

SHOP DRAWING STAMP

☐ ACCEPTED
☒ ACCEPTED AS NOTED
☐ RETURNED FOR CORRECTION

CORRECTIONS OR COMMENTS MADE ON THE SHOP DRAWINGS DURING THIS REVIEW DO NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. THIS CHECK IS ONLY FOR REVIEW OF GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS RESPONSIBLE FOR SELECTING FABRICATION PROCESSES AND TECHNIQUES OF CONSTRUCTION COORDINATING WORK WITH ALL OTHER TRADES, AND PERFORMING WORK IN A SAFE AND SATISFACTORY MANNER.

MICHAEL BAKER INTL

DATE 4-5-2024 BY ERBB

NOTES:

1. ALL LAYING INSTRUCTIONS GIVEN LOOKING IN THE DIRECTION OF LAYING. THIS LINE LAYOUT DRAWING IS SUPPLIED ONLY AS A GUIDE FOR DISTRIBUTING AND INSTALLING BOX AND FITTINGS. ADJUSTMENTS TO THE LAYOUT MUST BE MADE AS REQUIRED. THE LAYOUT WAS COMPLETED FROM INFORMATION SUPPLIED. VERIFICATION OF ALL INFORMATION PROVIDED IS THE SOLE RESPONSIBILITY OF THE PROJECT ENGINEER AND THE CONTRACTOR.
 2. FOR ADDITIONAL INFORMATION SEE RCB DRAWINGS B150-CE-4274 AND B250-CE-1714.
 3. RCB LAYOUT IS BASED ON A NOMINAL INTERIOR JOINT GAP OF 0.06' [3/4"].
 4. WHERE EXPOSED REINFORCEMENT IS PROVIDED, CONTRACTOR TO FIELD ADJUST AS REQUIRED FOR CAST-IN-PLACE CONNECTION.
 5. PER ASTM C1577, APPENDIX X1.5 "MULTIPLE CELL INSTALLATIONS" POSITIVE LATERAL BEARING IS REQUIRED BY CONTINUOUS CONTACT BETWEEN THE SIDES OF ADJACENT BOXES. FLOWABLE FILL OR GROUTING BETWEEN THE UNITS ARE CONSIDERED MEANS OF PROVIDING SUCH POSITIVE BEARING.
 6. FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN EACH RCB TOP SLAB. INSTALLER RESPONSIBLE FOR PROVIDING NECESSARY LIFTING AND RIGGING HARDWARE.

10' x 10' C1577 (3' - 10' COVER) R.C. BOX CULVERT SCHEDULE (SITE 1)

PIECE	QTY.	DESCRIPTION	LENGTH
P1	99	TONGUE x GROOVE STANDARD	5.00'
P2	1	PLAIN END w/ DOWEL BARS x GROOVE (WEEP HOLES REQUIRED)	4.63'
P3	3	PLAIN END w/ DOWEL BARS x GROOVE	4.63'
P4	1	PLAIN END w/ DOWEL BARS x GROOVE (WEEP HOLES REQUIRED)	4.63'
P5	1	TONGUE x PLAIN END w/ DOWEL BARS (WEEP HOLES REQUIRED)	5.00'
P6	3	TONGUE x PLAIN END w/ DOWEL BARS	5.00'
P7	1	TONGUE x PLAIN END w/ DOWEL BARS (WEEP HOLES REQUIRED)	5.00'
P8	33	TONGUE x GROOVE STANDARD (WEEP HOLES REQUIRED)	5.00'
P9	33	TONGUE x GROOVE STANDARD (WEEP HOLES REQUIRED)	5.00'

10' x 10' C1577 (3' - 10' COVER) R.C. BOX CULVERT SCHEDULE (SITE 2)

PIECE	QTY.	DESCRIPTION	LENGTH
P1	60	TONGUE x GROOVE STANDARD	5.00'
P8	20	TONGUE x GROOVE STANDARD (WEEP HOLES REQUIRED)	5.00'
P9	20	TONGUE x GROOVE STANDARD (WEEP HOLES REQUIRED)	5.00'
P10	1	PLAIN END w/ DOWEL BARS x GROOVE (WEEP HOLES REQUIRED)	4.63'
P11	3	PLAIN END w/ DOWEL BARS x GROOVE	4.63'
P12	1	PLAIN END w/ DOWEL BARS x GROOVE (WEEP HOLES REQUIRED)	4.63'
P13	1	TONGUE x PLAIN END w/ DOWEL BARS (WEEP HOLES REQUIRED)	5.00'
P14	3	TONGUE x PLAIN END w/ DOWEL BARS	5.00'
P15	1	TONGUE x PLAIN END w/ DOWEL BARS (WEEP HOLES REQUIRED)	5.00'



501 EAST JEFFERSON AVE.
WEST MEMPHIS, AR 72301
PHONE #: 870-735-5514

FOR APPROVAL

SCALE: N.T.S.



UPDATED PER ENGR. COMMENTS DATED 03.13.2024

TG

3.20.24

REVISIONS

DRAWN BY: T.GRAY T.G

DATE: FEB. 5, 2024

CHECKED BY: T.HICKS

GENERAL NOTES & RCB SCHEDULE

PROJECT: ARDOT HWY 63 & HWY 70 STRS. & APPRS

LOCATION: PRAIRIE COUNTY, ARKANSAS

ENGINEER: MICHAEL BAKER INTERNATIONAL, INC.

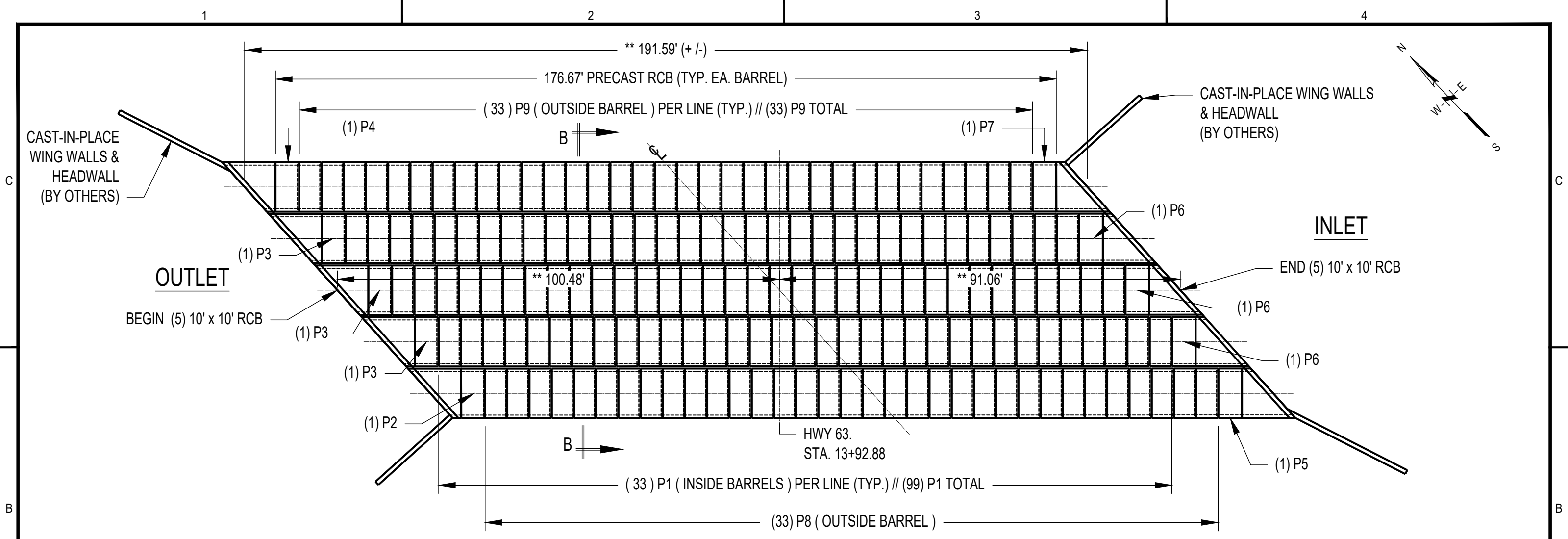
DRAWING NO.:

B450-CE-2958

SHEET NO.

(SHEET 1 OF 3)



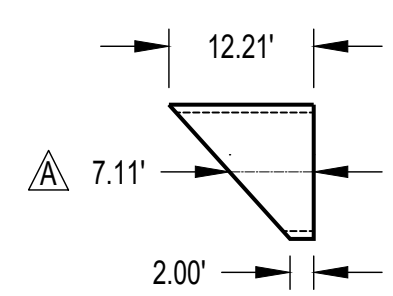


LAYING DIRECTION
LAY GROOVES AHEAD

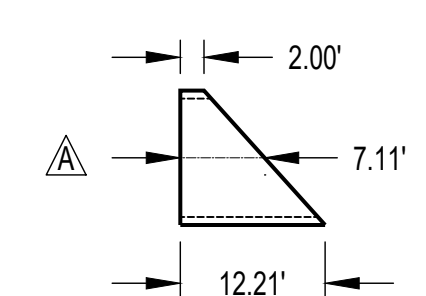
PLAN VIEW

REFER TO ARDOT STD. DWG. PBC-1
FOR DRAINAGE FILL REQUIREMENTS

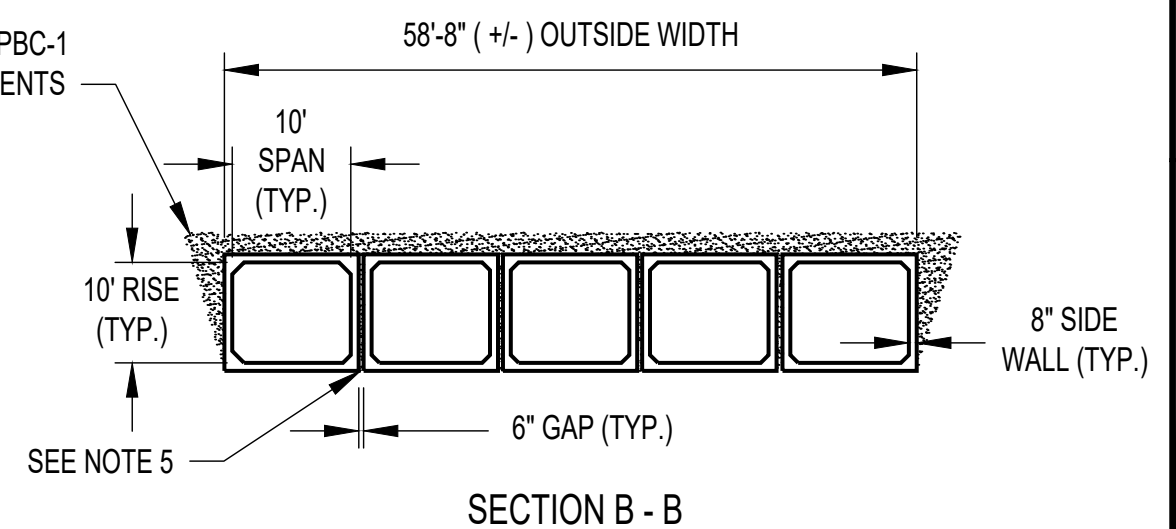
FLOW



**OUTLET CAST-INPLACE
END SECTION DETAIL**



**INLET CAST-INPLACE
END SECTION DETAIL**



SECTION B - B

** PROJECT ENGINEER TO VERIFY THAT THE PROPOSED
CULVERT DIMENSIONS ARE ACCEPTABLE FOR THE
PROJECT CONDITIONS.

*** PROJECT ENGINEER & CONTRACTOR TO SPECIFY
CAST-IN-PLACE END INLET AND OUTLET DIMENSIONS.

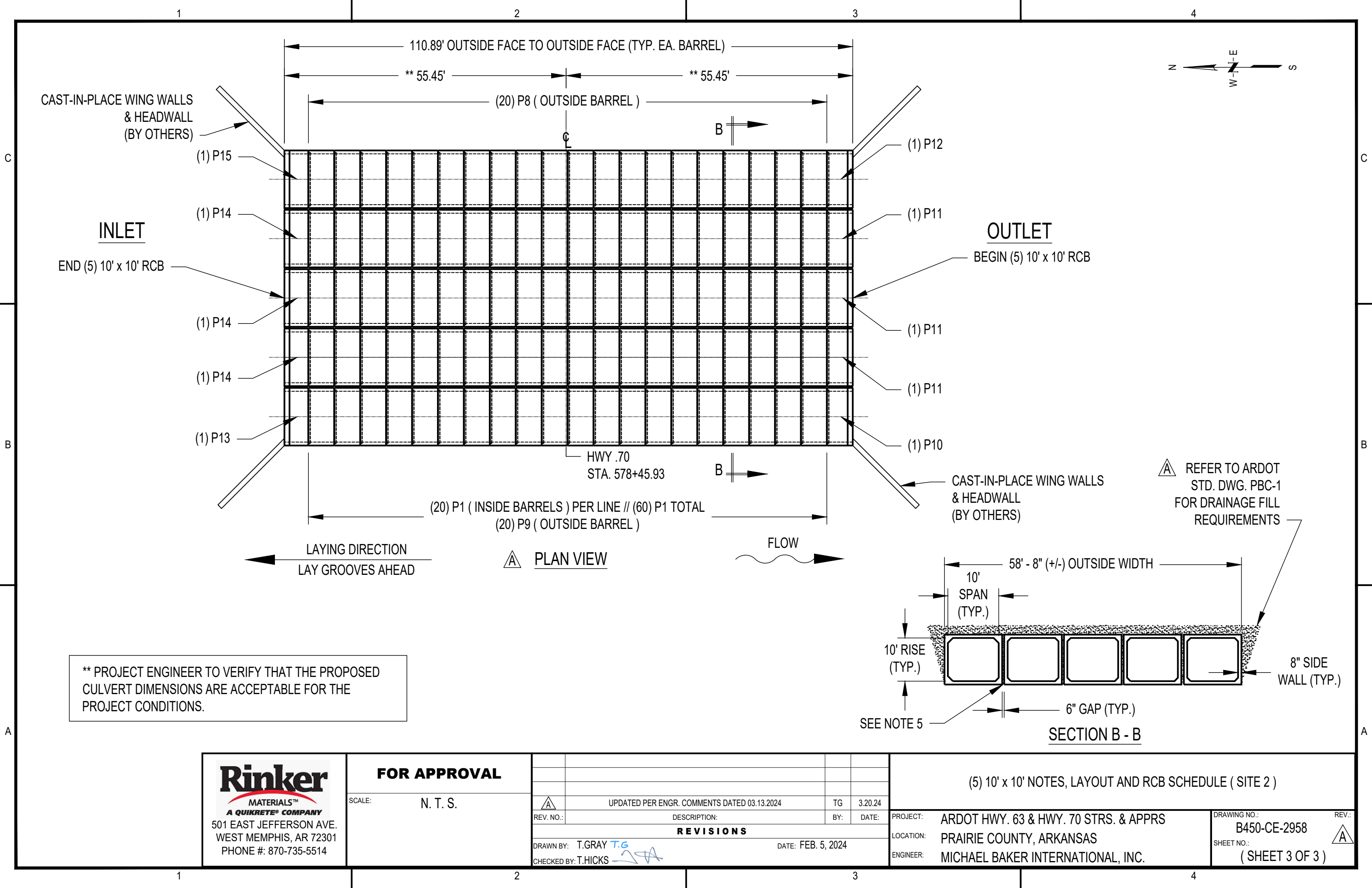
Rinker
MATERIALS™
A QUIKRETE® COMPANY
501 EAST JEFFERSON AVE.
WEST MEMPHIS, AR 72301
PHONE #: 870-735-5514

FOR APPROVAL
SCALE: N. T. S.

REV. NO.:	DESCRIPTION:	BY:	DATE:
1	UPDATED PER ENGR. COMMENTS DATED 03.13.2024	TG	3.20.24
REVISIONS			
DRAWN BY: T.GRAY T.G		DATE: FEB. 5, 2024	
CHECKED BY: T.HICKS			

(5) 10' x 10' NOTES, LAYOUT AND RCB SCHEDULE (SITE 1)

PROJECT:	ARDOT HWY. 63 & HWY. 70 STRS. & APPRS.	DRAWING NO.:	B450-CE-2958	REV.:	A
LOCATION:	PRAIRIE COUNTY, ARKANSAS	SHEET NO.:	(SHEET 2 OF 3)		
ENGINEER:	MICHAEL BAKER INTERNATIONAL, INC.				



INLET

OUTLET

PLAN VIEW

SECTION B - B

** PROJECT ENGINEER TO VERIFY THAT THE PROPOSED CULVERT DIMENSIONS ARE ACCEPTABLE FOR THE PROJECT CONDITIONS.

Rinker
MATERIALS™
A QUIKRETE® COMPANY
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WEST MEMPHIS, AR 72301
PHONE #: 870-735-5514

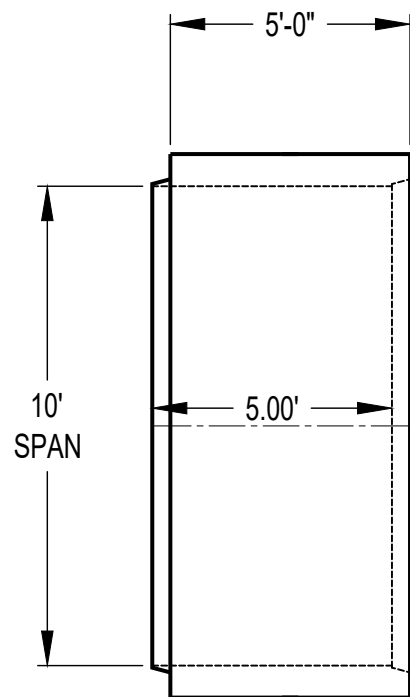
FOR APPROVAL

SCALE: N. T. S.

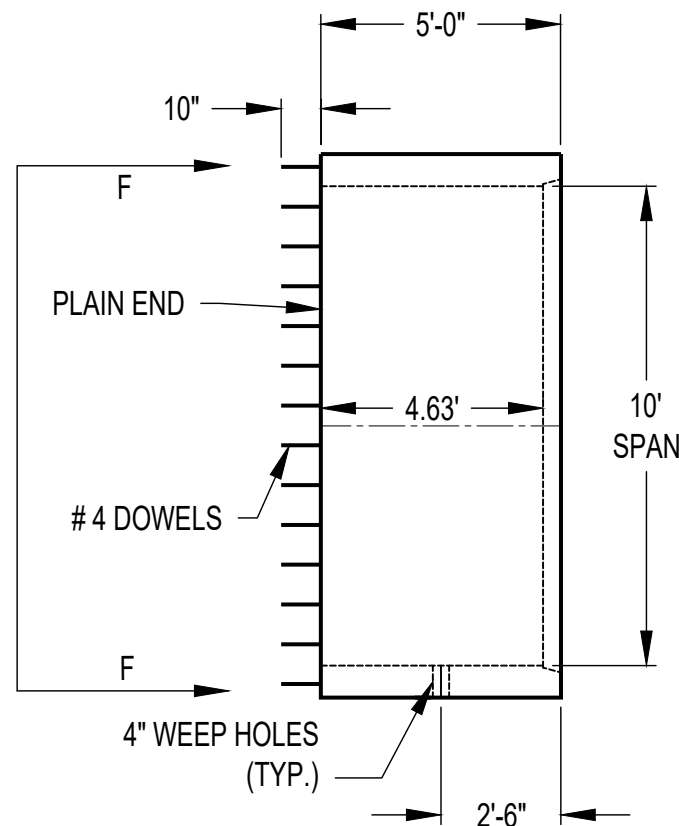
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1	UPDATED PER ENGR. COMMENTS DATED 03.13.2024	TG	3.20.24
REVISIONS			
DRAWN BY: T.GRAY T.G		DATE: FEB. 5, 2024	
CHECKED BY: T.HICKS			

(5) 10' x 10' NOTES, LAYOUT AND RCB SCHEDULE (SITE 2)

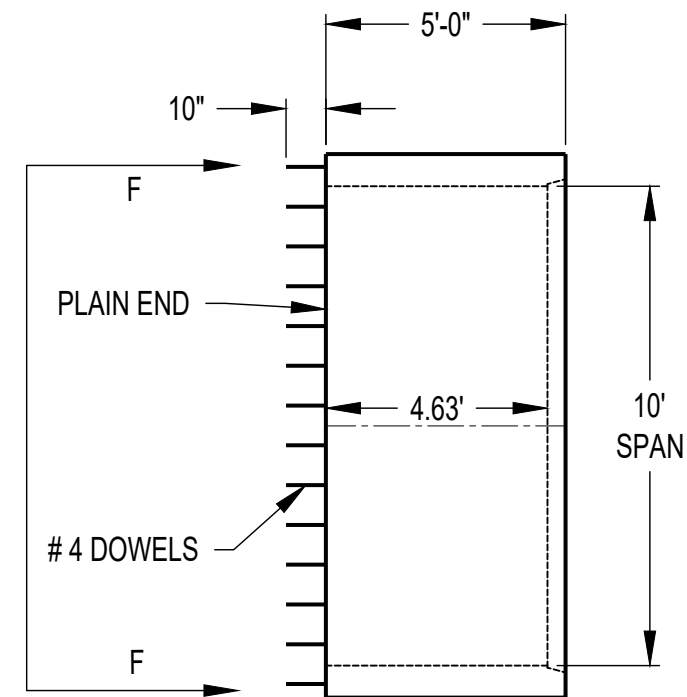
PROJECT:	ARDOT HWY. 63 & HWY. 70 STRS. & APPRS	DRAWING NO.:	B450-CE-2958	REV.:	A
LOCATION:	PRAIRIE COUNTY, ARKANSAS	SHEET NO.:	(SHEET 3 OF 3)		
ENGINEER:	MICHAEL BAKER INTERNATIONAL, INC.				



PLAN VIEW OF BOX CULVERT P1



PLAN VIEW OF BOX CULVERT P2



PLAN VIEW OF BOX CULVERT P3

NOTES:

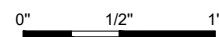
- SEE SHEET 6 FOR ADDITIONAL INFORMATON ON EXPOSED REINFORCEMENT FOR PIECES P2 - P3.
- FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN TOP SLAB FOR EACH RCB SECTION.



501 EAST JEFFERSON AVE.
WEST MEMPHIS, AR 72301
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SCALE: N. T. S.



SCALE VERIFICATION

BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.



UPDATED PER ENGR. COMMENTS DATED 03.20.2024

REV. NO.:

DESCRIPTION:

BY:

DATE:

REVISIONS

DRAWN BY: T.GRAY T.G

DATE: FEB. 12, 2024

CHECKED BY: T.HICKS

10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO. MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.:

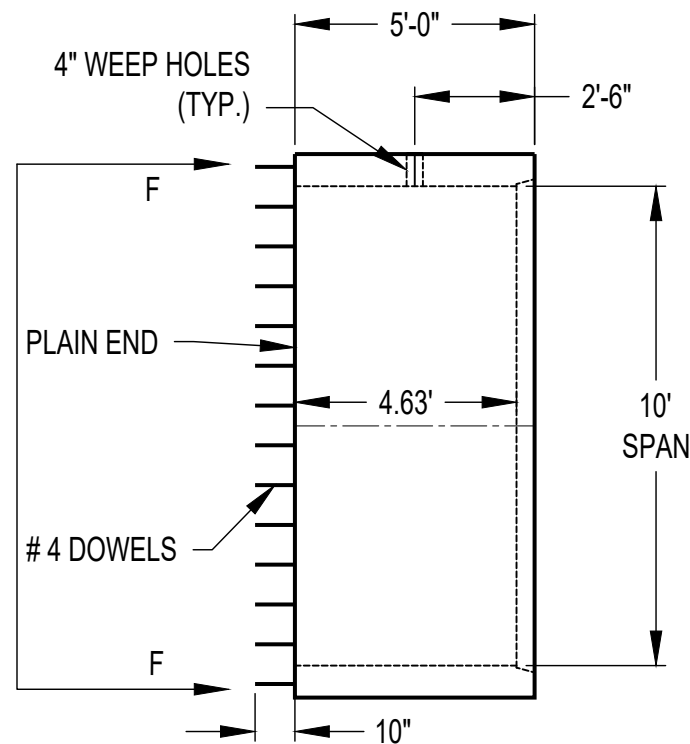
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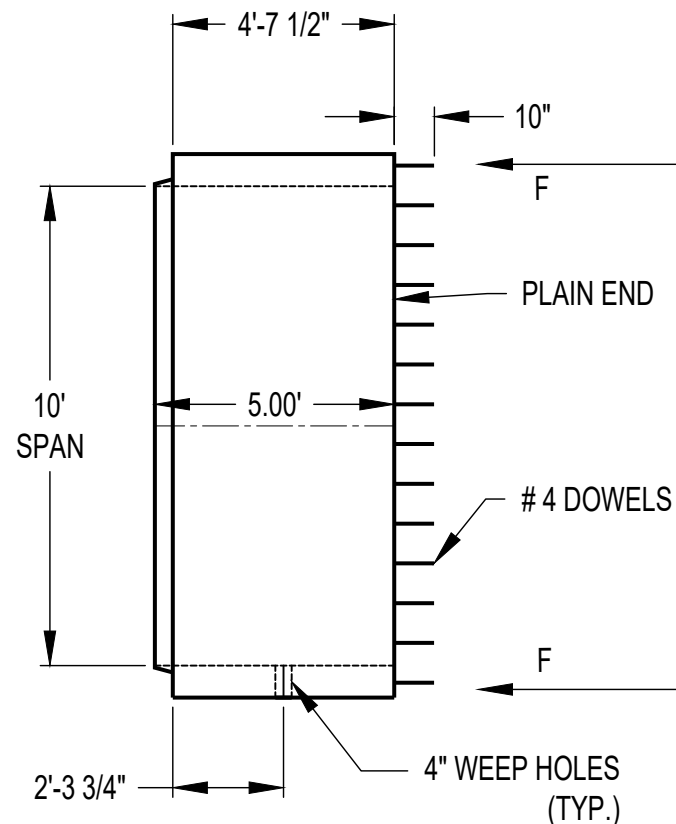
(SHEET 1 OF 7)

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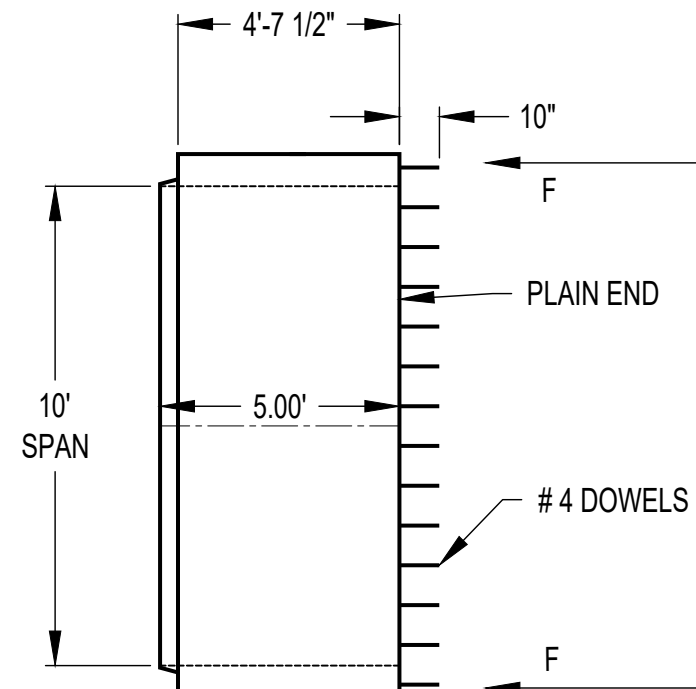




△ PLAN VIEW OF BOX CULVERT P4



△ PLAN VIEW OF BOX CULVERT P5



△ PLAN VIEW OF BOX CULVERT P6

△ NOTES:

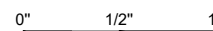
- SEE SHEET 6 FOR ADDITIONAL INFORMATION ON EXPOSED REINFORCEMENT FOR PIECES P4 - P6.
- FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN TOP SLAB FOR EACH RCB SECTION.



