V_n = 461.239$ kips ...... **OK**

in which :

$\Phi_v = 1.000$

VIII. Fatigue Limit State

■ Fatigue moment

1) Design Forces and Stresses

Loadcombination Name : scLCB102

Component		LCB	M_u (kips·in) / $f_{c,t}$ (ksi)			
			Steel	Long-term	Short-term	Sum
Forces	Top(Tens.)	-	0.000	-2.945	-78.029	-78.029
	Top(Comp.)	-	0.123	0.000	8.046	8.046
	Bot(Tens.)	-	0.123	0.000	8.046	8.046
	Bot(Comp.)	-	0.000	-2.945	-78.029	-78.029
Stresses	Top(Tens.)	-	0.000	0.000	0.004	0.004
	Top(Comp.)	-	0.000	0.000	0.000	0.000
	Bot(Tens.)	-	0.000	0.000	0.012	0.012
	Bot(Comp.)	-	0.000	-0.005	-0.120	-0.120

Loadcombination Name : scLCB98

Component	V_u (kips)
Shear Force	0.000

2) Load-Induced Fatigue (AASHTO LRFD Bridge, 2016, 6.6.1.2)

■ Top Flange

The stress from unfactored DL = 0.000 ksi (- : Compression)

The stress from fatigue LCB = 0.004 ksi

Check Load-Induced Fatigue. [(The compressive stress from unfactored DL) ≤ (The tensile stress from fatigue LCB)]

No	Category	$(ADTT)_{SL}$	Number of stress (n)
1	A	129.000	1.000

$(ADTT)_{SL}$(= 129.00) ≤ $(ADTT)_{SL}$ Equivalent to Infinite Life Table. 6.6.1.2.3-2 (= 530.00)
=> Check for fatigue II

For Fatigue II,
N = (365) · (75) · n · $(ADTT)_{SL}$ = 3.531E+06
∴ $(\Delta F)_n$ = $(A / N)^{1/3}$ = 19.201 ksi
in which :
A = 2.500E+10 ksi^3 (Table 6.6.1.2.5-1)

$\gamma(\Delta f)$ = 0.005 ksi < $(\Delta F)_n$ = 19.201 ksi (warping stress = 0.000 ksi) **...... OK**

■ Bottom Flange

The stress from unfactored DL = -0.004 ksi (- : Compression)
The stress from fatigue LCB = 0.012 ksi

Check Load-Induced Fatigue. [(The compressive stress from unfactored DL) ≤ (The tensile stress from fatigue LCB)]

No	Category	$(ADTT)_{SL}$	Number of stress (n)
1	A	129.000	1.000

$(ADTT)_{SL}$(= 129.00) ≤ $(ADTT)_{SL}$ Equivalent to Infinite Life Table. 6.6.1.2.3-2 (= 530.00)
=> Check for fatigue II

For Fatigue II,
N = (365) · (75) · n · $(ADTT)_{SL}$ = 3.531E+06
∴ $(\Delta F)_n$ = $(A / N)^{1/3}$ = 19.201 ksi
in which :
A = 2.500E+10 ksi^3 (Table 6.6.1.2.5-1)

$\gamma(\Delta f)$ = 0.133 ksi < $(\Delta F)_n$ = 19.201 ksi (warping stress = 0.000 ksi) **...... OK**

Beam Rating Input

Username: brr
Date: Friday, February 07, 2020 15:16:56

Bridge ID S-09-003 Maskwonicut Street over RR

NBI Structure ID (8): C13 (State)
Description:

Description

Location:	Sharon Massachusetts
Total Length:	54.50 *(ft)*
Facility Carried:	Maskwonicut St
Route Number:	
Feature Intersected:	MBTA/Amtrak RR
Mi Post:	*(mi)*
Units:	US Customary
Year Built:	2021
Recent ADTT:	
District:	
County:	
Owner:	State Highway Agency
National Highway System:	
Functional Class:	

Global Reference Point

X Coordinate:	0.000 *(ft)*
Y Coordinate:	0.000 *(ft)*
Elevation:	*(ft)*
Longitude:	*(Degrees)*
Latitude:	*(Degrees)*

Materials

Structural Steel

Name:	**Grade 50W**
Description:	AASHTO M270 Grade 50W
Specified minimum yield strength (Fy):	50.000 *(ksi)*
Specified minimum tensile strength (Fu):	70.000 *(ksi)*
Coefficient of thermal expansion:	0.0000065000 *(1/F)*
Density:	0.4900 *(kcf)*
Modulus of elasticity (E):	29000.00 *(ksi)*

Concrete

Name:	**Class A (US)**
Description:	Class A cement concrete
Specified compressive strength at 28 days (f'c):	4.000 *(ksi)*
Initial specified compressive strength (f'ci):	*(ksi)*
Coefficient of thermal expansion:	0.0000060000 *(1/F)*
Density (for dead loads):	0.150 *(kcf)*
Density (for modulus of elasticity):	0.145 *(kcf)*
Std Modulus of elasticity (Ec):	3644.15 *(ksi)*

LRFD Modulus of elasticity (Ec):	3644.15	*(ksi)*
Poisson's ratio:	0.200	
Modulus of rupture:	0.480	*(ksi)*
Shear factor:	1.000	
Composition of concrete:	Normal	
Std Initial modulus of elasticity (Eci):		*(ksi)*
LRFD Initial modulus of elasticity (Eci):		*(ksi)*
Splitting tensile strength (fct):		*(ksi)*

Reinforcing Steel

Name: **Grade 60**

Description: 60 ksi reinforcing steel

Specified yield strength (Fy):	60.000	*(ksi)*
Modulus of elasticity (Es):	29000.00	*(ksi)*
Ultimate strength (Fu):	90.000	*(ksi)*
Type:	Plain	

No prestressing strand materials.

No timber materials.

Beam Shapes

Steel Shapes

No steel angles.

Steel Channels

Name: **C 12x20.7**

Description: C 12x20.7 Imported from AISC Tables (2011)

Depth (d):	12.0000	*(in)*
Flange width (bf):	2.9400	*(in)*
Average flange thickness (tf):	0.5010	*(in)*
Web thickness (tw):	0.2820	*(in)*
k:	1.1300	*(in)*
Eo:	0.8700	*(in)*
X bar:	0.6980	*(in)*
Grip:		*(in)*
Cross sectional area:	6.080	*(in^2)*
Nominal load:	20.700	*(lb/ft)*
Ixx:	129.000	*(in^4)*
Iyy:	3.860	*(in^4)*
Maximum flange fastener:		*(in)*
Type:	Standard Channel	

Steel I Shapes

Name:	**W 18x60**	
Description:	W 18x60 Imported from AISC Tables (1994)	
Depth (d):		18.2400 *(in)*
Flange width (bf):		7.5550 *(in)*
Flange thickness (tf):		0.6950 *(in)*
Web thickness (tw):		0.4150 *(in)*
k:		1.3750 *(in)*
k1:		*(in)*
Cross sectional area:		17.600 *(in^2)*
Nominal load:		60.000 *(lb/ft)*
Ixx:		984.000 *(in^4)*
Iyy:		50.100 *(in^4)*
Zx:		123.000 *(in^3)*
Zy:		20.600 *(in^3)*
Nominal Depth:		18.0000 *(in)*
Type:		W Shape
Name:	**W 24x162**	
Description:	W 24x162 Imported from AISC Tables (1994)	
Depth (d):		25.0000 *(in)*
Flange width (bf):		12.9550 *(in)*
Flange thickness (tf):		1.2200 *(in)*
Web thickness (tw):		0.7050 *(in)*
k:		2.0000 *(in)*
k1:		*(in)*
Cross sectional area:		47.700 *(in^2)*
Nominal load:		162.000 *(lb/ft)*
Ixx:		5170.000 *(in^4)*
Iyy:		443.000 *(in^4)*
Zx:		468.000 *(in^3)*
Zy:		105.000 *(in^3)*
Nominal Depth:		24.0000 *(in)*
Type:		W Shape
Name:	**W 21x57**	
Description:	W 21x57 Imported from AISC Tables (1994)	
Depth (d):		21.0600 *(in)*
Flange width (bf):		6.5550 *(in)*
Flange thickness (tf):		0.6500 *(in)*
Web thickness (tw):		0.4050 *(in)*
k:		1.3750 *(in)*
k1:		*(in)*
Cross sectional area:		16.700 *(in^2)*
Nominal load:		57.000 *(lb/ft)*
Ixx:		1170.000 *(in^4)*
Iyy:		30.600 *(in^4)*
Zx:		129.000 *(in^3)*
Zy:		14.800 *(in^3)*
Nominal Depth:		21.0000 *(in)*
Type:		W Shape

No steel structural tee shapes.

Prestressed Shapes

No prestressed shapes.

Timber Shapes

No timber shapes.

Appurtenances

Parapets

Name:	**Parapet-15"**	
Description:		
X1:		14.0000 *(in)*
X2:		1.0000 *(in)*
X3:		-4.0000 *(in)*
Y1:		0.0000 *(in)*
Y2:		10.0000 *(in)*
Y3:		4.0000 *(in)*
Y4:		18.0000 *(in)*
Distance to Center of Gravity of Load:		*(in)*
Additional Load:		0.470 *(kip/ft)*
Concrete Density:		0.1500 *(kcf)*
Name:	**Parapet-18"**	
Description:		
X1:		17.0000 *(in)*
X2:		1.0000 *(in)*
X3:		-4.0000 *(in)*
Y1:		*(in)*
Y2:		10.0000 *(in)*
Y3:		4.0000 *(in)*
Y4:		18.0000 *(in)*
Distance to Center of Gravity of Load:		*(in)*
Additional Load:		0.470 *(kip/ft)*
Concrete Density:		0.1500 *(kcf)*

No concrete medians.

No concrete generics.

No steel railings.

Impact

Standard Impact Factor
Type: Standard - AASHTO
LRFD Dynamic Load Allowance
Fatigue and fracture limit states: 15.0 *(%)*
All other limit states: 33.0 *(%)*

Factors

No LFD Factors specified.

No LRFD Factors specified.

Bridge Alternatives Alternative1

Reference Line
Reference Line Length: *(ft)*
Starting Station: *(ft)*
Bearing: N 90^ 0' 0.00" E
Global Positioning
Distance: 0.000 *(ft)*
Offset: 0.000 *(ft)*
Elevation: *(ft)*

Structures
Name: Superstructure1
Description:

Structure Alternatives
Name: Superstructure Alt1
Description:
Superstructure Definition: Structure1

Superstructure Definition Structure1

Definition
Units: US Customary
Number of spans: 1
Number of girders: 6

Span	Length *(ft)*
1	54.5000

Frame Structure Simplified Definition:

Support	Frame Connection
1	
2	

Girder Spacing Display Type: Perpendicular
Average Humidity: *(%)*
<u>Analysis</u>
Default Library Factors
Factor Override
Analysis Module
Analysis Method: ASD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LFD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LRFD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LRFR
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: Distribution Factors
Analysis Module:
Analysis Module Component:
Properties:

Default rating method: LFD

<u>Impact</u>
Standard Impact Factor
Type: Standard - AASHTO
LRFD Dynamic Load Allowance
Fatigue and fracture limit states: 15.0 *(%)*
All other limit states: 33.0 *(%)*

<u>Structure Framing Plan Details</u>
<u>Layout</u>

Support	Skew *(Degrees)*
1	0.0000
2	0.0000

Girder Spacing Orientation: Perpendicular

Girder Bay	Girder Spacing Start	End

	(ft)	*(ft)*
1	6.0000	6.0000
2	6.0000	6.0000
3	6.0000	6.0000
4	6.0000	6.0000
5	6.0000	6.0000

Diaphragms

Girder Bay 1

Distance Left Girder	Distance Right Girder	Diaphragm Spacing	Number of Spaces	Diaphragm Weight
(ft)	*(ft)*	*(ft)*		*(kip)*
0.00	0.00	0.00	1	1.7000
0.00	0.00	13.62	3	3.4000
54.50	54.50	0.00	1	1.7000

Girder Bay 2

Distance Left Girder	Distance Right Girder	Diaphragm Spacing	Number of Spaces	Diaphragm Weight
(ft)	*(ft)*	*(ft)*		*(kip)*
0.00	0.00	0.00	1	1.7000
0.00	0.00	13.62	3	3.4000
54.50	54.50	0.00	1	1.7000

Girder Bay 3

Distance Left Girder	Distance Right Girder	Diaphragm Spacing	Number of Spaces	Diaphragm Weight
(ft)	*(ft)*	*(ft)*		*(kip)*
0.00	0.00	0.00	1	1.7000
0.00	0.00	13.62	3	3.4000
54.50	54.50	0.00	1	1.7000

Girder Bay 4

Distance Left Girder	Distance Right Girder	Diaphragm Spacing	Number of Spaces	Diaphragm Weight
(ft)	*(ft)*	*(ft)*		*(kip)*
0.00	0.00	0.00	1	1.7000
0.00	0.00	13.62	3	3.4000
54.50	54.50	0.00	1	1.7000

Girder Bay 5

Distance Left Girder	Distance Right Girder	Diaphragm Spacing	Number of Spaces	Diaphragm Weight
(ft)	*(ft)*	*(ft)*		*(kip)*
0.00	0.00	0.00	1	1.7000
0.00	0.00	13.62	3	3.4000
54.50	54.50	0.00	1	1.7000

Structure Typical Section

Deck

Left start width:	19.17	*(ft)*
Left end width:	19.17	*(ft)*
Right start width:	15.41	*(ft)*
Right end width:	15.41	*(ft)*
Left start overhang:	2.29	*(ft)*

Left end overhang: 2.29 *(ft)*

Deck (Cont'd)
Deck concrete: Class A (US)
Total deck thickness: 8.7500 *(in)*
Deck crack control parameter: *(kip/in)*
Sustained modular ratio factor:
Parapet

Name	Load Case	Measure To	Measured From	Distance At Start	Distance At End	Front Face Orientation
Parapet-1...	DC2	Front	Left Ed...	0.17	0.17	Left
Parapet-1...	DC2	Front	Right E...	0.17	0.17	Right

Sidewalk

Width	Thickness At End	Material	Load Case	Measure to	Measured From		At Start
72.0000	11.0000	Class A...	DC2		Left Ed...	1.17	...
72.0000	0.7500	Class A...	DC2		Left Ed...	1.17	...

Lane Position
Offset Left Start: -12.00 *(ft)*
Offset Left End: -12.00 *(ft)*
Offset Right Start: 0.00 *(ft)*
Offset Right End: 0.00 *(ft)*
Offset Left Start: 0.00 *(ft)*
Offset Left End: 0.00 *(ft)*
Offset Right Start: 14.00 *(ft)*
Offset Right End: 14.00 *(ft)*
Wearing Surface
Wearing surface material: Bit. Conc.
Description:
Wearing surface thickness: 3.0000 *(in)*
Wearing surface density: 145.000 *(pcf)*
Load case: DC2

Load Case Description

Load Case Name	Description	Stage	Type	Time *(Days)*
DC1		Non-composite (Sta...	D,DC	
DC2		Composite (long te...	D,DC	
DW		Composite (long te...	D,DW	

Superstructure Loads
DL Distribution
Stage 1 Dead Load Distribution: Tributary Area
Stage 2 Dead Load Distribution: Uniformly to All Girders

Shear Connector Definitions
Name: Stud1
Connector Type: Stud
Stud Diameter: 0.8750 *(in)*
Stud Height: 8.0000 *(in)*

LRFD Steel Minimum Tensile Strength: 40.000 *(ksi)*

Stiffener Definitions
No prestress stress limits.

No prestress properties.

No vertical shear reinforcement definitions.

No horizontal shear reinforcement definitions.

Member Member 1

Link with: None
Description: Girder member generated using the design wizard

Existing: Wizard Alternative - Member alternative generated using the design wizard
Current: Wizard Alternative - Member alternative generated using the design wizard
Number of Spans: 1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name
1				
2				

Support Constraints

General

Support Number	Support Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic

Support Number	X Translation *(kip/ft)*	Y Translation *(kip/ft)*	Z Rotation *(kip-in/rad)*	Override Computed Z Rotation
1				
2				

Member Alternative Wizard Alternative

Description: Member alternative generated using the design wizard

Description

Material Type:	Steel
Girder Type:	Rolled
Member units:	US Customary
Girder property input method:	Schedule based
Left end X:	*(in)*
Right end X:	*(in)*
Additional Self Load:	*(kip/ft)*
Additional Self Load %:	*(%)*

Analysis Module

Analysis Method:	ASD
Analysis Module:	
Analysis Module Component:	
Properties:	

Analysis Method:	LFD
Analysis Module:	AASHTO LFD
Analysis Module Component:	
Properties:	

Analysis Method:	LRFD
Analysis Module:	AASHTO LRFD
Analysis Module Component:	
Properties:	

Analysis Method:	LRFR
Analysis Module:	AASHTO LRFR
Analysis Module Component:	
Properties:	

Analysis Method:	Distribution Factors
Analysis Module:	
Analysis Module Component:	
Properties:	

Default rating method: LRFR

Factors

Factor Override

LRFD:

LFD:

ASD Factors

	Inventory	Operating
Structural steel		
Concrete		
PS Concrete Comp.		
PS Concrete Tens.		

PS Moment Cap.	
Reinforcement	
Bearing Stiffener	
Stirrup	
Timber	NA

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact

Standard Impact Factor

Type: Standard - AASHTO

LRFD Dynamic Load Allowance

Fatigue and fracture limit states:	15.0 *(%)*
All other limit states:	33.0 *(%)*

Live Load Distribution

Standard

	Distribution Factor (Wheels)			
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape:	W 24x162
Distance:	0.00 *(ft)*
Length:	54.50 *(ft)*
Material:	Grade 50W

Deck Profile

Deck Concrete

Material (LRFD)	Distance	Length	Total Thickness	Structural Thickness	Effective Width (Std)	Effective Width
	(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start Distance	Length	Connector Name	Number per Row	Number of Spaces	Transverse Spacing
(ft)	*(ft)*				*(in)*
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance	Length	Z1	Z2	Z3	Z4	Y1	Y2
(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in)*
0.00	54.50					4.0000	4.0000

Bracing Ranges

Lateral Support

Distance	Length
(ft)	*(ft)*
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support: 24.52 *(ft)*
Side: Right

Transverse Stiffeners

Override Schedule: FALSE
Stiffener spacing: *(in)*
Stiffener width: *(in)*
Stiffener thickness: *(in)*
Material: Grade 50W
Stiffener number: Single
Stiffener type: Plate

Other Stiffeners

Bearing Stiffener

Override Schedule: FALSE
Stiffener width: *(in)*
Stiffener thickness: *(in)*
Material: Grade 50W
Clip: *(in)*
Number of pairs:
Pair spacing: *(in)*
Attachment Type: Welds

Longitudinal Stiffener

Override Schedule: FALSE
Stiffener width: *(in)*
Stiffener thickness: *(in)*
Material: Grade 50W
Distance from flange to stiffener: *(in)*
Distance measured from: Top Flange

Fatigue

Number of cycles: 0

Bracing

Deck provides lateral support:
Override diaphragm schedule: FALSE
Distance to left diaphragm: *(ft)*

Distance to right diaphragm:	*(ft)*	
Diaphragm at this location:	FALSE	

ASD

Compression flange unsupported length:	*(ft)*	
Tension Field Action	Ignore combined shear and bending	

Riveted Section

Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Member   Member 2

Link with: None
Description: Girder member generated using the design wizard

Existing: Wizard Alternative - Member alternative generated using the design wizard
Current: Wizard Alternative - Member alternative generated using the design wizard
Number of Spans: 1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name
1				
2				

Support Constraints

General

Support Number	Support Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic

Support	X Translation	Y Translation	Z Rotation	Override Computed

Number	*(kip/ft)*	*(kip/ft)*	*(kip-in/rad)*	Z Rotation
1				
2				

Member Alternative Wizard Alternative

Description: Member alternative generated using the design wizard

Description

Material Type: Steel
Girder Type: Rolled
Member units: US Customary
Girder property input method: Schedule based
Left end X: *(in)*
Right end X: *(in)*
Additional Self Load: *(kip/ft)*
Additional Self Load %: *(%)*

Analysis Module

Analysis Method: ASD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LFD
Analysis Module: AASHTO LFD
Analysis Module Component:
Properties:

Analysis Method: LRFD
Analysis Module: AASHTO LRFD
Analysis Module Component:
Properties:

Analysis Method: LRFR
Analysis Module: AASHTO LRFR
Analysis Module Component:
Properties:

Analysis Method: Distribution Factors
Analysis Module:
Analysis Module Component:
Properties:

Default rating method: LRFR

Factors

Factor Override

LRFD:

LFD:

ASD Factors

	Inventory	Operating
Structural steel		

Concrete	
PS Concrete Comp.	
PS Concrete Tens.	
PS Moment Cap.	
Reinforcement	
Bearing Stiffener	
Stirrup	
Timber	NA

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact

Standard Impact Factor

Type: Standard - AASHTO

LRFD Dynamic Load Allowance

Fatigue and fracture limit states:	15.0 *(%)*
All other limit states:	33.0 *(%)*

Live Load Distribution

Standard

	Distribution Factor (Wheels)			
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape:	W 24x162
Distance:	0.00 *(ft)*
Length:	54.50 *(ft)*
Material:	Grade 50W

Deck Profile

Deck Concrete

Material (LRFD)	Distancen	Length	Total Thickness	Structural Thickness	Effective Width (Std)	Effective Width
	(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start	Connector	Number	Number of	Transverse

Distance	Length	Name	per Row	Spaces	Spacing
(ft)	*(ft)*				*(in)*
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance	Length	Z1	Z2	Y1
(ft)	*(ft)*	*(in)*	*(in)*	*(in)*
0.00	54.50			4.0000

Bracing Ranges

Lateral Support

Distance	Length
(ft)	*(ft)*
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support: 24.52 *(ft)*

Side: Right

Transverse Stiffeners

Override Schedule: FALSE

Stiffener spacing: *(in)*

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Stiffener number: Single

Stiffener type: Plate

Other Stiffeners

Bearing Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Clip: *(in)*

Number of pairs:

Pair spacing: *(in)*

Attachment Type: Welds

Longitudinal Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Distance from flange to stiffener: *(in)*

Distance measured from: Top Flange

Fatigue

Number of cycles: 0

Bracing

Deck provides lateral support:	
Override diaphragm schedule:	FALSE
Distance to left diaphragm:	*(ft)*
Distance to right diaphragm:	*(ft)*
Diaphragm at this location:	FALSE

ASD

Compression flange unsupported length:	*(ft)*
Tension Field Action	Ignore combined shear and bending

Riveted Section

Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Member Member 3

Link with: None

Description: Girder member generated using the design wizard

Existing: Wizard Alternative - Member alternative generated using the design wizard

Current: Wizard Alternative - Member alternative generated using the design wizard

Number of Spans: 1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name
1				
2				

Support Constraints

General

Support Number	Support Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic

Support Number	X Translation *(kip/ft)*	Y Translation *(kip/ft)*	Z Rotation *(kip-in/rad)*	Override Computed Z Rotation
1				
2				

Member Alternative Wizard Alternative

Description: Member alternative generated using the design wizard

Description

Material Type: Steel
Girder Type: Rolled
Member units: US Customary
Girder property input method: Schedule based
Left end X: *(in)*
Right end X: *(in)*
Additional Self Load: *(kip/ft)*
Additional Self Load %: *(%)*

Analysis Module

Analysis Method: ASD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LFD
Analysis Module: AASHTO LFD
Analysis Module Component:
Properties:

Analysis Method: LRFD
Analysis Module: AASHTO LRFD
Analysis Module Component:
Properties:

Analysis Method: LRFR
Analysis Module: AASHTO LRFR
Analysis Module Component:
Properties:

Analysis Method: Distribution Factors
Analysis Module:
Analysis Module Component:
Properties:

Default rating method: LRFR

Factors

Factor Override

LRFD:
LFD:

ASD Factors

	Inventory	Operating
Structural steel		
Concrete		
PS Concrete Comp.		
PS Concrete Tens.		
PS Moment Cap.		
Reinforcement		
Bearing Stiffener		
Stirrup		
Timber	NA	

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact

Standard Impact Factor

Type: Standard - AASHTO

LRFD Dynamic Load Allowance

Fatigue and fracture limit states: 15.0 *(%)*

All other limit states: 33.0 *(%)*

Live Load Distribution

Standard

	Distribution Factor (Wheels)			
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape:	W 24x162
Distance:	0.00 *(ft)*
Length:	54.50 *(ft)*
Material:	Grade 50W

Deck Profile

Deck Concrete

Material (LRFD)	Distancen *(ft)*	Length *(ft)*	Total Thickness *(in)*	Structural Thickness *(in)*	Effective Width (Std) *(in)*	Effective Width *(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start Distance (ft)	Length (ft)	Connector Name	Number per Row	Number of Spaces	Transverse Spacing (in)
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance (ft)	Length (ft)	Z1 (in)	Z2 (in)	Y1 (in)
0.00	54.50			4.0000

Bracing Ranges

Lateral Support

Distance (ft)	Length (ft)
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support: 24.52 *(ft)*

Side: Right

Transverse Stiffeners

Override Schedule: FALSE

Stiffener spacing: *(in)*

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Stiffener number: Single

Stiffener type: Plate

Other Stiffeners

Bearing Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Clip: *(in)*

Number of pairs:

Pair spacing: *(in)*

Attachment Type: Welds

Longitudinal Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Distance from flange to stiffener: *(in)*

Distance measured from: Top Flange

Fatigue

Number of cycles:	0

Bracing

Deck provides lateral support:	
Override diaphragm schedule:	FALSE
Distance to left diaphragm:	*(ft)*
Distance to right diaphragm:	*(ft)*
Diaphragm at this location:	FALSE

ASD

Compression flange unsupported length:	*(ft)*
Tension Field Action	Ignore combined shear and bending

Riveted Section

Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Member Member 4

Link with: None
Description: Girder member generated using the design wizard

Existing:	Wizard Alternative - Member alternative generated using the design wizard
Current:	Wizard Alternative - Member alternative generated using the design wizard
Number of Spans:	1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name
1				
2				

Support Constraints

General

Support Support

Number	Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic Support Number	X Translation *(kip/ft)*	Y Translation *(kip/ft)*	Z Rotation *(kip-in/rad)*	Override Computed Z Rotation
1				
2				

Member Alternative Wizard Alternative

Description: Member alternative generated using the design wizard

Description

Material Type: Steel
Girder Type: Rolled
Member units: US Customary
Girder property input method: Schedule based
Left end X: *(in)*
Right end X: *(in)*
Additional Self Load: *(kip/ft)*
Additional Self Load %: *(%)*

Analysis Module

Analysis Method: ASD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LFD
Analysis Module: AASHTO LFD
Analysis Module Component:
Properties:

Analysis Method: LRFD
Analysis Module: AASHTO LRFD
Analysis Module Component:
Properties:

Analysis Method: LRFR
Analysis Module: AASHTO LRFR
Analysis Module Component:
Properties:

Analysis Method: Distribution Factors
Analysis Module:
Analysis Module Component:
Properties:

Default rating method: LRFR

Factors

Factor Override
LRFD:
LFD:
ASD Factors

	Inventory	Operating
Structural steel		
Concrete		
PS Concrete Comp.		
PS Concrete Tens.		
PS Moment Cap.		
Reinforcement		
Bearing Stiffener		
Stirrup		
Timber	NA	

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact
Standard Impact Factor
Type: Standard - AASHTO
LRFD Dynamic Load Allowance
Fatigue and fracture limit states: 15.0 *(%)*
All other limit states: 33.0 *(%)*

Live Load Distribution
Standard

	Distribution Factor (Wheels)			
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape:	W 24x162
Distance:	0.00 *(ft)*
Length:	54.50 *(ft)*
Material:	Grade 50W

Deck Profile
Deck Concrete

Material	Distance	Length	Total Thickness	Structural Thickness	Effective Width (Std)	Effective Width

(LRFD)	n					
	(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start Distance	Length	Connector Name	Number per Row	Number of Spaces	Transverse Spacing
(ft)	*(ft)*				*(in)*
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance	Length	Z1	Z2	Y1
(ft)	*(ft)*	*(in)*	*(in)*	*(in)*
0.00	54.50			4.0000

Bracing Ranges

Lateral Support

Distance	Length
(ft)	*(ft)*
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support: 24.52 *(ft)*

Side: Right

Transverse Stiffeners

Override Schedule: FALSE

Stiffener spacing: *(in)*

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Stiffener number: Single

Stiffener type: Plate

Other Stiffeners

Bearing Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Clip: *(in)*

Number of pairs:

Pair spacing: *(in)*

Attachment Type: Welds

Longitudinal Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material:	Grade 50W
Distance from flange to stiffener:	*(in)*
Distance measured from:	Top Flange
Fatigue	
Number of cycles:	0
Bracing	
Deck provides lateral support:	
Override diaphragm schedule:	FALSE
Distance to left diaphragm:	*(ft)*
Distance to right diaphragm:	*(ft)*
Diaphragm at this location:	FALSE
ASD	
Compression flange unsupported length:	*(ft)*
Tension Field Action	Ignore combined shear and bending
Riveted Section	
Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Member Member 5

Link with: None

Description: Girder member generated using the design wizard

Existing: Wizard Alternative - Member alternative generated using the design wizard

Current: Wizard Alternative - Member alternative generated using the design wizard

Number of Spans: 1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name
1				
2				

Support Constraints

General

Support Number	Support Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic

Support Number	X Translation *(kip/ft)*	Y Translation *(kip/ft)*	Z Rotation *(kip-in/rad)*	Override Computed Z Rotation
1				
2				

Member Alternative **Wizard Alternative**

Description: Member alternative generated using the design wizard

Description

Material Type: Steel

Girder Type: Rolled

Member units: US Customary

Girder property input method: Schedule based

Left end X: *(in)*

Right end X: *(in)*

Additional Self Load: *(kip/ft)*

Additional Self Load %: *(%)*

Analysis Module

Analysis Method: ASD

Analysis Module:

Analysis Module Component:

Properties:

Analysis Method: LFD

Analysis Module: AASHTO LFD

Analysis Module Component:

Properties:

Analysis Method: LRFD

Analysis Module: AASHTO LRFD

Analysis Module Component:

Properties:

Analysis Method: LRFR

Analysis Module: AASHTO LRFR

Analysis Module Component:

Properties:

Analysis Method: Distribution Factors

Analysis Module:

Analysis Module Component:

Properties:

Default rating method: LRFR

Factors

Factor Override

LRFD:

LFD:

ASD Factors

	Inventory	Operating
Structural steel		
Concrete		
PS Concrete Comp.		
PS Concrete Tens.		
PS Moment Cap.		
Reinforcement		
Bearing Stiffener		
Stirrup		
Timber	NA	

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact

Standard Impact Factor

Type: Standard - AASHTO

LRFD Dynamic Load Allowance

Fatigue and fracture limit states: 15.0 *(%)*

All other limit states: 33.0 *(%)*

Live Load Distribution

Standard

Distribution Factor (Wheels)				
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape:	W 24x162
Distance:	0.00 *(ft)*
Length:	54.50 *(ft)*
Material:	Grade 50W

Deck Profile

Deck Concrete

Material (LRFD)	Distance	Length	Total Thickness	Structural Thickness	Effective Width (Std)	Effective Width
	(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start Distance	Length	Connector Name	Number per Row	Number of Spaces	Transverse Spacing
(ft)	*(ft)*				*(in)*
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance	Length	Z1	Z2	Y1
(ft)	*(ft)*	*(in)*	*(in)*	*(in)*
0.00	54.50			4.0000

Bracing Ranges

Lateral Support

Distance	Length
(ft)	*(ft)*
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support:	24.52 *(ft)*
Side:	Right
Transverse Stiffeners	
Override Schedule:	FALSE
Stiffener spacing:	*(in)*
Stiffener width:	*(in)*
Stiffener thickness:	*(in)*
Material:	Grade 50W
Stiffener number:	Single
Stiffener type:	Plate
Other Stiffeners	
Bearing Stiffener	
Override Schedule:	FALSE
Stiffener width:	*(in)*
Stiffener thickness:	*(in)*
Material:	Grade 50W
Clip:	*(in)*
Number of pairs:	
Pair spacing:	*(in)*
Attachment Type:	Welds
Longitudinal Stiffener	

Override Schedule:	FALSE
Stiffener width:	*(in)*
Stiffener thickness:	*(in)*
Material:	Grade 50W
Distance from flange to stiffener:	*(in)*
Distance measured from:	Top Flange
Fatigue	
Number of cycles:	0
Bracing	
Deck provides lateral support:	
Override diaphragm schedule:	FALSE
Distance to left diaphragm:	*(ft)*
Distance to right diaphragm:	*(ft)*
Diaphragm at this location:	FALSE
ASD	
Compression flange unsupported length:	*(ft)*
Tension Field Action	Ignore combined shear and bending
Riveted Section	
Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Member Member 6

Link with: None

Description: Girder member generated using the design wizard

Existing: Wizard Alternative - Member alternative generated using the design wizard

Current: Wizard Alternative - Member alternative generated using the design wizard

Number of Spans: 1

Span Number	Span Length *(ft)*
1	54.500000

Support	Frame Connection
1	
2	

Pedestrian load: *(lb/ft)*

Member Loads

Member Loads - Settlement

Support Number	Horizontal *(in)*	Vertical *(in)*	Rotational *(Radians)*	Load Case Name

1
2

Support Constraints

General

Support Number	Support Type	X Translation	Y Translation	Z Rotation
1	Pinned	Fixed	Fixed	Free
2	Roller	Free	Fixed	Free

Elastic

Support Number	X Translation *(kip/ft)*	Y Translation *(kip/ft)*	Z Rotation *(kip-in/rad)*	Override Computed Z Rotation
1				
2				

Member Alternative   Wizard Alternative

Description: Member alternative generated using the design wizard

Description

Material Type: Steel
Girder Type: Rolled
Member units: US Customary
Girder property input method: Schedule based
Left end X: *(in)*
Right end X: *(in)*
Additional Self Load: *(kip/ft)*
Additional Self Load %: *(%)*

Analysis Module

Analysis Method: ASD
Analysis Module:
Analysis Module Component:
Properties:

Analysis Method: LFD
Analysis Module: AASHTO LFD
Analysis Module Component:
Properties:

Analysis Method: LRFD
Analysis Module: AASHTO LRFD
Analysis Module Component:
Properties:

Analysis Method: LRFR
Analysis Module: AASHTO LRFR
Analysis Module Component:
Properties:

Analysis Method: Distribution Factors
Analysis Module:

Analysis Module Component:
Properties:

Default rating method: LRFR

Factors

Factor Override

LRFD:

LFD:

ASD Factors

	Inventory	Operating
Structural steel		
Concrete		
PS Concrete Comp.		
PS Concrete Tens.		
PS Moment Cap.		
Reinforcement		
Bearing Stiffener		
Stirrup		
Timber	NA	

Default Materials

Structural steel:	Grade 50W
Deck concrete:	Class A (US)
Deck reinforcement:	Grade 60
Welds:	
Bolts:	

Impact

Standard Impact Factor

Type: Standard - AASHTO

LRFD Dynamic Load Allowance

Fatigue and fracture limit states: 15.0 *(%)*

All other limit states: 33.0 *(%)*

Live Load Distribution

Standard

	Distribution Factor (Wheels)			
Lanes Loaded	Shear	Shear at Supports	Moment	Deflection
1 Lane				
Multi-Lane				

Girder Profile

Shape

Shape: W 24x162

Distance: 0.00 *(ft)*

Length: 54.50 *(ft)*

Material: Grade 50W

Deck Profile

Deck Concrete

Material (LRFD)	Distance n	Length	Total Thickness	Structural Thickness	Effective Width (Std)	Effective Width
	(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*
Class A (US)	0.00	54.50	8.0000	8.0000		9.0000

Shear Connectors

Start Distance	Length	Connector Name	Number per Row	Number of Spaces	Transverse Spacing
(ft)	*(ft)*				*(in)*
0.00	54.50	Composite			

Haunch Profile

Haunch Type: Flange edges

Embedded flange: FALSE

Distance	Length	Z1	Z2	Z3	Z4	Y1	Y2
(ft)	*(ft)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in)*	*(in)*
0.00	54.50					4.0000	4.0000

Bracing Ranges

Lateral Support

Distance	Length
(ft)	*(ft)*
0.00	54.50

Bearing Stiffener Locations

Points of Interest

Distance from left most support: 24.52 *(ft)*

Side: Right

Transverse Stiffeners

Override Schedule: FALSE

Stiffener spacing: *(in)*

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Stiffener number: Single

Stiffener type: Plate

Other Stiffeners

Bearing Stiffener

Override Schedule: FALSE

Stiffener width: *(in)*

Stiffener thickness: *(in)*

Material: Grade 50W

Clip: *(in)*

Number of pairs:

Pair spacing:	*(in)*
Attachment Type:	Welds
Longitudinal Stiffener	
Override Schedule:	FALSE
Stiffener width:	*(in)*
Stiffener thickness:	*(in)*
Material:	Grade 50W
Distance from flange to stiffener:	*(in)*
Distance measured from:	Top Flange
Fatigue	
Number of cycles:	0
Bracing	
Deck provides lateral support:	
Override diaphragm schedule:	FALSE
Distance to left diaphragm:	*(ft)*
Distance to right diaphragm:	*(ft)*
Diaphragm at this location:	FALSE
ASD	
Compression flange unsupported length:	*(ft)*
Tension Field Action	Ignore combined shear and bending
Riveted Section	
Net moment of inertia:	*(in^4)*
Distance to centroid:	*(in)*
Net area of web:	*(in^2)*
Top plate allowable shear:	*(ksi)*
Bottom plate allowable shear:	*(ksi)*
Percent area top flange:	*(%)*
Percent area bottom flange:	*(%)*

Beam Rating Output

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:09

Structure Definition Name: Structure1
Member Name: Member 1
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	3.414	STRENGTH-I Steel Flexure Stress	68.27	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	4.425	STRENGTH-I Steel Flexure Stress	88.50	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.898	STRENGTH-I Steel Flexure Stress	68.31	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	2.460	STRENGTH-I Steel Flexure Stress	88.56	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	2.378	STRENGTH-I Steel Flexure Stress	85.62	1	24.52	45.0	As Requested	As Requested
HS 20-44	Operating	3.083	STRENGTH-I Steel Flexure Stress	110.99	1	24.52	45.0	As Requested	As Requested
Type 3	Legal	3.821	STRENGTH-I Steel Flexure Stress	95.53	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	3.910	STRENGTH-I Steel Flexure Stress	140.75	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.81	N/A	17.48	Axle Load	0.00	Lane
2	41.81	N/A	17.48	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	202.28	N/A	85.20	Axle Load	0.00	Lane
6.81(B)	12.5	246.31	N/A	103.37	Axle Load	0.00	Lane
10.90(B)	20.0	362.69	N/A	150.33	Axle Load	0.00	Lane
13.62(L)	25.0	427.20	N/A	175.36	Axle Load	0.00	Lane
13.62(R)	25.0	427.20	N/A	175.36	Axle Load	0.00	Lane
16.35(B)	30.0	476.61	N/A	195.37	Axle Load	0.00	Lane
20.44(B)	37.5	531.11	N/A	215.97	Axle Load	0.00	Lane
21.80(B)	40.0	544.04	N/A	220.33	Axle Load	0.00	Lane
24.52(B)	45.0	562.05	N/A	225.28	Axle Load	0.00	Lane
27.25(L)	50.0	569.60	N/A	225.21	Axle Load	0.00	Lane
27.25(R)	50.0	569.60	N/A	225.21	Axle Load	0.00	Lane
32.70(B)	60.0	544.04	N/A	220.33	Axle Load	0.00	Lane
34.06(B)	62.5	531.11	N/A	215.97	Axle Load	0.00	Lane
38.15(B)	70.0	476.61	N/A	195.37	Axle Load	0.00	Lane
40.87(L)	75.0	427.20	N/A	175.36	Axle Load	0.00	Lane
40.87(R)	75.0	427.20	N/A	175.36	Axle Load	0.00	Lane
43.60(B)	80.0	362.69	N/A	150.33	Axle Load	0.00	Lane
47.69(B)	87.5	246.31	N/A	103.37	Axle Load	0.00	Lane
49.05(B)	90.0	202.28	N/A	85.20	Axle Load	0.00	Lane
54.50(L)	100.0	0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.96	N/A	17.48	Axle Load	0.00	Lane
5.45(B)	10.0	33.27	N/A	15.63	Axle Load	-1.47	Axle Load
6.81(B)	12.5	31.35	N/A	15.17	Axle Load	-1.84	Axle Load
10.90(B)	20.0	25.59	N/A	13.79	Axle Load	-2.95	Axle Load
13.62(L)	25.0	21.75	N/A	12.87	Axle Load	-3.68	Axle Load
13.62(R)	25.0	20.05	N/A	12.87	Axle Load	-3.68	Axle Load
16.35(B)	30.0	16.21	N/A	11.95	Axle Load	-4.58	Axle Load
20.44(B)	37.5	10.45	N/A	10.57	Axle Load	-5.96	Axle Load
21.80(B)	40.0	8.53	N/A	10.11	Axle Load	-6.42	Axle Load
24.52(B)	45.0	4.69	N/A	9.19	Axle Load	-7.34	Axle Load
27.25(L)	50.0	0.85	N/A	8.26	Axle Load	-8.26	Axle Load
27.25(R)	50.0	-0.85	N/A	8.26	Axle Load	-8.26	Axle Load
32.70(B)	60.0	-8.53	N/A	6.42	Axle Load	-10.11	Axle Load
34.06(B)	62.5	-10.45	N/A	5.96	Axle Load	-10.57	Axle Load
38.15(B)	70.0	-16.21	N/A	4.58	Axle Load	-11.95	Axle Load
40.87(L)	75.0	-20.05	N/A	3.68	Axle Load	-12.87	Axle Load
40.87(R)	75.0	-21.75	N/A	3.68	Axle Load	-12.87	Axle Load
43.60(B)	80.0	-25.59	N/A	2.95	Axle Load	-13.79	Axle Load
47.69(B)	87.5	-31.35	N/A	1.84	Axle Load	-15.17	Axle Load
49.05(B)	90.0	-33.27	N/A	1.47	Axle Load	-15.63	Axle Load
54.50(L)	100.0	-40.96	N/A	-0.00	Lane	-17.48	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.81	N/A	33.52	Truck + Lane	0.00	Tandem + Lane
2	41.81	N/A	33.52	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	202.28	N/A	161.32	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	246.31	N/A	194.98	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	362.69	N/A	279.92	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	427.20	N/A	323.20	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	427.20	N/A	323.20	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	476.61	N/A	355.79	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	531.11	N/A	391.10	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	544.04	N/A	399.25	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	562.05	N/A	407.53	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	569.60	N/A	405.14	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	569.60	N/A	405.14	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	544.04	N/A	399.25	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	531.11	N/A	391.10	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	476.61	N/A	355.79	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	427.20	N/A	323.20	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	427.20	N/A	323.20	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	362.69	N/A	279.92	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	246.31	N/A	194.98	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	202.28	N/A	161.32	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.96	N/A	33.52	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	33.27	N/A	29.06	Truck + Lane	-1.53	Truck + Lane
6.81(B)	12.5	31.35	N/A	27.96	Truck + Lane	-2.13	Tandem + Lane
10.90(B)	20.0	25.59	N/A	24.71	Truck + Lane	-4.00	Tandem + Lane
13.62(L)	25.0	21.75	N/A	22.59	Truck + Lane	-5.29	Tandem + Lane
13.62(R)	25.0	20.05	N/A	22.59	Truck + Lane	-5.29	Tandem + Lane
16.35(B)	30.0	16.21	N/A	20.49	Truck + Lane	-6.61	Tandem + Lane
20.44(B)	37.5	10.45	N/A	17.41	Truck + Lane	-8.64	Tandem + Lane
21.80(B)	40.0	8.53	N/A	16.39	Truck + Lane	-9.33	Tandem + Lane
24.52(B)	45.0	4.69	N/A	14.39	Truck + Lane	-10.74	Tandem + Lane
27.25(L)	50.0	0.85	N/A	12.46	Truck + Lane	-12.46	Truck + Lane
27.25(R)	50.0	-0.85	N/A	12.46	Truck + Lane	-12.46	Truck + Lane
32.70(B)	60.0	-8.53	N/A	9.33	Tandem + Lane	-16.39	Truck + Lane
34.06(B)	62.5	-10.45	N/A	8.64	Tandem + Lane	-17.41	Truck + Lane
38.15(B)	70.0	-16.21	N/A	6.61	Tandem + Lane	-20.49	Truck + Lane
40.87(L)	75.0	-20.05	N/A	5.29	Tandem + Lane	-22.59	Truck + Lane
40.87(R)	75.0	-21.75	N/A	5.29	Tandem + Lane	-22.59	Truck + Lane
43.60(B)	80.0	-25.59	N/A	4.00	Tandem + Lane	-24.71	Truck + Lane
47.69(B)	87.5	-31.35	N/A	2.13	Tandem + Lane	-27.96	Truck + Lane

49.05(B)	90.0	-33.27	N/A	1.53	Truck + Lane	-29.06	Truck + Lane
54.50(L)	100.0	-40.96	N/A	-0.00	Tandem + Lane	-33.52	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.81	N/A	27.48	Axle Load	0.00	Lane
2	41.81	N/A	27.48	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	202.28	N/A	131.70	Axle Load	0.00	Lane
6.81(B)	12.5	246.31	N/A	158.98	Axle Load	0.00	Lane
10.90(B)	20.0	362.69	N/A	227.26	Axle Load	0.00	Lane
13.62(L)	25.0	427.20	N/A	261.48	Axle Load	0.00	Lane
13.62(R)	25.0	427.20	N/A	261.48	Axle Load	0.00	Lane
16.35(B)	30.0	476.61	N/A	286.67	Axle Load	0.00	Lane
20.44(B)	37.5	531.11	N/A	313.96	Axle Load	0.00	Lane
21.80(B)	40.0	544.04	N/A	320.26	Axle Load	0.00	Lane
24.52(B)	45.0	562.05	N/A	326.07	Axle Load	0.00	Lane
27.25(L)	50.0	569.60	N/A	322.85	Axle Load	0.00	Lane
27.25(R)	50.0	569.60	N/A	322.85	Axle Load	0.00	Lane
32.70(B)	60.0	544.04	N/A	320.26	Axle Load	0.00	Lane
34.06(B)	62.5	531.11	N/A	313.96	Axle Load	0.00	Lane
38.15(B)	70.0	476.61	N/A	286.67	Axle Load	0.00	Lane
40.87(L)	75.0	427.20	N/A	261.48	Axle Load	0.00	Lane
40.87(R)	75.0	427.20	N/A	261.48	Axle Load	0.00	Lane
43.60(B)	80.0	362.69	N/A	227.26	Axle Load	0.00	Lane
47.69(B)	87.5	246.31	N/A	158.98	Axle Load	0.00	Lane
49.05(B)	90.0	202.28	N/A	131.70	Axle Load	0.00	Lane
54.50(L)	100.0	0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.96	N/A	27.48	Axle Load	0.00	Lane
5.45(B)	10.0	33.27	N/A	24.17	Axle Load	-1.47	Axle Load
6.81(B)	12.5	31.35	N/A	23.34	Axle Load	-1.84	Axle Load
10.90(B)	20.0	25.59	N/A	20.85	Axle Load	-2.95	Axle Load
13.62(L)	25.0	21.75	N/A	19.19	Axle Load	-3.68	Axle Load
13.62(R)	25.0	20.05	N/A	19.19	Axle Load	-3.68	Axle Load
16.35(B)	30.0	16.21	N/A	17.53	Axle Load	-5.06	Axle Load
20.44(B)	37.5	10.45	N/A	15.05	Axle Load	-7.27	Axle Load
21.80(B)	40.0	8.53	N/A	14.22	Axle Load	-8.00	Axle Load
24.52(B)	45.0	4.69	N/A	12.56	Axle Load	-9.48	Axle Load
27.25(L)	50.0	0.85	N/A	10.95	Axle Load	-10.95	Axle Load
27.25(R)	50.0	-0.85	N/A	10.95	Axle Load	-10.95	Axle Load
32.70(B)	60.0	-8.53	N/A	8.00	Axle Load	-14.22	Axle Load
34.06(B)	62.5	-10.45	N/A	7.27	Axle Load	-15.05	Axle Load
38.15(B)	70.0	-16.21	N/A	5.06	Axle Load	-17.53	Axle Load
40.87(L)	75.0	-20.05	N/A	3.68	Axle Load	-19.19	Axle Load
40.87(R)	75.0	-21.75	N/A	3.68	Axle Load	-19.19	Axle Load
43.60(B)	80.0	-25.59	N/A	2.95	Axle Load	-20.85	Axle Load
47.69(B)	87.5	-31.35	N/A	1.84	Axle Load	-23.34	Axle Load
49.05(B)	90.0	-33.27	N/A	1.47	Axle Load	-24.17	Axle Load
54.50(L)	100.0	-40.96	N/A	-0.00	Lane	-27.48	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.81	N/A	19.88	Axle Load	0.00	Axle Load
2	41.81	N/A	19.88	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	202.28	N/A	95.82	Axle Load	0.00	Axle Load
6.81(B)	12.5	246.31	N/A	115.85	Axle Load	0.00	Axle Load
10.90(B)	20.0	362.69	N/A	166.54	Axle Load	0.00	Axle Load
13.62(L)	25.0	427.20	N/A	192.49	Axle Load	0.00	Axle Load
13.62(R)	25.0	427.20	N/A	192.49	Axle Load	0.00	Axle Load
16.35(B)	30.0	476.61	N/A	212.16	Axle Load	0.00	Axle Load
20.44(B)	37.5	531.11	N/A	233.12	Axle Load	0.00	Axle Load
21.80(B)	40.0	544.04	N/A	238.20	Axle Load	0.00	Axle Load
24.52(B)	45.0	562.05	N/A	243.65	Axle Load	0.00	Axle Load
27.25(L)	50.0	569.60	N/A	242.83	Axle Load	0.00	Axle Load
27.25(R)	50.0	569.60	N/A	242.83	Axle Load	0.00	Axle Load
32.70(B)	60.0	544.04	N/A	238.20	Axle Load	0.00	Axle Load
34.06(B)	62.5	531.11	N/A	233.12	Axle Load	0.00	Axle Load
38.15(B)	70.0	476.61	N/A	212.16	Axle Load	0.00	Axle Load
40.87(L)	75.0	427.20	N/A	192.49	Axle Load	0.00	Axle Load
40.87(R)	75.0	427.20	N/A	192.49	Axle Load	0.00	Axle Load
43.60(B)	80.0	362.69	N/A	166.54	Axle Load	0.00	Axle Load
47.69(B)	87.5	246.31	N/A	115.85	Axle Load	0.00	Axle Load
49.05(B)	90.0	202.28	N/A	95.82	Axle Load	0.00	Axle Load
54.50(L)	100.0	0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.96	N/A	19.88	Axle Load	0.00	Axle Load
5.45(B)	10.0	33.27	N/A	17.58	Axle Load	-0.99	Axle Load
6.81(B)	12.5	31.35	N/A	17.01	Axle Load	-1.38	Axle Load
10.90(B)	20.0	25.59	N/A	15.28	Axle Load	-2.56	Axle Load
13.62(L)	25.0	21.75	N/A	14.13	Axle Load	-3.34	Axle Load
13.62(R)	25.0	20.05	N/A	14.13	Axle Load	-3.34	Axle Load
16.35(B)	30.0	16.21	N/A	12.98	Axle Load	-4.12	Axle Load
20.44(B)	37.5	10.45	N/A	11.25	Axle Load	-5.49	Axle Load
21.80(B)	40.0	8.53	N/A	10.67	Axle Load	-6.07	Axle Load
24.52(B)	45.0	4.69	N/A	9.52	Axle Load	-7.22	Axle Load
27.25(L)	50.0	0.85	N/A	8.37	Axle Load	-8.37	Axle Load
27.25(R)	50.0	-0.85	N/A	8.37	Axle Load	-8.37	Axle Load
32.70(B)	60.0	-8.53	N/A	6.07	Axle Load	-10.67	Axle Load
34.06(B)	62.5	-10.45	N/A	5.49	Axle Load	-11.25	Axle Load
38.15(B)	70.0	-16.21	N/A	4.12	Axle Load	-12.98	Axle Load
40.87(L)	75.0	-20.05	N/A	3.34	Axle Load	-14.13	Axle Load
40.87(R)	75.0	-21.75	N/A	3.34	Axle Load	-14.13	Axle Load
43.60(B)	80.0	-25.59	N/A	2.56	Axle Load	-15.28	Axle Load
47.69(B)	87.5	-31.35	N/A	1.38	Axle Load	-17.01	Axle Load
49.05(B)	90.0	-33.27	N/A	0.99	Axle Load	-17.58	Axle Load
54.50(L)	100.0	-40.96	N/A	-0.00	Axle Load	-19.88	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.81	N/A	21.84	Axle Load	0.00	Axle Load
2	41.81	N/A	21.84	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	202.28	N/A	100.94	Axle Load	0.00	Axle Load
6.81(B)	12.5	246.31	N/A	120.52	Axle Load	0.00	Axle Load
10.90(B)	20.0	362.69	N/A	165.73	Axle Load	0.00	Axle Load
13.62(L)	25.0	427.20	N/A	193.78	Axle Load	0.00	Axle Load
13.62(R)	25.0	427.20	N/A	193.78	Axle Load	0.00	Axle Load
16.35(B)	30.0	476.61	N/A	215.56	Axle Load	0.00	Axle Load
20.44(B)	37.5	531.11	N/A	234.05	Axle Load	0.00	Axle Load
21.80(B)	40.0	544.04	N/A	238.09	Axle Load	0.00	Axle Load
24.52(B)	45.0	562.05	N/A	239.39	Axle Load	0.00	Axle Load
27.25(L)	50.0	569.60	N/A	231.66	Axle Load	0.00	Axle Load
27.25(R)	50.0	569.60	N/A	231.66	Axle Load	0.00	Axle Load
32.70(B)	60.0	544.04	N/A	238.09	Axle Load	0.00	Axle Load
34.06(B)	62.5	531.11	N/A	234.05	Axle Load	0.00	Axle Load
38.15(B)	70.0	476.61	N/A	215.56	Axle Load	0.00	Axle Load
40.87(L)	75.0	427.20	N/A	193.78	Axle Load	0.00	Axle Load
40.87(R)	75.0	427.20	N/A	193.78	Axle Load	0.00	Axle Load
43.60(B)	80.0	362.69	N/A	165.73	Axle Load	0.00	Axle Load
47.69(B)	87.5	246.31	N/A	120.52	Axle Load	0.00	Axle Load
49.05(B)	90.0	202.28	N/A	100.94	Axle Load	0.00	Axle Load
54.50(L)	100.0	0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.96	N/A	21.84	Axle Load	0.00	Axle Load
5.45(B)	10.0	33.27	N/A	18.52	Axle Load	-0.90	Axle Load
6.81(B)	12.5	31.35	N/A	17.69	Axle Load	-1.26	Axle Load
10.90(B)	20.0	25.59	N/A	15.20	Axle Load	-2.33	Axle Load
13.62(L)	25.0	21.75	N/A	13.56	Axle Load	-3.05	Axle Load
13.62(R)	25.0	20.05	N/A	13.56	Axle Load	-3.05	Axle Load
16.35(B)	30.0	16.21	N/A	12.13	Axle Load	-3.76	Axle Load
20.44(B)	37.5	10.45	N/A	10.01	Axle Load	-4.83	Axle Load
21.80(B)	40.0	8.53	N/A	9.54	Axle Load	-5.19	Axle Load
24.52(B)	45.0	4.69	N/A	8.26	Axle Load	-5.90	Axle Load
27.25(L)	50.0	0.85	N/A	6.80	Axle Load	-6.80	Axle Load
27.25(R)	50.0	-0.85	N/A	6.80	Axle Load	-6.80	Axle Load
32.70(B)	60.0	-8.53	N/A	5.19	Axle Load	-9.54	Axle Load
34.06(B)	62.5	-10.45	N/A	4.83	Axle Load	-10.01	Axle Load
38.15(B)	70.0	-16.21	N/A	3.76	Axle Load	-12.13	Axle Load
40.87(L)	75.0	-20.05	N/A	3.05	Axle Load	-13.56	Axle Load
40.87(R)	75.0	-21.75	N/A	3.05	Axle Load	-13.56	Axle Load
43.60(B)	80.0	-25.59	N/A	2.33	Axle Load	-15.20	Axle Load
47.69(B)	87.5	-31.35	N/A	1.26	Axle Load	-17.69	Axle Load
49.05(B)	90.0	-33.27	N/A	0.90	Axle Load	-18.52	Axle Load
54.50(L)	100.0	-40.96	N/A	-0.00	Axle Load	-21.84	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**17.48**	**13.408**	**268.15**	**17.380**	**347.61**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.92**	**12.822**	**256.43**	**16.621**	**332.42**
5.45	10.0	Shear	KIPS	461.24	33.27	15.63	15.339	306.77	19.883	397.67
5.45	10.0	Overload	KSI	50.00	5.61	1.92	16.819	336.38	21.865	437.29
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.38**	**6.327**	**126.54**	**8.202**	**164.03**
10.90	20.0	Shear	KIPS	461.24	25.59	13.79	17.785	355.70	23.055	461.10
10.90	20.0	Overload	KSI	50.00	10.06	3.38	8.520	170.41	11.076	221.53
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.39**	**4.355**	**87.09**	**5.645**	**112.90**
16.35	30.0	Shear	KIPS	461.24	16.21	11.95	21.088	421.76	27.336	546.73
16.35	30.0	Overload	KSI	50.00	13.21	4.39	6.003	120.06	7.804	156.07
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**4.95**	**3.592**	**71.84**	**4.656**	**93.13**
21.80	40.0	Shear	KIPS	461.24	8.53	10.11	25.475	509.49	33.023	660.45
21.80	40.0	Overload	KSI	50.00	15.08	4.95	5.033	100.65	6.542	130.85
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**5.07**	**3.442**	**68.85**	**4.462**	**89.25**
24.52	45.0	Shear	KIPS	461.24	4.69	9.19	28.328	566.56	36.721	734.42
24.52	45.0	Overload	KSI	50.00	15.58	5.07	4.846	96.92	6.300	126.00
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**5.06**	**3.414**	**68.27**	**4.425**	**88.50**
27.25	50.0	Shear	KIPS	461.24	-0.85	-8.26	31.817	636.34	41.244	824.88
27.25	50.0	Overload	KSI	50.00	15.80	5.06	4.815	96.31	6.260	125.20
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**4.95**	**3.592**	**71.84**	**4.656**	**93.13**
32.70	60.0	Shear	KIPS	461.24	-8.53	-10.11	25.475	509.49	33.023	660.45
32.70	60.0	Overload	KSI	50.00	15.08	4.95	5.033	100.65	6.542	130.85
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.39**	**4.355**	**87.09**	**5.645**	**112.90**
38.15	70.0	Shear	KIPS	461.24			21.088	421.76	27.336	546.73

					-16.21	-11.95				
38.15	70.0	Overload	KSI	50.00	13.21	4.39	6.003	120.06	7.804	156.07
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.38**	**6.327**	**126.54**	**8.202**	**164.03**
43.60	80.0	Shear	KIPS	461.24	-25.59	-13.79	17.785	355.70	23.055	461.10
43.60	80.0	Overload	KSI	50.00	10.06	3.38	8.520	170.41	11.076	221.53
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.92**	**12.822**	**256.43**	**16.621**	**332.42**
49.05	90.0	Shear	KIPS	461.24	-33.27	-15.63	15.339	306.77	19.883	397.67
49.05	90.0	Overload	KSI	50.00	5.61	1.92	16.819	336.38	21.865	437.29
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-17.48**	**13.408**	**268.15**	**17.380**	**347.61**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**15.04**	**15.576**	**311.53**	**20.192**	**403.83**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.35**	**18.148**	**362.97**	**23.526**	**470.51**
5.45	10.0	Shear	KIPS	461.24	33.27	12.99	18.453	369.07	23.921	478.42
5.45	10.0	Overload	KSI	50.00	5.61	1.35	23.806	476.12	30.948	618.96
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**2.41**	**8.888**	**177.76**	**11.521**	**230.42**
10.90	20.0	Shear	KIPS	461.24	25.59	11.07	22.162	443.24	28.728	574.57
10.90	20.0	Overload	KSI	50.00	10.06	2.41	11.969	239.37	15.559	311.19
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**3.16**	**6.057**	**121.14**	**7.852**	**157.04**
16.35	30.0	Shear	KIPS	461.24	16.21	9.26	27.207	544.15	35.269	705.38
16.35	30.0	Overload	KSI	50.00	13.21	3.16	8.350	166.99	10.855	217.09
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**3.61**	**4.930**	**98.61**	**6.391**	**127.82**
21.80	40.0	Shear	KIPS	461.24	8.53	7.58	33.984	679.69	44.054	881.08

21.80	40.0	Overload	KSI	50.00	15.08	3.61	6.908	138.16	8.980	179.60
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**3.72**	**4.685**	**93.70**	**6.073**	**121.46**
24.52	45.0	Shear	KIPS	461.24	4.69	6.78	38.387	767.74	49.761	995.21
24.52	45.0	Overload	KSI	50.00	15.58	3.72	6.595	131.90	8.573	171.47
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**3.76**	**4.598**	**91.96**	**5.960**	**119.20**
27.25	50.0	Shear	KIPS	461.24	-0.85	-6.01	43.742	874.85	56.703	1134.06
27.25	50.0	Overload	KSI	50.00	15.80	3.76	6.486	129.71	8.431	168.63
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**3.61**	**4.930**	**98.61**	**6.391**	**127.82**
32.70	60.0	Shear	KIPS	461.24	-8.53	-7.58	33.984	679.69	44.054	881.08
32.70	60.0	Overload	KSI	50.00	15.08	3.61	6.908	138.16	8.980	179.60
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**3.16**	**6.057**	**121.14**	**7.852**	**157.04**
38.15	70.0	Shear	KIPS	461.24	-16.21	-9.26	27.207	544.15	35.269	705.38
38.15	70.0	Overload	KSI	50.00	13.21	3.16	8.350	166.99	10.855	217.09
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**2.41**	**8.888**	**177.76**	**11.521**	**230.42**
43.60	80.0	Shear	KIPS	461.24	-25.59	-11.07	22.162	443.24	28.728	574.57
43.60	80.0	Overload	KSI	50.00	10.06	2.41	11.969	239.37	15.559	311.19
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.35**	**18.148**	**362.97**	**23.526**	**470.51**
49.05	90.0	Shear	KIPS	461.24	-33.27	-12.99	18.453	369.07	23.921	478.42
49.05	90.0	Overload	KSI	50.00	5.61	1.35	23.806	476.12	30.948	618.96
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-15.04**	**15.576**	**311.53**	**20.192**	**403.83**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**33.52**	**6.990**	**251.64**	**9.061**	**326.20**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.63**	**6.772**	**243.79**	**8.778**	**316.02**
5.45	10.0	Shear	KIPS	461.24	33.27	29.06	8.253	297.09	10.698	385.12
5.45	10.0	Overload	KSI	50.00	5.61	3.63	8.883	319.79	11.548	415.72
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**6.29**	**3.398**	**122.32**	**4.405**	**158.57**
10.90	20.0	Shear	KIPS	461.24	25.59	24.71	9.925	357.29	12.865	463.15
10.90	20.0	Overload	KSI	50.00	10.06	6.29	4.576	164.73	5.948	214.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**8.00**	**2.391**	**86.08**	**3.100**	**111.59**
16.35	30.0	Shear	KIPS	461.24	16.21	20.49	12.296	442.67	15.940	573.83
16.35	30.0	Overload	KSI	50.00	13.21	8.00	3.296	118.66	4.285	154.26
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**8.98**	**1.982**	**71.36**	**2.570**	**92.51**
21.80	40.0	Shear	KIPS	461.24	8.53	16.39	15.708	565.48	20.362	733.02
21.80	40.0	Overload	KSI	50.00	15.08	8.98	2.777	99.98	3.611	129.98
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**9.16**	**1.903**	**68.51**	**2.467**	**88.81**
24.52	45.0	Shear	KIPS	461.24	4.69	14.39	18.088	651.16	23.447	844.10
24.52	45.0	Overload	KSI	50.00	15.58	9.16	2.679	96.44	3.483	125.37
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**9.11**	**1.898**	**68.31**	**2.460**	**88.56**
27.25	50.0	Shear	KIPS	461.24	-0.85	-12.46	21.101	759.64	27.353	984.72
27.25	50.0	Overload	KSI	50.00	15.80	9.11	2.677	96.37	3.480	125.28
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**8.98**	**1.982**	**71.36**	**2.570**	**92.51**
32.70	60.0	Shear	KIPS	461.24	-8.53	-16.39	15.708	565.48	20.362	733.02
32.70	60.0	Overload	KSI	50.00	15.08	8.98	2.777	99.98	3.611	129.98
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**8.00**	**2.391**	**86.08**	**3.100**	**111.59**
38.15	70.0	Shear	KIPS	461.24	-16.21	-20.49	12.296	442.67	15.940	573.83
38.15	70.0	Overload	KSI	50.00	13.21	8.00	3.296	118.66	4.285	154.26
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**6.29**	**3.398**	**122.32**	**4.405**	**158.57**
43.60	80.0	Shear	KIPS	461.24	-25.59	-24.71	9.925	357.29	12.865	463.15
43.60	80.0	Overload	KSI	50.00	10.06	6.29	4.576	164.73	5.948	214.14
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.63**	**6.772**	**243.79**	**8.778**	**316.02**
49.05	90.0	Shear	KIPS	461.24	-33.27	-29.06	8.253	297.09	10.698	385.12
49.05	90.0	Overload	KSI	50.00	5.61	3.63	8.883	319.79	11.548	415.72
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-33.52**	**6.990**	**251.64**	**9.061**	**326.20**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Tandem + Lane

Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**28.22**	**8.302**	**298.89**	**10.762**	**387.44**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.10**	**7.918**	**285.05**	**10.264**	**369.51**
5.45	10.0	Shear	KIPS	461.24	33.27	24.77	9.680	348.49	12.548	451.74
5.45	10.0	Overload	KSI	50.00	5.61	3.10	10.387	373.92	13.503	486.10
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.49**	**3.894**	**140.18**	**5.048**	**181.72**
10.90	20.0	Shear	KIPS	461.24	25.59	21.44	11.439	411.81	14.829	533.83
10.90	20.0	Overload	KSI	50.00	10.06	5.49	5.244	188.78	6.817	245.41
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**7.17**	**2.668**	**96.06**	**3.459**	**124.52**
16.35	30.0	Shear	KIPS	461.24	16.21	18.23	13.820	497.51	17.914	644.92
16.35	30.0	Overload	KSI	50.00	13.21	7.17	3.678	132.41	4.781	172.13
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**8.14**	**2.188**	**78.75**	**2.836**	**102.09**
21.80	40.0	Shear	KIPS	461.24	8.53	15.15	16.999	611.98	22.036	793.31
21.80	40.0	Overload	KSI	50.00	15.08	8.14	3.065	110.34	3.985	143.44
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**8.35**	**2.088**	**75.18**	**2.707**	**97.46**
24.52	45.0	Shear	KIPS	461.24	4.69	13.65	19.067	686.42	24.717	889.81
24.52	45.0	Overload	KSI	50.00	15.58	8.35	2.940	105.83	3.822	137.58
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**8.39**	**2.061**	**74.20**	**2.672**	**96.18**
27.25	50.0	Shear	KIPS	461.24	-0.85	-12.18	21.592	777.30	27.989	1007.61
27.25	50.0	Overload	KSI	50.00	15.80	8.39	2.907	104.67	3.780	136.06
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**8.14**	**2.188**	**78.75**	**2.836**	**102.09**
32.70	60.0	Shear	KIPS	461.24	-8.53	-15.15	16.999	611.98	22.036	793.31
32.70	60.0	Overload	KSI	50.00	15.08	8.14	3.065	110.34	3.985	143.44
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**7.17**	**2.668**	**96.06**	**3.459**	**124.52**
38.15	70.0	Shear	KIPS	461.24	-16.21	-18.23	13.820	497.51	17.914	644.92
38.15	70.0	Overload	KSI	50.00	13.21	7.17	3.678	132.41	4.781	172.13
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.49**	**3.894**	**140.18**	**5.048**	**181.72**
43.60	80.0	Shear	KIPS	461.24	-25.59	-21.44	11.439	411.81	14.829	533.83
43.60	80.0	Overload	KSI	50.00	10.06	5.49	5.244	188.78	6.817	245.41

49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.10**	**7.918**	**285.05**	**10.264**	**369.51**
49.05	90.0	Shear	KIPS	461.24	-33.27	-24.77	9.680	348.49	12.548	451.74
49.05	90.0	Overload	KSI	50.00	5.61	3.10	10.387	373.92	13.503	486.10
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-28.22**	**8.302**	**298.89**	**10.762**	**387.44**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**27.48**	**8.526**	**306.94**	**11.052**	**397.89**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.96**	**8.295**	**298.62**	**10.753**	**387.10**
5.45	10.0	Shear	KIPS	461.24	33.27	24.17	9.923	357.23	12.863	463.08
5.45	10.0	Overload	KSI	50.00	5.61	2.96	10.881	391.71	14.145	509.23
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.11**	**4.185**	**150.67**	**5.425**	**195.31**
10.90	20.0	Shear	KIPS	461.24	25.59	20.85	11.765	423.52	15.250	549.01
10.90	20.0	Overload	KSI	50.00	10.06	5.11	5.636	202.90	7.327	263.77
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**6.45**	**2.968**	**106.84**	**3.847**	**138.50**
16.35	30.0	Shear	KIPS	461.24	16.21	17.53	14.372	517.38	18.630	670.68
16.35	30.0	Overload	KSI	50.00	13.21	6.45	4.091	147.28	5.318	191.46
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**7.20**	**2.471**	**88.96**	**3.203**	**115.32**
21.80	40.0	Shear	KIPS	461.24	8.53	14.22	18.110	651.95	23.475	845.12
21.80	40.0	Overload	KSI	50.00	15.08	7.20	3.462	124.65	4.501	162.04
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**7.33**	**2.378**	**85.62**	**3.083**	**110.99**
24.52	45.0	Shear	KIPS	461.24	4.69	12.56	20.719	745.88	26.858	966.88
24.52	45.0	Overload	KSI	50.00	15.58	7.33	3.348	120.53	4.353	156.69
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**7.26**	**2.381**	**85.73**	**3.087**	**111.13**
27.25	50.0	Shear	KIPS	461.24	-0.85	-10.95	24.010	864.36	31.124	1120.47

27.25	50.0	Overload	KSI	50.00	15.80	7.26	3.359	120.93	4.367	157.20
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**7.20**	**2.471**	**88.96**	**3.203**	**115.32**
32.70	60.0	Shear	KIPS	461.24	-8.53	-14.22	18.110	651.95	23.475	845.12
32.70	60.0	Overload	KSI	50.00	15.08	7.20	3.462	124.65	4.501	162.04
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**6.45**	**2.968**	**106.84**	**3.847**	**138.50**
38.15	70.0	Shear	KIPS	461.24	-16.21	-17.53	14.372	517.38	18.630	670.68
38.15	70.0	Overload	KSI	50.00	13.21	6.45	4.091	147.28	5.318	191.46
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.11**	**4.185**	**150.67**	**5.425**	**195.31**
43.60	80.0	Shear	KIPS	461.24	-25.59	-20.85	11.765	423.52	15.250	549.01
43.60	80.0	Overload	KSI	50.00	10.06	5.11	5.636	202.90	7.327	263.77
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.96**	**8.295**	**298.62**	**10.753**	**387.10**
49.05	90.0	Shear	KIPS	461.24	-33.27	-24.17	9.923	357.23	12.863	463.08
49.05	90.0	Overload	KSI	50.00	5.61	2.96	10.881	391.71	14.145	509.23
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-27.48**	**8.526**	**306.94**	**11.052**	**397.89**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**15.04**	**15.576**	**560.75**	**20.192**	**726.90**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.35**	**18.148**	**653.34**	**23.526**	**846.92**
5.45	10.0	Shear	KIPS	461.24	33.27	12.99	18.453	664.32	23.921	861.15
5.45	10.0	Overload	KSI	50.00	5.61	1.35	23.806	857.02	30.948	1114.13
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**2.41**	**8.888**	**319.96**	**11.521**	**414.76**
10.90	20.0	Shear	KIPS	461.24	25.59	11.07	22.162	797.83	28.728	1034.22

10.90	20.0	Overload	KSI	50.00	10.06	2.41	11.969	430.87	15.559	560.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**3.16**	**6.057**	**218.06**	**7.852**	**282.67**
16.35	30.0	Shear	KIPS	461.24	16.21	9.26	27.207	979.47	35.269	1269.68
16.35	30.0	Overload	KSI	50.00	13.21	3.16	8.350	300.59	10.855	390.76
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**3.61**	**4.930**	**177.49**	**6.391**	**230.08**
21.80	40.0	Shear	KIPS	461.24	8.53	7.58	33.984	1223.44	44.054	1585.94
21.80	40.0	Overload	KSI	50.00	15.08	3.61	6.908	248.68	8.980	323.28
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**3.72**	**4.685**	**168.65**	**6.073**	**218.63**
24.52	45.0	Shear	KIPS	461.24	4.69	6.78	38.387	1381.93	49.761	1791.39
24.52	45.0	Overload	KSI	50.00	15.58	3.72	6.595	237.42	8.573	308.65
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**3.76**	**4.598**	**165.52**	**5.960**	**214.56**
27.25	50.0	Shear	KIPS	461.24	-0.85	-6.01	43.742	1574.73	56.703	2041.31
27.25	50.0	Overload	KSI	50.00	15.80	3.76	6.486	233.49	8.431	303.53
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**3.61**	**4.930**	**177.49**	**6.391**	**230.08**
32.70	60.0	Shear	KIPS	461.24	-8.53	-7.58	33.984	1223.44	44.054	1585.94
32.70	60.0	Overload	KSI	50.00	15.08	3.61	6.908	248.68	8.980	323.28
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**3.16**	**6.057**	**218.06**	**7.852**	**282.67**
38.15	70.0	Shear	KIPS	461.24	-16.21	-9.26	27.207	979.47	35.269	1269.68
38.15	70.0	Overload	KSI	50.00	13.21	3.16	8.350	300.59	10.855	390.76
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**2.41**	**8.888**	**319.96**	**11.521**	**414.76**
43.60	80.0	Shear	KIPS	461.24	-25.59	-11.07	22.162	797.83	28.728	1034.22
43.60	80.0	Overload	KSI	50.00	10.06	2.41	11.969	430.87	15.559	560.14
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**1.35**	**18.148**	**653.34**	**23.526**	**846.92**
49.05	90.0	Shear	KIPS	461.24	-33.27	-12.99	18.453	664.32	23.921	861.15
49.05	90.0	Overload	KSI	50.00	5.61	1.35	23.806	857.02	30.948	1114.13
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-15.04**	**15.576**	**560.75**	**20.192**	**726.90**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location	Legal Rating	Legal Load Rating

(ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**19.88**	**14.222**	**355.54**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.15**	**13.760**	**344.00**
5.45	10.0	Shear	KIPS	461.24	33.27	17.58	16.461	411.53
5.45	10.0	Overload	KSI	50.00	5.61	2.15	14.956	373.89
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.75**	**6.893**	**172.32**
10.90	20.0	Shear	KIPS	461.24	25.59	15.28	19.375	484.39
10.90	20.0	Overload	KSI	50.00	10.06	3.75	7.691	192.27
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.77**	**4.840**	**121.00**
16.35	30.0	Shear	KIPS	461.24	16.21	12.98	23.437	585.93
16.35	30.0	Overload	KSI	50.00	13.21	4.77	5.528	138.20
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**5.36**	**4.010**	**100.25**
21.80	40.0	Shear	KIPS	461.24	8.53	10.67	29.114	727.86
21.80	40.0	Overload	KSI	50.00	15.08	5.36	4.655	116.38
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**5.48**	**3.841**	**96.04**
24.52	45.0	Shear	KIPS	461.24	4.69	9.52	32.983	824.57
24.52	45.0	Overload	KSI	50.00	15.58	5.48	4.481	112.02
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**5.46**	**3.821**	**95.53**
27.25	50.0	Shear	KIPS	461.24	-0.85	-8.37	37.915	947.88
27.25	50.0	Overload	KSI	50.00	15.80	5.46	4.466	111.65
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**5.36**	**4.010**	**100.25**
32.70	60.0	Shear	KIPS	461.24	-8.53	-10.67	29.114	727.86
32.70	60.0	Overload	KSI	50.00	15.08	5.36	4.655	116.38
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.77**	**4.840**	**121.00**
38.15	70.0	Shear	KIPS	461.24	-16.21	-12.98	23.437	585.93
38.15	70.0	Overload	KSI	50.00	13.21	4.77	5.528	138.20
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.75**	**6.893**	**172.32**
43.60	80.0	Shear	KIPS	461.24	-25.59	-15.28	19.375	484.39
43.60	80.0	Overload	KSI	50.00	10.06	3.75	7.691	192.27
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.15**	**13.760**	**344.00**
49.05	90.0	Shear	KIPS	461.24	-33.27	-17.58	16.461	411.53
49.05	90.0	Overload	KSI	50.00	5.61	2.15	14.956	373.89
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-19.88**	**14.222**	**355.54**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results
Wizard Alternative
Type 3S2
Axle Load

Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj -LL***	**LL**	**Legal Rating Factor**	**Legal Load Rating (Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.96**	**21.84**	**12.950**	**466.21**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.27**	**13.063**	**470.25**
5.45	10.0	Shear	KIPS	461.24	33.27	18.52	15.627	562.56
5.45	10.0	Overload	KSI	50.00	5.61	2.27	14.197	511.11
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.73**	**6.926**	**249.35**
10.90	20.0	Shear	KIPS	461.24	25.59	15.20	19.470	700.93
10.90	20.0	Overload	KSI	50.00	10.06	3.73	7.729	278.23
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.85**	**4.763**	**171.48**
16.35	30.0	Shear	KIPS	461.24	16.21	12.13	25.073	902.64
16.35	30.0	Overload	KSI	50.00	13.21	4.85	5.441	195.86
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**5.35**	**4.012**	**144.42**
21.80	40.0	Shear	KIPS	461.24	8.53	9.54	32.579	1172.83
21.80	40.0	Overload	KSI	50.00	15.08	5.35	4.657	167.66
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.58**	**5.38**	**3.910**	**140.75**
24.52	45.0	Shear	KIPS	461.24	4.69	8.26	38.005	1368.20
24.52	45.0	Overload	KSI	50.00	15.58	5.38	4.560	164.17
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**5.21**	**4.005**	**144.19**
27.25	50.0	Shear	KIPS	461.24	-0.85	-6.80	46.681	1680.52
27.25	50.0	Overload	KSI	50.00	15.80	5.21	4.681	168.53
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.08**	**5.35**	**4.012**	**144.42**
32.70	60.0	Shear	KIPS	461.24	-8.53	-9.54	32.579	1172.83
32.70	60.0	Overload	KSI	50.00	15.08	5.35	4.657	167.66
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.21**	**4.85**	**4.763**	**171.48**
38.15	70.0	Shear	KIPS	461.24	-16.21	-12.13	25.073	902.64
38.15	70.0	Overload	KSI	50.00	13.21	4.85	5.441	195.86
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.73**	**6.926**	**249.35**
43.60	80.0	Shear	KIPS	461.24	-25.59	-15.20	19.470	700.93
43.60	80.0	Overload	KSI	50.00	10.06	3.73	7.729	278.23
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.27**	**13.063**	**470.25**
49.05	90.0	Shear	KIPS	461.24	-33.27	-18.52	15.627	562.56
49.05	90.0	Overload	KSI	50.00	5.61	2.27	14.197	511.11
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00

54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.96**	**-21.84**	**12.950**	**466.21**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:10

Structure Definition Name: Structure1
Member Name: Member 2
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	1.996	STRENGTH-I Steel Flexure Stress	39.92	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	2.588	STRENGTH-I Steel Flexure Stress	51.75	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.110	STRENGTH-I Steel Flexure Stress	39.95	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	1.438	STRENGTH-I Steel Flexure Stress	51.78	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	1.392	STRENGTH-I Steel Flexure Stress	50.13	1	27.25	50.0	As Requested	As Requested
HS 20-44	Operating	1.805	STRENGTH-I Steel Flexure Stress	64.98	1	27.25	50.0	As Requested	As Requested
Type 3	Legal	2.234	STRENGTH-I Steel Flexure Stress	55.86	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	2.296	STRENGTH-I Steel Flexure Stress	82.66	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	33.84	Axle Load	0.00	Lane
2	47.32	N/A	33.84	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	132.58	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	160.85	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	233.92	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	304.01	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	336.07	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	342.85	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	350.55	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	342.85	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	336.07	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	304.01	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	233.92	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	160.85	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	132.58	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	33.84	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	30.28	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	29.38	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	26.71	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	24.92	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	24.92	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	23.14	Axle Load	-8.87	Axle Load
20.44(B)	37.5	11.83	N/A	20.46	Axle Load	-11.55	Axle Load
21.80(B)	40.0	9.80	N/A	19.57	Axle Load	-12.44	Axle Load
24.52(B)	45.0	5.75	N/A	17.79	Axle Load	-14.22	Axle Load
27.25(L)	50.0	1.70	N/A	16.01	Axle Load	-16.01	Axle Load
27.25(R)	50.0	-1.70	N/A	16.01	Axle Load	-16.01	Axle Load
32.70(B)	60.0	-9.80	N/A	12.44	Axle Load	-19.57	Axle Load
34.06(B)	62.5	-11.83	N/A	11.55	Axle Load	-20.46	Axle Load
38.15(B)	70.0	-17.91	N/A	8.87	Axle Load	-23.14	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-24.92	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-24.92	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-26.71	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-29.38	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-30.28	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-33.84	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
2	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	634.61	N/A	634.15	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	37.52	N/A	56.27	Truck + Lane	-2.97	Truck + Lane
6.81(B)	12.5	35.49	N/A	54.15	Truck + Lane	-4.12	Tandem + Lane
10.90(B)	20.0	29.41	N/A	47.86	Truck + Lane	-7.75	Tandem + Lane
13.62(L)	25.0	25.36	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
13.62(R)	25.0	21.96	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
16.35(B)	30.0	17.91	N/A	39.69	Truck + Lane	-12.79	Tandem + Lane
20.44(B)	37.5	11.83	N/A	33.71	Truck + Lane	-16.73	Tandem + Lane
21.80(B)	40.0	9.80	N/A	31.74	Truck + Lane	-18.07	Tandem + Lane
24.52(B)	45.0	5.75	N/A	27.86	Truck + Lane	-20.80	Tandem + Lane
27.25(L)	50.0	1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
27.25(R)	50.0	-1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
32.70(B)	60.0	-9.80	N/A	18.07	Tandem + Lane	-31.74	Truck + Lane
34.06(B)	62.5	-11.83	N/A	16.73	Tandem + Lane	-33.71	Truck + Lane
38.15(B)	70.0	-17.91	N/A	12.79	Tandem + Lane	-39.69	Truck + Lane
40.87(L)	75.0	-21.96	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
40.87(R)	75.0	-25.36	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
43.60(B)	80.0	-29.41	N/A	7.75	Tandem + Lane	-47.86	Truck + Lane
47.69(B)	87.5	-35.49	N/A	4.12	Tandem + Lane	-54.15	Truck + Lane

49.05(B)	90.0	-37.52	N/A	2.97	Truck + Lane	-56.27	Truck + Lane
54.50(L)	100.0	-45.62	N/A	-0.00	Tandem + Lane	-64.92	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	53.22	Axle Load	0.00	Lane
2	47.32	N/A	53.22	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	204.94	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	247.38	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	353.63	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	446.08	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	488.54	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	498.34	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	507.39	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	498.34	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	488.54	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	446.08	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	353.63	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	247.38	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	204.94	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	53.22	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	46.80	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	45.19	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	40.38	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	37.17	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	37.17	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	33.95	Axle Load	-9.79	Axle Load
20.44(B)	37.5	11.83	N/A	29.14	Axle Load	-14.07	Axle Load
21.80(B)	40.0	9.80	N/A	27.53	Axle Load	-15.50	Axle Load
24.52(B)	45.0	5.75	N/A	24.32	Axle Load	-18.36	Axle Load
27.25(L)	50.0	1.70	N/A	21.21	Axle Load	-21.21	Axle Load
27.25(R)	50.0	-1.70	N/A	21.21	Axle Load	-21.21	Axle Load
32.70(B)	60.0	-9.80	N/A	15.50	Axle Load	-27.53	Axle Load
34.06(B)	62.5	-11.83	N/A	14.07	Axle Load	-29.14	Axle Load
38.15(B)	70.0	-17.91	N/A	9.79	Axle Load	-33.95	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-37.17	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-37.17	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-40.38	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-45.19	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-46.80	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-53.22	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	38.51	Axle Load	0.00	Axle Load
2	47.32	N/A	38.51	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	379.14	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	38.51	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	34.05	Axle Load	-1.92	Axle Load
6.81(B)	12.5	35.49	N/A	32.93	Axle Load	-2.68	Axle Load
10.90(B)	20.0	29.41	N/A	29.59	Axle Load	-4.95	Axle Load
13.62(L)	25.0	25.36	N/A	27.36	Axle Load	-6.47	Axle Load
13.62(R)	25.0	21.96	N/A	27.36	Axle Load	-6.47	Axle Load
16.35(B)	30.0	17.91	N/A	25.13	Axle Load	-7.98	Axle Load
20.44(B)	37.5	11.83	N/A	21.78	Axle Load	-10.64	Axle Load
21.80(B)	40.0	9.80	N/A	20.67	Axle Load	-11.75	Axle Load
24.52(B)	45.0	5.75	N/A	18.44	Axle Load	-13.98	Axle Load
27.25(L)	50.0	1.70	N/A	16.21	Axle Load	-16.21	Axle Load
27.25(R)	50.0	-1.70	N/A	16.21	Axle Load	-16.21	Axle Load
32.70(B)	60.0	-9.80	N/A	11.75	Axle Load	-20.67	Axle Load
34.06(B)	62.5	-11.83	N/A	10.64	Axle Load	-21.78	Axle Load
38.15(B)	70.0	-17.91	N/A	7.98	Axle Load	-25.13	Axle Load
40.87(L)	75.0	-21.96	N/A	6.47	Axle Load	-27.36	Axle Load
40.87(R)	75.0	-25.36	N/A	6.47	Axle Load	-27.36	Axle Load
43.60(B)	80.0	-29.41	N/A	4.95	Axle Load	-29.59	Axle Load
47.69(B)	87.5	-35.49	N/A	2.68	Axle Load	-32.93	Axle Load
49.05(B)	90.0	-37.52	N/A	1.92	Axle Load	-34.05	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-38.51	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	42.29	Axle Load	0.00	Axle Load
2	47.32	N/A	42.29	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	372.51	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	42.29	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	35.87	Axle Load	-1.75	Axle Load
6.81(B)	12.5	35.49	N/A	34.26	Axle Load	-2.44	Axle Load
10.90(B)	20.0	29.41	N/A	29.44	Axle Load	-4.52	Axle Load
13.62(L)	25.0	25.36	N/A	26.25	Axle Load	-5.90	Axle Load
13.62(R)	25.0	21.96	N/A	26.25	Axle Load	-5.90	Axle Load
16.35(B)	30.0	17.91	N/A	23.49	Axle Load	-7.28	Axle Load
20.44(B)	37.5	11.83	N/A	19.39	Axle Load	-9.35	Axle Load
21.80(B)	40.0	9.80	N/A	18.47	Axle Load	-10.05	Axle Load
24.52(B)	45.0	5.75	N/A	16.00	Axle Load	-11.43	Axle Load
27.25(L)	50.0	1.70	N/A	13.17	Axle Load	-13.17	Axle Load
27.25(R)	50.0	-1.70	N/A	13.17	Axle Load	-13.17	Axle Load
32.70(B)	60.0	-9.80	N/A	10.05	Axle Load	-18.47	Axle Load
34.06(B)	62.5	-11.83	N/A	9.35	Axle Load	-19.39	Axle Load
38.15(B)	70.0	-17.91	N/A	7.28	Axle Load	-23.49	Axle Load
40.87(L)	75.0	-21.96	N/A	5.90	Axle Load	-26.25	Axle Load
40.87(R)	75.0	-25.36	N/A	5.90	Axle Load	-26.25	Axle Load
43.60(B)	80.0	-29.41	N/A	4.52	Axle Load	-29.44	Axle Load
47.69(B)	87.5	-35.49	N/A	2.44	Axle Load	-34.26	Axle Load
49.05(B)	90.0	-37.52	N/A	1.75	Axle Load	-35.87	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-42.29	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**33.84**	**6.825**	**136.50**	**8.847**	**176.94**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**30.28**	**7.820**	**156.41**	**10.137**	**202.75**
5.45	10.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
10.90	20.0	Shear	KIPS	461.24	29.41	26.71	9.082	181.63	11.773	235.45
10.90	20.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**
16.35	30.0	Shear	KIPS	461.24	17.91	23.14	10.837	216.74	14.048	280.96
16.35	30.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
21.80	40.0	Shear	KIPS	461.24	9.80	19.57	13.108	262.16	16.992	339.84
21.80	40.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**7.88**	**2.022**	**40.43**	**2.621**	**52.41**
24.52	45.0	Shear	KIPS	461.24	5.75	17.79	14.585	291.70	18.907	378.13
24.52	45.0	Overload	KSI	50.00	17.69	7.88	2.909	58.18	3.782	75.63
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**7.88**	**1.996**	**39.92**	**2.588**	**51.75**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.01	16.391	327.83	21.248	424.96
27.25	50.0	Overload	KSI	50.00	17.98	7.88	2.882	57.63	3.746	74.93
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
32.70	60.0	Shear	KIPS	461.24	-9.80	-19.57	13.108	262.16	16.992	339.84
32.70	60.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**

38.15	70.0	Shear	KIPS	461.24	-17.91	-23.14	10.837	216.74	14.048	280.96
38.15	70.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
43.60	80.0	Shear	KIPS	461.24	-29.41	-26.71	9.082	181.63	11.773	235.45
43.60	80.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
49.05	90.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-30.28**	**7.820**	**156.41**	**10.137**	**202.75**
49.05	90.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-33.84**	**6.825**	**136.50**	**8.847**	**176.94**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**158.58**	**10.278**	**205.56**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**188.17**	**12.196**	**243.92**
5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	226.33	14.670	293.39
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	279.63	18.124	362.49
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	349.73	22.668	453.36

21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**55.02**	**3.566**	**71.33**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	395.28	25.620	512.40
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	79.17	5.146	102.93
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**53.77**	**3.485**	**69.70**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	450.70	29.212	584.25
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	77.63	5.046	100.92
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	349.73	22.668	453.36
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	279.63	18.124	362.49
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	226.33	14.670	293.39
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**188.17**	**12.196**	**243.92**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**158.58**	**10.278**	**205.56**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**64.92**	**3.558**	**128.09**	**4.612**	**166.05**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**56.27**	**4.208**	**151.47**	**5.454**	**196.35**
5.45	10.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
10.90	20.0	Shear	KIPS	461.24	29.41	47.86	5.068	182.44	6.569	236.50
10.90	20.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
16.35	30.0	Shear	KIPS	461.24	17.91	39.69	6.319	227.48	8.191	294.89
16.35	30.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
21.80	40.0	Shear	KIPS	461.24	9.80	31.74	8.082	290.96	10.477	377.18
21.80	40.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**14.26**	**1.118**	**40.23**	**1.449**	**52.15**
24.52	45.0	Shear	KIPS	461.24	5.75	27.86	9.313	335.26	12.072	434.60
24.52	45.0	Overload	KSI	50.00	17.69	14.26	1.608	57.89	2.090	75.26
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**14.18**	**1.110**	**39.95**	**1.438**	**51.78**
27.25	50.0	Shear	KIPS	461.24	-1.70	-24.13	10.871	391.35	14.092	507.31
27.25	50.0	Overload	KSI	50.00	17.98	14.18	1.602	57.67	2.083	74.97
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
32.70	60.0	Shear	KIPS	461.24	-9.80	-31.74	8.082	290.96	10.477	377.18
32.70	60.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
38.15	70.0	Shear	KIPS	461.24	-17.91	-39.69	6.319	227.48	8.191	294.89
38.15	70.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
43.60	80.0	Shear	KIPS	461.24	-29.41	-47.86	5.068	182.44	6.569	236.50
43.60	80.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
49.05	90.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-56.27**	**4.208**	**151.47**	**5.454**	**196.35**
49.05	90.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-64.92**	**3.558**	**128.09**	**4.612**	**166.05**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative

HL-93 (US)
Tandem + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory	Inventory	Operating	Operating
							Rating	Load Rating	Rating	Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**54.65**	**4.226**	**152.14**	**5.478**	**197.22**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**47.97**	**4.935**	**177.68**	**6.398**	**230.32**
5.45	10.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
10.90	20.0	Shear	KIPS	461.24	29.41	41.53	5.841	210.28	7.572	272.59
10.90	20.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
16.35	30.0	Shear	KIPS	461.24	17.91	35.31	7.102	255.66	9.206	331.42
16.35	30.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
21.80	40.0	Shear	KIPS	461.24	9.80	29.33	8.747	314.89	11.339	408.20
21.80	40.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**12.99**	**1.226**	**44.15**	**1.590**	**57.23**
24.52	45.0	Shear	KIPS	461.24	5.75	26.43	9.817	353.42	12.726	458.13
24.52	45.0	Overload	KSI	50.00	17.69	12.99	1.765	63.53	2.294	82.59
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**13.05**	**1.205**	**43.39**	**1.562**	**56.24**
27.25	50.0	Shear	KIPS	461.24	-1.70	-23.59	11.124	400.45	14.419	519.10
27.25	50.0	Overload	KSI	50.00	17.98	13.05	1.740	62.64	2.262	81.43
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
32.70	60.0	Shear	KIPS	461.24	-9.80	-29.33	8.747	314.89	11.339	408.20
32.70	60.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
38.15	70.0	Shear	KIPS	461.24	-17.91	-35.31	7.102	255.66	9.206	331.42
38.15	70.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
43.60	80.0	Shear	KIPS	461.24			5.841	210.28	7.572	272.59

					-29.41	-41.53				
43.60	80.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
49.05	90.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-47.97**	**4.935**	**177.68**	**6.398**	**230.32**
49.05	90.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-54.65**	**4.226**	**152.14**	**5.478**	**197.22**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**53.22**	**4.340**	**156.24**	**5.626**	**202.54**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**46.80**	**5.059**	**182.13**	**6.558**	**236.10**
5.45	10.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
10.90	20.0	Shear	KIPS	461.24	29.41	40.38	6.007	216.26	7.787	280.34
10.90	20.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
16.35	30.0	Shear	KIPS	461.24	17.91	33.95	7.385	265.88	9.574	344.66
16.35	30.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
21.80	40.0	Shear	KIPS	461.24	9.80	27.53	9.318	335.46	12.079	434.85
21.80	40.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**11.41**	**1.397**	**50.28**	**1.811**	**65.18**
24.52	45.0	Shear	KIPS	461.24	5.75	24.32	10.667	384.03	13.828	497.81
24.52	45.0	Overload	KSI	50.00	17.69	11.41	2.010	72.35	2.613	94.06

27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**11.30**	**1.392**	**50.13**	**1.805**	**64.98**
27.25	50.0	Shear	KIPS	461.24	-1.70	-21.21	12.369	445.30	16.034	577.24
27.25	50.0	Overload	KSI	50.00	17.98	11.30	2.010	72.37	2.613	94.08
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
32.70	60.0	Shear	KIPS	461.24	-9.80	-27.53	9.318	335.46	12.079	434.85
32.70	60.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
38.15	70.0	Shear	KIPS	461.24	-17.91	-33.95	7.385	265.88	9.574	344.66
38.15	70.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
43.60	80.0	Shear	KIPS	461.24	-29.41	-40.38	6.007	216.26	7.787	280.34
43.60	80.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
49.05	90.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-46.80**	**5.059**	**182.13**	**6.558**	**236.10**
49.05	90.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-53.22**	**4.340**	**156.24**	**5.626**	**202.54**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**285.44**	**10.278**	**370.01**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**338.70**	**12.196**	**439.06**

5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	407.39	14.670	528.10
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	503.34	18.124	652.48
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	629.52	22.668	816.04
21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**99.04**	**3.566**	**128.39**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	711.51	25.620	922.33
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	142.51	5.146	185.27
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**96.79**	**3.485**	**125.47**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	811.27	29.212	1051.64
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	139.73	5.046	181.65
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	629.52	22.668	816.04
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	503.34	18.124	652.48
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	407.39	14.670	528.10
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**338.70**	**12.196**	**439.06**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**285.44**	**10.278**	**370.01**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**38.51**	**7.239**	**180.98**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**34.05**	**8.393**	**209.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
10.90	20.0	Shear	KIPS	461.24	29.41	29.59	9.894	247.34
10.90	20.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
16.35	30.0	Shear	KIPS	461.24	17.91	25.13	12.044	301.10
16.35	30.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
21.80	40.0	Shear	KIPS	461.24	9.80	20.67	14.981	374.52
21.80	40.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.53**	**2.256**	**56.40**
24.52	45.0	Shear	KIPS	461.24	5.75	18.44	16.982	424.54
24.52	45.0	Overload	KSI	50.00	17.69	8.53	2.690	67.24
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.50**	**2.234**	**55.86**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.21	19.533	488.33
27.25	50.0	Overload	KSI	50.00	17.98	8.50	2.673	66.82
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
32.70	60.0	Shear	KIPS	461.24	-9.80	-20.67	14.981	374.52
32.70	60.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-25.13	12.044	301.10
38.15	70.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.59	9.894	247.34
43.60	80.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
49.05	90.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-34.05**	**8.393**	**209.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-38.51**	**7.239**	**180.98**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results
Wizard Alternative
Type 3S2
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj -LL***	**LL**	**Legal Rating Factor**	**Legal Load Rating (Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**42.29**	**6.592**	**237.31**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**35.87**	**7.967**	**286.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
10.90	20.0	Shear	KIPS	461.24	29.41	29.44	9.942	357.91
10.90	20.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
16.35	30.0	Shear	KIPS	461.24	17.91	23.49	12.885	463.86
16.35	30.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
21.80	40.0	Shear	KIPS	461.24	9.80	18.47	16.763	603.48
21.80	40.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.38**	**2.296**	**82.66**
24.52	45.0	Shear	KIPS	461.24	5.75	16.00	19.568	704.44
24.52	45.0	Overload	KSI	50.00	17.69	8.38	2.737	98.55
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.11**	**2.342**	**84.31**
27.25	50.0	Shear	KIPS	461.24	-1.70	-13.17	24.049	865.77
27.25	50.0	Overload	KSI	50.00	17.98	8.11	2.802	100.85
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
32.70	60.0	Shear	KIPS	461.24	-9.80	-18.47	16.763	603.48
32.70	60.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
38.15	70.0	Shear	KIPS	461.24	-17.91	-23.49	12.885	463.86
38.15	70.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.44	9.942	357.91

43.60	80.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
49.05	90.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-35.87**	**7.967**	**286.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-42.29**	**6.592**	**237.31**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:11

Structure Definition Name: Structure1
Member Name: Member 3
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	1.996	STRENGTH-I Steel Flexure Stress	39.92	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	2.588	STRENGTH-I Steel Flexure Stress	51.75	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.110	STRENGTH-I Steel Flexure Stress	39.95	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	1.438	STRENGTH-I Steel Flexure Stress	51.78	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	1.392	STRENGTH-I Steel Flexure Stress	50.13	1	27.25	50.0	As Requested	As Requested
HS 20-44	Operating	1.805	STRENGTH-I Steel Flexure Stress	64.98	1	27.25	50.0	As Requested	As Requested
Type 3	Legal	2.234	STRENGTH-I Steel Flexure Stress	55.86	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	2.296	STRENGTH-I Steel Flexure Stress	82.66	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	33.84	Axle Load	0.00	Lane
2	47.32	N/A	33.84	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	132.58	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	160.85	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	233.92	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	304.01	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	336.07	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	342.85	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	350.55	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	342.85	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	336.07	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	304.01	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	233.92	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	160.85	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	132.58	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	33.84	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	30.28	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	29.38	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	26.71	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	24.92	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	24.92	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	23.14	Axle Load	-8.87	Axle Load
20.44(B)	37.5	11.83	N/A	20.46	Axle Load	-11.55	Axle Load
21.80(B)	40.0	9.80	N/A	19.57	Axle Load	-12.44	Axle Load
24.52(B)	45.0	5.75	N/A	17.79	Axle Load	-14.22	Axle Load
27.25(L)	50.0	1.70	N/A	16.01	Axle Load	-16.01	Axle Load
27.25(R)	50.0	-1.70	N/A	16.01	Axle Load	-16.01	Axle Load
32.70(B)	60.0	-9.80	N/A	12.44	Axle Load	-19.57	Axle Load
34.06(B)	62.5	-11.83	N/A	11.55	Axle Load	-20.46	Axle Load
38.15(B)	70.0	-17.91	N/A	8.87	Axle Load	-23.14	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-24.92	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-24.92	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-26.71	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-29.38	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-30.28	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-33.84	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
2	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	634.61	N/A	634.15	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	37.52	N/A	56.27	Truck + Lane	-2.97	Truck + Lane
6.81(B)	12.5	35.49	N/A	54.15	Truck + Lane	-4.12	Tandem + Lane
10.90(B)	20.0	29.41	N/A	47.86	Truck + Lane	-7.75	Tandem + Lane
13.62(L)	25.0	25.36	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
13.62(R)	25.0	21.96	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
16.35(B)	30.0	17.91	N/A	39.69	Truck + Lane	-12.79	Tandem + Lane
20.44(B)	37.5	11.83	N/A	33.71	Truck + Lane	-16.73	Tandem + Lane
21.80(B)	40.0	9.80	N/A	31.74	Truck + Lane	-18.07	Tandem + Lane
24.52(B)	45.0	5.75	N/A	27.86	Truck + Lane	-20.80	Tandem + Lane
27.25(L)	50.0	1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
27.25(R)	50.0	-1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
32.70(B)	60.0	-9.80	N/A	18.07	Tandem + Lane	-31.74	Truck + Lane
34.06(B)	62.5	-11.83	N/A	16.73	Tandem + Lane	-33.71	Truck + Lane
38.15(B)	70.0	-17.91	N/A	12.79	Tandem + Lane	-39.69	Truck + Lane
40.87(L)	75.0	-21.96	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
40.87(R)	75.0	-25.36	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
43.60(B)	80.0	-29.41	N/A	7.75	Tandem + Lane	-47.86	Truck + Lane
47.69(B)	87.5	-35.49	N/A	4.12	Tandem + Lane	-54.15	Truck + Lane

49.05(B)	90.0	-37.52	N/A	2.97	Truck + Lane	-56.27	Truck + Lane
54.50(L)	100.0	-45.62	N/A	-0.00	Tandem + Lane	-64.92	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	53.22	Axle Load	0.00	Lane
2	47.32	N/A	53.22	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	204.94	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	247.38	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	353.63	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	446.08	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	488.54	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	498.34	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	507.39	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	498.34	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	488.54	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	446.08	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	353.63	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	247.38	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	204.94	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	53.22	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	46.80	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	45.19	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	40.38	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	37.17	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	37.17	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	33.95	Axle Load	-9.79	Axle Load
20.44(B)	37.5	11.83	N/A	29.14	Axle Load	-14.07	Axle Load
21.80(B)	40.0	9.80	N/A	27.53	Axle Load	-15.50	Axle Load
24.52(B)	45.0	5.75	N/A	24.32	Axle Load	-18.36	Axle Load
27.25(L)	50.0	1.70	N/A	21.21	Axle Load	-21.21	Axle Load
27.25(R)	50.0	-1.70	N/A	21.21	Axle Load	-21.21	Axle Load
32.70(B)	60.0	-9.80	N/A	15.50	Axle Load	-27.53	Axle Load
34.06(B)	62.5	-11.83	N/A	14.07	Axle Load	-29.14	Axle Load
38.15(B)	70.0	-17.91	N/A	9.79	Axle Load	-33.95	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-37.17	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-37.17	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-40.38	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-45.19	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-46.80	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-53.22	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	38.51	Axle Load	0.00	Axle Load
2	47.32	N/A	38.51	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	379.14	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	38.51	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	34.05	Axle Load	-1.92	Axle Load
6.81(B)	12.5	35.49	N/A	32.93	Axle Load	-2.68	Axle Load
10.90(B)	20.0	29.41	N/A	29.59	Axle Load	-4.95	Axle Load
13.62(L)	25.0	25.36	N/A	27.36	Axle Load	-6.47	Axle Load
13.62(R)	25.0	21.96	N/A	27.36	Axle Load	-6.47	Axle Load
16.35(B)	30.0	17.91	N/A	25.13	Axle Load	-7.98	Axle Load
20.44(B)	37.5	11.83	N/A	21.78	Axle Load	-10.64	Axle Load
21.80(B)	40.0	9.80	N/A	20.67	Axle Load	-11.75	Axle Load
24.52(B)	45.0	5.75	N/A	18.44	Axle Load	-13.98	Axle Load
27.25(L)	50.0	1.70	N/A	16.21	Axle Load	-16.21	Axle Load
27.25(R)	50.0	-1.70	N/A	16.21	Axle Load	-16.21	Axle Load
32.70(B)	60.0	-9.80	N/A	11.75	Axle Load	-20.67	Axle Load
34.06(B)	62.5	-11.83	N/A	10.64	Axle Load	-21.78	Axle Load
38.15(B)	70.0	-17.91	N/A	7.98	Axle Load	-25.13	Axle Load
40.87(L)	75.0	-21.96	N/A	6.47	Axle Load	-27.36	Axle Load
40.87(R)	75.0	-25.36	N/A	6.47	Axle Load	-27.36	Axle Load
43.60(B)	80.0	-29.41	N/A	4.95	Axle Load	-29.59	Axle Load
47.69(B)	87.5	-35.49	N/A	2.68	Axle Load	-32.93	Axle Load
49.05(B)	90.0	-37.52	N/A	1.92	Axle Load	-34.05	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-38.51	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	42.29	Axle Load	0.00	Axle Load
2	47.32	N/A	42.29	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	372.51	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	42.29	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	35.87	Axle Load	-1.75	Axle Load
6.81(B)	12.5	35.49	N/A	34.26	Axle Load	-2.44	Axle Load
10.90(B)	20.0	29.41	N/A	29.44	Axle Load	-4.52	Axle Load
13.62(L)	25.0	25.36	N/A	26.25	Axle Load	-5.90	Axle Load
13.62(R)	25.0	21.96	N/A	26.25	Axle Load	-5.90	Axle Load
16.35(B)	30.0	17.91	N/A	23.49	Axle Load	-7.28	Axle Load
20.44(B)	37.5	11.83	N/A	19.39	Axle Load	-9.35	Axle Load
21.80(B)	40.0	9.80	N/A	18.47	Axle Load	-10.05	Axle Load
24.52(B)	45.0	5.75	N/A	16.00	Axle Load	-11.43	Axle Load
27.25(L)	50.0	1.70	N/A	13.17	Axle Load	-13.17	Axle Load
27.25(R)	50.0	-1.70	N/A	13.17	Axle Load	-13.17	Axle Load
32.70(B)	60.0	-9.80	N/A	10.05	Axle Load	-18.47	Axle Load
34.06(B)	62.5	-11.83	N/A	9.35	Axle Load	-19.39	Axle Load
38.15(B)	70.0	-17.91	N/A	7.28	Axle Load	-23.49	Axle Load
40.87(L)	75.0	-21.96	N/A	5.90	Axle Load	-26.25	Axle Load
40.87(R)	75.0	-25.36	N/A	5.90	Axle Load	-26.25	Axle Load
43.60(B)	80.0	-29.41	N/A	4.52	Axle Load	-29.44	Axle Load
47.69(B)	87.5	-35.49	N/A	2.44	Axle Load	-34.26	Axle Load
49.05(B)	90.0	-37.52	N/A	1.75	Axle Load	-35.87	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-42.29	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**33.84**	**6.825**	**136.50**	**8.847**	**176.94**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**30.28**	**7.820**	**156.41**	**10.137**	**202.75**
5.45	10.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
10.90	20.0	Shear	KIPS	461.24	29.41	26.71	9.082	181.63	11.773	235.45
10.90	20.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**
16.35	30.0	Shear	KIPS	461.24	17.91	23.14	10.837	216.74	14.048	280.96
16.35	30.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
21.80	40.0	Shear	KIPS	461.24	9.80	19.57	13.108	262.16	16.992	339.84
21.80	40.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**7.88**	**2.022**	**40.43**	**2.621**	**52.41**
24.52	45.0	Shear	KIPS	461.24	5.75	17.79	14.585	291.70	18.907	378.13
24.52	45.0	Overload	KSI	50.00	17.69	7.88	2.909	58.18	3.782	75.63
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**7.88**	**1.996**	**39.92**	**2.588**	**51.75**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.01	16.391	327.83	21.248	424.96
27.25	50.0	Overload	KSI	50.00	17.98	7.88	2.882	57.63	3.746	74.93
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
32.70	60.0	Shear	KIPS	461.24	-9.80	-19.57	13.108	262.16	16.992	339.84
32.70	60.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**

38.15	70.0	Shear	KIPS	461.24	-17.91	-23.14	10.837	216.74	14.048	280.96
38.15	70.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
43.60	80.0	Shear	KIPS	461.24	-29.41	-26.71	9.082	181.63	11.773	235.45
43.60	80.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
49.05	90.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-30.28**	**7.820**	**156.41**	**10.137**	**202.75**
49.05	90.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-33.84**	**6.825**	**136.50**	**8.847**	**176.94**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							**Inventory Rating**	**Inventory Load Rating**	**Operating Rating**	**Operating Load Rating**
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**158.58**	**10.278**	**205.56**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**188.17**	**12.196**	**243.92**
5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	226.33	14.670	293.39
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	279.63	18.124	362.49
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	349.73	22.668	453.36

21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**55.02**	**3.566**	**71.33**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	395.28	25.620	512.40
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	79.17	5.146	102.93
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**53.77**	**3.485**	**69.70**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	450.70	29.212	584.25
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	77.63	5.046	100.92
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	349.73	22.668	453.36
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	279.63	18.124	362.49
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	226.33	14.670	293.39
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**188.17**	**12.196**	**243.92**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**158.58**	**10.278**	**205.56**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**64.92**	**3.558**	**128.09**	**4.612**	**166.05**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**56.27**	**4.208**	**151.47**	**5.454**	**196.35**
5.45	10.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
10.90	20.0	Shear	KIPS	461.24	29.41	47.86	5.068	182.44	6.569	236.50
10.90	20.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
16.35	30.0	Shear	KIPS	461.24	17.91	39.69	6.319	227.48	8.191	294.89
16.35	30.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
21.80	40.0	Shear	KIPS	461.24	9.80	31.74	8.082	290.96	10.477	377.18
21.80	40.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**14.26**	**1.118**	**40.23**	**1.449**	**52.15**
24.52	45.0	Shear	KIPS	461.24	5.75	27.86	9.313	335.26	12.072	434.60
24.52	45.0	Overload	KSI	50.00	17.69	14.26	1.608	57.89	2.090	75.26
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**14.18**	**1.110**	**39.95**	**1.438**	**51.78**
27.25	50.0	Shear	KIPS	461.24	-1.70	-24.13	10.871	391.35	14.092	507.31
27.25	50.0	Overload	KSI	50.00	17.98	14.18	1.602	57.67	2.083	74.97
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
32.70	60.0	Shear	KIPS	461.24	-9.80	-31.74	8.082	290.96	10.477	377.18
32.70	60.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
38.15	70.0	Shear	KIPS	461.24	-17.91	-39.69	6.319	227.48	8.191	294.89
38.15	70.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
43.60	80.0	Shear	KIPS	461.24	-29.41	-47.86	5.068	182.44	6.569	236.50
43.60	80.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
49.05	90.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-56.27**	**4.208**	**151.47**	**5.454**	**196.35**
49.05	90.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-64.92**	**3.558**	**128.09**	**4.612**	**166.05**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative

HL-93 (US)
Tandem + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**54.65**	**4.226**	**152.14**	**5.478**	**197.22**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**47.97**	**4.935**	**177.68**	**6.398**	**230.32**
5.45	10.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
10.90	20.0	Shear	KIPS	461.24	29.41	41.53	5.841	210.28	7.572	272.59
10.90	20.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
16.35	30.0	Shear	KIPS	461.24	17.91	35.31	7.102	255.66	9.206	331.42
16.35	30.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
21.80	40.0	Shear	KIPS	461.24	9.80	29.33	8.747	314.89	11.339	408.20
21.80	40.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**12.99**	**1.226**	**44.15**	**1.590**	**57.23**
24.52	45.0	Shear	KIPS	461.24	5.75	26.43	9.817	353.42	12.726	458.13
24.52	45.0	Overload	KSI	50.00	17.69	12.99	1.765	63.53	2.294	82.59
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**13.05**	**1.205**	**43.39**	**1.562**	**56.24**
27.25	50.0	Shear	KIPS	461.24	-1.70	-23.59	11.124	400.45	14.419	519.10
27.25	50.0	Overload	KSI	50.00	17.98	13.05	1.740	62.64	2.262	81.43
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
32.70	60.0	Shear	KIPS	461.24	-9.80	-29.33	8.747	314.89	11.339	408.20
32.70	60.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
38.15	70.0	Shear	KIPS	461.24	-17.91	-35.31	7.102	255.66	9.206	331.42
38.15	70.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
43.60	80.0	Shear	KIPS	461.24			5.841	210.28	7.572	272.59

					-29.41	-41.53				
43.60	80.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
49.05	90.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-47.97**	**4.935**	**177.68**	**6.398**	**230.32**
49.05	90.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-54.65**	**4.226**	**152.14**	**5.478**	**197.22**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location							**Inventory Rating**	**Inventory Load Rating**	**Operating Rating**	**Operating Load Rating**
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**53.22**	**4.340**	**156.24**	**5.626**	**202.54**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**46.80**	**5.059**	**182.13**	**6.558**	**236.10**
5.45	10.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
10.90	20.0	Shear	KIPS	461.24	29.41	40.38	6.007	216.26	7.787	280.34
10.90	20.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
16.35	30.0	Shear	KIPS	461.24	17.91	33.95	7.385	265.88	9.574	344.66
16.35	30.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
21.80	40.0	Shear	KIPS	461.24	9.80	27.53	9.318	335.46	12.079	434.85
21.80	40.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**11.41**	**1.397**	**50.28**	**1.811**	**65.18**
24.52	45.0	Shear	KIPS	461.24	5.75	24.32	10.667	384.03	13.828	497.81
24.52	45.0	Overload	KSI	50.00	17.69	11.41	2.010	72.35	2.613	94.06

27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**11.30**	**1.392**	**50.13**	**1.805**	**64.98**
27.25	50.0	Shear	KIPS	461.24	-1.70	-21.21	12.369	445.30	16.034	577.24
27.25	50.0	Overload	KSI	50.00	17.98	11.30	2.010	72.37	2.613	94.08
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
32.70	60.0	Shear	KIPS	461.24	-9.80	-27.53	9.318	335.46	12.079	434.85
32.70	60.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
38.15	70.0	Shear	KIPS	461.24	-17.91	-33.95	7.385	265.88	9.574	344.66
38.15	70.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
43.60	80.0	Shear	KIPS	461.24	-29.41	-40.38	6.007	216.26	7.787	280.34
43.60	80.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
49.05	90.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-46.80**	**5.059**	**182.13**	**6.558**	**236.10**
49.05	90.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-53.22**	**4.340**	**156.24**	**5.626**	**202.54**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**285.44**	**10.278**	**370.01**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**338.70**	**12.196**	**439.06**

5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	407.39	14.670	528.10
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	503.34	18.124	652.48
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	629.52	22.668	816.04
21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**99.04**	**3.566**	**128.39**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	711.51	25.620	922.33
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	142.51	5.146	185.27
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**96.79**	**3.485**	**125.47**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	811.27	29.212	1051.64
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	139.73	5.046	181.65
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	629.52	22.668	816.04
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	503.34	18.124	652.48
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	407.39	14.670	528.10
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**338.70**	**12.196**	**439.06**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**285.44**	**10.278**	**370.01**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**38.51**	**7.239**	**180.98**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**34.05**	**8.393**	**209.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
10.90	20.0	Shear	KIPS	461.24	29.41	29.59	9.894	247.34
10.90	20.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
16.35	30.0	Shear	KIPS	461.24	17.91	25.13	12.044	301.10
16.35	30.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
21.80	40.0	Shear	KIPS	461.24	9.80	20.67	14.981	374.52
21.80	40.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.53**	**2.256**	**56.40**
24.52	45.0	Shear	KIPS	461.24	5.75	18.44	16.982	424.54
24.52	45.0	Overload	KSI	50.00	17.69	8.53	2.690	67.24
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.50**	**2.234**	**55.86**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.21	19.533	488.33
27.25	50.0	Overload	KSI	50.00	17.98	8.50	2.673	66.82
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
32.70	60.0	Shear	KIPS	461.24	-9.80	-20.67	14.981	374.52
32.70	60.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-25.13	12.044	301.10
38.15	70.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.59	9.894	247.34
43.60	80.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
49.05	90.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-34.05**	**8.393**	**209.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-38.51**	**7.239**	**180.98**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results
Wizard Alternative
Type 3S2
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**42.29**	**6.592**	**237.31**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**35.87**	**7.967**	**286.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
10.90	20.0	Shear	KIPS	461.24	29.41	29.44	9.942	357.91
10.90	20.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
16.35	30.0	Shear	KIPS	461.24	17.91	23.49	12.885	463.86
16.35	30.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
21.80	40.0	Shear	KIPS	461.24	9.80	18.47	16.763	603.48
21.80	40.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.38**	**2.296**	**82.66**
24.52	45.0	Shear	KIPS	461.24	5.75	16.00	19.568	704.44
24.52	45.0	Overload	KSI	50.00	17.69	8.38	2.737	98.55
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.11**	**2.342**	**84.31**
27.25	50.0	Shear	KIPS	461.24	-1.70	-13.17	24.049	865.77
27.25	50.0	Overload	KSI	50.00	17.98	8.11	2.802	100.85
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
32.70	60.0	Shear	KIPS	461.24	-9.80	-18.47	16.763	603.48
32.70	60.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
38.15	70.0	Shear	KIPS	461.24	-17.91	-23.49	12.885	463.86
38.15	70.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.44	9.942	357.91

43.60	80.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
49.05	90.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-35.87**	**7.967**	**286.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-42.29**	**6.592**	**237.31**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:11

Structure Definition Name: Structure1
Member Name: Member 4
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	1.996	STRENGTH-I Steel Flexure Stress	39.92	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	2.588	STRENGTH-I Steel Flexure Stress	51.75	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.110	STRENGTH-I Steel Flexure Stress	39.95	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	1.438	STRENGTH-I Steel Flexure Stress	51.78	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	1.392	STRENGTH-I Steel Flexure Stress	50.13	1	27.25	50.0	As Requested	As Requested
HS 20-44	Operating	1.805	STRENGTH-I Steel Flexure Stress	64.98	1	27.25	50.0	As Requested	As Requested
Type 3	Legal	2.234	STRENGTH-I Steel Flexure Stress	55.86	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	2.296	STRENGTH-I Steel Flexure Stress	82.66	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	33.84	Axle Load	0.00	Lane
2	47.32	N/A	33.84	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	132.58	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	160.85	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	233.92	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	304.01	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	336.07	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	342.85	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	350.55	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	342.85	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	336.07	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	304.01	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	233.92	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	160.85	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	132.58	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	33.84	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	30.28	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	29.38	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	26.71	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	24.92	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	24.92	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	23.14	Axle Load	-8.87	Axle Load
20.44(B)	37.5	11.83	N/A	20.46	Axle Load	-11.55	Axle Load
21.80(B)	40.0	9.80	N/A	19.57	Axle Load	-12.44	Axle Load
24.52(B)	45.0	5.75	N/A	17.79	Axle Load	-14.22	Axle Load
27.25(L)	50.0	1.70	N/A	16.01	Axle Load	-16.01	Axle Load
27.25(R)	50.0	-1.70	N/A	16.01	Axle Load	-16.01	Axle Load
32.70(B)	60.0	-9.80	N/A	12.44	Axle Load	-19.57	Axle Load
34.06(B)	62.5	-11.83	N/A	11.55	Axle Load	-20.46	Axle Load
38.15(B)	70.0	-17.91	N/A	8.87	Axle Load	-23.14	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-24.92	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-24.92	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-26.71	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-29.38	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-30.28	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-33.84	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
2	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	634.61	N/A	634.15	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	37.52	N/A	56.27	Truck + Lane	-2.97	Truck + Lane
6.81(B)	12.5	35.49	N/A	54.15	Truck + Lane	-4.12	Tandem + Lane
10.90(B)	20.0	29.41	N/A	47.86	Truck + Lane	-7.75	Tandem + Lane
13.62(L)	25.0	25.36	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
13.62(R)	25.0	21.96	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
16.35(B)	30.0	17.91	N/A	39.69	Truck + Lane	-12.79	Tandem + Lane
20.44(B)	37.5	11.83	N/A	33.71	Truck + Lane	-16.73	Tandem + Lane
21.80(B)	40.0	9.80	N/A	31.74	Truck + Lane	-18.07	Tandem + Lane
24.52(B)	45.0	5.75	N/A	27.86	Truck + Lane	-20.80	Tandem + Lane
27.25(L)	50.0	1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
27.25(R)	50.0	-1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
32.70(B)	60.0	-9.80	N/A	18.07	Tandem + Lane	-31.74	Truck + Lane
34.06(B)	62.5	-11.83	N/A	16.73	Tandem + Lane	-33.71	Truck + Lane
38.15(B)	70.0	-17.91	N/A	12.79	Tandem + Lane	-39.69	Truck + Lane
40.87(L)	75.0	-21.96	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
40.87(R)	75.0	-25.36	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
43.60(B)	80.0	-29.41	N/A	7.75	Tandem + Lane	-47.86	Truck + Lane
47.69(B)	87.5	-35.49	N/A	4.12	Tandem + Lane	-54.15	Truck + Lane

49.05(B)	90.0	-37.52	N/A	2.97	Truck + Lane	-56.27	Truck + Lane
54.50(L)	100.0	-45.62	N/A	-0.00	Tandem + Lane	-64.92	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	53.22	Axle Load	0.00	Lane
2	47.32	N/A	53.22	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	204.94	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	247.38	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	353.63	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	446.08	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	488.54	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	498.34	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	507.39	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	498.34	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	488.54	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	446.08	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	353.63	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	247.38	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	204.94	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	53.22	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	46.80	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	45.19	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	40.38	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	37.17	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	37.17	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	33.95	Axle Load	-9.79	Axle Load
20.44(B)	37.5	11.83	N/A	29.14	Axle Load	-14.07	Axle Load
21.80(B)	40.0	9.80	N/A	27.53	Axle Load	-15.50	Axle Load
24.52(B)	45.0	5.75	N/A	24.32	Axle Load	-18.36	Axle Load
27.25(L)	50.0	1.70	N/A	21.21	Axle Load	-21.21	Axle Load
27.25(R)	50.0	-1.70	N/A	21.21	Axle Load	-21.21	Axle Load
32.70(B)	60.0	-9.80	N/A	15.50	Axle Load	-27.53	Axle Load
34.06(B)	62.5	-11.83	N/A	14.07	Axle Load	-29.14	Axle Load
38.15(B)	70.0	-17.91	N/A	9.79	Axle Load	-33.95	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-37.17	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-37.17	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-40.38	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-45.19	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-46.80	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-53.22	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	38.51	Axle Load	0.00	Axle Load
2	47.32	N/A	38.51	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	379.14	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	38.51	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	34.05	Axle Load	-1.92	Axle Load
6.81(B)	12.5	35.49	N/A	32.93	Axle Load	-2.68	Axle Load
10.90(B)	20.0	29.41	N/A	29.59	Axle Load	-4.95	Axle Load
13.62(L)	25.0	25.36	N/A	27.36	Axle Load	-6.47	Axle Load
13.62(R)	25.0	21.96	N/A	27.36	Axle Load	-6.47	Axle Load
16.35(B)	30.0	17.91	N/A	25.13	Axle Load	-7.98	Axle Load
20.44(B)	37.5	11.83	N/A	21.78	Axle Load	-10.64	Axle Load
21.80(B)	40.0	9.80	N/A	20.67	Axle Load	-11.75	Axle Load
24.52(B)	45.0	5.75	N/A	18.44	Axle Load	-13.98	Axle Load
27.25(L)	50.0	1.70	N/A	16.21	Axle Load	-16.21	Axle Load
27.25(R)	50.0	-1.70	N/A	16.21	Axle Load	-16.21	Axle Load
32.70(B)	60.0	-9.80	N/A	11.75	Axle Load	-20.67	Axle Load
34.06(B)	62.5	-11.83	N/A	10.64	Axle Load	-21.78	Axle Load
38.15(B)	70.0	-17.91	N/A	7.98	Axle Load	-25.13	Axle Load
40.87(L)	75.0	-21.96	N/A	6.47	Axle Load	-27.36	Axle Load
40.87(R)	75.0	-25.36	N/A	6.47	Axle Load	-27.36	Axle Load
43.60(B)	80.0	-29.41	N/A	4.95	Axle Load	-29.59	Axle Load
47.69(B)	87.5	-35.49	N/A	2.68	Axle Load	-32.93	Axle Load
49.05(B)	90.0	-37.52	N/A	1.92	Axle Load	-34.05	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-38.51	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	42.29	Axle Load	0.00	Axle Load
2	47.32	N/A	42.29	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	372.51	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	42.29	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	35.87	Axle Load	-1.75	Axle Load
6.81(B)	12.5	35.49	N/A	34.26	Axle Load	-2.44	Axle Load
10.90(B)	20.0	29.41	N/A	29.44	Axle Load	-4.52	Axle Load
13.62(L)	25.0	25.36	N/A	26.25	Axle Load	-5.90	Axle Load
13.62(R)	25.0	21.96	N/A	26.25	Axle Load	-5.90	Axle Load
16.35(B)	30.0	17.91	N/A	23.49	Axle Load	-7.28	Axle Load
20.44(B)	37.5	11.83	N/A	19.39	Axle Load	-9.35	Axle Load
21.80(B)	40.0	9.80	N/A	18.47	Axle Load	-10.05	Axle Load
24.52(B)	45.0	5.75	N/A	16.00	Axle Load	-11.43	Axle Load
27.25(L)	50.0	1.70	N/A	13.17	Axle Load	-13.17	Axle Load
27.25(R)	50.0	-1.70	N/A	13.17	Axle Load	-13.17	Axle Load
32.70(B)	60.0	-9.80	N/A	10.05	Axle Load	-18.47	Axle Load
34.06(B)	62.5	-11.83	N/A	9.35	Axle Load	-19.39	Axle Load
38.15(B)	70.0	-17.91	N/A	7.28	Axle Load	-23.49	Axle Load
40.87(L)	75.0	-21.96	N/A	5.90	Axle Load	-26.25	Axle Load
40.87(R)	75.0	-25.36	N/A	5.90	Axle Load	-26.25	Axle Load
43.60(B)	80.0	-29.41	N/A	4.52	Axle Load	-29.44	Axle Load
47.69(B)	87.5	-35.49	N/A	2.44	Axle Load	-34.26	Axle Load
49.05(B)	90.0	-37.52	N/A	1.75	Axle Load	-35.87	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-42.29	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**33.84**	**6.825**	**136.50**	**8.847**	**176.94**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**30.28**	**7.820**	**156.41**	**10.137**	**202.75**
5.45	10.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
10.90	20.0	Shear	KIPS	461.24	29.41	26.71	9.082	181.63	11.773	235.45
10.90	20.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**
16.35	30.0	Shear	KIPS	461.24	17.91	23.14	10.837	216.74	14.048	280.96
16.35	30.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
21.80	40.0	Shear	KIPS	461.24	9.80	19.57	13.108	262.16	16.992	339.84
21.80	40.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**7.88**	**2.022**	**40.43**	**2.621**	**52.41**
24.52	45.0	Shear	KIPS	461.24	5.75	17.79	14.585	291.70	18.907	378.13
24.52	45.0	Overload	KSI	50.00	17.69	7.88	2.909	58.18	3.782	75.63
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**7.88**	**1.996**	**39.92**	**2.588**	**51.75**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.01	16.391	327.83	21.248	424.96
27.25	50.0	Overload	KSI	50.00	17.98	7.88	2.882	57.63	3.746	74.93
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
32.70	60.0	Shear	KIPS	461.24	-9.80	-19.57	13.108	262.16	16.992	339.84
32.70	60.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**

38.15	70.0	Shear	KIPS	461.24	-17.91	-23.14	10.837	216.74	14.048	280.96
38.15	70.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
43.60	80.0	Shear	KIPS	461.24	-29.41	-26.71	9.082	181.63	11.773	235.45
43.60	80.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
49.05	90.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-30.28**	**7.820**	**156.41**	**10.137**	**202.75**
49.05	90.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-33.84**	**6.825**	**136.50**	**8.847**	**176.94**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**158.58**	**10.278**	**205.56**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**188.17**	**12.196**	**243.92**
5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	226.33	14.670	293.39
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	279.63	18.124	362.49
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	349.73	22.668	453.36

21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**55.02**	**3.566**	**71.33**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	395.28	25.620	512.40
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	79.17	5.146	102.93
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**53.77**	**3.485**	**69.70**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	450.70	29.212	584.25
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	77.63	5.046	100.92
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	349.73	22.668	453.36
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	279.63	18.124	362.49
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	226.33	14.670	293.39
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**188.17**	**12.196**	**243.92**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**158.58**	**10.278**	**205.56**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							**Inventory Rating**	**Inventory Load Rating**	**Operating Rating**	**Operating Load Rating**
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**64.92**	**3.558**	**128.09**	**4.612**	**166.05**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**56.27**	**4.208**	**151.47**	**5.454**	**196.35**
5.45	10.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
10.90	20.0	Shear	KIPS	461.24	29.41	47.86	5.068	182.44	6.569	236.50
10.90	20.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
16.35	30.0	Shear	KIPS	461.24	17.91	39.69	6.319	227.48	8.191	294.89
16.35	30.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
21.80	40.0	Shear	KIPS	461.24	9.80	31.74	8.082	290.96	10.477	377.18
21.80	40.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**14.26**	**1.118**	**40.23**	**1.449**	**52.15**
24.52	45.0	Shear	KIPS	461.24	5.75	27.86	9.313	335.26	12.072	434.60
24.52	45.0	Overload	KSI	50.00	17.69	14.26	1.608	57.89	2.090	75.26
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**14.18**	**1.110**	**39.95**	**1.438**	**51.78**
27.25	50.0	Shear	KIPS	461.24	-1.70	-24.13	10.871	391.35	14.092	507.31
27.25	50.0	Overload	KSI	50.00	17.98	14.18	1.602	57.67	2.083	74.97
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
32.70	60.0	Shear	KIPS	461.24	-9.80	-31.74	8.082	290.96	10.477	377.18
32.70	60.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
38.15	70.0	Shear	KIPS	461.24	-17.91	-39.69	6.319	227.48	8.191	294.89
38.15	70.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
43.60	80.0	Shear	KIPS	461.24	-29.41	-47.86	5.068	182.44	6.569	236.50
43.60	80.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
49.05	90.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-56.27**	**4.208**	**151.47**	**5.454**	**196.35**
49.05	90.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-64.92**	**3.558**	**128.09**	**4.612**	**166.05**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative

HL-93 (US)
Tandem + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**54.65**	**4.226**	**152.14**	**5.478**	**197.22**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**47.97**	**4.935**	**177.68**	**6.398**	**230.32**
5.45	10.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
10.90	20.0	Shear	KIPS	461.24	29.41	41.53	5.841	210.28	7.572	272.59
10.90	20.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
16.35	30.0	Shear	KIPS	461.24	17.91	35.31	7.102	255.66	9.206	331.42
16.35	30.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
21.80	40.0	Shear	KIPS	461.24	9.80	29.33	8.747	314.89	11.339	408.20
21.80	40.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**12.99**	**1.226**	**44.15**	**1.590**	**57.23**
24.52	45.0	Shear	KIPS	461.24	5.75	26.43	9.817	353.42	12.726	458.13
24.52	45.0	Overload	KSI	50.00	17.69	12.99	1.765	63.53	2.294	82.59
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**13.05**	**1.205**	**43.39**	**1.562**	**56.24**
27.25	50.0	Shear	KIPS	461.24	-1.70	-23.59	11.124	400.45	14.419	519.10
27.25	50.0	Overload	KSI	50.00	17.98	13.05	1.740	62.64	2.262	81.43
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
32.70	60.0	Shear	KIPS	461.24	-9.80	-29.33	8.747	314.89	11.339	408.20
32.70	60.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
38.15	70.0	Shear	KIPS	461.24	-17.91	-35.31	7.102	255.66	9.206	331.42
38.15	70.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
43.60	80.0	Shear	KIPS	461.24			5.841	210.28	7.572	272.59

					-29.41	-41.53				
43.60	80.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
49.05	90.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-47.97**	**4.935**	**177.68**	**6.398**	**230.32**
49.05	90.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-54.65**	**4.226**	**152.14**	**5.478**	**197.22**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location							**Inventory Rating**	**Inventory Load Rating**	**Operating Rating**	**Operating Load Rating**
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**53.22**	**4.340**	**156.24**	**5.626**	**202.54**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**46.80**	**5.059**	**182.13**	**6.558**	**236.10**
5.45	10.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
10.90	20.0	Shear	KIPS	461.24	29.41	40.38	6.007	216.26	7.787	280.34
10.90	20.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
16.35	30.0	Shear	KIPS	461.24	17.91	33.95	7.385	265.88	9.574	344.66
16.35	30.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
21.80	40.0	Shear	KIPS	461.24	9.80	27.53	9.318	335.46	12.079	434.85
21.80	40.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**11.41**	**1.397**	**50.28**	**1.811**	**65.18**
24.52	45.0	Shear	KIPS	461.24	5.75	24.32	10.667	384.03	13.828	497.81
24.52	45.0	Overload	KSI	50.00	17.69	11.41	2.010	72.35	2.613	94.06

27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**11.30**	**1.392**	**50.13**	**1.805**	**64.98**
27.25	50.0	Shear	KIPS	461.24	-1.70	-21.21	12.369	445.30	16.034	577.24
27.25	50.0	Overload	KSI	50.00	17.98	11.30	2.010	72.37	2.613	94.08
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
32.70	60.0	Shear	KIPS	461.24	-9.80	-27.53	9.318	335.46	12.079	434.85
32.70	60.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
38.15	70.0	Shear	KIPS	461.24	-17.91	-33.95	7.385	265.88	9.574	344.66
38.15	70.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
43.60	80.0	Shear	KIPS	461.24	-29.41	-40.38	6.007	216.26	7.787	280.34
43.60	80.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
49.05	90.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-46.80**	**5.059**	**182.13**	**6.558**	**236.10**
49.05	90.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-53.22**	**4.340**	**156.24**	**5.626**	**202.54**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**285.44**	**10.278**	**370.01**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**338.70**	**12.196**	**439.06**