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DESCRIPTION:

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DATE:

REVISIONS

DRAWN BY: T.GRAY T.G

DATE: FEB. 12, 2024

CHECKED BY: T.HICKS

10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO: MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.:

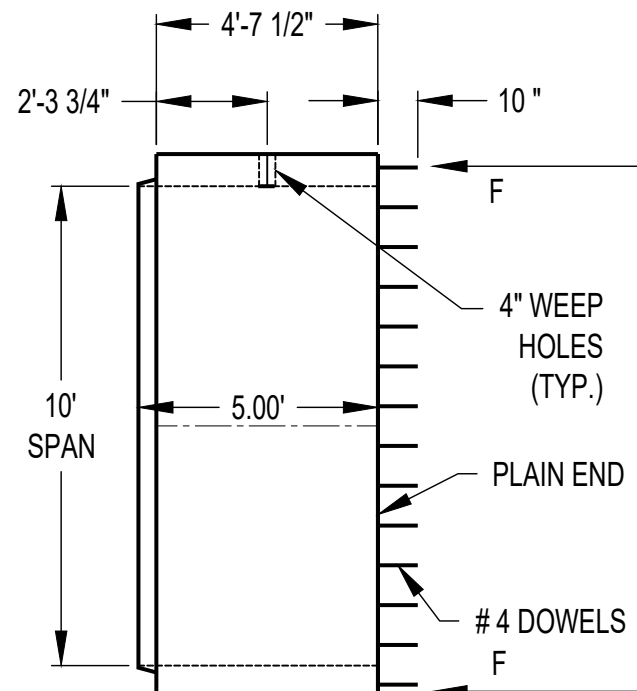
B250-CE-1714

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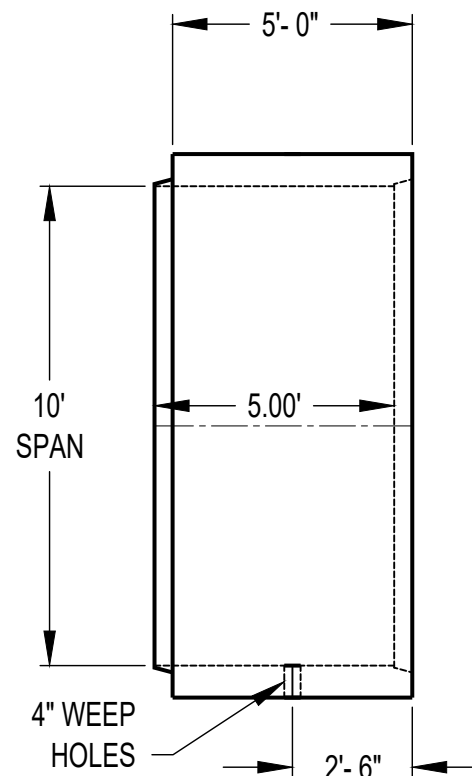
(SHEET 2 OF 7)

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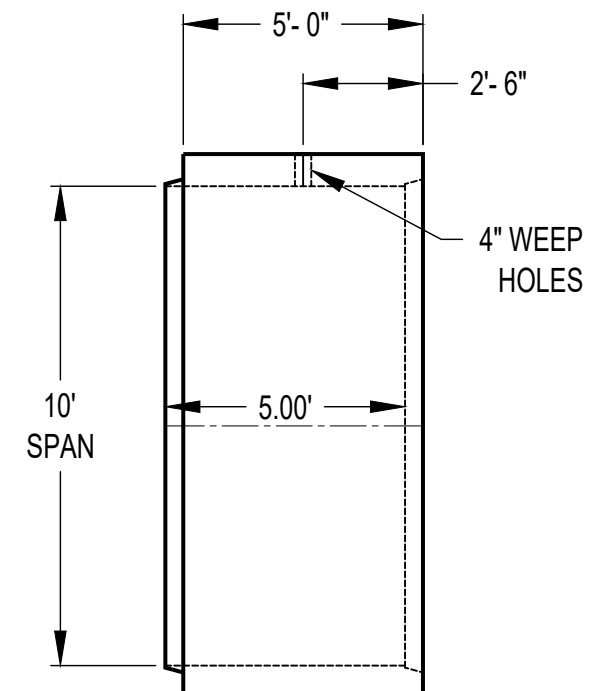




A PLAN VIEW OF BOX CULVERT P7



PLAN VIEW OF BOX CULVERT P8



PLAN VIEW OF BOX CULVERT P9

A NOTES:

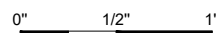
- SEE SHEET 6 FOR ADDITIONAL INFORMATION ON EXPOSED REINFORCEMENT FOR PIECES P7 - P9.
- FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN TOP SLAB FOR EACH RCB SECTION.



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DATE:

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DRAWN BY: T.GRAY T.G

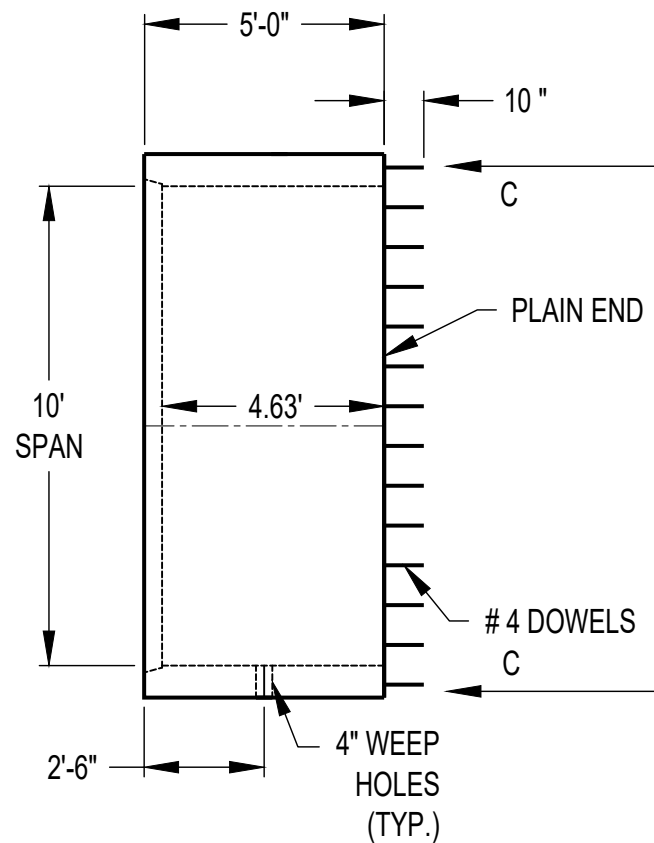
DATE: FEB. 12, 2024

CHECKED BY: T.HICKS

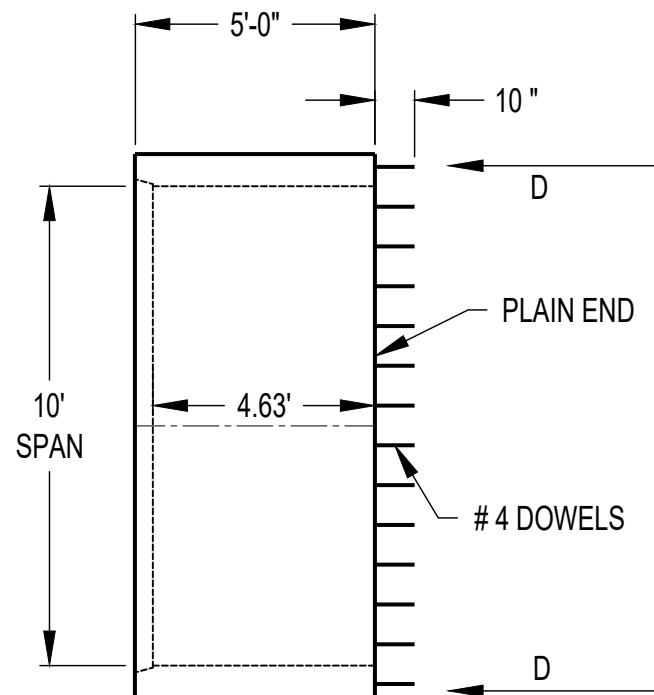
10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO: MICHAEL BAKER INTERNATIONAL, INC.

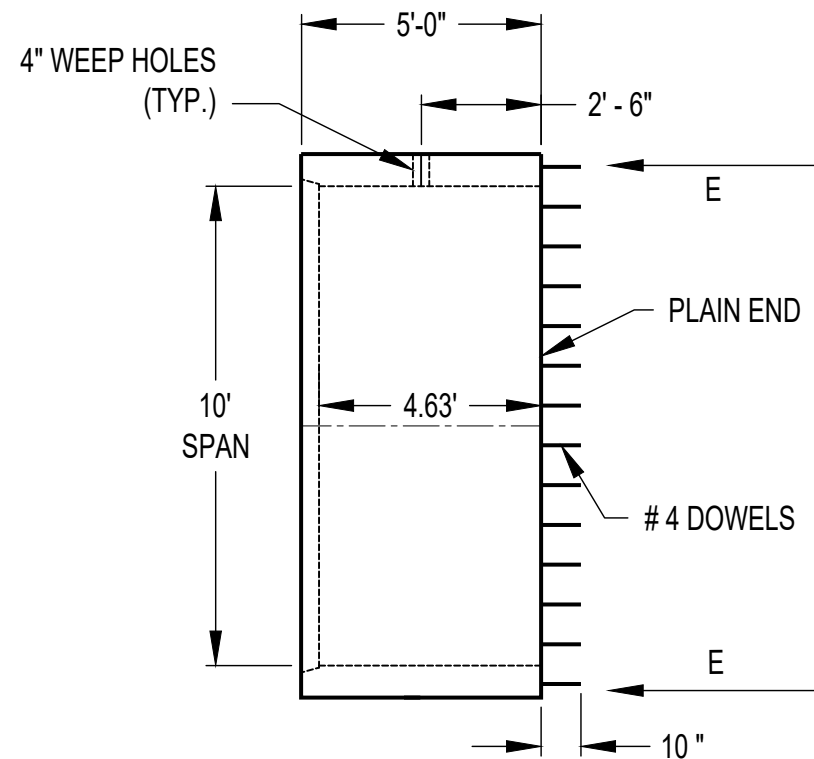
DRAWING NO.: B250-CE-1714
SHEET NO.: (SHEET 3 OF 7)
REV.: **A**



A PLAN VIEW OF BOX CULVERT P10



A PLAN VIEW OF BOX CULVERT P11



A PLAN VIEW OF BOX CULVERT P12

A NOTES:

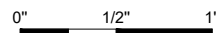
- SEE SHEET 6 FOR ADDITIONAL INFORMATION ON EXPOSED REINFORCEMENT FOR PIECES P10 - P12.
- FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN TOP SLAB FOR EACH RCB SECTION.



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DRAWN BY: T.GRAY T.G.

DATE: FEB. 12, 2024

CHECKED BY: T.HICKS

10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO: MICHAEL BAKER INTERNATIONAL, INC.

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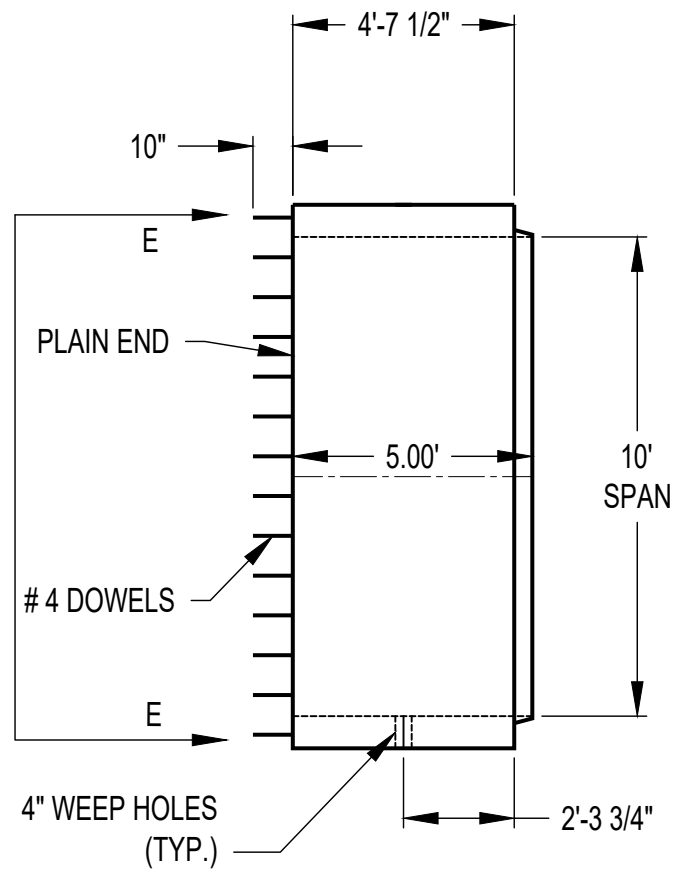
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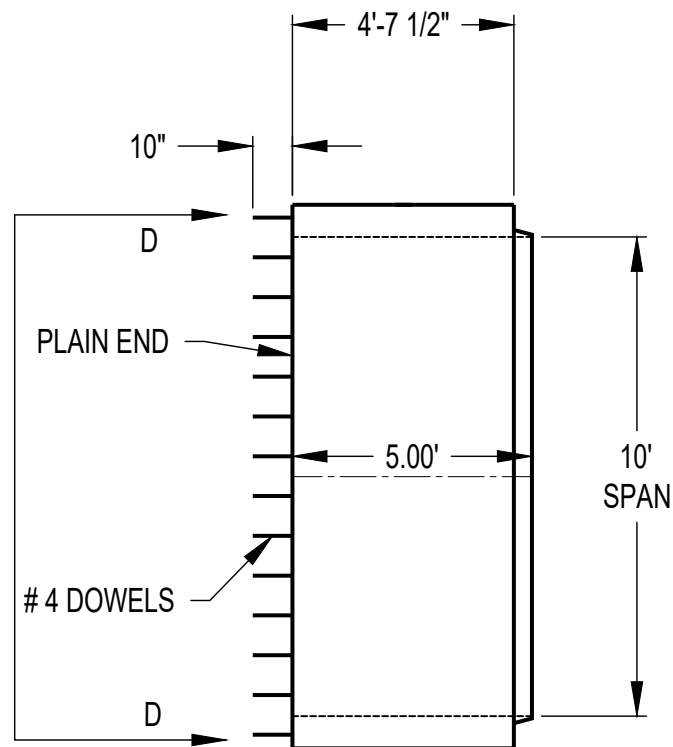
(SHEET 4 OF 7)

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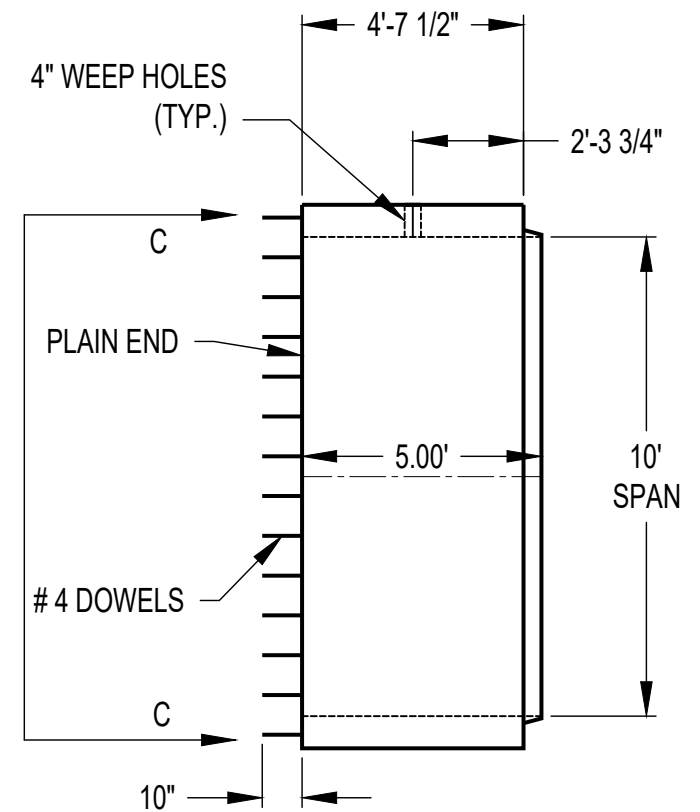




△ PLAN VIEW OF BOX CULVERT P13



△ PLAN VIEW OF BOX CULVERT P14



△ PLAN VIEW OF BOX CULVERT P15

△ NOTES:

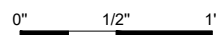
- SEE SHEET 6 FOR ADDITIONAL INFORMATION ON EXPOSED REINFORCEMENT FOR PIECES P13 - P15.
- FOUR (4) 2" DIAMETER LIFT HOLES PROVIDED IN TOP SLAB FOR EACH RCB SECTION.



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FOR APPROVAL

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TG 03.20.24

REV. NO.:

DESCRIPTION:

BY:

DATE:

REVISIONS

DRAWN BY: T.GRAY T.G

DATE: FEB. 12, 2024

CHECKED BY: T.HICKS

10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO: MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.:

B250-CE-1714

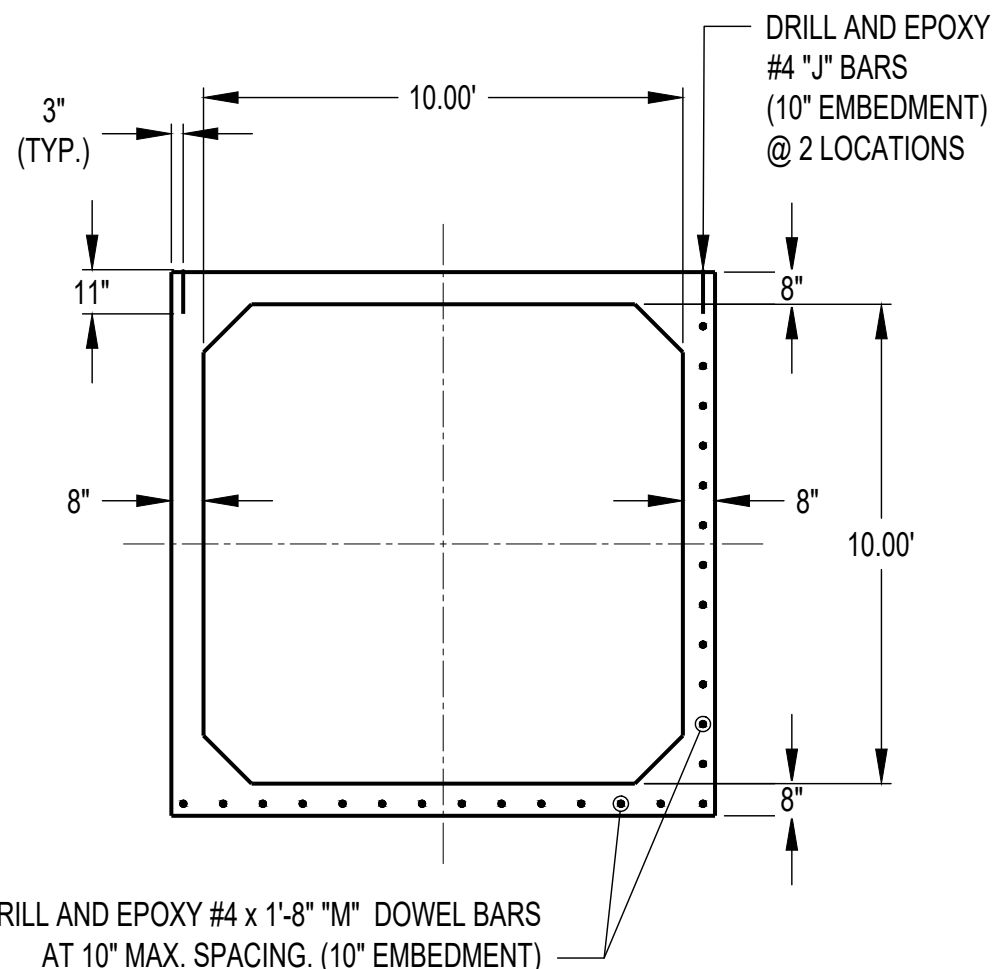
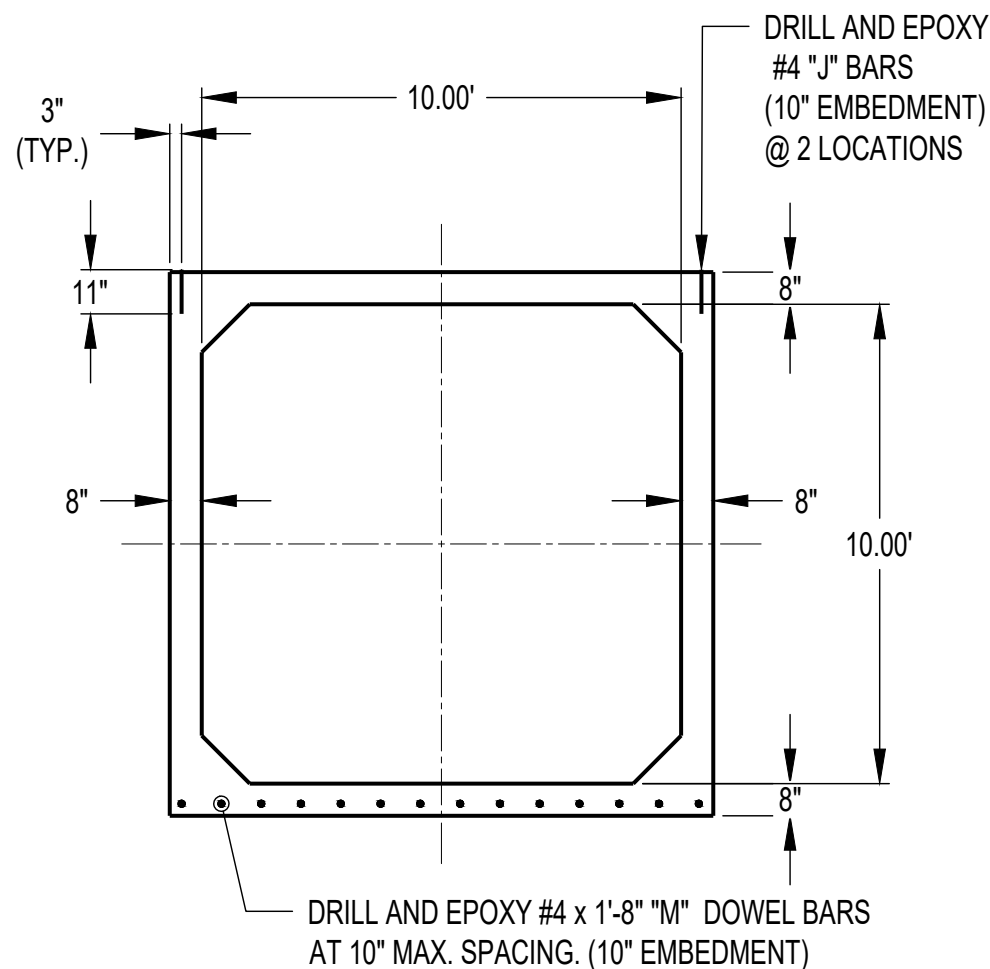
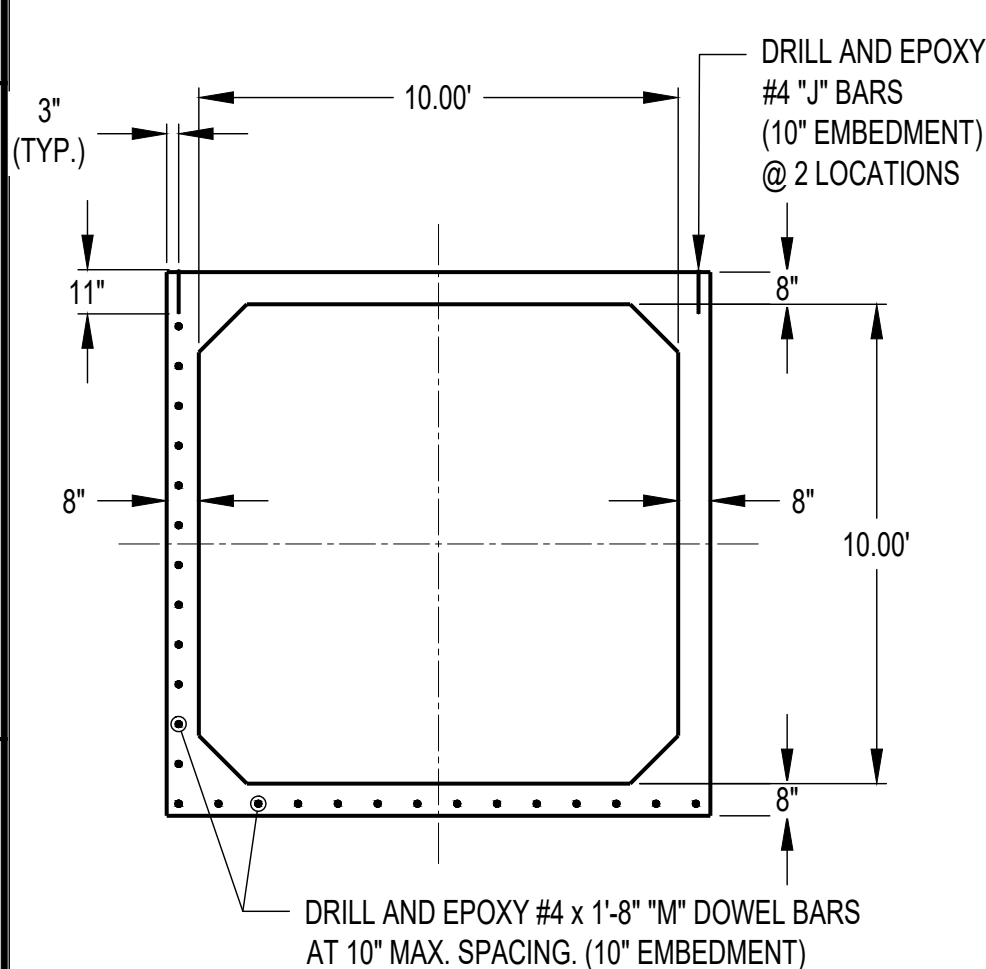
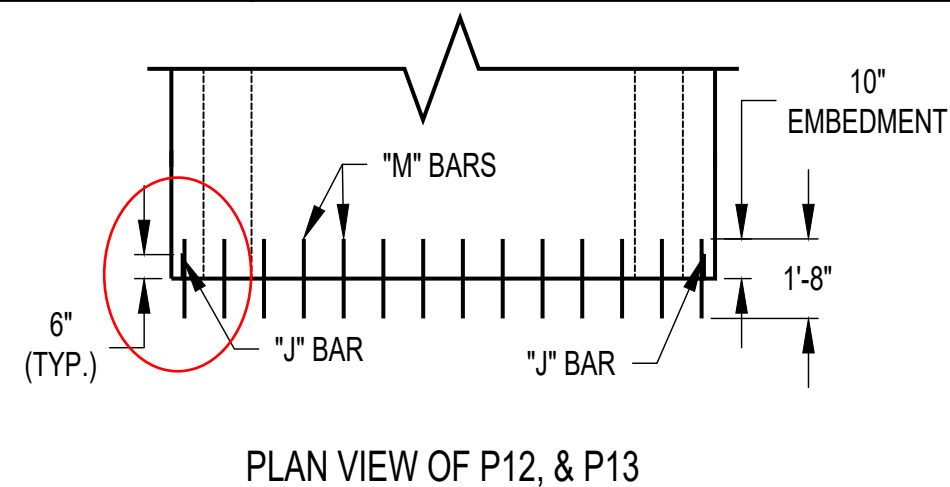
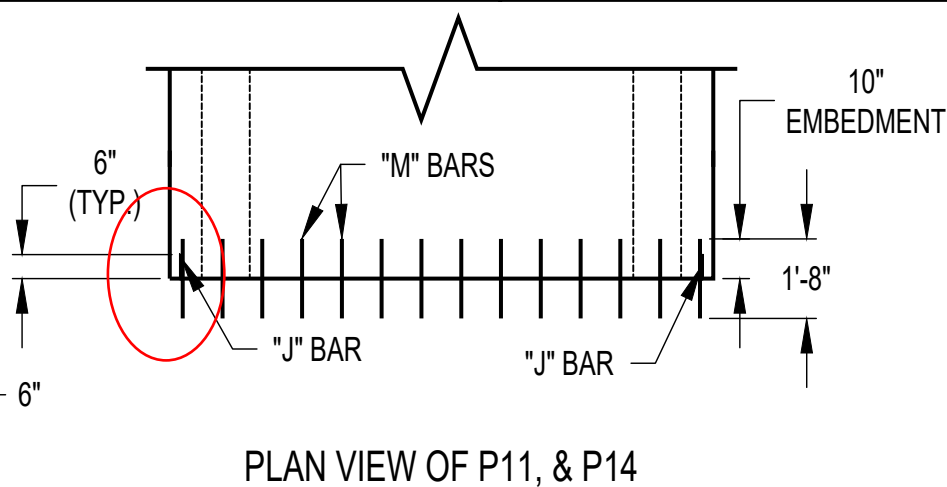
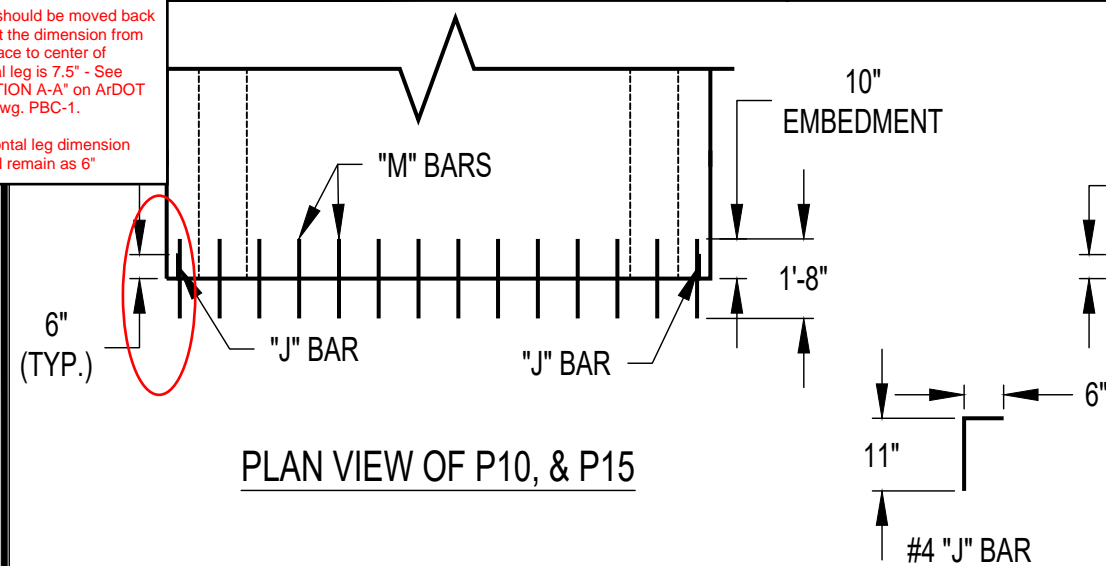
SHEET NO.:

(SHEET 5 OF 7)

REV.:



Horizontal leg dimension should remain as 6"



VIEW C - C
END VIEW OF P10, & P15



VIEW D - D
END VIEW OF P11, & P14

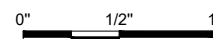


VIEW E - E
END VIEW OF P12, & P13





FOR APPROVAL

SCALE: N.T.S.



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REVISIONS			
DRAWN BY: T.GRAY <i>T.G</i>		DATE: FEB. 12, 2024	
CHECKED BY: T.HICKS 			

10' x 10' RCB
PIECE DETAILS

PROJECT:	ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION:	PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO.	MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.:
B250-CE-1714

SHEET NO.:
(SHEET 6 OF 7)



C

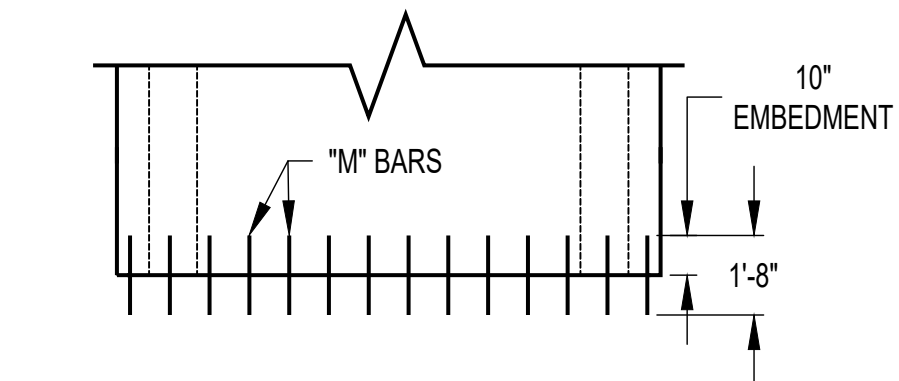
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A

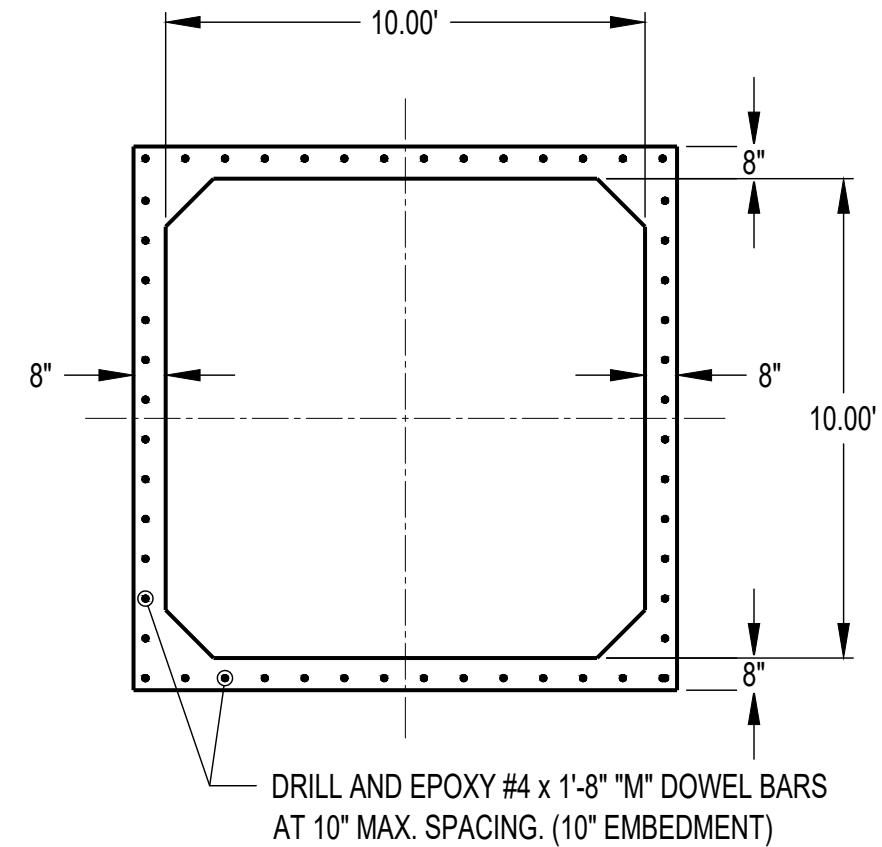
C

B

A



A PLAN VIEW OF P2, P3, P4, P5, P6 & P7



A VIEW F - F
END VIEW OF P2, P3, P4, P5, P6 & P7

501 EAST JEFFERSON AVE.
WEST MEMPHIS, AR 72301
PHONE #: 870-735-5514

FOR APPROVAL

SCALE: N. T. S.

0" 1/2" 1"

SCALE VERIFICATION
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A	UPDATED PER ENGR. COMMENTS DATED 03.20.2024	TG	03.20.24
REVISIONS			
DRAWN BY: T.GRAY T.G		DATE: FEB. 12, 2024	
CHECKED BY: T.HICKS			

10' x 10' RCB
PIECE DETAILS

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER INFO. MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.: B250-CE-1714
SHEET NO.: (SHEET 7 OF 7)

REV.: **A**

C

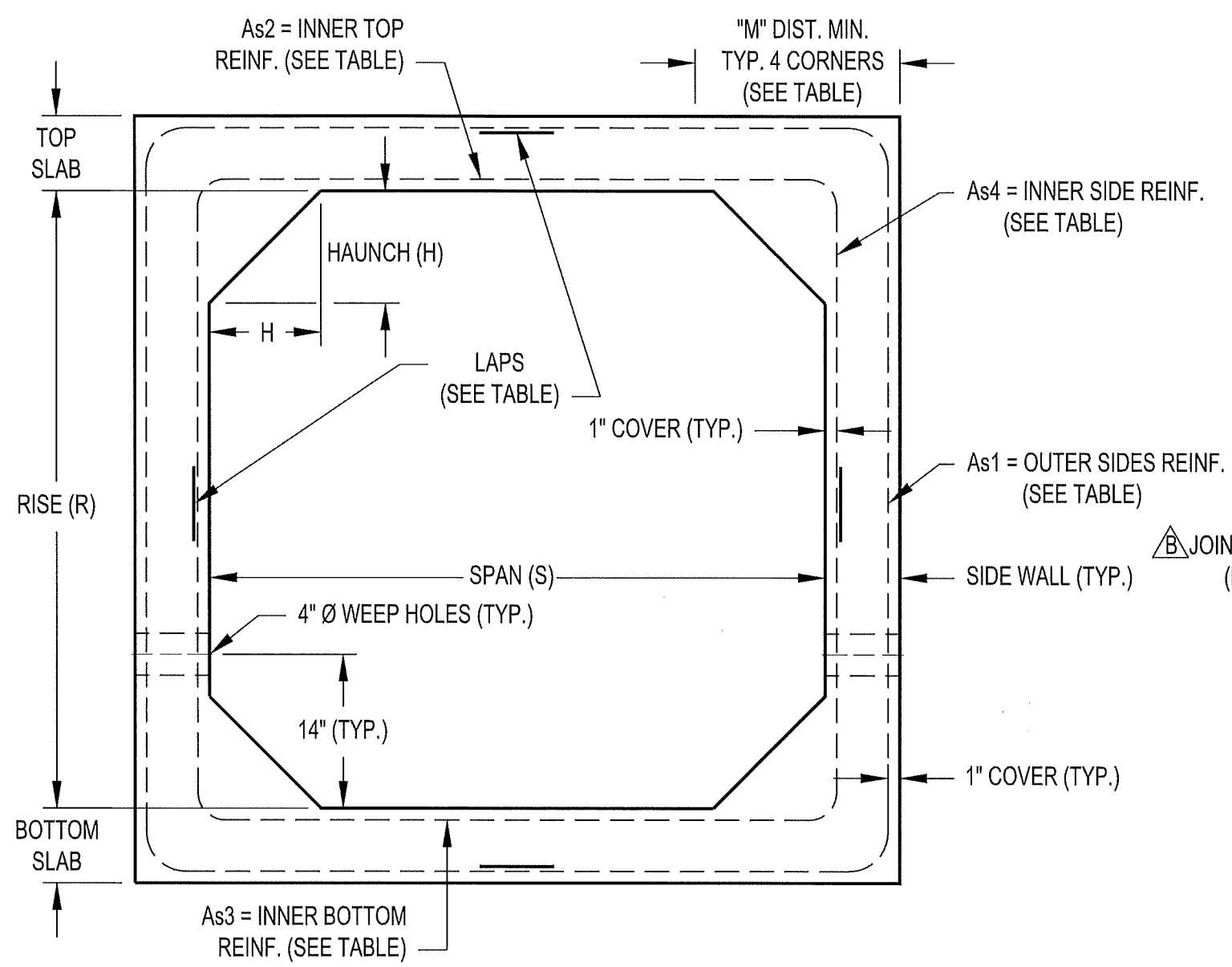
B

A

C

B

A



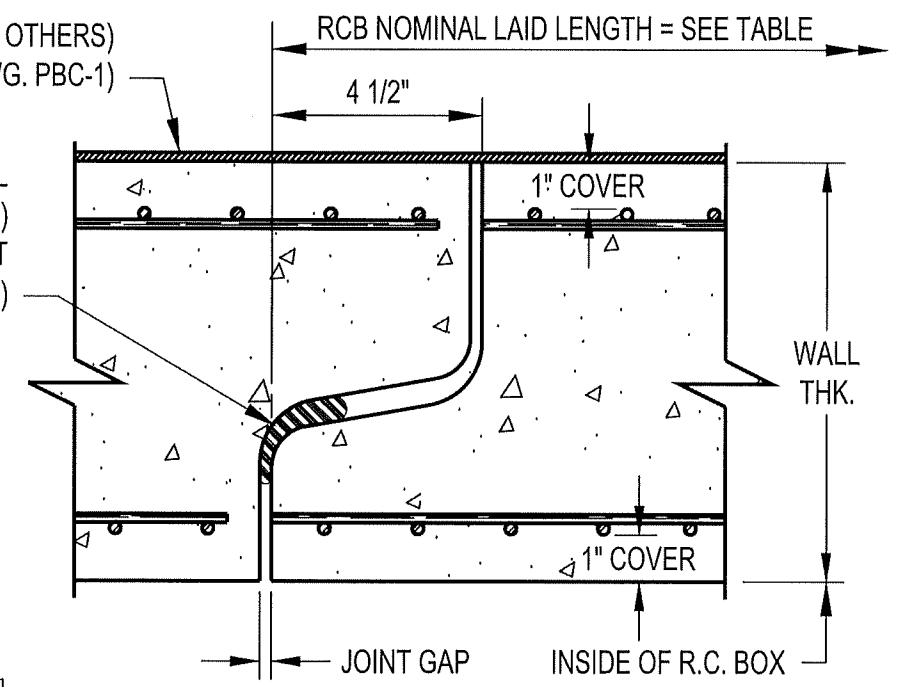
TYPICAL BOX SECTION

NOTES:

- 1) DESIGNED IN ACCORDANCE WITH AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (FIFTH EDITION WITH 2010 INTERIM REVISIONS) AND TO BE MANUFACTURED IN ACCORDANCE WITH ASTM C1577 (LATEST EDITION).
- 2) LIVE LOAD = HL-93 SKEWED (APPLIED PARALLEL AND PERPENDICULAR TO CULVERT SPAN).
- 3) SEE TABLE ON THIS SHEET FOR DESIGN EARTH COVER.
- 4) BOX WEIGHT BASED ON CONCRETE UNIT WEIGHT OF 150 PCF.
- 5) POSITIONING OF LONGITUDINAL REINFORCEMENT RELATIVE TO CIRCUMFERENTIAL REINFORCEMENT MAY VARY FROM THAT SHOWN PROVIDED CONCRETE COVER REQUIREMENT IS MAINTAINED.
- 6) THE "M" DISTANCE IS DEFINED AS THE PROJECTION OF As1 INTO THE OUTER TOP AND BOTTOM SLABS TO THE LOCATION OF ZERO MOMENT (REF. ASTM C1577, FIG. 1 TYPICAL BOX SECTIONS).
- 7) LAPS PER ASTM C1577, SECTION 7.4.

△ B JOINT MEMBRANE WATERPROOFING (BY OTHERS)
(REF. ARDOT SECTION 815 & STD. DWG. PBC-1)

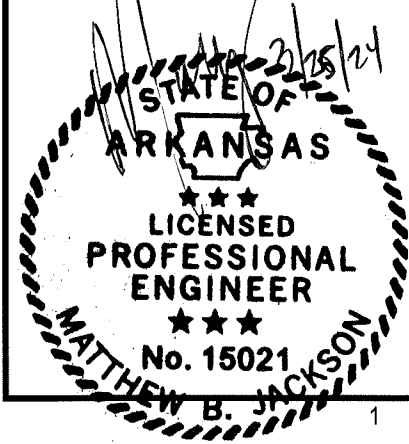
△ B PREFORMED JOINT MATERIAL
PER ASTM C990 (AASHTO M198)
SEE BIDCO C-56 DATA SHEET
(REF. ARDOT SEC. 606.02 b)



TYPICAL SECTION THRU BOX JOINT

BOX LABEL	R.C. BOX (S x R)	EARTH COVER	TOP SLAB	BOTTOM SLAB	SIDE WALL	H	As1 (MIN.) (IN ² /FT.)	As2 (MIN.) (IN ² /FT.)	As3 (MIN.) (IN ² /FT.)	As4 (MIN.) (IN ² /FT.)	"M" (MIN.) (NOTE 6)	LAP (MIN.) (NOTE 7)	LAID LENGTH (FT.)	BOX WEIGHT (SEE NOTE 5)	MIN. CONC. STRENGTH f _c	MIN. REINF. STRENGTH f _y
P	10' x 10'	3' - 10'	8"	8"	8"	12"	0.41	0.88	0.93	0.21	67"	10"	5.06'	4,567 LB./FT.	5,000 PSI	65,000 PSI

ARDOT PROJECT NO. 061467
FEDERAL AID PROJECT (FAP) NO. 9040061467
ARDOT QPL 607 / ACPA CERTIFIED MANUFACTURING PLANT:
RINKER MATERIALS WEST MEMPHIS PIPE
501 E. JEFFERSON AVE. | WEST MEMPHIS, AR 72301



Rinker
MATERIALS[®]
A QUIKRETE[®] COMPANY
501 EAST JEFFERSON AVE.
WEST MEMPHIS, AR 72301
PHONE #: 870-735-5514

FOR APPROVAL
SCALE: N. T. S.
0" 1/2" 1"
SCALE VERIFICATION
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

REV. NO.	DESCRIPTION	BY	DATE
△ B	UPDATED PER ENGR. COMMENTS DATED 03.13.24	TH	03.19.24
△ A	UPDATED REINFORCEMENT AREAS	TH	02.27.24

DRAWN BY: T. HICKS
CHECKED BY: N. FANGTANG

DATE: JAN. 30, 2024

R.C. BOX JOINT & REINFORCEMENT DETAIL FOR
10'(S) x 10'(R) PER AASHTO & ASTM C1577

PROJECT: ARDOT HWY. 63 & HWY. 70 STRS. & APPRS.
LOCATION: PRAIRIE COUNTY, ARKANSAS
ENGINEER: MICHAEL BAKER INTERNATIONAL, INC.

DRAWING NO.: B150-CE-4274
SHEET NO.:
REV.: △ B

CULVERT PROPERTIES

=====
Type of Culvert: Precast
Operating Mode : Analysis
Specification : LRFD 5th Edition 2010

Physical Dimensions

No. of Boxes: 1 Name: BoxCulvert
Clear Span : 10.0000 ft
Clear Height: 10.0000 ft Skew Angle : 0.00 deg
Length : 5.0000 ft Bottom Slab Support: Full Slab
Fill Depth Range: Maximum : 5.00 ft Minimum : 3.00 ft Increment : 1.00 ft
Haunches: Top, Length: 12.0000 in Height: 12.0000 in
 Bottom, Length: 12.0000 in Height: 12.0000 in
Member Thicknesses: Top Slab: 8.0000 in Bot Slab: 8.0000 in
 Ext Wall: 8.0000 in
Wall Joint: None

Material Properties

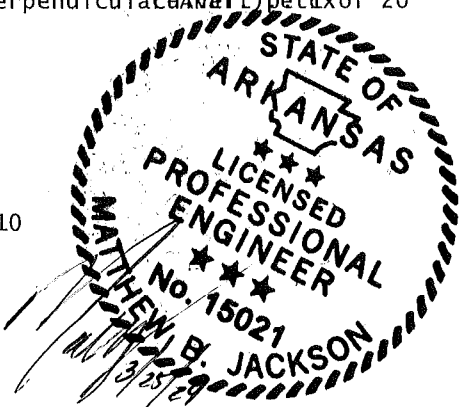
Concrete: Strength, f'c : 5.000 ksi Density : 0.150 kcf Elasticity, Ec: 4287 ksi
 Type : Normal Weight
 Fr Factor : 0.37
Steel: Yield, fy : 65.00 ksi fss Limit : 1.00fy Elasticity, Es: 29000 ksi
 Yield, fyv : 60.00 ksi Diameter : 1.000 in Type : Mesh
Soil: Density : 0.120 kcf Slope Factor: 1.150 (User Defined)
 Poisson's : 0.5
 Fe Factor : 1.150 (Maximum for Compacted Fill)
Serviceability, Gamma-e: 0.75

Loads

Live Load: Vehicle: (AA) HL-93 - Design Vehicle
 Axle No. Weight(k) Dist. From Previous(ft)
 1 8.00 0.00
 2 32.00 14.00
 3 32.00 14.00
 Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length: 10.00 in
 Include Tandem: yes
 Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00 ft
 Lane Load: 0.00 klf, P-Moment: 0.00 k, P-Shear: 0.00 k
 Combine: Truck + Lane Or Tandem + Lane
 Inventory Rating Load Factor: 1.75 Operating Rating Load Factor: 1.35
 Design Load Combinations: Strength I
 Override MPF: no
 Override DLA: no
 Include Lane Load : no Max. No. of Lanes: Computed by Program
 Traffic Direction : Lanes Perpendicular to Main Reinforcement
 Neglect Live Load for Large Fill Depths: no
 Apply Surcharge at Fill Depths > 2 ft : yes
 Compute Surcharge Depth: yes
Dead Load: Future Wearing Surface : 0.00 klf Add. Dead Load : 0.00 klf
 Concentrated Loads : none
Lateral Soil Loads: Max. Equiv. Fluid Press.: 60.00 pcf Min. Equiv. Fluid Press. : 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check : no
Fluid Pressures : Apply Water Press. : yes, interior only
 Interior Pressure Head : 0.00 ft
Foundation Model : Uniform Loads
Seismic Analysis : Do not include

Load and Resistance Factors

Max Min
DC: 1.250 0.900
DW: 1.500 0.650
EV: 1.300 0.900
EH: 1.350 0.900
WA: 1.000
EQ: 1.000
LL I : 1.750 LL II : 1.350 LL Legal : 1.750 LL Extreme : 0.500
Ductility: 1.000 Importance: 1.000 Redundancy, non-earth: 1.000 Redundancy, earth: 1.050
Condition: 1.000 System : 1.000
Phi Shear: 0.900 Phi Moment: 1.000 PM Compression: 0.750 PM Tension : 1.000



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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Perpendicular Culvert)pet2xof 20

Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

Sht: ___ of ___
By:TH | MJ Chk: ___
3/25/2024 5:23:58 PM

Reinforcement

Reinforcement Covers	Exterior	Interior
Top Slab:	1.0000 in	1.0000 in
Walls:	1.0000 in	1.0000 in
Bot Slab:	1.0000 in	1.0000 in

Assigned reinforcement	Location	Mark	Size	Spacing (in)	# of Layers
Top Slab Inside	A100	(AS2)	w29.34	4.0000	1
Bottom Slab Inside	A200	(AS3)	w31	4.0000	1
Top Slab Outside	A300	(AS7)	w6.4	4.0000	1
Bottom Slab Outside	A400	(AS8)	w6.4	4.0000	1
Top Corner	A1	(AS1)	w13.5	4.0000	1
Bottom Corner	A2	(AS1)	w13.5	4.0000	1
Ext. Wall Inside	B1	(AS4)	w7	4.0000	1
Ext. Wall Outside	B2	(AS1)	w13.5	4.0000	1
Longitudinal	C1	(AS6)	None	8.0000	1
Top Distribution	C100	(AS5)	None	8.0000	1
Bottom Distribution	C200		None	8.0000	1

Analysis Options

LL Analysis : Automatically Set Traffic Direction to Account for Skew Effects: no
Limit LL Distribution width to Culvert Length for: Fills < 2 ft
Combine Longitudinal Axle Distribution Overlaps: yes
Combine Transverse Axle Distribution Overlaps: yes
Axle Placement Increment for Moving Load Analysis: 20
Include Impact on Bottom Slab: yes
Always Distribute Wheel Load: yes
Deflection Criteria : 1/800
Approach Slab will be Used: no

Reinforcement : Always Include Distribution Steel: no
Distribution Slab Provided: no
User Defined Longitudinal Steel: yes
Max. AS used in Vc Calcs: 2.00 in²/ft
Distribute Minimum Reinforcement per Face: yes
Use individual Member Thicknesses for Min Steel: yes
Epoxy coat steel: no
Use M-dimension for bar length calcs.: yes

Slenderness : Not Checked

Analysis Modeling : Use Haunches in the Structural Analysis Model: yes

Critical Sections : Flexure critical section location: end of haunch
Shear critical section location: dv beyond haunch
Use Max. Moment with Max. Shear at the Critical Section for Shear: no
Include depth of haunch for critical sections: no

Flexure : Ignore Axial Thrust: no
Use Eq. 12.10.4.2.4a-1: yes Nu Multiplier: 1.00

Shear : Always Check Iterative Beta Method

Environmental : Apply durability factors: no

Load Combinations : LRFD min/min: no

ANALYSIS RESULTS
=====

Top Slab Thickness = 8.00 in
Bottom Slab Thickness = 8.00 in
Exterior Wall Thickness = 8.00 in

Modular Ratio (N) = 6.76 Max. Steel Ratio = 0.022
Design Span = 10.67 ft Design Height = 10.67 ft

Volume of Concrete: 1.128 cy/ft

Note: Design and analysis results do not include force effects from stripping and handling stages

M dimension = 2' 4" (method of equivalent capacity)
= 5' 3" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Mat Mark	Sheets Included	Layers	As,prv (in2/ft)
Top Slab (int)	A100 (AS2)	Top	1	0.880
Bot Slab (int)	A200 (AS3)	Bot	1	0.930
Top Slab (ext)	A300 (AS7)	Top	1	0.192
Bot Slab (ext)	A400 (AS8)	Bot	1	0.192
Corner Top-U	A1 (AS1)	Top	1	0.405
Corner Bottom-U	A2 (AS1)	Bot	1	0.405
Ext Wall (int)	B1 (AS4)	L&R	1	0.210
Ext Wall (ext)	B2 (AS1)	L&R	1	0.405
Top Slab (int- 1)	C100 (AS5)	Top	1	0.000
Bot slab (int- 1)	C200	Bot	1	0.000
Temperature (1)	C1 (AS6)	Top	1	0.000
Temperature (1)	C1 (AS6)	Bot	1	0.000
Temperature (1)	C1 (AS6)	L&R	1	0.000
Temperature (1)	C1 (AS6)	L&R	1	0.000

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.405
Transverse Top Slab - Inside Face (AS2)	0.880
Transverse Bottom Slab - Inside Face (AS3)	0.930
Transverse Side Wall - Inside Face (AS4)	0.210
Distribution Top Slab - Inside Face (AS5)	0.000
Distribution Top Slab - Outside Face (AS6)	0.000
Transverse Top Slab - Outside Face (AS7)	0.192
Transverse Bottom Slab - Outside Face (AS8)	0.192

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Sheet Inventory

Interior sheets - 4 sheet layout with no laps

Sheet Loc.	Mat Mark	Zone	Size	Spac. (in)	Length (ft-in)	Area (in2/ft)	H leg (ft-in)	V leg (ft-in)	Mat Mark	Size	Spac. (in)	Area (in2/ft)	Wgt (lbs)
Top	A100	Base	w29.34	4.00	10- 6	0.880							158
(1) sheets, Total weight:													158
L&R	B1	Base	w7	4.00	10- 6	0.210		10- 6					38
(1) sheets, Total weight:													38
Bot	A200	Base	w31	4.00	10- 6	0.930							167
(1) sheets, Total weight:													167

Exterior sheets - 4 sheet layout with laps located in the slab

Sheet Loc.	Mat Mark	Zone	Size	Spac. (in)	Length (ft-in)	Area (in2/ft)	H leg (ft-in)	V leg (ft-in)	Mat Mark	Size	Spac. (in)	Area (in2/ft)	Wgt (lbs)
Top	A300	Base	w6.4	4.00	11- 2	0.192							37
(1) sheets, Total weight:													37
L&R	B2	Base	w13.5	4.00	15-10	0.405	2- 4	11- 2					110
	A1	Base	w13.5	4.00	15-10	0.405	2- 4	11- 2					-----
	A2	Base	w13.5	4.00	15-10	0.405	2- 4	11- 2					-----

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Perpendicular Culvert)pet 4 of 20

Sht: _____ of _____
By: TH | MJ Chk: _____
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(2) sheets, Total weight: 220

Bot A400 Base W6.4 4.00 11- 2 0.192

(1) sheets, Total weight: 37

Weight of Steel: 131 lb/ft

Total weight of all sheets: 657

Notes:

Epoxy coating may be needed for A1, A300, and some C1 reinforcement, check with governing agency.
 L&R - left and right, TC - top corner, BC - bottom corner, INT - interior walls, EXT - exterior walls
 Nested line wires are additive to the base line wires, but nested cross wires replace base cross wires.
 Adder sheets may require cross wires, check with mesh supplier.