5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	407.39	14.670	528.10
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	503.34	18.124	652.48
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	629.52	22.668	816.04
21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**99.04**	**3.566**	**128.39**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	711.51	25.620	922.33
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	142.51	5.146	185.27
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**96.79**	**3.485**	**125.47**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	811.27	29.212	1051.64
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	139.73	5.046	181.65
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	629.52	22.668	816.04
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	503.34	18.124	652.48
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	407.39	14.670	528.10
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**338.70**	**12.196**	**439.06**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**285.44**	**10.278**	**370.01**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**38.51**	**7.239**	**180.98**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**34.05**	**8.393**	**209.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
10.90	20.0	Shear	KIPS	461.24	29.41	29.59	9.894	247.34
10.90	20.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
16.35	30.0	Shear	KIPS	461.24	17.91	25.13	12.044	301.10
16.35	30.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
21.80	40.0	Shear	KIPS	461.24	9.80	20.67	14.981	374.52
21.80	40.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.53**	**2.256**	**56.40**
24.52	45.0	Shear	KIPS	461.24	5.75	18.44	16.982	424.54
24.52	45.0	Overload	KSI	50.00	17.69	8.53	2.690	67.24
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.50**	**2.234**	**55.86**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.21	19.533	488.33
27.25	50.0	Overload	KSI	50.00	17.98	8.50	2.673	66.82
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
32.70	60.0	Shear	KIPS	461.24	-9.80	-20.67	14.981	374.52
32.70	60.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-25.13	12.044	301.10
38.15	70.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.59	9.894	247.34
43.60	80.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
49.05	90.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-34.05**	**8.393**	**209.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-38.51**	**7.239**	**180.98**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results
Wizard Alternative
Type 3S2
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**42.29**	**6.592**	**237.31**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**35.87**	**7.967**	**286.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
10.90	20.0	Shear	KIPS	461.24	29.41	29.44	9.942	357.91
10.90	20.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
16.35	30.0	Shear	KIPS	461.24	17.91	23.49	12.885	463.86
16.35	30.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
21.80	40.0	Shear	KIPS	461.24	9.80	18.47	16.763	603.48
21.80	40.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.38**	**2.296**	**82.66**
24.52	45.0	Shear	KIPS	461.24	5.75	16.00	19.568	704.44
24.52	45.0	Overload	KSI	50.00	17.69	8.38	2.737	98.55
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.11**	**2.342**	**84.31**
27.25	50.0	Shear	KIPS	461.24	-1.70	-13.17	24.049	865.77
27.25	50.0	Overload	KSI	50.00	17.98	8.11	2.802	100.85
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
32.70	60.0	Shear	KIPS	461.24	-9.80	-18.47	16.763	603.48
32.70	60.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
38.15	70.0	Shear	KIPS	461.24	-17.91	-23.49	12.885	463.86
38.15	70.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.44	9.942	357.91

43.60	80.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
49.05	90.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-35.87**	**7.967**	**286.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-42.29**	**6.592**	**237.31**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:12

Structure Definition Name: Structure1
Member Name: Member 5
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	1.996	STRENGTH-I Steel Flexure Stress	39.92	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	2.588	STRENGTH-I Steel Flexure Stress	51.75	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.110	STRENGTH-I Steel Flexure Stress	39.95	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	1.438	STRENGTH-I Steel Flexure Stress	51.78	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	1.392	STRENGTH-I Steel Flexure Stress	50.13	1	27.25	50.0	As Requested	As Requested
HS 20-44	Operating	1.805	STRENGTH-I Steel Flexure Stress	64.98	1	27.25	50.0	As Requested	As Requested
Type 3	Legal	2.234	STRENGTH-I Steel Flexure Stress	55.86	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	2.296	STRENGTH-I Steel Flexure Stress	82.66	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	33.84	Axle Load	0.00	Lane
2	47.32	N/A	33.84	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	132.58	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	160.85	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	233.92	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	272.87	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	304.01	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	336.07	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	342.85	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	350.55	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	350.45	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	342.85	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	336.07	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	304.01	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	272.87	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	233.92	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	160.85	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	132.58	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	33.84	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	30.28	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	29.38	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	26.71	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	24.92	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	24.92	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	23.14	Axle Load	-8.87	Axle Load
20.44(B)	37.5	11.83	N/A	20.46	Axle Load	-11.55	Axle Load
21.80(B)	40.0	9.80	N/A	19.57	Axle Load	-12.44	Axle Load
24.52(B)	45.0	5.75	N/A	17.79	Axle Load	-14.22	Axle Load
27.25(L)	50.0	1.70	N/A	16.01	Axle Load	-16.01	Axle Load
27.25(R)	50.0	-1.70	N/A	16.01	Axle Load	-16.01	Axle Load
32.70(B)	60.0	-9.80	N/A	12.44	Axle Load	-19.57	Axle Load
34.06(B)	62.5	-11.83	N/A	11.55	Axle Load	-20.46	Axle Load
38.15(B)	70.0	-17.91	N/A	8.87	Axle Load	-23.14	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-24.92	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-24.92	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-26.71	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-29.38	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-30.28	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-33.84	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
2	47.32	N/A	64.92	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	634.61	N/A	634.15	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	644.76	N/A	630.42	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	613.41	N/A	621.26	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	598.67	N/A	608.58	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	537.89	N/A	553.63	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	483.57	N/A	502.91	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	408.94	N/A	435.57	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	276.29	N/A	303.40	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	226.55	N/A	251.03	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	64.92	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	37.52	N/A	56.27	Truck + Lane	-2.97	Truck + Lane
6.81(B)	12.5	35.49	N/A	54.15	Truck + Lane	-4.12	Tandem + Lane
10.90(B)	20.0	29.41	N/A	47.86	Truck + Lane	-7.75	Tandem + Lane
13.62(L)	25.0	25.36	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
13.62(R)	25.0	21.96	N/A	43.74	Truck + Lane	-10.24	Tandem + Lane
16.35(B)	30.0	17.91	N/A	39.69	Truck + Lane	-12.79	Tandem + Lane
20.44(B)	37.5	11.83	N/A	33.71	Truck + Lane	-16.73	Tandem + Lane
21.80(B)	40.0	9.80	N/A	31.74	Truck + Lane	-18.07	Tandem + Lane
24.52(B)	45.0	5.75	N/A	27.86	Truck + Lane	-20.80	Tandem + Lane
27.25(L)	50.0	1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
27.25(R)	50.0	-1.70	N/A	24.13	Truck + Lane	-24.13	Truck + Lane
32.70(B)	60.0	-9.80	N/A	18.07	Tandem + Lane	-31.74	Truck + Lane
34.06(B)	62.5	-11.83	N/A	16.73	Tandem + Lane	-33.71	Truck + Lane
38.15(B)	70.0	-17.91	N/A	12.79	Tandem + Lane	-39.69	Truck + Lane
40.87(L)	75.0	-21.96	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
40.87(R)	75.0	-25.36	N/A	10.24	Tandem + Lane	-43.74	Truck + Lane
43.60(B)	80.0	-29.41	N/A	7.75	Tandem + Lane	-47.86	Truck + Lane
47.69(B)	87.5	-35.49	N/A	4.12	Tandem + Lane	-54.15	Truck + Lane

49.05(B)	90.0	-37.52	N/A	2.97	Truck + Lane	-56.27	Truck + Lane
54.50(L)	100.0	-45.62	N/A	-0.00	Tandem + Lane	-64.92	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	53.22	Axle Load	0.00	Lane
2	47.32	N/A	53.22	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	226.55	N/A	204.94	Axle Load	0.00	Lane
6.81(B)	12.5	276.29	N/A	247.38	Axle Load	0.00	Lane
10.90(B)	20.0	408.94	N/A	353.63	Axle Load	0.00	Lane
13.62(L)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
13.62(R)	25.0	483.57	N/A	406.88	Axle Load	0.00	Lane
16.35(B)	30.0	537.89	N/A	446.08	Axle Load	0.00	Lane
20.44(B)	37.5	598.67	N/A	488.54	Axle Load	0.00	Lane
21.80(B)	40.0	613.41	N/A	498.34	Axle Load	0.00	Lane
24.52(B)	45.0	634.61	N/A	507.39	Axle Load	0.00	Lane
27.25(L)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
27.25(R)	50.0	644.76	N/A	502.38	Axle Load	0.00	Lane
32.70(B)	60.0	613.41	N/A	498.34	Axle Load	0.00	Lane
34.06(B)	62.5	598.67	N/A	488.54	Axle Load	0.00	Lane
38.15(B)	70.0	537.89	N/A	446.08	Axle Load	0.00	Lane
40.87(L)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
40.87(R)	75.0	483.57	N/A	406.88	Axle Load	0.00	Lane
43.60(B)	80.0	408.94	N/A	353.63	Axle Load	0.00	Lane
47.69(B)	87.5	276.29	N/A	247.38	Axle Load	0.00	Lane
49.05(B)	90.0	226.55	N/A	204.94	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	53.22	Axle Load	0.00	Lane
5.45(B)	10.0	37.52	N/A	46.80	Axle Load	-2.85	Axle Load
6.81(B)	12.5	35.49	N/A	45.19	Axle Load	-3.57	Axle Load
10.90(B)	20.0	29.41	N/A	40.38	Axle Load	-5.71	Axle Load
13.62(L)	25.0	25.36	N/A	37.17	Axle Load	-7.14	Axle Load
13.62(R)	25.0	21.96	N/A	37.17	Axle Load	-7.14	Axle Load
16.35(B)	30.0	17.91	N/A	33.95	Axle Load	-9.79	Axle Load
20.44(B)	37.5	11.83	N/A	29.14	Axle Load	-14.07	Axle Load
21.80(B)	40.0	9.80	N/A	27.53	Axle Load	-15.50	Axle Load
24.52(B)	45.0	5.75	N/A	24.32	Axle Load	-18.36	Axle Load
27.25(L)	50.0	1.70	N/A	21.21	Axle Load	-21.21	Axle Load
27.25(R)	50.0	-1.70	N/A	21.21	Axle Load	-21.21	Axle Load
32.70(B)	60.0	-9.80	N/A	15.50	Axle Load	-27.53	Axle Load
34.06(B)	62.5	-11.83	N/A	14.07	Axle Load	-29.14	Axle Load
38.15(B)	70.0	-17.91	N/A	9.79	Axle Load	-33.95	Axle Load
40.87(L)	75.0	-21.96	N/A	7.14	Axle Load	-37.17	Axle Load
40.87(R)	75.0	-25.36	N/A	7.14	Axle Load	-37.17	Axle Load
43.60(B)	80.0	-29.41	N/A	5.71	Axle Load	-40.38	Axle Load
47.69(B)	87.5	-35.49	N/A	3.57	Axle Load	-45.19	Axle Load
49.05(B)	90.0	-37.52	N/A	2.85	Axle Load	-46.80	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Lane	-53.22	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	38.51	Axle Load	0.00	Axle Load
2	47.32	N/A	38.51	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	379.14	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	377.86	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.66	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	362.75	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	330.13	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	299.52	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	259.14	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	180.27	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	149.10	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	38.51	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	34.05	Axle Load	-1.92	Axle Load
6.81(B)	12.5	35.49	N/A	32.93	Axle Load	-2.68	Axle Load
10.90(B)	20.0	29.41	N/A	29.59	Axle Load	-4.95	Axle Load
13.62(L)	25.0	25.36	N/A	27.36	Axle Load	-6.47	Axle Load
13.62(R)	25.0	21.96	N/A	27.36	Axle Load	-6.47	Axle Load
16.35(B)	30.0	17.91	N/A	25.13	Axle Load	-7.98	Axle Load
20.44(B)	37.5	11.83	N/A	21.78	Axle Load	-10.64	Axle Load
21.80(B)	40.0	9.80	N/A	20.67	Axle Load	-11.75	Axle Load
24.52(B)	45.0	5.75	N/A	18.44	Axle Load	-13.98	Axle Load
27.25(L)	50.0	1.70	N/A	16.21	Axle Load	-16.21	Axle Load
27.25(R)	50.0	-1.70	N/A	16.21	Axle Load	-16.21	Axle Load
32.70(B)	60.0	-9.80	N/A	11.75	Axle Load	-20.67	Axle Load
34.06(B)	62.5	-11.83	N/A	10.64	Axle Load	-21.78	Axle Load
38.15(B)	70.0	-17.91	N/A	7.98	Axle Load	-25.13	Axle Load
40.87(L)	75.0	-21.96	N/A	6.47	Axle Load	-27.36	Axle Load
40.87(R)	75.0	-25.36	N/A	6.47	Axle Load	-27.36	Axle Load
43.60(B)	80.0	-29.41	N/A	4.95	Axle Load	-29.59	Axle Load
47.69(B)	87.5	-35.49	N/A	2.68	Axle Load	-32.93	Axle Load
49.05(B)	90.0	-37.52	N/A	1.92	Axle Load	-34.05	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-38.51	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	47.32	N/A	42.29	Axle Load	0.00	Axle Load
2	47.32	N/A	42.29	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
6.81(B)	12.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
10.90(B)	20.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
13.62(L)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
13.62(R)	25.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
16.35(B)	30.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
20.44(B)	37.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
21.80(B)	40.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
24.52(B)	45.0	634.61	N/A	372.51	Axle Load	0.00	Axle Load
27.25(L)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
27.25(R)	50.0	644.76	N/A	360.48	Axle Load	0.00	Axle Load
32.70(B)	60.0	613.41	N/A	370.48	Axle Load	0.00	Axle Load
34.06(B)	62.5	598.67	N/A	364.20	Axle Load	0.00	Axle Load
38.15(B)	70.0	537.89	N/A	335.43	Axle Load	0.00	Axle Load
40.87(L)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
40.87(R)	75.0	483.57	N/A	301.53	Axle Load	0.00	Axle Load
43.60(B)	80.0	408.94	N/A	257.88	Axle Load	0.00	Axle Load
47.69(B)	87.5	276.29	N/A	187.54	Axle Load	0.00	Axle Load
49.05(B)	90.0	226.55	N/A	157.06	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	45.62	N/A	42.29	Axle Load	0.00	Axle Load
5.45(B)	10.0	37.52	N/A	35.87	Axle Load	-1.75	Axle Load
6.81(B)	12.5	35.49	N/A	34.26	Axle Load	-2.44	Axle Load
10.90(B)	20.0	29.41	N/A	29.44	Axle Load	-4.52	Axle Load
13.62(L)	25.0	25.36	N/A	26.25	Axle Load	-5.90	Axle Load
13.62(R)	25.0	21.96	N/A	26.25	Axle Load	-5.90	Axle Load
16.35(B)	30.0	17.91	N/A	23.49	Axle Load	-7.28	Axle Load
20.44(B)	37.5	11.83	N/A	19.39	Axle Load	-9.35	Axle Load
21.80(B)	40.0	9.80	N/A	18.47	Axle Load	-10.05	Axle Load
24.52(B)	45.0	5.75	N/A	16.00	Axle Load	-11.43	Axle Load
27.25(L)	50.0	1.70	N/A	13.17	Axle Load	-13.17	Axle Load
27.25(R)	50.0	-1.70	N/A	13.17	Axle Load	-13.17	Axle Load
32.70(B)	60.0	-9.80	N/A	10.05	Axle Load	-18.47	Axle Load
34.06(B)	62.5	-11.83	N/A	9.35	Axle Load	-19.39	Axle Load
38.15(B)	70.0	-17.91	N/A	7.28	Axle Load	-23.49	Axle Load
40.87(L)	75.0	-21.96	N/A	5.90	Axle Load	-26.25	Axle Load
40.87(R)	75.0	-25.36	N/A	5.90	Axle Load	-26.25	Axle Load
43.60(B)	80.0	-29.41	N/A	4.52	Axle Load	-29.44	Axle Load
47.69(B)	87.5	-35.49	N/A	2.44	Axle Load	-34.26	Axle Load
49.05(B)	90.0	-37.52	N/A	1.75	Axle Load	-35.87	Axle Load
54.50(L)	100.0	-45.62	N/A	-0.00	Axle Load	-42.29	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**33.84**	**6.825**	**136.50**	**8.847**	**176.94**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**30.28**	**7.820**	**156.41**	**10.137**	**202.75**
5.45	10.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
10.90	20.0	Shear	KIPS	461.24	29.41	26.71	9.082	181.63	11.773	235.45
10.90	20.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**
16.35	30.0	Shear	KIPS	461.24	17.91	23.14	10.837	216.74	14.048	280.96
16.35	30.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
21.80	40.0	Shear	KIPS	461.24	9.80	19.57	13.108	262.16	16.992	339.84
21.80	40.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**7.88**	**2.022**	**40.43**	**2.621**	**52.41**
24.52	45.0	Shear	KIPS	461.24	5.75	17.79	14.585	291.70	18.907	378.13
24.52	45.0	Overload	KSI	50.00	17.69	7.88	2.909	58.18	3.782	75.63
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**7.88**	**1.996**	**39.92**	**2.588**	**51.75**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.01	16.391	327.83	21.248	424.96
27.25	50.0	Overload	KSI	50.00	17.98	7.88	2.882	57.63	3.746	74.93
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**7.71**	**2.122**	**42.44**	**2.751**	**55.01**
32.70	60.0	Shear	KIPS	461.24	-9.80	-19.57	13.108	262.16	16.992	339.84
32.70	60.0	Overload	KSI	50.00	17.10	7.71	3.033	60.67	3.943	78.87
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**6.84**	**2.613**	**52.26**	**3.387**	**67.74**

38.15	70.0	Shear	KIPS	461.24	-17.91	-23.14	10.837	216.74	14.048	280.96
38.15	70.0	Overload	KSI	50.00	14.99	6.84	3.658	73.15	4.755	95.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.26**	**3.884**	**77.68**	**5.035**	**100.69**
43.60	80.0	Shear	KIPS	461.24	-29.41	-26.71	9.082	181.63	11.773	235.45
43.60	80.0	Overload	KSI	50.00	11.40	5.26	5.279	105.59	6.863	137.26
49.05	90.0	Flexure	KSI	50.00	6.31	2.98	8.071	161.42	10.463	209.25
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-30.28**	**7.820**	**156.41**	**10.137**	**202.75**
49.05	90.0	Overload	KSI	50.00	6.31	2.98	10.627	212.54	13.815	276.30
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-33.84**	**6.825**	**136.50**	**8.847**	**176.94**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**158.58**	**10.278**	**205.56**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**188.17**	**12.196**	**243.92**
5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	226.33	14.670	293.39
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	279.63	18.124	362.49
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	349.73	22.668	453.36

21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**55.02**	**3.566**	**71.33**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	395.28	25.620	512.40
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	79.17	5.146	102.93
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**53.77**	**3.485**	**69.70**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	450.70	29.212	584.25
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	77.63	5.046	100.92
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**58.25**	**3.775**	**75.51**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	349.73	22.668	453.36
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	83.27	5.413	108.25
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**72.69**	**4.711**	**94.22**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	279.63	18.124	362.49
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	101.75	6.614	132.28
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**109.12**	**7.072**	**141.45**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	226.33	14.670	293.39
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	148.32	9.641	192.82
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	228.48	14.809	296.18
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**188.17**	**12.196**	**243.92**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	300.84	19.554	391.09
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**158.58**	**10.278**	**205.56**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**64.92**	**3.558**	**128.09**	**4.612**	**166.05**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**56.27**	**4.208**	**151.47**	**5.454**	**196.35**
5.45	10.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
10.90	20.0	Shear	KIPS	461.24	29.41	47.86	5.068	182.44	6.569	236.50
10.90	20.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
16.35	30.0	Shear	KIPS	461.24	17.91	39.69	6.319	227.48	8.191	294.89
16.35	30.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
21.80	40.0	Shear	KIPS	461.24	9.80	31.74	8.082	290.96	10.477	377.18
21.80	40.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**14.26**	**1.118**	**40.23**	**1.449**	**52.15**
24.52	45.0	Shear	KIPS	461.24	5.75	27.86	9.313	335.26	12.072	434.60
24.52	45.0	Overload	KSI	50.00	17.69	14.26	1.608	57.89	2.090	75.26
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**14.18**	**1.110**	**39.95**	**1.438**	**51.78**
27.25	50.0	Shear	KIPS	461.24	-1.70	-24.13	10.871	391.35	14.092	507.31
27.25	50.0	Overload	KSI	50.00	17.98	14.18	1.602	57.67	2.083	74.97
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**13.97**	**1.171**	**42.16**	**1.518**	**54.65**
32.70	60.0	Shear	KIPS	461.24	-9.80	-31.74	8.082	290.96	10.477	377.18
32.70	60.0	Overload	KSI	50.00	17.10	13.97	1.674	60.27	2.176	78.35
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**12.45**	**1.435**	**51.65**	**1.860**	**66.95**
38.15	70.0	Shear	KIPS	461.24	-17.91	-39.69	6.319	227.48	8.191	294.89
38.15	70.0	Overload	KSI	50.00	14.99	12.45	2.008	72.31	2.611	94.00
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**9.80**	**2.086**	**75.09**	**2.704**	**97.34**
43.60	80.0	Shear	KIPS	461.24	-29.41	-47.86	5.068	182.44	6.569	236.50
43.60	80.0	Overload	KSI	50.00	11.40	9.80	2.835	102.07	3.686	132.69
49.05	90.0	Flexure	KSI	50.00	6.31	5.65	4.263	153.46	5.526	198.93
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-56.27**	**4.208**	**151.47**	**5.454**	**196.35**
49.05	90.0	Overload	KSI	50.00	6.31	5.65	5.613	202.06	7.296	262.67
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-64.92**	**3.558**	**128.09**	**4.612**	**166.05**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative

HL-93 (US)
Tandem + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**54.65**	**4.226**	**152.14**	**5.478**	**197.22**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**47.97**	**4.935**	**177.68**	**6.398**	**230.32**
5.45	10.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
10.90	20.0	Shear	KIPS	461.24	29.41	41.53	5.841	210.28	7.572	272.59
10.90	20.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
16.35	30.0	Shear	KIPS	461.24	17.91	35.31	7.102	255.66	9.206	331.42
16.35	30.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
21.80	40.0	Shear	KIPS	461.24	9.80	29.33	8.747	314.89	11.339	408.20
21.80	40.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**12.99**	**1.226**	**44.15**	**1.590**	**57.23**
24.52	45.0	Shear	KIPS	461.24	5.75	26.43	9.817	353.42	12.726	458.13
24.52	45.0	Overload	KSI	50.00	17.69	12.99	1.765	63.53	2.294	82.59
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**13.05**	**1.205**	**43.39**	**1.562**	**56.24**
27.25	50.0	Shear	KIPS	461.24	-1.70	-23.59	11.124	400.45	14.419	519.10
27.25	50.0	Overload	KSI	50.00	17.98	13.05	1.740	62.64	2.262	81.43
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**12.66**	**1.292**	**46.52**	**1.675**	**60.31**
32.70	60.0	Shear	KIPS	461.24	-9.80	-29.33	8.747	314.89	11.339	408.20
32.70	60.0	Overload	KSI	50.00	17.10	12.66	1.847	66.51	2.402	86.46
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**11.16**	**1.601**	**57.63**	**2.075**	**74.71**
38.15	70.0	Shear	KIPS	461.24	-17.91	-35.31	7.102	255.66	9.206	331.42
38.15	70.0	Overload	KSI	50.00	14.99	11.16	2.241	80.68	2.913	104.88
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**8.55**	**2.390**	**86.05**	**3.099**	**111.55**
43.60	80.0	Shear	KIPS	461.24			5.841	210.28	7.572	272.59

					-29.41	-41.53				
43.60	80.0	Overload	KSI	50.00	11.40	8.55	3.249	116.97	4.224	152.06
49.05	90.0	Flexure	KSI	50.00	6.31	4.83	4.984	179.44	6.461	232.60
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-47.97**	**4.935**	**177.68**	**6.398**	**230.32**
49.05	90.0	Overload	KSI	50.00	6.31	4.83	6.563	236.26	8.532	307.14
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-54.65**	**4.226**	**152.14**	**5.478**	**197.22**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**53.22**	**4.340**	**156.24**	**5.626**	**202.54**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**46.80**	**5.059**	**182.13**	**6.558**	**236.10**
5.45	10.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
10.90	20.0	Shear	KIPS	461.24	29.41	40.38	6.007	216.26	7.787	280.34
10.90	20.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
16.35	30.0	Shear	KIPS	461.24	17.91	33.95	7.385	265.88	9.574	344.66
16.35	30.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
21.80	40.0	Shear	KIPS	461.24	9.80	27.53	9.318	335.46	12.079	434.85
21.80	40.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**11.41**	**1.397**	**50.28**	**1.811**	**65.18**
24.52	45.0	Shear	KIPS	461.24	5.75	24.32	10.667	384.03	13.828	497.81
24.52	45.0	Overload	KSI	50.00	17.69	11.41	2.010	72.35	2.613	94.06

27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**11.30**	**1.392**	**50.13**	**1.805**	**64.98**
27.25	50.0	Shear	KIPS	461.24	-1.70	-21.21	12.369	445.30	16.034	577.24
27.25	50.0	Overload	KSI	50.00	17.98	11.30	2.010	72.37	2.613	94.08
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**11.21**	**1.460**	**52.55**	**1.892**	**68.13**
32.70	60.0	Shear	KIPS	461.24	-9.80	-27.53	9.318	335.46	12.079	434.85
32.70	60.0	Overload	KSI	50.00	17.10	11.21	2.087	75.13	2.713	97.67
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**10.03**	**1.781**	**64.10**	**2.308**	**83.10**
38.15	70.0	Shear	KIPS	461.24	-17.91	-33.95	7.385	265.88	9.574	344.66
38.15	70.0	Overload	KSI	50.00	14.99	10.03	2.493	89.74	3.241	116.66
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**7.95**	**2.569**	**92.49**	**3.330**	**119.89**
43.60	80.0	Shear	KIPS	461.24	-29.41	-40.38	6.007	216.26	7.787	280.34
43.60	80.0	Overload	KSI	50.00	11.40	7.95	3.492	125.72	4.540	163.43
49.05	90.0	Flexure	KSI	50.00	6.31	4.61	5.222	187.98	6.769	243.67
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-46.80**	**5.059**	**182.13**	**6.558**	**236.10**
49.05	90.0	Overload	KSI	50.00	6.31	4.61	6.875	247.50	8.938	321.75
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-53.22**	**4.340**	**156.24**	**5.626**	**202.54**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**29.13**	**7.929**	**285.44**	**10.278**	**370.01**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**25.17**	**9.408**	**338.70**	**12.196**	**439.06**

5.45	10.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
10.90	20.0	Shear	KIPS	461.24	29.41	21.43	11.316	407.39	14.670	528.10
10.90	20.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
16.35	30.0	Shear	KIPS	461.24	17.91	17.94	13.982	503.34	18.124	652.48
16.35	30.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
21.80	40.0	Shear	KIPS	461.24	9.80	14.67	17.487	629.52	22.668	816.04
21.80	40.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**5.79**	**2.751**	**99.04**	**3.566**	**128.39**
24.52	45.0	Shear	KIPS	461.24	5.75	13.13	19.764	711.51	25.620	922.33
24.52	45.0	Overload	KSI	50.00	17.69	5.79	3.959	142.51	5.146	185.27
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**5.85**	**2.689**	**96.79**	**3.485**	**125.47**
27.25	50.0	Shear	KIPS	461.24	-1.70	-11.64	22.535	811.27	29.212	1051.64
27.25	50.0	Overload	KSI	50.00	17.98	5.85	3.881	139.73	5.046	181.65
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**5.62**	**2.913**	**104.85**	**3.775**	**135.92**
32.70	60.0	Shear	KIPS	461.24	-9.80	-14.67	17.487	629.52	22.668	816.04
32.70	60.0	Overload	KSI	50.00	17.10	5.62	4.164	149.89	5.413	194.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**4.92**	**3.634**	**130.83**	**4.711**	**169.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-17.94	13.982	503.34	18.124	652.48
38.15	70.0	Overload	KSI	50.00	14.99	4.92	5.088	183.16	6.614	238.10
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**3.74**	**5.456**	**196.41**	**7.072**	**254.60**
43.60	80.0	Shear	KIPS	461.24	-29.41	-21.43	11.316	407.39	14.670	528.10
43.60	80.0	Overload	KSI	50.00	11.40	3.74	7.416	266.98	9.641	347.07
49.05	90.0	Flexure	KSI	50.00	6.31	2.11	11.424	411.27	14.809	533.13
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-25.17**	**9.408**	**338.70**	**12.196**	**439.06**
49.05	90.0	Overload	KSI	50.00	6.31	2.11	15.042	541.50	19.554	703.96
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-29.13**	**7.929**	**285.44**	**10.278**	**370.01**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**38.51**	**7.239**	**180.98**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**34.05**	**8.393**	**209.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
10.90	20.0	Shear	KIPS	461.24	29.41	29.59	9.894	247.34
10.90	20.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
16.35	30.0	Shear	KIPS	461.24	17.91	25.13	12.044	301.10
16.35	30.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
21.80	40.0	Shear	KIPS	461.24	9.80	20.67	14.981	374.52
21.80	40.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.53**	**2.256**	**56.40**
24.52	45.0	Shear	KIPS	461.24	5.75	18.44	16.982	424.54
24.52	45.0	Overload	KSI	50.00	17.69	8.53	2.690	67.24
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.50**	**2.234**	**55.86**
27.25	50.0	Shear	KIPS	461.24	-1.70	-16.21	19.533	488.33
27.25	50.0	Overload	KSI	50.00	17.98	8.50	2.673	66.82
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.34**	**2.369**	**59.22**
32.70	60.0	Shear	KIPS	461.24	-9.80	-20.67	14.981	374.52
32.70	60.0	Overload	KSI	50.00	17.10	8.34	2.806	70.15
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.42**	**2.904**	**72.60**
38.15	70.0	Shear	KIPS	461.24	-17.91	-25.13	12.044	301.10
38.15	70.0	Overload	KSI	50.00	14.99	7.42	3.368	84.21
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.83**	**4.231**	**105.78**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.59	9.894	247.34
43.60	80.0	Overload	KSI	50.00	11.40	5.83	4.765	119.14
49.05	90.0	Flexure	KSI	50.00	6.31	3.35	8.662	216.54
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-34.05**	**8.393**	**209.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.35	9.450	236.24
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-38.51**	**7.239**	**180.98**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results
Wizard Alternative
Type 3S2
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**45.62**	**42.29**	**6.592**	**237.31**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	10.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
5.45	**10.0**	**Shear**	**KIPS**	**461.24**	**37.52**	**35.87**	**7.967**	**286.82**
5.45	10.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
10.90	20.0	Shear	KIPS	461.24	29.41	29.44	9.942	357.91
10.90	20.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
16.35	30.0	Shear	KIPS	461.24	17.91	23.49	12.885	463.86
16.35	30.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
21.80	40.0	Shear	KIPS	461.24	9.80	18.47	16.763	603.48
21.80	40.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**17.69**	**8.38**	**2.296**	**82.66**
24.52	45.0	Shear	KIPS	461.24	5.75	16.00	19.568	704.44
24.52	45.0	Overload	KSI	50.00	17.69	8.38	2.737	98.55
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**17.98**	**8.11**	**2.342**	**84.31**
27.25	50.0	Shear	KIPS	461.24	-1.70	-13.17	24.049	865.77
27.25	50.0	Overload	KSI	50.00	17.98	8.11	2.802	100.85
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**17.10**	**8.33**	**2.370**	**85.32**
32.70	60.0	Shear	KIPS	461.24	-9.80	-18.47	16.763	603.48
32.70	60.0	Overload	KSI	50.00	17.10	8.33	2.807	101.06
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**14.99**	**7.54**	**2.858**	**102.89**
38.15	70.0	Shear	KIPS	461.24	-17.91	-23.49	12.885	463.86
38.15	70.0	Overload	KSI	50.00	14.99	7.54	3.315	119.34
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**11.40**	**5.80**	**4.252**	**153.07**
43.60	80.0	Shear	KIPS	461.24	-29.41	-29.44	9.942	357.91

43.60	80.0	Overload	KSI	50.00	11.40	5.80	4.789	172.39
49.05	90.0	Flexure	KSI	50.00	6.31	3.53	8.223	296.02
49.05	**90.0**	**Shear**	**KIPS**	**461.24**	**-37.52**	**-35.87**	**7.967**	**286.82**
49.05	90.0	Overload	KSI	50.00	6.31	3.53	8.971	322.94
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-45.62**	**-42.29**	**6.592**	**237.31**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Bridge Name: Maskwonicut Street over RR
NBI Structure ID: C13 (State)
Bridge ID: S-09-003

Analyzed By: BrR
Analyze Date: Friday, February 07, 2020 15:10:12
Analysis Engine: AASHTO LRFR Engine Version 6.8.2.3001
Analysis Preference Setting: None

Report By: brr
Report Date: Friday, February 07, 2020 15:13:12

Structure Definition Name: Structure1
Member Name: Member 6
Member Alternative Name: Wizard Alternative

Load and Resistance Factor Rating Summary

Girder Summary

Live Load		Rating Factor	Controls	Capacity (Ton)	Span	Location (ft)	Percent	Impact	Lane
H 20-44	Inventory	2.281	STRENGTH-I Steel Flexure Stress	45.62	1	27.25	50.0	As Requested	As Requested
H 20-44	Operating	2.957	STRENGTH-I Steel Flexure Stress	59.14	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Inventory	1.268	STRENGTH-I Steel Flexure Stress	45.65	1	27.25	50.0	As Requested	As Requested
HL-93 (US)	Operating	1.644	STRENGTH-I Steel Flexure Stress	59.17	1	27.25	50.0	As Requested	As Requested
HS 20-44	Inventory	1.589	STRENGTH-I Steel Flexure Stress	57.21	1	24.52	45.0	As Requested	As Requested
HS 20-44	Operating	2.060	STRENGTH-I Steel Flexure Stress	74.17	1	24.52	45.0	As Requested	As Requested
Type 3	Legal	2.553	STRENGTH-I Steel Flexure Stress	63.83	1	27.25	50.0	As Requested	As Requested
Type 3S2	Legal	2.613	STRENGTH-I Steel Flexure Stress	94.05	1	24.52	45.0	As Requested	As Requested

Note:
"N/A" indicates not applicable
"**" indicates not available

Reactions
Live Load H 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.82	N/A	26.15	Axle Load	0.00	Lane
2	41.82	N/A	26.15	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	202.35	N/A	127.48	Axle Load	0.00	Lane
6.81(B)	12.5	246.39	N/A	154.65	Axle Load	0.00	Lane
10.90(B)	20.0	362.82	N/A	224.91	Axle Load	0.00	Lane
13.62(L)	25.0	427.35	N/A	262.36	Axle Load	0.00	Lane
13.62(R)	25.0	427.35	N/A	262.36	Axle Load	0.00	Lane
16.35(B)	30.0	476.78	N/A	292.30	Axle Load	0.00	Lane
20.44(B)	37.5	531.30	N/A	323.13	Axle Load	0.00	Lane
21.80(B)	40.0	544.23	N/A	329.65	Axle Load	0.00	Lane
24.52(B)	45.0	562.26	N/A	337.06	Axle Load	0.00	Lane
27.25(L)	50.0	569.81	N/A	336.95	Axle Load	0.00	Lane
27.25(R)	50.0	569.81	N/A	336.95	Axle Load	0.00	Lane
32.70(B)	60.0	544.23	N/A	329.65	Axle Load	0.00	Lane
34.06(B)	62.5	531.30	N/A	323.13	Axle Load	0.00	Lane
38.15(B)	70.0	476.78	N/A	292.30	Axle Load	0.00	Lane
40.87(L)	75.0	427.35	N/A	262.36	Axle Load	0.00	Lane
40.87(R)	75.0	427.35	N/A	262.36	Axle Load	0.00	Lane
43.60(B)	80.0	362.82	N/A	224.91	Axle Load	0.00	Lane
47.69(B)	87.5	246.39	N/A	154.65	Axle Load	0.00	Lane
49.05(B)	90.0	202.35	N/A	127.48	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load H 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.97	N/A	26.15	Axle Load	0.00	Lane
5.45(B)	10.0	33.29	N/A	23.39	Axle Load	-2.21	Axle Load
6.81(B)	12.5	31.37	N/A	22.70	Axle Load	-2.76	Axle Load
10.90(B)	20.0	25.60	N/A	20.63	Axle Load	-4.41	Axle Load
13.62(L)	25.0	21.76	N/A	19.26	Axle Load	-5.51	Axle Load
13.62(R)	25.0	20.06	N/A	19.26	Axle Load	-5.51	Axle Load
16.35(B)	30.0	16.22	N/A	17.88	Axle Load	-6.85	Axle Load
20.44(B)	37.5	10.46	N/A	15.81	Axle Load	-8.92	Axle Load
21.80(B)	40.0	8.53	N/A	15.12	Axle Load	-9.61	Axle Load
24.52(B)	45.0	4.69	N/A	13.74	Axle Load	-10.99	Axle Load
27.25(L)	50.0	0.85	N/A	12.37	Axle Load	-12.37	Axle Load
27.25(R)	50.0	-0.85	N/A	12.37	Axle Load	-12.37	Axle Load
32.70(B)	60.0	-8.53	N/A	9.61	Axle Load	-15.12	Axle Load
34.06(B)	62.5	-10.46	N/A	8.92	Axle Load	-15.81	Axle Load
38.15(B)	70.0	-16.22	N/A	6.85	Axle Load	-17.88	Axle Load
40.87(L)	75.0	-20.06	N/A	5.51	Axle Load	-19.26	Axle Load
40.87(R)	75.0	-21.76	N/A	5.51	Axle Load	-19.26	Axle Load
43.60(B)	80.0	-25.60	N/A	4.41	Axle Load	-20.63	Axle Load
47.69(B)	87.5	-31.37	N/A	2.76	Axle Load	-22.70	Axle Load
49.05(B)	90.0	-33.29	N/A	2.21	Axle Load	-23.39	Axle Load
54.50(L)	100.0	-40.97	N/A	-0.00	Lane	-26.15	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HL-93 (US)
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.82	N/A	50.15	Truck + Lane	0.00	Tandem + Lane
2	41.82	N/A	50.15	Truck + Lane	0.00	Tandem + Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane
5.45(B)	10.0	202.35	N/A	241.37	Truck + Lane	0.00	Tandem + Lane
6.81(B)	12.5	246.39	N/A	291.72	Truck + Lane	0.00	Tandem + Lane
10.90(B)	20.0	362.82	N/A	418.80	Truck + Lane	0.00	Tandem + Lane
13.62(L)	25.0	427.35	N/A	483.55	Truck + Lane	0.00	Tandem + Lane
13.62(R)	25.0	427.35	N/A	483.55	Truck + Lane	0.00	Tandem + Lane
16.35(B)	30.0	476.78	N/A	532.31	Truck + Lane	0.00	Tandem + Lane
20.44(B)	37.5	531.30	N/A	585.14	Truck + Lane	0.00	Tandem + Lane
21.80(B)	40.0	544.23	N/A	597.33	Truck + Lane	0.00	Tandem + Lane
24.52(B)	45.0	562.26	N/A	609.73	Truck + Lane	0.00	Tandem + Lane
27.25(L)	50.0	569.81	N/A	606.15	Truck + Lane	0.00	Tandem + Lane
27.25(R)	50.0	569.81	N/A	606.15	Truck + Lane	0.00	Tandem + Lane
32.70(B)	60.0	544.23	N/A	597.33	Truck + Lane	0.00	Tandem + Lane
34.06(B)	62.5	531.30	N/A	585.14	Truck + Lane	0.00	Tandem + Lane
38.15(B)	70.0	476.78	N/A	532.31	Truck + Lane	0.00	Tandem + Lane
40.87(L)	75.0	427.35	N/A	483.55	Truck + Lane	0.00	Tandem + Lane
40.87(R)	75.0	427.35	N/A	483.55	Truck + Lane	0.00	Tandem + Lane
43.60(B)	80.0	362.82	N/A	418.80	Truck + Lane	0.00	Tandem + Lane
47.69(B)	87.5	246.39	N/A	291.72	Truck + Lane	0.00	Tandem + Lane

49.05(B)	90.0	202.35	N/A	241.37	Truck + Lane	0.00	Tandem + Lane
54.50(L)	100.0	-0.00	N/A	0.00	Tandem + Lane	0.00	Tandem + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HL-93 (US)
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.97	N/A	50.15	Truck + Lane	0.00	Tandem + Lane
5.45(B)	10.0	33.29	N/A	43.47	Truck + Lane	-2.30	Truck + Lane
6.81(B)	12.5	31.37	N/A	41.83	Truck + Lane	-3.18	Tandem + Lane
10.90(B)	20.0	25.60	N/A	36.98	Truck + Lane	-5.99	Tandem + Lane
13.62(L)	25.0	21.76	N/A	33.80	Truck + Lane	-7.91	Tandem + Lane
13.62(R)	25.0	20.06	N/A	33.80	Truck + Lane	-7.91	Tandem + Lane
16.35(B)	30.0	16.22	N/A	30.66	Truck + Lane	-9.88	Tandem + Lane
20.44(B)	37.5	10.46	N/A	26.04	Truck + Lane	-12.93	Tandem + Lane
21.80(B)	40.0	8.53	N/A	24.52	Truck + Lane	-13.96	Tandem + Lane
24.52(B)	45.0	4.69	N/A	21.52	Truck + Lane	-16.07	Tandem + Lane
27.25(L)	50.0	0.85	N/A	18.64	Truck + Lane	-18.64	Truck + Lane
27.25(R)	50.0	-0.85	N/A	18.64	Truck + Lane	-18.64	Truck + Lane
32.70(B)	60.0	-8.53	N/A	13.96	Tandem + Lane	-24.52	Truck + Lane
34.06(B)	62.5	-10.46	N/A	12.93	Tandem + Lane	-26.04	Truck + Lane
38.15(B)	70.0	-16.22	N/A	9.88	Tandem + Lane	-30.66	Truck + Lane
40.87(L)	75.0	-20.06	N/A	7.91	Tandem + Lane	-33.80	Truck + Lane
40.87(R)	75.0	-21.76	N/A	7.91	Tandem + Lane	-33.80	Truck + Lane
43.60(B)	80.0	-25.60	N/A	5.99	Tandem + Lane	-36.98	Truck + Lane
47.69(B)	87.5	-31.37	N/A	3.18	Tandem + Lane	-41.83	Truck + Lane

49.05(B)	90.0	-33.29	N/A	2.30	Truck + Lane	-43.47	Truck + Lane
54.50(L)	100.0	-40.97	N/A	-0.00	Tandem + Lane	-50.15	Truck + Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load HS 20-44
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.82	N/A	41.12	Axle Load	0.00	Lane
2	41.82	N/A	41.12	Axle Load	0.00	Lane

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Lane	0.00	Lane
5.45(B)	10.0	202.35	N/A	197.05	Axle Load	0.00	Lane
6.81(B)	12.5	246.39	N/A	237.86	Axle Load	0.00	Lane
10.90(B)	20.0	362.82	N/A	340.01	Axle Load	0.00	Lane
13.62(L)	25.0	427.35	N/A	391.22	Axle Load	0.00	Lane
13.62(R)	25.0	427.35	N/A	391.22	Axle Load	0.00	Lane
16.35(B)	30.0	476.78	N/A	428.90	Axle Load	0.00	Lane
20.44(B)	37.5	531.30	N/A	469.73	Axle Load	0.00	Lane
21.80(B)	40.0	544.23	N/A	479.15	Axle Load	0.00	Lane
24.52(B)	45.0	562.26	N/A	487.85	Axle Load	0.00	Lane
27.25(L)	50.0	569.81	N/A	483.04	Axle Load	0.00	Lane
27.25(R)	50.0	569.81	N/A	483.04	Axle Load	0.00	Lane
32.70(B)	60.0	544.23	N/A	479.15	Axle Load	0.00	Lane
34.06(B)	62.5	531.30	N/A	469.73	Axle Load	0.00	Lane
38.15(B)	70.0	476.78	N/A	428.90	Axle Load	0.00	Lane
40.87(L)	75.0	427.35	N/A	391.22	Axle Load	0.00	Lane
40.87(R)	75.0	427.35	N/A	391.22	Axle Load	0.00	Lane
43.60(B)	80.0	362.82	N/A	340.01	Axle Load	0.00	Lane
47.69(B)	87.5	246.39	N/A	237.86	Axle Load	0.00	Lane
49.05(B)	90.0	202.35	N/A	197.05	Axle Load	0.00	Lane
54.50(L)	100.0	-0.00	N/A	0.00	Lane	0.00	Lane

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load HS 20-44
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.97	N/A	41.12	Axle Load	0.00	Lane
5.45(B)	10.0	33.29	N/A	36.16	Axle Load	-2.21	Axle Load
6.81(B)	12.5	31.37	N/A	34.91	Axle Load	-2.76	Axle Load
10.90(B)	20.0	25.60	N/A	31.19	Axle Load	-4.41	Axle Load
13.62(L)	25.0	21.76	N/A	28.71	Axle Load	-5.51	Axle Load
13.62(R)	25.0	20.06	N/A	28.71	Axle Load	-5.51	Axle Load
16.35(B)	30.0	16.22	N/A	26.23	Axle Load	-7.57	Axle Load
20.44(B)	37.5	10.46	N/A	22.51	Axle Load	-10.87	Axle Load
21.80(B)	40.0	8.53	N/A	21.27	Axle Load	-11.98	Axle Load
24.52(B)	45.0	4.69	N/A	18.79	Axle Load	-14.18	Axle Load
27.25(L)	50.0	0.85	N/A	16.39	Axle Load	-16.39	Axle Load
27.25(R)	50.0	-0.85	N/A	16.39	Axle Load	-16.39	Axle Load
32.70(B)	60.0	-8.53	N/A	11.98	Axle Load	-21.27	Axle Load
34.06(B)	62.5	-10.46	N/A	10.87	Axle Load	-22.51	Axle Load
38.15(B)	70.0	-16.22	N/A	7.57	Axle Load	-26.23	Axle Load
40.87(L)	75.0	-20.06	N/A	5.51	Axle Load	-28.71	Axle Load
40.87(R)	75.0	-21.76	N/A	5.51	Axle Load	-28.71	Axle Load
43.60(B)	80.0	-25.60	N/A	4.41	Axle Load	-31.19	Axle Load
47.69(B)	87.5	-31.37	N/A	2.76	Axle Load	-34.91	Axle Load
49.05(B)	90.0	-33.29	N/A	2.21	Axle Load	-36.16	Axle Load
54.50(L)	100.0	-40.97	N/A	-0.00	Lane	-41.12	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.82	N/A	29.75	Axle Load	0.00	Axle Load
2	41.82	N/A	29.75	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	202.35	N/A	143.36	Axle Load	0.00	Axle Load
6.81(B)	12.5	246.39	N/A	173.33	Axle Load	0.00	Axle Load
10.90(B)	20.0	362.82	N/A	249.17	Axle Load	0.00	Axle Load
13.62(L)	25.0	427.35	N/A	287.99	Axle Load	0.00	Axle Load
13.62(R)	25.0	427.35	N/A	287.99	Axle Load	0.00	Axle Load
16.35(B)	30.0	476.78	N/A	317.42	Axle Load	0.00	Axle Load
20.44(B)	37.5	531.30	N/A	348.79	Axle Load	0.00	Axle Load
21.80(B)	40.0	544.23	N/A	356.39	Axle Load	0.00	Axle Load
24.52(B)	45.0	562.26	N/A	364.54	Axle Load	0.00	Axle Load
27.25(L)	50.0	569.81	N/A	363.31	Axle Load	0.00	Axle Load
27.25(R)	50.0	569.81	N/A	363.31	Axle Load	0.00	Axle Load
32.70(B)	60.0	544.23	N/A	356.39	Axle Load	0.00	Axle Load
34.06(B)	62.5	531.30	N/A	348.79	Axle Load	0.00	Axle Load
38.15(B)	70.0	476.78	N/A	317.42	Axle Load	0.00	Axle Load
40.87(L)	75.0	427.35	N/A	287.99	Axle Load	0.00	Axle Load
40.87(R)	75.0	427.35	N/A	287.99	Axle Load	0.00	Axle Load
43.60(B)	80.0	362.82	N/A	249.17	Axle Load	0.00	Axle Load
47.69(B)	87.5	246.39	N/A	173.33	Axle Load	0.00	Axle Load
49.05(B)	90.0	202.35	N/A	143.36	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.97	N/A	29.75	Axle Load	0.00	Axle Load
5.45(B)	10.0	33.29	N/A	26.30	Axle Load	-1.48	Axle Load
6.81(B)	12.5	31.37	N/A	25.44	Axle Load	-2.07	Axle Load
10.90(B)	20.0	25.60	N/A	22.86	Axle Load	-3.83	Axle Load
13.62(L)	25.0	21.76	N/A	21.14	Axle Load	-5.00	Axle Load
13.62(R)	25.0	20.06	N/A	21.14	Axle Load	-5.00	Axle Load
16.35(B)	30.0	16.22	N/A	19.41	Axle Load	-6.17	Axle Load
20.44(B)	37.5	10.46	N/A	16.83	Axle Load	-8.22	Axle Load
21.80(B)	40.0	8.53	N/A	15.97	Axle Load	-9.08	Axle Load
24.52(B)	45.0	4.69	N/A	14.25	Axle Load	-10.80	Axle Load
27.25(L)	50.0	0.85	N/A	12.52	Axle Load	-12.52	Axle Load
27.25(R)	50.0	-0.85	N/A	12.52	Axle Load	-12.52	Axle Load
32.70(B)	60.0	-8.53	N/A	9.08	Axle Load	-15.97	Axle Load
34.06(B)	62.5	-10.46	N/A	8.22	Axle Load	-16.83	Axle Load
38.15(B)	70.0	-16.22	N/A	6.17	Axle Load	-19.41	Axle Load
40.87(L)	75.0	-20.06	N/A	5.00	Axle Load	-21.14	Axle Load
40.87(R)	75.0	-21.76	N/A	5.00	Axle Load	-21.14	Axle Load
43.60(B)	80.0	-25.60	N/A	3.83	Axle Load	-22.86	Axle Load
47.69(B)	87.5	-31.37	N/A	2.07	Axle Load	-25.44	Axle Load
49.05(B)	90.0	-33.29	N/A	1.48	Axle Load	-26.30	Axle Load
54.50(L)	100.0	-40.97	N/A	-0.00	Axle Load	-29.75	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Reactions
Live Load Type 3S2
Impact = 33.000 %

Support	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
1	41.82	N/A	32.67	Axle Load	0.00	Axle Load
2	41.82	N/A	32.67	Axle Load	0.00	Axle Load

Note:
Impact and distribution factors included in above live load reactions.

Moment Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip-ft)	DW Load (kip-ft)	+(LL+I) (kip-ft)	Controlling Live Load	-(LL+I) (kip-ft)	Controlling Live Load
0.00(R)	0.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load
5.45(B)	10.0	202.35	N/A	151.02	Axle Load	0.00	Axle Load
6.81(B)	12.5	246.39	N/A	180.32	Axle Load	0.00	Axle Load
10.90(B)	20.0	362.82	N/A	247.95	Axle Load	0.00	Axle Load
13.62(L)	25.0	427.35	N/A	289.92	Axle Load	0.00	Axle Load
13.62(R)	25.0	427.35	N/A	289.92	Axle Load	0.00	Axle Load
16.35(B)	30.0	476.78	N/A	322.51	Axle Load	0.00	Axle Load
20.44(B)	37.5	531.30	N/A	350.18	Axle Load	0.00	Axle Load
21.80(B)	40.0	544.23	N/A	356.22	Axle Load	0.00	Axle Load
24.52(B)	45.0	562.26	N/A	358.17	Axle Load	0.00	Axle Load
27.25(L)	50.0	569.81	N/A	346.60	Axle Load	0.00	Axle Load
27.25(R)	50.0	569.81	N/A	346.60	Axle Load	0.00	Axle Load
32.70(B)	60.0	544.23	N/A	356.22	Axle Load	0.00	Axle Load
34.06(B)	62.5	531.30	N/A	350.18	Axle Load	0.00	Axle Load
38.15(B)	70.0	476.78	N/A	322.51	Axle Load	0.00	Axle Load
40.87(L)	75.0	427.35	N/A	289.92	Axle Load	0.00	Axle Load
40.87(R)	75.0	427.35	N/A	289.92	Axle Load	0.00	Axle Load
43.60(B)	80.0	362.82	N/A	247.95	Axle Load	0.00	Axle Load
47.69(B)	87.5	246.39	N/A	180.32	Axle Load	0.00	Axle Load
49.05(B)	90.0	202.35	N/A	151.02	Axle Load	0.00	Axle Load
54.50(L)	100.0	-0.00	N/A	0.00	Axle Load	0.00	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load moments.

Sides:
(B) Both
(L) Left
(R) Right

Shear Summary
Live Load Type 3S2
Impact = ** %

Span 1

Location (ft)	Percent	DC Load (kip)	DW Load (kip)	+(LL+I) (kip)	Controlling Live Load	-(LL+I) (kip)	Controlling Live Load
0.00(R)	0.0	40.97	N/A	32.67	Axle Load	0.00	Axle Load
5.45(B)	10.0	33.29	N/A	27.71	Axle Load	-1.35	Axle Load
6.81(B)	12.5	31.37	N/A	26.47	Axle Load	-1.89	Axle Load
10.90(B)	20.0	25.60	N/A	22.75	Axle Load	-3.49	Axle Load
13.62(L)	25.0	21.76	N/A	20.28	Axle Load	-4.56	Axle Load
13.62(R)	25.0	20.06	N/A	20.28	Axle Load	-4.56	Axle Load
16.35(B)	30.0	16.22	N/A	18.15	Axle Load	-5.62	Axle Load
20.44(B)	37.5	10.46	N/A	14.98	Axle Load	-7.23	Axle Load
21.80(B)	40.0	8.53	N/A	14.27	Axle Load	-7.76	Axle Load
24.52(B)	45.0	4.69	N/A	12.36	Axle Load	-8.83	Axle Load
27.25(L)	50.0	0.85	N/A	10.17	Axle Load	-10.17	Axle Load
27.25(R)	50.0	-0.85	N/A	10.17	Axle Load	-10.17	Axle Load
32.70(B)	60.0	-8.53	N/A	7.76	Axle Load	-14.27	Axle Load
34.06(B)	62.5	-10.46	N/A	7.23	Axle Load	-14.98	Axle Load
38.15(B)	70.0	-16.22	N/A	5.62	Axle Load	-18.15	Axle Load
40.87(L)	75.0	-20.06	N/A	4.56	Axle Load	-20.28	Axle Load
40.87(R)	75.0	-21.76	N/A	4.56	Axle Load	-20.28	Axle Load
43.60(B)	80.0	-25.60	N/A	3.49	Axle Load	-22.75	Axle Load
47.69(B)	87.5	-31.37	N/A	1.89	Axle Load	-26.47	Axle Load
49.05(B)	90.0	-33.29	N/A	1.35	Axle Load	-27.71	Axle Load
54.50(L)	100.0	-40.97	N/A	-0.00	Axle Load	-32.67	Axle Load

Note:
"N/A" indicates not applicable
"**" indicates not available

Note:
Impact and distribution factors included in above live load shears.

Sides:
(B) Both
(L) Left
(R) Right

Report by Action: ☑ **Flexure** ☑ **Shear** ☑ **Overload** ☑ **Critical**

Detailed Rating Results
Wizard Alternative
H 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**26.15**	**8.961**	**179.22**	**11.616**	**232.32**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.87**	**8.569**	**171.39**	**11.108**	**222.17**
5.45	10.0	Shear	KIPS	461.24	33.29	23.39	10.252	205.03	13.289	265.78
5.45	10.0	Overload	KSI	50.00	5.61	2.87	11.241	224.82	14.613	292.26
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.06**	**4.228**	**84.57**	**5.481**	**109.62**
10.90	20.0	Shear	KIPS	461.24	25.60	20.63	11.887	237.74	15.409	308.18
10.90	20.0	Overload	KSI	50.00	10.06	5.06	5.694	113.89	7.403	148.05
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**6.57**	**2.910**	**58.20**	**3.772**	**75.45**
16.35	30.0	Shear	KIPS	461.24	16.22	17.88	14.095	281.89	18.271	365.42
16.35	30.0	Overload	KSI	50.00	13.22	6.57	4.012	80.23	5.215	104.30
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**7.41**	**2.400**	**48.01**	**3.111**	**62.23**
21.80	40.0	Shear	KIPS	461.24	8.53	15.12	17.027	340.53	22.072	441.43
21.80	40.0	Overload	KSI	50.00	15.09	7.41	3.363	67.26	4.372	87.44
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**7.58**	**2.300**	**46.01**	**2.982**	**59.64**
24.52	45.0	Shear	KIPS	461.24	4.69	13.74	18.934	378.67	24.544	490.87
24.52	45.0	Overload	KSI	50.00	15.59	7.58	3.238	64.77	4.210	84.20
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**7.58**	**2.281**	**45.62**	**2.957**	**59.14**
27.25	50.0	Shear	KIPS	461.24	-0.85	-12.37	21.266	425.32	27.567	551.34
27.25	50.0	Overload	KSI	50.00	15.80	7.58	3.218	64.36	4.183	83.67
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**7.41**	**2.400**	**48.01**	**3.111**	**62.23**
32.70	60.0	Shear	KIPS	461.24	-8.53	-15.12	17.027	340.53	22.072	441.43
32.70	60.0	Overload	KSI	50.00	15.09	7.41	3.363	67.26	4.372	87.44
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**6.57**	**2.910**	**58.20**	**3.772**	**75.45**

38.15	70.0	Shear	KIPS	461.24	-16.22	-17.88	14.095	281.89	18.271	365.42
38.15	70.0	Overload	KSI	50.00	13.22	6.57	4.012	80.23	5.215	104.30
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.06**	**4.228**	**84.57**	**5.481**	**109.62**
43.60	80.0	Shear	KIPS	461.24	-25.60	-20.63	11.887	237.74	15.409	308.18
43.60	80.0	Overload	KSI	50.00	10.06	5.06	5.694	113.89	7.403	148.05
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.87**	**8.569**	**171.39**	**11.108**	**222.17**
49.05	90.0	Shear	KIPS	461.24	-33.29	-23.39	10.252	205.03	13.289	265.78
49.05	90.0	Overload	KSI	50.00	5.61	2.87	11.241	224.82	14.613	292.26
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-26.15**	**8.961**	**179.22**	**11.616**	**232.32**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
H 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							**Inventory Rating**	**Inventory Load Rating**	**Operating Rating**	**Operating Load Rating**
(ft)	**Percent**	**Limit State**	**Units**	**Capacity**	**DL + Adj-LL***	**LL**	**Factor**	**(Ton)**	**Factor**	**(Ton)**
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**22.51**	**10.411**	**208.21**	**13.495**	**269.90**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.03**	**12.129**	**242.59**	**15.723**	**314.46**
5.45	10.0	Shear	KIPS	461.24	33.29	19.44	12.333	246.67	15.988	319.76
5.45	10.0	Overload	KSI	50.00	5.61	2.03	15.911	318.22	20.684	413.68
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.60**	**5.940**	**118.79**	**7.700**	**153.99**
10.90	20.0	Shear	KIPS	461.24	25.60	16.56	14.812	296.24	19.201	384.02
10.90	20.0	Overload	KSI	50.00	10.06	3.60	7.999	159.98	10.399	207.97
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**4.73**	**4.048**	**80.96**	**5.247**	**104.94**
16.35	30.0	Shear	KIPS	461.24	16.22	13.86	18.185	363.69	23.573	471.45
16.35	30.0	Overload	KSI	50.00	13.22	4.73	5.580	111.60	7.254	145.08
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**5.40**	**3.295**	**65.89**	**4.271**	**85.42**
21.80	40.0	Shear	KIPS	461.24	8.53	11.34	22.714	454.29	29.445	588.89

21.80	40.0	Overload	KSI	50.00	15.09	5.40	4.616	92.32	6.001	120.02
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**5.57**	**3.131**	**62.61**	**4.058**	**81.16**
24.52	45.0	Shear	KIPS	461.24	4.69	10.14	25.657	513.14	33.259	665.18
24.52	45.0	Overload	KSI	50.00	15.59	5.57	4.407	88.14	5.729	114.59
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**5.63**	**3.072**	**61.45**	**3.983**	**79.65**
27.25	50.0	Shear	KIPS	461.24	-0.85	-8.99	29.237	584.73	37.899	757.99
27.25	50.0	Overload	KSI	50.00	15.80	5.63	4.334	86.68	5.634	112.69
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**5.40**	**3.295**	**65.89**	**4.271**	**85.42**
32.70	60.0	Shear	KIPS	461.24	-8.53	-11.34	22.714	454.29	29.445	588.89
32.70	60.0	Overload	KSI	50.00	15.09	5.40	4.616	92.32	6.001	120.02
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**4.73**	**4.048**	**80.96**	**5.247**	**104.94**
38.15	70.0	Shear	KIPS	461.24	-16.22	-13.86	18.185	363.69	23.573	471.45
38.15	70.0	Overload	KSI	50.00	13.22	4.73	5.580	111.60	7.254	145.08
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.60**	**5.940**	**118.79**	**7.700**	**153.99**
43.60	80.0	Shear	KIPS	461.24	-25.60	-16.56	14.812	296.24	19.201	384.02
43.60	80.0	Overload	KSI	50.00	10.06	3.60	7.999	159.98	10.399	207.97
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.03**	**12.129**	**242.59**	**15.723**	**314.46**
49.05	90.0	Shear	KIPS	461.24	-33.29	-19.44	12.333	246.67	15.988	319.76
49.05	90.0	Overload	KSI	50.00	5.61	2.03	15.911	318.22	20.684	413.68
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-22.51**	**10.411**	**208.21**	**13.495**	**269.90**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	1980.00	99.000	1980.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)
Truck + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**50.15**	**4.672**	**168.19**	**6.056**	**218.02**

0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**5.43**	**4.526**	**162.93**	**5.867**	**211.21**
5.45	10.0	Shear	KIPS	461.24	33.29	43.47	5.516	198.57	7.150	257.40
5.45	10.0	Overload	KSI	50.00	5.61	5.43	5.937	213.73	7.718	277.85
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**9.42**	**2.271**	**81.75**	**2.944**	**105.97**
10.90	20.0	Shear	KIPS	461.24	25.60	36.98	6.633	238.80	8.599	309.56
10.90	20.0	Overload	KSI	50.00	10.06	9.42	3.058	110.09	3.975	143.11
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**11.97**	**1.598**	**57.53**	**2.071**	**74.57**
16.35	30.0	Shear	KIPS	461.24	16.22	30.66	8.219	295.87	10.654	383.53
16.35	30.0	Overload	KSI	50.00	13.22	11.97	2.203	79.30	2.864	103.09
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**13.43**	**1.325**	**47.69**	**1.717**	**61.82**
21.80	40.0	Shear	KIPS	461.24	8.53	24.52	10.499	377.95	13.609	489.94
21.80	40.0	Overload	KSI	50.00	15.09	13.43	1.856	66.82	2.413	86.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**13.71**	**1.272**	**45.78**	**1.648**	**59.34**
24.52	45.0	Shear	KIPS	461.24	4.69	21.52	12.090	435.22	15.672	564.18
24.52	45.0	Overload	KSI	50.00	15.59	13.71	1.790	64.45	2.327	83.78
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**13.63**	**1.268**	**45.65**	**1.644**	**59.17**
27.25	50.0	Shear	KIPS	461.24	-0.85	-18.64	14.104	507.73	18.282	658.17
27.25	50.0	Overload	KSI	50.00	15.80	13.63	1.789	64.40	2.325	83.72
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**13.43**	**1.325**	**47.69**	**1.717**	**61.82**
32.70	60.0	Shear	KIPS	461.24	-8.53	-24.52	10.499	377.95	13.609	489.94
32.70	60.0	Overload	KSI	50.00	15.09	13.43	1.856	66.82	2.413	86.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**11.97**	**1.598**	**57.53**	**2.071**	**74.57**
38.15	70.0	Shear	KIPS	461.24	-16.22	-30.66	8.219	295.87	10.654	383.53
38.15	70.0	Overload	KSI	50.00	13.22	11.97	2.203	79.30	2.864	103.09
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**9.42**	**2.271**	**81.75**	**2.944**	**105.97**
43.60	80.0	Shear	KIPS	461.24	-25.60	-36.98	6.633	238.80	8.599	309.56
43.60	80.0	Overload	KSI	50.00	10.06	9.42	3.058	110.09	3.975	143.11
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**5.43**	**4.526**	**162.93**	**5.867**	**211.21**
49.05	90.0	Shear	KIPS	461.24	-33.29	-43.47	5.516	198.57	7.150	257.40
49.05	90.0	Overload	KSI	50.00	5.61	5.43	5.937	213.73	7.718	277.85
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-50.15**	**4.672**	**168.19**	**6.056**	**218.02**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HL-93 (US)

Tandem + Lane
Impact: As Requested
Lane: As Requested

Span 1

Location							Inventory Rating	Inventory Load Rating	Operating Rating	Operating Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**42.22**	**5.549**	**199.76**	**7.193**	**258.95**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**4.64**	**5.292**	**190.51**	**6.860**	**246.96**
5.45	10.0	Shear	KIPS	461.24	33.29	37.06	6.470	232.92	8.387	301.93
5.45	10.0	Overload	KSI	50.00	5.61	4.64	6.942	249.91	9.024	324.88
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**8.22**	**2.602**	**93.68**	**3.373**	**121.44**
10.90	20.0	Shear	KIPS	461.24	25.60	32.08	7.646	275.24	9.911	356.79
10.90	20.0	Overload	KSI	50.00	10.06	8.22	3.505	126.16	4.556	164.01
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**10.73**	**1.783**	**64.19**	**2.311**	**83.21**
16.35	30.0	Shear	KIPS	461.24	16.22	27.28	9.237	332.52	11.973	431.05
16.35	30.0	Overload	KSI	50.00	13.22	10.73	2.458	88.49	3.195	115.03
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**12.17**	**1.462**	**52.63**	**1.895**	**68.22**
21.80	40.0	Shear	KIPS	461.24	8.53	22.66	11.362	409.03	14.729	530.23
21.80	40.0	Overload	KSI	50.00	15.09	12.17	2.048	73.74	2.663	95.86
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**12.49**	**1.395**	**50.24**	**1.809**	**65.12**
24.52	45.0	Shear	KIPS	461.24	4.69	20.42	12.744	458.79	16.520	594.73
24.52	45.0	Overload	KSI	50.00	15.59	12.49	1.965	70.72	2.554	91.94
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**12.55**	**1.377**	**49.58**	**1.785**	**64.27**
27.25	50.0	Shear	KIPS	461.24	-0.85	-18.22	14.431	519.53	18.707	673.47
27.25	50.0	Overload	KSI	50.00	15.80	12.55	1.943	69.94	2.526	90.93
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**12.17**	**1.462**	**52.63**	**1.895**	**68.22**
32.70	60.0	Shear	KIPS	461.24	-8.53	-22.66	11.362	409.03	14.729	530.23
32.70	60.0	Overload	KSI	50.00	15.09	12.17	2.048	73.74	2.663	95.86
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**10.73**	**1.783**	**64.19**	**2.311**	**83.21**
38.15	70.0	Shear	KIPS	461.24	-16.22	-27.28	9.237	332.52	11.973	431.05
38.15	70.0	Overload	KSI	50.00	13.22	10.73	2.458	88.49	3.195	115.03
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**8.22**	**2.602**	**93.68**	**3.373**	**121.44**
43.60	80.0	Shear	KIPS	461.24	-25.60	-32.08	7.646	275.24	9.911	356.79

43.60	80.0	Overload	KSI	50.00	10.06	8.22	3.505	126.16	4.556	164.01
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**4.64**	**5.292**	**190.51**	**6.860**	**246.96**
49.05	90.0	Shear	KIPS	461.24	-33.29	-37.06	6.470	232.92	8.387	301.93
49.05	90.0	Overload	KSI	50.00	5.61	4.64	6.942	249.91	9.024	324.88
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-42.22**	**5.549**	**199.76**	**7.193**	**258.95**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Inventory Rating Factor	Inventory Load Rating (Ton)	Operating Rating Factor	Operating Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**41.12**	**5.698**	**205.14**	**7.387**	**265.93**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**4.43**	**5.544**	**199.58**	**7.186**	**258.71**
5.45	10.0	Shear	KIPS	461.24	33.29	36.16	6.632	238.76	8.597	309.50
5.45	10.0	Overload	KSI	50.00	5.61	4.43	7.272	261.80	9.454	340.34
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**7.65**	**2.797**	**100.69**	**3.626**	**130.53**
10.90	20.0	Shear	KIPS	461.24	25.60	31.19	7.863	283.07	10.193	366.94
10.90	20.0	Overload	KSI	50.00	10.06	7.65	3.767	135.60	4.897	176.28
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**9.65**	**1.983**	**71.40**	**2.571**	**92.55**
16.35	30.0	Shear	KIPS	461.24	16.22	26.23	9.606	345.80	12.452	448.26
16.35	30.0	Overload	KSI	50.00	13.22	9.65	2.734	98.42	3.554	127.95
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**10.78**	**1.651**	**59.45**	**2.141**	**77.06**
21.80	40.0	Shear	KIPS	461.24	8.53	21.27	12.104	435.75	15.690	564.86
21.80	40.0	Overload	KSI	50.00	15.09	10.78	2.314	83.30	3.008	108.29
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**10.97**	**1.589**	**57.21**	**2.060**	**74.17**
24.52	45.0	Shear	KIPS	461.24	4.69	18.79	13.848	498.53	17.951	646.24
24.52	45.0	Overload	KSI	50.00	15.59	10.97	2.237	80.55	2.909	104.71
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**10.86**	**1.591**	**57.28**	**2.063**	**74.26**
27.25	50.0	Shear	KIPS	461.24	-0.85		16.048	577.72	20.803	748.90