Summary of Ratings Table:

Truck	Flexure					Shear				
	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR
(AA) HL-93	3.00	1	BOT	1.44	1.86	3.00	2	LT	2.11	2.74

Critical Sections Summary: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
BOT	16.00	-14.03	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.44	1.86	AA	3.00
MID	64.00	5.96	2.33	7.64	6.85	8.36	1.00	0.21	10.59	2.02	2.62	AA	3.00
MID-	64.00	-11.90	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.71	2.22	AA	3.00
TOP	16.00	-12.74	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.64	2.13	AA	3.00

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
LT	16.00	-6.68	4.45	14.34	6.79	15.61	1.00	0.41	10.59	3.61	4.68	AA	3.00
MID	64.00	18.99	0.44	29.24	6.69	29.35	1.00	0.88	10.59	1.76	2.28	AA	3.00
MID-	64.00	-1.33	4.36	7.00	6.86	8.35	1.00	0.19	10.59	5.58	7.23	AA	3.00
RT	16.00	-6.69	4.45	14.34	6.79	15.61	1.00	0.41	10.59	3.61	4.68	AA	3.00

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
LT	16.00	-6.88	7.31	14.34	6.79	16.41	1.00	0.41	10.59	7.09	9.19	AA	5.00
MID	64.00	20.12	0.88	30.69	6.69	30.90	1.00	0.93	10.59	1.81	2.35	AA	3.00
MID-	64.00	-0.72	6.38	7.00	6.86	8.97	1.00	0.19	10.59	6.33	8.20	AA	3.00
RT	16.00	-6.88	7.31	14.34	6.79	16.41	1.00	0.41	10.59	7.09	9.19	AA	5.00

Critical Sections Summary: Vertical Shear

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings		Truck	Fill Depth (ft)
												IR	OR		
BOT	21.85	4.53	11.4	10.14	6.53	10.29	2.064	11.43	a	0.00	0.00	7.09	9.19	AA	5.00
MID	64.00	0.43	6.0	2.33	6.72	10.49	2.046	11.66	a	0.00	0.00	63.05	81.73	AA	3.00
MID-	64.00	0.29	11.5	12.67	6.53	11.31	2.267	12.56	a	0.00	0.00	69.42	89.99	AA	3.00
TOP	21.85	-3.73	9.9	10.14	6.53	11.17	2.239	12.41	a	0.00	0.00	8.38	10.86	AA	5.00

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings		Truck	Fill Depth (ft)
												IR	OR		
LT	21.85	8.55	6.5	4.45	6.79	15.55	n/a	17.28	c	0.00	0.00	2.11	2.74	AA	3.00
MID	64.00	2.38	19.0	0.44	6.69	15.33	n/a	17.03	c	0.00	0.00	6.43	8.34	AA	3.00
MID-	64.00	2.38	1.3	4.36	6.86	17.93	3.426	19.92	a	0.00	0.00	7.53	9.76	AA	3.00
RT	21.85	8.55	6.5	4.45	6.79	15.55	n/a	17.28	c	0.00	0.00	2.11	2.74	AA	3.00

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings		Truck	Fill Depth (ft)
												IR	OR		
LT	21.85	8.63	5.0	6.60	6.79	15.55	n/a	17.28	c	0.00	0.00	2.28	2.96	AA	3.00
MID	64.00	0.08	20.1	0.88	6.69	15.31	n/a	17.01	c	0.00	0.00	NC	NC	AA	3.00
MID-	64.00	0.08	0.0	6.38	6.86	20.87	5.117	23.18	a	0.00	0.00	NC	NC	AA	3.00
RT	21.85	8.63	5.0	6.60	6.79	15.55	n/a	17.28	c	0.00	0.00	2.28	2.96	AA	3.00

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Perpendicular Culvert)pet6xof 20

Sht: ____ of ____

By:TH | MJ Chk: ____

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Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Analysis Results: Fill Depth = 3.00 ft

Load Parameters:

Fe = 1.05 Surcharge Depth : 2.57 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of wall	Top of wall
Live Load Surcharge	0.154	0.154
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	0.840	0.200

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	0.379
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior wall)							
Bottom							
1- 0	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00
1- 1	-1.96	-2.08	0.00	0.12	-0.06	-0.19	0.00
1- 2	-1.77	-2.08	0.00	2.37	0.55	-1.62	0.00
1- 3	-1.57	-2.08	0.00	3.81	0.99	-2.47	0.00
1- 4	-1.37	-2.08	0.00	4.52	1.26	-2.82	0.00
1- 5	-1.18	-2.08	0.00	4.56	1.34	-2.74	0.00
1- 6	-0.98	-2.08	0.00	4.01	1.26	-2.30	0.00
1- 7	-0.79	-2.08	0.00	2.94	0.99	-1.58	0.00
1- 8	-0.59	-2.08	0.00	1.42	0.55	-0.66	0.00
1- 9	-0.40	-2.08	0.00	-0.47	-0.06	0.40	0.00
1-10	-0.20	-2.08	0.00	-2.66	-0.85	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

M-PT	Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
Member 1: (Exterior wall)							
Bottom							
1- 0	0.18	0.00	0.00	3.37	0.82	-2.08	0.00
1- 1	0.18	0.00	0.00	2.51	0.66	-1.64	0.00
1- 2	0.18	0.00	0.00	1.72	0.49	-1.05	0.00
1- 3	0.18	0.00	0.00	0.99	0.33	-0.54	0.00
1- 4	0.18	0.00	0.00	0.33	0.16	-0.11	0.00
1- 5	0.18	0.00	0.00	-0.26	0.00	0.26	0.00
1- 6	0.18	0.00	0.00	-0.78	-0.16	0.56	0.00
1- 7	0.18	0.00	0.00	-1.23	-0.33	0.79	0.00
1- 8	0.18	0.00	0.00	-1.61	-0.49	0.94	0.00
1- 9	0.18	0.00	0.00	-1.93	-0.66	1.03	0.00
1-10	0.18	0.00	0.00	-2.18	-0.82	1.04	0.00
Top							

Member 2: (Top Slab)

Left														
2- 0	-0.20	-2.08	0.00	-2.71	-0.85	1.55	0.00	0.66	2.02	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.14	0.00	-2.71	-0.85	1.55	0.00	0.43	1.62	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	1.37	0.00	-2.71	-0.85	1.55	0.00	0.32	1.21	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	2.44	0.00	-2.71	-0.85	1.55	0.00	0.21	0.81	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	3.09	0.00	-2.71	-0.85	1.55	0.00	0.11	0.40	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	3.31	0.00	-2.71	-0.85	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	3.09	0.00	-2.71	-0.85	1.55	0.00	-0.11	-0.40	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	2.44	0.00	-2.71	-0.85	1.55	0.00	-0.21	-0.81	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	1.37	0.00	-2.71	-0.85	1.55	0.00	-0.32	-1.21	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.14	0.00	-2.71	-0.85	1.55	0.00	-0.43	-1.62	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-2.08	0.00	-2.71	-0.85	1.55	0.00	-0.66	-2.02	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom Slab)

Left														
4- 0	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00	1.73	2.02	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.14	0.00	-3.01	-0.85	1.86	0.00	1.38	1.62	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	1.37	0.00	-3.01	-0.85	1.86	0.00	1.04	1.21	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	2.44	0.00	-3.01	-0.85	1.86	0.00	0.69	0.81	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	3.09	0.00	-3.01	-0.85	1.86	0.00	0.34	0.40	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	3.31	0.00	-3.01	-0.85	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	3.09	0.00	-3.01	-0.85	1.86	0.00	-0.35	-0.40	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	2.44	0.00	-3.01	-0.85	1.86	0.00	-0.69	-0.81	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	1.37	0.00	-3.01	-0.85	1.86	0.00	-1.04	-1.21	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.14	0.00	-3.01	-0.85	1.86	0.00	-1.38	-1.62	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00	-1.73	-2.02	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 3.00 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	2.02	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	2.18	0.82	-1.04
4	0.18	0.00	0.00	3.37	0.82	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	1.057	5.12	
	2	1.057	5.12	6.00

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Traffic Direction is Perpendicular to Main Reinforcement

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Distribution Width : 4.28 ft
Impact Factor      : 1.21
Truck MPF          : 1.20      Tandem MPF          : 1.20
Lane Load Distribution Width : 0.00 ft
Lane Load: 0.000 k/ft

```

Maximum +Moment in Top Slab				
Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	1.057	5.12	7.07
	2	1.057	5.12	1.07
Maximum +Moment			:	7.80 k-ft
Corresponding Moment at End			:	-5.03 k-ft
Coincident Bottom Slab Load			:	0.87 k/ft

Maximum +Shear in Top Slab			
Truck	1	1.057	5.12
	2	1.057	5.12
Maximum +Shear			5.19 k
Corresponding Shear at Mid			-0.22 k
Coincident Bottom Slab Load			0.97 k/ft

Maximum +Moment in Top Slab			
Tandem	1	0.854	5.12
	2	0.854	5.12
Maximum +Moment	:		6.30 k-ft
Corresponding Moment at End	:		-4.06 k-ft
Coincident Bottom Slab Load	:		0.70 k/ft

Maximum +Shear in Top Slab			
Tandem	1	0.854	5.12
	2	0.854	5.12
Maximum +Shear			4.19 k
Corresponding Shear at Mid			-0.18 k
Coincident Bottom Slab Load			0.78 k/ft

Maximum -Moment in Top Slab				
Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	1.057	5.12	9.20
	2	1.057	5.12	3.20
Maximum -Moment			:	-5.09 k-ft
Corresponding Moment at Mid			:	7.77 k-ft
Coincident Bottom Slab Load			:	0.91 k/ft

Maximum -Shear in Top Slab			
Truck	1	1.057	5.12
	2	1.057	5.12
Maximum -Shear			-5.19 k
Corresponding Shear at Mid			0.22 k
Coincident Bottom Slab Load			0.97 k/ft

Maximum -Moment in Top Slab			
Tandem	1	0.854	5.12
	2	0.854	5.12
Maximum -Moment			-4.11 k-ft
Corresponding Moment at Mid			6.28 k-ft
Coincident Bottom Slab Load			0.73 k/ft

Maximum -Shear in Top Slab			
Tandem	1	0.854	5.12
	2	0.854	5.12
Maximum -Shear			-4.19 k
Corresponding Shear at Mid			0.18 k
Coincident Bottom Slab Load			0.78 k/ft

M-PT	M11+	Truck M11-	V11+	V11-	M11+	Tandem M11-	V11+	V11-	M11+	Lane M11-	V11+	V11-
Member 1: (Exterior wall)												
Bottom												
1- 0	0.00	-5.26	0.09	-0.09	0.00	-4.38	0.07	-0.07	0.00	0.00	0.00	0.00
1- 1	0.00	-5.09	0.09	-0.09	0.00	-4.34	0.07	-0.07	0.00	0.00	0.00	0.00
1- 2	0.00	-4.94	0.09	-0.09	0.00	-4.31	0.07	-0.07	0.00	0.00	0.00	0.00
1- 3	0.00	-4.79	0.09	-0.09	0.00	-4.28	0.07	-0.07	0.00	0.00	0.00	0.00
1- 4	0.00	-4.79	0.09	-0.09	0.00	-4.24	0.07	-0.07	0.00	0.00	0.00	0.00
1- 5	0.00	-4.80	0.09	-0.09	0.00	-4.21	0.07	-0.07	0.00	0.00	0.00	0.00
1- 6	0.00	-4.80	0.09	-0.09	0.00	-4.18	0.07	-0.07	0.00	0.00	0.00	0.00
1- 7	0.00	-4.96	0.09	-0.09	0.00	-4.15	0.07	-0.07	0.00	0.00	0.00	0.00
1- 8	0.00	-5.09	0.09	-0.09	0.00	-4.11	0.07	-0.07	0.00	0.00	0.00	0.00
1- 9	0.01	-5.08	0.09	-0.09	0.01	-4.11	0.07	-0.07	0.00	0.00	0.00	0.00
1-10	0.05	-5.09	0.09	-0.09	0.04	-4.11	0.07	-0.07	0.00	0.00	0.00	0.00
Top												

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Member 4: (Bottom Slab)

Left												
4- 0	0.00	-5.26	4.66	0.00	0.00	-4.38	4.18	0.00	0.00	0.00	0.00	0.00
4- 1	0.16	-0.45	3.74	0.00	0.13	-0.37	3.34	0.00	0.00	0.00	0.00	0.00
4- 2	3.14	0.00	2.81	0.00	2.76	0.00	2.51	0.00	0.00	0.00	0.00	0.00
4- 3	5.61	0.00	1.88	0.00	4.99	0.00	1.67	0.00	0.00	0.00	0.00	0.00
4- 4	7.09	0.00	0.96	0.00	6.32	0.00	0.84	0.00	0.00	0.00	0.00	0.00
4- 5	7.59	0.00	0.05	-0.05	6.77	0.00	0.04	-0.04	0.00	0.00	0.00	0.00
4- 6	7.09	0.00	0.00	-0.96	6.32	0.00	0.00	-0.84	0.00	0.00	0.00	0.00
4- 7	5.61	0.00	0.00	-1.88	4.99	0.00	0.00	-1.67	0.00	0.00	0.00	0.00
4- 8	3.14	0.00	0.00	-2.81	2.76	0.00	0.00	-2.51	0.00	0.00	0.00	0.00
4- 9	0.16	-0.45	0.00	-3.74	0.13	-0.37	0.00	-3.34	0.00	0.00	0.00	0.00
4-10	0.00	-5.25	0.00	-4.66	0.00	-4.38	0.00	-4.18	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 3.00 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-8.0	7.87	27.95	4.00	12.57
A2	Bot Corner Bar	-9.3	7.87	33.83	4.00	9.96
A100	Top Slab (int)	12.6	-0.23	28.78	4.00	11.66
A200	Bot Slab (int)	13.7	-0.30	29.79	4.00	11.13
B1	Ext Wall (int)	2.6	2.68	16.68	4.00	23.09
B2	Ext Wall (ext)	-8.8	7.87	31.77	4.00	10.76

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
BOT	16.00	-14.03	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.44	1.86
MID	64.00	5.96	2.33	7.64	6.85	8.36	1.00	0.21	10.59	2.02	2.62
MID-	64.00	-11.90	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.71	2.22
TOP	16.00	-12.74	12.67	14.34	6.79	17.88	1.00	0.41	10.59	1.64	2.13

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
LT	16.00	-6.68	4.45	14.34	6.79	15.61	1.00	0.41	10.59	3.61	4.68
MID	64.00	18.99	0.44	29.24	6.69	29.35	1.00	0.88	10.59	1.76	2.28
MID-	64.00	-1.33	4.36	7.00	6.86	8.35	1.00	0.19	10.59	5.58	7.23
RT	16.00	-6.69	4.45	14.34	6.79	15.61	1.00	0.41	10.59	3.61	4.68

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
LT	16.00	-6.49	6.60	14.34	6.79	16.22	1.00	0.41	10.59	5.80	7.51
MID	64.00	20.12	0.88	30.69	6.69	30.90	1.00	0.93	10.59	1.81	2.35
MID-	64.00	-0.72	6.38	7.00	6.86	8.97	1.00	0.19	10.59	6.33	8.20
RT	16.00	-6.49	6.60	14.34	6.79	16.22	1.00	0.41	10.59	5.80	7.51

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Member 1: (external wall), thickness = 8.00 in														
Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR OR	
BOT	21.85	4.09	13.6	12.67	6.53	9.97	2.000	45.00	11.08	b	0.00	0.00	0.00	6.33 8.20
MID	64.00	0.43	6.0	2.33	6.72	10.49	2.046	38.40	11.66	a	0.00	0.00	0.00	63.05 81.73
MID-	64.00	0.29	11.5	12.67	6.53	11.31	2.267	36.86	12.56	a	0.00	0.00	0.00	69.42 89.99
TOP	21.85	-3.29	12.2	12.67	6.53	10.38	2.082	37.97	11.53	a	0.00	0.00	0.00	7.00 9.07

Member 2: (Top slab), Thickness = 8.00 in

Member 2: (top slab), thickness = 8.00 in														
Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load IR	Ratings OR
LT	21.85	8.55	6.5	4.45	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	2.11	2.74
MID	64.00	2.38	19.0	0.44	6.69	15.33	n/a	n/a	17.03 c	0.00	0.00	0.00	6.43	8.34
MID-	64.00	2.38	1.3	4.36	6.86	17.93	3.426	31.81	19.92 a	0.00	0.00	0.00	7.53	9.76
RT	21.85	8.55	6.5	4.45	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	2.11	2.74

Member 4: (Bottom Slab), Thickness = 8.00 in

Member 4: (Bottom Slab), thickness = 8.00 in														
Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings	
													IR	OR
LT	21.85	8.63	5.0	6.60	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	2.28	2.96
MID	64.00	0.08	20.1	0.88	6.69	15.31	n/a	n/a	17.01 c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.08	0.0	6.38	6.86	20.87	5.117	27.38	23.18 a	0.00	0.00	0.00	NC	NC
RT	21.85	8.63	5.0	6.60	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	2.28	2.96

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 3.00 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-6.260	-20.496	3.582	12.666	6.601	0.883
1- 1	-3.485	-14.284	2.325	12.666	5.092	0.585
1- 2	0.953	-13.285	2.325	12.666	3.680	0.486
1- 3	3.941	-12.406	2.325	12.666	2.364	0.374
1- 4	5.577	-11.901	2.325	12.666	1.145	0.250
1- 5	5.964	-11.544	2.325	12.666	0.430	-0.293
1- 6	5.207	-11.340	2.325	12.666	0.281	-1.318
1- 7	3.407	-11.570	2.325	12.666	0.120	-2.246
1- 8	0.668	-11.934	2.325	12.666	-0.054	-3.078
1- 9	-2.911	-13.005	2.325	12.666	-0.240	-3.813
1-10	-3.792	-17.261	3.582	12.666	-0.436	-4.452
Top						
Member 2: (Top Slab)						
Left						
2- 0	-3.784	-17.326	0.436	4.452	12.666	2.325
2- 1	1.723	-7.760	0.436	4.452	10.124	1.775
2- 2	8.467	-3.455	0.436	4.357	7.904	1.328
2- 3	14.734	-2.275	0.436	4.357	5.877	0.536
2- 4	18.216	-1.567	0.436	4.357	4.044	-0.820
2- 5	18.993	-1.331	0.436	4.357	2.382	-2.382
2- 6	18.224	-1.567	0.436	4.357	0.820	-4.044
2- 7	14.734	-2.275	0.436	4.357	-0.536	-5.877
2- 8	8.467	-3.455	0.436	4.357	-1.328	-7.904
2- 9	1.723	-7.762	0.436	4.452	-1.775	-10.124
2-10	-3.784	-17.315	0.436	4.452	-2.325	-12.666
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-6.260	-20.496	0.883	6.601	13.078	3.285
4- 1	-1.259	-7.368	0.883	6.601	10.474	2.628
4- 2	7.626	-3.873	0.883	6.380	7.869	1.971
4- 3	14.569	-2.121	0.883	6.380	5.265	1.314
4- 4	18.735	-1.069	0.883	6.380	2.660	0.657
4- 5	20.124	-0.719	0.883	6.380	0.079	-0.079
4- 6	18.735	-1.069	0.883	6.380	-0.657	-2.660
4- 7	14.569	-2.121	0.883	6.380	-1.314	-5.264
4- 8	7.626	-3.873	0.883	6.380	-1.971	-7.869
4- 9	-1.255	-7.368	0.883	6.601	-2.628	-10.473
4-10	-6.260	-20.478	0.883	6.601	-3.285	-13.077
Right						

Analysis Results: Fill Depth = 4.00 ft

Load Parameters:

Fe = 1.07 Surcharge Depth : 2.47 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of wall	Top of wall
Live Load Surcharge	0.148	0.148
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	0.900	0.260

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	0.514
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior wall)							
Bottom							
1- 0	-2.16	-2.83	0.00	-3.34	-0.81	1.86	0.00
1- 1	-1.96	-2.83	0.00	0.10	-0.06	-0.19	0.00
1- 2	-1.77	-2.83	0.00	2.59	0.53	-1.62	0.00
1- 3	-1.57	-2.83	0.00	4.20	0.95	-2.47	0.00
1- 4	-1.37	-2.83	0.00	5.01	1.21	-2.82	0.00
1- 5	-1.18	-2.83	0.00	5.08	1.29	-2.74	0.00
1- 6	-0.98	-2.83	0.00	4.50	1.21	-2.30	0.00
1- 7	-0.79	-2.83	0.00	3.33	0.95	-1.58	0.00
1- 8	-0.59	-2.83	0.00	1.64	0.53	-0.66	0.00
1- 9	-0.40	-2.83	0.00	-0.49	-0.06	0.40	0.00
1-10	-0.20	-2.83	0.00	-2.99	-0.81	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
0.18	0.00	0.00	3.69	0.79	-2.08	0.00
0.18	0.00	0.00	2.76	0.63	-1.64	0.00
0.18	0.00	0.00	1.91	0.47	-1.05	0.00
0.18	0.00	0.00	1.12	0.32	-0.54	0.00
0.18	0.00	0.00	0.40	0.16	-0.11	0.00
0.18	0.00	0.00	-0.26	0.00	0.26	0.00
0.18	0.00	0.00	-0.84	-0.16	0.56	0.00
0.18	0.00	0.00	-1.36	-0.32	0.79	0.00
0.18	0.00	0.00	-1.80	-0.47	0.94	0.00
0.18	0.00	0.00	-2.18	-0.63	1.03	0.00
0.18	0.00	0.00	-2.50	-0.79	1.04	0.00

Member 2: (Top slab)

Left														
2- 0	-0.20	-2.83	0.00	-3.04	-0.81	1.55	0.00	0.66	2.74	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.20	0.00	-3.04	-0.81	1.55	0.00	0.43	2.19	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	1.85	0.00	-3.04	-0.81	1.55	0.00	0.32	1.64	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	3.31	0.00	-3.04	-0.81	1.55	0.00	0.21	1.10	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	4.19	0.00	-3.04	-0.81	1.55	0.00	0.11	0.55	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	4.48	0.00	-3.04	-0.81	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	4.19	0.00	-3.04	-0.81	1.55	0.00	-0.11	-0.55	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	3.31	0.00	-3.04	-0.81	1.55	0.00	-0.21	-1.10	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	1.85	0.00	-3.04	-0.81	1.55	0.00	-0.32	-1.64	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.20	0.00	-3.04	-0.81	1.55	0.00	-0.43	-2.19	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-2.83	0.00	-3.04	-0.81	1.55	0.00	-0.66	-2.74	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom slab)

Left														
4- 0	-2.16	-2.83	0.00	-3.34	-0.81	1.86	0.00	1.73	2.74	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.20	0.00	-3.34	-0.81	1.86	0.00	1.38	2.19	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	1.85	0.00	-3.34	-0.81	1.86	0.00	1.04	1.64	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	3.31	0.00	-3.34	-0.81	1.86	0.00	0.69	1.10	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	4.19	0.00	-3.34	-0.81	1.86	0.00	0.34	0.55	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	4.48	0.00	-3.34	-0.81	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	4.19	0.00	-3.34	-0.81	1.86	0.00	-0.35	-0.55	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	3.31	0.00	-3.34	-0.81	1.86	0.00	-0.69	-1.10	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	1.85	0.00	-3.34	-0.81	1.86	0.00	-1.04	-1.64	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.20	0.00	-3.34	-0.81	1.86	0.00	-1.38	-2.19	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-2.83	0.00	-3.34	-0.81	1.86	0.00	-1.73	-2.74	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 4.00 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	2.74	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	2.50	0.79	-1.04
4	0.18	0.00	0.00	3.69	0.79	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.671	12.27	
Tandem	1	0.604	12.27	

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By: TH | MJ Chk:
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Live Load Parameters:

Traffic Direction is Perpendicular to Main Reinforcement

Distribution Width : 5.43 ft

Impact Factor : 1.17

Truck MPF : 1.20

Tandem MPF : 1.20

Lane Load Distribution Width : 0.00 ft

Lane Load: 0.000 k/ft

Truck Positions That Cause Maximum Results:

Maximum +Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.671	12.27	6.13
Maximum +Moment : 5.85 k-ft				
Corresponding Moment at End : -3.69 k-ft				
Coincident Bottom Slab Load : 0.67 k/ft				

Maximum +Shear in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.671	12.27	6.13
Maximum +Shear : 3.58 k				
Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.67 k/ft				

Maximum +Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Tandem	1	0.604	12.27	6.13
Maximum +Moment : 5.27 k-ft				
Corresponding Moment at End : -3.32 k-ft				
Coincident Bottom Slab Load : 0.60 k/ft				

Maximum +Shear in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Tandem	1	0.604	12.27	6.13
Maximum +Shear : 3.22 k				
Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.60 k/ft				

Maximum -Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.671	12.27	6.67
Maximum -Moment : -3.72 k-ft				
Corresponding Moment at Mid : 5.78 k-ft				
Coincident Bottom Slab Load : 0.64 k/ft				

Maximum -Shear in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.671	12.27	6.13
Maximum -Shear : -3.58 k				
Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.67 k/ft				

Maximum -Moment in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Tandem	1	0.604	12.27	6.67
Maximum -Moment : -3.35 k-ft				
Corresponding Moment at Mid : 5.20 k-ft				
Coincident Bottom Slab Load : 0.57 k/ft				

Maximum -Shear in Top Slab

Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Tandem	1	0.604	12.27	6.13
Maximum -Shear : -3.22 k				
Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.60 k/ft				

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

M-PT	M11+	Truck M11-	V11+	V11-	M11+	Tandem M11-	V11+	V11-	M11+	Lane M11-	V11+	V11-
Member 1: (Exterior Wall)												
Bottom												
1- 0	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 1	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 2	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 3	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 4	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 5	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 6	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 7	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 8	0.00	-3.69	0.06	-0.06	0.00	-3.32	0.05	-0.05	0.00	0.00	0.00	0.00
1- 9	0.00	-3.70	0.06	-0.06	0.00	-3.33	0.05	-0.05	0.00	0.00	0.00	0.00
1-10	0.03	-3.72	0.06	-0.06	0.03	-3.35	0.05	-0.05	0.00	0.00	0.00	0.00
Top												

Member 2: (Top Slab)

Left												
2- 0	0.03	-3.72	3.58	0.00	0.03	-3.35	3.22	0.00	0.00	0.00	0.00	0.00
2- 1	0.81	-1.06	2.90	-0.03	0.73	-0.96	2.61	-0.03	0.00	0.00	0.00	0.00
2- 2	2.42	0.00	2.28	-0.13	2.18	0.00	2.05	-0.12	0.00	0.00	0.00	0.00
2- 3	4.33	0.00	1.73	-0.30	3.89	0.00	1.56	-0.27	0.00	0.00	0.00	0.00
2- 4	5.47	0.00	1.26	-0.55	4.93	0.00	1.14	-0.49	0.00	0.00	0.00	0.00
2- 5	5.85	0.00	0.87	-0.87	5.27	0.00	0.78	-0.78	0.00	0.00	0.00	0.00
2- 6	5.47	0.00	0.55	-1.26	4.93	0.00	0.49	-1.14	0.00	0.00	0.00	0.00
2- 7	4.33	0.00	0.30	-1.73	3.89	0.00	0.27	-1.56	0.00	0.00	0.00	0.00
2- 8	2.42	0.00	0.13	-2.28	2.18	0.00	0.12	-2.05	0.00	0.00	0.00	0.00
2- 9	0.81	-1.06	0.03	-2.90	0.73	-0.96	0.03	-2.61	0.00	0.00	0.00	0.00
2-10	0.03	-3.72	0.00	-3.58	0.03	-3.35	0.00	-3.22	0.00	0.00	0.00	0.00
Right												

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-3.69	3.58	0.00	0.00	-3.32	3.22	0.00	0.00	0.00	0.00	0.00
4- 1	0.02	-0.27	2.86	0.00	0.02	-0.25	2.58	0.00	0.00	0.00	0.00	0.00
4- 2	2.42	0.00	2.15	0.00	2.18	0.00	1.93	0.00	0.00	0.00	0.00	0.00

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 Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Perpendicular Culvert)petid 8 of 20
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4- 3	4.33	0.00	1.43	0.00	3.89	0.00	1.29	0.00	0.00	0.00	0.00	0.00
4- 4	5.47	0.00	0.72	0.00	4.93	0.00	0.64	0.00	0.00	0.00	0.00	0.00
4- 5	5.85	0.00	0.03	-0.03	5.27	0.00	0.03	-0.03	0.00	0.00	0.00	0.00
4- 6	5.47	0.00	0.00	-0.72	4.93	0.00	0.00	-0.64	0.00	0.00	0.00	0.00
4- 7	4.33	0.00	0.00	-1.43	3.89	0.00	0.00	-1.29	0.00	0.00	0.00	0.00
4- 8	2.42	0.00	0.00	-2.15	2.18	0.00	0.00	-1.93	0.00	0.00	0.00	0.00
4- 9	0.02	-0.27	0.00	-2.86	0.02	-0.25	0.00	-2.58	0.00	0.00	0.00	0.00
4-10	0.00	-3.69	0.00	-3.58	0.00	-3.32	0.00	-3.22	0.00	0.00	0.00	0.00

Right

Note: Unfactored live load results computed at 4.00 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

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By:TH | MJ Chk: ____
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Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.3	6.98	25.94	4.00	13.72
A2	Bot Corner Bar	-8.6	6.98	31.94	4.00	10.69
A100	Top Slab (int)	11.7	-0.04	26.55	4.00	12.85
A200	Bot Slab (int)	13.0	-0.11	28.12	4.00	11.95
B1	Ext Wall (int)	2.4	3.40	12.63	4.00	31.23
B2	Ext Wall (ext)	-8.2	6.98	30.02	4.00	11.53

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
BOT	16.00	-12.64	10.83	14.34	6.79	17.38	1.00	0.41	10.59	1.73	2.25
MID	64.00	5.98	2.94	7.64	6.85	8.55	1.00	0.21	10.59	2.14	2.77
MID-	64.00	-10.57	10.83	14.34	6.79	17.38	1.00	0.41	10.59	2.06	2.66
TOP	16.00	-11.30	10.83	14.34	6.79	17.38	1.00	0.41	10.59	2.03	2.63

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.40	4.79	14.34	6.79	15.71	1.00	0.41	10.59	4.41	5.72
MID	64.00	16.92	0.77	29.24	6.69	29.43	1.00	0.88	10.59	2.22	2.88
MID-	64.00	-0.73	4.75	7.00	6.86	8.47	1.00	0.19	10.59	6.22	8.07
RT	16.00	-6.40	4.79	14.34	6.79	15.71	1.00	0.41	10.59	4.41	5.72

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.62	6.94	14.34	6.79	16.31	1.00	0.41	10.59	6.61	8.57
MID	64.00	18.42	1.22	30.69	6.69	30.98	1.00	0.93	10.59	2.23	2.89
MID-	64.00	-0.12	6.78	7.00	6.86	9.09	1.00	0.19	10.59	7.00	9.08
RT	16.00	-6.62	6.94	14.34	6.79	16.31	1.00	0.41	10.59	6.61	8.57

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
BOT	21.85	4.30	12.2	10.83	6.53	10.08	2.021	38.40	11.20	a	0.00	0.00	6.73	8.72
MID	64.00	0.37	6.0	2.94	6.72	10.62	2.072	38.22	11.80	a	0.00	0.00	NC	NC
MID-	64.00	0.23	10.2	10.83	6.53	11.81	2.368	36.27	13.12	a	0.00	0.00	NC	NC
TOP	21.85	-3.50	10.7	10.83	6.53	10.86	2.177	37.38	12.06	a	0.00	0.00	7.84	10.16

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	7.21	4.9	4.79	6.79	15.55	n/a	n/a	17.28	c	0.00	0.00	2.94	3.81
MID	64.00	1.52	16.9	0.77	6.69	15.33	n/a	n/a	17.03	c	0.00	0.00	10.11	13.11
MID-	64.00	1.52	0.7	4.75	6.86	20.87	4.467	28.74	23.18	a	0.00	0.00	13.77	17.85
RT	21.85	7.21	4.9	4.79	6.79	15.55	n/a	n/a	17.28	c	0.00	0.00	2.94	3.81

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	8.01	4.9	6.94	6.79	15.55	n/a	n/a	17.28	c	0.00	0.00	2.83	3.67
MID	64.00	0.05	18.4	1.22	6.69	15.31	n/a	n/a	17.01	c	0.00	0.00	NC	NC
MID-	64.00	0.05	0.0	6.78	6.86	20.87	5.122	27.37	23.18	a	0.00	0.00	NC	NC
RT	21.85	8.01	4.9	6.94	6.79	15.55	n/a	n/a	17.28	c	0.00	0.00	2.83	3.67

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arrema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 4.00 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-7.555	-19.176	4.564	10.829	6.942	1.216
1- 1	-4.149	-12.877	2.942	10.829	5.353	0.863
1- 2	0.586	-11.931	2.942	10.829	3.861	0.710
1- 3	3.786	-11.156	2.942	10.829	2.466	0.543
1- 4	5.549	-10.566	2.942	10.829	1.168	0.364
1- 5	5.979	-10.173	2.942	10.829	0.373	-0.233
1- 6	5.179	-9.990	2.942	10.829	0.169	-1.338
1- 7	3.252	-10.032	2.942	10.829	-0.047	-2.346
1- 8	0.301	-10.310	2.942	10.829	-0.276	-3.258
1- 9	-3.575	-11.624	2.942	10.829	-0.517	-4.072
1-10	-5.117	-16.288	4.564	10.829	-0.767	-4.790
Top						
Member 2: (Top Slab)						
Left						
2- 0	-5.109	-16.353	0.767	4.790	10.829	2.942
2- 1	0.559	-7.389	0.767	4.790	8.603	2.268
2- 2	6.671	-3.449	0.767	4.754	6.636	1.698
2- 3	12.363	-1.940	0.767	4.754	4.799	1.132
2- 4	15.778	-1.035	0.767	4.754	3.091	-0.075
2- 5	16.917	-0.733	0.767	4.754	1.516	-1.516
2- 6	15.778	-1.035	0.767	4.754	0.075	-3.091
2- 7	12.363	-1.940	0.767	4.754	-1.132	-4.799
2- 8	6.671	-3.449	0.767	4.754	-1.698	-6.636
2- 9	0.559	-7.389	0.767	4.790	-2.268	-8.603
2-10	-5.110	-16.355	0.767	4.790	-2.942	-10.829
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-7.555	-19.176	1.216	6.942	12.162	3.902
4- 1	-1.860	-7.533	1.216	6.942	9.730	3.121
4- 2	6.741	-3.867	1.216	6.778	7.297	2.341
4- 3	13.227	-1.786	1.216	6.778	4.865	1.561
4- 4	17.119	-0.537	1.216	6.778	2.432	0.780
4- 5	18.416	-0.121	1.216	6.778	0.050	-0.050
4- 6	17.119	-0.537	1.216	6.778	-0.780	-2.432
4- 7	13.227	-1.786	1.216	6.778	-1.561	-4.865
4- 8	6.741	-3.867	1.216	6.778	-2.341	-7.297
4- 9	-1.860	-7.533	1.216	6.942	-3.121	-9.730
4-10	-7.555	-19.176	1.216	6.942	-3.902	-12.162
Right						

Analysis Results: Fill Depth = 5.00 ft

Load Parameters:

Fe = 1.09 Surcharge Depth : 2.37 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of Wall	Top of Wall
Live Load Surcharge	0.142	0.142
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	0.960	0.320

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	0.653
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior Wall)							
Bottom							
1- 0	-2.16	-3.59	0.00	-3.67	-0.78	1.86	0.00
1- 1	-1.96	-3.59	0.00	0.07	-0.05	-0.19	0.00
1- 2	-1.77	-3.59	0.00	2.80	0.51	-1.62	0.00
1- 3	-1.57	-3.59	0.00	4.59	0.92	-2.47	0.00
1- 4	-1.37	-3.59	0.00	5.50	1.16	-2.82	0.00
1- 5	-1.18	-3.59	0.00	5.61	1.24	-2.74	0.00
1- 6	-0.98	-3.59	0.00	4.99	1.16	-2.30	0.00
1- 7	-0.79	-3.59	0.00	3.71	0.92	-1.58	0.00
1- 8	-0.59	-3.59	0.00	1.86	0.51	-0.66	0.00
1- 9	-0.40	-3.59	0.00	-0.51	-0.05	0.40	0.00
1-10	-0.20	-3.59	0.00	-3.32	-0.78	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

	Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
Member 1: (Exterior Wall)							
Bottom							
1- 0	0.18	0.00	0.00	4.01	0.76	-2.08	0.00
1- 1	0.18	0.00	0.00	3.02	0.61	-1.64	0.00
1- 2	0.18	0.00	0.00	2.10	0.45	-1.05	0.00
1- 3	0.18	0.00	0.00	1.25	0.30	-0.54	0.00
1- 4	0.18	0.00	0.00	0.46	0.15	-0.11	0.00
1- 5	0.18	0.00	0.00	-0.26	0.00	0.26	0.00
1- 6	0.18	0.00	0.00	-0.90	-0.15	0.56	0.00
1- 7	0.18	0.00	0.00	-1.48	-0.30	0.79	0.00
1- 8	0.18	0.00	0.00	-2.00	-0.45	0.94	0.00
1- 9	0.18	0.00	0.00	-2.44	-0.61	1.03	0.00
1-10	0.18	0.00	0.00	-2.82	-0.76	1.04	0.00
Top							

Member 2: (Top Slab)

Left														
2- 0	-0.20	-3.59	0.00	-3.37	-0.78	1.55	0.00	0.66	3.48	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.25	0.00	-3.37	-0.78	1.55	0.00	0.43	2.79	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	2.35	0.00	-3.37	-0.78	1.55	0.00	0.32	2.09	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	4.21	0.00	-3.37	-0.78	1.55	0.00	0.21	1.39	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	5.32	0.00	-3.37	-0.78	1.55	0.00	0.11	0.70	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	5.70	0.00	-3.37	-0.78	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	5.32	0.00	-3.37	-0.78	1.55	0.00	-0.11	-0.70	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	4.21	0.00	-3.37	-0.78	1.55	0.00	-0.21	-1.39	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	2.35	0.00	-3.37	-0.78	1.55	0.00	-0.32	-2.09	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.25	0.00	-3.37	-0.78	1.55	0.00	-0.43	-2.79	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-3.59	0.00	-3.37	-0.78	1.55	0.00	-0.66	-3.48	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom Slab)

Left														
4- 0	-2.16	-3.59	0.00	-3.67	-0.78	1.86	0.00	1.73	3.48	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.25	0.00	-3.67	-0.78	1.86	0.00	1.38	2.79	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	2.35	0.00	-3.67	-0.78	1.86	0.00	1.04	2.09	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	4.21	0.00	-3.67	-0.78	1.86	0.00	0.69	1.39	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	5.32	0.00	-3.67	-0.78	1.86	0.00	0.34	0.70	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	5.70	0.00	-3.67	-0.78	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	5.32	0.00	-3.67	-0.78	1.86	0.00	-0.35	-0.70	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	4.21	0.00	-3.67	-0.78	1.86	0.00	-0.69	-1.39	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	2.35	0.00	-3.67	-0.78	1.86	0.00	-1.04	-2.09	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.25	0.00	-3.67	-0.78	1.86	0.00	-1.38	-2.79	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-3.59	0.00	-3.67	-0.78	1.86	0.00	-1.73	-3.48	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 5.00 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	3.48	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	2.82	0.76	-1.04
4	0.18	0.00	0.00	4.01	0.76	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.489	13.42	
Tandem	1	0.475	13.42	

Live Load Parameters:

Traffic Direction is Perpendicular to Main Reinforcement
Distribution Width : 6.58 ft
Impact Factor : 1.12
Truck MPF : 1.20 Tandem MPF : 1.20
Lane Load Distribution Width : 0.00 ft
Lane Load: 0.000 k/ft

Truck Positions That Cause Maximum Results:

Maximum +Moment in Top Slab					Maximum -Moment in Top Slab				
Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)	Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.489	13.42	6.71	Truck	1	0.489	13.42	7.24
Maximum +Moment : 4.26 k-ft					Maximum -Moment : -2.71 k-ft				
Corresponding Moment at End : -2.69 k-ft					Corresponding Moment at Mid : 4.21 k-ft				
Coincident Bottom Slab Load : 0.49 k/ft					Coincident Bottom Slab Load : 0.46 k/ft				
Maximum +Shear in Top Slab					Maximum -Shear in Top Slab				
Truck	1	0.489	13.42	6.71	Truck	1	0.489	13.42	6.71
Maximum +Shear : 2.61 k					Maximum -Shear : -2.61 k				
Corresponding Shear at Mid : 0.00 k					Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.49 k/ft					Coincident Bottom Slab Load : 0.49 k/ft				
Maximum +Moment in Top Slab					Maximum -Moment in Top Slab				
Tandem	1	0.475	13.42	6.71	Tandem	1	0.475	13.42	7.24
Maximum +Moment : 4.14 k-ft					Maximum -Moment : -2.63 k-ft				
Corresponding Moment at End : -2.61 k-ft					Corresponding Moment at Mid : 4.09 k-ft				
Coincident Bottom Slab Load : 0.47 k/ft					Coincident Bottom Slab Load : 0.45 k/ft				
Maximum +Shear in Top slab					Maximum -Shear in Top Slab				
Tandem	1	0.475	13.42	6.71	Tandem	1	0.475	13.42	6.71
Maximum +Shear : 2.53 k					Maximum -Shear : -2.53 k				
Corresponding Shear at Mid : 0.00 k					Corresponding Shear at Mid : 0.00 k				
Coincident Bottom Slab Load : 0.47 k/ft					Coincident Bottom Slab Load : 0.47 k/ft				

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

M-PT	M11+	Truck M11-	V11+	V11-	M11+	Tandem M11-	V11+	V11-	M11+	Lane M11-	V11+	V11-
Member 1: (Exterior wall)												
Bottom												
1- 0	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 1	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 2	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 3	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 4	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 5	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 6	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 7	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 8	0.00	-2.69	0.04	-0.04	0.00	-2.61	0.04	-0.04	0.00	0.00	0.00	0.00
1- 9	0.00	-2.69	0.04	-0.04	0.00	-2.62	0.04	-0.04	0.00	0.00	0.00	0.00
1-10	0.02	-2.71	0.04	-0.04	0.02	-2.63	0.04	-0.04	0.00	0.00	0.00	0.00
Top												
Member 2: (Top Slab)												
Left												
2- 0	0.02	-2.71	2.61	0.00	0.02	-2.63	2.53	0.00	0.00	0.00	0.00	0.00
2- 1	0.59	-0.77	2.11	-0.02	0.57	-0.75	2.05	-0.02	0.00	0.00	0.00	0.00
2- 2	1.76	0.00	1.66	-0.10	1.71	0.00	1.61	-0.09	0.00	0.00	0.00	0.00
2- 3	3.15	0.00	1.26	-0.22	3.06	0.00	1.23	-0.21	0.00	0.00	0.00	0.00
2- 4	3.98	0.00	0.92	-0.40	3.87	0.00	0.89	-0.39	0.00	0.00	0.00	0.00
2- 5	4.26	0.00	0.63	-0.63	4.14	0.00	0.61	-0.61	0.00	0.00	0.00	0.00
2- 6	3.98	0.00	0.40	-0.92	3.87	0.00	0.39	-0.89	0.00	0.00	0.00	0.00
2- 7	3.15	0.00	0.22	-1.26	3.06	0.00	0.21	-1.23	0.00	0.00	0.00	0.00
2- 8	1.76	0.00	0.10	-1.66	1.71	0.00	0.09	-1.61	0.00	0.00	0.00	0.00
2- 9	0.59	-0.77	0.02	-2.11	0.57	-0.75	0.02	-2.05	0.00	0.00	0.00	0.00
2-10	0.02	-2.71	0.00	-2.61	0.02	-2.63	0.00	-2.53	0.00	0.00	0.00	0.00
Right												
Member 4: (Bottom Slab)												
Left												
4- 0	0.00	-2.69	2.61	0.00	0.00	-2.61	2.53	0.00	0.00	0.00	0.00	0.00
4- 1	0.01	-0.20	2.08	0.00	0.01	-0.19	2.03	0.00	0.00	0.00	0.00	0.00
4- 2	1.76	0.00	1.56	0.00	1.71	0.00	1.52	0.00	0.00	0.00	0.00	0.00

Eriksson Culvert v6.2.2

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Perpendicular Culvert)

Sht: ____ of ____

By:TH | MJ Chk: ____

3/25/2024 5:23:59 PM

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4- 3	3.15	0.00	1.04	0.00	3.06	0.00	1.01	0.00	0.00	0.00	0.00	0.00
4- 4	3.98	0.00	0.52	0.00	3.87	0.00	0.51	0.00	0.00	0.00	0.00	0.00
4- 5	4.26	0.00	0.02	-0.02	4.14	0.00	0.02	-0.02	0.00	0.00	0.00	0.00
4- 6	3.98	0.00	0.00	-0.52	3.87	0.00	0.00	-0.51	0.00	0.00	0.00	0.00
4- 7	3.15	0.00	0.00	-1.04	3.06	0.00	0.00	-1.01	0.00	0.00	0.00	0.00
4- 8	1.76	0.00	0.00	-1.56	1.71	0.00	0.00	-1.52	0.00	0.00	0.00	0.00
4- 9	0.01	-0.20	0.00	-2.08	0.01	-0.19	0.00	-2.03	0.00	0.00	0.00	0.00
4-10	0.00	-2.69	0.00	-2.61	0.00	-2.61	0.00	-2.53	0.00	0.00	0.00	0.00

Right

Note: Unfactored live load results computed at 5.00 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.1	6.75	25.04	4.00	14.31
A2	Bot Corner Bar	-8.4	6.75	31.01	4.00	11.09
A100	Top Slab (int)	11.1	0.14	25.21	4.00	13.68
A200	Bot Slab (int)	12.4	0.07	26.85	4.00	12.64
B1	Ext wall (int)	2.1	4.14	8.47	4.00	47.71
B2	Ext wall (ext)	-7.7	6.75	28.03	4.00	12.52

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings	
										IR	OR
BOT	16.00	-11.89	10.14	14.34	6.79	17.19	1.00	0.41	10.59	2.13	2.76
MID	64.00	5.97	3.58	7.64	6.85	8.74	1.00	0.21	10.59	2.28	2.95
MID-	64.00	-9.43	10.14	14.34	6.79	17.19	1.00	0.41	10.59	2.65	3.44
TOP	16.00	-10.55	10.14	14.34	6.79	17.19	1.00	0.41	10.59	2.53	3.29

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings	
										IR	OR
LT	16.00	-6.38	5.16	14.34	6.79	15.81	1.00	0.41	10.59	5.11	6.63
MID	64.00	15.50	1.07	29.24	6.69	29.50	1.00	0.88	10.59	2.88	3.73
MID-	64.00	-0.10	5.15	7.00	6.86	8.59	1.00	0.19	10.59	6.94	9.00
RT	16.00	-6.38	5.16	14.34	6.79	15.81	1.00	0.41	10.59	5.11	6.63

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings	
										IR	OR
LT	16.00	-6.88	7.31	14.34	6.79	16.41	1.00	0.41	10.59	7.09	9.19
MID	64.00	17.00	1.52	30.69	6.69	31.05	1.00	0.93	10.59	2.88	3.74
MID-	64.00	0.0#	7.18	7.00	6.86	9.21	1.00	0.19	10.59	NC	NC
RT	16.00	-6.88	7.31	14.34	6.79	16.41	1.00	0.41	10.59	7.09	9.19

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load
- a 0.0 design moment indicates no negative moments at this location. Check the 'Load Combination Results' table to determine if a positive moment exists.

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings	
													IR	OR
BOT	21.85	4.53	11.4	10.14	6.53	10.29	2.064	38.10	11.43 a	0.00	0.00	0.00	7.09	9.19
MID	64.00	0.35	6.0	3.58	6.72	10.77	2.100	38.02	11.96 a	0.00	0.00	0.00	NC	NC
MID-	64.00	0.21	9.0	10.14	6.53	12.39	2.484	35.60	13.76 a	0.00	0.00	0.00	NC	NC
TOP	21.85	-3.73	9.9	10.14	6.53	11.17	2.239	37.02	12.41 a	0.00	0.00	0.00	8.38	10.86

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings	
													IR	OR
LT	21.85	6.71	4.6	5.16	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	3.82	4.95
MID	64.00	1.10	15.5	1.07	6.69	15.33	n/a	n/a	17.03 c	0.00	0.00	0.00	13.89	18.01
MID-	64.00	1.10	0.1	5.15	6.86	20.87	5.062	27.46	23.18 a	0.00	0.00	0.00	18.91	24.52
RT	21.85	6.71	4.6	5.16	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	3.82	4.95

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings	
													IR	OR
LT	21.85	7.55	5.0	7.31	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	3.66	4.75
MID	64.00	0.04	17.0	1.52	6.69	15.31	n/a	n/a	17.01 c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.04	0.0	7.18	6.86	20.87	5.127	27.36	23.18 a	0.00	0.00	0.00	NC	NC
RT	21.85	7.55	5.0	7.31	6.79	15.55	n/a	n/a	17.28 c	0.00	0.00	0.00	3.66	4.75


Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 5.00 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior wall)						
Bottom						
1- 0	-8.882	-18.872	5.576	10.136	7.312	1.517
1- 1	-4.832	-12.182	3.577	10.136	5.644	1.110
1- 2	0.199	-11.032	3.577	10.136	4.073	0.901
1- 3	3.611	-10.111	3.577	10.136	2.598	0.680
1- 4	5.501	-9.432	3.577	10.136	1.220	0.446
1- 5	5.974	-9.010	3.577	10.136	0.346	-0.206
1- 6	5.131	-8.857	3.577	10.136	0.087	-1.391
1- 7	3.077	-8.986	3.577	10.136	-0.184	-2.478
1- 8	-0.086	-9.411	3.577	10.136	-0.468	-3.469
1- 9	-4.259	-10.934	3.577	10.136	-0.764	-4.363
1-10	-6.458	-15.970	5.576	10.136	-1.069	-5.161
Top						
Member 2: (Top Slab)						
Left						
2- 0	-6.450	-16.035	1.069	5.161	10.136	3.577
2- 1	-0.180	-7.365	1.069	5.161	8.033	2.777
2- 2	5.920	-3.430	1.069	5.152	6.157	2.079
2- 3	11.243	-1.582	1.069	5.152	4.378	1.386
2- 4	14.437	-0.473	1.069	5.152	2.692	0.388
2- 5	15.501	-0.103	1.069	5.152	1.103	-1.103
2- 6	14.437	-0.473	1.069	5.152	-0.388	-2.692
2- 7	11.243	-1.582	1.069	5.152	-1.386	-4.378
2- 8	5.920	-3.430	1.069	5.152	-2.079	-6.157
2- 9	-0.180	-7.365	1.069	5.161	-2.777	-8.033
2-10	-6.451	-16.036	1.069	5.161	-3.577	-10.136
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-8.882	-18.872	1.517	7.312	11.469	4.537
4- 1	-2.225	-7.885	1.517	7.312	9.176	3.630
4- 2	5.990	-3.847	1.517	7.176	6.882	2.722
4- 3	12.107	-1.427	1.517	7.176	4.588	1.815
4- 4	15.778	0.025	1.517	7.176	2.294	0.907
4- 5	17.001	0.509	1.517	7.176	0.037	-0.037
4- 6	15.778	0.025	1.517	7.176	-0.907	-2.294
4- 7	12.107	-1.427	1.517	7.176	-1.815	-4.588
4- 8	5.990	-3.847	1.517	7.176	-2.722	-6.882
4- 9	-2.225	-7.885	1.517	7.312	-3.630	-9.176
4-10	-8.882	-18.872	1.517	7.312	-4.537	-11.469
Right						

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2010



STATE OF
ARKANSAS

LICENSED
PROFESSIONAL
ENGINEER

No. 15021
MATTHEW B. JACKSON

3/25/24

Specification : LRFD 5th Edition 2010

Physical Dimensions

No. of Boxes: 1 Name: BoxCulvert
Clear Span : 10.0000 ft
Clear Height: 10.0000 ft Skew Angle : 0.00 deg
Length : 5.0000 ft Bottom Slab Support: Full Slab
Fill Depth Range: Maximum : 10.00 ft Minimum : 3.00 ft Increment : 1.75 ft
Haunches: Top, Length: 12.0000 in Height: 12.0000 in
 Bottom, Length: 12.0000 in Height: 12.0000 in
Member Thicknesses: Top Slab: 8.0000 in Bot Slab: 8.0000 in
 Ext Wall: 8.0000 in

Wall Joint: None

Material Properties

Concrete:	Strength, f'c :	5.000 ksi	Density :	0.150 kcf	Elasticity, Ec:	4287 ksi
	Type :	Normal	Weight :			
	Fr Factor :	0.37				
Steel:	Yield, fy :	65.00 ksi	fss Limit :	1.00fy	Elasticity, Es:	29000 ksi
	Yield, fyv :	60.00 ksi	Diameter :	1.000 in	Type :	Mesh
Soil:	Density :	0.120 kcf	Slope Factor:	1.150 (User Defined)		
	Poisson's :	0.5				
	Fe Factor :	1.150	(Maximum for Compacted Fill)			
Serviceability,	Gamma-e :	0.75				

Loads