						-16.39				
27.25	50.0	Overload	KSI	50.00	15.80	10.86	2.245	80.81	2.918	105.05
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**10.78**	**1.651**	**59.45**	**2.141**	**77.06**
32.70	60.0	Shear	KIPS	461.24	-8.53	-21.27	12.104	435.75	15.690	564.86
32.70	60.0	Overload	KSI	50.00	15.09	10.78	2.314	83.30	3.008	108.29
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**9.65**	**1.983**	**71.40**	**2.571**	**92.55**
38.15	70.0	Shear	KIPS	461.24	-16.22	-26.23	9.606	345.80	12.452	448.26
38.15	70.0	Overload	KSI	50.00	13.22	9.65	2.734	98.42	3.554	127.95
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**7.65**	**2.797**	**100.69**	**3.626**	**130.53**
43.60	80.0	Shear	KIPS	461.24	-25.60	-31.19	7.863	283.07	10.193	366.94
43.60	80.0	Overload	KSI	50.00	10.06	7.65	3.767	135.60	4.897	176.28
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**4.43**	**5.544**	**199.58**	**7.186**	**258.71**
49.05	90.0	Shear	KIPS	461.24	-33.29	-36.16	6.632	238.76	8.597	309.50
49.05	90.0	Overload	KSI	50.00	5.61	4.43	7.272	261.80	9.454	340.34
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-41.12**	**5.698**	**205.14**	**7.387**	**265.93**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
HS 20-44
Lane
Impact: As Requested
Lane: As Requested

Span 1

							Inventory	Inventory	Operating	Operating
Location							Rating	Load Rating	Rating	Load Rating
(ft)	Percent	Limit State	Units	Capacity	DL + Adj-LL*	LL	Factor	(Ton)	Factor	(Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**22.51**	**10.411**	**374.78**	**13.495**	**485.83**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.03**	**12.129**	**436.65**	**15.723**	**566.03**
5.45	10.0	Shear	KIPS	461.24	33.29	19.44	12.333	444.00	15.988	575.56
5.45	10.0	Overload	KSI	50.00	5.61	2.03	15.911	572.79	20.684	744.63

10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.60**	**5.940**	**213.83**	**7.700**	**277.18**
10.90	20.0	Shear	KIPS	461.24	25.60	16.56	14.812	533.24	19.201	691.24
10.90	20.0	Overload	KSI	50.00	10.06	3.60	7.999	287.96	10.399	374.35
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**4.73**	**4.048**	**145.72**	**5.247**	**188.90**
16.35	30.0	Shear	KIPS	461.24	16.22	13.86	18.185	654.65	23.573	848.62
16.35	30.0	Overload	KSI	50.00	13.22	4.73	5.580	200.88	7.254	261.14
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**5.40**	**3.295**	**118.61**	**4.271**	**153.75**
21.80	40.0	Shear	KIPS	461.24	8.53	11.34	22.714	817.72	29.445	1060.00
21.80	40.0	Overload	KSI	50.00	15.09	5.40	4.616	166.18	6.001	216.04
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**5.57**	**3.131**	**112.70**	**4.058**	**146.09**
24.52	45.0	Shear	KIPS	461.24	4.69	10.14	25.657	923.65	33.259	1197.33
24.52	45.0	Overload	KSI	50.00	15.59	5.57	4.407	158.66	5.729	206.26
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**5.63**	**3.072**	**110.60**	**3.983**	**143.38**
27.25	50.0	Shear	KIPS	461.24	-0.85	-8.99	29.237	1052.52	37.899	1364.38
27.25	50.0	Overload	KSI	50.00	15.80	5.63	4.334	156.03	5.634	202.84
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**5.40**	**3.295**	**118.61**	**4.271**	**153.75**
32.70	60.0	Shear	KIPS	461.24	-8.53	-11.34	22.714	817.72	29.445	1060.00
32.70	60.0	Overload	KSI	50.00	15.09	5.40	4.616	166.18	6.001	216.04
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**4.73**	**4.048**	**145.72**	**5.247**	**188.90**
38.15	70.0	Shear	KIPS	461.24	-16.22	-13.86	18.185	654.65	23.573	848.62
38.15	70.0	Overload	KSI	50.00	13.22	4.73	5.580	200.88	7.254	261.14
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**3.60**	**5.940**	**213.83**	**7.700**	**277.18**
43.60	80.0	Shear	KIPS	461.24	-25.60	-16.56	14.812	533.24	19.201	691.24
43.60	80.0	Overload	KSI	50.00	10.06	3.60	7.999	287.96	10.399	374.35
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**2.03**	**12.129**	**436.65**	**15.723**	**566.03**
49.05	90.0	Shear	KIPS	461.24	-33.29	-19.44	12.333	444.00	15.988	575.56
49.05	90.0	Overload	KSI	50.00	5.61	2.03	15.911	572.79	20.684	744.63
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-22.51**	**10.411**	**374.78**	**13.495**	**485.83**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00	99.000	3564.00

Detailed Rating Results
Wizard Alternative
Type 3
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**29.75**	**9.505**	**237.63**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.22**	**9.196**	**229.91**
5.45	10.0	Shear	KIPS	461.24	33.29	26.30	11.002	275.05
5.45	10.0	Overload	KSI	50.00	5.61	3.22	9.996	249.89
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.60**	**4.606**	**115.16**
10.90	20.0	Shear	KIPS	461.24	25.60	22.86	12.950	323.75
10.90	20.0	Overload	KSI	50.00	10.06	5.60	5.140	128.50
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**7.14**	**3.234**	**80.86**
16.35	30.0	Shear	KIPS	461.24	16.22	19.41	15.665	391.62
16.35	30.0	Overload	KSI	50.00	13.22	7.14	3.694	92.35
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**8.01**	**2.680**	**66.99**
21.80	40.0	Shear	KIPS	461.24	8.53	15.97	19.459	486.48
21.80	40.0	Overload	KSI	50.00	15.09	8.01	3.111	77.77
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**8.20**	**2.567**	**64.17**
24.52	45.0	Shear	KIPS	461.24	4.69	14.25	22.045	551.12
24.52	45.0	Overload	KSI	50.00	15.59	8.20	2.994	74.86
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**8.17**	**2.553**	**63.83**
27.25	50.0	Shear	KIPS	461.24	-0.85	-12.52	25.342	633.55
27.25	50.0	Overload	KSI	50.00	15.80	8.17	2.984	74.61
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**8.01**	**2.680**	**66.99**
32.70	60.0	Shear	KIPS	461.24	-8.53	-15.97	19.459	486.48
32.70	60.0	Overload	KSI	50.00	15.09	8.01	3.111	77.77
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**7.14**	**3.234**	**80.86**
38.15	70.0	Shear	KIPS	461.24	-16.22	-19.41	15.665	391.62
38.15	70.0	Overload	KSI	50.00	13.22	7.14	3.694	92.35
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.60**	**4.606**	**115.16**
43.60	80.0	Shear	KIPS	461.24	-25.60	-22.86	12.950	323.75
43.60	80.0	Overload	KSI	50.00	10.06	5.60	5.140	128.50
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.22**	**9.196**	**229.91**
49.05	90.0	Shear	KIPS	461.24	-33.29	-26.30	11.002	275.05
49.05	90.0	Overload	KSI	50.00	5.61	3.22	9.996	249.89
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	2475.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-29.75**	**9.505**	**237.63**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	2475.00

Detailed Rating Results

Wizard Alternative
Type 3S2
Axle Load
Impact: As Requested
Lane: As Requested

Span 1

Location (ft)	Percent	Limit State	Units	Capacity	DL + Adj -LL*	LL	Legal Rating Factor	Legal Load Rating (Ton)
0.00	0.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
0.00	**0.0**	**Shear**	**KIPS**	**461.24**	**40.97**	**32.67**	**8.655**	**311.59**
0.00	0.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00
5.45	**10.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.40**	**8.730**	**314.29**
5.45	10.0	Shear	KIPS	461.24	33.29	27.71	10.444	375.99
5.45	10.0	Overload	KSI	50.00	5.61	3.40	9.489	341.60
10.90	**20.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.58**	**4.629**	**166.64**
10.90	20.0	Shear	KIPS	461.24	25.60	22.75	13.013	468.48
10.90	20.0	Overload	KSI	50.00	10.06	5.58	5.165	185.94
16.35	**30.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**7.25**	**3.183**	**114.60**
16.35	30.0	Shear	KIPS	461.24	16.22	18.15	16.758	603.30
16.35	30.0	Overload	KSI	50.00	13.22	7.25	3.636	130.89
21.80	**40.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**8.01**	**2.681**	**96.51**
21.80	40.0	Shear	KIPS	461.24	8.53	14.27	21.775	783.89
21.80	40.0	Overload	KSI	50.00	15.09	8.01	3.112	112.04
24.52	**45.0**	**Flexure**	**KSI**	**50.00**	**15.59**	**8.05**	**2.613**	**94.05**
24.52	45.0	Shear	KIPS	461.24	4.69	12.36	25.402	914.47
24.52	45.0	Overload	KSI	50.00	15.59	8.05	3.048	109.71
27.25	**50.0**	**Flexure**	**KSI**	**50.00**	**15.80**	**7.79**	**2.676**	**96.35**
27.25	50.0	Shear	KIPS	461.24	-0.85	-10.17	31.201	1123.23
27.25	50.0	Overload	KSI	50.00	15.80	7.79	3.128	112.62
32.70	**60.0**	**Flexure**	**KSI**	**50.00**	**15.09**	**8.01**	**2.681**	**96.51**
32.70	60.0	Shear	KIPS	461.24	-8.53	-14.27	21.775	783.89
32.70	60.0	Overload	KSI	50.00	15.09	8.01	3.112	112.04
38.15	**70.0**	**Flexure**	**KSI**	**50.00**	**13.22**	**7.25**	**3.183**	**114.60**
38.15	70.0	Shear	KIPS	461.24	-16.22	-18.15	16.758	603.30
38.15	70.0	Overload	KSI	50.00	13.22	7.25	3.636	130.89
43.60	**80.0**	**Flexure**	**KSI**	**50.00**	**10.06**	**5.58**	**4.629**	**166.64**
43.60	80.0	Shear	KIPS	461.24	-25.60	-22.75	13.013	468.48
43.60	80.0	Overload	KSI	50.00	10.06	5.58	5.165	185.94
49.05	**90.0**	**Flexure**	**KSI**	**50.00**	**5.61**	**3.40**	**8.730**	**314.29**
49.05	90.0	Shear	KIPS	461.24	-33.29	-27.71	10.444	375.99

49.05	90.0	Overload	KSI	50.00	5.61	3.40	9.489	341.60
54.50	100.0	Flexure	KSI	-50.00	-0.00	-0.00	99.000	3564.00
54.50	**100.0**	**Shear**	**KIPS**	**461.24**	**-40.97**	**-32.67**	**8.655**	**311.59**
54.50	100.0	Overload	KSI	-50.00	-0.00	-0.00	99.000	3564.00

Note:
*Adj-LL is only applicable for Permit load rating.

Shear Connector Design

SHEAR CONNECTOR DESIGN For stud type shear connectors

Material Properties / Geometry:

Bridge Skew =	0.00 deg				
Beam Span Length =	54.50 ft	Deck Thickness T_d =	8.75 in	Concrete Density =	0.150 kcf
Beam Spacing S =	6.00 ft	WS Thickness T_{ws}=	3.00 in	WS Density =	0.140 kcf
# Beams =	6			Steel Beam Density =	0.490 kcf
		Left Barrier Width =	1.250 ft		
Overhang Spacing S_b=	2.292 ft	Right Barrier Width =	1.500 ft	LT Barrier Weight =	0.457 k/ft
Bridge Width (Out to Out) =	34.58 ft	Roadway Width =	26.00 ft	RT Barrier Weight =	0.519 k/ft

Effective width of the conc. deck for exterior stringer $(b_s)_{ext} = \frac{S}{2} + s_b =$ 5.292 ft <----- Use conservatively for SC design

Effective width of the conc. deck for interior stringer $(b_s)_{int} = s =$ 6.000 ft

For SC design b_s = 5.292 ft

		Haunch ht =	2.00 in	Future Utility Weight =	0.125 k/ft (Ref 1, I, 3.5.5.2)
				# Barriers =	2
Beam =	W24 - 162	F_y =	50 ksi		
Abeam=	47.80 in^2	Deck f'_c =	4 ksi		
d =	25.00 in	Deck E_c =	3640 ksi		
b_f=	13.00 in				
I_{x-x} =	5170 in^4			$(b_s)_{ext}$	
W_t =	0.162 k/ft	E_s =	29000 ksi		

$n = \frac{E_S}{Ec} =$ 8

Fatigue Resistance:

V_{LL}=	20.3 k	Fatigue I Load Factor =	γ_I =	1.500
IM for Fatigue = IM_f =	1.15	Fatigue II Load Factor =	γ_{II}=	0.75

Truck Traffic:

ADT=	2580	ADTT= ADT*Tper =	129	
T_{per}=	5%	p =	0.85	(Ref 2, Table 3.6.1.4.2-1)
		$(ADTT)_{SL}$ = p *ADTT =	110	(Ref 2, 3.6.1.4.2-1)

$(ADTT)_{SL}$ < 960 Use Fatigue II load combination (Ref 2, 6.10.10.2)

@ Beam Ends:

		n_c =	1	Cycles per Truck Pasage	(Ref 2, Table 6.6.1.2.5-2)
d_{stud}=	0.8750 in	N = 365(75)n_c*$(ADTT)_{SL}$=	3011250		(Ref 2, Eq. 6.6.1.2.5-3)
n_{row}=	3	α=	6.771		(Ref 2, Eq. 6.10.10.2-3)
Pitch = p_{end} =	15 in	Z_r=	5.184	kip	(Ref 2, Eq. 6.10.10.2-1 or 6.10.10.2-2)
$(F_u)_{sc}$=	60 ksi				

Composite Section Properties

$I_{deck} = \frac{b_s T_{deck}^3}{12} =$ 3545 in^4

$A_{deck}=b_s*T_d/n$ = 69.45 in^2 $Y_{deck} = d+T_{deck}/2$ = 29.38 in

$Y_{beam} = d/2$ = 12.50 in $Y_{comp}=(A_{beam}*Y_{beam}+A_{deck}*Y_{deck}/A_{beam}+A_{deck})$= 22.50 in

$I_{sc}=I_{beam}+I_{deck}-(A_{beam}(Y_{beam}-Y_{comp})^2)+(A_{deck}*(Y_{deck}-Y_{comp})^2)$ = 16778 in ^4

$Q = A_{deck}*(Y_{deck}-Y_{comp})$ = 478 in ^3

$V_{fat}=V_{LL}*\gamma_{II}*Q/I_{sc}$=	0.434 k/in	AASHTO 6.10.10.1.2-3
F_{fat}=	0.00 k/in	AASHTO 6.10.10.1.2-4
$V_{sr} = (V_{fat}^2+F_{fat}^2)^{.5}$ =	0.434 k/in	AASHTO 6.10.10.1.2-2
$P_{fat}=n_{row}*Z_r/V_{sr}$=	35.87	AASHTO 6.10.10.1.2-1

If Pend≤Pfat , "OK", Revise	OK	AASHTO 6.10.10.1.2 pitch Upper Limit
If Pend<=24 in , "OK", Revise	OK	AASHTO 6.10.10.1.2 pitch Lower Limit
If Pend>6*dstud , "OK", Revise	OK	AASHTO 6.10.10.1.3 Transverse Spacing Check
If Pend>4*dstud , "OK", Revise	OK	

Factored Shear Resistance of One Shear Connector:

ϕ_{sc} = 1 $A_{sc} = \frac{1}{4}\pi d_{stud}^2 =$ 0.601 in^2

$Q_n = Min(0.5*A_{sc}*(f'_c*E_c)^{.5}, A_{sc}*(F_u)_{sc})$ = 36.08 k (Ref 2, Eq. 6.10.10.4.3-1)

$Q_r = \phi_{sc}*Q_n$= 36.08 k (Ref 2, Eq. 6.10.10.4.1.1-1)

SHEAR CONNECTOR DESIGN (CONT'D)

Nominal Shear Force:

P_{1p} = .85*f'$_c$*b_s*T_d = 1889.1 k (Ref 2, Eq. 6.10.10.4.2.2-2)

For steel plate girder $P_{2p} = F_{yw}Dt_w + F_{yt}b_{ft}t_{ft} + F_{yc}b_{ft}t_{fc}$ (Ref 2, Eq. 6.10.10.4.2.2-3)

For steel rolled beam $P_{2p} = F_yA_{beam}$ = 2390.0 k

Use P_p = 1889.1 k (Ref 2, 6.10.10.4.2)

For straight span, F_p may be taken equal to zero F_p = 0 k (Ref 2, Eq. 6.10.10.4.2-4)

Nominal Shear Force $P_n = \sqrt{P_P^2 + F_P^2} =$ 1889 k (Ref 2, Eq. 6.10.10.4.2-1)

$n_{stud\_req} = \dfrac{P_n}{Q_r} =$ 53.0 (Ref 2, Eq. 6.10.10.4.1-2)

nstud, prov 288

Pult=nrow(span)/(2*nstud.req) = 18.51 in

Preq=min(Pfat,Pult)= 18.51 in

Check Pend= if (Pend < Preq, Ok, Revise) = OK

@ Midspan:

Pmid (pitch midspan)= 16 in nrowmid= 3

Vfat.max= nrowmis*Zr/Pmid= 0.972 k/in AASHTO 6.10.10.1.2-3

Vsr.max=(Vfat.max^2+Ffat^2)^.5 = 0.972 k/in AASHTO 6.10.10.1.2-2

For straight span, F_p may be taken equal to zero F_p = 1 k (Ref 2, Eq. 6.10.10.4.2-4)

Summary:

Diameter of Shear studs	1.000 in
Pitch at Beam Ends for Shear Studs	16 in
Number of Studs per Row at each end	3
Number of Studs per row at Midspan	3

Bearing Design

BEARING DESIGN

The purpose of this calculation is to design the bearings in accordance with the provisions set forth in the MassDOT 2013 LRFD Bridge Manual and the 8th Edition of AASHTO LRFD Bridge Design Specificaitons.

References

1) MassDOT Bridge Design Manual, 2013 Edition
2) AASHTO LRFD Bridge Design Specifications, 8th Edition

INPUT

Bridge Skew =	0.00 deg
Thermal Span (Pier) =	0.00 ft
Thermal Span (Abut) =	62.21 ft
Beam Spacing =	6.00 ft
# Beams =	6

THERMAL MOVEMENT

Coeff. Of Thermal Exp. =	6.5E-06 1/°F	
Min. Temperature =	-20 °F	(Ref 2, 3.1.8)
Max. Temperature =	120 °F	(Ref 2, 3.1.8)
Median Temperature =	60 °F	
Max. Temperature Range =	80.00 °F	
Thermal Movement (Pier) =	0.00 in	
Thermal Movement (Abut) =	0.39 in	

Minimum Abutment Support Length

Governing Equation: $N = (8 + 0.02L + 0.08H)(1 + 0.000125S^2)$ *(Ref 2, Eq. 4.7.4.4-1)*

H: 31.00 ft

N: 11.72 in **Minimum**

Max Camber Slope

Camber at Bearing Location	0.000
Max Camber @ 0.1L (= 5.45)	1.022 in, @ girder 6
Camber Slope	1.563%

BEARING DESIGN (PIER)

Design in accordance with "Method B"

Input Input "1" when using steel girder beams, "2" for prestressed concrete beams: 1

Service Level Loads at Beam Ends (No Impact)

	(Load)	(Def)	(Rot)
DL =	74.75 k	0.243 in	0.014 rad
LL =	48.75 k	0.0002 in	0.0029 rad
BR =	7.27 k	0.590 in	(Horiz. Def)
T =	4.78 k	0.388 in	(Horiz. Def)

Bridge Geometry

Beam Span =	54.5 ft		
Thermal Span (Corner to Corner) =	N/A		
Profile Grade =	3.90%		
Camber Slope =	1.56%		
Deck free to translate horiz. =	YES	(YES or NO)	OK

Bearing Input

# of Bearing Pads =	1		
Pad Diameter =	14.00 in		
Total Bearing Height =	2.500 in	BRG Design Height =	2.500 in
# of Steel Lams =	4		
Thick of Steel Lams =	0.1250 in		
Thick of Int. Load PL =	0.00 in	N/A	
T/B Cover =	0.25 in	OK	(Ref 2, 14.7.5.1)
Thick of Elas (hri) =	0.500 in		
Shape Factor (Si) =	28.00	(Ref 2, 14.7.5.1-2)	
Area BRG =	153.9 in^2		
Total Elas Thick (hrt) =	2		

Beveled Sole Plate?

Profile+Camber Slope = 5.46% >= 1.00%

Provide Beveled Sole Plate

Shear Modulus

Specify Shear Modulus =	0.160 ksi	
Max/Min Design Shear Modulus =	+/-15%	(Ref 2, 14.7.5.2)
Max =	0.175 ksi	(Ref 2, 14.7.5.2)
Min =	0.136 ksi	

Shear Deformations

Per REF 2, 14.7.5.3.2)

hrt	>=	2 x	Δs
2.000	>=	2 x	0.388
2.000	>=	0.776	OK

Combined Compression, Rotation, and Shear

Per (REF 2, 14.7.5.3.3) w/ (REF 1, 3.5.7.6)

Axial Strain

(Ref 2, 14.7.5.3.3-3)

$\sigma s_{(st)} =$ DL / A
$\sigma s_{(st)} =$ 74.75 k / 153.9 in^2
$\sigma s_{(st)} =$ 0.49 ksi

$\gamma a_{(st)} =$ (Da x σs) / (G Si)
$\gamma a_{(st)} =$ (1.40 x 0.49) / (0.136 x 28.00)
$\gamma a_{(st)} =$ 0.18

$\sigma s_{(cy)} =$ LL / A
$\sigma s_{(cy)} =$ 48.75 k / 153.9 in^2
$\sigma s_{(cy)} =$ 0.32 ksi

$\gamma a_{(cy)} =$ (Da x σs) / (G Si)
$\gamma a_{(cy)} =$ (1.40 x 0.32) / (0.136 x 28.00)
$\gamma a_{(cy)} =$ 0.12

Rotational Strain

(Ref 2, 14.7.5.3.3-8)

$\theta s_{(st)} =$ DL + Uncert
$\theta s_{(st)} =$ 0.014 + 0.005
$\theta s_{(st)} =$ 0.019 rad

$\gamma r_{(st)} = \text{Dr} \times \left(\frac{L}{hri}\right)^2 \times \left(\frac{\theta s}{n}\right)$
$\gamma r_{(st)} = 0.500 \times \left(\frac{0.00\ in}{0.5000\ in}\right)^2 \times \left(\frac{0.019\ rad}{4}\right)$
$\gamma r_{(st)} =$ 0.00

$\theta s_{(cy)} =$ LL
$\theta s_{(cy)} =$ 0.0029 rad

$\gamma r_{(cy)} = \text{Dr} \times \left(\frac{D}{hri}\right)^2 \times \left(\frac{\theta s}{n}\right)$
$\gamma r_{(cy)} = 0.500 \times \left(\frac{0.00\ in}{0.5000\ in}\right)^2 \times \left(\frac{0.003\ rad}{4}\right)$
$\gamma r_{(cy)} =$ 0.00

Shear Deformation Strain

(Ref 2, 14.7.5.3.3-8)

$\gamma s_{(st)} =$ Δs / hrt
$\gamma s_{(st)} =$ 0.388 / 2.000
$\gamma s_{(st)} =$ 0.194

$\gamma s_{(cy)} =$ Δbr / hrt
$\gamma s_{(cy)} =$ 0.590 / 2.000
$\gamma s_{(cy)} =$ 0.295

Combined Equation

(Ref 2, 14.7.5.3.3-1)

$\gamma a_{(st)} + \gamma r_{(st)} + \gamma s_{(st)} + 1.75 \times (\gamma a_{(cy)} + \gamma r_{(cy)} + \gamma s_{(cy)}) \le 5.0$

0.179 + 0.000 + 0.194 + 1.75 x (0.116 + 0.000 + 0.295) <= 5.0

1.093 <= 5.0 OK

BEARING DESIGN (PIER) - (CONT'D)

Design in accordance with "Method B"

Combined Compression, Rotation, and Shear (CONT'D)

Per (REF 2, 14.7.5.3.3)

Check static component

(Ref 2, 14.7.5.3.3-2)

$\gamma a_{(st)}$ = <= 3

0.179 <= 3 OK

Stability of Elastomeric Bearings

Per (REF 2, 14.7.5.3.4)

$$A = \frac{1.92 \times (hrt / L)}{SQRT(1 + (2L / W))}$$

$$A = \frac{1.92 \times (2.000 / 11.20)}{SQRT(1 + (2 \times 11.20 / 11.20))}$$

$$A = 0.20$$

$$B = \frac{2.67}{(Si + 2)(1 + (L / 4W))}$$

$$B = \frac{2.67}{(28.00 + 2)(1 + (11.20 / 4 \times 11.20))}$$

$$B = 0.07$$

2 x A <= B

2 x 0.20 <= 0.07

0.40 > 0.07 Check Below Equations

If the Bridge Deck is Free to Translate Horizontally

$$\sigma s \le \frac{G \times Si}{2A - B}$$

$$0.80 \le \frac{0.18 \times 28.00}{2 \times 0.20 - 0.07}$$

0.80 <= 15.09 OK

If the Bridge Deck is Fixed against Horizontal Translation

$$\sigma s \le \frac{G \times Si}{A - B}$$

$$0.80 \le \frac{0.18 \times 28.00}{0.20 - 0.07}$$

0.80 <= 38.66 N/A

Steel Reinforcement

Per (REF 2, 14.7.5.3.5)

$$hs \ge \frac{3 \times hri \times \sigma s}{Fy}$$

$$0.125 \ge \frac{3 \times 0.500 \times 0.80}{36}$$

0.125 >= 0.0334272 OK

$$hs \ge \frac{2 \times hri \times \sigma_L}{\Delta F_{TH}}$$

$$0.125 \ge \frac{2 \times 0.500 \times 0.32}{24}$$

0.125 >= 0.0132 OK

Compressive Deflection

Per (REF 2, 14.7.5.3.6)

ε_{Li} = σL / (4.8 x G x S^2)

ε_{Li} = 0.32 / (4.8 x 0.175 x 28.00^2)

ε_{Li} = 0.0005

ε_{Le} = σL / 4.8 x G S^2

ε_{Le} = 0.32 / (4.8 x 0.175 x 28.00^2)

ε_{Le} = 0.0005

o_L = ∑ (ε_{Li} hri)

o_L = 0.001

ε_{di} = σd / (4.8 x G x S^2)

ε_{di} = 0.49 / (4.8 x 0.175 x 28.00^2)

ε_{di} = 0.001

ε_{de} = σd / 4.8 x G S^2

ε_{de} = 0.49 / (4.8 x 0.175 x 28.00^2)

ε_{de} = 0.001

o_d = ∑ (ε_{di} hri)

o_d = 0.001

acr = 0.35 (From REF 2, Table 14.7.6.2-1)

o_{LT} = o_d + (acr x o_d)

o_{LT} = 0.001 + (0.35 x 0.001)

o_{LT} = 0.002

Anchorage

Per (REF 2, 14.7.5.4)

$$\frac{\theta s}{n} \ge \frac{3 \times \varepsilon_a}{Si}$$

$$\frac{0.022}{4} \ge \frac{3 \times 0.003}{28.00}$$

0.006 >= 0.0003 Restraint System Required

Bearing Lateral Stiffness

$$K_h = \frac{G \times A}{h}$$

$$K_h = \frac{0.160 \text{ ksi} \times 153.9 \text{ in}^2}{2.500 \text{ in}}$$

K_h = 9.9 k/in

SOLE PLATE DESIGN

Profile Slope	3.90%	
Camber Slope	1.56%	
Condition 1 Slope	5.46%	End Bridge, STA 15 + 43
Condition 2 Slope	2.34%	Begin Bridge, STA 14 + 89
Sole Plate Length	16	in
Min. Sole Plate Thickness @ brg.	1.5	in

The profile grade compounds with the camber slope at the end bridge location, but they oppose at the begin bridge location. Both cases must be investigated.

Sole Plate at Begin Bridge

Min Plate thickness	1.31	in
Max Plate thickness	1.69	in

Sole Plate at End Bridge

Min Plate thickness	1.06	in
Max Plate thickness	1.94	in

SUBSTRUCTURE DESIGN

Abutment Design

```
******************************************************************************************
*                                                                                        *
*  Program Title        LRFD Abutment and Retaining Wall                                 *
*  Program Name         ABLRFD                                                           *
*  Version              1.16.0.0                                                         *
*  Last Updated         02/07/2017                                                       *
*  Documentation        01/2017                                                          *
*  License No.          336711                                                           *
*                                                                                        *
******************************************************************************************
*                                                                                        *
*   S-09-003                                                                             *
*                                                                                        *
******************************************************************************************
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S-09-003
INPUT SUMMARY

CONTROL

Sys of Units	Type of Run	Footing Datum
US	A	T

ABUTMENT TYPE I

Height (ft)	Top Width (in)	Seat Width (in)	Seat Slope Height (in)	Seat Face Height (in)	Corbel Width (in)	Corbel Height (in)	Corbel Slope Height (in)
27.75	18.0	30.0	0.0	37.0	0.0	0.0	0.0

Paving Notch Width (in)	Paving Notch Height (in)	Bearing X Locn (in)	Bearing Y Locn (in)	Front Water Level (ft)	Back Water Level (ft)	Architectural Treatment Thickness (in)	Backwall/ Stem Bar Alignment
10.0	24.0	15.0	37.0	none	none	6.0	N/A

NOTE: An architectural treatment has been specified. All structure dimensions shown do not account for the architectural treatment. For drafting purposes the architectural treatment thickness is used to dimension the architectural treatment along the front face of the stem.

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
3.00	4.00	7.00	none	none	none	none	none

Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)
2.00	3.00	1.00

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Epoxy Coated Backwall	Stem	Footing
4.000	4.000	4.000	60.000	Y	Y	Y

Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete Density For DL (lb/ft^3)	For Ec (lb/ft^3)
35.00	130.0	140.0	35.0	150.0	150.0

Architectural Treatment Density (lb/ft^3)	fu (ksi)
145.0	90.000

SOIL

Stem Top to Soil Layer (ft)	Footing Length (Parallel) (ft)	Footing Near Slope	Soil Level Over Toe (ft)	Allow Settle (in)	Bearing Cap Resistance Factor	Sliding Resist Factor
27.75	40.00	N	2.00	0.00	0.45	0.80

Soil Layer Number	Soil Layer Thick (ft)	Undrained Shear Strength (ksf)	Cohesion (ksf)	Mass Unit Weight/ Density (lb/ft^3)	Saturated Unit Weight/ Density (lb/ft^3)
1	27.75	0.00	0.00	125.00	140.00

Soil Layer Number	Effective Friction Angle (deg)	Elastic Modulus (ksf)	Poissons Ratio	Ncq	N Gamma q	Apply Inclination Factors
1	34.00	1000.00	0.00	none	none	N

Precast or
Cast-in-
Place

S-09-003
INPUT SUMMARY (cont.)

SOIL (cont.)

C

MISCELLANEOUS REINFORCEMENT DATA

Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class
1.50	1.00	2	2	2

REINFORCEMENT COVER

Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
2.0	2.0	3.0	0.0	4.0	0.0	2.0	2.0

BAR SIZE

Backwall Back Vertical (US bar)	Footing Perpend Top (US bar)	Footing Parallel Top (US bar)	Footing Perpend Bottom (US bar)	Footing Parallel Bottom (US bar)	Footing Perp Top Bar Type	Footing Perp Bot Bar Type
6	7	none	7	none	Straight	Straight

BAR SPACING FOR ANALYSIS

Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)
9.0	6.0	0.0	6.0	0.0

STEM REINFORCING AREA

Range Number	Area/ Width (in^2)	End Location (ft)	Max Bar Diameter (in)
1	1.20	4.00	0.900
2	0.90	10.00	0.900
3	0.60	0.00	0.500

LOAD CONTROL

Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)
1.00	1.00	1.00	0.00	0.00	0.00	0.00

LOADS ON ABUTMENTS

DC (kip)	DW (kip)	PL (kip)	Vertical WSUP (kip)	Horizontal WSUP (kip)	WL (kip)	TU (kip)	Backwall Vert LL (kip)	Backwall Horiz LL (kip)
3.80	1.29	0.69	0.00	0.72	0.00	0.80	0.00	0.00

Horizontal WSUB (kip)	FR (kip)
0.0	0.00

APPROACH SLAB LOADS

Approach Slab DC (kip)	Approach Slab LL (kip)	X distance to Approach Slab Load (in)	Approach Slab on Beam Notch
1.87	0.37	44.00	N

DESIGN LIVE LOAD

Downward LL (kip)	Upward LL (kip)	BR (kip)	CE (kip)
7.67	0.00	0.56	0.00

EARTHQUAKE LOADS

Response Modification	Soil Pressure Factor	Bearing Cap Phi Factor	Vertical Eq Soil Pressure	Super-structure Force (kip)	External Structure Force (kip)
1.50	1.50	1.00	N/A	1.15	none

S-09-003
INPUT SUMMARY (cont.)

EARTHQUAKE LOADS (cont.)

OUTPUT OF RESULTS

Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Reinf Summary	Footing Flexure
1	1	1	1	1	1	1

Crack Control	Shear Results	Development Length
1	1	1

OUTPUT OF INTERMEDIATE DATA

Unfactored Loads	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resist Values	Detailed Stem Cutoff Load Values
1	1	1	1	1	1

Minimum Reinf Check
1

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ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection Toe (ft)	Projection Heel (ft)	Effective Depth Toe (ft)	Effective Depth Heel (ft)
3.00	15.83	4.00	7.00	2.63	2.71

NOTE: An architectural treatment has been specified. The toe projection is referenced from the front face of the stem and does not include the thickness of the architectural treatment.

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

S-09-003
OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-IP	Strength IP	-
STR-III	Strength III	-
STR-V	Strength V	-
EXT-I	Extreme I	- Earthquake
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Abbrev	Loads	Description
DC-A	DC	- Dead Load of Concrete, Parapet
DC-S	DC	- Dead Load of Superstructure
DW-A	DW	- FWS on Abutment
DW-S	DW	- Wearing Surface / Utilities
EV	EV	- Dead Load of Earth
EH-V	EH	- Earth Pressure - Vertical
WA	WA	- Water Load
EQ	EQ	- Earthquake
WSUP	WS	- Wind on Superstructure
PL	PL	- Pedestrian Live Load
LLDD	LL	- Design Live Load - Downward
LLDU	LL	- Design Live Load - Upward
DCAT	DC	- Dead Load - Arch. Treatment
DCAS	DC	- Dead Load - Approach Slab
LLAS	LL	- Live Load - Approach Slab
EH	EH	- Earth Pressure - Horizontal
WL	WL	- Wind on Live Load
TU	TU	- Thermal Load
BR-D	BR	- Design Live Load Braking
CE-D	CE	- Design Live Load Centrifugal
WSUB	WS	- Wind on Substructure
FR	FR	- Friction Load
WA-E	WA	- Water Load from Backfill
ES	ES	- Earth Surcharge
LS	LS	- Live Load Surcharge
LLBW	LL	- Vert Live Load on the Backwall
LLBH	LL	- Horiz Live Load on the Backwall

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

S-09-003
UNFACTORED LOADS

LATERAL EARTH PRESSURE (EH) INTERMEDIATE VALUES

Temporary Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.246	0.235	0.074	27.67	--	27.50	90.00	35.00	0.00
	MEFP	0.282*	0.269*	0.085*						
Stem	Coul	0.246	0.235	0.074	24.67	--	27.50	90.00	35.00	0.00
	MEFP	0.282*	0.269*	0.085*						

Final Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.246	0.235	0.074	30.75	--	27.50	90.00	35.00	0.00
	MEFP	0.282*	0.269*	0.085*						
Stem	Coul	0.246	0.235	0.074	27.75	--	27.50	90.00	35.00	0.00
	MEFP	0.282*	0.269*	0.085*						

Legend
- Alpha - Angle of soil wedge measured from the vertical
- Theta - Stem back face batter angle
- Phi-Prime - Backfill internal friction angle
- Beta - Backfill slope measured from the horizontal

* Note: The Minimum Equivalent Fluid Pressure (MEFP) controlled the Kah calculation. Ka, Kah and Kav are based on the Minimum Equivalent Fluid Pressure.

S-09-003
UNFACTORED LOADS (cont.)

FOUNDATION

Temporary Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	25.01	-171.16	EH	13.40	123.41
EV	22.45	-276.84	ES	0.00	0.00
EH-V	4.22	-66.87	LS	0.00	0.00
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
WA	0.00	0.00	WA-E	0.00	0.00
DCAT	1.79	-6.71			

FOUNDATION (cont.)

Final Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	25.84	-177.33	EH	16.55	169.44
DC-S	3.80	-19.95	WA	0.00	0.00
DW-A	0.28	-3.13	EQ	17.31	190.65
DW-S	1.29	-6.77	WL	0.00	0.02
EV	25.31	-311.40	WSUP	0.72	19.84
EH-V	5.22	-82.61	TU	0.80	22.13
WA	0.00	0.00	BR-D	0.56	15.49
EQ	0.00	0.00	CE-D	0.00	0.00
WSUP	0.00	0.00	WSUB	0.00	0.00
PL	0.69	-3.62	FR	0.00	0.00
LLDD	7.67	-40.27	WA-E	0.00	0.00
LLDU	0.00	0.00			
DCAT	1.79	-6.71			
DCAS	1.87	-14.37			
LLAS	0.37	-2.84			

BACKWALL

Final Stage 1.54 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	0.35	-0.00	EH	0.04	0.02
DW-A	0.07	-0.03	EQ	0.04	0.02
EV	0.00	0.00	LLBH	0.00	0.00
LLBW	0.00	0.00			
DCAS	1.87	-0.78			
LLAS	0.37	-0.15			

BACKWALL (cont.)

Final Stage 3.08 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	0.83	0.19	EH	0.17	0.17
DW-A	0.07	0.00	EQ	0.17	0.17
EV	0.20	-0.15	LLBH	0.00	0.00
LLBW	0.00	0.00			
DCAS	1.87	0.00			
LLAS	0.37	0.00			

STEM

Temporary Stage Location A 9.25 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	4.47	0.00	EH	0.67	1.37
EV	0.00	0.00	ES	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Temporary Stage Location A 9.25 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
EH-V	0.00	0.00	LS	0.00	0.00
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.45	1.19	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location A 9.25 (ft) from top of structure

Vertical				Horizontal		
Applied Load	Force (kip)	2" +ecc Moment (kip-ft)	2" -ecc Moment (kip-ft)	Applied Load	Force (kip)	Moment (kip-ft)
DC-A*	5.30	-0.85		EH	1.50	4.61
DC-S	3.80	5.07	3.80	WA	0.00	0.00
DW-A*	0.07	-0.09		EQ	2.26	9.34
DW-S	1.29	1.72	1.29	WL	0.00	0.00
EV *	0.20	-0.40		WSUP	0.72	4.42
EH-V*	0.00	0.00		TU	0.80	4.93
EQ *	0.00	0.00		BR-D	0.56	3.45
WSUP	0.00	0.00	0.00	CE-D	0.00	0.00
PL	0.69	0.92	0.69	WSUB	0.00	0.00
LLDD	7.67	10.23	7.67	FR	0.00	0.00
LLDU	0.00	0.00	0.00	WA-E	0.00	0.00
DCAT*	0.45	1.19				
DCAS*	1.87	-2.34				
LLAS*	0.37	-0.46				

Note: An asterisk (*) indicates that the vertical load
does not act through the bearings.

STEM (cont.)

Temporary Stage Location B 15.42 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	8.94	0.00	EH	2.66	10.93
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.00	0.00
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.89	2.38	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location B 15.42 (ft) from top of structure

Vertical				Horizontal		
Applied Load	Force (kip)	2" +ecc Moment (kip-ft)	2" -ecc Moment (kip-ft)	Applied Load	Force (kip)	Moment (kip-ft)
DC-A*	9.77	-0.85		EH	4.16	21.35
DC-S	3.80	5.07	3.80	WA	0.00	0.00
DW-A*	0.07	-0.09		EQ	4.93	30.81
DW-S	1.29	1.72	1.29	WL	0.00	0.01
EV *	0.20	-0.40		WSUP	0.72	8.84
EH-V*	0.00	0.00		TU	0.80	9.87
EQ *	0.00	0.00		BR-D	0.56	6.91
WSUP	0.00	0.00	0.00	CE-D	0.00	0.00
PL	0.69	0.92	0.69	WSUB	0.00	0.00
LLDD	7.67	10.23	7.67	FR	0.00	0.00
LLDU	0.00	0.00	0.00	WA-E	0.00	0.00
DCAT*	0.89	2.38				
DCAS*	1.87	-2.34				

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Final Stage Location B 15.42 (ft) from top of structure

Applied Load	Vertical Force (kip)	2" +ecc Moment (kip-ft)	2" -ecc Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Moment (kip-ft)
LLAS*	0.37	-0.46				

Note: An asterisk (*) indicates that the vertical load does not act through the bearings.

STEM (cont.)

Temporary Stage Location C 21.58 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	13.41	0.00	EH	5.99	36.90
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.00	0.00
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	1.34	3.58	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location C 21.58 (ft) from top of structure

Applied Load	Vertical Force (kip)	2" +ecc Moment (kip-ft)	2" -ecc Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Moment (kip-ft)
DC-A*	14.24	-0.85		EH	8.15	58.59
DC-S	3.80	5.07	3.80	WA	0.00	0.00
DW-A*	0.07	-0.09		EQ	8.92	72.78
DW-S	1.29	1.72	1.29	WL	0.00	0.01
EV *	0.20	-0.40		WSUP	0.72	13.26
EH-V*	0.00	0.00		TU	0.80	14.80
EQ *	0.00	0.00		BR-D	0.56	10.36
WSUP	0.00	0.00	0.00	CE-D	0.00	0.00
PL	0.69	0.92	0.69	WSUB	0.00	0.00
LLDD	7.67	10.23	7.67	FR	0.00	0.00
LLDU	0.00	0.00	0.00	WA-E	0.00	0.00
DCAT*	1.34	3.58				
DCAS*	1.87	-2.34				
LLAS*	0.37	-0.46				

Note: An asterisk (*) indicates that the vertical load does not act through the bearings.

STEM (cont.)

Temporary Stage Location D 27.75 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	17.88	0.00	EH	10.65	87.46
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.00	0.00
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	1.79	4.77	WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Final Stage Location D 27.75 (ft) from top of structure

Vertical				Horizontal		
Applied Load	Force (kip)	2" +ecc Moment (kip-ft)	2" -ecc Moment (kip-ft)	Applied Load	Force (kip)	Moment (kip-ft)
DC-A*	18.71	-0.85		EH	13.48	124.53
DC-S	3.80	5.07	3.80	WA	0.00	0.00
DW-A*	0.07	-0.09		EQ	14.24	143.44
DW-S	1.29	1.72	1.29	WL	0.00	0.01
EV *	0.20	-0.40		WSUP	0.72	17.69
EH-V*	0.00	0.00		TU	0.80	19.73
EQ *	0.00	0.00		BR-D	0.56	13.81
WSUP	0.00	0.00	0.00	CE-D	0.00	0.00
PL	0.69	0.92	0.69	WSUB	0.00	0.00
LLDD	7.67	10.23	7.67	FR	0.00	0.00
LLDU	0.00	0.00	0.00	WA-E	0.00	0.00
DCAT*	1.79	4.77				
DCAS*	1.87	-2.34				
LLAS*	0.37	-0.46				

Note: An asterisk (*) indicates that the vertical load does not act through the bearings.

FOOTING

Temporary Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.62	1.80	3.60	DC-A	1.93	3.15	11.03
WA	0.00	0.00	0.00	EV	13.75	22.45	78.56
				EH-V	1.44	1.44	10.08
				ES	0.00	0.00	0.00
				LS	0.00	0.00	0.00
				WA	0.00	0.00	0.00

FOOTING (cont.)

Final Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.62	1.80	3.60	DC-A	1.93	3.15	11.03
WA	0.00	0.00	0.00	DW-A	0.13	0.21	0.73
				EV	15.38	25.11	87.89
				EH-V	1.62	1.62	11.32
				ES	0.00	0.00	0.00
				LS	0.00	0.00	0.00
				WA	0.00	0.00	0.00

Foundation moments are taken about the bottom of the footing at the toe. Stem and Backwall moments are taken about the centerline of the section at the location analyzed. Positive moment clockwise; negative moment counterclockwise; toe on right; heel on left. Footing moments are the moments at the section of the toe or heel due only to those loads applied directly to the toe or heel.

S-09-003
LOAD FACTORS

FOUNDATION

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	TU	*	0.50	*	1.00
			DW-S	*	1.50	*	1.00	BR-D	*	1.75	*	1.00
			EV	*	1.35	*	1.00	CE-D	*	1.75	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			LLDD	*	1.75	*	1.00					
			LLDU	*	1.75	*	1.00					
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.75	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	TU	*	0.50	*	1.00
			DW-S	*	0.65	/	1.00	BR-D	*	1.75	*	1.00
			EV	*	1.00	/	1.00	CE-D	*	1.75	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			LLDD	*	0.00	/	1.00					
			LLDU	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
STR-IP	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-IP	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-IP	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	TU	*	0.50	*	1.00
			DW-S	*	1.50	*	1.00	BR-D	*	1.35	*	1.00
			EV	*	1.35	*	1.00	CE-D	*	1.35	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			PL	*	1.75	*	1.00					
			LLDD	*	1.35	*	1.00					
			LLDU	*	1.35	*	1.00					
			DCAT	*	1.25	*	1.00					

S-09-003
LOAD FACTORS (cont.)

FOUNDATION (cont.)

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-IP	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	TU	*	0.50	*	1.00
			DW-S	*	0.65	/	1.00	BR-D	*	1.35	*	1.00
			EV	*	1.00	/	1.00	CE-D	*	1.35	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			PL	*	0.00	/	1.00					
			LLDD	*	0.00	/	1.00					
			LLDU	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			DW-S	*	1.50	*	1.00	TU	*	0.50	*	1.00
			EV	*	1.35	*	1.00	WSUB	*	1.40	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			WSUP	*	1.40	*	1.00					
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	WSUP	*	1.40	*	1.00
			DW-S	*	0.65	/	1.00	TU	*	0.50	*	1.00
			EV	*	1.00	/	1.00	WSUB	*	1.40	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			WSUP	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					

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LOAD FACTORS (cont.)

FOUNDATION (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	WL	*	1.00	*	1.00
			DW-S	*	1.50	*	1.00	WSUP	*	0.40	*	1.00
			EV	*	1.35	*	1.00	TU	*	0.50	*	1.00
			EH-V	*	1.50	*	1.00	BR-D	*	1.35	*	1.00
			WA	*	1.00	*	1.00	CE-D	*	1.35	*	1.00
			WSUP	*	0.40	*	1.00	WSUB	*	0.40	*	1.00
			LLDD	*	1.35	*	1.00	FR	*	1.00	*	1.00
			LLDU	*	1.35	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	WL	*	1.00	*	1.00
			DW-S	*	0.65	/	1.00	WSUP	*	0.40	*	1.00
			EV	*	1.00	/	1.00	TU	*	0.50	*	1.00
			EH-V	*	1.50	*	1.00	BR-D	*	1.35	*	1.00
			WA	*	1.00	/	1.00	CE-D	*	1.35	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.40	*	1.00
			LLDD	*	0.00	/	1.00	FR	*	1.00	*	1.00
			LLDU	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
EXT-I	Max	Fin	DC-A	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DC-S	*	1.25	*	1.00	EQ	*	1.00	*	1.00
			DW-A	*	1.50	*	1.00	BR-D	*	0.00	*	1.00
			DW-S	*	1.50	*	1.00	CE-D	*	0.00	*	1.00
			EV	*	1.35	*	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			EQ	*	1.00	*	1.00					
			LLDD	*	0.00	*	1.00					
			LLDU	*	0.00	*	1.00					
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	0.00	*	1.00					
EXT-I	Min	Fin	DC-A	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DC-S	*	0.90	/	1.00	EQ	*	1.00	*	1.00
			DW-A	*	0.65	/	1.00	BR-D	*	0.00	*	1.00
			DW-S	*	0.65	/	1.00	CE-D	*	0.00	*	1.00
			EV	*	1.00	/	1.00	FR	*	1.00	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			EQ	*	1.00	*	1.00					
			LLDD	*	0.00	/	1.00					
			LLDU	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	*	1.00					
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00					

S-09-003
LOAD FACTORS (cont.)

FOUNDATION (cont.)

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			DC-S	*	1.00	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.00	*	1.00	WL	*	1.00	*	1.00
			DW-S	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			EV	*	1.00	*	1.00	TU	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	BR-D	*	1.00	*	1.00
			WA	*	1.00	*	1.00	CE-D	*	1.00	*	1.00
			WSUP	*	0.30	*	1.00	WSUB	*	0.30	*	1.00
			LLDD	*	1.00	*	1.00	FR	*	1.00	*	1.00
			LLDU	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	*	1.00					
			DCAS	*	1.00	*	1.00					
			LLAS	*	1.00	*	1.00					
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			DC-S	*	1.00	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.00	/	1.00	WL	*	1.00	*	1.00
			DW-S	*	1.00	/	1.00	WSUP	*	0.30	*	1.00
			EV	*	1.00	/	1.00	TU	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	BR-D	*	1.00	*	1.00
			WA	*	1.00	/	1.00	CE-D	*	1.00	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.30	*	1.00
			LLDD	*	0.00	/	1.00	FR	*	1.00	*	1.00
			LLDU	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00					
			DCAS	*	1.00	/	1.00					
			LLAS	*	0.00	/	1.00					
CSS	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			DC-S	*	1.00	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DW-S	*	1.00	*	1.00					
			EV	*	1.00	*	1.00					
			EH-V	*	1.00	*	1.00					
			WA	*	1.00	*	1.00					
			DCAT	*	1.00	*	1.00					
			DCAS	*	1.00	*	1.00					
CSS	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			DC-S	*	1.00	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DW-S	*	1.00	/	1.00					
			EV	*	1.00	/	1.00					
			EH-V	*	1.00	*	1.00					
			WA	*	1.00	/	1.00					
			DCAT	*	1.00	/	1.00					
			DCAS	*	1.00	/	1.00					

BACKWALL

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DW-A	*	1.50	*	1.00	LLBH	*	1.75	*	1.00
			EV	*	1.35	*	1.00					
			LLBW	*	1.75	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.75	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DW-A	*	0.65	/	1.00	LLBH	*	0.00	/	1.00
			EV	*	1.00	/	1.00					
			LLBW	*	0.00	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					

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LOAD FACTORS (cont.)

BACKWALL (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-IP	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DW-A	*	1.50	*	1.00	LLBH	*	1.35	*	1.00
			EV	*	1.35	*	1.00					
			LLBW	*	1.35	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-IP	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DW-A	*	0.65	/	1.00	LLBH	*	0.00	/	1.00
			EV	*	1.00	/	1.00					
			LLBW	*	0.00	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DW-A	*	1.50	*	1.00					
			EV	*	1.35	*	1.00					
			DCAS	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DW-A	*	0.65	/	1.00					
			EV	*	1.00	/	1.00					
			DCAS	*	0.90	/	1.00					
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DW-A	*	1.50	*	1.00	LLBH	*	1.35	*	1.00
			EV	*	1.35	*	1.00					
			LLBW	*	1.35	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DW-A	*	0.65	/	1.00	LLBH	*	0.00	/	1.00
			EV	*	1.00	/	1.00					
			LLBW	*	0.00	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
EXT-I	Max	Fin	DC-A	*	1.25	*	1.00	EQ	*	1.00	*	1.00
			DW-A	*	1.50	*	1.00	LLBH	*	0.00	*	1.00
			EV	*	1.35	*	1.00					
			LLBW	*	0.00	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	0.00	*	1.00					
EXT-I	Min	Fin	DC-A	*	0.90	/	1.00	EQ	*	1.00	*	1.00
			DW-A	*	0.65	/	1.00	LLBH	*	0.00	/	1.00
			EV	*	1.00	/	1.00					
			LLBW	*	0.00	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			DW-A	*	1.00	*	1.00	LLBH	*	1.00	*	1.00
			EV	*	1.00	*	1.00					
			LLBW	*	1.00	*	1.00					
			DCAS	*	1.00	*	1.00					
			LLAS	*	1.00	*	1.00					
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			DW-A	*	1.00	/	1.00	LLBH	*	0.00	/	1.00
			EV	*	1.00	/	1.00					
			LLBW	*	0.00	/	1.00					
			DCAS	*	1.00	/	1.00					
			LLAS	*	0.00	/	1.00					

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LOAD FACTORS (cont.)

STEM

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	TU	*	0.50	*	1.00
			DW-S	*	1.50	*	1.00	BR-D	*	1.75	*	1.00
			EV	*	1.35	*	1.00	CE-D	*	1.75	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			LLDD	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			LLDU	*	1.75	*	1.00					
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.75	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	TU	*	0.50	*	1.00
			DW-S	*	0.65	/	1.00	BR-D	*	1.75	*	1.00
			EV	*	1.00	/	1.00	CE-D	*	1.75	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			LLDD	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			LLDU	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
STR-IP	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-IP	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-IP	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	TU	*	0.50	*	1.00
			DW-S	*	1.50	*	1.00	BR-D	*	1.35	*	1.00
			EV	*	1.35	*	1.00	CE-D	*	1.35	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			PL	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			LLDD	*	1.35	*	1.00					
			LLDU	*	1.35	*	1.00					
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-IP	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	TU	*	0.50	*	1.00
			DW-S	*	0.65	/	1.00	BR-D	*	1.35	*	1.00

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LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			EV	*	1.00	/	1.00	CE-D	*	1.35	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			PL	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			LLDD	*	0.00	/	1.00					
			LLDU	*	0.00	/	1.00					
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
			LLAS	*	0.00	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			DW-S	*	1.50	*	1.00	TU	*	0.50	*	1.00
			EV	*	1.35	*	1.00	WSUB	*	1.40	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WSUP	*	1.40	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
			DCAS	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			DC-S	*	0.90	/	1.00	WA	*	1.00	/	1.00
			DW-A	*	0.65	/	1.00	WSUP	*	1.40	*	1.00
			DW-S	*	0.65	/	1.00	TU	*	0.50	*	1.00
			EV	*	1.00	/	1.00	WSUB	*	1.40	*	1.00
			EH-V	*	1.50	*	1.00	FR	*	1.00	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
			DCAS	*	0.90	/	1.00					
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			DC-S	*	1.25	*	1.00	WA	*	1.00	/	1.00
			DW-A	*	1.50	*	1.00	WL	*	1.00	*	1.00
			DW-S	*	1.50	*	1.00	WSUP	*	0.40	*	1.00
			EV	*	1.35	*	1.00	TU	*	0.50	*	1.00
			EH-V	*	1.50	*	1.00	BR-D	*	1.35	*	1.00
			WSUP	*	0.40	*	1.00	CE-D	*	1.35	*	1.00
			LLDD	*	1.35	*	1.00	WSUB	*	0.40	*	1.00
			LLDU	*	1.35	*	1.00	FR	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
			DCAS	*	1.25	*	1.00					
			LLAS	*	1.35	*	1.00					
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00

S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

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                             Vertical                        Horizontal

 Limit  Load          Applied    Load      Eta      Applied    Load      Eta
 State  Case Stage     Load     Factor   Factor      Load     Factor   Factor
                       DC-S  *  0.90  /  1.00         WA   *  1.00  /  1.00
                       DW-A  *  0.65  /  1.00         WL   *  1.00  *  1.00
                       DW-S  *  0.65  /  1.00         WSUP *  0.40  *  1.00
                       EV    *  1.00  /  1.00         TU   *  0.50  *  1.00
                       EH-V  *  1.50  *  1.00         BR-D *  1.35  *  1.00
                       WSUP  *  0.00  /  1.00         CE-D *  1.35  *  1.00
                       LLDD  *  0.00  /  1.00         WSUB *  0.40  *  1.00
                       LLDU  *  0.00  /  1.00         FR   *  1.00  *  1.00
                       DCAT  *  0.90  /  1.00         WA-E *  1.00  *  1.00
                       DCAS  *  0.90  /  1.00
                       LLAS  *  0.00  /  1.00

 EXT-I   Max  Fin      DC-A  *  1.25  *  1.00         WA   *  1.00  /  1.00
                       DC-S  *  1.25  *  1.00         EQ   *  1.00  *  1.00
                       DW-A  *  1.50  *  1.00         BR-D *  0.00  *  1.00
                       DW-S  *  1.50  *  1.00         CE-D *  0.00  *  1.00
                       EV    *  1.35  *  1.00         FR   *  1.00  *  1.00
                       EQ    *  1.00  *  1.00         WA-E *  1.00  *  1.00
                       LLDD  *  0.00  *  1.00
                       LLDU  *  0.00  *  1.00
                       DCAT  *  1.25  *  1.00
                       DCAS  *  1.25  *  1.00
                       LLAS  *  0.00  *  1.00

 EXT-I   Min  Fin      DC-A  *  0.90  /  1.00         WA   *  1.00  /  1.00
                       DC-S  *  0.90  /  1.00         EQ   *  1.00  *  1.00
                       DW-A  *  0.65  /  1.00         BR-D *  0.00  *  1.00
                       DW-S  *  0.65  /  1.00         CE-D *  0.00  *  1.00
                       EV    *  1.00  /  1.00         FR   *  1.00  *  1.00
                       EQ    *  1.00  *  1.00         WA-E *  1.00  *  1.00
                       LLDD  *  0.00  /  1.00
                       LLDU  *  0.00  /  1.00
                       DCAT  *  0.90  /  1.00
                       DCAS  *  0.90  /  1.00
                       LLAS  *  0.00  /  1.00

 SER-I   Max  Tmp      DC-A  *  1.00  *  1.00         EH   *  1.00  *  1.00
                       EV    *  1.00  *  1.00         ES   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00         LS   *  1.00  *  1.00
                       ES    *  1.00  *  1.00         WA   *  1.00  /  1.00
                       LS    *  1.00  *  1.00         WSUB *  0.30  *  1.00
                       DCAT  *  1.00  *  1.00         WA-E *  1.00  *  1.00

 SER-I   Min  Tmp      DC-A  *  1.00  /  1.00         EH   *  1.00  *  1.00
                       EV    *  1.00  /  1.00         ES   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00         LS   *  1.00  *  1.00
                       ES    *  1.00  *  1.00         WA   *  1.00  /  1.00
                       LS    *  1.00  *  1.00         WSUB *  0.30  *  1.00
                       DCAT  *  1.00  /  1.00         WA-E *  1.00  *  1.00

 SER-I   Max  Fin      DC-A  *  1.00  *  1.00         EH   *  1.00  *  1.00
                       DC-S  *  1.00  *  1.00         WA   *  1.00  /  1.00
                       DW-A  *  1.00  *  1.00         WL   *  1.00  *  1.00
                       DW-S  *  1.00  *  1.00         WSUP *  0.30  *  1.00
                       EV    *  1.00  *  1.00         TU   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00         BR-D *  1.00  *  1.00
                       WSUP  *  0.30  *  1.00         CE-D *  1.00  *  1.00
                       LLDD  *  1.00  *  1.00         WSUB *  0.30  *  1.00
                       LLDU  *  1.00  *  1.00         FR   *  1.00  *  1.00
                       DCAT  *  1.00  *  1.00         WA-E *  1.00  *  1.00
                       DCAS  *  1.00  *  1.00
                       LLAS  *  1.00  *  1.00

 SER-I   Min  Fin      DC-A  *  1.00  /  1.00         EH   *  1.00  *  1.00
                       DC-S  *  1.00  /  1.00         WA   *  1.00  /  1.00
                       DW-A  *  1.00  /  1.00         WL   *  1.00  *  1.00
                       DW-S  *  1.00  /  1.00         WSUP *  0.30  *  1.00
                       EV    *  1.00  /  1.00         TU   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00         BR-D *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			WSUP	*	0.00	/	1.00	CE-D	*	1.00	*	1.00
			LLDD	*	0.00	/	1.00	WSUB	*	0.30	*	1.00
			LLDU	*	0.00	/	1.00	FR	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAS	*	1.00	/	1.00					
			LLAS	*	0.00	/	1.00					

FOOTING

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.50	*	1.00
								EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	0.65	/	1.00
								EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-IP	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-IP	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-IP	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.50	*	1.00
								EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.35	*	1.00
								WA	*	1.00	*	1.00
STR-IP	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	0.65	/	1.00
								EV	*	1.00	/	1.00

S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.35	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.50	*	1.00
								EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	0.65	/	1.00
								EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.50	*	1.00
								EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.35	*	1.00
								WA	*	1.00	*	1.00
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	0.65	/	1.00
								EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.35	*	1.00
								WA	*	1.00	/	1.00
EXT-I	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.50	*	1.00
								EV	*	1.35	*	1.00
								ES	*	1.50	*	1.00
								LS	*	0.00	*	1.00
								WA	*	1.00	*	1.00
EXT-I	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00

S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

			Toe					Heel			
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
			WA	*	1.00	/	1.00	DW-A	*	0.65	/	1.00
								EV	*	1.00	/	1.00
								ES	*	1.50	*	1.00
								LS	*	0.00	*	1.00
								WA	*	1.00	/	1.00
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	*	1.00
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	/	1.00
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.00	*	1.00
								EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	1.00	/	1.00
								EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	/	1.00
CSS	Max	Fin	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	DW-A	*	1.00	*	1.00
								EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	*	1.00
CSS	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	DW-A	*	1.00	/	1.00
								EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	/	1.00

S-09-003
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	7.29	70.13	1.31	-696.38	1.34
STR-I	Min	Tmp	6.66	52.90	0.99	-537.23	1.03
STR-I	Max	Fin	6.15	100.05	1.36	-907.53	1.36
STR-I	Min	Fin	5.39	64.13	0.98	-638.27	1.03
STR-IP	Max	Tmp	7.29	70.13	1.31	-696.38	1.34
STR-IP	Min	Tmp	6.66	52.90	0.99	-537.23	1.03
STR-IP	Max	Fin	6.23	98.04	1.32	-896.63	1.34
STR-IP	Min	Fin	5.49	64.13	0.98	-638.27	1.03
STR-III	Max	Tmp	7.29	70.13	1.31	-696.38	1.34
STR-III	Min	Tmp	6.66	52.90	0.99	-537.23	1.03
STR-III	Max	Fin	6.27	85.98	1.31	-832.10	1.34
STR-III	Min	Fin	5.38	64.13	0.98	-638.27	1.03
STR-V	Max	Tmp	7.29	70.13	1.31	-696.38	1.34
STR-V	Min	Tmp	6.66	52.90	0.99	-537.23	1.03
STR-V	Max	Fin	6.16	96.83	1.32	-890.29	1.34
STR-V	Min	Fin	5.37	64.13	0.98	-638.27	1.03
EXT-I	Max	Fin	6.62	78.15	1.30	-708.19	1.31
EXT-I	Min	Fin	5.75	56.30	0.94	-514.36	0.95
SER-I	Max	Tmp	7.45	53.47	1.00	-521.58	1.00
SER-I	Min	Tmp	7.45	53.47	1.00	-521.58	1.00
SER-I	Max	Fin	6.16	73.44	1.00	-665.37	1.00
SER-I	Min	Fin	6.26	65.40	1.00	-622.26	1.00
CSS	Max	Fin	6.92	65.40	1.00	-622.26	1.00
CSS	Min	Fin	6.92	65.40	1.00	-622.26	1.00

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	7.29	20.09	1.50	185.12	1.50
STR-I	Min	Tmp	6.66	20.09	1.50	185.12	1.50
STR-I	Max	Fin	6.15	26.20	1.46	292.34	1.41
STR-I	Min	Fin	5.39	26.20	1.46	292.34	1.41
STR-IP	Max	Tmp	7.29	20.09	1.50	185.12	1.50
STR-IP	Min	Tmp	6.66	20.09	1.50	185.12	1.50
STR-IP	Max	Fin	6.23	25.98	1.45	286.14	1.38
STR-IP	Min	Fin	5.49	25.98	1.45	286.14	1.38
STR-III	Max	Tmp	7.29	20.09	1.50	185.12	1.50
STR-III	Min	Tmp	6.66	20.09	1.50	185.12	1.50
STR-III	Max	Fin	6.27	26.22	1.45	293.00	1.39
STR-III	Min	Fin	5.38	26.22	1.45	293.00	1.39
STR-V	Max	Tmp	7.29	20.09	1.50	185.12	1.50
STR-V	Min	Tmp	6.66	20.09	1.50	185.12	1.50
STR-V	Max	Fin	6.16	26.26	1.41	294.10	1.30
STR-V	Min	Fin	5.37	26.26	1.41	294.10	1.30
EXT-I	Max	Fin	6.62	17.31	1.00	190.65	1.00
EXT-I	Min	Fin	5.75	17.31	1.00	190.65	1.00
SER-I	Max	Tmp	7.45	13.40	1.00	123.41	1.00
SER-I	Min	Tmp	7.45	13.40	1.00	123.41	1.00
SER-I	Max	Fin	6.16	18.12	0.97	213.04	0.94
SER-I	Min	Fin	6.26	18.12	0.97	213.04	0.94
CSS	Max	Fin	6.92	16.55	1.00	169.44	1.00
CSS	Min	Fin	6.92	16.55	1.00	169.44	1.00

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

ABUTMENT BACKWALL 1.54 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Fin	3.53	-1.26	0.06
STR-I	Min	Fin	2.04	-0.69	0.06
STR-IP	Max	Fin	3.38	-1.20	0.06
STR-IP	Min	Fin	2.04	-0.69	0.06
STR-III	Max	Fin	2.88	-0.99	0.06
STR-III	Min	Fin	2.04	-0.69	0.06

S-09-003
FACTORED FORCES (cont.)

ABUTMENT BACKWALL 1.54 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-V	Max	Fin	3.38	-1.20	0.06
STR-V	Min	Fin	2.04	-0.69	0.06
EXT-I	Max	Fin	2.88	-1.00	0.04
EXT-I	Min	Fin	2.04	-0.70	0.04
SER-I	Max	Fin	2.66	-0.94	0.04
SER-I	Min	Fin	2.29	-0.79	0.04

ABUTMENT BACKWALL AT SEAT LEVEL 3.08 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Fin	4.40	0.29	0.25
STR-I	Min	Fin	2.68	0.27	0.25
STR-IP	Max	Fin	4.25	0.29	0.25
STR-IP	Min	Fin	2.68	0.27	0.25
STR-III	Max	Fin	3.75	0.29	0.25
STR-III	Min	Fin	2.68	0.27	0.25
STR-V	Max	Fin	4.25	0.29	0.25
STR-V	Min	Fin	2.68	0.27	0.25
EXT-I	Max	Fin	3.75	0.20	0.17
EXT-I	Min	Fin	2.68	0.19	0.17
SER-I	Max	Fin	3.34	0.21	0.17
SER-I	Min	Fin	2.97	0.21	0.17

STEM LOCATION A 9.25 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	6.15	3.54	1.00
STR-I	Min	Tmp	4.43	3.12	1.00
STR-I	Max	Fin	30.66	38.26	3.63
STR-I	Min	Fin	11.36	17.43	3.63
STR-IP	Max	Tmp	6.15	3.54	1.00
STR-IP	Min	Tmp	4.43	3.12	1.00
STR-IP	Max	Fin	28.65	34.58	3.40
STR-IP	Min	Fin	11.36	16.05	3.40
STR-III	Max	Tmp	6.15	3.54	1.00
STR-III	Min	Tmp	4.43	3.12	1.00
STR-III	Max	Fin	16.59	21.32	3.65
STR-III	Min	Fin	11.36	17.58	3.65
STR-V	Max	Tmp	6.15	3.54	1.00
STR-V	Min	Tmp	4.43	3.12	1.00
STR-V	Max	Fin	27.44	34.74	3.69
STR-V	Min	Fin	11.36	17.82	3.69
EXT-I	Max	Fin	16.59	15.08	2.26
EXT-I	Min	Fin	11.36	11.34	2.26
SER-I	Max	Tmp	4.92	2.56	0.67
SER-I	Min	Tmp	4.92	2.56	0.67
SER-I	Max	Fin	21.02	28.39	3.07
SER-I	Min	Fin	12.98	16.93	3.07

STEM LOCATION B 15.42 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	12.29	19.38	3.99
STR-I	Min	Tmp	8.85	18.54	3.99
STR-I	Max	Fin	36.80	73.37	7.62
STR-I	Min	Fin	15.79	52.12	7.62
STR-IP	Max	Tmp	12.29	19.38	3.99
STR-IP	Min	Tmp	8.85	18.54	3.99
STR-IP	Max	Fin	34.80	68.31	7.39

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FACTORED FORCES (cont.)

STEM LOCATION B 15.42 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-IP	Min	Fin	15.79	49.36	7.39
STR-III	Max	Tmp	12.29	19.38	3.99
STR-III	Min	Tmp	8.85	18.54	3.99
STR-III	Max	Fin	22.73	56.58	7.64
STR-III	Min	Fin	15.79	52.42	7.64
STR-V	Max	Tmp	12.29	19.38	3.99
STR-V	Min	Tmp	8.85	18.54	3.99
STR-V	Max	Fin	33.59	70.25	7.68
STR-V	Min	Fin	15.79	52.91	7.68
EXT-I	Max	Fin	22.73	38.04	4.93
EXT-I	Min	Fin	15.79	33.88	4.93
SER-I	Max	Tmp	9.84	13.32	2.66
SER-I	Min	Tmp	9.84	13.32	2.66
SER-I	Max	Fin	25.94	56.04	5.73
SER-I	Min	Fin	17.90	44.58	5.73

STEM LOCATION C 21.58 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	18.44	59.82	8.98
STR-I	Min	Tmp	13.28	58.57	8.98
STR-I	Max	Fin	42.95	139.23	13.61
STR-I	Min	Fin	20.22	117.57	13.61
STR-IP	Max	Tmp	18.44	59.82	8.98
STR-IP	Min	Tmp	13.28	58.57	8.98
STR-IP	Max	Fin	40.94	132.79	13.38
STR-IP	Min	Fin	20.22	113.42	13.38
STR-III	Max	Tmp	18.44	59.82	8.98
STR-III	Min	Tmp	13.28	58.57	8.98
STR-III	Max	Fin	28.88	122.58	13.63
STR-III	Min	Fin	20.22	118.01	13.63
STR-V	Max	Tmp	18.44	59.82	8.98
STR-V	Min	Tmp	13.28	58.57	8.98
STR-V	Max	Fin	39.74	136.50	13.67
STR-V	Min	Fin	20.22	118.74	13.67
EXT-I	Max	Fin	28.88	81.50	8.92
EXT-I	Min	Fin	20.22	76.92	8.92
SER-I	Max	Tmp	14.75	40.47	5.99
SER-I	Min	Tmp	14.75	40.47	5.99
SER-I	Max	Fin	30.86	104.19	9.73
SER-I	Min	Fin	22.82	92.73	9.73

STEM LOCATION D 27.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	24.59	137.15	15.97
STR-I	Min	Tmp	17.70	135.48	15.97
STR-I	Max	Fin	49.10	248.13	21.59
STR-I	Min	Fin	24.64	226.05	21.59
STR-IP	Max	Tmp	24.59	137.15	15.97
STR-IP	Min	Tmp	17.70	135.48	15.97
STR-IP	Max	Fin	47.09	240.31	21.37
STR-IP	Min	Fin	24.64	220.53	21.37
STR-III	Max	Tmp	24.59	137.15	15.97
STR-III	Min	Tmp	17.70	135.48	15.97
STR-III	Max	Fin	35.03	231.63	21.62
STR-III	Min	Fin	24.64	226.64	21.62
STR-V	Max	Tmp	24.59	137.15	15.97
STR-V	Min	Tmp	17.70	135.48	15.97
STR-V	Max	Fin	45.88	245.79	21.66
STR-V	Min	Fin	24.64	227.62	21.66
EXT-I	Max	Fin	35.03	153.65	14.24
EXT-I	Min	Fin	24.64	148.66	14.24
SER-I	Max	Tmp	19.67	92.23	10.65

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FACTORED FORCES (cont.)

STEM LOCATION D 27.75 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
SER-I	Min	Tmp	19.67	92.23	10.65
SER-I	Max	Fin	35.78	181.04	15.05
SER-I	Min	Fin	27.74	169.58	15.05

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.77	2.25	4.50	23.13	36.40	134.96
STR-I	Min	Tmp	0.55	1.62	3.24	17.64	27.44	103.61
STR-I	Max	Fin	0.77	2.25	4.50	25.79	40.58	150.52
STR-I	Min	Fin	0.55	1.62	3.24	19.62	30.51	115.28
STR-IP	Max	Tmp	0.77	2.25	4.50	23.13	36.40	134.96
STR-IP	Min	Tmp	0.55	1.62	3.24	17.64	27.44	103.61
STR-IP	Max	Fin	0.77	2.25	4.50	25.79	40.58	150.52
STR-IP	Min	Fin	0.55	1.62	3.24	19.62	30.51	115.28
STR-III	Max	Tmp	0.77	2.25	4.50	23.13	36.40	134.96
STR-III	Min	Tmp	0.55	1.62	3.24	17.64	27.44	103.61
STR-III	Max	Fin	0.77	2.25	4.50	25.79	40.58	150.52
STR-III	Min	Fin	0.55	1.62	3.24	19.62	30.51	115.28
STR-V	Max	Tmp	0.77	2.25	4.50	23.13	36.40	134.96
STR-V	Min	Tmp	0.55	1.62	3.24	17.64	27.44	103.61
STR-V	Max	Fin	0.77	2.25	4.50	25.79	40.58	150.52
STR-V	Min	Fin	0.55	1.62	3.24	19.62	30.51	115.28
SER-I	Max	Tmp	0.62	1.80	3.60	17.11	27.04	99.67
SER-I	Min	Tmp	0.62	1.80	3.60	17.11	27.04	99.67
SER-I	Max	Fin	0.62	1.80	3.60	19.05	30.09	110.98
SER-I	Min	Fin	0.62	1.80	3.60	19.05	30.09	110.98
CSS	Max	Fin	0.62	1.80	3.60	19.05	30.09	110.98
CSS	Min	Fin	0.62	1.80	3.60	19.05	30.09	110.98

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

S-09-003
FOOTING STABILITY

INTERMEDIATE BEARING RESISTANCE VALUES

Limit State	Case	Stage	Soil Cat	Soil Cond	Number of Layers	Description
			1	1	1	Single Soil Layer - Sand

STR-I Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	54.89	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.85	1.00
					q	29.44	1.25	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
24.70	54.89	5.00	14.58	40.0

STR-I Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	52.15	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.87	1.00
					q	29.44	1.22	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
23.47	52.15	5.00	13.31	40.0

STR-I Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	49.90	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.88	1.00
					q	29.44	1.21	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
22.45	49.90	5.00	12.30	40.0

STR-I Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	46.45	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.89	1.00
					q	29.44	1.18	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
20.90	46.45	5.00	10.79	40.0

STR-IP Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	54.89	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.85	1.00
					q	29.44	1.25	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
24.70	54.89	5.00	14.58	40.0

STR-IP Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	52.15	0.0	34.0	125.00	c	42.16	1.00	1.00
					g	41.06	0.87	1.00
					q	29.44	1.22	1.00

Bearing Resist	Final qult	Df	B'	L'

(ksf)	(ksf)	(ft)	(ft)	(ft)
23.47	52.15	5.00	13.31	40.0

S-09-003
FOOTING STABILITY (cont.)

INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