```

Live Load:  Vehicle:  (AA) HL-93 - Design Vehicle
                Axle No.      Weight(k)      Dist. From Previous(ft)
                    1             8.00             0.00
                    2            32.00            14.00
                    3            32.00            14.00
                Gage Width: 6.00 ft, Tread Width: 20.00 in, Tread Length: 10.00 in
                Include Tandem: yes
                Tandem: Axle 1: 25.00 k, Axle 2: 25.00 k, Axle Spacing: 4.00 ft
                Lane Load: 0.00 klf, P-Moment: 0.00 k, P-Shear: 0.00 k
                Combine: Truck + Lane Or Tandem + Lane
                Inventory Rating Load Factor: 1.75  Operating Rating Load Factor: 1.35
                Design Load Combinations: Strength I
                Override MPF: no
                Override DLA: no
                Include Lane Load      : no      Max. No. of Lanes: Computed by Program
                Traffic Direction      : Lanes Parallel to Main Reinforcement
                Neglect Live Load for Large Fill Depths: no
                Apply Surcharge at Fill Depths > 2 ft : yes
                Compute Surcharge Depth: yes
Dead Load:  Future Wearing Surface : 0.00 klf  Add. Dead Load : 0.00 klf
                Concentrated Loads    : none
Lateral Soil Loads: Max. Equiv. Fluid Press.: 60.00 pcf  Min. Equiv. Fluid Press. : 30.00 pcf
Include Additional Uniform Horiz. Load: no
Include Additional Uniform Vert. Load: no
Buoyancy Check      : no
Fluid Pressures     : Apply Water Press. : yes, interior only
                    : Interior Pressure Head : 0.00 ft
Foundation Model    : Uniform Loads
Seismic Analysis    : Do not include

```

Load and Resistance Factors

	Max	Min					
DC:	1.250	0.900					
DW:	1.500	0.650					
EV:	1.300	0.900					
EH:	1.350	0.900					
WA:	1.000						
EQ:	1.000						
LL I :	1.750	LL II :	1.350	LL Legal :	1.750	LL Extreme :	0.500
Ductility:	1.000	Importance:	1.000	Redundancy, non-earth:	1.000	Redundancy, earth:	1.050
Condition:	1.000	System :	1.000				
Phi Shear:	0.900	Phi Moment:	1.000	PM Compression:	0.750	PM Tension :	1.000

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-Ana

Load Factor Multipliers, Design Mode: 1.00 Analysis Mode: 1.00

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Reinforcement

Reinforcement Covers	Exterior	Interior
Top Slab:	1.0000 in	1.0000 in
Walls:	1.0000 in	1.0000 in
Bot Slab:	1.0000 in	1.0000 in

Assigned reinforcement:	Location	Mark	Size	Spacing (in)	# of Layers
Top Slab Inside	A100	(AS2)	W19.33	4.0000	1
Bottom Slab Inside	A200	(AS3)	W21	4.0000	1
Top Slab Outside	A300	(AS7)	W6.4	4.0000	1
Bottom Slab Outside	A400	(AS8)	W6.4	4.0000	1
Top Corner	A1	(AS1)	W11.5	4.0000	1
Bottom Corner	A2	(AS1)	W11.5	4.0000	1
Ext. Wall Inside	B1	(AS4)	W6.8	4.0000	1
Ext. Wall Outside	B2	(AS1)	W11.5	4.0000	1
Longitudinal	C1	(AS6)	None	8.0000	1
Top Distribution	C100	(AS5)	None	8.0000	1
Bottom Distribution	C200		None	8.0000	1

Analysis Options

LL Analysis : Automatically Set Traffic Direction to Account for Skew Effects: no
Limit LL Distribution width to Culvert Length for: Fills < 2 ft
Combine Longitudinal Axle Distribution Overlaps: Yes
Combine Transverse Axle Distribution Overlaps: Yes
Axle Placement Increment for Moving Load Analysis: 20
Include Impact on Bottom Slab: yes
Always Distribute Wheel Load: yes
Deflection Criteria : 1/800
Approach Slab will be Used: no
Reinforcement : Always Include Distribution Steel: no
Distribution Slab Provided: no
User Defined Longitudinal Steel: yes
Max. As used in Vc Calcs: 2.00 in²/ft
Distribute Minimum Reinforcement per Face: yes
Use individual Member Thicknesses for Min Steel: yes
Epoxy coat steel: no
Use M-dimension for bar length calcs.: yes
Slenderness : Not Checked
Analysis Modeling : Use Haunches in the Structural Analysis Model: yes
Critical Sections : Flexure critical section location: end of haunch
Shear critical section location: dv beyond haunch
Use Max. Moment with Max. Shear at the Critical Section for Shear: no
Include depth of haunch for critical sections: no
Flexure : Ignore Axial Thrust: no
Use Eq. 12.10.4.2.4a-1: yes Nu Multiplier: 1.00
Shear : Always Check Iterative Beta Method
Environmental : Apply durability factors: no
Load Combinations : LRFD min/min: no

ANALYSIS RESULTS
=====

Top Slab Thickness = 8.00 in
Bottom Slab Thickness = 8.00 in
Exterior Wall Thickness = 8.00 in

Modular Ratio (N) = 6.76 Max. Steel Ratio = 0.022
Design Span = 10.67 ft Design Height = 10.67 ft

Volume of Concrete: 1.128 cy/ft

Note: Design and analysis results do not include force effects from stripping and handling stages

M dimension = 2' 8" (method of equivalent capacity)
 = 5' 7" (method of contraflexure - ASTM)

Reinforcing Steel Schedule

Location	Mat Mark	Sheets Included	Layers	As,prv (in2/ft)
Top Slab (int)	A100 (AS2)	Top	1	0.580
Bot Slab (int)	A200 (AS3)	Bot	1	0.630
Top Slab (ext)	A300 (AS7)	Top	1	0.192
Bot Slab (ext)	A400 (AS8)	Bot	1	0.192
Corner Top-U	A1 (AS1)	Top	1	0.345
Corner Bottom-U	A2 (AS1)	Bot	1	0.345
Ext Wall (int)	B1 (AS4)	L&R	1	0.204
Ext Wall (ext)	B2 (AS1)	L&R	1	0.345
Top Slab (int- 1)	C100 (AS5)	Top	1	0.000
Bot Slab (int- 1)	C200	Bot	1	0.000
Temperature (1)	C1 (AS6)	Top	1	0.000
Temperature (1)	C1 (AS6)	Bot	1	0.000
Temperature (1)	C1 (AS6)	L&R	1	0.000
Temperature (1)	C1 (AS6)	L&R	1	0.000

Note: A denotes flexural steel, B denotes vertical steel, C denotes longitudinal steel

AS Bar Marks

Location	As prv in2/ft
Transverse Side Wall - Outside Face (AS1)	0.345
Transverse Top Slab - Inside Face (AS2)	0.580
Transverse Bottom Slab - Inside Face (AS3)	0.630
Transverse Side wall - Inside Face (AS4)	0.204
Distribution Top Slab - Inside Face (AS5)	0.000
Distribution Top Slab - Outside Face (AS6)	0.000
Transverse Top Slab - Outside Face (AS7)	0.192
Transverse Bottom Slab - Outside Face (AS8)	0.192

Notes: 1.) Final areas of steel provided must be checked in analysis mode

Sheet Inventory

Interior sheets - 4 sheet layout with no laps

Sheet Loc.	Mat Mark	Zone	Size	Spac. (in)	Length (ft-in)	Area (in2/ft)	H leg (ft-in)	V leg (ft-in)	Cross Wires(L,tot= 4-11)-	Wgt (lbs)
Top	A100	Base	W19.33	4.00	10- 6	0.580			(1) sheets, Total weight:	104
L&R	B1	Base	W6.8	4.00	10- 6	0.204		10- 6	(1) sheets, Total weight:	37
Bot	A200	Base	W21	4.00	10- 6	0.630			(1) sheets, Total weight:	113

Exterior sheets - 4 sheet layout with laps located in the slab

Sheet Loc.	Mat Mark	Zone	Size	Spac. (in)	Length (ft-in)	Area (in2/ft)	H leg (ft-in)	V leg (ft-in)	Cross Wires(L,tot= 4-11)-	Wgt (lbs)
Top	A300	Base	W6.4	4.00	11- 2	0.192			(1) sheets, Total weight:	37
L&R	B2	Base	W11.5	4.00	16- 4	0.345	2- 7	11- 2		96
	A1	Base	W11.5	4.00	16- 4	0.345	2- 7	11- 2		-----
	A2	Base	W11.5	4.00	16- 4	0.345	2- 7	11- 2		-----

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-AnaCulvert)exp. 4 of 30

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(2) sheets, Total weight: 192

Bot A400 Base W6.4 4.00 11- 2 0.192

(1) sheets, Total weight: 37

Weight of Steel: 104 lb/ft

Total weight of all sheets: 520

Notes:

Epoxy coating may be needed for A1, A300, and some C1 reinforcement, check with governing agency.
 L&R - left and right, TC - top corner, BC - bottom corner, INT - interior walls, EXT - exterior walls
 Nested line wires are additive to the base line wires, but nested cross wires replace base cross wires.
 Adder sheets may require cross wires, check with mesh supplier.

Summary of Ratings Table:

Truck	Flexure					Shear				
	Fill	Member	Location	IR	OR	Fill	Member	Location	IR	OR
(AA) HL-93	3.00	2	MID	1.31	1.70	3.00	2	LT	2.62	3.39

Critical Sections Summary: Flexure

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
BOT	16.00	-14.51	12.83	12.31	6.81	15.98	1.00	0.34	10.59	1.73	2.24	AA	10.00
MID	64.00	5.96	2.33	7.43	6.85	8.15	1.00	0.20	10.59	1.93	2.50	AA	3.00
MID-	64.00	-9.94	10.69	12.31	6.81	15.39	1.00	0.34	10.59	1.80	2.33	AA	3.00
TOP	16.00	-13.20	12.83	12.31	6.81	15.98	1.00	0.34	10.59	2.68	3.48	AA	10.00

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
LT	16.00	-7.65	7.18	12.31	6.81	14.40	1.00	0.34	10.59	5.68	7.37	AA	10.00
MID	64.00	18.49	2.48	20.05	6.75	20.72	1.00	0.58	10.59	1.70	2.20	AA	10.00
MID-	64.00	-1.33	4.36	7.00	6.86	8.35	1.00	0.19	10.59	5.58	7.23	AA	3.00
RT	16.00	-7.65	7.18	12.31	6.81	14.40	1.00	0.34	10.59	5.68	7.37	AA	10.00

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings		Truck	Fill Depth (ft)
										IR	OR		
LT	16.00	-8.58	9.33	12.31	6.81	15.01	1.00	0.34	10.59	6.62	8.58	AA	10.00
MID	64.00	19.99	2.93	21.64	6.74	22.41	1.00	0.63	10.59	1.76	2.28	AA	10.00
MID-	64.00	-0.72	6.38	7.00	6.86	8.97	1.00	0.19	10.59	6.33	8.20	AA	3.00
RT	16.00	-8.58	9.33	12.31	6.81	15.01	1.00	0.34	10.59	6.62	8.58	AA	10.00

Critical Sections Summary: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load IR	Ratings OR	Truck	Fill Depth (ft)
BOT	21.85	5.85	13.5	12.83	6.59	10.06	2.000	11.17 b	0.00	0.00	0.00	6.47	8.39	AA	10.00
MID	64.00	0.42	6.0	2.33	6.72	10.39	2.025	11.54 a	0.00	0.00	0.00	66.67	86.43	AA	3.00
MID-	64.00	0.39	9.8	10.69	6.59	11.43	2.273	12.70 a	0.00	0.00	0.00	43.09	55.86	AA	3.00
TOP	21.85	-5.08	12.0	12.83	6.59	10.06	2.000	11.17 b	0.00	0.00	0.00	7.53	9.76	AA	10.00

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings			Fill Depth (ft)
												IR	OR	Truck	
LT	21.85	8.40	5.0	7.18	6.81	15.59	n/a	17.32 c	0.00	0.00	0.00	6.33	8.21	AA	10.00
MID	64.00	2.15	16.6	0.45	6.75	15.46	n/a	17.18 c	0.00	0.00	0.00	7.19	9.32	AA	3.00
MID-	64.00	2.15	1.3	4.36	6.86	18.45	3.526	20.50 a	0.00	0.00	0.00	8.59	11.13	AA	3.00
RT	21.85	8.40	5.0	7.18	6.81	15.59	n/a	17.32 c	0.00	0.00	0.00	6.33	8.21	AA	10.00

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn	Beta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings			Fill Depth (ft)
												IR	OR	Truck	
LT	21.85	9.33	5.6	9.33	6.81	15.59	n/a	17.32 c	0.00	0.00	0.00	5.85	7.59	AA	10.00
MID	64.00	0.07	16.7	0.78	6.74	15.43	n/a	17.15 c	0.00	0.00	0.00	NC	NC	AA	3.00
MID-	64.00	0.07	0.0	6.38	6.86	20.87	5.117	23.18 a	0.00	0.00	0.00	NC	NC	AA	3.00
RT	21.85	9.33	5.6	9.33	6.81	15.59	n/a	17.32 c	0.00	0.00	0.00	5.85	7.59	AA	10.00

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

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Analysis Results: Fill Depth = 3.00 ft

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Load Parameters:

Fe = 1.05 Surcharge Depth : 2.57 ft

Applied Horizontal Loads: (k/ft)				Applied Uniform Bottom Slab Loads: (k/ft)			
Load Description	Bottom of wall	Top of wall		Load Description			
Live Load Surcharge	0.154	0.154		Dead Load	0.323		
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)		Vertical Earth	0.379		
External Water Pressure	0.000(0.0in)	0.000(0.0in)		Wearing Surface	0.000		
Horizontal Earth Load	0.840	0.200					

Unfactored Moments due to All Loads: (k-ft)								Unfactored Shears due to All Loads: (k)						
M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw	Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
Member 1: (Exterior Wall)														
Bottom														
1- 0	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00	0.18	0.00	0.00	3.37	0.82	-2.08	0.00
1- 1	-1.96	-2.08	0.00	0.12	-0.06	-0.19	0.00	0.18	0.00	0.00	2.51	0.66	-1.64	0.00
1- 2	-1.77	-2.08	0.00	2.37	0.55	-1.62	0.00	0.18	0.00	0.00	1.72	0.49	-1.05	0.00
1- 3	-1.57	-2.08	0.00	3.81	0.99	-2.47	0.00	0.18	0.00	0.00	0.99	0.33	-0.54	0.00
1- 4	-1.37	-2.08	0.00	4.52	1.26	-2.82	0.00	0.18	0.00	0.00	0.33	0.16	-0.11	0.00
1- 5	-1.18	-2.08	0.00	4.56	1.34	-2.74	0.00	0.18	0.00	0.00	-0.26	0.00	0.26	0.00
1- 6	-0.98	-2.08	0.00	4.01	1.26	-2.30	0.00	0.18	0.00	0.00	-0.78	-0.16	0.56	0.00
1- 7	-0.79	-2.08	0.00	2.94	0.99	-1.58	0.00	0.18	0.00	0.00	-1.23	-0.33	0.79	0.00
1- 8	-0.59	-2.08	0.00	1.42	0.55	-0.66	0.00	0.18	0.00	0.00	-1.61	-0.49	0.94	0.00
1- 9	-0.40	-2.08	0.00	-0.47	-0.06	0.40	0.00	0.18	0.00	0.00	-1.93	-0.66	1.03	0.00
1-10	-0.20	-2.08	0.00	-2.66	-0.85	1.50	0.00	0.18	0.00	0.00	-2.18	-0.82	1.04	0.00
Top														

Member 2: (Top Slab)														
Left														
2- 0	-0.20	-2.08	0.00	-2.71	-0.85	1.55	0.00	0.66	2.02	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.14	0.00	-2.71	-0.85	1.55	0.00	0.43	1.62	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	1.37	0.00	-2.71	-0.85	1.55	0.00	0.32	1.21	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	2.44	0.00	-2.71	-0.85	1.55	0.00	0.21	0.81	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	3.09	0.00	-2.71	-0.85	1.55	0.00	0.11	0.40	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	3.31	0.00	-2.71	-0.85	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	3.09	0.00	-2.71	-0.85	1.55	0.00	-0.11	-0.40	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	2.44	0.00	-2.71	-0.85	1.55	0.00	-0.21	-0.81	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	1.37	0.00	-2.71	-0.85	1.55	0.00	-0.32	-1.21	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.14	0.00	-2.71	-0.85	1.55	0.00	-0.43	-1.62	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-2.08	0.00	-2.71	-0.85	1.55	0.00	-0.66	-2.02	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom Slab)														
Left														
4- 0	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00	1.73	2.02	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.14	0.00	-3.01	-0.85	1.86	0.00	1.38	1.62	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	1.37	0.00	-3.01	-0.85	1.86	0.00	1.04	1.21	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	2.44	0.00	-3.01	-0.85	1.86	0.00	0.69	0.81	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	3.09	0.00	-3.01	-0.85	1.86	0.00	0.34	0.40	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	3.31	0.00	-3.01	-0.85	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	3.09	0.00	-3.01	-0.85	1.86	0.00	-0.35	-0.40	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	2.44	0.00	-3.01	-0.85	1.86	0.00	-0.69	-0.81	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	1.37	0.00	-3.01	-0.85	1.86	0.00	-1.04	-1.21	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.14	0.00	-3.01	-0.85	1.86	0.00	-1.38	-1.62	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-2.08	0.00	-3.01	-0.85	1.86	0.00	-1.73	-2.02	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 3.00 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	2.02	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	2.18	0.82	-1.04
4	0.18	0.00	0.00	3.37	0.82	-2.08

----- Analysis Truck, HL-93 -----

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.247	4.28	
	2	0.988	4.28	14.00
	3	0.988	4.28	14.00

Tandem	1	0.799	8.28
--------	---	-------	------

Live Load Parameters:

Traffic Direction is Parallel to Main Reinforcement

Distribution Width : 9.12 ft

Impact Factor : 1.21

Truck MPF : 1.20

Lane Load Distribution Width : 0.00 ft

Lane Load: 0.000 k/ft

Truck Positions That Cause Maximum Results:

Maximum Vehicle	+Moment in Axle	Top Slab weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.247	4.28	19.34
	2	0.988	4.28	5.34
	3	0.988	4.28	-8.66

Maximum +Moment	:	5.57	k-ft
Corresponding Moment at End	:	-3.46	k-ft
Coincident Bottom Slab Load	:	0.40	k/ft

Maximum +Shear in Top Slab				
Truck	1	0.247	4.28	16.14
	2	0.988	4.28	2.14
	3	0.988	4.28	-11.86

Maximum +Shear	:	3.42	k
Corresponding Shear at Mid	:	-0.81	k
Coincident Bottom Slab Load	:	0.40	k/ft

Maximum +Moment in Top Slab
Tandem 1 0.799 8.28 5.33
Maximum +Moment : 6.46 k-ft
Corresponding Moment at End : -4.34 k-ft
Coincident Bottom Slab Load : 0.62 k/ft

Maximum +Shear in Top Slab			
Tandem 1	0.799	8.28	4.14
Maximum +Shear	:	4.06	k
Corresponding Shear at Mid	:	-0.20	k
Coincident Bottom Slab Load	:	0.62	k/ft

Maximum Vehicle	-Moment Axle No.	in Top Slab weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.247	4.28	18.81
	2	0.988	4.28	4.81
	3	0.988	4.28	-9.19

Maximum -Moment : -3.48 k-ft
Corresponding Moment at Mid : 5.48 k-ft
Coincident Bottom Slab Load : 0.40 k/ft

Maximum -shear in Top Slab				
Truck	1	0.247	4.28	22.53
	2	0.988	4.28	8.53
	3	0.988	4.28	-5.47

Maximum -Shear : -3.42 k
Corresponding Shear at Mid : 0.81 k
Coincident Bottom Slab Load : 0.40 k/ft

Maximum -Moment in Top Slab				
Tandem	1	0.799	8.28	5.21
Maximum -Moment	:		-4.34	k-ft
Corresponding Moment at Mid	:		6.45	k-ft
Coincident Bottom Slab Load	:		0.62	k/ft

Maximum -Shear in Top Slab
Tandem 1 0.799 8.28 6.53
Maximum -Shear : -4.06 k
Corresponding Shear at Mid : 0.20 k
Coincident Bottom Slab Load : 0.62 k/ft

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

[illegible]

Member 2: (Top Slab)

[illegible]

Eriksson Culvert v6.2.2

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-Ana

Sht:____of____
By:TH | MJ Chk:____
3/25/2024 5:16:51 PM
Culvert exp. 8 of 30

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-2.48	2.16	0.00	0.00	-3.35	3.32	0.00	0.00	0.00	0.00	0.00
4- 1	0.21	-0.40	1.73	0.00	0.02	-0.33	2.66	0.00	0.00	0.00	0.00	0.00
4- 2	1.77	0.00	1.31	0.00	2.46	0.00	2.00	0.00	0.00	0.00	0.00	0.00
4- 3	2.88	0.00	0.89	0.00	4.22	0.00	1.34	0.00	0.00	0.00	0.00	0.00
4- 4	3.54	0.00	0.46	0.00	5.28	0.00	0.68	0.00	0.00	0.00	0.00	0.00
4- 5	3.77	0.00	0.04	-0.04	5.63	0.00	0.03	-0.03	0.00	0.00	0.00	0.00
4- 6	3.54	0.00	0.00	-0.46	5.28	0.00	0.00	-0.68	0.00	0.00	0.00	0.00
4- 7	2.88	0.00	0.00	-0.89	4.22	0.00	0.00	-1.34	0.00	0.00	0.00	0.00
4- 8	1.77	0.00	0.00	-1.31	2.46	0.00	0.00	-2.00	0.00	0.00	0.00	0.00
4- 9	0.21	-0.40	0.00	-1.73	0.02	-0.33	0.00	-2.66	0.00	0.00	0.00	0.00
4-10	0.00	-2.48	0.00	-2.16	0.00	-3.35	0.00	-3.32	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 3.00 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.1	6.74	29.15	4.00	12.02
A2	Bot Corner Bar	-7.6	6.74	32.06	4.00	10.72
A100	Top Slab (int)	11.2	-0.22	38.01	4.00	8.43
A200	Bot Slab (int)	11.7	-0.36	36.82	4.00	8.74
B1	Ext Wall (int)	2.6	2.68	17.14	4.00	22.43
B2	Ext Wall (ext)	-7.7	6.74	32.32	4.00	10.61

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
BOT	16.00	-11.22	10.69	12.31	6.81	15.39	1.00	0.34	10.59	1.69	2.19
MID	64.00	5.96	2.33	7.43	6.85	8.15	1.00	0.20	10.59	1.93	2.50
MID-	64.00	-9.94	10.69	12.31	6.81	15.39	1.00	0.34	10.59	1.80	2.33
TOP	16.00	-11.19	10.69	12.31	6.81	15.39	1.00	0.34	10.59	1.65	2.14

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.44	4.55	12.31	6.81	13.65	1.00	0.34	10.59	3.27	4.25
MID	64.00	16.65	0.45	20.05	6.75	20.17	1.00	0.58	10.59	1.31	1.70
MID-	64.00	-1.33	4.36	7.00	6.86	8.35	1.00	0.19	10.59	5.58	7.23
RT	16.00	-6.44	4.55	12.31	6.81	13.65	1.00	0.34	10.59	3.27	4.25

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.43	6.59	12.31	6.81	14.23	1.00	0.34	10.59	5.00	6.49
MID	64.00	16.70	0.78	21.64	6.74	21.84	1.00	0.63	10.59	1.52	1.97
MID-	64.00	-0.72	6.38	7.00	6.86	8.97	1.00	0.19	10.59	6.33	8.20
RT	16.00	-6.43	6.59	12.31	6.81	14.23	1.00	0.34	10.59	5.00	6.49

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
BOT	21.85	4.08	10.9	10.69	6.59	10.06	2.001	38.59	11.18 a	0.00	0.00	0.00	6.47	8.38
MID	64.00	0.42	6.0	2.33	6.72	10.39	2.025	38.56	11.54 a	0.00	0.00	0.00	66.67	86.43
MID-	64.00	0.39	9.8	10.69	6.59	11.43	2.273	36.88	12.70 a	0.00	0.00	0.00	43.09	55.86
TOP	21.85	-3.39	10.6	10.69	6.59	10.31	2.051	38.24	11.46 a	0.00	0.00	0.00	6.36	8.25

Member 2: (Top slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	7.35	5.7	4.55	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	2.62	3.39
MID	64.00	2.15	16.6	0.45	6.75	15.46	n/a	n/a	17.18 c	0.00	0.00	0.00	7.19	9.32
MID-	64.00	2.15	1.3	4.36	6.86	18.45	3.526	31.46	20.50 a	0.00	0.00	0.00	8.59	11.13
RT	21.85	7.35	5.7	4.55	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	2.62	3.39

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	7.08	4.9	6.59	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	3.22	4.17
MID	64.00	0.07	16.7	0.78	6.74	15.43	n/a	n/a	17.15 c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.07	0.0	6.38	6.86	20.87	5.117	27.38	23.18 a	0.00	0.00	0.00	NC	NC
RT	21.85	7.08	4.9	6.59	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	3.22	4.17

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 3.00 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior wall)						
Bottom						
1- 0	-6.260	-17.157	3.582	10.691	6.591	0.783
1- 1	-3.485	-11.375	2.325	10.691	5.082	0.485
1- 2	0.953	-10.761	2.325	10.691	3.670	0.386
1- 3	3.941	-10.264	2.325	10.691	2.354	0.274
1- 4	5.577	-9.937	2.325	10.691	1.135	0.150
1- 5	5.964	-9.763	2.325	10.691	0.420	-0.393
1- 6	5.207	-9.743	2.325	10.691	0.271	-1.418
1- 7	3.407	-9.891	2.325	10.691	0.110	-2.346
1- 8	0.668	-10.224	2.325	10.691	-0.064	-3.178
1- 9	-2.911	-11.510	2.325	10.691	-0.250	-3.913
1-10	-3.734	-15.954	3.582	10.691	-0.446	-4.552
Top						
Member 2: (Top slab)						
Left						
2- 0	-3.726	-16.019	0.446	4.552	10.691	2.325
2- 1	1.580	-7.439	0.446	4.552	8.675	1.775
2- 2	7.409	-3.455	0.446	4.357	6.801	1.328
2- 3	12.348	-2.275	0.446	4.357	5.069	0.590
2- 4	15.567	-1.567	0.446	4.357	3.602	-0.723
2- 5	16.645	-1.331	0.446	4.357	2.149	-2.149
2- 6	15.573	-1.567	0.446	4.357	0.723	-3.602
2- 7	12.348	-2.275	0.446	4.357	-0.590	-5.069
2- 8	7.417	-3.455	0.446	4.357	-1.328	-6.801
2- 9	1.580	-7.439	0.446	4.552	-1.775	-8.675
2-10	-3.726	-16.015	0.446	4.552	-2.325	-10.691
Right						
Member 4: (Bottom slab)						
Left						
4- 0	-6.260	-17.157	0.783	6.591	10.730	3.285
4- 1	-1.173	-7.279	0.783	6.591	8.590	2.628