```
                                 Number
Limit                Soil  Soil    of
State  Case Stage    Cat   Cond   Layers   Description
                      1     1       1      Single Soil Layer - Sand

STR-IP  Max  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    50.25   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.88  1.00
                                                      q  29.44  1.21  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              22.61     50.25    5.00  12.45   40.0

STR-IP  Min  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    46.90   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.89  1.00
                                                      q  29.44  1.19  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              21.10     46.90    5.00  10.98   40.0

STR-III Max  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    54.89   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.85  1.00
                                                      q  29.44  1.25  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              24.70     54.89    5.00  14.58   40.0

STR-III Min  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    52.15   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.87  1.00
                                                      q  29.44  1.22  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              23.47     52.15    5.00  13.31   40.0

STR-III Max  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    50.44   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.87  1.00
                                                      q  29.44  1.21  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              22.70     50.44    5.00  12.54   40.0

STR-III Min  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    46.40   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.89  1.00
                                                      q  29.44  1.18  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
20.88	46.40	5.00	10.77	40.0

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                                      S-09-003
                              FOOTING STABILITY (cont.)
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                         INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

                                         Number
  Limit                  Soil  Soil        of
  State  Case Stage      Cat   Cond     Layers    Description
                          1      1         1      Single Soil Layer - Sand

  STR-V   Max  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    54.89   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.85  1.00
                                                        q  29.44  1.25  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                24.70     54.89    5.00  14.58   40.0

  STR-V   Min  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    52.15   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.87  1.00
                                                        q  29.44  1.22  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                23.47     52.15    5.00  13.31   40.0

  STR-V   Max  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    49.93   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.88  1.00
                                                        q  29.44  1.21  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                22.47     49.93    5.00  12.31   40.0

  STR-V   Min  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    46.32   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.89  1.00
                                                        q  29.44  1.18  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                20.84     46.32    5.00  10.73   40.0

  EXT-I   Max  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    52.00   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.87  1.00
                                                        q  29.44  1.22  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                23.40     52.00    5.00  13.24   40.0

  EXT-I   Min  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    48.09   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                        g  41.06  0.89  1.00
                                                        q  29.44  1.19  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
21.64	48.09	5.00	11.50	40.0

S-09-003
FOOTING STABILITY (cont.)

INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

```
                                   Number
Limit                 Soil  Soil     of
State  Case Stage      Cat   Cond   Layers   Description
                        1      1       1     Single Soil Layer - Sand

SER-I   Max  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    55.55   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.85  1.00
                                                      q  29.44  1.25  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              55.55     55.55   5.00  14.89   40.0

SER-I   Min  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    55.55   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.85  1.00
                                                      q  29.44  1.25  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              55.55     55.55   5.00  14.89   40.0

SER-I   Max  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    49.94   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.88  1.00
                                                      q  29.44  1.21  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              49.94     49.94   5.00  12.32   40.0

SER-I   Min  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    50.38   0.0  34.0    125.00   c  42.16  1.00  1.00
                                                      g  41.06  0.87  1.00
                                                      q  29.44  1.21  1.00

             Bearing    Final
             Resist     qult    Df      B'     L'
              (ksf)     (ksf)   (ft)    (ft)   (ft)
              50.38     50.38   5.00  12.51   40.0
```

NOTE: The Bearing Resistance values are based on a Bearing Capacity Resistance Factor (Phi) of 0.45 times the Final qult value for all limit states except the Service limit state. The Service limit state uses a Phi of 1.0 times the Final qult value.

S-09-003
FOOTING STABILITY (cont.)

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	0.63	5.28	8.42	5.48	3.38	4.81	24.70	5.134
STR-I	Min	Tmp	1.26	5.28	4.19	4.94	1.75	3.97	23.47	5.906
STR-I	Max	Fin	1.77	5.28	2.99	10.55	2.09	8.14	22.45	2.760
STR-I	Min	Fin	2.52	5.28	2.09	7.92	0.18	5.94	20.90	3.516
STR-IP	Max	Tmp	0.63	5.28	8.42	5.48	3.38	4.81	24.70	5.134
STR-IP	Min	Tmp	1.26	5.28	4.19	4.94	1.75	3.97	23.47	5.906
STR-IP	Max	Fin	1.69	5.28	3.12	10.16	2.23	7.87	22.61	2.872
STR-IP	Min	Fin	2.43	5.28	2.18	7.77	0.33	5.84	21.10	3.614
STR-III	Max	Tmp	0.63	5.28	8.42	5.48	3.38	4.81	24.70	5.134
STR-III	Min	Tmp	1.26	5.28	4.19	4.94	1.75	3.97	23.47	5.906
STR-III	Max	Fin	1.65	5.28	3.21	8.82	2.04	6.86	22.70	3.311
STR-III	Min	Fin	2.53	5.28	2.08	7.94	0.16	5.96	20.88	3.506
STR-V	Max	Tmp	0.63	5.28	8.42	5.48	3.38	4.81	24.70	5.134
STR-V	Min	Tmp	1.26	5.28	4.19	4.94	1.75	3.97	23.47	5.906
STR-V	Max	Fin	1.76	5.28	3.00	10.19	2.04	7.86	22.47	2.857
STR-V	Min	Fin	2.55	5.28	2.07	7.96	0.14	5.97	20.84	3.489
EXT-I	Max	Fin	1.29	5.28	4.08	7.36	2.51	5.90	52.00	8.812
EXT-I	Min	Fin	2.17	5.28	2.44	6.48	0.64	4.90	48.09	9.820
SER-I	Max	Tmp	0.47	5.28	11.24	3.98	2.78	3.59	55.55	15.475
SER-I	Min	Tmp	0.47	5.28	11.24	3.98	2.78	3.59	55.55	15.475
SER-I	Max	Fin	1.76	5.28	3.00	7.73	1.55	5.96	49.94	8.377
SER-I	Min	Fin	1.66	5.28	3.18	6.73	1.53	5.23	50.38	9.641

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel. The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	20.09	28.54	1.421
STR-I	Min	Fin	26.20	34.60	1.321
STR-IP	Min	Tmp	20.09	28.54	1.421
STR-IP	Min	Fin	25.98	34.60	1.332
STR-III	Min	Tmp	20.09	28.54	1.421
STR-III	Min	Fin	26.22	34.60	1.320
STR-V	Min	Tmp	20.09	28.54	1.421
STR-V	Min	Fin	26.26	34.60	1.318
EXT-I	Min	Fin	17.31	30.38	1.755

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 0.80.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

S-09-003
FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

	Settlement				Perform	Temp Stage
Elastic (in)	Consol (in)	Second (in)	Total (in)	Allow (in)	Ratio	Settlement (in)
0.52	0.00	0.00	0.52	0.00	0.000	0.34

Notes:

Elastic settlement is based on:
effective width of 12.32 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 13.85 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 14.89 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

Error: A performance ratio less than 1 was found

S-09-003
INTERNAL FOOTING FORCES

TOE MOMENT
Critical section at stem front face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	42.44	4.50	37.94	1
STR-I	Min	Tmp	37.34	3.24	34.10	1
STR-I	Max	Fin	78.71	4.50	74.21	1
STR-I	Min	Fin	58.16	3.24	54.92	1
STR-IP	Max	Tmp	42.44	4.50	37.94	1
STR-IP	Min	Tmp	37.34	3.24	34.10	1
STR-IP	Max	Fin	75.91	4.50	71.41	1
STR-IP	Min	Fin	57.17	3.24	53.93	1
STR-III	Max	Tmp	42.44	4.50	37.94	1
STR-III	Min	Tmp	37.34	3.24	34.10	1
STR-III	Max	Fin	65.98	4.50	61.48	1
STR-III	Min	Fin	58.26	3.24	55.02	1
STR-V	Max	Tmp	42.44	4.50	37.94	1
STR-V	Min	Tmp	37.34	3.24	34.10	1
STR-V	Max	Fin	76.06	4.50	71.56	1
STR-V	Min	Fin	58.44	3.24	55.20	1
SER-I	Max	Tmp	31.01	3.60	27.41	1
SER-I	Min	Tmp	31.01	3.60	27.41	1
SER-I	Max	Fin	57.66	3.60	54.06	1
SER-I	Min	Fin	50.32	3.60	46.72	1
CSS	Max	Fin	43.38	3.60	39.78	1
CSS	Min	Fin	43.38	3.60	39.78	1

Note: Moment direction "1" indicates that tension occurs in the bottom perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the top perpendicular reinforcement.

Total Toe Moment = Moment due to Soil Pressure - Moment due to Footing

HEEL MOMENT
Critical section at stem back face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	90.34	134.96	44.62	1
STR-I	Min	Tmp	54.28	103.61	49.33	1
STR-I	Max	Fin	81.67	150.52	68.85	1
STR-I	Min	Fin	32.34	115.28	82.94	1
STR-IP	Max	Tmp	90.34	134.96	44.62	1
STR-IP	Min	Tmp	54.28	103.61	49.33	1
STR-IP	Max	Fin	83.19	150.52	67.33	1
STR-IP	Min	Fin	34.90	115.28	80.38	1
STR-III	Max	Tmp	90.34	134.96	44.62	1
STR-III	Min	Tmp	54.28	103.61	49.33	1
STR-III	Max	Fin	74.50	150.52	76.03	1
STR-III	Min	Fin	32.06	115.28	83.21	1
STR-V	Max	Tmp	90.34	134.96	44.62	1
STR-V	Min	Tmp	54.28	103.61	49.33	1
STR-V	Max	Fin	79.37	150.52	71.15	1
STR-V	Min	Fin	31.61	115.28	83.67	1
SER-I	Max	Tmp	72.35	99.67	27.32	1
SER-I	Min	Tmp	72.35	99.67	27.32	1
SER-I	Max	Fin	60.26	110.98	50.71	1
SER-I	Min	Fin	56.32	110.98	54.66	1
CSS	Max	Fin	74.35	110.98	36.63	1
CSS	Min	Fin	74.35	110.98	36.63	1

Note: Moment direction "1" indicates that tension occurs in the top perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the bottom perpendicular reinforcement.

Total Heel Moment = Moment due to Footing - Moment due to Soil Pressure

S-09-003
INTERNAL FOOTING FORCES (cont.)

TOE SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	7.38	0.77	6.61	Eff Depth
STR-I	Min	Tmp	6.57	0.55	6.02	Eff Depth
STR-I	Max	Fin	13.95	0.77	13.18	Eff Depth
STR-I	Min	Fin	10.39	0.55	9.84	Eff Depth
STR-IP	Max	Tmp	7.38	0.77	6.61	Eff Depth
STR-IP	Min	Tmp	6.57	0.55	6.02	Eff Depth
STR-IP	Max	Fin	13.44	0.77	12.67	Eff Depth
STR-IP	Min	Fin	10.21	0.55	9.65	Eff Depth
STR-III	Max	Tmp	7.38	0.77	6.61	Eff Depth
STR-III	Min	Tmp	6.57	0.55	6.02	Eff Depth
STR-III	Max	Fin	11.68	0.77	10.91	Eff Depth
STR-III	Min	Fin	10.41	0.55	9.86	Eff Depth
STR-V	Max	Tmp	7.38	0.77	6.61	Eff Depth
STR-V	Min	Tmp	6.57	0.55	6.02	Eff Depth
STR-V	Max	Fin	13.48	0.77	12.71	Eff Depth
STR-V	Min	Fin	10.44	0.55	9.89	Eff Depth
SER-I	Max	Tmp	5.38	0.62	4.76	Eff Depth
SER-I	Min	Tmp	5.38	0.62	4.76	Eff Depth
SER-I	Max	Fin	10.22	0.62	9.60	Eff Depth
SER-I	Min	Fin	8.91	0.62	8.29	Eff Depth
CSS	Max	Fin	7.60	0.62	6.99	Eff Depth
CSS	Min	Fin	7.60	0.62	6.99	Eff Depth

Effective Depth 2.63 (ft)

Total Toe Shear = ABS(Shear due to Soil Pressure - Shear due to Footing)

HEEL SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	26.90	36.40	9.50	Face
STR-I	Min	Tmp	17.16	27.44	10.29	Face
STR-I	Max	Fin	23.75	36.76	13.01	0.70 ft
STR-I	Min	Fin	13.23	30.51	17.28	Face
STR-IP	Max	Tmp	26.90	36.40	9.50	Face
STR-IP	Min	Tmp	17.16	27.44	10.29	Face
STR-IP	Max	Fin	24.73	37.53	12.80	0.56 ft
STR-IP	Min	Fin	13.81	30.51	16.70	Face
STR-III	Max	Tmp	26.90	36.40	9.50	Face
STR-III	Min	Tmp	17.16	27.44	10.29	Face
STR-III	Max	Fin	24.78	40.58	15.80	Face
STR-III	Min	Fin	13.17	30.51	17.34	Face
STR-V	Max	Tmp	26.90	36.40	9.50	Face
STR-V	Min	Tmp	17.16	27.44	10.29	Face
STR-V	Max	Fin	24.56	38.29	13.73	0.42 ft
STR-V	Min	Fin	13.07	30.51	17.44	Face
SER-I	Max	Tmp	21.29	27.04	5.75	Face
SER-I	Min	Tmp	21.29	27.04	5.75	Face
SER-I	Max	Fin	18.07	27.81	9.74	0.56 ft
SER-I	Min	Fin	18.77	30.09	11.32	Face
CSS	Max	Fin	22.85	30.09	7.24	Face
CSS	Min	Fin	22.85	30.09	7.24	Face

Effective Depth 2.71 (ft)

Shear Location as distance is measured from back face of stem

Total Heel Shear = ABS(Shear due to Footing - Shear due to Soil Pressure)

S-09-003
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State	Load Case (Controlling)	Stage	Moment (kip-ft)		Limit State	Load Case (Controlling)	Stage	Shear (kip)
STR-I	Max	Fin	74.21T	(Strength)	STR-I	Max	Fin	13.18
SER-I	Max	Fin	54.06T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State	Load Case (Controlling)	Stage	Moment (kip-ft)		Limit State	Load Case (Controlling)	Stage	Shear (kip)
STR-V	Min	Fin	83.67H	(Strength)	STR-V	Min	Fin	17.44
SER-I	Min	Fin	54.66H	(Crack Control)				(Face)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

S-09-003
MOMENT AXIAL INTERACTION

ABUTMENT BACKWALL 1.54 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Fin	-1.26+	-95.72	3.53	268.57	76.106	0.20	CM
STR-I	Min	Fin	-0.69+	-93.19	2.04	276.23	135.109	0.20	CM
STR-IP	Max	Fin	-1.20+	-95.38	3.38	269.61	79.744	0.20	CM
STR-IP	Min	Fin	-0.69+	-93.19	2.04	276.23	135.109	0.20	CM
STR-III	Max	Fin	-0.99+	-93.94	2.88	273.98	95.086	0.20	CM
STR-III	Min	Fin	-0.69+	-93.19	2.04	276.23	135.109	0.20	CM
STR-V	Max	Fin	-1.20+	-95.38	3.38	269.61	79.744	0.20	CM
STR-V	Min	Fin	-0.69+	-93.19	2.04	276.23	135.109	0.20	CM
EXT-I	Max	Fin	-1.00+	-94.43	2.88	272.48	94.565	0.20	CM
EXT-I	Min	Fin	-0.70+	-93.90	2.04	274.08	134.059	0.20	CM
SER-I	Max	Fin	-0.94+	-95.45	2.66	269.38	101.228	0.20	CM
SER-I	Min	Fin	-0.79+	-94.12	2.29	273.41	119.333	0.20	CM

Section Thickness = 18.00 (in)
Effective Depth = 15.62 (in)

ABUTMENT BACKWALL AT SEAT LEVEL 3.08 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Fin	0.29	46.17	4.40	705.36	160.245	0.59	CM
STR-I	Min	Fin	0.27	72.41	2.68	705.36	263.335	0.59	CM
STR-IP	Max	Fin	0.29	47.77	4.25	705.36	165.821	0.59	CM
STR-IP	Min	Fin	0.27	72.41	2.68	705.36	263.335	0.59	CM
STR-III	Max	Fin	0.29	54.13	3.75	705.36	187.883	0.59	CM
STR-III	Min	Fin	0.27	72.41	2.68	705.36	263.335	0.59	CM
STR-V	Max	Fin	0.29	47.77	4.25	705.36	165.821	0.59	CM
STR-V	Min	Fin	0.27	72.41	2.68	705.36	263.335	0.59	CM
EXT-I	Max	Fin	0.20	38.08	3.75	705.36	187.883	0.59	CM
EXT-I	Min	Fin	0.19	49.92	2.68	705.36	263.335	0.59	CM
SER-I	Max	Fin	0.21	43.95	3.34	705.36	210.971	0.59	CM
SER-I	Min	Fin	0.21	49.42	2.97	705.36	237.223	0.59	CM

Section Thickness = 28.00 (in)
Effective Depth = 25.62 (in)

+ Note: Negative applied load encountered in the backwall. Temp/Shrink
steel in front face of backwall provides adequate capacity.
This message will result in a specification check warning.

STEM LOCATION A 9.25 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	3.54	697.03	6.15	1210.39	196.894	0.60	CM
STR-I	Min	Tmp	3.12	795.31	4.43	1127.22	254.673	0.60	CM
STR-I	Max	Fin	38.26	1092.67	30.66	875.57	28.560	0.60	CM
STR-I	Min	Fin	17.43	1148.36	11.36	748.64	65.883	0.60	TR
STR-IP	Max	Tmp	3.54	697.03	6.15	1210.39	196.894	0.60	CM
STR-IP	Min	Tmp	3.12	795.31	4.43	1127.22	254.673	0.60	CM
STR-IP	Max	Fin	34.58	1074.97	28.65	890.54	31.085	0.60	CM
STR-IP	Min	Fin	16.05	1140.30	11.36	807.37	71.051	0.60	TR
STR-III	Max	Tmp	3.54	697.03	6.15	1210.39	196.894	0.60	CM
STR-III	Min	Tmp	3.12	795.31	4.43	1127.22	254.673	0.60	CM
STR-III	Max	Fin	21.32	1108.30	16.59	862.34	51.990	0.60	CM
STR-III	Min	Fin	17.58	1149.15	11.36	742.90	65.378	0.60	TR
STR-V	Max	Tmp	3.54	697.03	6.15	1210.39	196.894	0.60	CM
STR-V	Min	Tmp	3.12	795.31	4.43	1127.22	254.673	0.60	CM
STR-V	Max	Fin	34.74	1100.35	27.44	869.06	31.671	0.60	CM
STR-V	Min	Fin	17.82	1150.44	11.36	733.54	64.554	0.60	TR
EXT-I	Max	Fin	15.08	925.11	16.59	1017.37	61.336	0.60	CM
EXT-I	Min	Fin	11.34	974.09	11.36	975.91	85.884	0.60	CM
SER-I	Max	Tmp	2.56	650.33	4.92	1249.91	254.154	0.60	CM

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MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION A 9.25 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
SER-I	Min	Tmp	2.56	650.33	4.92	1249.91	254.154	0.60	CM
SER-I	Max	Fin	28.39	1133.48	21.02	839.20	39.921	0.60	TR
SER-I	Min	Fin	16.93	1116.13	12.98	855.71	65.919	0.60	CM

Section Thickness = 58.00 (in)
Effective Depth = 55.75 (in)

STEM LOCATION B 15.42 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	19.38	1150.90	12.29	730.16	59.388	0.60	TR
STR-I	Min	Tmp	18.54	686.87	8.85	327.87	37.038	0.60	TN
STR-I	Max	Fin	73.37	840.86	36.80	421.80	11.461	0.60	TN
STR-I	Min	Fin	52.12	296.67	15.79	89.87	5.692	0.60	TN
STR-IP	Max	Tmp	19.38	1150.90	12.29	730.16	59.388	0.60	TR
STR-IP	Min	Tmp	18.54	686.87	8.85	327.87	37.038	0.60	TN
STR-IP	Max	Fin	68.31	905.59	34.80	461.28	13.257	0.60	TN
STR-IP	Min	Fin	49.36	314.00	15.79	100.44	6.361	0.60	TN
STR-III	Max	Tmp	19.38	1150.90	12.29	730.16	59.388	0.60	TR
STR-III	Min	Tmp	18.54	686.87	8.85	327.87	37.038	0.60	TN
STR-III	Max	Fin	56.58	437.67	22.73	175.87	7.736	0.60	TN
STR-III	Min	Fin	52.42	295.04	15.79	88.87	5.629	0.60	TN
STR-V	Max	Tmp	19.38	1150.90	12.29	730.16	59.388	0.60	TR
STR-V	Min	Tmp	18.54	686.87	8.85	327.87	37.038	0.60	TN
STR-V	Max	Fin	70.25	691.09	33.59	330.45	9.838	0.60	TN
STR-V	Min	Fin	52.91	292.40	15.79	87.26	5.527	0.60	TN
EXT-I	Max	Fin	38.04	1156.28	22.73	691.01	30.395	0.60	TR
EXT-I	Min	Fin	33.88	632.71	15.79	294.84	18.673	0.60	TN
SER-I	Max	Tmp	13.32	1134.43	9.84	837.88	85.186	0.60	TR
SER-I	Min	Tmp	13.32	1134.43	9.84	837.88	85.186	0.60	TR
SER-I	Max	Fin	56.04	619.21	25.94	286.60	11.049	0.60	TN
SER-I	Min	Fin	44.58	436.95	17.90	175.43	9.801	0.60	TN

Section Thickness = 58.00 (in)
Effective Depth = 55.75 (in)

STEM LOCATION C 21.58 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	59.82	445.14	18.44	137.24	7.442	0.90	TN
STR-I	Min	Tmp	58.57	351.82	13.28	79.77	6.007	0.90	TN
STR-I	Max	Fin	139.23	445.41	42.95	137.41	3.199	0.90	TN
STR-I	Min	Fin	117.57	308.40	20.22	53.03	2.623	0.90	TN
STR-IP	Max	Tmp	59.82	445.14	18.44	137.24	7.442	0.90	TN
STR-IP	Min	Tmp	58.57	351.82	13.28	79.77	6.007	0.90	TN
STR-IP	Max	Fin	132.79	445.18	40.94	137.26	3.353	0.90	TN
STR-IP	Min	Fin	113.42	312.83	20.22	55.76	2.758	0.90	TN
STR-III	Max	Tmp	59.82	445.14	18.44	137.24	7.442	0.90	TN
STR-III	Min	Tmp	58.57	351.82	13.28	79.77	6.007	0.90	TN
STR-III	Max	Fin	122.58	360.04	28.88	84.83	2.937	0.90	TN
STR-III	Min	Fin	118.01	307.96	20.22	52.76	2.610	0.90	TN
STR-V	Max	Tmp	59.82	445.14	18.44	137.24	7.442	0.90	TN
STR-V	Min	Tmp	58.57	351.82	13.28	79.77	6.007	0.90	TN
STR-V	Max	Fin	136.50	421.57	39.74	122.72	3.089	0.90	TN
STR-V	Min	Fin	118.74	307.23	20.22	52.31	2.587	0.90	TN
EXT-I	Max	Fin	81.50	523.57	28.88	185.54	6.424	0.90	TN
EXT-I	Min	Fin	76.92	387.76	20.22	101.90	5.041	0.90	TN
SER-I	Max	Tmp	40.47	544.70	14.75	198.56	13.458	0.90	TN
SER-I	Min	Tmp	40.47	544.70	14.75	198.56	13.458	0.90	TN
SER-I	Max	Fin	104.19	428.23	30.86	126.82	4.110	0.90	TN
SER-I	Min	Fin	92.73	370.21	22.82	91.09	3.992	0.90	TN

Section Thickness = 58.00 (in)
Effective Depth = 55.55 (in)

S-09-003
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 21.58 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	137.15	414.51	24.59	74.32	3.022	1.20	TN
STR-I	Min	Tmp	135.48	373.58	17.70	48.82	2.757	1.20	TN
STR-I	Max	Fin	248.13	432.63	49.10	85.61	1.744	1.20	TN
STR-I	Min	Fin	226.05	357.82	24.64	39.01	1.583	1.20	TN
STR-IP	Max	Tmp	137.15	414.51	24.59	74.32	3.022	1.20	TN
STR-IP	Min	Tmp	135.48	373.58	17.70	48.82	2.757	1.20	TN
STR-IP	Max	Fin	240.31	430.69	47.09	84.40	1.792	1.20	TN
STR-IP	Min	Fin	220.53	359.73	24.64	40.20	1.631	1.20	TN
STR-III	Max	Tmp	137.15	414.51	24.59	74.32	3.022	1.20	TN
STR-III	Min	Tmp	135.48	373.58	17.70	48.82	2.757	1.20	TN
STR-III	Max	Fin	231.63	389.85	35.03	58.95	1.683	1.20	TN
STR-III	Min	Fin	226.64	357.63	24.64	38.88	1.578	1.20	TN
STR-V	Max	Tmp	137.15	414.51	24.59	74.32	3.022	1.20	TN
STR-V	Min	Tmp	135.48	373.58	17.70	48.82	2.757	1.20	TN
STR-V	Max	Fin	245.79	421.53	45.88	78.69	1.715	1.20	TN
STR-V	Min	Fin	227.62	357.30	24.64	38.68	1.570	1.20	TN
EXT-I	Max	Fin	153.65	465.61	35.03	106.15	3.030	1.20	TN
EXT-I	Min	Fin	148.66	402.24	24.64	66.67	2.706	1.20	TN
SER-I	Max	Tmp	92.23	448.92	19.67	95.75	4.867	1.20	TN
SER-I	Min	Tmp	92.23	448.92	19.67	95.75	4.867	1.20	TN
SER-I	Max	Fin	181.04	432.37	35.78	85.44	2.388	1.20	TN
SER-I	Min	Fin	169.58	400.31	27.74	65.47	2.361	1.20	TN

Section Thickness = 58.00 (in)
Effective Depth = 55.55 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Phi Factor Code Descriptions
TN - Tension controlled section
TR - Transition section
CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

S-09-003
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State	Load Case (Controlling)	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	STR-I	Max	Fin	74.21T	165.67	0.900	2.232	1.200
Heel	STR-V	Min	Fin	83.67H	171.07	0.900	2.045	1.200

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling moment is found in the Heel for the current location.

S-09-003
MINIMUM REINFORCEMENT CHECK

BACKWALL AND STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Backwall	1.54	27.65	-1.68+	0.02	0.20*	0.20	
Seat	3.08	66.90	0.38+	0.00	0.20*	0.59	
Stem A	9.25	287.06	51.01+	0.20	0.57*	0.60	
Stem B	15.42	287.06	97.83+	0.39	0.57*	0.60	
Stem C	21.58	287.06	185.64+	0.75*	0.57	0.90	
Stem D	27.75	287.06+	330.85	1.17*	0.57	1.20	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	110.59	98.95+	0.71*	0.33	1.20	
Heel	110.59+	111.56	0.77*	0.33	1.20	

Status Code Descriptions
+ - Controlling moment for Rho Min Area calculation
* - Controlling minimum area of steel
A - Area provided smaller than required minimum area of steel

S-09-003
CRACK CONTROL - ANALYSIS

BACKWALL AND STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Controlling Axial (kip)	Status Codes
Backwall *	1.54	0.59	0.00	999.99	-0.94	2.66	E
Seat	3.08	0.59	0.00	999.99	0.21	2.97	E
Stem A	9.25	0.60	0.00	999.99	28.39	21.02	E
Stem B	15.42	0.60	0.00	999.99	56.04	25.94	E
Stem C	21.58	0.90	0.00	999.99	104.19	30.86	E
Stem D	27.75	1.20	0.00	999.99	181.04	35.78	E

* Warning: An applied moment was negative (See Moment Axial Interaction Table) and may have cracked the section in the front face. User should determine if the front face has cracked. If so compute an allowable crack control spacing and compare it to the temp/shrinkage reinforcement spacing.

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	1.20	0.00	999.99	54.06T	E
Heel	1.20	0.00	999.99	54.66H	E

NOTE: A "T" following the moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)
- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to 0.6*fy in allowable spacing calculation

S-09-003
REINFORCEMENT SUMMARY - ANALYSIS

ABUTMENT BACKWALL AT SEAT LEVEL

Bar Size	Bar Spacing (in)	Develop Length (in)	Area Reqd (in^2)	Area Prov (in^2)	Splice Length (in)	Status Codes
6	9.0	12.0	0.200	0.587	15.6	A

Backwall Height = 11.0 (in)

Status Code Descriptions
A - Splice length exceeds backwall height

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
7	6.0	19.9	46.0	S	0.708	1.200

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
7	6.0	24.5	82.0	S	0.768	1.200

Bar Type Description
S - Straight Bar
H - Hooked Bar

BACKWALL AND STEM

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Backwall	1.54	6 @ 9.00	0.59	OK	OK	OK
Seat	3.08	6 @ 9.00	0.59	OK	OK	OK
Stem A	9.25	N/A @ 3.9	0.60	OK	OK	OK
Stem B	15.42	N/A @ 3.9	0.60	OK	OK	OK
Stem C	21.58	N/A @ 8.4	0.90	OK	OK	OK
Stem D	27.75	N/A @ 6.3	1.20	OK	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Toe	7 @ 6.00	1.20	OK	OK	OK
Heel	7 @ 6.00	1.20	OK	OK	OK

An architectural treatment was considered in the analysis of this substructure by applying an additional dead load to the front face of the stem/wall. However, it is important to note all dimensions in the output are referenced to the front face of the stem/wall that would exist when no architectural treatment is present.

NOTE: No bar size is available because reinforcement was entered with the ARE and or SRA commands. Spacings are calculated based on the maximum bar diameters.

S-09-003
SHEAR RESULTS

BACKWALL AND STEM

Location	Dist from Struc Top (ft)	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Backwall	1.54	STR-I	Max	Fin	0.06	20.74	332.447
Seat	3.08	STR-I	Max	Fin	0.25	34.39	137.813
Stem A	9.25	STR-V	Max	Fin	3.69	75.50	20.465
Stem B	15.42	STR-V	Max	Fin	7.68	75.50	9.828
Stem C	21.58	STR-V	Max	Fin	13.67	74.93	5.481
Stem D	27.75	STR-V	Max	Fin	21.66	74.63	3.446

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	STR-I	Max	Fin	13.18	41.88	3.177
Heel	STR-V	Min	Fin	17.44	43.25	2.480

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

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SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program encountered one or more specification check warnings. The following is a list of output table headings for which warnings have occurred. It should be noted that the program does not perform specification checking corresponding to commands that have not been input by the user.

```
THE FOLLOWING TABLES HAVE SPEC CHECK WARNINGS                 PAGE NO.
---------------------------------------------                 --------
MOMENT AXIAL INTERACTION
     BACKWALL                1.54 (ft) FROM TOP OF STRUCTURE... 36
CRACK CONTROL - ANALYSIS
     BACKWALL AND STEM......................................... 41
```

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SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program encountered one or more specification check errors. The following is a list of output table headings for which errors have occurred. It should be noted that the program does not perform specification checking corresponding to commands that have not been input by the user.

THE FOLLOWING TABLES HAVE SPEC CHECK ERRORS	PAGE NO.
FOOTING STABILITY	
SETTLEMENT SUMMARY	32
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ABUTMENT BACKWALL AT SEAT LEVEL	42

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Wingwall Design

```
*********************************************************************************************
*                                                                                           *
*  Program Title         LRFD Abutment and Retaining Wall                                   *
*  Program Name          ABLRFD                                                             *
*  Version               1.16.0.0                                                           *
*  Last Updated          02/07/2017                                                         *
*  Documentation         01/2017                                                            *
*  License No.           336711                                                             *
*                                                                                           *
*********************************************************************************************
*                                                                                           *
*   S-09-003                                                                                *
*                                                                                           *
*********************************************************************************************
```

```
              %WARNING - <Backfill Friction Angle>:
                  The Backfill Friction Angle entered exceeds
                  35 degrees.
                  Chief Bridge Engineer approval is required!
```

S-09-003
INPUT SUMMARY

CONTROL

Sys of Units	Type of Run	Footing Datum
US	A	T

RETAINING WALL

Height (ft)	Top Width (in)	Front Face Horizontal Component	Front Face Vertical Component	Back Face Horizontal Component	Back Face Vertical Component
28.50	36.0	none	none	none	none

Exposed Stem Height (in)	Backfill Horizontal Component	Backfill Vertical Component	Backfill Slope Height (ft)	Front Water Level (ft)	Back Water Level (ft)	Type of Wall	Architectural Treatment Thickness (in)
0.0	none	none	none	none	none	C	0.0

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
3.00	3.91	11.50	none	none	none	none	none

Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)
2.00	3.00	1.00

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Epoxy Coated Backwall	Stem	Footing
NA	4.000	4.000	60.000	NA	Y	Y

Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete Density For DL (lb/ft^3)	For Ec (lb/ft^3)
36.00	130.0	140.0	35.0	150.0	150.0

Architectural Treatment Density (lb/ft^3)	fu (ksi)
150.0	90.000

SOIL

Stem Top to Soil Layer (ft)	Footing Length (Parallel) (ft)	Footing Near Slope	Soil Level Over Toe (ft)	Allow Settle (in)	Bearing Cap Resistance Factor	Sliding Resist Factor
29.00	31.00	N	2.00	0.00	0.55	1.00

Soil Layer Number	Soil Layer Thick (ft)	Undrained Shear Strength (ksf)	Cohesion (ksf)	Mass Unit Weight/ Density (lb/ft^3)	Saturated Unit Weight/ Density (lb/ft^3)
1	100.00	0.00	0.00	125.00	140.00

Soil Layer Number	Effective Friction Angle (deg)	Elastic Modulus (ksf)	Poissons Ratio	Ncq	N Gamma q	Apply Inclination Factors
1	35.00	1000.00	0.00	none	none	N

Precast or Cast-in-Place
C

S-09-003
INPUT SUMMARY (cont.)

MISCELLANEOUS REINFORCEMENT DATA

Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class
1.50	1.00	none	2	2

REINFORCEMENT COVER

Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
none	2.0	2.0	2.0	3.0	3.0	2.0	2.0

BAR SIZE

Backwall Back Vertical (US bar)	Footing Perpend Top (US bar)	Footing Parallel Top (US bar)	Footing Perpend Bottom (US bar)	Footing Parallel Bottom (US bar)	Footing Perp Top Bar Type	Footing Perp Bot Bar Type
none	8	none	8	none	Straight	Straight

BAR SPACING FOR ANALYSIS

Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)
none	6.0	0.0	6.0	0.0

STEM REINFORCING AREA

Range Number	Area/ Width (in^2)	End Location (ft)	Max Bar Diameter (in)
1	2.00	8.00	1.000
2	0.88	14.25	1.000
3	0.62	28.50	1.000

LOAD CONTROL

Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)
1.00	1.00	1.00	2.00	2.00	0.00	0.00

LOADS ON RETAINING WALLS

CT (kip)	Y Distance to CT (in)	Parapet Dead Load (kip)	X Distance to Parapet (in)	Noise Wall Dead Load (kip)	X Distance to Noise Wall (in)
2.00	32.0	0.51	8.5	0.00	0.0

Wind on External Structure (kip)	Y Distance to Wind on External Structure (in)
0.70	57.0

OUTPUT OF RESULTS

Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Reinf Summary	Footing Flexure
1	1	1	1	1	1	1

Crack Control	Shear Results	Development Length
1	1	1

OUTPUT OF INTERMEDIATE DATA

Unfactored Loads	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resist Values	Detailed Stem Cutoff Load Values
1	1	1	1	1	1

Minimum Reinf Check
1

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ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection Toe (ft)	Projection Heel (ft)	Effective Depth Toe (ft)	Effective Depth Heel (ft)
3.00	18.41	3.91	11.50	2.71	2.79

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

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OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-III	Strength III	-
STR-V	Strength V	-
EXT-II	Extreme II	- Collision
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Abbrev	Loads	Description
DC-A	DC	- Dead Load of Concrete, Parapet
EV	EV	- Dead Load of Earth
EH-V	EH	- Earth Pressure - Vertical
ES	ES	- Earth Surcharge
LS	LS	- Live Load Surcharge
WA	WA	- Water Load
WSUP	WS	- Wind on Superstructure
DCAT	DC	- Dead Load - Arch. Treatment
EH	EH	- Earth Pressure - Horizontal
CT	CT	- Collision
WSUB	WS	- Wind on Substructure
WA-E	WA	- Water Load from Backfill

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

S-09-003
UNFACTORED LOADS

LATERAL EARTH PRESSURE (EH) INTERMEDIATE VALUES

Temporary Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	31.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	28.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Final Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	31.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	28.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Legend
- Alpha - Angle of soil wedge measured from the vertical
- Theta - Stem back face batter angle
- Phi-Prime - Backfill internal friction angle
- Beta - Backfill slope measured from the horizontal

WARNING: The Backfill Friction Angle entered exceeds 35 degrees.
Chief Bridge Engineer approval is required!

* Note: The Minimum Equivalent Fluid Pressure (MEFP) controlled
the Kah calculation. Ka, Kah and Kav are based on
the Minimum Equivalent Fluid Pressure.

S-09-003
UNFACTORED LOADS (cont.)

FOUNDATION

Temporary Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	21.11	-145.64	EH	17.36	182.14
EV	42.61	-539.41	ES	0.00	0.00
EH-V	5.64	-103.87	LS	2.21	34.73
ES	0.00	0.00	WA	0.00	0.00
LS	2.99	-37.85	WSUB	0.00	0.00
WA	0.00	0.00	WA-E	0.00	0.00
DCAT	0.00	0.00			

FOUNDATION (cont.)

Final Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	21.62	-147.98	EH	17.36	182.14
EV	42.61	-539.41	ES	0.00	0.00
EH-V	5.64	-103.87	LS	2.21	34.73
ES	0.00	0.00	WA	0.00	0.00
LS	2.99	-37.85	WSUP	0.70	25.38
WA	0.00	0.00	CT	2.00	68.33
WSUP	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM

Temporary Stage Location A 7.12 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	3.21	0.00	EH	0.89	2.11
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.50	1.78
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location A 7.12 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	3.71	0.40	EH	0.89	2.11
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.50	1.78
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	8.31
WSUP	0.00	0.00	CT	2.00	19.58
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location B 14.25 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	6.41	0.00	EH	3.55	16.86
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.00	7.11
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Final Stage Location B 14.25 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	6.92	0.40	EH	3.55	16.86
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.00	7.11
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	13.30
WSUP	0.00	0.00	CT	2.00	33.83
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location C 21.38 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	9.62	0.00	EH	8.00	56.91
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.50	15.99
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location C 21.38 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	10.12	0.40	EH	8.00	56.91
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.50	15.99
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	18.29
WSUP	0.00	0.00	CT	2.00	48.08
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location D 28.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	12.82	0.00	EH	14.21	134.90
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	2.00	28.43
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location D 28.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	13.33	0.40	EH	14.21	134.90
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	2.00	28.43
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	23.27
WSUP	0.00	0.00	CT	2.00	62.33
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

FOOTING

Temporary Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.54	1.76	3.44	DC-A	3.92	5.17	29.76
WA	0.00	0.00	0.00	EV	32.26	42.61	244.99
				EH-V	2.16	2.16	24.78
				ES	0.00	0.00	0.00
				LS	2.26	2.99	17.19
				WA	0.00	0.00	0.00

FOOTING (cont.)

Final Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.54	1.76	3.44	DC-A	3.92	5.17	29.76
WA	0.00	0.00	0.00	EV	32.26	42.61	244.99
				EH-V	2.16	2.16	24.78
				ES	0.00	0.00	0.00
				LS	2.26	2.99	17.19
				WA	0.00	0.00	0.00

Foundation moments are taken about the bottom of the footing at the toe. Stem and Backwall moments are taken about the centerline of the section at the location analyzed. Positive moment clockwise; negative moment counterclockwise; toe on right; heel on left. Footing moments are the moments at the section of the toe or heel due only to those loads applied directly to the toe or heel.

S-09-003
LOAD FACTORS

FOUNDATION

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					

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LOAD FACTORS (cont.)

FOUNDATION (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WA	*	1.00	*	1.00	WSUB	*	0.40	*	1.00
			WSUP	*	0.40	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	0.40	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
EXT-II	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
EXT-II	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	*	1.00					
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00					
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WA	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			WSUP	*	0.30	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	*	1.00					
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00

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LOAD FACTORS (cont.)

FOUNDATION (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	0.30	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00					
CSS	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.00	*	1.00					
CSS	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	1.00	/	1.00					

STEM

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00

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LOAD FACTORS (cont.)

STEM (cont.)

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.40	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
EXT-II	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
EXT-II	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00

S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.30	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00

FOOTING

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00

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                                   S-09-003
                              LOAD FACTORS (cont.)
----------------------------------------------------------------------------

                                FOOTING (cont.)

                          Toe                            Heel

 Limit  Load          Applied    Load     Eta      Applied    Load     Eta
 State  Case Stage     Load     Factor   Factor     Load     Factor   Factor
                                                     WA    *  1.00  *  1.00

 STR-III Min  Fin      DC-A  *  0.90  /  1.00        DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00        EV   *  1.00  /  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     WA   *  1.00  /  1.00

 STR-V   Max  Tmp      DC-A  *  1.25  *  1.00        DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00        EV   *  1.35  *  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  1.50  *  1.00
                                                     WA   *  1.00  *  1.00

 STR-V   Min  Tmp      DC-A  *  0.90  /  1.00        DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00        EV   *  1.00  /  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  1.50  *  1.00
                                                     WA   *  1.00  /  1.00

 STR-V   Max  Fin      DC-A  *  1.25  *  1.00        DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00        EV   *  1.35  *  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  1.35  *  1.00
                                                     WA   *  1.00  *  1.00

 STR-V   Min  Fin      DC-A  *  0.90  /  1.00        DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00        EV   *  1.00  /  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  1.35  *  1.00
                                                     WA   *  1.00  /  1.00

 EXT-II  Max  Fin      DC-A  *  1.25  *  1.00        DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00        EV   *  1.35  *  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  0.50  *  1.00
                                                     WA   *  1.00  *  1.00

 EXT-II  Min  Fin      DC-A  *  0.90  /  1.00        DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00        EV   *  1.00  /  1.00
                                                     EH-V *  1.50  *  1.00
                                                     ES   *  1.50  *  1.00
                                                     LS   *  0.50  *  1.00
                                                     WA   *  1.00  /  1.00

 SER-I   Max  Tmp      DC-A  *  1.00  *  1.00        DC-A *  1.00  *  1.00
                       WA    *  1.00  *  1.00        EV   *  1.00  *  1.00
                                                     EH-V *  1.00  *  1.00
                                                     ES   *  1.00  *  1.00
                                                     LS   *  1.00  *  1.00
                                                     WA   *  1.00  *  1.00

 SER-I   Min  Tmp      DC-A  *  1.00  /  1.00        DC-A *  1.00  /  1.00
                       WA    *  1.00  /  1.00        EV   *  1.00  /  1.00
                                                     EH-V *  1.00  *  1.00
                                                     ES   *  1.00  *  1.00
                                                     LS   *  1.00  *  1.00
                                                     WA   *  1.00  /  1.00

 SER-I   Max  Fin      DC-A  *  1.00  *  1.00        DC-A *  1.00  *  1.00
                       WA    *  1.00  *  1.00        EV   *  1.00  *  1.00
                                                     EH-V *  1.00  *  1.00
                                                     ES   *  1.00  *  1.00
                                                     LS   *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
								WA	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	/	1.00
CSS	Max	Fin	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	*	1.00
CSS	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	/	1.00

S-09-003
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	8.18	97.60	1.35	-1132.31	1.37
STR-I	Min	Tmp	7.42	75.30	1.04	-892.54	1.08
STR-I	Max	Fin	8.16	98.24	1.35	-1135.23	1.37
STR-I	Min	Fin	7.40	75.76	1.04	-894.64	1.08
STR-III	Max	Tmp	8.58	92.37	1.33	-1066.06	1.35
STR-III	Min	Tmp	7.89	70.07	1.01	-826.29	1.05
STR-III	Max	Fin	8.17	93.00	1.33	-1068.98	1.35
STR-III	Min	Fin	7.37	70.52	1.01	-828.40	1.05
STR-V	Max	Tmp	8.23	96.86	1.34	-1122.84	1.36
STR-V	Min	Tmp	7.48	74.55	1.03	-883.07	1.07
STR-V	Max	Fin	8.14	97.04	1.33	-1120.09	1.35
STR-V	Min	Fin	7.37	74.56	1.02	-879.50	1.06
EXT-II	Max	Fin	7.71	94.50	1.30	-1087.91	1.31
EXT-II	Min	Fin	6.78	72.02	0.99	-847.32	1.02
SER-I	Max	Tmp	8.43	72.35	1.00	-826.78	1.00
SER-I	Min	Tmp	8.43	72.35	1.00	-826.78	1.00
SER-I	Max	Fin	8.30	72.86	1.00	-829.11	1.00
SER-I	Min	Fin	8.30	72.86	1.00	-829.11	1.00
CSS	Max	Fin	8.72	69.87	1.00	-791.26	1.00
CSS	Min	Fin	8.72	69.87	1.00	-791.26	1.00

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	8.18	29.91	1.53	333.99	1.54
STR-I	Min	Tmp	7.42	29.91	1.53	333.99	1.54
STR-I	Max	Fin	8.16	29.91	1.53	333.99	1.54
STR-I	Min	Fin	7.40	29.91	1.53	333.99	1.54
STR-III	Max	Tmp	8.58	26.05	1.50	273.22	1.50
STR-III	Min	Tmp	7.89	26.05	1.50	273.22	1.50
STR-III	Max	Fin	8.17	27.03	1.50	308.74	1.49
STR-III	Min	Fin	7.37	27.03	1.50	308.74	1.49
STR-V	Max	Tmp	8.23	29.35	1.50	325.31	1.50
STR-V	Min	Tmp	7.48	29.35	1.50	325.31	1.50
STR-V	Max	Fin	8.14	29.30	1.45	330.25	1.36
STR-V	Min	Fin	7.37	29.30	1.45	330.25	1.36
EXT-II	Max	Fin	7.71	29.15	1.35	358.91	1.26
EXT-II	Min	Fin	6.78	29.15	1.35	358.91	1.26
SER-I	Max	Tmp	8.43	19.57	1.00	216.87	1.00
SER-I	Min	Tmp	8.43	19.57	1.00	216.87	1.00
SER-I	Max	Fin	8.30	19.78	0.98	224.48	0.93
SER-I	Min	Fin	8.30	19.78	0.98	224.48	0.93
CSS	Max	Fin	8.72	17.36	1.00	182.14	1.00
CSS	Min	Fin	8.72	17.36	1.00	182.14	1.00

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

STEM LOCATION A 7.12 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	4.01	6.27	2.21
STR-I	Min	Tmp	2.89	6.27	2.21
STR-I	Max	Fin	4.64	6.77	2.21
STR-I	Min	Fin	3.34	6.63	2.21
STR-III	Max	Tmp	4.01	3.16	1.33
STR-III	Min	Tmp	2.89	3.16	1.33
STR-III	Max	Fin	4.64	15.30	2.31
STR-III	Min	Fin	3.34	15.16	2.31
STR-V	Max	Tmp	4.01	5.83	2.08
STR-V	Min	Tmp	2.89	5.83	2.08
STR-V	Max	Fin	4.64	9.39	2.29
STR-V	Min	Fin	3.34	9.25	2.29
EXT-II	Max	Fin	4.64	24.13	3.58
EXT-II	Min	Fin	3.34	23.99	3.58

S-09-003
FACTORED FORCES (cont.)

STEM LOCATION A 7.12 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
SER-I	Max	Tmp	3.21	3.88	1.39
SER-I	Min	Tmp	3.21	3.88	1.39
SER-I	Max	Fin	3.71	6.78	1.60
SER-I	Min	Fin	3.71	6.78	1.60

STEM LOCATION B 14.25 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	8.02	37.73	7.08
STR-I	Min	Tmp	5.77	37.73	7.08
STR-I	Max	Fin	8.65	38.23	7.08
STR-I	Min	Fin	6.23	38.09	7.08
STR-III	Max	Tmp	8.02	25.29	5.33
STR-III	Min	Tmp	5.77	25.29	5.33
STR-III	Max	Fin	8.65	44.41	6.31
STR-III	Min	Fin	6.23	44.27	6.31
STR-V	Max	Tmp	8.02	35.95	6.83
STR-V	Min	Tmp	5.77	35.95	6.83
STR-V	Max	Fin	8.65	40.71	6.96
STR-V	Min	Fin	6.23	40.57	6.96
EXT-II	Max	Fin	8.65	63.18	7.83
EXT-II	Min	Fin	6.23	63.04	7.83
SER-I	Max	Tmp	6.41	23.97	4.55
SER-I	Min	Tmp	6.41	23.97	4.55
SER-I	Max	Fin	6.92	28.36	4.76
SER-I	Min	Fin	6.92	28.36	4.76

STEM LOCATION C 21.38 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	12.02	113.35	14.61
STR-I	Min	Tmp	8.66	113.35	14.61
STR-I	Max	Fin	12.66	113.85	14.61
STR-I	Min	Fin	9.11	113.71	14.61
STR-III	Max	Tmp	12.02	85.37	11.99
STR-III	Min	Tmp	8.66	85.37	11.99
STR-III	Max	Fin	12.66	111.47	12.97
STR-III	Min	Fin	9.11	111.33	12.97
STR-V	Max	Tmp	12.02	109.35	14.24
STR-V	Min	Tmp	8.66	109.35	14.24
STR-V	Max	Fin	12.66	114.77	14.29
STR-V	Min	Fin	9.11	114.63	14.29
EXT-II	Max	Fin	12.66	141.95	14.74
EXT-II	Min	Fin	9.11	141.81	14.74
SER-I	Max	Tmp	9.62	72.90	9.49
SER-I	Min	Tmp	9.62	72.90	9.49
SER-I	Max	Fin	10.12	78.79	9.70
SER-I	Min	Fin	10.12	78.79	9.70

STEM LOCATION D 28.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	16.03	252.10	24.81
STR-I	Min	Tmp	11.54	252.10	24.81
STR-I	Max	Fin	16.66	252.60	24.81
STR-I	Min	Fin	12.00	252.46	24.81
STR-III	Max	Tmp	16.03	202.35	21.32
STR-III	Min	Tmp	11.54	202.35	21.32
STR-III	Max	Fin	16.66	235.44	22.30
STR-III	Min	Fin	12.00	235.30	22.30
STR-V	Max	Tmp	16.03	245.00	24.31

S-09-003
FACTORED FORCES (cont.)

STEM LOCATION D 28.50 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-V	Min	Tmp	11.54	245.00	24.31
STR-V	Max	Fin	16.66	250.54	24.29
STR-V	Min	Fin	12.00	250.40	24.29
EXT-II	Max	Fin	16.66	279.40	24.32
EXT-II	Min	Fin	12.00	279.26	24.32
SER-I	Max	Tmp	12.82	163.33	16.21
SER-I	Min	Tmp	12.82	163.33	16.21
SER-I	Max	Fin	13.33	170.71	16.42
SER-I	Min	Fin	13.33	170.71	16.42

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.68	2.20	4.30	55.65	72.45	435.20
STR-I	Min	Tmp	0.49	1.58	3.10	42.99	55.73	339.04
STR-I	Max	Fin	0.68	2.20	4.30	55.65	72.45	435.20
STR-I	Min	Fin	0.49	1.58	3.10	42.99	55.73	339.04
STR-III	Max	Tmp	0.68	2.20	4.30	51.69	67.22	405.11
STR-III	Min	Tmp	0.49	1.58	3.10	39.02	50.50	308.95
STR-III	Max	Fin	0.68	2.20	4.30	51.69	67.22	405.11
STR-III	Min	Fin	0.49	1.58	3.10	39.02	50.50	308.95
STR-V	Max	Tmp	0.68	2.20	4.30	55.08	71.71	430.90
STR-V	Min	Tmp	0.49	1.58	3.10	42.42	54.98	334.74
STR-V	Max	Fin	0.68	2.20	4.30	54.74	71.26	428.32
STR-V	Min	Fin	0.49	1.58	3.10	42.08	54.53	332.16
EXT-II	Max	Fin	0.68	2.20	4.30	52.82	68.72	413.71
EXT-II	Min	Fin	0.49	1.58	3.10	40.16	51.99	317.55
SER-I	Max	Tmp	0.54	1.76	3.44	40.60	52.93	316.73
SER-I	Min	Tmp	0.54	1.76	3.44	40.60	52.93	316.73
SER-I	Max	Fin	0.54	1.76	3.44	40.60	52.93	316.73
SER-I	Min	Fin	0.54	1.76	3.44	40.60	52.93	316.73
CSS	Max	Fin	0.54	1.76	3.44	38.34	49.94	299.53
CSS	Min	Fin	0.54	1.76	3.44	38.34	49.94	299.53

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

S-09-003
FOOTING STABILITY

INTERMEDIATE BEARING RESISTANCE VALUES

Limit State	Case	Stage	Soil Cat	Soil Cond	Number of Layers	Description
			1	1	1	Single Soil Layer - Sand

STR-I Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	67.24	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
36.98	67.24	5.00	16.36	31.0

STR-I Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	63.79	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.81	1.00
					q	33.30	1.34	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
35.08	63.79	5.00	14.83	31.0

STR-I Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	67.14	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
36.93	67.14	5.00	16.31	31.0

STR-I Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	63.71	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.81	1.00
					q	33.30	1.33	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
35.04	63.71	5.00	14.80	31.0

STR-III Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	69.00	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.78	1.00
					q	33.30	1.39	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
37.95	69.00	5.00	17.17	31.0

STR-III Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	65.97	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.36	1.00

Bearing Resist	Final qult	Df	B'	L'

(ksf)	(ksf)	(ft)	(ft)	(ft)
36.28	65.97	5.00	15.79	31.0

S-09-003
FOOTING STABILITY (cont.)

INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

Limit State	Case	Stage	Soil Cat	Soil Cond	Number of Layers	Description
			1	1	1	Single Soil Layer - Sand

STR-III Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	67.22	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
36.97	67.22	5.00	16.35	31.0

STR-III Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	63.56	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.81	1.00
					q	33.30	1.33	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
34.96	63.56	5.00	14.74	31.0

STR-V Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	67.48	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
37.11	67.48	5.00	16.47	31.0

STR-V Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	64.09	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.81	1.00
					q	33.30	1.34	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
35.25	64.09	5.00	14.96	31.0

STR-V Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	67.06	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
36.88	67.06	5.00	16.28	31.0

STR-V Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	63.55	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.81	1.00
					q	33.30	1.33	1.00

Bearing Resist	Final qult	Df	B'	L'

(ksf)	(ksf)	(ft)	(ft)	(ft)
34.95	63.55	5.00	14.73	31.0

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                                   S-09-003
                          FOOTING STABILITY (cont.)
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                   INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

                                Number
 Limit              Soil  Soil    of
 State  Case Stage   Cat   Cond   Layers   Description
                      1      1       1     Single Soil Layer - Sand

 EXT-II  Max  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    65.16   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.80  1.00
                                                      q  33.30  1.35  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
               (ksf)     (ksf)   (ft)    (ft)   (ft)
               35.84     65.16    5.00  15.43   31.0

 EXT-II  Min  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    60.77   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.82  1.00
                                                      q  33.30  1.31  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
               (ksf)     (ksf)   (ft)    (ft)   (ft)
               33.43     60.77    5.00  13.56   31.0

 SER-I   Max  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    68.34   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.78  1.00
                                                      q  33.30  1.38  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
               (ksf)     (ksf)   (ft)    (ft)   (ft)
               68.34     68.34    5.00  16.86   31.0

 SER-I   Min  Tmp
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    68.34   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.78  1.00
                                                      q  33.30  1.38  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
               (ksf)     (ksf)   (ft)    (ft)   (ft)
               68.34     68.34    5.00  16.86   31.0

 SER-I   Max  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    67.77   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.79  1.00
                                                      q  33.30  1.37  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
               (ksf)     (ksf)   (ft)    (ft)   (ft)
               67.77     67.77    5.00  16.60   31.0

 SER-I   Min  Fin
                 Layer  qult    c    phi     Gamma   Sub   N     s     i
                        (ksf) (ksf) (deg)    (pcf)
                   1    67.77   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                      g  48.03  0.79  1.00
                                                      q  33.30  1.37  1.00

              Bearing    Final
              Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
67.77	67.77	5.00	16.60	31.0

NOTE: The Bearing Resistance values are based on a Bearing Capacity Resistance Factor (Phi) of 0.55 times the Final qult value for all limit states except the Service limit state. The Service limit state uses a Phi of 1.0 times the Final qult value.

S-09-003
FOOTING STABILITY (cont.)

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	1.03	6.14	5.98	7.07	3.53	5.97	36.98	6.198
STR-I	Min	Tmp	1.79	6.14	3.43	6.47	1.71	5.08	35.08	6.912
STR-I	Max	Fin	1.05	6.14	5.85	7.16	3.51	6.02	36.93	6.132
STR-I	Min	Fin	1.80	6.14	3.40	6.53	1.70	5.12	35.04	6.846
STR-III	Max	Tmp	0.62	6.14	9.87	6.03	4.00	5.38	37.95	7.052
STR-III	Min	Tmp	1.31	6.14	4.68	5.43	2.18	4.44	36.28	8.174
STR-III	Max	Fin	1.03	6.14	5.95	6.75	3.35	5.69	36.97	6.499
STR-III	Min	Fin	1.84	6.14	3.34	6.12	1.54	4.79	34.96	7.305
STR-V	Max	Tmp	0.97	6.14	6.32	6.93	3.60	5.88	37.11	6.311
STR-V	Min	Tmp	1.72	6.14	3.56	6.32	1.77	4.98	35.25	7.074
STR-V	Max	Fin	1.07	6.14	5.76	7.10	3.44	5.96	36.88	6.188
STR-V	Min	Fin	1.84	6.14	3.34	6.48	1.62	5.06	34.95	6.907
EXT-II	Max	Fin	1.49	6.14	4.12	7.63	2.64	6.12	35.84	5.851
EXT-II	Min	Fin	2.42	6.14	2.53	7.00	0.82	5.31	33.43	6.295
SER-I	Max	Tmp	0.77	6.14	7.92	4.92	2.94	4.29	68.34	15.925
SER-I	Min	Tmp	0.77	6.14	7.92	4.92	2.94	4.29	68.34	15.925
SER-I	Max	Fin	0.91	6.14	6.77	5.13	2.79	4.39	67.77	15.439
SER-I	Min	Fin	0.91	6.14	6.77	5.13	2.79	4.39	67.77	15.439

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel. The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	29.91	52.73	1.763
STR-I	Min	Fin	29.91	53.05	1.774
STR-III	Min	Tmp	26.05	49.06	1.884
STR-III	Min	Fin	27.03	49.38	1.827
STR-V	Min	Tmp	29.35	52.20	1.778
STR-V	Min	Fin	29.30	52.21	1.782
EXT-II	Min	Fin	29.15	50.43	1.730

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 1.00.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

S-09-003
FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

Elastic (in)	Consol (in)	Settlement Second (in)	Total (in)	Allow (in)	Perform Ratio	Temp Stage Settlement (in)
0.71	0.00	0.00	0.71	0.00	0.000	0.70

Notes:

Elastic settlement is based on:
effective width of 16.60 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 17.44 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 16.86 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

Error: A performance ratio less than 1 was found

S-09-003
INTERNAL FOOTING FORCES

TOE MOMENT
Critical section at stem front face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	52.16	4.30	47.86	1
STR-I	Min	Tmp	46.90	3.10	43.81	1
STR-I	Max	Fin	52.76	4.30	48.46	1
STR-I	Min	Fin	47.33	3.10	44.24	1
STR-III	Max	Tmp	45.02	4.30	40.72	1
STR-III	Min	Tmp	39.77	3.10	36.67	1
STR-III	Max	Fin	49.75	4.30	45.45	1
STR-III	Min	Fin	44.33	3.10	41.23	1
STR-V	Max	Tmp	51.14	4.30	46.84	1
STR-V	Min	Tmp	45.88	3.10	42.79	1
STR-V	Max	Fin	52.30	4.30	48.00	1
STR-V	Min	Fin	46.88	3.10	43.79	1
EXT-II	Max	Fin	55.60	4.30	51.30	1
EXT-II	Min	Fin	50.18	3.10	47.08	1
SER-I	Max	Tmp	36.55	3.44	33.11	1
SER-I	Min	Tmp	36.55	3.44	33.11	1
SER-I	Max	Fin	37.92	3.44	34.48	1
SER-I	Min	Fin	37.92	3.44	34.48	1
CSS	Max	Fin	32.96	3.44	29.52	1
CSS	Min	Fin	32.96	3.44	29.52	1

Note: Moment direction "1" indicates that tension occurs in the bottom perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the top perpendicular reinforcement.

Total Toe Moment = Moment due to Soil Pressure - Moment due to Footing

HEEL MOMENT
Critical section at stem back face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	282.18	435.20	153.02	1
STR-I	Min	Tmp	178.52	339.04	160.52	1
STR-I	Max	Fin	282.47	435.20	152.73	1
STR-I	Min	Fin	178.73	339.04	160.31	1
STR-III	Max	Tmp	292.55	405.11	112.56	1
STR-III	Min	Tmp	188.89	308.95	120.06	1
STR-III	Max	Fin	268.57	405.11	136.54	1
STR-III	Min	Fin	164.83	308.95	144.12	1
STR-V	Max	Tmp	283.66	430.90	147.24	1
STR-V	Min	Tmp	180.00	334.74	154.74	1
STR-V	Max	Fin	277.90	428.32	150.42	1
STR-V	Min	Fin	174.16	332.16	158.00	1
EXT-II	Max	Fin	243.20	413.71	170.51	1
EXT-II	Min	Fin	139.46	317.55	178.09	1
SER-I	Max	Tmp	221.56	316.73	95.16	1
SER-I	Min	Tmp	221.56	316.73	95.16	1
SER-I	Max	Fin	216.59	316.73	100.13	1
SER-I	Min	Fin	216.59	316.73	100.13	1
CSS	Max	Fin	227.72	299.53	71.81	1
CSS	Min	Fin	227.72	299.53	71.81	1

Note: Moment direction "1" indicates that tension occurs in the top perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the bottom perpendicular reinforcement.

Total Heel Moment = Moment due to Footing - Moment due to Soil Pressure

TOE SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	8.36	0.68	7.69	Eff Depth
STR-I	Min	Tmp	7.59	0.49	7.10	Eff Depth

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INTERNAL FOOTING FORCES (cont.)

TOE SHEAR (cont.)

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Fin	8.46	0.68	7.78	Eff Depth
STR-I	Min	Fin	7.66	0.49	7.18	Eff Depth
STR-III	Max	Tmp	7.17	0.68	6.50	Eff Depth
STR-III	Min	Tmp	6.40	0.49	5.91	Eff Depth
STR-III	Max	Fin	7.98	0.68	7.30	Eff Depth
STR-III	Min	Fin	7.18	0.49	6.69	Eff Depth
STR-V	Max	Tmp	8.19	0.68	7.52	Eff Depth
STR-V	Min	Tmp	7.42	0.49	6.93	Eff Depth
STR-V	Max	Fin	8.39	0.68	7.71	Eff Depth
STR-V	Min	Fin	7.59	0.49	7.11	Eff Depth
EXT-II	Max	Fin	8.97	0.68	8.29	Eff Depth
EXT-II	Min	Fin	8.17	0.49	7.68	Eff Depth
SER-I	Max	Tmp	5.84	0.54	5.30	Eff Depth
SER-I	Min	Tmp	5.84	0.54	5.30	Eff Depth
SER-I	Max	Fin	6.07	0.54	5.53	Eff Depth
SER-I	Min	Fin	6.07	0.54	5.53	Eff Depth
CSS	Max	Fin	5.24	0.54	4.70	Eff Depth
CSS	Min	Fin	5.24	0.54	4.70	Eff Depth

Effective Depth 2.71 (ft)

Total Toe Shear = ABS(Shear due to Soil Pressure - Shear due to Footing)

HEEL SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	53.32	72.45	19.14	Face
STR-I	Min	Tmp	34.62	53.63	19.01	0.46 ft
STR-I	Max	Fin	53.49	72.45	18.96	Face
STR-I	Min	Fin	33.68	52.58	18.90	0.69 ft
STR-III	Max	Tmp	53.31	67.22	13.91	Face
STR-III	Min	Tmp	33.88	47.66	13.78	0.69 ft
STR-III	Max	Fin	50.77	67.22	16.45	Face
STR-III	Min	Fin	29.26	45.77	16.51	1.15 ft
STR-V	Max	Tmp	53.32	71.71	18.39	Face
STR-V	Min	Tmp	34.65	52.91	18.26	0.46 ft
STR-V	Max	Fin	52.71	71.26	18.54	Face
STR-V	Min	Fin	32.95	51.46	18.51	0.69 ft
EXT-II	Max	Fin	46.95	67.41	20.46	0.23 ft
EXT-II	Min	Fin	25.51	46.14	20.63	1.38 ft
SER-I	Max	Tmp	40.91	52.93	12.02	Face
SER-I	Min	Tmp	40.91	52.93	12.02	Face
SER-I	Max	Fin	40.47	52.93	12.46	Face
SER-I	Min	Fin	40.47	52.93	12.46	Face
CSS	Max	Fin	41.04	49.94	8.89	Face
CSS	Min	Fin	41.04	49.94	8.89	Face

Effective Depth 2.79 (ft)

Shear Location as distance is measured from back face of stem

Total Heel Shear = ABS(Shear due to Footing - Shear due to Soil Pressure)

S-09-003
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State	Load Case (Controlling)	Stage	Moment (kip-ft)		Limit State	Load Case (Controlling)	Stage	Shear (kip)
EXT-II	Max	Fin	51.30T	(Strength)	EXT-II	Max	Fin	8.29
SER-I	Max	Fin	34.48T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State	Load Case (Controlling)	Stage	Moment (kip-ft)		Limit State	Load Case (Controlling)	Stage	Shear (kip)
EXT-II	Min	Fin	178.09H	(Strength)	EXT-II	Min	Fin	20.63
SER-I	Max	Fin	100.13H	(Crack Control)				(Xdist)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

The Maximum shear in Heel is located at Xdist from back face of stem, where Xdist is (1.38) ft.

S-09-003
MOMENT AXIAL INTERACTION

STEM LOCATION A 7.12 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	6.27	263.41	4.01	168.35	42.004	0.62	TN
STR-I	Min	Tmp	6.27	173.30	2.89	79.74	27.634	0.62	TN
STR-I	Max	Fin	6.77	304.21	4.64	208.45	44.922	0.62	TN
STR-I	Min	Fin	6.63	189.08	3.34	95.26	28.511	0.62	TN
STR-III	Max	Tmp	3.16	420.54	4.01	533.07	133.008	0.62	CM
STR-III	Min	Tmp	3.16	453.80	2.89	414.17	143.529	0.62	TR
STR-III	Max	Fin	15.30	133.32	4.64	40.43	8.714	0.62	TN
STR-III	Min	Fin	15.16	118.83	3.34	26.19	7.838	0.62	TN
STR-V	Max	Tmp	5.83	306.86	4.01	211.06	52.662	0.62	TN
STR-V	Min	Tmp	5.83	185.75	2.89	91.99	31.878	0.62	TN
STR-V	Max	Fin	9.39	185.43	4.64	91.67	19.756	0.62	TN
STR-V	Min	Fin	9.25	145.77	3.34	52.67	15.765	0.62	TN
EXT-II	Max	Fin	24.13	114.60	4.64	22.04	4.749	0.62	TN
EXT-II	Min	Fin	23.99	107.40	3.34	14.96	4.476	0.62	TN
SER-I	Max	Tmp	3.88	455.94	3.21	376.32	117.371	0.62	TR
SER-I	Min	Tmp	3.88	455.94	3.21	376.32	117.371	0.62	TR
SER-I	Max	Fin	6.78	208.10	3.71	113.96	30.697	0.62	TN
SER-I	Min	Fin	6.78	208.10	3.71	113.96	30.697	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION B 14.25 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	37.73	117.60	8.02	24.98	3.117	0.62	TN
STR-I	Min	Tmp	37.73	109.18	5.77	16.70	2.894	0.62	TN
STR-I	Max	Fin	38.23	119.74	8.65	27.09	3.132	0.62	TN
STR-I	Min	Fin	38.09	110.58	6.23	18.08	2.903	0.62	TN
STR-III	Max	Tmp	25.29	136.04	8.02	43.11	5.378	0.62	TN
STR-III	Min	Tmp	25.29	120.05	5.77	27.39	4.746	0.62	TN
STR-III	Max	Fin	44.41	114.96	8.65	22.38	2.588	0.62	TN
STR-III	Min	Fin	44.27	107.58	6.23	15.13	2.430	0.62	TN
STR-V	Max	Tmp	35.95	119.23	8.02	26.58	3.316	0.62	TN
STR-V	Min	Tmp	35.95	110.18	5.77	17.69	3.064	0.62	TN
STR-V	Max	Fin	40.71	117.60	8.65	24.98	2.889	0.62	TN
STR-V	Min	Fin	40.57	109.25	6.23	16.77	2.693	0.62	TN
EXT-II	Max	Fin	63.18	107.10	8.65	14.66	1.695	0.62	TN
EXT-II	Min	Fin	63.04	102.49	6.23	10.12	1.626	0.62	TN
SER-I	Max	Tmp	23.97	126.66	6.41	33.88	5.284	0.62	TN
SER-I	Min	Tmp	23.97	126.66	6.41	33.88	5.284	0.62	TN
SER-I	Max	Fin	28.36	122.62	6.92	29.91	4.323	0.62	TN
SER-I	Min	Fin	28.36	122.62	6.92	29.91	4.323	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION C 21.38 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	113.35	319.91	12.02	33.93	2.822	2.00	TN
STR-I	Min	Tmp	113.35	310.37	8.66	23.70	2.738	2.00	TN
STR-I	Max	Fin	113.85	321.60	12.66	35.75	2.825	2.00	TN
STR-I	Min	Fin	113.71	311.55	9.11	24.97	2.740	2.00	TN
STR-III	Max	Tmp	85.37	331.85	12.02	46.74	3.887	2.00	TN
STR-III	Min	Tmp	85.37	318.37	8.66	32.29	3.729	2.00	TN
STR-III	Max	Fin	111.47	322.40	12.66	36.60	2.892	2.00	TN
STR-III	Min	Fin	111.33	312.09	9.11	25.54	2.803	2.00	TN
STR-V	Max	Tmp	109.35	321.20	12.02	35.32	2.937	2.00	TN
STR-V	Min	Tmp	109.35	311.24	8.66	24.64	2.846	2.00	TN
STR-V	Max	Fin	114.77	321.30	12.66	35.43	2.800	2.00	TN

S-09-003
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 21.38 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-V	Min	Fin	114.63	311.34	9.11	24.75	2.716	2.00	TN
EXT-II	Max	Fin	141.95	314.41	12.66	28.03	2.215	2.00	TN
EXT-II	Min	Fin	141.81	306.64	9.11	19.70	2.162	2.00	TN
SER-I	Max	Tmp	72.90	328.71	9.62	43.37	4.509	2.00	TN
SER-I	Min	Tmp	72.90	328.71	9.62	43.37	4.509	2.00	TN
SER-I	Max	Fin	78.79	327.51	10.12	42.09	4.157	2.00	TN
SER-I	Min	Fin	78.79	327.51	10.12	42.09	4.157	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION D 28.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	252.10	306.44	16.03	19.49	1.216	2.00	TN
STR-I	Min	Tmp	252.10	301.12	11.54	13.79	1.194	2.00	TN
STR-I	Max	Fin	252.60	307.16	16.66	20.26	1.216	2.00	TN
STR-I	Min	Fin	252.46	301.63	12.00	14.33	1.195	2.00	TN
STR-III	Max	Tmp	202.35	311.26	16.03	24.66	1.538	2.00	TN
STR-III	Min	Tmp	202.35	304.46	11.54	17.37	1.505	2.00	TN
STR-III	Max	Fin	235.44	308.64	16.66	21.84	1.311	2.00	TN
STR-III	Min	Fin	235.30	302.66	12.00	15.43	1.286	2.00	TN
STR-V	Max	Tmp	245.00	307.00	16.03	20.09	1.253	2.00	TN
STR-V	Min	Tmp	245.00	301.51	11.54	14.21	1.231	2.00	TN
STR-V	Max	Fin	250.54	307.33	16.66	20.44	1.227	2.00	TN
STR-V	Min	Fin	250.40	301.75	12.00	14.46	1.205	2.00	TN
EXT-II	Max	Fin	279.40	305.24	16.66	18.20	1.092	2.00	TN
EXT-II	Min	Fin	279.26	300.30	12.00	12.90	1.075	2.00	TN
SER-I	Max	Tmp	163.33	311.04	12.82	24.42	1.904	2.00	TN
SER-I	Min	Tmp	163.33	311.04	12.82	24.42	1.904	2.00	TN
SER-I	Max	Fin	170.71	310.91	13.33	24.28	1.821	2.00	TN
SER-I	Min	Fin	170.71	310.91	13.33	24.28	1.821	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Phi Factor Code Descriptions
- TN - Tension controlled section
- TR - Transition section
- CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

S-09-003
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State	Load Case (Controlling)	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	EXT-II	Max	Fin	51.30T	222.81	0.900	4.344	1.580
Heel	EXT-II	Min	Fin	178.09H	229.92	0.900	1.291	1.580

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling moment is found in the Heel for the current location.

S-09-003
MINIMUM REINFORCEMENT CHECK

STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Stem A	7.12	110.59	32.18+	0.21	0.35*	0.62	
Stem B	14.25	110.59	84.24+	0.57*	0.35	0.62	
Stem C	21.38	110.59+	189.26	0.75*	0.35	2.00	
Stem D	28.50	110.59+	372.53	0.75*	0.35	2.00	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	110.59	68.40+	0.47*	0.34	1.58	
Heel	110.59+	237.45	0.75*	0.34	1.58	

Status Code Descriptions
+ - Controlling moment for Rho Min Area calculation
* - Controlling minimum area of steel
A - Area provided smaller than required minimum area of steel

S-09-003

CRACK CONTROL - ANALYSIS

STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Controlling Axial (kip)	Status Codes
Stem A	7.12	0.62	0.00	999.99	6.78	3.71	E
Stem B	14.25	0.62	0.00	999.99	28.36	6.92	E
Stem C	21.38	2.00	0.00	999.99	78.79	10.12	E
Stem D	28.50	2.00	30.20	10.71	170.71	13.33	

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	1.58	0.00	999.99	34.48T	E
Heel	1.58	24.51	14.36	100.13H	

NOTE: A "T" following the moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)

- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to 0.6*fy in allowable spacing calculation

S-09-003
REINFORCEMENT SUMMARY - ANALYSIS

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	13.3	44.9	S	0.473	1.580

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	38.7	136.0	S	1.214	1.580

Bar Type Description
S - Straight Bar
H - Hooked Bar

STEM

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Stem A	7.12	N/A @ 15.2	0.62	OK	OK	OK
Stem B	14.25	N/A @ 15.2	0.62	OK	OK	OK
Stem C	21.38	N/A @ 4.7	2.00	OK	OK	OK
Stem D	28.50	N/A @ 4.7	2.00	OK	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Toe	8 @ 6.00	1.58	OK	OK	OK
Heel	8 @ 6.00	1.58	OK	OK	OK

NOTE: No bar size is available because reinforcement was entered with the ARE and or SRA commands. Spacings are calculated based on the maximum bar diameters.

S-09-003
SHEAR RESULTS

STEM

Location	Dist from Struc Top (ft)	Limit State (Controlling)	Load Case	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Stem A	7.12	EXT-II	Max	Fin	3.58	45.11	12.593
Stem B	14.25	EXT-II	Max	Fin	7.83	45.11	5.762
Stem C	21.38	EXT-II	Max	Fin	14.74	43.72	2.966
Stem D	28.50	STR-I	Max	Tmp	24.81	43.72	1.762

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State (Controlling)	Load Case	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	EXT-II	Max	Fin	8.29	42.78	5.159
Heel	EXT-II	Min	Fin	20.63	44.15	2.140

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

S-09-003
SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program did not encounter any specification check warnings for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

S-09-003

SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program encountered one or more specification check errors. The following is a list of output table headings for which errors have occurred. It should be noted that the program does not perform specification checking corresponding to commands that have not been input by the user.

S-09-003

Table of Contents

```
*****************************************************************************************************
*                                                                                                   *
*  Program Title        LRFD Abutment and Retaining Wall                                            *
*  Program Name         ABLRFD                                                                      *
*  Version              1.16.0.0                                                                    *
*  Last Updated         02/07/2017                                                                  *
*  Documentation        01/2017                                                                     *
*  License No.          336711                                                                      *
*                                                                                                   *
*****************************************************************************************************
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*   S-09-003                                                                                        *
*                                                                                                   *
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*                                                                                                   *
*****************************************************************************************************
              %WARNING - <Backfill Friction Angle>:
                  The Backfill Friction Angle entered exceeds
                  35 degrees.
                  Chief Bridge Engineer approval is required!
```

S-09-003
INPUT SUMMARY

CONTROL

Sys of Units	Type of Run	Footing Datum
US	A	T

RETAINING WALL

Height (ft)	Top Width (in)	Front Face Horizontal Component	Front Face Vertical Component	Back Face Horizontal Component	Back Face Vertical Component
23.50	36.0	none	none	none	none

Exposed Stem Height (in)	Backfill Horizontal Component	Backfill Vertical Component	Backfill Slope Height (ft)	Front Water Level (ft)	Back Water Level (ft)	Type of Wall	Architectural Treatment Thickness (in)
0.0	none	none	none	none	none	C	0.0

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
2.50	3.92	10.50	none	none	none	none	none

Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)
2.00	3.00	1.00

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Epoxy Coated Backwall	Stem	Footing
NA	4.000	4.000	60.000	NA	Y	Y

Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete Density For DL (lb/ft^3)	For Ec (lb/ft^3)
36.00	130.0	140.0	35.0	150.0	150.0

Architectural Treatment Density (lb/ft^3)	fu (ksi)
150.0	90.000

SOIL

Stem Top to Soil Layer (ft)	Footing Length (Parallel) (ft)	Footing Near Slope	Soil Level Over Toe (ft)	Allow Settle (in)	Bearing Cap Resistance Factor	Sliding Resist Factor
25.00	31.00	N	2.00	0.00	0.55	1.00

Soil Layer Number	Soil Layer Thick (ft)	Undrained Shear Strength (ksf)	Cohesion (ksf)	Mass Unit Weight/ Density (lb/ft^3)	Saturated Unit Weight/ Density (lb/ft^3)
1	100.00	0.00	0.00	125.00	140.00

Soil Layer Number	Effective Friction Angle (deg)	Elastic Modulus (ksf)	Poissons Ratio	Ncq	N Gamma q	Apply Inclination Factors
1	35.00	1000.00	0.00	none	none	N

Precast or Cast-in-Place
C

S-09-003
INPUT SUMMARY (cont.)

MISCELLANEOUS REINFORCEMENT DATA

Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class
1.50	1.00	none	2	2

REINFORCEMENT COVER

Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
none	2.0	2.0	2.0	3.0	3.0	2.0	2.0

BAR SIZE

Backwall Back Vertical (US bar)	Footing Perpend Top (US bar)	Footing Parallel Top (US bar)	Footing Perpend Bottom (US bar)	Footing Parallel Bottom (US bar)	Footing Perp Top Bar Type	Footing Perp Bot Bar Type
none	8	none	8	none	Straight	Straight

BAR SPACING FOR ANALYSIS

Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)
none	6.0	0.0	6.0	0.0

STEM REINFORCING AREA

Range Number	Area/ Width (in^2)	End Location (ft)	Max Bar Diameter (in)
1	2.00	8.00	1.000
2	0.88	11.75	1.000
3	0.62	23.50	1.000

LOAD CONTROL

Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)
1.00	1.00	1.00	2.00	2.00	0.00	0.00

LOADS ON RETAINING WALLS

CT (kip)	Y Distance to CT (in)	Parapet Dead Load (kip)	X Distance to Parapet (in)	Noise Wall Dead Load (kip)	X Distance to Noise Wall (in)
2.00	32.0	0.51	8.5	0.00	0.0

Wind on External Structure (kip)	Y Distance to Wind on External Structure (in)
0.70	57.0

OUTPUT OF RESULTS

Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Reinf Summary	Footing Flexure
1	1	1	1	1	1	1

Crack Control	Shear Results	Development Length
1	1	1

OUTPUT OF INTERMEDIATE DATA

Unfactored Loads	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resist Values	Detailed Stem Cutoff Load Values
1	1	1	1	1	1

Minimum Reinf Check
1

S-09-003
ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection Toe (ft)	Projection Heel (ft)	Effective Depth Toe (ft)	Effective Depth Heel (ft)
2.50	17.42	3.92	10.50	2.21	2.29

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

S-09-003
OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-III	Strength III	-
STR-V	Strength V	-
EXT-II	Extreme II	- Collision
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Abbrev	Loads	Description
DC-A	DC	- Dead Load of Concrete, Parapet
EV	EV	- Dead Load of Earth
EH-V	EH	- Earth Pressure - Vertical
ES	ES	- Earth Surcharge
LS	LS	- Live Load Surcharge
WA	WA	- Water Load
WSUP	WS	- Wind on Superstructure
DCAT	DC	- Dead Load - Arch. Treatment
EH	EH	- Earth Pressure - Horizontal
CT	CT	- Collision
WSUB	WS	- Wind on Substructure
WA-E	WA	- Water Load from Backfill

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

S-09-003
UNFACTORED LOADS

LATERAL EARTH PRESSURE (EH) INTERMEDIATE VALUES

Temporary Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	26.00	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	23.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Final Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	26.00	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	23.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Legend
- Alpha - Angle of soil wedge measured from the vertical
- Theta - Stem back face batter angle
- Phi-Prime - Backfill internal friction angle
- Beta - Backfill slope measured from the horizontal

WARNING: The Backfill Friction Angle entered exceeds 35 degrees.
Chief Bridge Engineer approval is required!

* Note: The Minimum Equivalent Fluid Pressure (MEFP) controlled the Kah calculation. Ka, Kah and Kav are based on the Minimum Equivalent Fluid Pressure.

S-09-003
UNFACTORED LOADS (cont.)

FOUNDATION

Temporary Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	17.11	-114.21	EH	11.83	102.42
EV	32.08	-390.38	ES	0.00	0.00
EH-V	3.84	-66.96	LS	1.82	23.66
ES	0.00	0.00	WA	0.00	0.00
LS	2.73	-33.22	WSUB	0.00	0.00
WA	0.00	0.00	WA-E	0.00	0.00
DCAT	0.00	0.00			

FOUNDATION (cont.)

Final Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	17.61	-116.56	EH	11.83	102.42
EV	32.08	-390.38	ES	0.00	0.00
EH-V	3.84	-66.96	LS	1.82	23.66
ES	0.00	0.00	WA	0.00	0.00
LS	2.73	-33.22	WSUP	0.70	21.52
WA	0.00	0.00	CT	2.00	57.33
WSUP	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM

Temporary Stage Location A 5.88 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	2.64	0.00	EH	0.60	1.18
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.41	1.21
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location A 5.88 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	3.15	0.40	EH	0.60	1.18
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.41	1.21
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	7.44
WSUP	0.00	0.00	CT	2.00	17.08
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location B 11.75 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	5.29	0.00	EH	2.42	9.45
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.82	4.83
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Final Stage Location B 11.75 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	5.79	0.40	EH	2.42	9.45
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.82	4.83
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	11.55
WSUP	0.00	0.00	CT	2.00	28.83
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location C 17.62 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	7.93	0.00	EH	5.44	31.91
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.23	10.87
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location C 17.62 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	8.44	0.40	EH	5.44	31.91
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.23	10.87
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	15.66
WSUP	0.00	0.00	CT	2.00	40.58
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location D 23.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	10.57	0.00	EH	9.66	75.63
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.65	19.33
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location D 23.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	11.08	0.40	EH	9.66	75.63
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.65	19.33
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	19.77
WSUP	0.00	0.00	CT	2.00	52.33
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

FOOTING

Temporary Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.64	1.47	2.88	DC-A	3.08	3.94	20.67
WA	0.00	0.00	0.00	EV	25.08	32.08	168.41
				EH-V	1.55	1.55	16.27
				ES	0.00	0.00	0.00
				LS	2.13	2.73	14.33
				WA	0.00	0.00	0.00

FOOTING (cont.)

Final Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.64	1.47	2.88	DC-A	3.08	3.94	20.67
WA	0.00	0.00	0.00	EV	25.08	32.08	168.41
				EH-V	1.55	1.55	16.27
				ES	0.00	0.00	0.00
				LS	2.13	2.73	14.33
				WA	0.00	0.00	0.00

Foundation moments are taken about the bottom of the footing at the toe. Stem and Backwall moments are taken about the centerline of the section at the location analyzed. Positive moment clockwise; negative moment counterclockwise; toe on right; heel on left. Footing moments are the moments at the section of the toe or heel due only to those loads applied directly to the toe or heel.

S-09-003
LOAD FACTORS

FOUNDATION

			Vertical					Horizontal				
Limit State	Load Case	Stage	Applied Load		Load Factor		Eta Factor	Applied Load		Load Factor		Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					

S-09-003
LOAD FACTORS (cont.)

FOUNDATION (cont.)

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                          Vertical                     Horizontal

Limit  Load         Applied    Load      Eta      Applied    Load      Eta
State  Case Stage    Load     Factor   Factor      Load     Factor   Factor
STR-V   Min  Tmp     DC-A  *  0.90  /  1.00         EH   *  1.50  *  1.00
                     EV    *  1.00  /  1.00         ES   *  1.50  *  1.00
                     EH-V  *  1.50  *  1.00         LS   *  1.50  *  1.00
                     ES    *  1.50  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.50  *  1.00         WSUB *  0.40  *  1.00
                     WA    *  1.00  /  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  0.90  /  1.00

STR-V   Max  Fin     DC-A  *  1.25  *  1.00         EH   *  1.50  *  1.00
                     EV    *  1.35  *  1.00         ES   *  1.50  *  1.00
                     EH-V  *  1.50  *  1.00         LS   *  1.35  *  1.00
                     ES    *  1.50  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.35  *  1.00         WSUP *  0.40  *  1.00
                     WA    *  1.00  *  1.00         WSUB *  0.40  *  1.00
                     WSUP  *  0.40  *  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  1.25  *  1.00

STR-V   Min  Fin     DC-A  *  0.90  /  1.00         EH   *  1.50  *  1.00
                     EV    *  1.00  /  1.00         ES   *  1.50  *  1.00
                     EH-V  *  1.50  *  1.00         LS   *  1.35  *  1.00
                     ES    *  1.50  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.35  *  1.00         WSUP *  0.40  *  1.00
                     WA    *  1.00  /  1.00         WSUB *  0.40  *  1.00
                     WSUP  *  0.00  /  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  0.90  /  1.00

EXT-II  Max  Fin     DC-A  *  1.25  *  1.00         EH   *  1.50  *  1.00
                     EV    *  1.35  *  1.00         ES   *  1.50  *  1.00
                     EH-V  *  1.50  *  1.00         LS   *  0.50  *  1.00
                     ES    *  1.50  *  1.00         WA   *  1.00  /  1.00
                     LS    *  0.50  *  1.00         CT   *  1.00  *  1.00
                     WA    *  1.00  *  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  1.25  *  1.00

EXT-II  Min  Fin     DC-A  *  0.90  /  1.00         EH   *  1.50  *  1.00
                     EV    *  1.00  /  1.00         ES   *  1.50  *  1.00
                     EH-V  *  1.50  *  1.00         LS   *  0.50  *  1.00
                     ES    *  1.50  *  1.00         WA   *  1.00  /  1.00
                     LS    *  0.50  *  1.00         CT   *  1.00  *  1.00
                     WA    *  1.00  /  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  0.90  /  1.00

SER-I   Max  Tmp     DC-A  *  1.00  *  1.00         EH   *  1.00  *  1.00
                     EV    *  1.00  *  1.00         ES   *  1.00  *  1.00
                     EH-V  *  1.00  *  1.00         LS   *  1.00  *  1.00
                     ES    *  1.00  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.00  *  1.00         WSUB *  0.30  *  1.00
                     WA    *  1.00  *  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  1.00  *  1.00

SER-I   Min  Tmp     DC-A  *  1.00  /  1.00         EH   *  1.00  *  1.00
                     EV    *  1.00  /  1.00         ES   *  1.00  *  1.00
                     EH-V  *  1.00  *  1.00         LS   *  1.00  *  1.00
                     ES    *  1.00  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.00  *  1.00         WSUB *  0.30  *  1.00
                     WA    *  1.00  /  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  1.00  /  1.00

SER-I   Max  Fin     DC-A  *  1.00  *  1.00         EH   *  1.00  *  1.00
                     EV    *  1.00  *  1.00         ES   *  1.00  *  1.00
                     EH-V  *  1.00  *  1.00         LS   *  1.00  *  1.00
                     ES    *  1.00  *  1.00         WA   *  1.00  /  1.00
                     LS    *  1.00  *  1.00         WSUP *  0.30  *  1.00
                     WA    *  1.00  *  1.00         WSUB *  0.30  *  1.00
                     WSUP  *  0.30  *  1.00         WA-E *  1.00  *  1.00
                     DCAT  *  1.00  *  1.00

SER-I   Min  Fin     DC-A  *  1.00  /  1.00         EH   *  1.00  *  1.00
                     EV    *  1.00  /  1.00         ES   *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

FOUNDATION (cont.)

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                                Vertical                       Horizontal

 Limit  Load          Applied    Load     Eta        Applied    Load     Eta
 State  Case Stage     Load     Factor   Factor       Load     Factor   Factor
                       EH-V  *  1.00  *  1.00          LS   *  1.00  *  1.00
                       ES    *  1.00  *  1.00          WA   *  1.00  /  1.00
                       LS    *  1.00  *  1.00          WSUP *  0.30  *  1.00
                       WA    *  1.00  /  1.00          WSUB *  0.30  *  1.00
                       WSUP  *  0.00  /  1.00          WA-E *  1.00  *  1.00
                       DCAT  *  1.00  /  1.00

 CSS     Max  Fin      DC-A  *  1.00  *  1.00          EH   *  1.00  *  1.00
                       EV    *  1.00  *  1.00          ES   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00          WA   *  1.00  /  1.00
                       ES    *  1.00  *  1.00          WA-E *  1.00  *  1.00
                       WA    *  1.00  *  1.00
                       DCAT  *  1.00  *  1.00

 CSS     Min  Fin      DC-A  *  1.00  /  1.00          EH   *  1.00  *  1.00
                       EV    *  1.00  /  1.00          ES   *  1.00  *  1.00
                       EH-V  *  1.00  *  1.00          WA   *  1.00  /  1.00
                       ES    *  1.00  *  1.00          WA-E *  1.00  *  1.00
                       WA    *  1.00  /  1.00
                       DCAT  *  1.00  /  1.00
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STEM

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                                Vertical                       Horizontal

 Limit  Load          Applied    Load     Eta        Applied    Load     Eta
 State  Case Stage     Load     Factor   Factor       Load     Factor   Factor
 STR-I   Max  Tmp      DC-A  *  1.25  *  1.00          EH   *  1.50  *  1.00
                       EV    *  1.35  *  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          LS   *  1.75  *  1.00
                       ES    *  1.50  *  1.00          WA   *  1.00  /  1.00
                       LS    *  1.75  *  1.00          WA-E *  1.00  *  1.00
                       DCAT  *  1.25  *  1.00

 STR-I   Min  Tmp      DC-A  *  0.90  /  1.00          EH   *  1.50  *  1.00
                       EV    *  1.00  /  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          LS   *  1.75  *  1.00
                       ES    *  1.50  *  1.00          WA   *  1.00  /  1.00
                       LS    *  1.75  *  1.00          WA-E *  1.00  *  1.00
                       DCAT  *  0.90  /  1.00

 STR-I   Max  Fin      DC-A  *  1.25  *  1.00          EH   *  1.50  *  1.00
                       EV    *  1.35  *  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          LS   *  1.75  *  1.00
                       ES    *  1.50  *  1.00          WA   *  1.00  /  1.00
                       LS    *  1.75  *  1.00          WA-E *  1.00  *  1.00
                       DCAT  *  1.25  *  1.00

 STR-I   Min  Fin      DC-A  *  0.90  /  1.00          EH   *  1.50  *  1.00
                       EV    *  1.00  /  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          LS   *  1.75  *  1.00
                       ES    *  1.50  *  1.00          WA   *  1.00  /  1.00
                       LS    *  1.75  *  1.00          WA-E *  1.00  *  1.00
                       DCAT  *  0.90  /  1.00

 STR-III Max  Tmp      DC-A  *  1.25  *  1.00          EH   *  1.50  *  1.00
                       EV    *  1.35  *  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          WA   *  1.00  /  1.00
                       ES    *  1.50  *  1.00          WSUB *  1.40  *  1.00
                       DCAT  *  1.25  *  1.00          WA-E *  1.00  *  1.00

 STR-III Min  Tmp      DC-A  *  0.90  /  1.00          EH   *  1.50  *  1.00
                       EV    *  1.00  /  1.00          ES   *  1.50  *  1.00
                       EH-V  *  1.50  *  1.00          WA   *  1.00  /  1.00
                       ES    *  1.50  *  1.00          WSUB *  1.40  *  1.00
                       DCAT  *  0.90  /  1.00          WA-E *  1.00  *  1.00

 STR-III Max  Fin      DC-A  *  1.25  *  1.00          EH   *  1.50  *  1.00
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S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.40	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
EXT-II	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
EXT-II	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00

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LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.30	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00

FOOTING

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00

S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

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                                    Toe                              Heel

 Limit  Load         Applied     Load      Eta       Applied     Load      Eta
 State  Case Stage    Load      Factor    Factor       Load     Factor   Factor
                                                       WA    *  1.00  *  1.00

 STR-III Min  Fin     DC-A  *  0.90  /  1.00          DC-A *  0.90  /  1.00
                      WA    *  1.00  /  1.00          EV   *  1.00  /  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      WA   *  1.00  /  1.00

 STR-V   Max  Tmp     DC-A  *  1.25  *  1.00          DC-A *  1.25  *  1.00
                      WA    *  1.00  *  1.00          EV   *  1.35  *  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  1.50  *  1.00
                                                      WA   *  1.00  *  1.00

 STR-V   Min  Tmp     DC-A  *  0.90  /  1.00          DC-A *  0.90  /  1.00
                      WA    *  1.00  /  1.00          EV   *  1.00  /  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  1.50  *  1.00
                                                      WA   *  1.00  /  1.00

 STR-V   Max  Fin     DC-A  *  1.25  *  1.00          DC-A *  1.25  *  1.00
                      WA    *  1.00  *  1.00          EV   *  1.35  *  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  1.35  *  1.00
                                                      WA   *  1.00  *  1.00

 STR-V   Min  Fin     DC-A  *  0.90  /  1.00          DC-A *  0.90  /  1.00
                      WA    *  1.00  /  1.00          EV   *  1.00  /  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  1.35  *  1.00
                                                      WA   *  1.00  /  1.00

 EXT-II  Max  Fin     DC-A  *  1.25  *  1.00          DC-A *  1.25  *  1.00
                      WA    *  1.00  *  1.00          EV   *  1.35  *  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  0.50  *  1.00
                                                      WA   *  1.00  *  1.00

 EXT-II  Min  Fin     DC-A  *  0.90  /  1.00          DC-A *  0.90  /  1.00
                      WA    *  1.00  /  1.00          EV   *  1.00  /  1.00
                                                      EH-V *  1.50  *  1.00
                                                      ES   *  1.50  *  1.00
                                                      LS   *  0.50  *  1.00
                                                      WA   *  1.00  /  1.00

 SER-I   Max  Tmp     DC-A  *  1.00  *  1.00          DC-A *  1.00  *  1.00
                      WA    *  1.00  *  1.00          EV   *  1.00  *  1.00
                                                      EH-V *  1.00  *  1.00
                                                      ES   *  1.00  *  1.00
                                                      LS   *  1.00  *  1.00
                                                      WA   *  1.00  *  1.00

 SER-I   Min  Tmp     DC-A  *  1.00  /  1.00          DC-A *  1.00  /  1.00
                      WA    *  1.00  /  1.00          EV   *  1.00  /  1.00
                                                      EH-V *  1.00  *  1.00
                                                      ES   *  1.00  *  1.00
                                                      LS   *  1.00  *  1.00
                                                      WA   *  1.00  /  1.00

 SER-I   Max  Fin     DC-A  *  1.00  *  1.00          DC-A *  1.00  *  1.00
                      WA    *  1.00  *  1.00          EV   *  1.00  *  1.00
                                                      EH-V *  1.00  *  1.00
                                                      ES   *  1.00  *  1.00
                                                      LS   *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
								WA	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	/	1.00
CSS	Max	Fin	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	*	1.00
CSS	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	/	1.00

S-09-003
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	8.42	75.23	1.35	-828.37	1.37
STR-I	Min	Tmp	7.87	58.02	1.04	-651.76	1.08
STR-I	Max	Fin	8.39	75.86	1.35	-831.29	1.37
STR-I	Min	Fin	7.85	58.47	1.04	-653.86	1.08
STR-III	Max	Tmp	8.75	70.45	1.33	-770.22	1.35
STR-III	Min	Tmp	8.26	53.24	1.00	-593.61	1.04
STR-III	Max	Fin	8.29	71.09	1.33	-773.15	1.35
STR-III	Min	Fin	7.67	53.70	1.00	-595.72	1.04
STR-V	Max	Tmp	8.46	74.55	1.34	-820.06	1.36
STR-V	Min	Tmp	7.92	57.33	1.03	-643.45	1.06
STR-V	Max	Fin	8.34	74.77	1.33	-818.00	1.35
STR-V	Min	Fin	7.78	57.38	1.02	-640.58	1.06
EXT-II	Max	Fin	7.83	72.45	1.29	-789.76	1.30
EXT-II	Min	Fin	7.07	55.06	0.98	-612.33	1.01
SER-I	Max	Tmp	8.59	55.76	1.00	-604.78	1.00
SER-I	Min	Tmp	8.59	55.76	1.00	-604.78	1.00
SER-I	Max	Fin	8.43	56.26	1.00	-607.12	1.00
SER-I	Min	Fin	8.43	56.26	1.00	-607.12	1.00
CSS	Max	Fin	8.81	53.53	1.00	-573.90	1.00
CSS	Min	Fin	8.81	53.53	1.00	-573.90	1.00

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	8.42	20.93	1.53	195.04	1.55
STR-I	Min	Tmp	7.87	20.93	1.53	195.04	1.55
STR-I	Max	Fin	8.39	20.93	1.53	195.04	1.55
STR-I	Min	Fin	7.85	20.93	1.53	195.04	1.55
STR-III	Max	Tmp	8.75	17.75	1.50	153.64	1.50
STR-III	Min	Tmp	8.26	17.75	1.50	153.64	1.50
STR-III	Max	Fin	8.29	18.73	1.49	183.77	1.48
STR-III	Min	Fin	7.67	18.73	1.49	183.77	1.48
STR-V	Max	Tmp	8.46	20.48	1.50	189.13	1.50
STR-V	Min	Tmp	7.92	20.48	1.50	189.13	1.50
STR-V	Max	Fin	8.34	20.48	1.43	194.19	1.32
STR-V	Min	Fin	7.78	20.48	1.43	194.19	1.32
EXT-II	Max	Fin	7.83	20.66	1.32	222.80	1.21
EXT-II	Min	Fin	7.07	20.66	1.32	222.80	1.21
SER-I	Max	Tmp	8.59	13.65	1.00	126.08	1.00
SER-I	Min	Tmp	8.59	13.65	1.00	126.08	1.00
SER-I	Max	Fin	8.43	13.86	0.97	132.54	0.90
SER-I	Min	Fin	8.43	13.86	0.97	132.54	0.90
CSS	Max	Fin	8.81	11.83	1.00	102.42	1.00
CSS	Min	Fin	8.81	11.83	1.00	102.42	1.00

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

STEM LOCATION A 5.88 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	3.30	3.89	1.63
STR-I	Min	Tmp	2.38	3.89	1.63
STR-I	Max	Fin	3.94	4.39	1.63
STR-I	Min	Fin	2.83	4.25	1.63
STR-III	Max	Tmp	3.30	1.77	0.91
STR-III	Min	Tmp	2.38	1.77	0.91
STR-III	Max	Fin	3.94	12.69	1.89
STR-III	Min	Fin	2.83	12.55	1.89
STR-V	Max	Tmp	3.30	3.58	1.52
STR-V	Min	Tmp	2.38	3.58	1.52
STR-V	Max	Fin	3.94	6.88	1.74
STR-V	Min	Fin	2.83	6.74	1.74
EXT-II	Max	Fin	3.94	19.96	3.11
EXT-II	Min	Fin	2.83	19.82	3.11

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FACTORED FORCES (cont.)

STEM LOCATION A 5.88 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
SER-I	Max	Tmp	2.64	2.39	1.02
SER-I	Min	Tmp	2.64	2.39	1.02
SER-I	Max	Fin	3.15	5.02	1.23
SER-I	Min	Fin	3.15	5.02	1.23

STEM LOCATION B 11.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	6.61	22.64	5.06
STR-I	Min	Tmp	4.76	22.64	5.06
STR-I	Max	Fin	7.24	23.14	5.06
STR-I	Min	Fin	5.21	23.00	5.06
STR-III	Max	Tmp	6.61	14.18	3.62
STR-III	Min	Tmp	4.76	14.18	3.62
STR-III	Max	Fin	7.24	30.85	4.60
STR-III	Min	Fin	5.21	30.71	4.60
STR-V	Max	Tmp	6.61	21.43	4.86
STR-V	Min	Tmp	4.76	21.43	4.86
STR-V	Max	Fin	7.24	25.82	5.01
STR-V	Min	Fin	5.21	25.68	5.01
EXT-II	Max	Fin	7.24	45.93	6.04
EXT-II	Min	Fin	5.21	45.79	6.04
SER-I	Max	Tmp	5.29	14.29	3.24
SER-I	Min	Tmp	5.29	14.29	3.24
SER-I	Max	Fin	5.79	18.15	3.45
SER-I	Min	Fin	5.79	18.15	3.45

STEM LOCATION C 17.62 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	9.91	66.89	10.31
STR-I	Min	Tmp	7.14	66.89	10.31
STR-I	Max	Fin	10.55	67.39	10.31
STR-I	Min	Fin	7.59	67.25	10.31
STR-III	Max	Tmp	9.91	47.86	8.15
STR-III	Min	Tmp	7.14	47.86	8.15
STR-III	Max	Fin	10.55	70.29	9.13
STR-III	Min	Fin	7.59	70.15	9.13
STR-V	Max	Tmp	9.91	64.17	10.00
STR-V	Min	Tmp	7.14	64.17	10.00
STR-V	Max	Fin	10.55	69.30	10.10
STR-V	Min	Fin	7.59	69.16	10.10
EXT-II	Max	Fin	10.55	94.38	10.77
EXT-II	Min	Fin	7.59	94.24	10.77
SER-I	Max	Tmp	7.93	42.78	6.67
SER-I	Min	Tmp	7.93	42.78	6.67
SER-I	Max	Fin	8.44	47.88	6.88
SER-I	Min	Fin	8.44	47.88	6.88

STEM LOCATION D 23.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	13.22	147.27	17.38
STR-I	Min	Tmp	9.52	147.27	17.38
STR-I	Max	Fin	13.85	147.77	17.38
STR-I	Min	Fin	9.97	147.63	17.38
STR-III	Max	Tmp	13.22	113.44	14.50
STR-III	Min	Tmp	9.52	113.44	14.50
STR-III	Max	Fin	13.85	141.63	15.48
STR-III	Min	Fin	9.97	141.49	15.48
STR-V	Max	Tmp	13.22	142.44	16.96

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FACTORED FORCES (cont.)

STEM LOCATION D 23.50 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-V	Min	Tmp	9.52	142.44	16.96
STR-V	Max	Fin	13.85	147.95	17.00
STR-V	Min	Fin	9.97	147.81	17.00
EXT-II	Max	Fin	13.85	175.94	17.32
EXT-II	Min	Fin	9.97	175.80	17.32
SER-I	Max	Tmp	10.57	94.96	11.31
SER-I	Min	Tmp	10.57	94.96	11.31
SER-I	Max	Fin	11.08	101.29	11.52
SER-I	Min	Fin	11.08	101.29	11.52

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.80	1.84	3.60	43.76	55.33	302.67
STR-I	Min	Tmp	0.58	1.32	2.59	33.91	42.72	236.49
STR-I	Max	Fin	0.80	1.84	3.60	43.76	55.33	302.67
STR-I	Min	Fin	0.58	1.32	2.59	33.91	42.72	236.49
STR-III	Max	Tmp	0.80	1.84	3.60	40.02	50.55	277.59
STR-III	Min	Tmp	0.58	1.32	2.59	30.17	37.95	211.41
STR-III	Max	Fin	0.80	1.84	3.60	40.02	50.55	277.59
STR-III	Min	Fin	0.58	1.32	2.59	30.17	37.95	211.41
STR-V	Max	Tmp	0.80	1.84	3.60	43.23	54.65	299.09
STR-V	Min	Tmp	0.58	1.32	2.59	33.37	42.04	232.91
STR-V	Max	Fin	0.80	1.84	3.60	42.91	54.24	296.94
STR-V	Min	Fin	0.58	1.32	2.59	33.05	41.63	230.76
EXT-II	Max	Fin	0.80	1.84	3.60	41.09	51.92	284.76
EXT-II	Min	Fin	0.58	1.32	2.59	31.24	39.31	218.58
SER-I	Max	Tmp	0.64	1.47	2.88	31.84	40.29	219.68
SER-I	Min	Tmp	0.64	1.47	2.88	31.84	40.29	219.68
SER-I	Max	Fin	0.64	1.47	2.88	31.84	40.29	219.68
SER-I	Min	Fin	0.64	1.47	2.88	31.84	40.29	219.68
CSS	Max	Fin	0.64	1.47	2.88	29.70	37.56	205.35
CSS	Min	Fin	0.64	1.47	2.88	29.70	37.56	205.35

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

S-09-003
FOOTING STABILITY

INTERMEDIATE BEARING RESISTANCE VALUES

Limit State	Case	Stage	Soil Cat	Soil Cond	Number of Layers	Description
			1	1	1	Single Soil Layer - Sand

STR-I Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	65.41	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.78	1.00
					q	33.30	1.38	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
35.98	65.41	4.50	16.84	31.0

STR-I Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	63.05	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.36	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
34.68	63.05	4.50	15.74	31.0

STR-I Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	65.28	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.78	1.00
					q	33.30	1.38	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
35.90	65.28	4.50	16.77	31.0

STR-I Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	62.94	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.35	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
34.62	62.94	4.50	15.69	31.0

STR-III Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	66.46	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.78	1.00
					q	33.30	1.39	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
36.55	66.46	4.50	17.34	31.0

STR-III Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	64.75	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.79	1.00
					q	33.30	1.37	1.00

Bearing Resist	Final qult	Df	B'	L'

(ksf)	(ksf)	(ft)	(ft)	(ft)
35.61	64.75	4.50	16.53	31.0

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FOOTING STABILITY (cont.)

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                    INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

                                       Number
  Limit                   Soil  Soil     of
  State  Case Stage       Cat   Cond   Layers   Description
                           1      1       1     Single Soil Layer - Sand

  STR-III Max  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    64.87   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.79  1.00
                                                       q  33.30  1.37  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                35.68     64.87    4.50  16.58   31.0

  STR-III Min  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    62.16   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.80  1.00
                                                       q  33.30  1.35  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                34.19     62.16    4.50  15.34   31.0

  STR-V   Max  Tmp
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    65.60   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.78  1.00
                                                       q  33.30  1.38  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                36.08     65.60    4.50  16.93   31.0

  STR-V   Min  Tmp
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    63.28   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.80  1.00
                                                       q  33.30  1.36  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                34.80     63.28    4.50  15.85   31.0

  STR-V   Max  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    65.09   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.78  1.00
                                                       q  33.30  1.38  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                35.80     65.09    4.50  16.69   31.0

  STR-V   Min  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    62.64   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.80  1.00
                                                       q  33.30  1.35  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
34.45	62.64	4.50	15.56	31.0

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                                S-09-003
                       FOOTING STABILITY (cont.)
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                   INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

                                Number
  Limit                 Soil  Soil    of
  State  Case Stage     Cat   Cond   Layers   Description
                         1      1       1     Single Soil Layer - Sand

  EXT-II  Max  Fin
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    62.84   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.80  1.00
                                                         q  33.30  1.35  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
                 (ksf)     (ksf)   (ft)    (ft)   (ft)
                 34.56     62.84    4.50  15.65   31.0

  EXT-II  Min  Fin
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    59.43   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.82  1.00
                                                         q  33.30  1.32  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
                 (ksf)     (ksf)   (ft)    (ft)   (ft)
                 32.69     59.43    4.50  14.15   31.0

  SER-I   Max  Tmp
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    66.12   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.78  1.00
                                                         q  33.30  1.39  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
                 (ksf)     (ksf)   (ft)    (ft)   (ft)
                 66.12     66.12    4.50  17.17   31.0

  SER-I   Min  Tmp
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    66.12   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.78  1.00
                                                         q  33.30  1.39  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
                 (ksf)     (ksf)   (ft)    (ft)   (ft)
                 66.12     66.12    4.50  17.17   31.0

  SER-I   Max  Fin
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    65.48   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.78  1.00
                                                         q  33.30  1.38  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
                 (ksf)     (ksf)   (ft)    (ft)   (ft)
                 65.48     65.48    4.50  16.87   31.0

  SER-I   Min  Fin
                    Layer  qult    c    phi     Gamma   Sub   N     s     i
                           (ksf) (ksf) (deg)    (pcf)
                      1    65.48   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                         g  48.03  0.78  1.00
                                                         q  33.30  1.38  1.00

                Bearing    Final
                Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
65.48	65.48	4.50	16.87	31.0

NOTE: The Bearing Resistance values are based on a Bearing Capacity Resistance Factor (Phi) of 0.55 times the Final qult value for all limit states except the Service limit state. The Service limit state uses a Phi of 1.0 times the Final qult value.

S-09-003
FOOTING STABILITY (cont.)

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	0.29	5.81	19.90	4.75	3.88	4.47	35.98	8.051
STR-I	Min	Tmp	0.84	5.81	6.93	4.29	2.37	3.69	34.68	9.410
STR-I	Max	Fin	0.32	5.81	17.96	4.84	3.87	4.52	35.90	7.938
STR-I	Min	Fin	0.86	5.81	6.73	4.35	2.36	3.73	34.62	9.291
STR-III	Max	Tmp	-0.04	5.81	139.75	3.99	4.10	4.06	36.55	8.995
STR-III	Min	Tmp	0.45	5.81	13.02	3.53	2.59	3.22	35.61	11.056
STR-III	Max	Fin	0.42	5.81	13.86	4.67	3.49	4.29	35.68	8.322
STR-III	Min	Fin	1.04	5.81	5.59	4.18	1.98	3.50	34.19	9.770
STR-V	Max	Tmp	0.25	5.81	23.53	4.64	3.92	4.40	36.08	8.192
STR-V	Min	Tmp	0.79	5.81	7.39	4.18	2.40	3.62	34.80	9.620
STR-V	Max	Fin	0.37	5.81	15.82	4.84	3.75	4.48	35.80	7.989
STR-V	Min	Fin	0.93	5.81	6.24	4.35	2.24	3.69	34.45	9.341
EXT-II	Max	Fin	0.88	5.81	6.56	5.43	2.89	4.63	34.56	7.466
EXT-II	Min	Fin	1.64	5.81	3.55	4.94	1.38	3.89	32.69	8.400
SER-I	Max	Tmp	0.12	5.81	46.50	3.34	3.06	3.25	66.12	20.359
SER-I	Min	Tmp	0.12	5.81	46.50	3.34	3.06	3.25	66.12	20.359
SER-I	Max	Fin	0.28	5.81	21.10	3.54	2.92	3.34	65.48	19.633
SER-I	Min	Fin	0.28	5.81	21.10	3.54	2.92	3.34	65.48	19.633

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel. The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	20.93	40.62	1.941
STR-I	Min	Fin	20.93	40.94	1.956
STR-III	Min	Tmp	17.75	37.28	2.101
STR-III	Min	Fin	18.73	37.60	2.008
STR-V	Min	Tmp	20.48	40.15	1.961
STR-V	Min	Fin	20.48	40.18	1.962
EXT-II	Min	Fin	20.66	38.55	1.867

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 1.00.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

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FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

Elastic (in)	Consol (in)	Settlement Second (in)	Total (in)	Allow (in)	Perform Ratio	Temp Stage Settlement (in)
0.55	0.00	0.00	0.55	0.00	0.000	0.53

Notes:

Elastic settlement is based on:
effective width of 16.87 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 17.23 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 17.17 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

Error: A performance ratio less than 1 was found

S-09-003
INTERNAL FOOTING FORCES

TOE MOMENT
Critical section at stem front face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	36.02	3.60	32.41	1
STR-I	Min	Tmp	31.87	2.59	29.27	1
STR-I	Max	Fin	36.63	3.60	33.03	1
STR-I	Min	Fin	32.31	2.59	29.71	1
STR-III	Max	Tmp	30.70	3.60	27.09	1
STR-III	Min	Tmp	26.55	2.59	23.95	1
STR-III	Max	Fin	35.20	3.60	31.60	1
STR-III	Min	Fin	30.88	2.59	28.29	1
STR-V	Max	Tmp	35.26	3.60	31.65	1
STR-V	Min	Tmp	31.11	2.59	28.51	1
STR-V	Max	Fin	36.52	3.60	32.92	1
STR-V	Min	Fin	32.20	2.59	29.61	1
EXT-II	Max	Fin	40.23	3.60	36.63	1
EXT-II	Min	Fin	35.91	2.59	33.32	1
SER-I	Max	Tmp	25.49	2.88	22.61	1
SER-I	Min	Tmp	25.49	2.88	22.61	1
SER-I	Max	Fin	26.82	2.88	23.93	1
SER-I	Min	Fin	26.82	2.88	23.93	1
CSS	Max	Fin	22.94	2.88	20.06	1
CSS	Min	Fin	22.94	2.88	20.06	1

Note: Moment direction "1" indicates that tension occurs in the bottom perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the top perpendicular reinforcement.

Total Toe Moment = Moment due to Soil Pressure - Moment due to Footing

HEEL MOMENT
Critical section at stem back face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	223.76	302.67	78.91	1
STR-I	Min	Tmp	151.90	236.49	84.60	1
STR-I	Max	Fin	224.08	302.67	78.59	1
STR-I	Min	Fin	152.13	236.49	84.37	1
STR-III	Max	Tmp	224.86	277.59	52.73	1
STR-III	Min	Tmp	153.00	211.41	58.41	1
STR-III	Max	Fin	205.53	277.59	72.06	1
STR-III	Min	Fin	133.58	211.41	77.83	1
STR-V	Max	Tmp	223.92	299.09	75.17	1
STR-V	Min	Tmp	152.06	232.91	80.86	1
STR-V	Max	Fin	218.72	296.94	78.22	1
STR-V	Min	Fin	146.77	230.76	84.00	1
EXT-II	Max	Fin	187.49	284.76	97.27	1
EXT-II	Min	Fin	115.53	218.58	103.04	1
SER-I	Max	Tmp	171.91	219.68	47.77	1
SER-I	Min	Tmp	171.91	219.68	47.77	1
SER-I	Max	Fin	167.95	219.68	51.73	1
SER-I	Min	Fin	167.95	219.68	51.73	1
CSS	Max	Fin	172.79	205.35	32.56	1
CSS	Min	Fin	172.79	205.35	32.56	1

Note: Moment direction "1" indicates that tension occurs in the top perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the bottom perpendicular reinforcement.

Total Heel Moment = Moment due to Footing - Moment due to Soil Pressure

TOE SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	8.06	0.80	7.26	Eff Depth
STR-I	Min	Tmp	7.18	0.58	6.61	Eff Depth

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INTERNAL FOOTING FORCES (cont.)

TOE SHEAR (cont.)

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Fin	8.20	0.80	7.40	Eff Depth
STR-I	Min	Fin	7.29	0.58	6.71	Eff Depth
STR-III	Max	Tmp	6.83	0.80	6.03	Eff Depth
STR-III	Min	Tmp	5.96	0.58	5.38	Eff Depth
STR-III	Max	Fin	7.89	0.80	7.09	Eff Depth
STR-III	Min	Fin	6.98	0.58	6.40	Eff Depth
STR-V	Max	Tmp	7.89	0.80	7.08	Eff Depth
STR-V	Min	Tmp	7.01	0.58	6.43	Eff Depth
STR-V	Max	Fin	8.18	0.80	7.38	Eff Depth
STR-V	Min	Fin	7.27	0.58	6.69	Eff Depth
EXT-II	Max	Fin	9.08	0.80	8.27	Eff Depth
EXT-II	Min	Fin	8.16	0.58	7.58	Eff Depth
SER-I	Max	Tmp	5.69	0.64	5.05	Eff Depth
SER-I	Min	Tmp	5.69	0.64	5.05	Eff Depth
SER-I	Max	Fin	6.00	0.64	5.36	Eff Depth
SER-I	Min	Fin	6.00	0.64	5.36	Eff Depth
CSS	Max	Fin	5.10	0.64	4.46	Eff Depth
CSS	Min	Fin	5.10	0.64	4.46	Eff Depth

Effective Depth 2.21 (ft)

Total Toe Shear = ABS(Shear due to Soil Pressure - Shear due to Footing)

HEEL SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	43.54	55.33	11.79	Face
STR-I	Min	Tmp	30.96	42.72	11.76	Face
STR-I	Max	Fin	43.70	55.33	11.62	Face
STR-I	Min	Fin	31.08	42.72	11.64	Face
STR-III	Max	Tmp	42.71	50.55	7.84	Face
STR-III	Min	Tmp	30.13	37.95	7.81	Face
STR-III	Max	Fin	40.39	50.55	10.16	Face
STR-III	Min	Fin	27.77	37.95	10.18	Face
STR-V	Max	Tmp	43.42	54.65	11.23	Face
STR-V	Min	Tmp	30.84	42.04	11.20	Face
STR-V	Max	Fin	42.81	54.24	11.43	Face
STR-V	Min	Fin	30.18	41.63	11.45	Face
EXT-II	Max	Fin	38.38	51.92	13.53	Face
EXT-II	Min	Fin	25.76	39.31	13.55	Face
SER-I	Max	Tmp	33.03	40.29	7.26	Face
SER-I	Min	Tmp	33.03	40.29	7.26	Face
SER-I	Max	Fin	32.64	40.29	7.66	Face
SER-I	Min	Fin	32.64	40.29	7.66	Face
CSS	Max	Fin	32.70	37.56	4.87	Face
CSS	Min	Fin	32.70	37.56	4.87	Face

Effective Depth 2.29 (ft)

Shear Location as distance is measured from back face of stem

Total Heel Shear = ABS(Shear due to Footing - Shear due to Soil Pressure)

S-09-003
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State	Load Case Stage (Controlling)		Moment (kip-ft)		Limit State	Load Case Stage (Controlling)		Shear (kip)
EXT-II	Max	Fin	36.63T	(Strength)	EXT-II	Max	Fin	8.27
SER-I	Max	Fin	23.93T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State	Load Case Stage (Controlling)		Moment (kip-ft)		Limit State	Load Case Stage (Controlling)		Shear (kip)
EXT-II	Min	Fin	103.04H	(Strength)	EXT-II	Min	Fin	13.55
SER-I	Max	Fin	51.73H	(Crack Control)				(Face)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

S-09-003
MOMENT AXIAL INTERACTION

STEM LOCATION A 5.88 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	3.89	455.33	3.30	387.15	117.153	0.62	TR
STR-I	Min	Tmp	3.89	244.32	2.38	149.57	62.862	0.62	TN
STR-I	Max	Fin	4.39	454.18	3.94	407.57	103.519	0.62	TR
STR-I	Min	Fin	4.25	287.08	2.83	191.61	67.593	0.62	TN
STR-III	Max	Tmp	1.77	344.00	3.30	641.34	194.070	0.62	CM
STR-III	Min	Tmp	1.77	409.14	2.38	549.20	230.818	0.62	CM
STR-III	Max	Fin	12.69	134.72	3.94	41.81	10.620	0.62	TN
STR-III	Min	Fin	12.55	119.70	2.83	27.05	9.541	0.62	TN
STR-V	Max	Tmp	3.58	453.58	3.30	418.16	126.535	0.62	TR
STR-V	Min	Tmp	3.58	283.77	2.38	188.36	79.164	0.62	TN
STR-V	Max	Fin	6.88	220.62	3.94	126.27	32.071	0.62	TN
STR-V	Min	Fin	6.74	161.13	2.83	67.78	23.911	0.62	TN
EXT-II	Max	Fin	19.96	115.33	3.94	22.75	5.778	0.62	TN
EXT-II	Min	Fin	19.82	107.89	2.83	15.43	5.443	0.62	TN
SER-I	Max	Tmp	2.39	447.31	2.64	494.86	187.180	0.62	TR
SER-I	Min	Tmp	2.39	447.31	2.64	494.86	187.180	0.62	TR
SER-I	Max	Fin	5.02	254.65	3.15	159.73	50.711	0.62	TN
SER-I	Min	Fin	5.02	254.65	3.15	159.73	50.711	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION B 11.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	22.64	131.14	6.61	38.29	5.793	0.62	TN
STR-I	Min	Tmp	22.64	117.27	4.76	24.65	5.180	0.62	TN
STR-I	Max	Fin	23.14	135.25	7.24	42.33	5.845	0.62	TN
STR-I	Min	Fin	23.00	119.83	5.21	27.17	5.210	0.62	TN
STR-III	Max	Tmp	14.18	175.29	6.61	81.70	12.362	0.62	TN
STR-III	Min	Tmp	14.18	139.97	4.76	46.97	9.870	0.62	TN
STR-III	Max	Fin	30.85	121.11	7.24	28.43	3.926	0.62	TN
STR-III	Min	Fin	30.71	111.44	5.21	18.92	3.629	0.62	TN
STR-V	Max	Tmp	21.43	134.33	6.61	41.43	6.269	0.62	TN
STR-V	Min	Tmp	21.43	119.09	4.76	26.45	5.558	0.62	TN
STR-V	Max	Fin	25.82	128.98	7.24	36.17	4.995	0.62	TN
STR-V	Min	Fin	25.68	116.18	5.21	23.59	4.523	0.62	TN
EXT-II	Max	Fin	45.93	109.80	7.24	17.31	2.391	0.62	TN
EXT-II	Min	Fin	45.79	104.27	5.21	11.87	2.277	0.62	TN
SER-I	Max	Tmp	14.29	147.85	5.29	54.72	10.350	0.62	TN
SER-I	Min	Tmp	14.29	147.85	5.29	54.72	10.350	0.62	TN
SER-I	Max	Fin	18.15	136.51	5.79	43.57	7.521	0.62	TN
SER-I	Min	Fin	18.15	136.51	5.79	43.57	7.521	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION C 17.62 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	66.89	334.50	9.91	49.58	5.001	2.00	TN
STR-I	Min	Tmp	66.89	320.12	7.14	34.16	4.786	2.00	TN
STR-I	Max	Fin	67.39	337.53	10.55	52.83	5.009	2.00	TN
STR-I	Min	Fin	67.25	322.19	7.59	36.38	4.791	2.00	TN
STR-III	Max	Tmp	47.86	357.28	9.91	74.01	7.465	2.00	TN
STR-III	Min	Tmp	47.86	334.84	7.14	49.94	6.996	2.00	TN
STR-III	Max	Fin	70.29	335.16	10.55	50.29	4.768	2.00	TN
STR-III	Min	Fin	70.15	320.63	7.59	34.71	4.571	2.00	TN
STR-V	Max	Tmp	64.17	336.79	9.91	52.03	5.249	2.00	TN
STR-V	Min	Tmp	64.17	321.63	7.14	35.78	5.012	2.00	TN
STR-V	Max	Fin	69.30	335.94	10.55	51.12	4.847	2.00	TN

S-09-003
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 17.62 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-V	Min	Fin	69.16	321.15	7.59	35.26	4.643	2.00	TN
EXT-II	Max	Fin	94.38	321.80	10.55	35.96	3.410	2.00	TN
EXT-II	Min	Fin	94.24	311.68	7.59	25.11	3.307	2.00	TN
SER-I	Max	Tmp	42.78	348.52	7.93	64.62	8.147	2.00	TN
SER-I	Min	Tmp	42.78	348.52	7.93	64.62	8.147	2.00	TN
SER-I	Max	Fin	47.88	344.95	8.44	60.79	7.205	2.00	TN
SER-I	Min	Fin	47.88	344.95	8.44	60.79	7.205	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION D 23.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	147.27	314.60	13.22	28.24	2.136	2.00	TN
STR-I	Min	Tmp	147.27	306.75	9.52	19.82	2.083	2.00	TN
STR-I	Max	Fin	147.77	315.88	13.85	29.61	2.138	2.00	TN
STR-I	Min	Fin	147.63	307.65	9.97	20.78	2.084	2.00	TN
STR-III	Max	Tmp	113.44	323.41	13.22	37.68	2.851	2.00	TN
STR-III	Min	Tmp	113.44	312.73	9.52	26.24	2.757	2.00	TN
STR-III	Max	Fin	141.63	317.19	13.85	31.02	2.240	2.00	TN
STR-III	Min	Fin	141.49	308.55	9.97	21.75	2.181	2.00	TN
STR-V	Max	Tmp	142.44	315.58	13.22	29.29	2.216	2.00	TN
STR-V	Min	Tmp	142.44	307.42	9.52	20.54	2.158	2.00	TN
STR-V	Max	Fin	147.95	315.84	13.85	29.57	2.135	2.00	TN
STR-V	Min	Fin	147.81	307.62	9.97	20.76	2.081	2.00	TN
EXT-II	Max	Fin	175.94	311.10	13.85	24.49	1.768	2.00	TN
EXT-II	Min	Fin	175.80	304.37	9.97	17.27	1.731	2.00	TN
SER-I	Max	Tmp	94.96	321.67	10.57	35.82	3.388	2.00	TN
SER-I	Min	Tmp	94.96	321.67	10.57	35.82	3.388	2.00	TN
SER-I	Max	Fin	101.29	321.01	11.08	35.12	3.169	2.00	TN
SER-I	Min	Fin	101.29	321.01	11.08	35.12	3.169	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Phi Factor Code Descriptions
TN - Tension controlled section
TR - Transition section
CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

S-09-003
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State	Load Case (Controlling)	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	EXT-II	Max	Fin	36.63T	180.15	0.900	4.918	1.580
Heel	EXT-II	Min	Fin	103.04H	187.26	0.900	1.817	1.580

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling moment is found in the Heel for the current location.

S-09-003
MINIMUM REINFORCEMENT CHECK

STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Stem A	5.88	110.59	26.61+	0.18	0.35*	0.62	
Stem B	11.75	110.59	61.24+	0.41*	0.35	0.62	
Stem C	17.62	110.59+	125.84	0.75*	0.35	2.00	
Stem D	23.50	110.59+	234.59	0.75*	0.35	2.00	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	76.80	48.84+	0.41*	0.28	1.58	
Heel	76.80+	137.39	0.63*	0.28	1.58	

Status Code Descriptions
+ - Controlling moment for Rho Min Area calculation
* - Controlling minimum area of steel
A - Area provided smaller than required minimum area of steel

S-09-003
CRACK CONTROL - ANALYSIS

STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Controlling Axial (kip)	Status Codes
Stem A	5.88	0.62	0.00	999.99	5.02	3.15	E
Stem B	11.75	0.62	0.00	999.99	18.15	5.79	E
Stem C	17.62	2.00	0.00	999.99	47.88	8.44	E
Stem D	23.50	2.00	17.21	22.57	101.29	11.08	

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	1.58	0.00	999.99	23.93T	E
Heel	1.58	0.00	999.99	51.73H	E

NOTE: A "T" following the moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)
- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to 0.6*fy in allowable spacing calculation

S-09-003
REINFORCEMENT SUMMARY - ANALYSIS

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	12.0	45.0	S	0.414	1.580

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	27.2	124.0	S	0.852	1.580

Bar Type Description
S - Straight Bar
H - Hooked Bar

STEM

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Stem A	5.88	N/A @ 15.2	0.62	OK	OK	OK
Stem B	11.75	N/A @ 15.2	0.62	OK	OK	OK
Stem C	17.62	N/A @ 4.7	2.00	OK	OK	OK
Stem D	23.50	N/A @ 4.7	2.00	OK	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Toe	8 @ 6.00	1.58	OK	OK	OK
Heel	8 @ 6.00	1.58	OK	OK	OK

NOTE: No bar size is available because reinforcement was entered with the ARE and or SRA commands. Spacings are calculated based on the maximum bar diameters.