4- 2	6.440	-3.873	0.783	6.380	6.449	1.971
4- 3	12.140	-2.121	0.783	6.380	4.308	1.314
4- 4	15.562	-1.069	0.783	6.380	2.167	0.657
4- 5	16.703	-0.719	0.783	6.380	0.072	-0.071
4- 6	15.563	-1.069	0.783	6.380	-0.657	-2.167
4- 7	12.141	-2.121	0.783	6.380	-1.314	-4.308
4- 8	6.443	-3.873	0.783	6.380	-1.971	-6.449
4- 9	-1.173	-7.279	0.783	6.591	-2.628	-8.590
4-10	-6.260	-17.157	0.783	6.591	-3.285	-10.730
Right						

Analysis Results: Fill Depth = 4.75 ft

Load Parameters:

Fe = 1.08 Surcharge Depth : 2.39 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of Wall	Top of Wall
Live Load Surcharge	0.144	0.144
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	0.945	0.305

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	0.618
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior Wall)							
Bottom							
1- 0	-2.16	-3.40	0.00	-3.59	-0.79	1.86	0.00
1- 1	-1.96	-3.40	0.00	0.08	-0.05	-0.19	0.00
1- 2	-1.77	-3.40	0.00	2.75	0.52	-1.62	0.00
1- 3	-1.57	-3.40	0.00	4.49	0.93	-2.47	0.00
1- 4	-1.37	-3.40	0.00	5.37	1.17	-2.82	0.00
1- 5	-1.18	-3.40	0.00	5.47	1.25	-2.74	0.00
1- 6	-0.98	-3.40	0.00	4.86	1.17	-2.30	0.00
1- 7	-0.79	-3.40	0.00	3.62	0.93	-1.58	0.00
1- 8	-0.59	-3.40	0.00	1.80	0.52	-0.66	0.00
1- 9	-0.40	-3.40	0.00	-0.51	-0.05	0.40	0.00
1-10	-0.20	-3.40	0.00	-3.24	-0.79	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
0.18	0.00	0.00	3.93	0.77	-2.08	0.00
0.18	0.00	0.00	2.96	0.61	-1.64	0.00
0.18	0.00	0.00	2.05	0.46	-1.05	0.00
0.18	0.00	0.00	1.21	0.31	-0.54	0.00
0.18	0.00	0.00	0.44	0.15	-0.11	0.00
0.18	0.00	0.00	-0.26	0.00	0.26	0.00
0.18	0.00	0.00	-0.89	-0.15	0.56	0.00
0.18	0.00	0.00	-1.45	-0.31	0.79	0.00
0.18	0.00	0.00	-1.95	-0.46	0.94	0.00
0.18	0.00	0.00	-2.38	-0.61	1.03	0.00
0.18	0.00	0.00	-2.74	-0.77	1.04	0.00

Member 2: (Top slab)

Left														
2- 0	-0.20	-3.40	0.00	-3.29	-0.79	1.55	0.00	0.66	3.29	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.23	0.00	-3.29	-0.79	1.55	0.00	0.43	2.64	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	2.23	0.00	-3.29	-0.79	1.55	0.00	0.32	1.98	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	3.98	0.00	-3.29	-0.79	1.55	0.00	0.21	1.32	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	5.04	0.00	-3.29	-0.79	1.55	0.00	0.11	0.66	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	5.39	0.00	-3.29	-0.79	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	5.04	0.00	-3.29	-0.79	1.55	0.00	-0.11	-0.66	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	3.98	0.00	-3.29	-0.79	1.55	0.00	-0.21	-1.32	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	2.23	0.00	-3.29	-0.79	1.55	0.00	-0.32	-1.98	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.23	0.00	-3.29	-0.79	1.55	0.00	-0.43	-2.64	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-3.40	0.00	-3.29	-0.79	1.55	0.00	-0.66	-3.29	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom slab)

Left														
4- 0	-2.16	-3.40	0.00	-3.59	-0.79	1.86	0.00	1.73	3.29	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.23	0.00	-3.59	-0.79	1.86	0.00	1.38	2.64	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	2.23	0.00	-3.59	-0.79	1.86	0.00	1.04	1.98	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	3.98	0.00	-3.59	-0.79	1.86	0.00	0.69	1.32	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	5.04	0.00	-3.59	-0.79	1.86	0.00	0.34	0.66	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	5.39	0.00	-3.59	-0.79	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	5.04	0.00	-3.59	-0.79	1.86	0.00	-0.35	-0.66	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	3.98	0.00	-3.59	-0.79	1.86	0.00	-0.69	-1.32	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	2.23	0.00	-3.59	-0.79	1.86	0.00	-1.04	-1.98	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.23	0.00	-3.59	-0.79	1.86	0.00	-1.38	-2.64	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-3.40	0.00	-3.59	-0.79	1.86	0.00	-1.73	-3.29	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 4.75 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	3.29	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	2.74	0.77	-1.04
4	0.18	0.00	0.00	3.93	0.77	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.132	6.30	
	2	0.527	6.30	14.00
	3	0.527	6.30	14.00

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-1.78	1.68	0.00	0.00	-2.65	2.59	0.00	0.00	0.00	0.00	0.00
4- 1	0.09	-0.23	1.35	0.00	0.01	-0.21	2.07	0.00	0.00	0.00	0.00	0.00
4- 2	1.32	0.00	1.02	0.00	1.78	0.00	1.55	0.00	0.00	0.00	0.00	0.00
4- 3	2.20	0.00	0.68	0.00	3.16	0.00	1.04	0.00	0.00	0.00	0.00	0.00
4- 4	2.72	0.00	0.35	0.00	3.99	0.00	0.52	0.00	0.00	0.00	0.00	0.00
4- 5	2.90	0.00	0.02	-0.02	4.27	0.00	0.02	-0.02	0.00	0.00	0.00	0.00
4- 6	2.72	0.00	0.00	-0.35	3.99	0.00	0.00	-0.52	0.00	0.00	0.00	0.00
4- 7	2.20	0.00	0.00	-0.68	3.16	0.00	0.00	-1.04	0.00	0.00	0.00	0.00
4- 8	1.32	0.00	0.00	-1.02	1.78	0.00	0.00	-1.55	0.00	0.00	0.00	0.00
4- 9	0.09	-0.23	0.00	-1.35	0.01	-0.20	0.00	-2.07	0.00	0.00	0.00	0.00
4-10	0.00	-1.78	0.00	-1.68	0.00	-2.65	0.00	-2.59	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 4.75 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.0	6.63	28.58	4.00	12.31
A2	Bot Corner Bar	-8.1	6.63	34.96	4.00	9.63
A100	Top Slab (int)	10.9	0.06	36.74	4.00	8.81
A200	Bot Slab (int)	12.2	-0.02	37.88	4.00	8.43
B1	Ext Wall (int)	2.1	3.95	9.76	4.00	41.14
B2	Ext Wall (ext)	-7.6	6.63	32.02	4.00	10.74

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
BOT	16.00	-11.60	10.01	12.31	6.81	15.20	1.00	0.34	10.59	1.77	2.30
MID	64.00	5.98	3.42	7.43	6.85	8.48	1.00	0.20	10.59	2.15	2.78
MID-	64.00	-9.30	10.01	12.31	6.81	15.20	1.00	0.34	10.59	2.24	2.90
TOP	16.00	-10.44	10.01	12.31	6.81	15.20	1.00	0.34	10.59	2.10	2.72

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.41	5.15	12.31	6.81	13.82	1.00	0.34	10.59	4.08	5.29
MID	64.00	15.32	0.93	20.05	6.75	20.30	1.00	0.58	10.59	1.65	2.14
MID-	64.00	-0.26	5.05	7.00	6.86	8.56	1.00	0.19	10.59	6.76	8.76
RT	16.00	-6.41	5.15	12.31	6.81	13.82	1.00	0.34	10.59	4.08	5.29

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.83	7.28	12.31	6.81	14.43	1.00	0.34	10.59	5.71	7.40
MID	64.00	16.66	1.36	21.64	6.74	22.00	1.00	0.63	10.59	1.71	2.22
MID-	64.00	0.0#	7.08	7.00	6.86	9.18	1.00	0.19	10.59	NC	NC
RT	16.00	-6.83	7.28	12.31	6.81	14.43	1.00	0.34	10.59	5.71	7.40

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load

- a 0.0 design moment indicates no negative moments at this location. Check the 'Load Combination Results' table to determine if a positive moment exists.

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
BOT	21.85	4.53	11.1	10.01	6.59	10.06	2.000	45.00	11.17	b	0.00	0.00	0.00	6.41 8.30
MID	64.00	0.41	6.0	3.42	6.72	10.61	2.068	38.25	11.79	a	0.00	0.00	0.00	71.87 93.16
MID-	64.00	0.29	8.9	10.01	6.59	11.89	2.366	36.34	13.22	a	0.00	0.00	0.00	74.10 96.05
TOP	21.85	-3.75	9.8	10.01	6.59	10.54	2.097	37.92	11.71	a	0.00	0.00	0.00	7.10 9.20

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	6.63	4.6	5.15	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	3.77 4.89
MID	64.00	1.19	15.3	0.93	6.75	15.46	n/a	n/a	17.18	c	0.00	0.00	0.00	12.99 16.84
MID-	64.00	1.19	0.3	5.05	6.86	20.87	5.057	27.47	23.18	a	0.00	0.00	0.00	17.54 22.74
RT	21.85	6.63	4.6	5.15	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	3.77 4.89

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in ²)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	7.37	5.0	7.28	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	3.75 4.86
MID	64.00	0.04	16.7	1.36	6.74	15.43	n/a	n/a	17.15	c	0.00	0.00	0.00	NC NC
MID-	64.00	0.04	0.0	7.08	6.86	20.87	5.125	27.36	23.18	a	0.00	0.00	0.00	NC NC
RT	21.85	7.37	5.0	7.28	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	3.75 4.86

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arera

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 4.75 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior wall)						
Bottom						
1- 0	-8.547	-18.433	5.320	10.013	7.280	1.365
1- 1	-4.660	-11.866	3.417	10.013	5.631	0.971
1- 2	0.298	-10.792	3.417	10.013	4.080	0.776
1- 3	3.657	-9.932	3.417	10.013	2.625	0.568
1- 4	5.515	-9.302	3.417	10.013	1.267	0.349
1- 5	5.977	-8.913	3.417	10.013	0.412	-0.291
1- 6	5.145	-8.778	3.417	10.013	0.168	-1.455
1- 7	3.122	-8.912	3.417	10.013	-0.090	-2.523
1- 8	0.012	-9.326	3.417	10.013	-0.360	-3.494
1- 9	-4.086	-10.813	3.417	10.013	-0.642	-4.368
1-10	-6.121	-15.751	5.320	10.013	-0.933	-5.145
Top						
Member 2: (Top Slab)						
Left						
2- 0	-6.113	-15.816	0.933	5.145	10.013	3.417
2- 1	-0.007	-7.407	0.933	5.145	7.940	2.648
2- 2	5.950	-3.436	0.933	5.053	6.092	1.982
2- 3	11.120	-1.673	0.933	5.053	4.394	1.322
2- 4	14.270	-0.616	0.933	5.053	2.766	0.282
2- 5	15.321	-0.264	0.933	5.053	1.190	-1.190
2- 6	14.269	-0.616	0.933	5.053	-0.282	-2.766
2- 7	11.119	-1.673	0.933	5.053	-1.322	-4.394
2- 8	5.950	-3.436	0.933	5.053	-1.982	-6.092
2- 9	-0.007	-7.408	0.933	5.145	-2.648	-7.940
2-10	-6.113	-15.816	0.933	5.145	-3.417	-10.013
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-8.547	-18.433	1.365	7.280	11.189	4.377
4- 1	-2.004	-7.826	1.365	7.280	8.951	3.501
4- 2	5.922	-3.853	1.365	7.076	6.713	2.626
4- 3	11.889	-1.519	1.365	7.076	4.476	1.751
4- 4	15.469	-0.119	1.365	7.076	2.238	0.875
4- 5	16.663	0.348	1.365	7.076	0.040	-0.040
4- 6	15.469	-0.119	1.365	7.076	-0.875	-2.238
4- 7	11.889	-1.519	1.365	7.076	-1.751	-4.476
4- 8	5.922	-3.853	1.365	7.076	-2.626	-6.713
4- 9	-2.003	-7.824	1.365	7.280	-3.501	-8.951
4-10	-8.547	-18.433	1.365	7.280	-4.377	-11.189
Right						

Analysis Results: Fill Depth = 6.50 ft

Load Parameters:

Fe = 1.11 Surcharge Depth : 2.22 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of wall	Top of wall
Live Load Surcharge	0.133	0.133
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	1.050	0.410

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	0.869
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior wall)							
Bottom							
1- 0	-2.16	-4.78	0.00	-4.17	-0.73	1.86	0.00
1- 1	-1.96	-4.78	0.00	0.04	-0.05	-0.19	0.00
1- 2	-1.77	-4.78	0.00	3.13	0.48	-1.62	0.00
1- 3	-1.57	-4.78	0.00	5.17	0.86	-2.47	0.00
1- 4	-1.37	-4.78	0.00	6.23	1.08	-2.82	0.00
1- 5	-1.18	-4.78	0.00	6.39	1.16	-2.74	0.00
1- 6	-0.98	-4.78	0.00	5.72	1.08	-2.30	0.00
1- 7	-0.79	-4.78	0.00	4.29	0.86	-1.58	0.00
1- 8	-0.59	-4.78	0.00	2.18	0.48	-0.66	0.00
1- 9	-0.40	-4.78	0.00	-0.55	-0.05	0.40	0.00
1-10	-0.20	-4.78	0.00	-3.82	-0.73	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

	Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
Member 1: (Exterior wall)							
Bottom							
1- 0	0.18	0.00	0.00	4.49	0.71	-2.08	0.00
1- 1	0.18	0.00	0.00	3.40	0.57	-1.64	0.00
1- 2	0.18	0.00	0.00	2.39	0.43	-1.05	0.00
1- 3	0.18	0.00	0.00	1.44	0.28	-0.54	0.00
1- 4	0.18	0.00	0.00	0.56	0.14	-0.11	0.00
1- 5	0.18	0.00	0.00	-0.26	0.00	0.26	0.00
1- 6	0.18	0.00	0.00	-1.00	-0.14	0.56	0.00
1- 7	0.18	0.00	0.00	-1.68	-0.28	0.79	0.00
1- 8	0.18	0.00	0.00	-2.28	-0.43	0.94	0.00
1- 9	0.18	0.00	0.00	-2.82	-0.57	1.03	0.00
1-10	0.18	0.00	0.00	-3.30	-0.71	1.04	0.00
Top							

Member 2: (Top slab)

Left													
2- 0	-0.20	-4.78	0.00	-3.86	-0.73	1.55	0.00	0.66	4.64	0.00	0.00	0.00	0.00
2- 1	0.37	-0.33	0.00	-3.86	-0.73	1.55	0.00	0.43	3.71	0.00	0.00	0.00	0.00
2- 2	0.77	3.13	0.00	-3.86	-0.73	1.55	0.00	0.32	2.78	0.00	0.00	0.00	0.00
2- 3	1.06	5.61	0.00	-3.86	-0.73	1.55	0.00	0.21	1.85	0.00	0.00	0.00	0.00
2- 4	1.23	7.09	0.00	-3.86	-0.73	1.55	0.00	0.11	0.93	0.00	0.00	0.00	0.00
2- 5	1.28	7.58	0.00	-3.86	-0.73	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	7.09	0.00	-3.86	-0.73	1.55	0.00	-0.11	-0.93	0.00	0.00	0.00	0.00
2- 7	1.06	5.61	0.00	-3.86	-0.73	1.55	0.00	-0.21	-1.85	0.00	0.00	0.00	0.00
2- 8	0.77	3.13	0.00	-3.86	-0.73	1.55	0.00	-0.32	-2.78	0.00	0.00	0.00	0.00
2- 9	0.37	-0.33	0.00	-3.86	-0.73	1.55	0.00	-0.43	-3.71	0.00	0.00	0.00	0.00
2-10	-0.20	-4.78	0.00	-3.86	-0.73	1.55	0.00	-0.66	-4.64	0.00	0.00	0.00	0.00
Right													

Member 4: (Bottom slab)

Left													
4- 0	-2.16	-4.78	0.00	-4.17	-0.73	1.86	0.00	1.73	4.64	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.33	0.00	-4.17	-0.73	1.86	0.00	1.38	3.71	0.00	0.00	0.00	0.00
4- 2	0.79	3.13	0.00	-4.17	-0.73	1.86	0.00	1.04	2.78	0.00	0.00	0.00	0.00
4- 3	1.71	5.61	0.00	-4.17	-0.73	1.86	0.00	0.69	1.85	0.00	0.00	0.00	0.00
4- 4	2.26	7.09	0.00	-4.17	-0.73	1.86	0.00	0.34	0.93	0.00	0.00	0.00	0.00
4- 5	2.44	7.58	0.00	-4.17	-0.73	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	7.09	0.00	-4.17	-0.73	1.86	0.00	-0.35	-0.93	0.00	0.00	0.00	0.00
4- 7	1.71	5.61	0.00	-4.17	-0.73	1.86	0.00	-0.69	-1.85	0.00	0.00	0.00	0.00
4- 8	0.79	3.13	0.00	-4.17	-0.73	1.86	0.00	-1.04	-2.78	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.33	0.00	-4.17	-0.73	1.86	0.00	-1.38	-3.71	0.00	0.00	0.00	0.00
4-10	-2.16	-4.78	0.00	-4.17	-0.73	1.86	0.00	-1.73	-4.64	0.00	0.00	0.00	0.00
Right													

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 6.50 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	4.64	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	3.30	0.71	-1.04
4	0.18	0.00	0.00	4.49	0.71	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.081	8.31	
	2	0.325	8.31	14.00
	3	0.325	8.31	14.00

Eriksson Culvert v6.2.2

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-Ana

Sht: ____ of ____
By: TH | MJ Chk: ____
3/25/2024 5:16:51 PM
Culvert exp. 18 of 30

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-1.37	1.36	0.00	0.00	-1.89	1.83	0.00	0.00	0.00	0.00	0.00
4- 1	0.01	-0.19	1.09	0.00	0.01	-0.14	1.46	0.00	0.00	0.00	0.00	0.00
4- 2	1.01	0.00	0.82	0.00	1.24	0.00	1.10	0.00	0.00	0.00	0.00	0.00
4- 3	1.72	0.00	0.55	0.00	2.21	0.00	0.73	0.00	0.00	0.00	0.00	0.00
4- 4	2.16	0.00	0.28	0.00	2.80	0.00	0.37	0.00	0.00	0.00	0.00	0.00
4- 5	2.30	0.00	0.01	-0.01	2.99	0.00	0.01	-0.01	0.00	0.00	0.00	0.00
4- 6	2.16	0.00	0.00	-0.28	2.80	0.00	0.00	-0.37	0.00	0.00	0.00	0.00
4- 7	1.72	0.00	0.00	-0.55	2.21	0.00	0.00	-0.73	0.00	0.00	0.00	0.00
4- 8	1.01	0.00	0.00	-0.82	1.24	0.00	0.00	-1.10	0.00	0.00	0.00	0.00
4- 9	0.01	-0.19	0.00	-1.09	0.01	-0.14	0.00	-1.46	0.00	0.00	0.00	0.00
4-10	0.00	-1.37	0.00	-1.36	0.00	-1.89	0.00	-1.83	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 6.50 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-7.5	7.13	30.49	4.00	11.39
A2	Bot Corner Bar	-8.7	7.13	37.40	4.00	8.85
A100	Top Slab (int)	11.5	0.37	38.29	4.00	8.35
A200	Bot Slab (int)	12.8	0.31	39.58	4.00	7.95
B1	Ext Wall (int)	1.6	5.30	2.73	4.00	99.99
B2	Ext Wall (ext)	-7.7	7.13	32.08	4.00	10.71

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
BOT	16.00	-12.07	10.36	12.31	6.81	15.30	1.00	0.34	10.59	1.98	2.56
MID	64.00	5.93	4.57	7.43	6.85	8.84	1.00	0.20	10.59	2.43	3.15
MID-	64.00	-9.03	10.36	12.31	6.81	15.30	1.00	0.34	10.59	2.90	3.76
TOP	16.00	-10.74	10.36	12.31	6.81	15.30	1.00	0.34	10.59	2.56	3.32

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-6.61	5.76	12.31	6.81	13.99	1.00	0.34	10.59	4.94	6.40
MID	64.00	15.44	1.46	20.05	6.75	20.44	1.00	0.58	10.59	1.96	2.54
MID-	64.00	0.0#	5.75	7.00	6.86	8.78	1.00	0.19	10.59	NC	NC
RT	16.00	-6.61	5.76	12.31	6.81	13.99	1.00	0.34	10.59	4.94	6.40

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-7.39	7.93	12.31	6.81	14.61	1.00	0.34	10.59	6.04	7.82
MID	64.00	16.94	1.93	21.64	6.74	22.15	1.00	0.63	10.59	2.00	2.59
MID-	64.00	0.0#	7.77	7.00	6.86	9.39	1.00	0.19	10.59	NC	NC
RT	16.00	-7.39	7.93	12.31	6.81	14.61	1.00	0.34	10.59	6.04	7.82

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load
 # - a 0.0 design moment indicates no negative moments at this location. Check the 'Load Combination Results' table to determine if a positive moment exists.

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
BOT	21.85	4.95	11.4	10.36	6.59	10.06	2.000	45.00	11.17 b	0.00	0.00	0.00	6.59	8.55
MID	64.00	0.37	5.9	4.57	6.72	10.97	2.138	37.80	12.19 a	0.00	0.00	0.00	NC	NC
MID-	64.00	0.21	8.6	10.36	6.59	12.21	2.428	35.97	13.57 a	0.00	0.00	0.00	NC	NC
TOP	21.85	-4.13	9.9	10.36	6.59	10.47	2.082	38.02	11.63 a	0.00	0.00	0.00	8.77	11.37

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	6.81	4.6	5.76	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	4.99	6.46
MID	64.00	0.77	15.4	1.46	6.75	15.46	n/a	n/a	17.18 c	0.00	0.00	0.00	19.95	25.86
MID-	64.00	0.77	0.9	5.75	6.86	20.87	5.065	27.46	23.18 a	0.00	0.00	0.00	26.93	34.91
RT	21.85	6.81	4.6	5.76	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	4.99	6.46

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR
LT	21.85	7.70	5.2	7.93	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	4.74	6.15
MID	64.00	0.03	16.9	1.93	6.74	15.43	n/a	n/a	17.15 c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.03	0.0	7.77	6.86	20.87	5.133	27.35	23.18 a	0.00	0.00	0.00	NC	NC
RT	21.85	7.70	5.2	7.93	6.81	15.59	n/a	n/a	17.32 c	0.00	0.00	0.00	4.74	6.15

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 6.50 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-10.932	-19.713	7.153	10.355	7.932	1.925
1- 1	-5.896	-12.438	4.567	10.355	6.144	1.436
1- 2	-0.419	-10.980	4.567	10.355	4.454	1.145
1- 3	3.311	-9.840	4.567	10.355	2.860	0.841
1- 4	5.392	-9.030	4.567	10.355	1.363	0.525
1- 5	5.928	-8.563	4.567	10.355	0.369	-0.210
1- 6	5.022	-8.454	4.567	10.355	0.028	-1.513
1- 7	2.777	-8.715	4.567	10.355	-0.325	-2.720
1- 8	-0.704	-9.359	4.567	10.355	-0.691	-3.830
1- 9	-5.322	-11.200	4.567	10.355	-1.070	-4.844
1-10	-8.520	-16.800	7.153	10.355	-1.457	-5.760
Top						
Member 2: (Top Slab)						
Left						
2- 0	-8.512	-16.865	1.457	5.760	10.355	4.567
2- 1	-1.022	-7.690	1.457	5.760	8.196	3.569
2- 2	5.644	-3.376	1.457	5.748	6.238	2.673
2- 3	11.084	-1.000	1.457	5.748	4.351	1.782
2- 4	14.347	0.425	1.457	5.748	2.529	0.891
2- 5	15.435	0.900	1.457	5.748	0.775	-0.775
2- 6	14.347	0.425	1.457	5.748	-0.891	-2.529
2- 7	11.084	-1.000	1.457	5.748	-1.782	-4.351
2- 8	5.644	-3.376	1.457	5.748	-2.673	-6.238
2- 9	-1.022	-7.690	1.457	5.760	-3.569	-8.196
2-10	-8.512	-16.866	1.457	5.760	-4.567	-10.355
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-10.932	-19.713	1.925	7.932	11.689	5.527
4- 1	-2.768	-8.593	1.925	7.932	9.351	4.422
4- 2	5.714	-3.794	1.925	7.772	7.013	3.316
4- 3	11.948	-0.846	1.925	7.772	4.675	2.211
4- 4	15.688	0.923	1.925	7.772	2.338	1.105
4- 5	16.935	1.512	1.925	7.772	0.026	-0.026
4- 6	15.688	0.923	1.925	7.772	-1.105	-2.338
4- 7	11.948	-0.846	1.925	7.772	-2.211	-4.675
4- 8	5.714	-3.794	1.925	7.772	-3.316	-7.013
4- 9	-2.768	-8.593	1.925	7.932	-4.422	-9.351
4-10	-10.932	-19.713	1.925	7.932	-5.527	-11.689
Right						

=====

Analysis Results: Fill Depth = 8.25 ft

=====

Load Parameters:

Fe = 1.15 Surcharge Depth : 2.04 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of wall	Top of wall
Live Load Surcharge	0.123	0.123
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	1.155	0.515

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	1.134
wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior wall)							
Bottom							
1- 0	-2.16	-6.24	0.00	-4.74	-0.67	1.86	0.00
1- 1	-1.96	-6.24	0.00	0.00	-0.05	-0.19	0.00
1- 2	-1.77	-6.24	0.00	3.50	0.44	-1.62	0.00
1- 3	-1.57	-6.24	0.00	5.84	0.79	-2.47	0.00
1- 4	-1.37	-6.24	0.00	7.09	1.00	-2.82	0.00
1- 5	-1.18	-6.24	0.00	7.31	1.07	-2.74	0.00
1- 6	-0.98	-6.24	0.00	6.58	1.00	-2.30	0.00
1- 7	-0.79	-6.24	0.00	4.97	0.79	-1.58	0.00
1- 8	-0.59	-6.24	0.00	2.56	0.44	-0.66	0.00
1- 9	-0.40	-6.24	0.00	-0.59	-0.05	0.40	0.00
1-10	-0.20	-6.24	0.00	-4.39	-0.67	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
0.18	0.00	0.00	5.05	0.65	-2.08	0.00
0.18	0.00	0.00	3.85	0.52	-1.64	0.00
0.18	0.00	0.00	2.72	0.39	-1.05	0.00
0.18	0.00	0.00	1.66	0.26	-0.54	0.00
0.18	0.00	0.00	0.67	0.13	-0.11	0.00
0.18	0.00	0.00	-0.26	0.00	0.26	0.00
0.18	0.00	0.00	-1.11	-0.13	0.56	0.00
0.18	0.00	0.00	-1.90	-0.26	0.79	0.00
0.18	0.00	0.00	-2.62	-0.39	0.94	0.00
0.18	0.00	0.00	-3.27	-0.52	1.03	0.00
0.18	0.00	0.00	-3.86	-0.65	1.04	0.00

Member 2: (Top slab)

Left														
2- 0	-0.20	-6.24	0.00	-4.44	-0.67	1.55	0.00	0.66	6.05	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.43	0.00	-4.44	-0.67	1.55	0.00	0.43	4.84	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	4.09	0.00	-4.44	-0.67	1.55	0.00	0.32	3.63	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	7.31	0.00	-4.44	-0.67	1.55	0.00	0.21	2.42	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	9.25	0.00	-4.44	-0.67	1.55	0.00	0.11	1.21	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	9.89	0.00	-4.44	-0.67	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	9.25	0.00	-4.44	-0.67	1.55	0.00	-0.11	-1.21	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	7.31	0.00	-4.44	-0.67	1.55	0.00	-0.21	-2.42	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	4.09	0.00	-4.44	-0.67	1.55	0.00	-0.32	-3.63	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.43	0.00	-4.44	-0.67	1.55	0.00	-0.43	-4.84	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-6.24	0.00	-4.44	-0.67	1.55	0.00	-0.66	-6.05	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom slab)

Left														