S-09-003
SHEAR RESULTS

STEM

Location	Dist from Struc Top (ft)	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Stem A	5.88	EXT-II	Max	Fin	3.11	45.11	14.497
Stem B	11.75	EXT-II	Max	Fin	6.04	45.11	7.474
Stem C	17.62	EXT-II	Max	Fin	10.77	43.72	4.059
Stem D	23.50	STR-I	Max	Tmp	17.38	43.72	2.516

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	EXT-II	Max	Fin	8.27	34.59	4.181
Heel	EXT-II	Min	Fin	13.55	35.95	2.654

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

S-09-003
SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program did not encounter any specification check warnings for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

S-09-003
SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program encountered one or more specification check errors. The following is a list of output table headings for which errors have occurred. It should be noted that the program does not perform specification checking corresponding to commands that have not been input by the user.

THE FOLLOWING TABLES HAVE SPEC CHECK ERRORS	PAGE NO.
FOOTING STABILITY	
SETTLEMENT SUMMARY	24

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Table of Contents

```
*********************************************************************************************
*                                                                                           *
*  Program Title         LRFD Abutment and Retaining Wall                                   *
*  Program Name          ABLRFD                                                             *
*  Version               1.16.0.0                                                           *
*  Last Updated          02/07/2017                                                         *
*  Documentation         01/2017                                                            *
*  License No.           336711                                                             *
*                                                                                           *
*********************************************************************************************
*                                                                                           *
*   S-09-003                                                                                *
*                                                                                           *
*********************************************************************************************
```



```
             %WARNING - <Backfill Friction Angle>:
                 The Backfill Friction Angle entered exceeds
                 35 degrees.
                 Chief Bridge Engineer approval is required!
```

S-09-003
INPUT SUMMARY

CONTROL

Sys of Units	Type of Run	Footing Datum
US	A	T

RETAINING WALL

Height (ft)	Top Width (in)	Front Face Horizontal Component	Front Face Vertical Component	Back Face Horizontal Component	Back Face Vertical Component
19.50	36.0	none	none	none	none

Exposed Stem Height (in)	Backfill Horizontal Component	Backfill Vertical Component	Backfill Slope Height (ft)	Front Water Level (ft)	Back Water Level (ft)	Type of Wall	Architectural Treatment Thickness (in)
0.0	none	none	none	none	none	C	0.0

FOOTING

Min Footing Thick (ft)	Min Toe Proj (ft)	Min Heel Proj (ft)	Min Footing Width (ft)	Max Footing Thick (ft)	Max Toe Proj (ft)	Max Heel Proj (ft)	Max Footing Width (ft)
2.50	3.92	8.50	none	none	none	none	none

Footing Thick Increment (in)	Footing Width Increment (in)	Stem Shift Increment (in)
2.00	3.00	1.00

MATERIALS

Backwall f'c (ksi)	Stem f'c (ksi)	Footing f'c (ksi)	fy (ksi)	Reinforcement Epoxy Coated Backwall	Stem	Footing
NA	4.000	4.000	60.000	NA	Y	Y

Backfill Friction Angle (deg)	Backfill Dry Density (lb/ft^3)	Backfill Saturated Density (lb/ft^3)	Minimum Equivalent Fluid Press (lb/ft^3)	Concrete Density For DL (lb/ft^3)	For Ec (lb/ft^3)
36.00	130.0	140.0	35.0	150.0	150.0

Architectural Treatment Density (lb/ft^3)	fu (ksi)
150.0	90.000

SOIL

Stem Top to Soil Layer (ft)	Footing Length (Parallel) (ft)	Footing Near Slope	Soil Level Over Toe (ft)	Allow Settle (in)	Bearing Cap Resistance Factor	Sliding Resist Factor
19.50	31.00	N	2.00	0.00	0.55	1.00

Soil Layer Number	Soil Layer Thick (ft)	Undrained Shear Strength (ksf)	Cohesion (ksf)	Mass Unit Weight/ Density (lb/ft^3)	Saturated Unit Weight/ Density (lb/ft^3)
1	100.00	0.00	0.00	125.00	140.00

Soil Layer Number	Effective Friction Angle (deg)	Elastic Modulus (ksf)	Poissons Ratio	Ncq	N Gamma q	Apply Inclination Factors
1	35.00	1000.00	0.00	none	none	N

Precast or Cast-in-Place
C

S-09-003
INPUT SUMMARY (cont.)

MISCELLANEOUS REINFORCEMENT DATA

Aggregate Size (in)	Development Correction	Backwall Exposure Class	Stem Exposure Class	Footing Exposure Class
1.50	1.00	none	2	2

REINFORCEMENT COVER

Backwall Back Vertical (in)	Stem Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)	Toe End (in)	Heel End (in)
none	2.0	2.0	2.0	3.0	3.0	2.0	2.0

BAR SIZE

Backwall Back Vertical (US bar)	Footing Perpend Top (US bar)	Footing Parallel Top (US bar)	Footing Perpend Bottom (US bar)	Footing Parallel Bottom (US bar)	Footing Perp Top Bar Type	Footing Perp Bot Bar Type
none	8	none	8	none	Straight	Straight

BAR SPACING FOR ANALYSIS

Backwall Back Vertical (in)	Footing Top Perpend (in)	Footing Top Parallel (in)	Footing Bottom Perpend (in)	Footing Bottom Parallel (in)
none	6.0	0.0	6.0	0.0

STEM REINFORCING AREA

Range Number	Area/ Width (in^2)	End Location (ft)	Max Bar Diameter (in)
1	2.00	8.00	1.000
2	0.88	9.75	1.000
3	0.62	19.50	1.000

LOAD CONTROL

Ductility Factor	Redundancy Factor	Importance Factor	Temp LS (ft)	Final LS (ft)	Temp ES (ft)	Final ES (ft)
1.00	1.00	1.00	2.00	2.00	0.00	0.00

LOADS ON RETAINING WALLS

CT (kip)	Y Distance to CT (in)	Parapet Dead Load (kip)	X Distance to Parapet (in)	Noise Wall Dead Load (kip)	X Distance to Noise Wall (in)
2.00	32.0	0.51	8.5	0.00	0.0

Wind on External Structure (kip)	Y Distance to Wind on External Structure (in)
0.70	57.0

OUTPUT OF RESULTS

Footing Geometry	Output Legend	Factored Forces	Footing Stability	Footing Control Forces	Reinf Summary	Footing Flexure
1	1	1	1	1	1	1

Crack Control	Shear Results	Development Length
1	1	1

OUTPUT OF INTERMEDIATE DATA

Unfactored Loads	Load Factors	Moment/Axial Interaction	Internal Footing Forces	Intermediate Bearing Resist Values	Detailed Stem Cutoff Load Values
1	1	1	1	1	1

Minimum Reinf Check
1

S-09-003
ADDITIONAL INFORMATION

FOOTING GEOMETRY

Footing Thick (ft)	Footing Width (ft)	Projection Toe (ft)	Projection Heel (ft)	Effective Depth Toe (ft)	Effective Depth Heel (ft)
2.50	15.42	3.92	8.50	2.21	2.29

Moments are assumed to cause tension on the bottom face of the footing at the toe and on the top face of the footing at the heel. Effective depths are based on this assumption.

S-09-003
OUTPUT LEGEND

Abbrev	Limit State	Description
STR-I	Strength I	-
STR-III	Strength III	-
STR-V	Strength V	-
EXT-II	Extreme II	- Collision
SER-I	Service I	-
CSS	Con-Sec-Stl	- Consolidation and Secondary Settlement Only

Abbrev	Load Case	Description
Max	Maximum	- Maximum downward vertical force, maximized moment, maximum shear
Min	Minimum	- Minimum downward vertical force, maximized moment, maximum shear

Abbrev	Stage	Description
Tmp	Temporary	- Temporary Construction Condition
Fin	Final	- Final Construction Condition

Abbrev	Loads	Description
DC-A	DC	- Dead Load of Concrete, Parapet
EV	EV	- Dead Load of Earth
EH-V	EH	- Earth Pressure - Vertical
ES	ES	- Earth Surcharge
LS	LS	- Live Load Surcharge
WA	WA	- Water Load
WSUP	WS	- Wind on Superstructure
DCAT	DC	- Dead Load - Arch. Treatment
EH	EH	- Earth Pressure - Horizontal
CT	CT	- Collision
WSUB	WS	- Wind on Substructure
WA-E	WA	- Water Load from Backfill

Symbol	Explanation
*	- Indicates a multiplication (Load Factors Report)
/	- Indicates a division (Load Factors Report)

Status Code	Description
OK	- Check was satisfied
NG	- Check failed
NC	- Not checked
NA	- Not applicable

S-09-003
UNFACTORED LOADS

LATERAL EARTH PRESSURE (EH) INTERMEDIATE VALUES

Temporary Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	22.00	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	19.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Final Stage

Locn	Failure Method	Ka	Kah	Kav	Soil Height (ft)	Height Ratio	Alpha (deg)	Theta (deg)	Phi-Prime (deg)	Beta (deg)
Found	Coul	0.236	0.225	0.073	22.00	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						
Stem	Coul	0.236	0.225	0.073	19.50	--	27.00	90.00	36.00	0.00
	MEFP	0.283*	0.269*	0.087*						

Legend
- Alpha - Angle of soil wedge measured from the vertical
- Theta - Stem back face batter angle
- Phi-Prime - Backfill internal friction angle
- Beta - Backfill slope measured from the horizontal

WARNING: The Backfill Friction Angle entered exceeds 35 degrees.
Chief Bridge Engineer approval is required!

* Note: The Minimum Equivalent Fluid Pressure (MEFP) controlled the Kah calculation. Ka, Kah and Kav are based on the Minimum Equivalent Fluid Pressure.

S-09-003
UNFACTORED LOADS (cont.)

FOUNDATION

Temporary Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	14.56	-92.14	EH	8.47	62.05
EV	21.55	-240.69	ES	0.00	0.00
EH-V	2.75	-42.44	LS	1.54	16.94
ES	0.00	0.00	WA	0.00	0.00
LS	2.21	-24.69	WSUB	0.00	0.00
WA	0.00	0.00	WA-E	0.00	0.00
DCAT	0.00	0.00			

FOUNDATION (cont.)

Final Stage (footing bottom at toe)

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	15.06	-94.49	EH	8.47	62.05
EV	21.55	-240.69	ES	0.00	0.00
EH-V	2.75	-42.44	LS	1.54	16.94
ES	0.00	0.00	WA	0.00	0.00
LS	2.21	-24.69	WSUP	0.70	18.72
WA	0.00	0.00	CT	2.00	49.33
WSUP	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM

Temporary Stage Location A 4.88 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	2.19	0.00	EH	0.42	0.68
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.34	0.83
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location A 4.88 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	2.70	0.40	EH	0.42	0.68
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.34	0.83
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	6.74
WSUP	0.00	0.00	CT	2.00	15.08
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location B 9.75 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	4.39	0.00	EH	1.66	5.40
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.68	3.33
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

STEM (cont.)

Final Stage Location B 9.75 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	4.89	0.40	EH	1.66	5.40
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	0.68	3.33
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	10.15
WSUP	0.00	0.00	CT	2.00	24.83
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location C 14.62 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	6.58	0.00	EH	3.74	18.23
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.02	7.49
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location C 14.62 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	7.09	0.40	EH	3.74	18.23
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.02	7.49
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	13.56
WSUP	0.00	0.00	CT	2.00	34.58
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

STEM (cont.)

Temporary Stage Location D 19.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	8.78	0.00	EH	6.65	43.21
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.37	13.31
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUB	0.00	0.00
DCAT	0.00	0.00	WA-E	0.00	0.00

STEM (cont.)

Final Stage Location D 19.50 (ft) from top of structure

Applied Load	Vertical Force (kip)	Vertical Moment (kip-ft)	Applied Load	Horizontal Force (kip)	Horizontal Moment (kip-ft)
DC-A	9.28	0.40	EH	6.65	43.21
EV	0.00	0.00	ES	0.00	0.00
EH-V	0.00	0.00	LS	1.37	13.31
ES	0.00	0.00	WA	0.00	0.00
LS	0.00	0.00	WSUP	0.70	16.97
WSUP	0.00	0.00	CT	2.00	44.33
DCAT	0.00	0.00	WSUB	0.00	0.00
			WA-E	0.00	0.00

S-09-003
UNFACTORED LOADS (cont.)

FOOTING

Temporary Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.64	1.47	2.88	DC-A	2.33	3.19	13.55
WA	0.00	0.00	0.00	EV	15.74	21.55	91.58
				EH-V	1.16	1.16	9.85
				ES	0.00	0.00	0.00
				LS	1.61	2.21	9.39
				WA	0.00	0.00	0.00

FOOTING (cont.)

Final Stage

Applied Load	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Applied Load	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
DC-A	0.64	1.47	2.88	DC-A	2.33	3.19	13.55
WA	0.00	0.00	0.00	EV	15.74	21.55	91.58
				EH-V	1.16	1.16	9.85
				ES	0.00	0.00	0.00
				LS	1.61	2.21	9.39
				WA	0.00	0.00	0.00

Foundation moments are taken about the bottom of the footing at the toe. Stem and Backwall moments are taken about the centerline of the section at the location analyzed. Positive moment clockwise; negative moment counterclockwise; toe on right; heel on left. Footing moments are the moments at the section of the toe or heel due only to those loads applied directly to the toe or heel.

S-09-003
LOAD FACTORS

FOUNDATION

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.25	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	0.90	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	*	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			WA	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					

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                                    S-09-003
                              LOAD FACTORS (cont.)
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                               FOUNDATION (cont.)

                         Vertical                          Horizontal

  Limit  Load          Applied     Load      Eta       Applied     Load      Eta
  State  Case Stage     Load      Factor   Factor       Load      Factor   Factor
  STR-V   Min  Tmp      DC-A   *  0.90  /  1.00          EH    *  1.50  *  1.00
                        EV     *  1.00  /  1.00          ES    *  1.50  *  1.00
                        EH-V   *  1.50  *  1.00          LS    *  1.50  *  1.00
                        ES     *  1.50  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.50  *  1.00          WSUB  *  0.40  *  1.00
                        WA     *  1.00  /  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  0.90  /  1.00

  STR-V   Max  Fin      DC-A   *  1.25  *  1.00          EH    *  1.50  *  1.00
                        EV     *  1.35  *  1.00          ES    *  1.50  *  1.00
                        EH-V   *  1.50  *  1.00          LS    *  1.35  *  1.00
                        ES     *  1.50  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.35  *  1.00          WSUP  *  0.40  *  1.00
                        WA     *  1.00  *  1.00          WSUB  *  0.40  *  1.00
                        WSUP   *  0.40  *  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  1.25  *  1.00

  STR-V   Min  Fin      DC-A   *  0.90  /  1.00          EH    *  1.50  *  1.00
                        EV     *  1.00  /  1.00          ES    *  1.50  *  1.00
                        EH-V   *  1.50  *  1.00          LS    *  1.35  *  1.00
                        ES     *  1.50  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.35  *  1.00          WSUP  *  0.40  *  1.00
                        WA     *  1.00  /  1.00          WSUB  *  0.40  *  1.00
                        WSUP   *  0.00  /  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  0.90  /  1.00

  EXT-II  Max  Fin      DC-A   *  1.25  *  1.00          EH    *  1.50  *  1.00
                        EV     *  1.35  *  1.00          ES    *  1.50  *  1.00
                        EH-V   *  1.50  *  1.00          LS    *  0.50  *  1.00
                        ES     *  1.50  *  1.00          WA    *  1.00  /  1.00
                        LS     *  0.50  *  1.00          CT    *  1.00  *  1.00
                        WA     *  1.00  *  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  1.25  *  1.00

  EXT-II  Min  Fin      DC-A   *  0.90  /  1.00          EH    *  1.50  *  1.00
                        EV     *  1.00  /  1.00          ES    *  1.50  *  1.00
                        EH-V   *  1.50  *  1.00          LS    *  0.50  *  1.00
                        ES     *  1.50  *  1.00          WA    *  1.00  /  1.00
                        LS     *  0.50  *  1.00          CT    *  1.00  *  1.00
                        WA     *  1.00  /  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  0.90  /  1.00

  SER-I   Max  Tmp      DC-A   *  1.00  *  1.00          EH    *  1.00  *  1.00
                        EV     *  1.00  *  1.00          ES    *  1.00  *  1.00
                        EH-V   *  1.00  *  1.00          LS    *  1.00  *  1.00
                        ES     *  1.00  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.00  *  1.00          WSUB  *  0.30  *  1.00
                        WA     *  1.00  *  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  1.00  *  1.00

  SER-I   Min  Tmp      DC-A   *  1.00  /  1.00          EH    *  1.00  *  1.00
                        EV     *  1.00  /  1.00          ES    *  1.00  *  1.00
                        EH-V   *  1.00  *  1.00          LS    *  1.00  *  1.00
                        ES     *  1.00  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.00  *  1.00          WSUB  *  0.30  *  1.00
                        WA     *  1.00  /  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  1.00  /  1.00

  SER-I   Max  Fin      DC-A   *  1.00  *  1.00          EH    *  1.00  *  1.00
                        EV     *  1.00  *  1.00          ES    *  1.00  *  1.00
                        EH-V   *  1.00  *  1.00          LS    *  1.00  *  1.00
                        ES     *  1.00  *  1.00          WA    *  1.00  /  1.00
                        LS     *  1.00  *  1.00          WSUP  *  0.30  *  1.00
                        WA     *  1.00  *  1.00          WSUB  *  0.30  *  1.00
                        WSUP   *  0.30  *  1.00          WA-E  *  1.00  *  1.00
                        DCAT   *  1.00  *  1.00

  SER-I   Min  Fin      DC-A   *  1.00  /  1.00          EH    *  1.00  *  1.00
                        EV     *  1.00  /  1.00          ES    *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

FOUNDATION (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Load Factor		Eta Factor	Horizontal Applied Load		Load Factor		Eta Factor
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WA	*	1.00	/	1.00	WSUB	*	0.30	*	1.00
			WSUP	*	0.00	/	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.00	/	1.00					
CSS	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	*	1.00					
			DCAT	*	1.00	*	1.00					
CSS	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
			WA	*	1.00	/	1.00					
			DCAT	*	1.00	/	1.00					

STEM

Limit State	Load Case	Stage	Vertical Applied Load		Load Factor		Eta Factor	Horizontal Applied Load		Load Factor		Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00					
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.75	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.75	*	1.00	WA-E	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00					
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00

S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	1.40	*	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-III	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	WA	*	1.00	/	1.00
			ES	*	1.50	*	1.00	WSUP	*	1.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	1.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Tmp	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Tmp	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.50	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
STR-V	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.40	*	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
STR-V	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	1.35	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.35	*	1.00	WSUP	*	0.40	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.40	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
EXT-II	Max	Fin	DC-A	*	1.25	*	1.00	EH	*	1.50	*	1.00
			EV	*	1.35	*	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	1.25	*	1.00	WA-E	*	1.00	*	1.00
EXT-II	Min	Fin	DC-A	*	0.90	/	1.00	EH	*	1.50	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.50	*	1.00
			EH-V	*	1.50	*	1.00	LS	*	0.50	*	1.00
			ES	*	1.50	*	1.00	WA	*	1.00	/	1.00
			LS	*	0.50	*	1.00	CT	*	1.00	*	1.00
			DCAT	*	0.90	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Tmp	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Tmp	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUB	*	0.30	*	1.00

S-09-003
LOAD FACTORS (cont.)

STEM (cont.)

Limit State	Load Case	Stage	Vertical Applied Load		Vertical Load Factor		Vertical Eta Factor	Horizontal Applied Load		Horizontal Load Factor		Horizontal Eta Factor
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00
SER-I	Max	Fin	DC-A	*	1.00	*	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	*	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.30	*	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	*	1.00	WA-E	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	EH	*	1.00	*	1.00
			EV	*	1.00	/	1.00	ES	*	1.00	*	1.00
			EH-V	*	1.00	*	1.00	LS	*	1.00	*	1.00
			ES	*	1.00	*	1.00	WA	*	1.00	/	1.00
			LS	*	1.00	*	1.00	WSUP	*	0.30	*	1.00
			WSUP	*	0.00	/	1.00	WSUB	*	0.30	*	1.00
			DCAT	*	1.00	/	1.00	WA-E	*	1.00	*	1.00

FOOTING

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
STR-I	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-I	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	*	1.00
STR-I	Min	Fin	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								LS	*	1.75	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Tmp	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	*	1.00
STR-III	Min	Tmp	DC-A	*	0.90	/	1.00	DC-A	*	0.90	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00
								WA	*	1.00	/	1.00
STR-III	Max	Fin	DC-A	*	1.25	*	1.00	DC-A	*	1.25	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.35	*	1.00
								EH-V	*	1.50	*	1.00
								ES	*	1.50	*	1.00

S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

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                                   Toe                           Heel

  Limit  Load        Applied    Load      Eta        Applied    Load      Eta
  State  Case Stage   Load     Factor    Factor        Load    Factor   Factor
                                                        WA    *  1.00  *  1.00

  STR-III Min  Fin     DC-A  *  0.90  /  1.00           DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00           EV   *  1.00  /  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        WA   *  1.00  /  1.00

  STR-V   Max  Tmp     DC-A  *  1.25  *  1.00           DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00           EV   *  1.35  *  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  1.50  *  1.00
                                                        WA   *  1.00  *  1.00

  STR-V   Min  Tmp     DC-A  *  0.90  /  1.00           DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00           EV   *  1.00  /  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  1.50  *  1.00
                                                        WA   *  1.00  /  1.00

  STR-V   Max  Fin     DC-A  *  1.25  *  1.00           DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00           EV   *  1.35  *  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  1.35  *  1.00
                                                        WA   *  1.00  *  1.00

  STR-V   Min  Fin     DC-A  *  0.90  /  1.00           DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00           EV   *  1.00  /  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  1.35  *  1.00
                                                        WA   *  1.00  /  1.00

  EXT-II  Max  Fin     DC-A  *  1.25  *  1.00           DC-A *  1.25  *  1.00
                       WA    *  1.00  *  1.00           EV   *  1.35  *  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  0.50  *  1.00
                                                        WA   *  1.00  *  1.00

  EXT-II  Min  Fin     DC-A  *  0.90  /  1.00           DC-A *  0.90  /  1.00
                       WA    *  1.00  /  1.00           EV   *  1.00  /  1.00
                                                        EH-V *  1.50  *  1.00
                                                        ES   *  1.50  *  1.00
                                                        LS   *  0.50  *  1.00
                                                        WA   *  1.00  /  1.00

  SER-I   Max  Tmp     DC-A  *  1.00  *  1.00           DC-A *  1.00  *  1.00
                       WA    *  1.00  *  1.00           EV   *  1.00  *  1.00
                                                        EH-V *  1.00  *  1.00
                                                        ES   *  1.00  *  1.00
                                                        LS   *  1.00  *  1.00
                                                        WA   *  1.00  *  1.00

  SER-I   Min  Tmp     DC-A  *  1.00  /  1.00           DC-A *  1.00  /  1.00
                       WA    *  1.00  /  1.00           EV   *  1.00  /  1.00
                                                        EH-V *  1.00  *  1.00
                                                        ES   *  1.00  *  1.00
                                                        LS   *  1.00  *  1.00
                                                        WA   *  1.00  /  1.00

  SER-I   Max  Fin     DC-A  *  1.00  *  1.00           DC-A *  1.00  *  1.00
                       WA    *  1.00  *  1.00           EV   *  1.00  *  1.00
                                                        EH-V *  1.00  *  1.00
                                                        ES   *  1.00  *  1.00
                                                        LS   *  1.00  *  1.00
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S-09-003
LOAD FACTORS (cont.)

FOOTING (cont.)

Limit State	Load Case	Stage	Toe Applied Load		Toe Load Factor		Toe Eta Factor	Heel Applied Load		Heel Load Factor		Heel Eta Factor
								WA	*	1.00	*	1.00
SER-I	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								LS	*	1.00	*	1.00
								WA	*	1.00	/	1.00
CSS	Max	Fin	DC-A	*	1.00	*	1.00	DC-A	*	1.00	*	1.00
			WA	*	1.00	*	1.00	EV	*	1.00	*	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	*	1.00
CSS	Min	Fin	DC-A	*	1.00	/	1.00	DC-A	*	1.00	/	1.00
			WA	*	1.00	/	1.00	EV	*	1.00	/	1.00
								EH-V	*	1.00	*	1.00
								ES	*	1.00	*	1.00
								WA	*	1.00	/	1.00

S-09-003
FACTORED FORCES

FOUNDATION FORCES AT FOOTING TOE - VERTICAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	7.67	55.28	1.35	-546.96	1.37
STR-I	Min	Tmp	7.22	42.64	1.04	-430.47	1.08
STR-I	Max	Fin	7.64	55.91	1.34	-549.89	1.37
STR-I	Min	Fin	7.19	43.10	1.04	-432.58	1.08
STR-III	Max	Tmp	7.99	51.41	1.32	-503.76	1.34
STR-III	Min	Tmp	7.59	38.78	1.00	-387.27	1.03
STR-III	Max	Fin	7.44	52.05	1.32	-506.69	1.34
STR-III	Min	Fin	6.88	39.23	1.00	-389.38	1.03
STR-V	Max	Tmp	7.72	54.73	1.33	-540.79	1.35
STR-V	Min	Tmp	7.27	42.09	1.02	-424.30	1.06
STR-V	Max	Fin	7.57	55.03	1.32	-540.01	1.34
STR-V	Min	Fin	7.09	42.22	1.02	-422.70	1.05
EXT-II	Max	Fin	6.93	53.15	1.28	-519.03	1.29
EXT-II	Min	Fin	6.22	40.34	0.97	-401.72	1.00
SER-I	Max	Tmp	7.82	41.07	1.00	-399.95	1.00
SER-I	Min	Tmp	7.82	41.07	1.00	-399.95	1.00
SER-I	Max	Fin	7.64	41.57	1.00	-402.29	1.00
SER-I	Min	Fin	7.64	41.57	1.00	-402.29	1.00
CSS	Max	Fin	8.02	39.36	1.00	-377.61	1.00
CSS	Min	Fin	8.02	39.36	1.00	-377.61	1.00

FOUNDATION FORCES AT FOOTING TOE - HORIZONTAL

Limit State	Load Case	Stage	Toe to Result (ft)	Force (kip)	Average Load Factor	Moment (kip-ft)	Average Load Factor
STR-I	Max	Tmp	7.67	15.40	1.54	122.72	1.55
STR-I	Min	Tmp	7.22	15.40	1.54	122.72	1.55
STR-I	Max	Fin	7.64	15.40	1.54	122.72	1.55
STR-I	Min	Fin	7.19	15.40	1.54	122.72	1.55
STR-III	Max	Tmp	7.99	12.71	1.50	93.08	1.50
STR-III	Min	Tmp	7.59	12.71	1.50	93.08	1.50
STR-III	Max	Fin	7.44	13.69	1.49	119.29	1.48
STR-III	Min	Fin	6.88	13.69	1.49	119.29	1.48
STR-V	Max	Tmp	7.72	15.02	1.50	118.49	1.50
STR-V	Min	Tmp	7.27	15.02	1.50	118.49	1.50
STR-V	Max	Fin	7.57	15.06	1.41	123.44	1.26
STR-V	Min	Fin	7.09	15.06	1.41	123.44	1.26
EXT-II	Max	Fin	6.93	15.48	1.29	150.88	1.18
EXT-II	Min	Fin	6.22	15.48	1.29	150.88	1.18
SER-I	Max	Tmp	7.82	10.01	1.00	78.99	1.00
SER-I	Min	Tmp	7.82	10.01	1.00	78.99	1.00
SER-I	Max	Fin	7.64	10.22	0.95	84.61	0.87
SER-I	Min	Fin	7.64	10.22	0.95	84.61	0.87
CSS	Max	Fin	8.02	8.47	1.00	62.05	1.00
CSS	Min	Fin	8.02	8.47	1.00	62.05	1.00

Note: Moments are taken about the bottom of the footing at the toe.
Positive moment clockwise; negative moment counterclockwise;
toe on right; heel on left.

STEM LOCATION A 4.88 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	2.74	2.47	1.22
STR-I	Min	Tmp	1.97	2.47	1.22
STR-I	Max	Fin	3.37	2.97	1.22
STR-I	Min	Fin	2.43	2.83	1.22
STR-III	Max	Tmp	2.74	1.01	0.62
STR-III	Min	Tmp	1.97	1.01	0.62
STR-III	Max	Fin	3.37	10.95	1.60
STR-III	Min	Fin	2.43	10.81	1.60
STR-V	Max	Tmp	2.74	2.26	1.14
STR-V	Min	Tmp	1.97	2.26	1.14
STR-V	Max	Fin	3.37	5.33	1.36
STR-V	Min	Fin	2.43	5.19	1.36
EXT-II	Max	Fin	3.37	17.01	2.79
EXT-II	Min	Fin	2.43	16.87	2.79

S-09-003
FACTORED FORCES (cont.)

STEM LOCATION A 4.88 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
SER-I	Max	Tmp	2.19	1.51	0.76
SER-I	Min	Tmp	2.19	1.51	0.76
SER-I	Max	Fin	2.70	3.93	0.97
SER-I	Min	Fin	2.70	3.93	0.97

STEM LOCATION B 9.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	5.48	13.92	3.69
STR-I	Min	Tmp	3.95	13.92	3.69
STR-I	Max	Fin	6.12	14.43	3.69
STR-I	Min	Fin	4.40	14.29	3.69
STR-III	Max	Tmp	5.48	8.10	2.50
STR-III	Min	Tmp	3.95	8.10	2.50
STR-III	Max	Fin	6.12	22.81	3.48
STR-III	Min	Fin	4.40	22.67	3.48
STR-V	Max	Tmp	5.48	13.09	3.52
STR-V	Min	Tmp	3.95	13.09	3.52
STR-V	Max	Fin	6.12	17.15	3.70
STR-V	Min	Fin	4.40	17.01	3.70
EXT-II	Max	Fin	6.12	35.10	4.84
EXT-II	Min	Fin	4.40	34.96	4.84
SER-I	Max	Tmp	4.39	8.73	2.35
SER-I	Min	Tmp	4.39	8.73	2.35
SER-I	Max	Fin	4.89	12.17	2.56
SER-I	Min	Fin	4.89	12.17	2.56

STEM LOCATION C 14.62 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	8.23	40.44	7.41
STR-I	Min	Tmp	5.92	40.44	7.41
STR-I	Max	Fin	8.86	40.95	7.41
STR-I	Min	Fin	6.38	40.81	7.41
STR-III	Max	Tmp	8.23	27.34	5.61
STR-III	Min	Tmp	5.92	27.34	5.61
STR-III	Max	Fin	8.86	46.83	6.59
STR-III	Min	Fin	6.38	46.69	6.59
STR-V	Max	Tmp	8.23	38.57	7.15
STR-V	Min	Tmp	5.92	38.57	7.15
STR-V	Max	Fin	8.86	43.38	7.28
STR-V	Min	Fin	6.38	43.24	7.28
EXT-II	Max	Fin	8.86	66.17	8.13
EXT-II	Min	Fin	6.38	66.03	8.13
SER-I	Max	Tmp	6.58	25.72	4.77
SER-I	Min	Tmp	6.58	25.72	4.77
SER-I	Max	Fin	7.09	30.18	4.98
SER-I	Min	Fin	7.09	30.18	4.98

STEM LOCATION D 19.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-I	Max	Tmp	10.97	88.11	12.37
STR-I	Min	Tmp	7.90	88.11	12.37
STR-I	Max	Fin	11.60	88.61	12.37
STR-I	Min	Fin	8.35	88.47	12.37
STR-III	Max	Tmp	10.97	64.82	9.98
STR-III	Min	Tmp	7.90	64.82	9.98
STR-III	Max	Fin	11.60	89.08	10.96
STR-III	Min	Fin	8.35	88.94	10.96
STR-V	Max	Tmp	10.97	84.78	12.03

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FACTORED FORCES (cont.)

STEM LOCATION D 19.50 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Axial (kip)	Moment (kip-ft)	Shear (kip)
STR-V	Min	Tmp	7.90	84.78	12.03
STR-V	Max	Fin	11.60	90.07	12.10
STR-V	Min	Fin	8.35	89.93	12.10
EXT-II	Max	Fin	11.60	116.30	12.66
EXT-II	Min	Fin	8.35	116.16	12.66
SER-I	Max	Tmp	8.78	56.52	8.02
SER-I	Min	Tmp	8.78	56.52	8.02
SER-I	Max	Fin	9.28	62.01	8.23
SER-I	Min	Fin	9.28	62.01	8.23

FOOTING - W/O FOUNDATION PRESSURE

Limit State	Load Case	Stage	Toe Shear Eff D (kip)	Toe Shear at Face (kip)	Toe Moment (kip-ft)	Heel Shear Eff D (kip)	Heel Shear at Face (kip)	Heel Moment (kip-ft)
STR-I	Max	Tmp	0.80	1.84	3.60	28.72	38.68	171.78
STR-I	Min	Tmp	0.58	1.32	2.59	22.40	30.02	134.98
STR-I	Max	Fin	0.80	1.84	3.60	28.72	38.68	171.78
STR-I	Min	Fin	0.58	1.32	2.59	22.40	30.02	134.98
STR-III	Max	Tmp	0.80	1.84	3.60	25.90	34.81	155.34
STR-III	Min	Tmp	0.58	1.32	2.59	19.57	26.15	118.55
STR-III	Max	Fin	0.80	1.84	3.60	25.90	34.81	155.34
STR-III	Min	Fin	0.58	1.32	2.59	19.57	26.15	118.55
STR-V	Max	Tmp	0.80	1.84	3.60	28.32	38.13	169.43
STR-V	Min	Tmp	0.58	1.32	2.59	21.99	29.47	132.64
STR-V	Max	Fin	0.80	1.84	3.60	28.07	37.80	168.02
STR-V	Min	Fin	0.58	1.32	2.59	21.75	29.14	131.23
EXT-II	Max	Fin	0.80	1.84	3.60	26.70	35.92	160.04
EXT-II	Min	Fin	0.58	1.32	2.59	20.38	27.26	123.24
SER-I	Max	Tmp	0.64	1.47	2.88	20.84	28.10	124.37
SER-I	Min	Tmp	0.64	1.47	2.88	20.84	28.10	124.37
SER-I	Max	Fin	0.64	1.47	2.88	20.84	28.10	124.37
SER-I	Min	Fin	0.64	1.47	2.88	20.84	28.10	124.37
CSS	Max	Fin	0.64	1.47	2.88	19.23	25.89	114.98
CSS	Min	Fin	0.64	1.47	2.88	19.23	25.89	114.98

Note: Moment critical sections in the footing are at the front and back face of the stem. Shear critical sections in the footing are located at the effective depth distance away from the front face of the stem for the toe and at the back face of the stem for the heel.

S-09-003
FOOTING STABILITY

INTERMEDIATE BEARING RESISTANCE VALUES

```
                                  Number
  Limit                Soil  Soil     of
  State  Case Stage    Cat   Cond   Layers   Description
                        1      1       1     Single Soil Layer - Sand

  STR-I   Max  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    62.17   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.80  1.00
                                                        q  33.30  1.35  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                34.19     62.17    4.50  15.35   31.0

  STR-I   Min  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    60.09   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.81  1.00
                                                        q  33.30  1.33  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                33.05     60.09    4.50  14.43   31.0

  STR-I   Max  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    62.02   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.80  1.00
                                                        q  33.30  1.35  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                34.11     62.02    4.50  15.28   31.0

  STR-I   Min  Fin
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    59.97   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.81  1.00
                                                        q  33.30  1.32  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                32.98     59.97    4.50  14.38   31.0

  STR-III Max  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    61.08   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.81  1.00
                                                        q  33.30  1.34  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)    (ft)   (ft)
                33.59     61.08    4.50  14.86   31.0

  STR-III Min  Tmp
                   Layer  qult    c    phi     Gamma   Sub   N     s     i
                          (ksf) (ksf) (deg)    (pcf)
                     1    61.78   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                        g  48.03  0.80  1.00
                                                        q  33.30  1.34  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
33.98	61.78	4.50	15.17	31.0

S-09-003
FOOTING STABILITY (cont.)

INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

```
                                    Number
  Limit                Soil  Soil     of
  State  Case Stage    Cat   Cond   Layers   Description
                        1     1       1      Single Soil Layer - Sand

  STR-III Max  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    61.13   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.81  1.00
                                                       q  33.30  1.34  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)   (ft)   (ft)
                33.62     61.13   4.50  14.89   31.0

  STR-III Min  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    58.54   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.82  1.00
                                                       q  33.30  1.31  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)   (ft)   (ft)
                32.20     58.54   4.50  13.77   31.0

  STR-V   Max  Tmp
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    62.30   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.80  1.00
                                                       q  33.30  1.35  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)   (ft)   (ft)
                34.27     62.30   4.50  15.41   31.0

  STR-V   Min  Tmp
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    60.32   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.81  1.00
                                                       q  33.30  1.33  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)   (ft)   (ft)
                33.17     60.32   4.50  14.53   31.0

  STR-V   Max  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    61.70   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.80  1.00
                                                       q  33.30  1.34  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
                (ksf)     (ksf)   (ft)   (ft)   (ft)
                33.94     61.70   4.50  15.14   31.0

  STR-V   Min  Fin
                  Layer  qult    c    phi     Gamma   Sub   N     s     i
                         (ksf) (ksf) (deg)    (pcf)
                    1    59.50   0.0  35.0    125.00   c  46.12  1.00  1.00
                                                       g  48.03  0.82  1.00
                                                       q  33.30  1.32  1.00

               Bearing    Final
               Resist     qult    Df      B'     L'
```

(ksf)	(ksf)	(ft)	(ft)	(ft)
32.73	59.50	4.50	14.18	31.0

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FOOTING STABILITY (cont.)

INTERMEDIATE BEARING RESISTANCE VALUES (cont.)

Limit State	Case	Stage	Soil Cat	Soil Cond	Number of Layers	Description
			1	1	1	Single Soil Layer - Sand

EXT-II Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	58.74	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.82	1.00
					q	33.30	1.31	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
32.31	58.74	4.50	13.85	31.0

EXT-II Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	55.33	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.84	1.00
					q	33.30	1.28	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
30.43	55.33	4.50	12.44	31.0

SER-I Max Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	61.86	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.34	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
61.86	61.86	4.50	15.21	31.0

SER-I Min Tmp

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	61.86	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.34	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
61.86	61.86	4.50	15.21	31.0

SER-I Max Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	62.02	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.35	1.00

Bearing Resist (ksf)	Final qult (ksf)	Df (ft)	B' (ft)	L' (ft)
62.02	62.02	4.50	15.28	31.0

SER-I Min Fin

Layer	qult (ksf)	c (ksf)	phi (deg)	Gamma (pcf)	Sub	N	s	i
1	62.02	0.0	35.0	125.00	c	46.12	1.00	1.00
					g	48.03	0.80	1.00
					q	33.30	1.35	1.00

Bearing Resist	Final qult	Df	B'	L'

(ksf)	(ksf)	(ft)	(ft)	(ft)
62.02	62.02	4.50	15.28	31.0

NOTE: The Bearing Resistance values are based on a Bearing Capacity Resistance Factor (Phi) of 0.55 times the Final qult value for all limit states except the Service limit state. The Service limit state uses a Phi of 1.0 times the Final qult value.

S-09-003
FOOTING STABILITY (cont.)

SPREAD FOOTING - BEARING RESISTANCE

Limit State	Load Case	Stage	Ecc (ft)	Allow Ecc (ft)	Ecc Perform Ratio	Factored Footing Pressure Toe (ksf)	Factored Footing Pressure Heel (ksf)	Uniform Factored Bearing Pressure (ksf)	Factored Bearing Resist (ksf)	Perform Ratio
STR-I	Max	Tmp	0.04	5.14	143.32	3.64	3.54	3.60	34.19	9.493
STR-I	Min	Tmp	0.49	5.14	10.42	3.30	2.23	2.95	33.05	11.186
STR-I	Max	Fin	0.07	5.14	73.10	3.73	3.53	3.66	34.11	9.321
STR-I	Min	Fin	0.52	5.14	9.87	3.36	2.23	3.00	32.98	11.003
STR-III	Max	Tmp	-0.28	5.14	18.51	2.97	3.69	3.46	33.59	9.712
STR-III	Min	Tmp	0.12	5.14	41.70	2.64	2.39	2.56	33.98	13.295
STR-III	Max	Fin	0.27	5.14	19.27	3.73	3.02	3.50	33.62	9.616
STR-III	Min	Fin	0.83	5.14	6.22	3.36	1.73	2.85	32.20	11.299
STR-V	Max	Tmp	-0.01	5.14	825.69	3.54	3.56	3.55	34.27	9.647
STR-V	Min	Tmp	0.44	5.14	11.56	3.20	2.26	2.90	33.17	11.452
STR-V	Max	Fin	0.14	5.14	36.71	3.76	3.37	3.63	33.94	9.337
STR-V	Min	Fin	0.62	5.14	8.28	3.40	2.08	2.98	32.73	10.990
EXT-II	Max	Fin	0.78	5.14	6.56	4.50	2.40	3.84	32.31	8.420
EXT-II	Min	Fin	1.49	5.14	3.45	4.13	1.10	3.24	30.43	9.383
SER-I	Max	Tmp	-0.11	5.14	48.71	2.55	2.77	2.70	61.86	22.909
SER-I	Min	Tmp	-0.11	5.14	48.71	2.55	2.77	2.70	61.86	22.909
SER-I	Max	Fin	0.07	5.14	75.15	2.77	2.62	2.72	62.02	22.802
SER-I	Min	Fin	0.07	5.14	75.15	2.77	2.62	2.72	62.02	22.802

Performance Ratio = Factored Bearing Resistance / Uniform Factored Bearing Pressure
Eccentricity Performance Ratio = Allowable Eccentricity / Eccentricity

The eccentricity is the distance from the center of the footing to the load resultant. Positive towards toe; negative towards heel. The allowable eccentricity is the distance from the center of the footing to the edge of the kern.

SPREAD FOOTING - SLIDING

Limit State	Load Case	Stage	Factored Horizontal Force (kip)	Factored Sliding Resistance (kip)	Performance Ratio
STR-I	Min	Tmp	15.40	29.86	1.939
STR-I	Min	Fin	15.40	30.18	1.960
STR-III	Min	Tmp	12.71	27.15	2.137
STR-III	Min	Fin	13.69	27.47	2.007
STR-V	Min	Tmp	15.02	29.47	1.963
STR-V	Min	Fin	15.06	29.56	1.962
EXT-II	Min	Fin	15.48	28.24	1.825

Note: Only the Min Load Cases are checked for sliding.
Sliding resistance is based on a phi factor of 1.00.

Performance Ratio = Factored Sliding Resistance / Factored Horizontal Force

S-09-003
FOOTING STABILITY (cont.)

SETTLEMENT SUMMARY

Elastic (in)	Consol (in)	Settlement Second (in)	Total (in)	Allow (in)	Perform Ratio	Temp Stage Settlement (in)
0.42	0.00	0.00	0.42	0.00	0.000	0.42

Notes:

Elastic settlement is based on:
effective width of 15.28 (ft) from SER-I Max Fin

Consolidation and Secondary settlement are based on:
effective width of 14.81 (ft) from CSS Max Fin

Temporary Stage settlement is based on:
effective width of 15.21 (ft) from SER-I Max Tmp

Uniform pressures (Vertical Force/Effective Width)
are used for settlement calculations.

Performance Ratio = Allowable Settlement / Total Settlement

Error: A performance ratio less than 1 was found

S-09-003
INTERNAL FOOTING FORCES

TOE MOMENT
Critical section at stem front face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	27.86	3.60	24.26	1
STR-I	Min	Tmp	24.64	2.59	22.04	1
STR-I	Max	Fin	28.49	3.60	24.89	1
STR-I	Min	Fin	25.09	2.59	22.50	1
STR-III	Max	Tmp	23.32	3.60	19.72	1
STR-III	Min	Tmp	20.09	2.59	17.50	1
STR-III	Max	Fin	28.17	3.60	24.57	1
STR-III	Min	Fin	24.76	2.59	22.17	1
STR-V	Max	Tmp	27.21	3.60	23.61	1
STR-V	Min	Tmp	23.99	2.59	21.39	1
STR-V	Max	Fin	28.66	3.60	25.06	1
STR-V	Min	Fin	25.26	2.59	22.66	1
EXT-II	Max	Fin	33.19	3.60	29.59	1
EXT-II	Min	Fin	29.79	2.59	27.19	1
SER-I	Max	Tmp	19.76	2.88	16.88	1
SER-I	Min	Tmp	19.76	2.88	16.88	1
SER-I	Max	Fin	21.17	2.88	18.29	1
SER-I	Min	Fin	21.17	2.88	18.29	1
CSS	Max	Fin	17.67	2.88	14.79	1
CSS	Min	Fin	17.67	2.88	14.79	1

Note: Moment direction "1" indicates that tension occurs in the bottom perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the top perpendicular reinforcement.

Total Toe Moment = Moment due to Soil Pressure - Moment due to Footing

HEEL MOMENT
Critical section at stem back face

Limit State	Load Case	Stage	Moment due to Soil Pressure (kip-ft)	Moment due to Footing (kip-ft)	Total Moment (kip-ft)	Moment Direction
STR-I	Max	Tmp	128.37	171.78	43.41	1
STR-I	Min	Tmp	87.77	134.98	47.21	1
STR-I	Max	Fin	128.73	171.78	43.05	1
STR-I	Min	Fin	88.03	134.98	46.95	1
STR-III	Max	Tmp	128.68	155.34	26.66	1
STR-III	Min	Tmp	88.09	118.55	30.46	1
STR-III	Max	Fin	113.93	155.34	41.41	1
STR-III	Min	Fin	73.23	118.55	45.31	1
STR-V	Max	Tmp	128.41	169.43	41.02	1
STR-V	Min	Tmp	87.82	132.64	44.82	1
STR-V	Max	Fin	124.48	168.02	43.54	1
STR-V	Min	Fin	83.78	131.23	47.44	1
EXT-II	Max	Fin	100.51	160.04	59.53	1
EXT-II	Min	Fin	59.81	123.24	63.43	1
SER-I	Max	Tmp	98.71	124.37	25.66	1
SER-I	Min	Tmp	98.71	124.37	25.66	1
SER-I	Max	Fin	95.76	124.37	28.61	1
SER-I	Min	Fin	95.76	124.37	28.61	1
CSS	Max	Fin	99.18	114.98	15.80	1
CSS	Min	Fin	99.18	114.98	15.80	1

Note: Moment direction "1" indicates that tension occurs in the top perpendicular reinforcement. Moment direction "2" indicates that tension occurs in the bottom perpendicular reinforcement.

Total Heel Moment = Moment due to Footing - Moment due to Soil Pressure

TOE SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	6.21	0.80	5.41	Eff Depth
STR-I	Min	Tmp	5.54	0.58	4.96	Eff Depth

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INTERNAL FOOTING FORCES (cont.)

TOE SHEAR (cont.)

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Fin	6.36	0.80	5.56	Eff Depth
STR-I	Min	Fin	5.65	0.58	5.07	Eff Depth
STR-III	Max	Tmp	5.16	0.80	4.36	Eff Depth
STR-III	Min	Tmp	4.49	0.58	3.91	Eff Depth
STR-III	Max	Fin	6.31	0.80	5.51	Eff Depth
STR-III	Min	Fin	5.60	0.58	5.02	Eff Depth
STR-V	Max	Tmp	6.06	0.80	5.26	Eff Depth
STR-V	Min	Tmp	5.39	0.58	4.81	Eff Depth
STR-V	Max	Fin	6.40	0.80	5.60	Eff Depth
STR-V	Min	Fin	5.69	0.58	5.12	Eff Depth
EXT-II	Max	Fin	7.50	0.80	6.70	Eff Depth
EXT-II	Min	Fin	6.79	0.58	6.21	Eff Depth
SER-I	Max	Tmp	4.39	0.64	3.75	Eff Depth
SER-I	Min	Tmp	4.39	0.64	3.75	Eff Depth
SER-I	Max	Fin	4.72	0.64	4.08	Eff Depth
SER-I	Min	Fin	4.72	0.64	4.08	Eff Depth
CSS	Max	Fin	3.91	0.64	3.26	Eff Depth
CSS	Min	Fin	3.91	0.64	3.26	Eff Depth

Effective Depth 2.21 (ft)

Total Toe Shear = ABS(Shear due to Soil Pressure - Shear due to Footing)

HEEL SHEAR

Limit State	Load Case	Stage	Shear due to Soil Pressure (kip)	Shear due to Footing (kip)	Total Shear (kip)	Shear Location
STR-I	Max	Tmp	30.28	38.68	8.40	Face
STR-I	Min	Tmp	21.48	30.02	8.54	Face
STR-I	Max	Fin	30.44	38.68	8.24	Face
STR-I	Min	Fin	21.60	30.02	8.42	Face
STR-III	Max	Tmp	29.72	34.81	5.10	Face
STR-III	Min	Tmp	20.92	26.15	5.24	Face
STR-III	Max	Fin	27.35	34.81	7.46	Face
STR-III	Min	Fin	18.51	26.15	7.65	Face
STR-V	Max	Tmp	30.20	38.13	7.93	Face
STR-V	Min	Tmp	21.40	29.47	8.07	Face
STR-V	Max	Fin	29.59	37.80	8.20	Face
STR-V	Min	Fin	20.75	29.14	8.39	Face
EXT-II	Max	Fin	25.29	35.92	10.63	Face
EXT-II	Min	Fin	16.44	27.26	10.82	Face
SER-I	Max	Tmp	23.05	28.10	5.05	Face
SER-I	Min	Tmp	23.05	28.10	5.05	Face
SER-I	Max	Fin	22.64	28.10	5.46	Face
SER-I	Min	Fin	22.64	28.10	5.46	Face
CSS	Max	Fin	22.86	25.89	3.03	Face
CSS	Min	Fin	22.86	25.89	3.03	Face

Effective Depth 2.29 (ft)

Shear Location as distance is measured from back face of stem

Total Heel Shear = ABS(Shear due to Footing - Shear due to Soil Pressure)

S-09-003
CONTROLLING FOOTING FORCES

TOE - WITH FOUNDATION PRESSURE

Limit State (Controlling)	Load Case	Stage	Moment (kip-ft)		Limit State (Controlling)	Load Case	Stage	Shear (kip)
EXT-II	Max	Fin	29.59T	(Strength)	EXT-II	Max	Fin	6.70
SER-I	Max	Fin	18.29T	(Crack Control)				(Eff D)

Note: A "T" following the moment value indicates that the controlling moment for the bottom perpendicular reinforcement was found in the Toe. An "H" indicates the controlling moment was found in the Heel.

HEEL - WITH FOUNDATION PRESSURE

Limit State (Controlling)	Load Case	Stage	Moment (kip-ft)		Limit State (Controlling)	Load Case	Stage	Shear (kip)
EXT-II	Min	Fin	63.43H	(Strength)	EXT-II	Min	Fin	10.82
SER-I	Max	Fin	28.61H	(Crack Control)				(Face)

Note: An "H" following the moment value indicates that the controlling moment for the top perpendicular reinforcement was found in the Heel. A "T" indicates the controlling moment was found in the Toe.

S-09-003
MOMENT AXIAL INTERACTION

STEM LOCATION A 4.88 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	2.47	446.63	2.74	496.17	180.940	0.62	CM
STR-I	Min	Tmp	2.47	456.57	1.97	365.20	184.967	0.62	TR
STR-I	Max	Fin	2.97	442.13	3.37	502.53	148.911	0.62	CM
STR-I	Min	Fin	2.83	455.12	2.43	390.90	160.881	0.62	TR
STR-III	Max	Tmp	1.01	273.62	2.74	740.89	270.180	0.62	CM
STR-III	Min	Tmp	1.01	335.29	1.97	653.66	331.071	0.62	CM
STR-III	Max	Fin	10.95	134.31	3.37	41.41	12.270	0.62	TN
STR-III	Min	Fin	10.81	119.53	2.43	26.88	11.062	0.62	TN
STR-V	Max	Tmp	2.26	429.26	2.74	520.74	189.900	0.62	CM
STR-V	Min	Tmp	2.26	454.76	1.97	397.21	201.183	0.62	TR
STR-V	Max	Fin	5.33	258.82	3.37	163.83	48.547	0.62	TN
STR-V	Min	Fin	5.19	175.96	2.43	82.36	33.896	0.62	TN
EXT-II	Max	Fin	17.01	115.49	3.37	22.91	6.789	0.62	TN
EXT-II	Min	Fin	16.87	108.01	2.43	15.55	6.402	0.62	TN
SER-I	Max	Tmp	1.51	392.97	2.19	572.07	260.772	0.62	CM
SER-I	Min	Tmp	1.51	392.97	2.19	572.07	260.772	0.62	CM
SER-I	Max	Fin	3.93	306.20	2.70	210.41	77.938	0.62	TN
SER-I	Min	Fin	3.93	306.20	2.70	210.41	77.938	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION B 9.75 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	13.92	153.81	5.48	60.58	11.046	0.62	TN
STR-I	Min	Tmp	13.92	129.56	3.95	36.74	9.305	0.62	TN
STR-I	Max	Fin	14.43	162.11	6.12	68.74	11.238	0.62	TN
STR-I	Min	Fin	14.29	134.31	4.40	41.41	9.402	0.62	TN
STR-III	Max	Tmp	8.10	295.96	5.48	200.34	36.529	0.62	TN
STR-III	Min	Tmp	8.10	182.82	3.95	89.10	22.565	0.62	TN
STR-III	Max	Fin	22.81	126.76	6.12	33.99	5.557	0.62	TN
STR-III	Min	Fin	22.67	114.89	4.40	22.32	5.067	0.62	TN
STR-V	Max	Tmp	13.09	160.63	5.48	67.29	12.269	0.62	TN
STR-V	Min	Tmp	13.09	132.99	3.95	40.11	10.157	0.62	TN
STR-V	Max	Fin	17.15	144.66	6.12	51.58	8.433	0.62	TN
STR-V	Min	Fin	17.01	125.14	4.40	32.39	7.355	0.62	TN
EXT-II	Max	Fin	35.10	112.05	6.12	19.53	3.192	0.62	TN
EXT-II	Min	Fin	34.96	105.74	4.40	13.32	3.025	0.62	TN
SER-I	Max	Tmp	8.73	188.63	4.39	94.82	21.611	0.62	TN
SER-I	Min	Tmp	8.73	188.63	4.39	94.82	21.611	0.62	TN
SER-I	Max	Fin	12.17	155.95	4.89	62.69	12.810	0.62	TN
SER-I	Min	Fin	12.17	155.95	4.89	62.69	12.810	0.62	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION C 14.62 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	40.44	355.74	8.23	72.36	8.796	2.00	TN
STR-I	Min	Tmp	40.44	333.86	5.92	48.89	8.255	2.00	TN
STR-I	Max	Fin	40.95	361.13	8.86	78.13	8.820	2.00	TN
STR-I	Min	Fin	40.81	337.46	6.38	52.75	8.270	2.00	TN
STR-III	Max	Tmp	27.34	400.68	8.23	120.55	14.653	2.00	TN
STR-III	Min	Tmp	27.34	361.23	5.92	78.25	13.211	2.00	TN
STR-III	Max	Fin	46.83	350.01	8.86	66.21	7.474	2.00	TN
STR-III	Min	Fin	46.69	330.35	6.38	45.13	7.075	2.00	TN
STR-V	Max	Tmp	38.57	359.83	8.23	76.74	9.328	2.00	TN
STR-V	Min	Tmp	38.57	336.44	5.92	51.66	8.722	2.00	TN
STR-V	Max	Fin	43.38	356.08	8.86	72.73	8.209	2.00	TN

S-09-003
MOMENT AXIAL INTERACTION (cont.)

STEM LOCATION C 14.62 (ft) FROM TOP OF STRUCTURE (cont.)

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-V	Min	Fin	43.24	334.25	6.38	49.31	7.731	2.00	TN
EXT-II	Max	Fin	66.17	329.39	8.86	44.10	4.978	2.00	TN
EXT-II	Min	Fin	66.03	316.80	6.38	30.60	4.798	2.00	TN
SER-I	Max	Tmp	25.72	378.63	6.58	96.90	14.724	2.00	TN
SER-I	Min	Tmp	25.72	378.63	6.58	96.90	14.724	2.00	TN
SER-I	Max	Fin	30.18	369.07	7.09	86.66	12.227	2.00	TN
SER-I	Min	Fin	30.18	369.07	7.09	86.66	12.227	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

STEM LOCATION D 19.50 (ft) FROM TOP OF STRUCTURE

Limit State	Load Case	Stage	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Applied Axial (kip)	Axial Resist (kip)	Perform Ratio	Area Prov (in^2)	Phi Factor
STR-I	Max	Tmp	88.11	326.13	10.97	40.60	3.702	2.00	TN
STR-I	Min	Tmp	88.11	314.56	7.90	28.20	3.570	2.00	TN
STR-I	Max	Fin	88.61	328.36	11.60	42.99	3.706	2.00	TN
STR-I	Min	Fin	88.47	316.10	8.35	29.85	3.573	2.00	TN
STR-III	Max	Tmp	64.82	342.28	10.97	57.92	5.281	2.00	TN
STR-III	Min	Tmp	64.82	325.22	7.90	39.63	5.018	2.00	TN
STR-III	Max	Fin	89.08	328.11	11.60	42.73	3.683	2.00	TN
STR-III	Min	Fin	88.94	315.93	8.35	29.67	3.552	2.00	TN
STR-V	Max	Tmp	84.78	327.82	10.97	42.41	3.867	2.00	TN
STR-V	Min	Tmp	84.78	315.69	7.90	29.41	3.724	2.00	TN
STR-V	Max	Fin	90.07	327.61	11.60	42.20	3.637	2.00	TN
STR-V	Min	Fin	89.93	315.60	8.35	29.31	3.509	2.00	TN
EXT-II	Max	Fin	116.30	317.83	11.60	31.70	2.733	2.00	TN
EXT-II	Min	Fin	116.16	308.98	8.35	22.22	2.660	2.00	TN
SER-I	Max	Tmp	56.52	337.07	8.78	52.33	5.964	2.00	TN
SER-I	Min	Tmp	56.52	337.07	8.78	52.33	5.964	2.00	TN
SER-I	Max	Fin	62.01	335.02	9.28	50.14	5.403	2.00	TN
SER-I	Min	Fin	62.01	335.02	9.28	50.14	5.403	2.00	TN

Section Thickness = 36.00 (in)
Effective Depth = 33.50 (in)

Performance Ratio = Axial Resistance / Applied Axial Force

Phi Factor Code Descriptions
- TN - Tension controlled section
- TR - Transition section
- CM - Compression controlled section

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Notes:

A positive applied moment produces tensile stress on the backface reinforcement. A positive applied axial force produces a compressive stress on the entire cross section. Applied loads are assumed to be positive. The resistance is based on backface reinforcement only.

S-09-003
FOOTING FLEXURE

FLEXURAL STRENGTH

Location	Limit State (Controlling)	Load Case (Controlling)	Stage (Controlling)	Applied Moment (kip-ft)	Moment Resist (kip-ft)	Phi Factor	Perform Ratio	Area Prov (in^2)
Toe	EXT-II	Max	Fin	29.59T	180.15	0.900	6.089	1.580
Heel	EXT-II	Min	Fin	63.43H	187.26	0.900	2.952	1.580

Phi Factor Epsilon (cl) = 0.00200
Phi Factor Epsilon (tl) = 0.00500

Performance Ratio = Moment Resistance / Applied Moment

NOTE: A "T" following the applied moment indicates that the controlling moment is found in the Toe for the current location.
An "H" following the applied moment indicates that the controlling moment is found in the Heel for the current location.

S-09-003
MINIMUM REINFORCEMENT CHECK

STEM

Location	Dist from Struc Top (ft)	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Stem A	4.88	110.59	22.68+	0.15	0.34*	0.62	
Stem B	9.75	110.59	46.80+	0.31	0.34*	0.62	
Stem C	14.62	110.59	88.23+	0.59*	0.34	2.00	
Stem D	19.50	110.59+	155.07	0.75*	0.34	2.00	

FOOTING

Location	Cracking Moment M(cr) (kip-ft)	4/3*M(u) (kip-ft)	Rho Min Area (in^2)	Temp Shrink Area (in^2)	Area Prov/ Width (in^2)	Status Code
Toe	76.80	39.45+	0.33*	0.28	1.58	
Heel	76.80+	84.57	0.63*	0.28	1.58	

Status Code Descriptions
+ - Controlling moment for Rho Min Area calculation
* - Controlling minimum area of steel
A - Area provided smaller than required minimum area of steel

S-09-003
CRACK CONTROL - ANALYSIS

STEM

Location	Dist from Struc Top (ft)	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Controlling Moment (kip-ft)	Controlling Axial (kip)	Status Codes
Stem A	4.88	0.62	0.00	999.99	3.93	2.70	E
Stem B	9.75	0.62	0.00	999.99	12.17	4.89	E
Stem C	14.62	2.00	0.00	999.99	30.18	7.09	E
Stem D	19.50	2.00	0.00	999.99	62.01	9.28	E

FOOTING

Location	Area/ Width (in^2)	Actual Stress (ksi)	Allow Spacing (in)	Control Moment (kip-ft)	Status Codes
Toe	1.58	0.00	999.99	18.29T	E
Heel	1.58	0.00	999.99	28.61H	E

NOTE: A "T" following the moment indicates that the controlling
moment is found in the Toe for the current location.
An "H" following the moment indicates that the controlling
moment is found in the Heel for the current location.

Status Code Descriptions (Blank indicates an OK status)
- A - area smaller than that required for shrinkage/temperature control or rho min
- B - actual spacing is greater than maximum allowed
- C - actual stress calculation did not converge
- D - actual spacing is greater than allowable crack control spacing
- E - applied loads did not crack the cross section. Rebar tensile stress is set to zero.
- F - spacing is less than the minimum allowed
- G - Actual stress limited to 0.6*fy in allowable spacing calculation

S-09-003
REINFORCEMENT SUMMARY - ANALYSIS

FOOTING REINFORCEMENT DETAILS

FOOTING TOE (BOTTOM)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	12.0	45.0	S	0.334	1.580

FOOTING HEEL (TOP)

Bar Size	Bar Spacing (in)	Develop Length (in)	Actual Length (in)	Bar Type	Area Reqd (in^2)	Area Prov (in^2)
8	6.0	20.1	100.0	S	0.631	1.580

Bar Type Description
S - Straight Bar
H - Hooked Bar

STEM

Location	Dist from Struc Top (ft)	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Stem A	4.88	N/A @ 15.2	0.62	OK	OK	OK
Stem B	9.75	N/A @ 15.2	0.62	OK	OK	OK
Stem C	14.62	N/A @ 4.7	2.00	OK	OK	OK
Stem D	19.50	N/A @ 4.7	2.00	OK	OK	OK

FOOTING

Location	Bar @ Spacing (in)	Area/ Width (in^2)	Strength Status	Service Status	Shear Status
Toe	8 @ 6.00	1.58	OK	OK	OK
Heel	8 @ 6.00	1.58	OK	OK	OK

NOTE: No bar size is available because reinforcement was entered with the ARE and or SRA commands. Spacings are calculated based on the maximum bar diameters.

S-09-003
SHEAR RESULTS

STEM

Location	Dist from Struc Top (ft)	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Stem A	4.88	EXT-II	Max	Fin	2.79	45.11	16.142
Stem B	9.75	EXT-II	Max	Fin	4.84	45.11	9.327
Stem C	14.62	EXT-II	Max	Fin	8.13	43.72	5.380
Stem D	19.50	EXT-II	Max	Fin	12.66	43.72	3.453

Note: Shear resistance is based on a phi factor of 0.90

FOOTING

Location	Limit State	Load Case (Controlling)	Stage	Applied Shear (kip)	Shear Resist (kip)	Perform Ratio
Toe	EXT-II	Max	Fin	6.70	34.59	5.165
Heel	EXT-II	Min	Fin	10.82	35.95	3.324

Note: Shear resistance is based on a phi factor of 0.90

Performance Ratio = Shear Resistance / Applied Shear

S-09-003
SUMMARY - SPECIFICATION CHECKS

SPECIFICATION CHECK WARNINGS

For the loadings input by the user, the program did not encounter any specification check warnings for any of the applicable limit states. It should be noted that the program does not perform the specification checking corresponding to commands that have not been input by the user.

S-09-003
SUMMARY - SPECIFICATION CHECKS (cont.)

SPECIFICATION CHECK ERRORS

For the loadings input by the user, the program encountered one or more specification check errors. The following is a list of output table headings for which errors have occurred. It should be noted that the program does not perform specification checking corresponding to commands that have not been input by the user.

THE FOLLOWING TABLES HAVE SPEC CHECK ERRORS	PAGE NO.
FOOTING STABILITY	
SETTLEMENT SUMMARY	24

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Table of Contents

Backwall Design

BACKWALL DESIGN

Critical Backwall Height

Top of wall = 216.03733
Bottom of wall = 213.707
Height = 2.3303333 SAY ----> 2.33 ft

Loading

Lateral Earth Load (EH)

Force =	0.5 x	Height x	Unit Wt x	Height x	Ka
Force =	0.5 x	2.3 x	0.125 x	2.3 x	0.3
Force =	0.102 k/ft				

Resultant Height =	Height /	3
Resultant Height =	2.3 /	3
Resultant Height =	0.78 ft	

Earth Surcharge (ES) *Not required per MassDOT 3.3.1.3*

Seismic (EQ)

Force =	Force /	Abut. Length
Force =	112.14 k /	34.58 ft
Force =	3.243 k/ft	

Resultant Height =	Height /	2
Resultant Height =	2.3 /	2
Resultant Height =	1.17 ft	

Factored Shear

(EH) :	Force x	γ =	0.102 k	x 1.5 =	0.153 k		
(EQ) :	Force x	γ =	3.243 k	x 1.0 =	3.243 k	<-----------	Governs

Factored Moment

(EH) :	Force x	arm =	0.153 k	x 0.78 =	0.119 k-ft		
(EQ) :	Force x	arm =	3.243 k	x 1.17 =	3.779 k-ft	<-----------	Governs

Check Cracking
(Ref 2, 5.4.2.6)

fr =	0.24 x	λ x	SQRT (	f'c)
fr =	0.24 x	1.00 x	SQRT (	4)
fr =	0.48			

Ix =	(1/12) x	b x	h ^3
Ix =	0.083 x	12 x	18 ^3
Ix =	5832		

Sc =	Ix /	c
Sc =	5832 /	9
Sc =	648	

Mcr =	γ3 [	((γ1 x	fr) +	(γ2 x	fcpe) x	Sc -	Mdnc x	((Sc /	Snc) -	1)]
Mcr =	0.67 [	((1.6 x	0.48) +	(0)) x		648 -	0]			
Mcr =	333 in-k	=	27.8 k-ft							

BACKWALL DESIGN (CONT'D)

Check Cracking (Cont'd)

Mcr	Vs	1.33 Mu	
27.8 k-ft	>	5.0 k-ft	Mcr Governs

Bending Capacity

Resistance Factors (Per AASHTO 5.5.4.2)

For Tension Controlled Reinforced Concrete : 0.9
For Shear/Torsion : 0.9

For Rectangular Sections use EQS. 5.7.3.1.1-1 to 5.7.3.2.2-1

Member Thickness = 18 in
cover = 2 in
main reinf bar diam = 0.75 in
A bar = 0.442 in^2
spacing = 12 in
fy = 60 ksi

5.7.3.2.2-1 Mn = As fs (ds - a/2)

As = 0.442 in^2 / ft
fs = 60 ksi   check c / ds = 0.049 < 0.375 Tension Controlled
ds = 15.625 in
B1 c = a = 0.650
B1 = 0.85
As fs / 0.85 f'c B1 b = c = 0.764
f'c = 4 ksi
b = 12 in

Mn = 406 in-k
ØMn = 365 in-k = 30.4 k-ft >= 27.8 k-ft OK

Shear Capacity

Vc =	0.0316 x	β x	SQRT (	f'c)	x bv	x dv	<=	0.25 x	f'c x	bv x	dv
Vc =	0.0316 x	2 x	SQRT (	4)	x 18	x 15.30	<=	0.25 x	4 x	18 x	15.30
Vc =	34.81 k						<=	275 k			

ØVc = 31.33 k >= 3.24 k OK

Shear Friction for Load Transfer to Abutment

(Per AASHTO 5.8.4)

Minimum area of reinforcement per 5.8.4.4   FOR: #6 @ 12"

Factored Shear Resistance (Vri) = Ø x Vni (with Ø = 1 for Extreme event)
and
Vri >= Vui

(5.8.4.1-3)

Vni =	c x	Acv +	μ (	Avf x	fy +	Pc)	<=	MIN ((5.8.4.1-4) , (5.8.4.1-5))
Vni =	0 x	0 +	0.7 (	0.31 x	60 +	0)	<=	MIN ((5.8.4.1-4) , (5.8.4.1-5))
Vni =	13 k	GOVERNS						

(5.8.4.1-4)

Vni =	K1 x	f'c x	Acv
Vni =	0.2 x	4.0 x	216
Vni =	173 k		

13 k >= 3 k OK

(5.8.4.1-5)

Vni =	K2 x	Acv
Vni =	0.8 x	216
Vni =	173 k	

(5.8.4.1-6)

Acv =	bvi x	Lvi
Acv =	12 x	18
Acv =	216 k	

Curtain Wall Design

CURTAIN WALL DESIGN

The purpose of this calculation is to design the curtain wall in accordance with the provisions set forth in the MassDOT 2013 LRFD Bridge Manual and the 8th Edition of AASHTO LRFD Bridge Design Specificaitons.

References

1) MassDOT 2013 LRFD Bridge Manual
2) AASHTO LRFD Bridge Specifications, 8th Edition

CURTAIN WALL DESIGN

Critical Keeper Block Height

H: 4.289 ft

Loading

Seismic (EQ)

Force = 112.140 k
Force per Curtain Wall= 56.070 k
Resultant Height = Height / 2
Resultant Height = 4.29 / 2
Resultant Height = 2.14 ft

Factored Shear+Moment

SHEAR	(EQ) :	Force x	γ =	56.070 k	x 1.0 =	56.07 k	<-----------	Governs
MOMENT	(EQ) :	Force x	arm =	56.070 k	x 2.14 =	120.24 k-ft	<-----------	Governs

Check Cracking
(Ref 2, 5.7.3.3.2)

fr = 0.24 λ SQRT (f'c)
fr = 0.24 1 SQRT (4
fr = 0.48

Ix = (1/12) x b x h ^3 (Unit Design)
Ix = 0.0833333 48 20
Ix = 32000

Sc = Ix / c
Sc = 32000 10
Sc = 3200

Mcr = γ3 [(γ1 x fr) + (γ2 x fcpe) x Sc - Mdnc x ((Sc / Snc) - 1)]
Mcr = 0.67 1.6 0.48 0 3200 0
Mcr = 1647 in-k = 137.2 k-ft

Design For : Mu >= MIN(Mcr + 1.33 Mu)
Design For : 120.24 k-ft >= MIN(137.2 k-ft <= 159.9 k-ft) Mcr Governs
Design For : 137.22 k-ft

Bending Capacity

For Tension Controlled Reinforced Concrete : 0.9
For Shear/Torsion : 0.9

For Rectangular Sections use EQS. 5.7.3.1.1-1 to 5.7.3.2.2-1

Member Thickness = 20 in
cover = 2 in
main reinf bar diam = 0.75 in
A bar = 0.440 in^2
spacing = 9 in
fy = 60 ksi

5.7.3.2.2-1 Mn = As fs (ds - a/2)

As = 2.35 in^2
fs = 60 ksi check c / ds = 0.0575883 < 0.375 Tension Controlled
ds = 17.625 in
B1 c = a = 0.8627451
B1 = 0.85
As fs / 0.85 f'c B1 b = c = 1.0149942
f'c = 4 ksi
b = 48 in

Mn = 2421 in-k
ØMn = 2179 in-k = 181.6 k-ft >= 137.2 k-ft OK

CURTAIN WALL DESIGN (CONT'D)

Shear Capacity (For #5 stirrrups @ 8" spacing)

Vc =	0.0316 x	β x	SQRT (	f'c)	x bv	x dv
Vc =	0.0316 x	2 x	SQRT (	4)	x 48	x 17.19
Vc =	104.32 k					

Vs =	(Av x	fy x	dv)	/ s
Vs =	(0.310 x	60 x	x 17.19)	/ 8
Vs =	39.98 k			

Vn =	Vc +	Vs	<=	0.25 x	f'c x	bv x	dv
Vn =	104.32 k +	39.98 k	<=	0.25 x	4 x	48 x	17.19
Vn =	144.29 k		<=	825 k			

Φ Vn =	129.86 k	>=	56.07 k	OK

Shear Friction for Load Transfer to Abutment
(Per AASHTO 5.8.4)

Minimum area of reinforcement per 5.8.4.4 FOR: #5 @ 6" STIRRUPS

Factored Shear Resistance (Vri) = Ø x Vni (with Ø = 1 for Extreme event)
and
Vri >= Vui

(5.8.4.1-3)

Vni =	c x	Acv +	μ (	Avf x	fy +	Pc)	<=	MIN ((5.8.4.1-4) , (5.8.4.1-5))
Vni =	0	0	0.7	3.1	60	0		
Vni =	130 k	GOVERNS						

(5.8.4.1-4)

Vni =	K1 x	f'c x	Acv
Vni =	0.2	4	960
Vni =	768 k		

(5.8.4.1-5)

Vni =	K2 x	Acv
Vni =	0.8	960
Vni =	768 k	

(5.8.4.1-6)

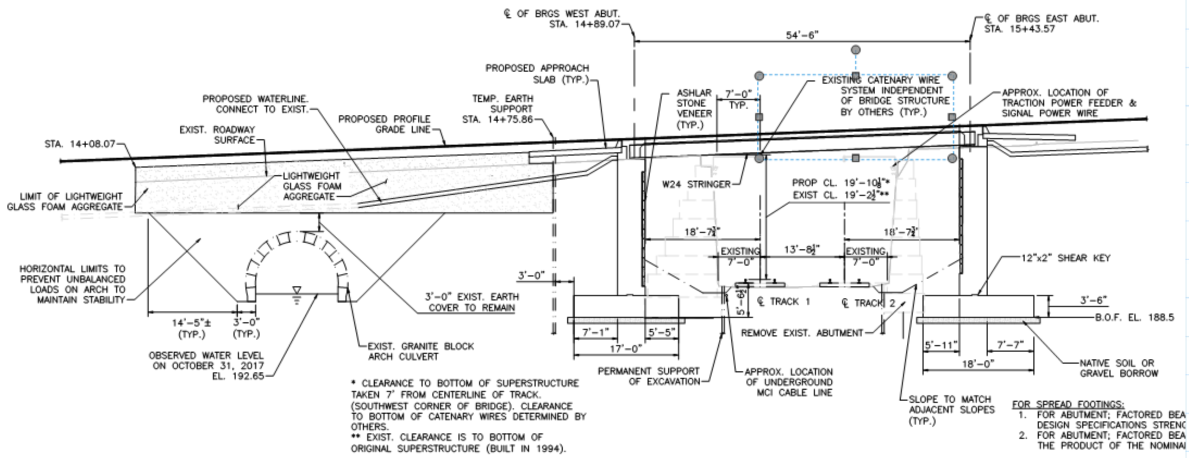
Acv =	bvi x	Lvi
Acv =	48	20
Acv =	960 k	

Vri =	Φ x	Vni		
Vri =	1.00 x	130 k		
Vri =	130 k	>=	56 k	OK

MISCELLANEOUS DESIGN

Pressure Reduction at Stone Arch (S-09-021)

STONE ARCH PRESSURE CHECK



1. Existing Conditions

Top of Arch Elevation $EL_{ARCH} := 202.34\ ft$

Top of Arch Elevation + Buffer $EL_{ARCH} + 3\ ft = 205.34\ ft$

Profile Grade above Arch (Existing) $EL_{PROF.EX} := 212.12\ ft$

Existing Fill Height $h_{EX} := EL_{PROF.EX} - EL_{ARCH} = 9.78\ ft$

Existing Soil Properties (Below)

Parameter	Values for:	
	Existing Fill	Glacial Deposits
Angle of Internal Friction, ϕ	30°	34°
Unit Weight, γ (pounds per cubic foot)	125	125
Buoyant Unit Weight, γ' (pounds per cubic foot)	62.6	62.6
At-Rest Earth Pressure Coefficient, K_o	0.50	0.44
Active Earth Pressure Coefficient, K_a	0.33	0.28
Passive Earth Pressure Coefficient, K_p	3.00	3.50

Existing Soil Unit Weight $\gamma_{SOIL} := 125\ \frac{lb}{ft^3}$

Existing Pressure on Arch $P_{ARCH.EX} := \gamma_{SOIL} \cdot h_{EX} = 1222.5\ \frac{lb}{ft^2}$

2. Proposed Condition

Profile Grade above Arch (Proposed) $EL_{PROF.PR} := 215.31\ ft$

Proposed Fill Height $h_{PR} := EL_{PROF.PR} - EL_{ARCH} = 12.97\ ft$

Lightweight Aggregate Properties (from Geotech Report)

	Existing Lightweight Aggregate Fill	Existing Sand Backfill	New Gravel Borrow Backfill	New Foamed Glass Aggregate
Unit Weight of soil above the water table, pcf	64	125	130	20
Soil Angle of Internal Friction, ϕ	38	32	36	40
Coefficient of Friction for Soil Against Formed Concrete (tan δ)	0.55	0.39	0.55	0.55
Coefficient of Friction for Soil Against Stone Masonry (tan δ)	0.55	0.39	0.55	0.55
Coefficient of Active Earth Pressure with level backfill, Ka	0.30*	0.36*	0.26	0.22
Coefficient of At-Rest Earth Pressure with level backfill, Ko	0.38	0.47	0.41	0.36

Lightweight Agg. Unit Weight $\gamma_{LA} := 20\ \frac{lb}{ft^3}$

Anticipated Pressure @ Arch $P_{ARCH.PR1} := \gamma_{LA} \cdot h_{PR} = 259.4\ \frac{lb}{ft^2}$

Increase in roadway grade does not impact arch, determine excavation limit...

Excavation limit at Arch $EL_{EXC} := 206\ ft$

Anticipated Pressure @ Arch

$$P_{ARCH.PR2} := \left(EL_{PROF.PR} - EL_{EXC}\right) \cdot \gamma_{LA} + \left(EL_{EXC} - EL_{ARCH}\right) \cdot \gamma_{SOIL} = 643.7\ \frac{lb}{ft^2}$$

Excavation Limit of 206 lowers pressure at arch (Compared to 1225 psf in existing condition)

Bottom of Arch $EL_{BOA} := 190.99\ ft$

Difference in height between FGA and Bottom of Arch $\Delta H := EL_{EXC} - EL_{BOA} = 15.01\ ft$

Proposed Station at inside face of Arch $STA_{ARCH} := 1426.04\ ft$

Provide 3 foot buffer (away from bridge) $STA_{ARCH} := 1426.04\ ft - 3\ ft = 1423.04\ ft$

Provide 1:1 slope off buffer STA $STA_{FGA} := STA_{ARCH} - \Delta H = 1408.03\ ft$

Non-Standard Utility Beam Design

Design of beam used to carry 18" drain pipe in sidewalk utility bay (between G5 and G6).
Diaphrams placed at span quarter points. Use W shape with penetration to carry pipe & casing.

Utility Load $W_{UTIL} := 250 \ \frac{lb}{ft}$

Bridge Span $S := 54.5 \ ft$

1. Carrying Beam Information

Size Designation W21x57

Beam Area $A_0 := 16.7 \ in^2$

Beam Depth $d := 21.1 \ in$

Flange Width $b_f := 21.1 \ in$

Web Thickness $t_w := 0.405 \ in$

Flange Thickness $t_f := 0.650 \ in$

Yield Strength $F_y := 50000 \ \frac{lb}{in^2}$

Beam Selfweight $W_{BEAM} := 57 \ \frac{lb}{ft}$

Plastic Section Modulus $Z := 129 \ in^3$

2. Load Application

Diaphrams placed at span quarter points.

Utility Load, Total $W_{UTIL.TOTAL} := W_{UTIL} \cdot S = \left(1.363 \cdot 10^4\right) \ lb$

Utility Load, Tributary $W_{UTIL.Trib} := W_{UTIL} \cdot \frac{S}{4} = \left(3.406 \cdot 10^3\right) \ lb$

Girder Spacing $S_g := 6 \ ft$

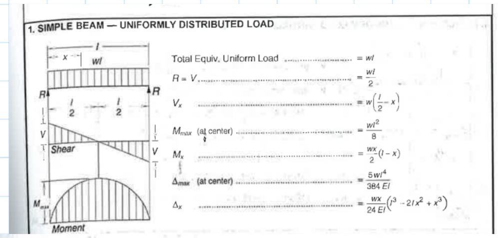
Utility offset from BL $x := 15.13 \ ft$

Distance between Crown and G5 $x_5 := 10.875 \ ft$

Distance between Crown and G6 $x_6 := x_5 + S_g = 16.875 \ ft$

Moment due to beam self weight

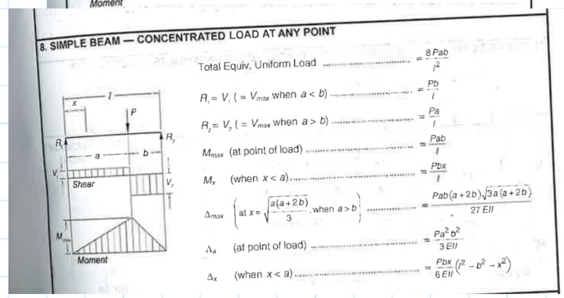
$$M_{SW} := \frac{W_{BEAM} \cdot {S_g}^2}{8} = 256.5\ ft \cdot lb$$



Moment due to Utility Load

$$a := x_6 - x = 1.745\ ft$$

$$b := S_g - a = 4.255\ ft$$



$$M_{UTIL} := \frac{W_{UTIL.Trib} \cdot a \cdot b}{S_g} = \left(4.215 \cdot 10^3\right)\ ft \cdot lb$$

$$M_{COMB} := M_{SW} + M_{UTIL} = \left(4.472 \cdot 10^3\right)\ ft \cdot lb$$

$$LF_{DL} := 1.2$$

$$M_U := LF_{DL} \cdot M_{COMB} = \left(5.366 \cdot 10^3\right)\ ft \cdot lb$$

3. Capacity Check

Use of vertical stiffeners designates beam as "unreinforced"

a. Steel beams

The nominal capacity of a steel member with a web opening in pure bending, M_m, is expressed in terms of the capacity of the member without an opening, M_p.

Unreinforced openings

For members with unreinforced openings,

$$M_m = M_p\left[1 - \frac{\Delta A_s\left(\frac{h_o}{4} + e\right)}{Z}\right] \qquad (3\text{–}6)$$

in which

M_p = $F_y Z$
ΔA_s = $h_o t_w$
h_o = depth of opening
t_w = thickness of web
e = eccentricity of opening = $|e|$
Z = plastic section modulus of member without opening
F_y = yield strength of steel

Eccentricity, measured at begin bridge

$EL_{BB5} := 213.832\ ft$ at beam seat

$EL_{BB6} := 213.707\ ft$ at beam seat

bearing height $h_b := 2.5\ in$

beam height $h_{W24} := 24.3\ in$

$$EL_{AVG} := \frac{\left(EL_{BB6} + EL_{BB5}\right)}{2} + h_b + \frac{h_{W24}}{2} = 214.99\ ft$$

$$EL_{INV.EAST} := 215.27\ ft$$

$$e := EL_{INV.EAST} - EL_{AVG} = 0.28\ ft$$

depth of opening $h_0 := 18\ in$

$$M_p := F_y \cdot Z = \left(5.375 \cdot 10^5\right)\ ft \cdot lb$$

$$M_n := M_p \cdot \left(1 - \frac{\left(h_0 \cdot t_w\right)\left(\frac{h_0}{4} + e\right)}{Z}\right) = \left(2.989 \cdot 10^5\right)\ ft \cdot lb$$

$$\phi_b := 0.90$$

$$\phi_b \cdot M_n = \left(2.69 \cdot 10^5\right)\ ft \cdot lb$$

Moment Slab Design

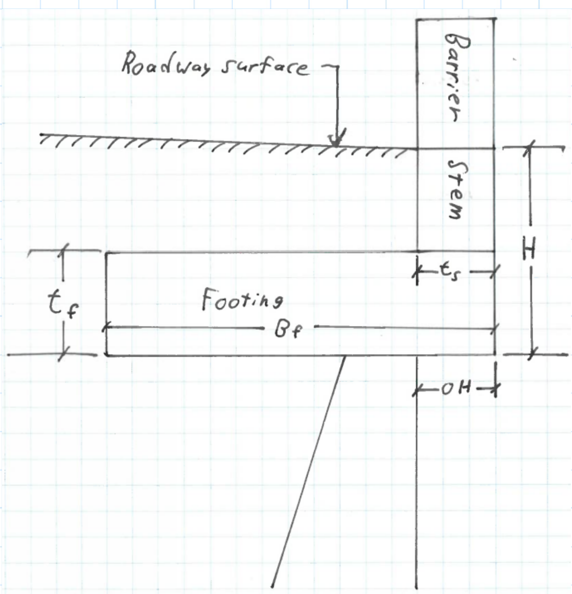
1. Description

The purpose of this calculation is to design a moment slab crash barrier as part of the subject project. The moment slab will be constructed directly above an existing wall, and will be designed to independently resist vehicle impact loading in accordance with the AASHTO LRFR Bridge Design Specifications.

2. Project variables

Design strip width	$b := 1\ ft$	
Concrete compressive strength	$f'_c := 4\ ksi$	(4000 psi, 1-1/2", 565 Cement Concrete)
Concrete unit weight	$\gamma_c := 150\ pcf$	
Reinforcement yield strength	$F_y := 60\ ksi$	
Soil unit weight	$\gamma_f := 130\ pcf$	
Sliding friction factor	$\mu := 0.5$	
Factored bearing resistance, Strength	$\phi\sigma_{R\_ST} := 6.5\ ksf$	
Factored bearing resistance, Extreme Event	$\phi\sigma_{R\_EE} := 14.4\ ksf$	
Concrete deisnty factor	$\lambda := 1.0$	(LRFD 5.4.2.8)

3. Geometry



Height	$H := 4\ ft$
Stem thickness	$t_s := 17\ in$
Footing width	$B_f := 6.5\ ft$
Footing thickness	$t_f := 2\ ft$
Overhang	$OH := 17\ in$

4. Loading

A. Lateral earth (EH)

Active lateral earth pressure coefficient

$$k_a = \frac{\sin(\theta + \phi'_f)^2}{\Gamma \cdot \left(\sin(\theta)^2 \cdot \sin(\theta + \beta)\right)}$$

(LRFD Eq. 3.11.5.3-1)

where $\Gamma = \left(1+\frac{\sin(\phi'_f+\delta)\cdot \sin(\phi'_f-\beta)}{\sin(\theta-\delta)\cdot \sin(\theta+\beta)}\right)^2$

Friction angle between fill and wall $\delta := 24\ deg$ (LRFD Table C3.11.5.3-1)

Angle of fill to the horizontal $\beta := 0\ deg$

Angle of back face of wall to the horizontal $\theta := 90\ deg$

Effective angle of internal friction $\phi'_f := 36\ deg$

$$\Gamma := \left(1+\frac{\sin(\phi'_f+\delta)\cdot \sin(\phi'_f-\beta)}{\sin(\theta-\delta)\cdot \sin(\theta+\beta)}\right)^2 = 2.425$$

$$k_a := \frac{\sin(\theta+\phi'_f)^2}{\Gamma\cdot\left(\sin(\theta)^2\cdot \sin(\theta+\beta)\right)} = 0.27$$

Lateral earth pressure @ bottom of footing $p := k_a \cdot \gamma_f \cdot H = 0.14\ ksf$

Lateral earth force $EH := \frac{p\cdot H^2}{2} = 1.123\ kip$

Height of lateral force above bottom of footing $h_{EH} := \frac{H}{3} = 1.333\ ft$

B. Horizontal live load surcharge (LS)

Equivalent height of soil $h_{eq} := 5\ ft$ (LRFD Table 3.11.6.4-2)

Constant horizontal earth pressure $\Delta_p := k_a \cdot \gamma_f \cdot h_{eq} = 0.175\ ksf$ (LRFD Eq. 3.11.6.4-1)

Lateral surcharge force $LS := \Delta_p \cdot H \cdot b = 0.702\ kip$

Height of lateral force above bottom of footing $h_{LS} := \frac{H}{2} = 2\ ft$

C. Vehicular Collision (CT)

Vehicular collision force $CT := 10\ kip$ (MassDOT LRFD Bridge Manual 3.3.2.4)

Height of collision force above bottom of footing $h_{CT} := H + 2\ ft + 8\ in = 6.667\ ft$ (Top of barrier)

Triburary width for stability $W_{stab} := 5\ ft + 2 \cdot h_{CT} = 18.333\ ft$

Vehicular collision force at bottom of stem, stability $CT_{stab} := \frac{CT}{W_{stab}} \cdot b = 0.545\ kip$

Triburary width for stem design $W_{stem} := 5\ ft = 5\ ft$

Vehicular collision force at bottom of stem, stem design $CT_{stem} := \frac{CT}{W_{stem}} \cdot b = 2\ kip$

D. Self weight (DC)

Footing $W_f := B_f \cdot t_f \cdot \gamma_c \cdot b = 1.95\ kip$

Footing CG from pivot point $e_f := \frac{B_f}{2} - OH = 1.833\ ft$

Stem $W_s := \left(H - t_f\right) \cdot t_s \cdot \gamma_c \cdot b = 0.425\ kip$

Stem CG from pivot point $e_s := -\frac{t_s}{2} = -0.708\ ft$

Barrier + handrail $W_b := \left(459\ plf + 30\ plf\right) \cdot b = 489\ lbf$

Barrier +handrail CG from pivot point $e_b := -\frac{t_s}{2} = -0.708\ ft$

E. Soil over heel (EV)

Weight of soil $W_{EV} := \left(H - t_f\right) \cdot \left(B_f - t_s\right) \cdot \gamma_f \cdot b = 1.322\ kip$

Soil C.G. from pivot point $e_{EV} := \frac{B_f - t_s}{2} = 2.542\ ft$

F. Live load surcharge over heel (LS)

Weight of surcharge $W_{LS} := h_{eq} \cdot \left(B_f - t_s\right) \cdot \gamma_f \cdot b = 3.304\ kip$

Surcharge C.G. from pivot point $e_{LS} := \frac{B_f - t_s}{2} = 2.542\ ft$

5. Load and resistance factors

A. Strength I load facors (LRFD Table 3.4.1-1)

Dead load, sliding and eccentricity $\gamma_{DC\_ST1\_min} := 0.90$

Dead load, bearing $\gamma_{DC\_ST1\_max} := 1.25$

Horizontal earth pressure $\gamma_{EH\_ST1} := 1.50$

Vertical earth pressure, sliding and eccentricity $\gamma_{EV\_ST1\_min} := 1.00$

Vertical earth pressure, bearing $\gamma_{EV\_ST1\_max} := 1.35$

Live load surcharge, sliding and eccentricity $\gamma_{LS\_ST1\_min} := 0$

Live load surcharge, sliding and eccentricity $\gamma_{LS\_ST1\_max} := 1.75$

Vehicular collision $\gamma_{CT\_ST1} := 0.00$

B. Extreme Event II load factors (LRFD Table 3.4.1-1)

Dead load $\gamma_{DC\_EE2} := 1.00$

Horizontal earth pressure $\gamma_{EH\_EE2} := 1.00$

Vertical earth pressure $\gamma_{EV\_EE2} := 1.00$

Live load surcharge $\gamma_{LS\_EE2} := 0.50$

Vehicular collision $\gamma_{CT\_EE2} := 1.00$

C. Resistance factors

Bearing resistance $\phi_b := 0.55$ (LRFD Table 11.5.7-1)

Sliding resistance $\phi_s := 1.00$ (LRFD Table 11.5.7-1)

Flexural resistance of concrete $\phi_f := 0.9$ (LRFD 5.5.4.2)

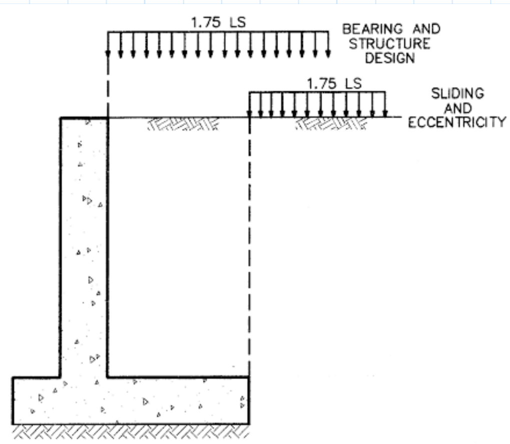
Shear resistance of concrete $\phi_v := 0.9$ (LRFD 5.5.4.2)

6. Strength I

A. Sliding and eccentricity

Vertical loads

* Do not apply LS over heel for sliding and eccentricity



(a) CONVENTIONAL STRUCTURE

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Footing	DC	0.90	1.950	1.755	1.833	3.218
Stem	DC	0.90	0.425	0.383	-0.708	-0.271
Barrier + handrail	DC	0.90	0.489	0.440	-0.708	-0.312
Soil over heel	EV	1.00	1.322	1.322	1.833	2.423
LL surch. over heel	LS	0.00	3.304	0.000	2.542	0.000
Total			7.49	3.899		5.058

Factored vertical force $V_{u\_se}=3.899\ kip$

Resisting moment $M_{R\_se}=5.058\ ft \cdot kip$

Horizontal loads

3.11.6.4—Live Load Surcharge (*LS*)

A live load surcharge shall be applied where vehicular load is expected to act on the surface of the backfill within a distance equal to one-half the wall height behind the back face of the wall. If the surcharge is for a highway, the

$B_f-t_s=5.083\ ft\ >\ \dfrac{H}{2}=2\ ft$, therefore

LS does not apply for sliding and eccentricity

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Lateral earth	EH	1.50	1.239	1.858	1.333	2.478
Horizontal LS	LS	0.00	0.774	0.000	2.000	0.000
Vehicular collision, stability	CT	0.00	0.545	0.000	6.667	0.000
Total			2.56	1.858		2.478

Factored sliding force $H_{u\_se}=?\ kip$

Overturning moment $M_{O\_se}=?\ ft \cdot kip$

Sliding check

Factored sliding resistance $\phi H_R:=\phi_s \cdot V_{u\_se} \cdot \mu=1.95\ kip\ >\ H_{u\_se}=?\ kip$ *Sliding*

$Sliding\_check\_ST1=?$

Eccentricity

Eccentricity $e:=\dfrac{M_{R\_se}-M_{O\_se}}{V_{u\_se}}=?$

Middle 2/3 $e_{lim}:=\dfrac{B_f-OH}{3}=1.694\ ft\ >\ e=?$ *E*

$\boxed{Ecc\_check\_ST1} = ?$

B. Bearing

Vertical loads

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Footing	DC	1.25	1.950	2.438	1.833	4.469
Stem	DC	1.25	0.425	0.531	-0.708	-0.376
Barrier + handrail	DC	1.25	0.489	0.611	-0.708	-0.433
Soil over heel	EV	1.35	1.322	1.784	1.833	3.271
LL surch. over heel	LS	1.75	3.304	5.782	2.542	14.697
Total			7.49	11.147		21.627

Factored vertical force $V_{u\_brg} = 11.147\ kip$

Resisting moment $M_{R\_brg} = 21.627\ ft \cdot kip$

Horizontal loads

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Lateral earth	EH	1.50	1.239	1.858	1.333	2.478
Horizontal LS	LS	1.75	0.774	1.355	2.000	2.710
Vehicular collision, stability	CT	0.00	0.545	0.000	6.667	0.000
Total			2.56	3.214		5.188

Factored sliding force $\boxed{H_{u\_brg}} = ?\ kip$

Overturning moment $\boxed{M_{O\_brg}} = ?\ ft \cdot kip$

Bearing check

Eccentricity for bearing $e := \dfrac{\boxed{M_{R\_brg}} - M_{O\_brg}}{V_{u\_brg}} = ?$

Max bearing pressure $\sigma := \dfrac{\boxed{V_{u\_brg}}}{\left(\left(B_f - OH\right) - 2 \cdot e\right) \cdot b} = ?\ ksf < \phi\sigma_{R\_ST} = 6.5\ ksf$

$\boxed{Brg\_check\_ST1} = ?$

C. Force effects

i. Stem

$$M_{u\_ST1\_stem} := \gamma_{EH\_ST1} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot \frac{(h_{EH} - t_f)}{3} \cdot b + \gamma_{EH\_ST1} \cdot \frac{\Delta_p \cdot (H - t_f)^2}{2} \cdot b + \gamma_{CT\_ST1} \cdot CT_{stem} \cdot (h_{CT} - t_f) = 0.503 \ ft \cdot kip$$

$$V_{u\_ST1\_stem} := \gamma_{EH\_ST1} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot b + \gamma_{EH\_ST1} \cdot \Delta_p \cdot (H - t_f) \cdot b + \gamma_{CT\_ST1} \cdot CT_{stem} = 0.632 \ kip$$

ii. Heel

$$M_{u\_ST1\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f \cdot \frac{(B_f - t_s)}{2} + \gamma_{EV\_ST1\_max} \cdot W_{EV} \cdot \frac{(B_f - t_s)}{2} + \gamma_{LS\_ST1\_max} \cdot W_{LS} \cdot \frac{(B_f - t_s)}{2} = 25.427 \ ft \cdot kip$$

$$V_{u\_ST1\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f + \gamma_{EV\_ST1\_max} \cdot W_{EV} + \gamma_{LS\_ST1\_max} \cdot W_{LS} = 10.004 \ kip$$

7. Extreme Event II

A. Sliding and eccentricity

Vertical loads

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Footing	DC	1.00	1.950	1.950	1.833	3.575
Stem	DC	1.00	0.425	0.425	-0.708	-0.301
Barrier + handrail	DC	1.00	0.489	0.489	-0.708	-0.346
Soil over heel	EV	1.00	1.950	1.950	1.833	3.575
LL surch. over heel	LS	0.00	3.304	0.000	2.542	0.000
Total			8.12	4.814		6.503

Factored vertical force $V_{u\_se} = 4.814 \ kip$

Resisting moment $M_{R\_se} = 6.503 \ ft \cdot kip$

Horizontal loads

For checking local stability, in addition to all other applicable dead and live load effects, the vehicular collision load shall be distributed down to the footing at a 1:1 slope and shall have a load factor of 1.0. The design horizontal earth pressure from the retained soil need not be considered (γ_p = 0) to act concurrently with this load, because the wall is considered to pull away from the backfill in the instant the collision occurs and the soil does not have the time to respond before the collision is removed.

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Lateral earth	EH	0.00	1.239	0.000	1.333	0.000
Horizontal LS	LS	0.00	0.774	0.000	2.000	0.000
Vehicular collision,	CT	1.00	0.545	0.545	6.667	3.636
stability						
Total			2.56	0.545		3.636

Factored sliding force $H_{u\_se} = ?\ kip$

Overturning moment $M_{O\_se} = ?\ ft \cdot kip$

Sliding check

Factored sliding resistance $\phi H_R := \phi_s \cdot V_{u\_se} \cdot \mu = 2.407\ kip > H_{u\_se} = ?\ kip$ Sliding

$Sliding\_check\_EE2 = ?$

Eccentricity

Eccentricity $e := \dfrac{M_{R\_se} - M_{O\_se}}{V_{u\_se}} = ?$

Middle 2/3 $e_{lim} := \dfrac{B_f}{3} = 2.167\ ft > e = ?$ E

B. Bearing

$Ecc\_check\_EE2 = ?$

Vertical loads

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Footing	DC	1.00	1.950	1.950	1.833	3.575
Stem	DC	1.00	0.425	0.425	-0.708	-0.301
Barrier + handrail	DC	1.00	0.489	0.489	-0.708	-0.346
Soil over heel	EV	1.00	1.950	1.950	1.833	3.575
LL surch. over heel	LS	0.50	3.304	1.652	2.542	4.199
Total			8.12	6.466		10.702

Factored vertical force $V_{u\_brg} = 6.466\ kip$

Resisting moment $M_{R\_brg} = 10.702\ ft \cdot kip$

Horizontal loads

Load	Load case	Load factor	Force	Fact. force	Eccentricity	Moment
			kip	kip	ft	ft-kip
Lateral earth	EH	0.00	1.239	0.000	1.333	0.000
Horizontal LS	LS	0.50	0.774	0.387	2.000	0.774
Vehicular collision, stability	CT	1.00	0.545	0.545	6.667	3.636
Total			2.56	0.933		4.411

Factored sliding force $H_{u\_brg} = ?\ kip$

Overturning moment $M_{O\_brg} = ?\ ft \cdot kip$

Bearing check

Eccentricity for bearing $e := \dfrac{M_{R\_brg} - M_{O\_brg}}{V_{u\_brg}} = ?$

Max bearing pressure $\sigma := \dfrac{V_{u\_brg}}{(B_f - 2 \cdot e) \cdot b} = ?\ ksf < \phi\sigma_{R\_EE} = 14.4\ ksf$

$Brg\_check\_EE2 = ?$

C. Force effects

i. Stem

$$M_{u\_EE2\_stem} := \gamma_{EH\_EE2} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot \frac{(h_{EH} - t_f)}{3} \cdot b + \gamma_{EH\_EE2} \cdot \frac{\Delta_p \cdot (H - t_f)^2}{2} \cdot b + \gamma_{CT\_EE2} \cdot CT_{stem} \cdot (h_{CT} - t_f) = 9.669\ ft \cdot kip$$

$$V_{u\_EE2\_stem} := \gamma_{EH\_EE2} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot b + \gamma_{EH\_EE2} \cdot \Delta_p \cdot (H - t_f) \cdot b + \gamma_{CT\_EE2} \cdot CT_{stem} = 2.421\ kip$$

ii. Heel

$$M_{u\_EE2\_heel} := \gamma_{DC\_EE2} \cdot W_f \cdot \frac{(B_f - t_s)}{2} + \gamma_{EV\_EE2} \cdot W_{EV} \cdot \frac{(B_f - t_s)}{2} + \gamma_{LS\_EE2} \cdot W_{LS} \cdot \frac{(B_f - t_s)}{2} = 12.515\ ft \cdot kip$$

$$V_{u\_EE2\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f + \gamma_{EV\_ST1\_max} \cdot W_{EV} + \gamma_{LS\_ST1\_max} \cdot W_{LS} = 10.004\ kip$$

8. Structural design

A. Stem

i. Flexural reinforcement

Factored moment $M_{u\_fact} := \max\left(M_{u\_ST1\_stem}, M_{u\_EE2\_stem}\right) = 9.669\ ft \cdot kip$

Section modulus $S_x := \dfrac{b \cdot t_s^{\,2}}{6} = 578\ in^3$

Modulus of rupture $f_r := 0.24 \cdot \lambda \cdot \sqrt{\dfrac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$

Flexural cracking variability factor $\gamma_1 := 1.6$ (LRFD 5.6.3.3)

Yield/ultimate ratio $\gamma_3 := 0.67$ (LRFD 5.6.3.3)

Cracking moment $M_{cr} := \gamma_3 \cdot \gamma_1 \cdot f_r \cdot S_x = 24.785\ ft \cdot kip$ (LRFD 5.6.3.3)

Design moment $M_{u\_stem} := \max\left(M_{u\_fact}, min\left(1.33 \cdot M_{u\_fact}, M_{cr}\right)\right) = 12.859\ ft \cdot kip$ (LRFD 5.6.3.3)

Assumed bar diameter (#5) $d_b := 0.625\ in$

Cover $c := 2\ in$

Depth to reinforcement $d := t_s - c - \dfrac{d_b}{2} = 14.688\ in$

$$A_{s1}(a) := \frac{M_{u\_stem}}{\phi_f \cdot F_y \cdot \left(d - \frac{a}{2}\right)}$$

$$A_{s2}(a) := \frac{0.85 \cdot a \cdot f'_c \cdot b}{F_y}$$

Guess Values

$a := 1\ in$

$A_s := 0.75\ in^2$

Constraints

$A_{s1}(a) = A_{s2}(a)$

$A_s = A_{s1}(a)$

Solver

$A_{s\_req} := \boxed{\mathbf{find}(\mathbf{A_s})} = ?\ in^2$

Required area of steel $\boxed{A_{s\_req}} = ?\ in^2$ Try #5 @ 12" o.c.

$A_s := 0.31\ in^2 \cdot \dfrac{1\ ft}{12\ in} = 0.31\ in^2 > \boxed{A_{s\_req}} = ?\ in^2$

$\boxed{Reinf\_check\_stem} = ?$ **USE #5 @ 12" o.c.**

ii. Temperature and shrinkage reinforcement

Temperature and shrinkage area required $A_{s\_req} := \dfrac{1.30 \cdot \dfrac{b}{in} \cdot \dfrac{t_s}{in}}{2 \cdot \left(\dfrac{b}{in} + \dfrac{t_s}{in}\right) \cdot \dfrac{F_y}{ksi}} \cdot in^2 = 0.076\ in^2$

Except that $0.11 \le A_{s\_req} \le 0.60$ Try #4 @ 12" o.c.

$A_s := 0.20\ in^2 \cdot \dfrac{12\ in}{1\ ft} = 0.2\ in^2 > A_{s\_req} = 0.076\ in^2$

$\boxed{Reinf\_check\_stem\_t\&s} = ?$ **USE #4 @ 12" o.c.**

ii. Shear

Design shear $V_u := \max\left(V_{u\_ST1\_stem}, V_{u\_EE2\_stem}\right) = 2.421\ kip$

Effective depth $d_v := d = 14.688\ in$

Effective width $b_v := b = 1\ ft$

Concrete shear capacity $V_c = 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\dfrac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v$ (LRFD Eq. 5.7.3.3-3)

$\beta := 2.0$ (LRFD 5.7.3.4.1)

$V_c := 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v = 22.278\ kip$

Factored shear resistance $\phi V_c := \phi_v \cdot V_c = 20.05\ kip$ > $V_u = 2.421\ kip$

$Shear\_check\_stem = ?$

B. Heel

i. Flexural reinforcement

Factored moment $M_{u\_fact} := \max\left(M_{u\_ST1\_heel}, M_{u\_EE2\_heel}\right) = 25.427\ ft \cdot kip$

Section modulus $S_x := \frac{b \cdot t_f^2}{6} = 1152\ in^3$

Modulus of rupture $f_r := 0.24 \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$

Flexural cracking variability factor $\gamma_1 := 1.6$ (LRFD 5.6.3.3)

Yield/ultimate ratio $\gamma_3 := 0.67$ (LRFD 5.6.3.3)

Cracking moment $M_{cr} := \gamma_3 \cdot \gamma_1 \cdot f_r \cdot S_x = 49.398\ ft \cdot kip$ (LRFD 5.6.3.3)

Design moment $M_{u\_stem} := \max\left(M_{u\_fact}, min\left(1.33 \cdot M_{u\_fact}, M_{cr}\right)\right) = 33.818\ ft \cdot kip$ (LRFD 5.6.3.3)

Assumed bar diameter (#5) $d_b := 0.625\ in$

Cover $c := 2\ in$

Depth to reinforcement $d := t_f - c - \frac{d_b}{2} = 21.688\ in$

$A_{s1}(a) := \frac{M_{u\_stem}}{\phi_f \cdot F_y \cdot \left(d - \frac{a}{2}\right)}$

$A_{s2}(a) := \frac{0.85 \cdot a \cdot f'_c \cdot b}{F_y}$

Guess Values

$a := 1\ in$

$A_s := 0.75\ in^2$

Constraints

$A_{s1}(a) = A_{s2}(a)$

$A_s = A_{s1}(a)$

Solver

$A_{s\_req} := \mathbf{find}\left(A_s\right) = ?\ in^2$

Required area of steel $\boxed{A_{s\_req}} = ?\ in^2$ Try #7@ 12" o.c.

$$A_s := 0.60\ in^2 \cdot \frac{1\ ft}{12\ in} = 0.6\ in^2 > \boxed{A_{s\_req}} = ?\ in^2$$

$\boxed{Reinf\_check\_heel} = ?$ **USE #7 @ 12" o.c.**

ii. Temperature and shrinkage reinforcement

Temperature and shrinkage area required

$$A_{s\_req} := \frac{1.30 \cdot \frac{b}{in} \cdot \frac{t_f}{in}}{2 \cdot \left(\frac{b}{in} + \frac{t_f}{in}\right) \cdot \frac{F_y}{ksi}} \cdot in^2 = 0.087\ in^2$$

Except that $0.11 \le A_{s\_req} \le 0.60$ Try #4 @ 12" o.c.

$$A_s := 0.20\ in^2 \cdot \frac{12\ in}{1\ ft} = 0.2\ in^2 > A_{s\_req} = 0.087\ in^2$$

$\boxed{Reinf\_check\_heel\_t\&s} = ?$ **USE #4 @ 12" o.c.**

ii. Shear

Design shear $V_u := \max\left(V_{u\_ST1\_heel}, V_{u\_EE2\_heel}\right) = 10.004\ kip$

Effective depth $d_v := d = 21.688\ in$

Effective width $b_v := b = 1\ ft$

Concrete shear capacity $V_c = 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v$ (LRFD Eq. 5.7.3.3-3)

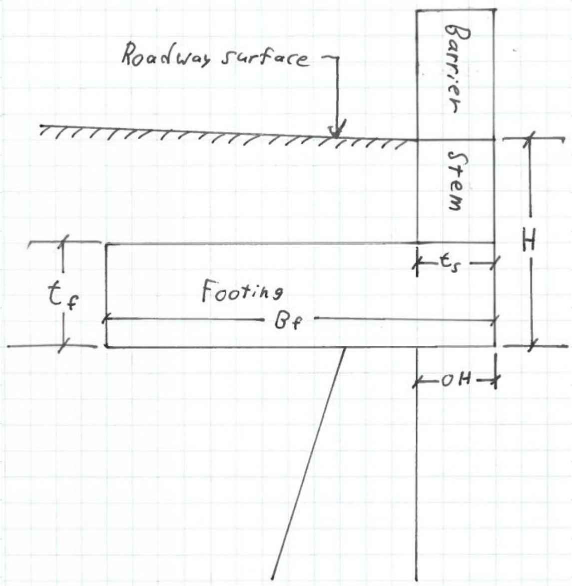
$\beta := 2.0$ (LRFD 5.7.3.4.1)

$$V_c := 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v = 32.896\ kip$$

Factored shear resistance $\phi V_c := \phi_v \cdot V_c = 29.606\ kip > V_u = 10.004\ kip$

$\boxed{Shear\_check\_stem} = ?$

9. Design summary



Height	$H = 4\ ft$
Stem thickness	$t_s = 17\ in$
Footing width	$B_f = 6.5\ ft$
Footing thickness	$t_f = 2\ ft$
Overhang	$OH = 17\ in$

A. Strength I stability

$\boxed{Sliding\_check\_ST1} = ?$

$\boxed{Ecc\_check\_ST1} = ?$

$\boxed{Brg\_check\_ST1} = ?$

B. Extreme Event II stability

$\boxed{Sliding\_check\_EE2} = ?$

$\boxed{Ecc\_check\_EE2} = ?$

$\boxed{Brg\_check\_EE2} = ?$

C. Structural design

$Reinf\_stem = \text{“\#5 @ 12'' o.c.”}$

$\boxed{Reinf\_check\_stem} = ?$

$Reinf\_stem\_t\&s = \text{“\#4 @ 12'' o.c.”}$

$\boxed{Reinf\_check\_stem\_t\&s} = ?$

$\boxed{Shear\_check\_stem} = ?$

$Reinf\_heel = \text{“\#7 @ 12'' o.c.”}$

$\boxed{Reinf\_check\_heel} = ?$

$Reinf\_heel\_t\&s = \text{“\#4 @ 12'' o.c.”}$

$\boxed{Reinf\_check\_heel\_t\&s} = ?$

$\boxed{Shear\_check\_heel} = ?$

Masonry Wall Extension

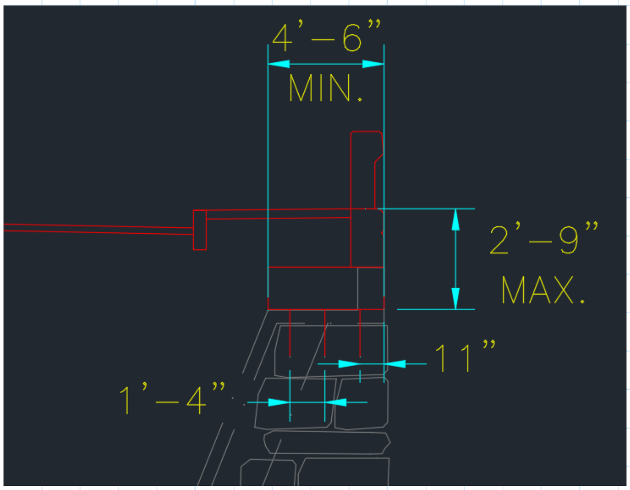
1. Description

The purpose of this calculation is to design a crash barrier structure that can attach to the existing masonry wall through the use of dowels to resist lateral earth pressures and vehicle impact.

2. Project variables

Design strip width	$b := 1\ ft$	
Concrete compressive strength	$f'_c := 4\ ksi$	(4000 psi, 1-1/2", 565 Cement Concrete)
Concrete unit weight	$\gamma_c := 150\ pcf$	
Reinforcement yield strength	$F_y := 60\ ksi$	
Soil unit weight	$\gamma_f := 130\ pcf$	
Concrete density factor	$\lambda := 1.0$	(LRFD 5.4.2.8)

3. Geometry



Height	$H := 2.75\ ft$
Stem thickness	$t_s := 15\ in$
Footing width	$B_f := 4.5\ ft$
Footing thickness	$t_f := 2\ ft$
Overhang	$OH := 0\ in$

4. Loading

A. Lateral earth (EH)

Active lateral earth pressure coefficient

$$k_a = \frac{\sin(\theta + \phi'_f)^2}{\Gamma \cdot \left(\sin(\theta)^2 \cdot \sin(\theta - \beta)\right)}$$ (LRFD Eq. 3.11.5.3-1)

where $$\Gamma = \left(1 + \frac{\sin(\phi'_f + \delta) \cdot \sin(\phi'_f - \beta)}{\sin(\theta - \delta) \cdot \sin(\theta + \beta)}\right)^2$$

Friction angle between fill and wall	$\delta := 24\ deg$	(LRFD Table C3.11.5.3-1)
Angle of fill to the horizontal	$\beta := 0\ deg$	
Angle of back face of wall to the horizontal	$\theta := 90\ deg$	

Effective angle of internal friction $\phi'_f := 36\ deg$

$$\Gamma := \left(1 + \frac{\sin(\phi'_f + \delta) \cdot \sin(\phi'_f - \beta)}{\sin(\theta - \delta) \cdot \sin(\theta + \beta)}\right)^2 = 2.425$$

$$k_a := \frac{\sin(\theta + \phi'_f)^2}{\Gamma \cdot \left(\sin(\theta)^2 \cdot \sin(\theta + \beta)\right)} = 0.27$$

Lateral earth pressure @ bottom of footing $p := k_a \cdot \gamma_f \cdot H = 0.096\ ksf$

Lateral earth force $EH := \dfrac{p \cdot H^2}{2} = 0.365\ kip$

Height of lateral force above bottom of footing $h_{EH} := \dfrac{H}{3} = 0.917\ ft$

B. Horizontal live load surcharge (LS)

Equivalent height of soil $h_{eq} := 2\ ft$ (LRFD Table 3.11.6.4-2)

Constant horizontal earth pressure $\Delta_p := k_a \cdot \gamma_f \cdot h_{eq} = 0.07\ ksf$ (LRFD Eq. 3.11.6.4-1)

Lateral surcharge force $LS := \Delta_p \cdot H \cdot b = 0.193\ kip$

Height of lateral force above bottom of footing $h_{LS} := \dfrac{H}{2} = 1.375\ ft$

C. Vehicular Collision (CT)

Vehicular collision force $CT := 10\ kip$ (MassDOT LRFD Bridge Manual 3.3.2.4)

Height of collision force above bottom of footing $h_{CT} := H + 2\ ft + 8\ in = 5.417\ ft$ (Top of barrier)

Tribuary width for stability $W_{stab} := 5\ ft + 2 \cdot h_{CT} = 15.833\ ft$

Vehicular collision force at bottom of stem, stability $CT_{stab} := \dfrac{CT}{W_{stab}} \cdot b = 0.632\ kip$

Tribuary width for stem design $W_{stem} := 5\ ft = 5\ ft$

Vehicular collision force at bottom of stem, stem design $CT_{stem} := \frac{CT}{W_{stem}} \cdot b = 2\ kip$

D. Self weight (DC)

Footing $W_f := B_f \cdot t_f \cdot \gamma_c \cdot b = 1.35\ kip$

Footing CG from pivot point $e_f := \frac{B_f}{2} - OH = 2.25\ ft$

Stem $W_s := (h_{CT} - t_f) \cdot t_s \cdot \gamma_c \cdot b = 0.641\ kip$

Stem CG from pivot point $e_s := -\frac{t_s}{2} = -0.625\ ft$

Barrier + handrail $W_b := (459\ plf + 30\ plf) \cdot b = 489\ lbf$

Barrier +handrail CG from pivot point $e_b := -\frac{t_s}{2} = -0.625\ ft$

E. Soil over heel (EV)

Weight of soil $W_{EV} := (H - t_f) \cdot (B_f - t_s) \cdot \gamma_f \cdot b = 0.317\ kip$

Soil C.G. from pivot point $e_{EV} := \frac{B_f - t_s}{2} = 1.625\ ft$

F. Live load surcharge over heel (LS)

Weight of surcharge $W_{LS} := h_{eq} \cdot (B_f - t_s) \cdot \gamma_f \cdot b = 0.845\ kip$

Surcharge C.G. from pivot point $e_{LS} := \frac{B_f - t_s}{2} = 1.625\ ft$

5. Load and resistance factors

A. Strength I load facors (LRFD Table 3.4.1-1)

Dead load, sliding and eccentricity $\gamma_{DC\_ST1\_min} := 0.90$

Dead load, bearing $\gamma_{DC\_ST1\_max} := 1.25$

Horizontal earth pressure $\gamma_{EH\_ST1} := 1.50$

Vertical earth pressure, sliding and eccentricity $\gamma_{EV\_ST1\_min} := 1.00$

Vertical earth pressure, bearing $\gamma_{EV\_ST1\_max} := 1.35$

Live load surcharge, sliding and eccentricity $\gamma_{LS\_ST1\_min} := 0$

Live load surcharge, sliding and eccentricity $\gamma_{LS\_ST1\_max} := 1.75$

Vehicular collision $\gamma_{CT\_ST1} := 0.00$

B. Extreme Event II load factors (LRFD Table 3.4.1-1)

Dead load $\gamma_{DC\_EE2} := 1.00$

Horizontal earth pressure $\gamma_{EH\_EE2} := 1.00$

Vertical earth pressure $\gamma_{EV\_EE2} := 1.00$

Live load surcharge $\gamma_{LS\_EE2} := 0.50$

Vehicular collision $\gamma_{CT\_EE2} := 1.00$

C. Resistance factors

Flexural resistance of concrete $\phi_f := 0.9$ (LRFD 5.5.4.2)

Shear resistance of concrete $\phi_v := 0.9$ (LRFD 5.5.4.2)

6. Force Effects- Strength I

i. Stem

$$M_{u\_ST1\_stem} := \gamma_{EH\_ST1} \cdot \frac{k_a \cdot \gamma_f \cdot \left(H - t_f\right)^2}{2} \cdot \frac{\left(h_{EH} - t_f\right)}{3} \cdot b + \gamma_{EH\_ST1} \cdot \frac{\Delta_p \cdot \left(H - t_f\right)^2}{2} \cdot b + \gamma_{CT\_ST1} \cdot CT_{stem} \cdot \left(h_{CT} - t_f\right) = 0.024\ ft \cdot kip$$

$$V_{u\_ST1\_stem} := \gamma_{EH\_ST1} \cdot \frac{k_a \cdot \gamma_f \cdot \left(H - t_f\right)^2}{2} \cdot b + \gamma_{EH\_ST1} \cdot \Delta_p \cdot \left(H - t_f\right) \cdot b + \gamma_{CT\_ST1} \cdot CT_{stem} = 0.094\ kip$$

ii. Heel

$$M_{u\_ST1\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f \cdot \frac{\left(B_f - t_s\right)}{2} + \gamma_{EV\_ST1\_max} \cdot W_{EV} \cdot \frac{\left(B_f - t_s\right)}{2} + \gamma_{LS\_ST1\_max} \cdot W_{LS} \cdot \frac{\left(B_f - t_s\right)}{2} = 5.84\ ft \cdot kip$$

$$V_{u\_ST1\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f + \gamma_{EV\_ST1\_max} \cdot W_{EV} + \gamma_{LS\_ST1\_max} \cdot W_{LS} = 3.594\ kip$$

7. Force Effects- Extreme Event II

i. Stem

$$M_{u\_EE2\_stem} := \gamma_{EH\_EE2} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot \frac{(h_{EH} - t_f)}{3} \cdot b + \gamma_{EH\_EE2} \cdot \frac{\Delta_p \cdot (H - t_f)^2}{2} \cdot b + \gamma_{CT\_EE2} \cdot CT_{stem} \cdot (h_{CT} - t_f) = 6.85\ ft \cdot kip$$

$$V_{u\_EE2\_stem} := \gamma_{EH\_EE2} \cdot \frac{k_a \cdot \gamma_f \cdot (H - t_f)^2}{2} \cdot b + \gamma_{EH\_EE2} \cdot \Delta_p \cdot (H - t_f) \cdot b + \gamma_{CT\_EE2} \cdot CT_{stem} = 2.063\ kip$$

ii. Heel

$$M_{u\_EE2\_heel} := \gamma_{DC\_EE2} \cdot W_f \cdot \frac{(B_f - t_s)}{2} + \gamma_{EV\_EE2} \cdot W_{EV} \cdot \frac{(B_f - t_s)}{2} + \gamma_{LS\_EE2} \cdot W_{LS} \cdot \frac{(B_f - t_s)}{2} = 3.395\ ft \cdot kip$$

$$V_{u\_EE2\_heel} := \gamma_{DC\_ST1\_max} \cdot W_f + \gamma_{EV\_ST1\_max} \cdot W_{EV} + \gamma_{LS\_ST1\_max} \cdot W_{LS} = 3.594\ kip$$

8. Structural design

A. Stem

i. Flexural reinforcement

Factored moment $M_{u\_fact\_stem} := \max(M_{u\_ST1\_stem}, M_{u\_EE2\_stem}) = 6.85\ ft \cdot kip$

Section modulus $S_x := \frac{b \cdot t_s^2}{6} = 450\ in^3$

Modulus of rupture $f_r := 0.24 \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$

Flexural cracking variability factor $\gamma_1 := 1.6$ (LRFD 5.6.3.3)

Yield/ultimate ratio $\gamma_3 := 0.67$ (LRFD 5.6.3.3)

Cracking moment $M_{cr\_stem} := \gamma_3 \cdot \gamma_1 \cdot f_r \cdot S_x = 19.296\ ft \cdot kip$ (LRFD 5.6.3.3)

Design moment $M_{u\_stem} := \max(M_{u\_fact\_stem}, min(1.33 \cdot M_{u\_fact\_stem}, M_{cr\_stem})) = 9.11\ ft \cdot kip$ (LRFD 5.6.3.3)

Assumed bar diameter (#5) $d_b := 0.625\ in$

Cover $c := 2\ in$

Depth to reinforcement $d := t_s - c - \frac{d_b}{2} = 12.688\ in$

$$A_{s1}(a) := \frac{M_{u\_stem}}{\phi_f \cdot F_y \cdot \left(d - \frac{a}{2}\right)}$$

$$A_{s2}(a) := \frac{0.85 \cdot a \cdot f'_c \cdot b}{F_y}$$

Guess Values

$a := 1\ in$

$A_s := 0.75\ in^2$

Constraints

$A_{s1}(a) = A_{s2}(a)$

$A_s = A_{s1}(a)$

Solver

$A_{s\_req} := \mathbf{find}(A_s) = 0.166\ in^2$

Required area of steel $A_{s\_req} = 0.166\ in^2$ Try #5 @ 12" o.c.

$$A_s := 0.31\ in^2 \cdot \frac{1\ ft}{12\ in} = 0.31\ in^2 > A_{s\_req} = 0.166\ in^2$$

$Reinf\_check\_stem =$ "OK" **USE #5 @ 12" o.c.**

ii. Temperature and shrinkage reinforcement

Temperature and shrinkage area required $$A_{s\_req} := \frac{1.30 \cdot \frac{b}{in} \cdot \frac{t_s}{in}}{2 \cdot \left(\frac{b}{in} + \frac{t_s}{in}\right) \cdot \frac{F_y}{ksi}} \cdot in^2 = 0.072\ in^2$$

Except that $0.11 \le A_{s\_req} \le 0.60$ Try #4 @ 12" o.c.

$$A_s := 0.20\ in^2 \cdot \frac{12\ in}{1\ ft} = 0.2\ in^2 > A_{s\_req} = 0.072\ in^2$$

$Reinf\_check\_stem\_t\&s =$ "OK" **USE #4 @ 12" o.c.**

ii. Shear

Design shear $V_u := \max\left(V_{u\_ST1\_stem}, V_{u\_EE2\_stem}\right) = 2.063\ kip$

Effective depth $d_v := d = 12.688\ in$

Effective width $b_v := b = 1\ ft$

Concrete shear capacity $V_c = 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v$ (LRFD Eq. 5.7.3.3-3)

$\beta := 2.0$ (LRFD 5.7.3.4.1)

$V_c := 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v = 19.244\ kip$

Factored shear resistance $\phi V_c := \phi_v \cdot V_c = 17.32\ kip$ > $V_u = 2.063\ kip$

$Shear\_check\_stem = \text{“OK”}$

B. Heel

i. Flexural reinforcement

Factored moment $M_{u\_fact\_heel} := \max\left(M_{u\_ST1\_heel}, M_{u\_EE2\_heel}\right) = 5.84\ ft \cdot kip$

Section modulus $S_x := \frac{b \cdot t_f^{\ 2}}{6} = 1152\ in^3$

Modulus of rupture $f_r := 0.24 \cdot \lambda \cdot \sqrt{\frac{f'_c}{ksi}} \cdot ksi = 0.48\ ksi$

Flexural cracking variability factor $\gamma_1 := 1.6$ (LRFD 5.6.3.3)

Yield/ultimate ratio $\gamma_3 := 0.67$ (LRFD 5.6.3.3)

Cracking moment $M_{cr\_heel} := \gamma_3 \cdot \gamma_1 \cdot f_r \cdot S_x = 49.398\ ft \cdot kip$ (LRFD 5.6.3.3)

Design moment $M_{u\_heel} := \max\left(M_{u\_fact\_heel}, min\left(1.33 \cdot M_{u\_fact\_heel}, M_{cr\_heel}\right)\right) = 7.768\ ft \cdot kip$ (LRFD 5.6.3.3)

Assumed bar diameter (#5) $d_b := 0.625\ in$

Cover $c := 2\ in$

Depth to reinforcement $d := t_f - c - \frac{d_b}{2} = 21.688\ in$

$A_{s1}(a) := \frac{M_{u\_stem}}{\phi_f \cdot F_y \cdot \left(d - \frac{a}{2}\right)}$

ess Values

$a := 1\ in$

$A_s := 0.75\ in^2$

$A_{s2}(a) := \dfrac{0.85 \cdot a \cdot f'_c \cdot b}{F_y}$

Gu

Constraints

$A_{s1}(a) = A_{s2}(a)$

$A_s = A_{s1}(a)$

Solver

$A_{s\_req} := \mathbf{find}(A_s) = 0.166\ in^2$

Required area of steel $\quad A_{s\_req} = 0.166\ in^2 \quad$ Try #5@ 12" o.c.

$A_s := 0.31\ in^2 \cdot \dfrac{1\ ft}{12\ in} = 0.31\ in^2\ >\ A_{s\_req} = 0.166\ in^2$

$Reinf\_check\_heel = \text{"OK"}$ **USE #5 @ 12" o.c.**

ii. Temperature and shrinkage reinforcement

Temperature and shrinkage area required $\quad A_{s\_req} := \dfrac{1.30 \cdot \dfrac{b}{in} \cdot \dfrac{t_f}{in}}{2 \cdot \left(\dfrac{b}{in} + \dfrac{t_f}{in}\right) \cdot \dfrac{F_y}{ksi}} \cdot in^2 = 0.087\ in^2$

Except that $\quad 0.11 \le A_{s\_req} \le 0.60 \quad$ Try #4 @ 12" o.c.

$A_s := 0.20\ in^2 \cdot \dfrac{12\ in}{1\ ft} = 0.2\ in^2\ >\ A_{s\_req} = 0.087\ in^2$

$Reinf\_check\_heel\_t\&s = \text{"OK"}$ **USE #4 @ 12" o.c.**

ii. Shear

Design shear $\quad V_u := \max\left(V_{u\_ST1\_heel}, V_{u\_EE2\_heel}\right) = 3.594\ kip$

Effective depth $\quad d_v := d = 21.688\ in$

Effective width $\quad b_v := b = 1\ ft$

Concrete shear capacity $\quad V_c = 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\dfrac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v \quad$ (LRFD Eq. 5.7.3.3-3)

$\beta := 2.0 \quad$ (LRFD 5.7.3.4.1)

$V_c := 0.0316 \cdot \beta \cdot \lambda \cdot \sqrt{\dfrac{f'_c}{ksi}} \cdot ksi \cdot b_v \cdot d_v = 32.896\ kip$

Factored shear resistance $\phi V_c := \phi_v \cdot V_c = 29.606\ kip > V_u = 3.594\ kip$

$Shear\_check\_stem = \text{"OK"}$

9. Attachment to Existing Wall

Max Sliding Shear $V_u := \max\left(V_{u\_ST1\_stem}, V_{u\_EE2\_stem}, V_{u\_ST1\_heel}, V_{u\_EE2\_heel}\right) = 3.594\ kip$

Max Overturning Moment $M_u := \max\left(M_{u\_stem}, M_{u\_heel}\right) = 9.11\ ft \cdot kip$

Select Dowel to satisfy pullout and shear, assume moment acts directly above dowel (requires full capacity from each dowel)

$$d := t_s - c - \frac{d_b}{2} = 12.688\ in$$

$$A_{s1}(a) := \frac{M_u}{\phi_f \cdot F_y \cdot \left(d - \frac{a}{2}\right)}$$

$$A_{s2}(a) := \frac{0.85 \cdot a \cdot f'_c \cdot b}{F_y}$$

Guess Values

$a := 1\ in$

$A_s := 0.75\ in^2$

Constraints

$A_{s1}(a) = A_{s2}(a)$

$A_s = A_{s1}(a)$

Solver

$A_{s\_req} := \mathbf{find}\left(\mathbf{A_s}\right) = 0.096\ in^2$

Required area of steel $A_{s\_req} = 0.096\ in^2$ Try #5@ 12" o.c.

$$A_s := 0.31\ in^2 \cdot \frac{1\ ft}{12\ in} = 0.31\ in^2 > A_{s\_req} = 0.096\ in^2$$

$Stab\_check = \text{"OK"}$ **USE #5 @ 12" o.c.**

10. Shear Friction

The nominal shear resistance of the interface plane shall be taken as:

$$V_{ni} = cA_{cv} + \mu\left(A_{vf} f_y + P_c\right) \quad (5.7.4.3\text{-}3)$$

The nominal shear resistance, V_{ni}, used in the design shall not exceed either of the following:

$$V_{ni} \le K_1 f'_c A_{cv}, \quad (5.7.4.3\text{-}4)$$

$$V_{ni} \le K_2 A_{cv} \quad (5.7.4.3\text{-}5)$$

in which:

$$A_{cv} = b_{vi} L_{vi} \quad (5.7.4.3\text{-}6)$$

where:

b_{vi} = interface width considered to be engaged in shear transfer (in.)

L_{vi} = interface length considered to be engaged in shear transfer (in.)

c = cohesion factor specified in Article 5.7.4.4 (ksi)

μ = friction factor specified in Article 5.7.4.4

P_c = permanent net compressive force normal to the shear plane; if force is tensile, $P_c = 0.0$ (kip)

f'_c = design concrete compressive strength of the weaker concrete on either side of the interface (ksi)

K_1 = fraction of concrete strength available to resist interface shear, as specified in Article 5.7.4.4.

K_2 = limiting interface shear resistance specified in Article 5.7.4.4 (ksi)

- For concrete placed against a clean concrete surface, free of laitance, but not intentionally roughened:

  c = 0.075 ksi
  μ = 0.6
  K_1 = 0.2
  K_2 = 0.8 ksi

$c := 0.075\ ksi$
$\mu := 0.6$
$K_1 := 0.2$
$K_2 := 0.8\ ksi$

$\mu := 0.6$

Interface Width $b_v := b = 12\ in$
Interface Length $L_v := 4.75\ ft = 57\ in$

$A_{cv} := b_v \cdot L_v = 684\ in^2$

$A_{vf} := 3 \cdot A_s = 0.93\ in^2$ Per unit width, Combined area of dowels (n= 3)

Structure Self Weight: $P_c := W_f + W_s + W_b = 2.48\ kip$

$V_{ni} := c \cdot A_{cv} + \mu \cdot \left(A_{vf} \cdot F_y + P_c\right) = 86.268\ kip$ but not more than...

$V_{ni1} := K_1 \cdot f'_c \cdot A_{cv} = 547.2\ kip$

$V_{ni2} := K_2 \cdot A_{cv} = 547.2\ kip$

$Shear\_int\_check1 = \text{"OK"}$

$Shear\_int\_check2 = \text{"OK"}$

Factored Shear Resistance $V_{ri} := \phi_v \cdot V_{ni} = 77.641\ kip$ > $V_u = 3.594\ kip$

$Shear\_int\_check\_FINAL = \text{"OK"}$

11. Design summary

$Reinf\_stem = \text{"\#5 @ 12'' o.c."}$
$Reinf\_check\_stem = \text{"OK"}$
$Reinf\_stem\_t\&s = \text{"\#4 @ 12'' o.c."}$
$Reinf\_check\_stem\_t\&s = \text{"OK"}$
$Shear\_check\_stem = \text{"OK"}$
$Reinf\_heel = \text{"\#7 @ 12'' o.c."}$
$Reinf\_check\_heel = \text{"OK"}$
$Reinf\_heel\_t\&s = \text{"\#4 @ 12'' o.c."}$
$Reinf\_check\_heel\_t\&s = \text{"OK"}$
$Shear\_check\_heel = \text{"OK"}$

Height $H = 2.75\ ft$
Stem thickness $t_s = 15\ in$
Footing width $B_f = 4.5\ ft$
Footing thickness $t_f = 2\ ft$
Overhang $OH = 0\ in$