4- 0	-2.16	-6.24	0.00	-4.74	-0.67	1.86	0.00	1.73	6.05	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.43	0.00	-4.74	-0.67	1.86	0.00	1.38	4.84	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	4.09	0.00	-4.74	-0.67	1.86	0.00	1.04	3.63	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	7.31	0.00	-4.74	-0.67	1.86	0.00	0.69	2.42	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	9.25	0.00	-4.74	-0.67	1.86	0.00	0.34	1.21	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	9.89	0.00	-4.74	-0.67	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	9.25	0.00	-4.74	-0.67	1.86	0.00	-0.35	-1.21	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	7.31	0.00	-4.74	-0.67	1.86	0.00	-0.69	-2.42	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	4.09	0.00	-4.74	-0.67	1.86	0.00	-1.04	-3.63	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.43	0.00	-4.74	-0.67	1.86	0.00	-1.38	-4.84	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-6.24	0.00	-4.74	-0.67	1.86	0.00	-1.73	-6.05	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 8.25 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	6.05	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	3.86	0.65	-1.04
4	0.18	0.00	0.00	5.05	0.65	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.057	10.32	
	2	0.228	10.32	14.00
	3	0.228	10.32	14.00

[illegible]

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-1.20	1.18	0.00	0.00	-1.41	1.37	0.00	0.00	0.00	0.00	0.00
4- 1	0.01	-0.13	0.94	0.00	0.01	-0.10	1.10	0.00	0.00	0.00	0.00	0.00
4- 2	0.81	0.00	0.71	0.00	0.93	0.00	0.82	0.00	0.00	0.00	0.00	0.00
4- 3	1.44	0.00	0.47	0.00	1.66	0.00	0.55	0.00	0.00	0.00	0.00	0.00
4- 4	1.81	0.00	0.24	0.00	2.10	0.00	0.27	0.00	0.00	0.00	0.00	0.00
4- 5	1.94	0.00	0.01	-0.01	2.24	0.00	0.01	-0.01	0.00	0.00	0.00	0.00
4- 6	1.81	0.00	0.00	-0.24	2.10	0.00	0.00	-0.27	0.00	0.00	0.00	0.00
4- 7	1.44	0.00	0.00	-0.47	1.66	0.00	0.00	-0.55	0.00	0.00	0.00	0.00
4- 8	0.81	0.00	0.00	-0.71	0.93	0.00	0.00	-0.82	0.00	0.00	0.00	0.00
4- 9	0.01	-0.13	0.00	-0.94	0.01	-0.10	0.00	-1.10	0.00	0.00	0.00	0.00
4-10	0.00	-1.20	0.00	-1.18	0.00	-1.41	0.00	-1.37	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 8.25 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Eriksson Culvert v6.2.2

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-AnaCulvert)exp. 24 of 30

Sht: ____ of ____
By: TH | MJ Chk: ____
3/25/2024 5:16:52 PM

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-8.4	8.08	34.38	4.00	9.84
A2	Bot Corner Bar	-9.7	8.08	41.22	4.00	7.81
A100	Top Slab (int)	12.8	0.67	42.30	4.00	7.32
A200	Bot Slab (int)	14.1	0.61	43.29	4.00	7.06
B1	Ext Wall (int)	1.0	6.71	0.00	4.00	99.99
B2	Ext Wall (ext)	-8.3	8.08	33.74	4.00	10.07

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
BOT	16.00	-13.18	11.48	12.31	6.81	15.61	1.00	0.34	10.59	1.98	2.57
MID	64.00	5.82	5.78	7.43	6.85	9.20	1.00	0.20	10.59	2.81	3.64
MID-	64.00	-9.46	11.48	12.31	6.81	15.61	1.00	0.34	10.59	3.49	4.52
TOP	16.00	-11.85	11.48	12.31	6.81	15.61	1.00	0.34	10.59	2.76	3.58

Member 2: (Top slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-7.05	6.42	12.31	6.81	14.18	1.00	0.34	10.59	5.51	7.14
MID	64.00	16.78	1.98	20.05	6.75	20.58	1.00	0.58	10.59	1.97	2.55
MID-	64.00	0.0#	6.44	7.00	6.86	8.99	1.00	0.19	10.59	NC	NC
RT	16.00	-7.05	6.42	12.31	6.81	14.18	1.00	0.34	10.59	5.51	7.14

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in ²)	1.2Mcr (k-ft)	Load Ratings IR	OR
LT	16.00	-7.94	8.59	12.31	6.81	14.80	1.00	0.34	10.59	6.51	8.44
MID	64.00	18.28	2.44	21.64	6.74	22.28	1.00	0.63	10.59	2.02	2.62
MID-	64.00	0.0#	8.47	7.00	6.86	9.60	1.00	0.19	10.59	NC	NC
RT	16.00	-7.94	8.59	12.31	6.81	14.80	1.00	0.34	10.59	6.51	8.44

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load
 # - a 0.0 design moment indicates no negative moments at this location. Check the 'Load Combination Results' table to determine if a positive moment exists.

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load IR	Ratings OR	
BOT	21.85	5.37	12.3	11.48	6.59	10.06	2.000	45.00	11.17	b	0.00	0.00	0.00	6.82	8.84
MID	64.00	0.33	5.8	5.78	6.72	11.49	2.239	37.20	12.76	a	0.00	0.00	0.00	NC	NC
MID-	64.00	0.20	8.9	11.48	6.59	12.17	2.420	36.02	13.52	a	0.00	0.00	0.00	NC	NC
TOP	21.85	-4.57	10.8	11.48	6.59	10.13	2.014	38.50	11.25	a	0.00	0.00	0.00	8.37	10.85

Member 2: (Top slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load IR	Ratings OR	
LT	21.85	7.53	4.8	6.42	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.88	7.63
MID	64.00	0.58	16.8	1.98	6.75	15.46	n/a	n/a	17.18	c	0.00	0.00	0.00	26.62	34.51
MID-	64.00	0.58	2.2	6.44	6.86	20.87	4.005	29.92	23.18	a	0.00	0.00	0.00	35.93	46.58
RT	21.85	7.53	4.8	6.42	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.88	7.63

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load IR	Ratings OR	
LT	21.85	8.44	5.4	8.59	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.52	7.16
MID	64.00	0.02	18.3	2.44	6.74	15.43	n/a	n/a	17.15	c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.02	0.0	8.47	6.86	20.87	5.141	27.34	23.18	a	0.00	0.00	0.00	NC	NC
RT	21.85	8.44	5.4	8.59	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.52	7.16

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arera

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 8.25 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior wall)						
Bottom						
1- 0	-13.414	-21.590	9.079	11.480	8.586	2.443
1- 1	-7.193	-13.631	5.777	11.480	6.659	1.857
1- 2	-1.197	-11.815	5.777	11.480	4.829	1.471
1- 3	2.904	-10.419	5.777	11.480	3.096	1.071
1- 4	5.208	-9.455	5.777	11.480	1.460	0.659
1- 5	5.818	-8.937	5.777	11.480	0.327	-0.198
1- 6	4.838	-8.879	5.777	11.480	-0.110	-1.641
1- 7	2.370	-9.294	5.777	11.480	-0.560	-2.987
1- 8	-1.482	-10.194	5.777	11.480	-1.021	-4.236
1- 9	-6.620	-12.407	5.777	11.480	-1.496	-5.388
1-10	-11.009	-18.670	9.079	11.480	-1.979	-6.444
Top						
Member 2: (Top Slab)						
Left						
2- 0	-11.001	-18.735	1.979	6.418	11.480	5.777
2- 1	-1.835	-8.307	1.979	6.418	9.088	4.536
2- 2	5.908	-3.277	1.979	6.444	6.883	3.399
2- 3	11.947	-0.255	1.979	6.444	4.732	2.266
2- 4	15.571	1.557	1.979	6.444	2.631	1.133
2- 5	16.779	2.161	1.979	6.444	0.581	-0.581
2- 6	15.571	1.557	1.979	6.444	-1.133	-2.631
2- 7	11.947	-0.255	1.979	6.444	-2.266	-4.732
2- 8	5.908	-3.277	1.979	6.444	-3.399	-6.883
2- 9	-1.835	-8.307	1.979	6.418	-4.536	-9.087
2-10	-11.001	-18.736	1.979	6.418	-5.777	-11.480
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-13.414	-21.590	2.443	8.586	12.813	6.737
4- 1	-3.405	-9.351	2.443	8.586	10.250	5.390
4- 2	5.978	-3.694	2.443	8.468	7.688	4.042
4- 3	12.812	-0.101	2.443	8.468	5.125	2.695
4- 4	16.912	2.055	2.443	8.468	2.563	1.347
4- 5	18.279	2.773	2.443	8.468	0.019	-0.019
4- 6	16.912	2.055	2.443	8.468	-1.347	-2.563
4- 7	12.812	-0.101	2.443	8.468	-2.695	-5.125
4- 8	5.978	-3.694	2.443	8.468	-4.042	-7.688
4- 9	-3.405	-9.351	2.443	8.586	-5.390	-10.250
4-10	-13.414	-21.590	2.443	8.586	-6.737	-12.813
Right						

Analysis Results: Fill Depth = 10.00 ft

Load Parameters:

Fe = 1.15 Surcharge Depth : 2.00 ft

Applied Horizontal Loads: (k/ft)

Load Description	Bottom of wall	Top of wall
Live Load Surcharge	0.120	0.120
Internal Water Pressure	-0.624(4.0in)	0.000(-4.0in)
External Water Pressure	0.000(0.0in)	0.000(0.0in)
Horizontal Earth Load	1.260	0.620

Applied Uniform Bottom Slab Loads: (k/ft)

Load Description	
Dead Load	0.323
Vertical Earth	1.380
Wearing Surface	0.000

Unfactored Moments due to All Loads: (k-ft)

M-PT	Mdc	Mev	Mdw	Meh	Mls	Mwa	Mgw
Member 1: (Exterior wall)							
Bottom							
1- 0	-2.16	-7.59	0.00	-5.32	-0.66	1.86	0.00
1- 1	-1.96	-7.59	0.00	-0.04	-0.05	-0.19	0.00
1- 2	-1.77	-7.59	0.00	3.88	0.43	-1.62	0.00
1- 3	-1.57	-7.59	0.00	6.52	0.77	-2.47	0.00
1- 4	-1.37	-7.59	0.00	7.94	0.98	-2.82	0.00
1- 5	-1.18	-7.59	0.00	8.22	1.05	-2.74	0.00
1- 6	-0.98	-7.59	0.00	7.43	0.98	-2.30	0.00
1- 7	-0.79	-7.59	0.00	5.65	0.77	-1.58	0.00
1- 8	-0.59	-7.59	0.00	2.94	0.43	-0.66	0.00
1- 9	-0.40	-7.59	0.00	-0.63	-0.05	0.40	0.00
1-10	-0.20	-7.59	0.00	-4.97	-0.66	1.50	0.00
Top							

Unfactored Shears due to All Loads: (k)

	Vdc	Vev	Vdw	Veh	Vls	Vwa	Vgw
Member 1: (Exterior wall)							
Bottom							
1- 0	0.18	0.00	0.00	5.61	0.64	-2.08	0.00
1- 1	0.18	0.00	0.00	4.30	0.51	-1.64	0.00
1- 2	0.18	0.00	0.00	3.06	0.38	-1.05	0.00
1- 3	0.18	0.00	0.00	1.89	0.26	-0.54	0.00
1- 4	0.18	0.00	0.00	0.78	0.13	-0.11	0.00
1- 5	0.18	0.00	0.00	-0.26	0.00	0.26	0.00
1- 6	0.18	0.00	0.00	-1.22	-0.13	0.56	0.00
1- 7	0.18	0.00	0.00	-2.12	-0.26	0.79	0.00
1- 8	0.18	0.00	0.00	-2.96	-0.38	0.94	0.00
1- 9	0.18	0.00	0.00	-3.72	-0.51	1.03	0.00
1-10	0.18	0.00	0.00	-4.42	-0.64	1.04	0.00
Top							

Member 2: (Top Slab)

Left														
2- 0	-0.20	-7.59	0.00	-5.02	-0.66	1.55	0.00	0.66	7.36	0.00	0.00	0.00	0.00	0.00
2- 1	0.37	-0.52	0.00	-5.02	-0.66	1.55	0.00	0.43	5.89	0.00	0.00	0.00	0.00	0.00
2- 2	0.77	4.97	0.00	-5.02	-0.66	1.55	0.00	0.32	4.42	0.00	0.00	0.00	0.00	0.00
2- 3	1.06	8.90	0.00	-5.02	-0.66	1.55	0.00	0.21	2.94	0.00	0.00	0.00	0.00	0.00
2- 4	1.23	11.25	0.00	-5.02	-0.66	1.55	0.00	0.11	1.47	0.00	0.00	0.00	0.00	0.00
2- 5	1.28	12.04	0.00	-5.02	-0.66	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2- 6	1.23	11.25	0.00	-5.02	-0.66	1.55	0.00	-0.11	-1.47	0.00	0.00	0.00	0.00	0.00
2- 7	1.06	8.90	0.00	-5.02	-0.66	1.55	0.00	-0.21	-2.94	0.00	0.00	0.00	0.00	0.00
2- 8	0.77	4.97	0.00	-5.02	-0.66	1.55	0.00	-0.32	-4.42	0.00	0.00	0.00	0.00	0.00
2- 9	0.37	-0.52	0.00	-5.02	-0.66	1.55	0.00	-0.43	-5.89	0.00	0.00	0.00	0.00	0.00
2-10	-0.20	-7.59	0.00	-5.02	-0.66	1.55	0.00	-0.66	-7.36	0.00	0.00	0.00	0.00	0.00
Right														

Member 4: (Bottom Slab)

Left														
4- 0	-2.16	-7.59	0.00	-5.32	-0.66	1.86	0.00	1.73	7.36	0.00	0.00	0.00	0.00	0.00
4- 1	-0.50	-0.52	0.00	-5.32	-0.66	1.86	0.00	1.38	5.89	0.00	0.00	0.00	0.00	0.00
4- 2	0.79	4.97	0.00	-5.32	-0.66	1.86	0.00	1.04	4.42	0.00	0.00	0.00	0.00	0.00
4- 3	1.71	8.90	0.00	-5.32	-0.66	1.86	0.00	0.69	2.94	0.00	0.00	0.00	0.00	0.00
4- 4	2.26	11.25	0.00	-5.32	-0.66	1.86	0.00	0.34	1.47	0.00	0.00	0.00	0.00	0.00
4- 5	2.44	12.04	0.00	-5.32	-0.66	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4- 6	2.26	11.25	0.00	-5.32	-0.66	1.86	0.00	-0.35	-1.47	0.00	0.00	0.00	0.00	0.00
4- 7	1.71	8.90	0.00	-5.32	-0.66	1.86	0.00	-0.69	-2.94	0.00	0.00	0.00	0.00	0.00
4- 8	0.79	4.97	0.00	-5.32	-0.66	1.86	0.00	-1.04	-4.42	0.00	0.00	0.00	0.00	0.00
4- 9	-0.50	-0.52	0.00	-5.32	-0.66	1.86	0.00	-1.38	-5.89	0.00	0.00	0.00	0.00	0.00
4-10	-2.16	-7.59	0.00	-5.32	-0.66	1.86	0.00	-1.73	-7.36	0.00	0.00	0.00	0.00	0.00
Right														

Unfactored Thrusts due to All Loads: (k) (Fill Depth = 10.00 ft)

Member	Pdc	Pev	Pdw	Peh	Pls	Pwa
1	0.66	7.36	0.00	0.00	0.00	0.00
2	-0.18	0.00	0.00	4.42	0.64	-1.04
4	0.18	0.00	0.00	5.61	0.64	-2.08

Analysis Truck, HL-93

Vehicle	Axle No.	Weight (k/ft)	Length (ft)	Dist. From Previous (ft)
Truck	1	0.044	12.33	
	2	0.178	12.33	14.00
	3	0.178	12.33	14.00

Tandem	1	0.210	16.33
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Live Load Parameters:

Traffic Direction is Parallel to Main Reinforcement
Distribution Width : 29.17 ft
Impact Factor : 1.00
Truck MPF : 1.20 Tandem MPF : 1.20
Lane Load Distribution Width : 0.00 ft
Lane Load: 0.000 k/ft

Truck Positions That Cause Maximum Results:

Maximum +Moment in Top Slab				
Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.044	12.33	20.17
	2	0.178	12.33	6.17
	3	0.178	12.33	-7.83
Maximum +Moment			:	1.55 k-ft
Corresponding Moment at End			:	-0.98 k-ft
Coincident Bottom Slab Load			:	0.18 k/ft

Maximum +Shear in Top Slab				
Truck	1	0.044	12.33	20.17
	2	0.178	12.33	6.17
	3	0.178	12.33	-7.83
Maximum +Shear	:		0.95	k
Corresponding Shear at Mid	:		0.00	k
Coincident Bottom Slab Load	:		0.18	k/ft

Maximum +Moment in Top Slab
Tandem 1 0.210 16.33 8.17
Maximum +Moment : 1.83 k-ft
Corresponding Moment at End : -1.15 k-ft
Coincident Bottom Slab Load : 0.21 k/ft

Maximum +Shear in Top Slab			
Tandem 1	0.210	16.33	8.17
Maximum +Shear	:	1.12	k
Corresponding Shear at Mid	:	0.00	k
Coincident Bottom Slab Load	:	0.21	k/ft

Maximum -Moment in Top Slab				
Vehicle	Axle No.	Weight (klf)	Length (ft)	Dist. From Left End (ft)
Truck	1	0.044	12.33	20.70
	2	0.178	12.33	6.70
	3	0.178	12.33	-7.30
Maximum -Moment			:	-0.99 k-ft
Corresponding Moment at Mid			:	1.53 k-ft
Coincident Bottom Slab Load			:	0.17 k/ft

Maximum -Shear in Top Slab				
Truck	1	0.044	12.33	20.17
	2	0.178	12.33	6.17
	3	0.178	12.33	-7.83
Maximum -Shear	:			-0.95 k
Corresponding Shear at Mid	:			0.00 k
Coincident Bottom Slab Load	:			0.18 k/ft

Maximum -Moment in Top Slab
Tandem 1 0.210 16.33 8.70
Maximum -Moment : -1.16 k-ft
Corresponding Moment at Mid : 1.81 k-ft
Coincident Bottom Slab Load : 0.20 k/ft

Maximum -Shear in Top Slab
Tandem 1 0.210 16.33 8.17
Maximum -Shear : -1.12 k
Corresponding Shear at Mid : 0.00 k
Coincident Bottom Slab Load : 0.21 k/ft

Unfactored Moments and Shears due to Truck Loads: (k-ft, k)

[illegible]

Member 2: (Top slab)

Left	2-0	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	Right
0.01	-0.99	0.95	0.00	0.01	-1.16	1.12	0.00	0.00	0.00	0.00	0.00	0.00
0.21	-0.28	0.77	-0.01	0.25	-0.33	0.91	-0.01	0.00	0.00	0.00	0.00	0.00
0.65	0.00	0.60	-0.04	0.76	0.00	0.71	-0.04	0.00	0.00	0.00	0.00	0.00
1.15	0.00	0.46	-0.08	1.35	0.00	0.54	-0.09	0.00	0.00	0.00	0.00	0.00
1.45	0.00	0.33	-0.14	1.71	0.00	0.39	-0.17	0.00	0.00	0.00	0.00	0.00
1.55	0.00	0.23	-0.23	1.83	0.00	0.27	-0.27	0.00	0.00	0.00	0.00	0.00
1.45	0.00	0.14	-0.33	1.71	0.00	0.17	-0.39	0.00	0.00	0.00	0.00	0.00
1.15	0.00	0.08	-0.46	1.35	0.00	0.09	-0.54	0.00	0.00	0.00	0.00	0.00
0.65	0.00	0.04	-0.60	0.76	0.00	0.04	-0.71	0.00	0.00	0.00	0.00	0.00
0.21	-0.28	0.01	-0.77	0.25	-0.33	0.01	-0.91	0.00	0.00	0.00	0.00	0.00
0.01	-0.99	0.00	-0.95	0.01	-1.16	0.00	-1.12	0.00	0.00	0.00	0.00	0.00

Eriksson Culvert v6.2.2

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Filename: 10x10.ARDOT Hwy. 63 & Hwy. 70, Job 061467, Prairie County, AR-(Parallel-Ana

Sht:____of____
By:TH | MJ Chk:____
3/25/2024 5:16:52 PM
Culvert exp. 28 of 30

Member 4: (Bottom Slab)

Left												
4- 0	0.00	-0.98	0.95	0.00	0.00	-1.15	1.12	0.00	0.00	0.00	0.00	0.00
4- 1	0.01	-0.09	0.76	0.00	0.01	-0.09	0.90	0.00	0.00	0.00	0.00	0.00
4- 2	0.64	0.00	0.57	0.00	0.76	0.00	0.67	0.00	0.00	0.00	0.00	0.00
4- 3	1.15	0.00	0.38	0.00	1.35	0.00	0.45	0.00	0.00	0.00	0.00	0.00
4- 4	1.45	0.00	0.19	0.00	1.71	0.00	0.22	0.00	0.00	0.00	0.00	0.00
4- 5	1.55	0.00	0.01	-0.01	1.83	0.00	0.01	-0.01	0.00	0.00	0.00	0.00
4- 6	1.45	0.00	0.00	-0.19	1.71	0.00	0.00	-0.22	0.00	0.00	0.00	0.00
4- 7	1.15	0.00	0.00	-0.38	1.35	0.00	0.00	-0.45	0.00	0.00	0.00	0.00
4- 8	0.64	0.00	0.00	-0.57	0.76	0.00	0.00	-0.67	0.00	0.00	0.00	0.00
4- 9	0.01	-0.09	0.00	-0.76	0.01	-0.09	0.00	-0.90	0.00	0.00	0.00	0.00
4-10	0.00	-0.98	0.00	-0.95	0.00	-1.15	0.00	-1.12	0.00	0.00	0.00	0.00
Right												

Note: Unfactored live load results computed at 10.00 ft and 0 ft fill depths, per LRFD 3.6.1.2.6

Serviceability Check: Crack Control

Bar Mark	Location	Moment (k-ft)	Thrust (k)	Fss (ksi)	Spacing (in)	Allow (in)
A1	Top Corner Bar	-9.5	9.14	38.72	4.00	8.46
A2	Bot Corner Bar	-10.7	9.14	45.48	4.00	6.85
A100	Top Slab (int)	14.2	0.96	46.90	4.00	6.36
A200	Bot Slab (int)	15.5	0.89	47.55	4.00	6.20
B2	Ext Wall (ext)	-9.0	9.14	35.85	4.00	9.33

Strength Limit State at Critical Sections: Flexure

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
BOT	16.00	-14.51	12.83	12.31	6.81	15.98	1.00	0.34	10.59	1.73	2.24
MID	64.00	5.92	6.90	7.43	6.85	9.54	1.00	0.20	10.59	2.98	3.86
MID-	64.00	-10.11	12.83	12.31	6.81	15.98	1.00	0.34	10.59	3.91	5.06
TOP	16.00	-13.20	12.83	12.31	6.81	15.98	1.00	0.34	10.59	2.68	3.48

Member 2: (Top Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
LT	16.00	-7.65	7.18	12.31	6.81	14.40	1.00	0.34	10.59	5.68	7.37
MID	64.00	18.49	2.48	20.05	6.75	20.72	1.00	0.58	10.59	1.70	2.20
MID-	64.00	0.0#	7.21	7.00	6.86	9.22	1.00	0.19	10.59	NC	NC
RT	16.00	-7.65	7.18	12.31	6.81	14.40	1.00	0.34	10.59	5.68	7.37

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist. (in)	Design Moment (k-ft)	Corr. A. F. (k)	Mu (k-ft)	ds (in)	Ma (k-ft)	phi	As (in2)	1.2Mcr (k-ft)	Load Ratings IR OR	
LT	16.00	-8.58	9.33	12.31	6.81	15.01	1.00	0.34	10.59	6.62	8.58
MID	64.00	19.99	2.93	21.64	6.74	22.41	1.00	0.63	10.59	1.76	2.28
MID-	64.00	0.0#	9.24	7.00	6.86	9.83	1.00	0.19	10.59	NC	NC
RT	16.00	-8.58	9.33	12.31	6.81	15.01	1.00	0.34	10.59	6.62	8.58

Notes: Mu - Resisting moment under pure flexure, Ma - Allowable moment under applied axial load
 # - a 0.0 design moment indicates no negative moments at this location. Check the 'Load Combination Results' table to determine if a positive moment exists.

Strength Limit State at Critical Sections: Vertical Shear

Member 1: (Exterior Wall), Thickness = 8.00 in

Loc	Dist. (in)	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR OR	
BOT	21.85	5.85	13.5	12.83	6.59	10.06	2.000	45.00	11.17 b	0.00	0.00	0.00	6.47	8.39
MID	64.00	0.30	5.9	6.90	6.72	11.74	2.287	36.92	13.04 a	0.00	0.00	0.00	NC	NC
MID-	64.00	0.20	9.5	12.83	6.59	12.01	2.389	36.20	13.35 a	0.00	0.00	0.00	NC	NC
TOP	21.85	-5.08	12.0	12.83	6.59	10.06	2.000	45.00	11.17 b	0.00	0.00	0.00	7.53	9.76

Member 2: (Top Slab), Thickness = 8.00 in

Summary of Results (continued), 3100 psi															
Loc	Dist.	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings IR	OR	
LT	21.85	8.40	5.0	7.18	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	6.33	8.21
MID	64.00	0.47	18.5	2.48	6.75	15.46	n/a	n/a	17.18	c	0.00	0.00	0.00	32.61	42.27
MID-	64.00	0.47	3.2	7.21	6.86	17.31	3.308	32.23	19.23	a	0.00	0.00	0.00	36.52	47.34
RT	21.85	8.40	5.0	7.18	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	6.33	8.21

Member 4: (Bottom Slab), Thickness = 8.00 in

Loc	Dist.	Design Shear (k)	Corr. Moment (k-ft)	Corr. A. F. (k)	Dv (in)	phi*Vn (k)	Beta	Theta	Vc (k)	Vs (k)	Av (in2)	Max. Spac (in)	Load Ratings		
	(in)												IR	OR	
LT	21.85	9.33	5.6	9.33	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.85	7.59
MID	64.00	0.02	20.0	2.93	6.74	15.43	n/a	n/a	17.15	c	0.00	0.00	0.00	NC	NC
MID-	64.00	0.02	0.0	9.24	6.86	20.87	5.149	27.33	23.18	a	0.00	0.00	0.00	NC	NC
RT	21.85	9.33	5.6	9.33	6.81	15.59	n/a	n/a	17.32	c	0.00	0.00	0.00	5.85	7.59

Vc Calculation By: a - Iterative Beta, b - Constant Beta, c - Box Culvert, d - Standard/Arema

Load Combination Results at Tenth Points: (k-ft, k)(Fill Depth = 10.00 ft)

M-PT	+Moment	-Moment	+Axial	-Axial	+Shear	-Shear
Member 1: (Exterior Wall)						
Bottom						
1- 0	-15.755	-23.776	10.869	12.828	9.334	2.930
1- 1	-8.407	-15.057	6.901	12.828	7.253	2.248
1- 2	-1.835	-12.882	6.901	12.828	5.269	1.766
1- 3	2.676	-11.230	6.901	12.828	3.382	1.270
1- 4	5.227	-10.112	6.901	12.828	1.591	0.762
1- 5	5.919	-9.544	6.901	12.828	0.304	-0.198
1- 6	4.857	-9.537	6.901	12.828	-0.229	-1.795
1- 7	2.142	-10.105	6.901	12.828	-0.774	-3.295
1- 8	-2.121	-11.261	6.901	12.828	-1.332	-4.698
1- 9	-7.834	-13.852	6.901	12.828	-1.902	-6.005
1-10	-13.353	-20.852	10.869	12.828	-2.481	-7.215
Top						
Member 2: (Top Slab)						
Left						
2- 0	-13.345	-20.917	2.481	7.182	12.828	6.901
2- 1	-2.557	-9.098	2.481	7.182	10.163	5.436
2- 2	6.324	-3.312	2.481	7.215	7.676	4.073
2- 3	13.083	0.309	2.481	7.215	5.235	2.715
2- 4	17.138	2.481	2.481	7.215	2.834	1.358
2- 5	18.490	3.205	2.481	7.215	0.474	-0.474
2- 6	17.138	2.481	2.481	7.215	-1.358	-2.834
2- 7	13.083	0.309	2.481	7.215	-2.715	-5.235
2- 8	6.324	-3.312	2.481	7.215	-4.073	-7.676
2- 9	-2.557	-9.098	2.481	7.182	-5.436	-10.163
2-10	-13.345	-20.918	2.481	7.182	-6.901	-12.828
Right						
Member 4: (Bottom Slab)						
Left						
4- 0	-15.755	-23.776	2.930	9.334	14.162	7.861
4- 1	-4.030	-10.194	2.930	9.334	11.329	6.289
4- 2	6.394	-3.730	2.930	9.238	8.497	4.717
4- 3	13.947	0.463	2.930	9.238	5.665	3.144
4- 4	18.479	2.978	2.930	9.238	2.832	1.572
4- 5	19.990	3.817	2.930	9.238	0.016	-0.016
4- 6	18.479	2.978	2.930	9.238	-1.572	-2.832
4- 7	13.947	0.463	2.930	9.238	-3.144	-5.665
4- 8	6.394	-3.730	2.930	9.238	-4.717	-8.497
4- 9	-4.030	-10.194	2.930	9.334	-6.289	-11.329
4-10	-15.755	-23.776	2.930	9.334	-7.861	-14.162
Right						



Rinker Materials
501 East Jefferson Street
West Memphis, AR 72301
Tel 870-735-5514
Fax 870-735-0331
www.rinkerpipe.com

March 20, 2024

Contractor:

White River Irrigation District

Project:

ArDOT Hwy 63 & Hwy 70 Strs & Apprs
ARDOT 061467
Prairie Co, Arkansas

Rinker Materials certifies the items below that we propose to manufacture and ship from our West Memphis AR location to the above project meets or exceeds the listed specifications:

Precast Concrete Box Culverts

Site #1 at Hwy 63
10x10 size box culvert

ASTM C1577 Standards per Section 7.2
Special Design using Eriksson Culvert
Design Software to HL-93 Live Loading

Site #2 at Hwy 70
10x10 size box culvert

ASTM C1577 Standards per Section 7.2
Special Design using Eriksson Culvert
Design Software to HL-93 Live Loading

Preformed Plastic Joint Mastic
Trelleborg Bidco C-56

Fed Spec SS-S-210A &
ArDOT QPL 606 list

Thanks,

Billy Wallin, P.E.
TRE

Joint Seal Gasket

Supplier	Brand
Concrete Sealants, Inc. Tipp City, OH	Conseal CS-102 Conseal CS-102B Conseal-202
Hamilton Kent, LLC. Winchester, TN	Tylox SOCL Tylox SuperSeal
Henry Sealant Division Houston, TX	BUTYL-NEK RAM-NEK
Martin Asphalt Company South Houston, TX	Evergrip 990
Rinker Materials Fort Worth, TX	Delta Rubber O-Ring Gasket Delta Seal Rubber Profile Gasket Omni-Flex
Rinker Materials Gainesville, GA	Delta Rubber O-Ring Gasket Delta Seal Rubber Profile Gasket
Superior Pipe Products, Inc. Depew, OK	Omni-Flex
Trelleborg Pipe Seals Park Hills, Inc. Park Hills, MO	Bidco C-56



Joint Seal Gasket

Method of Documentation of Acceptance:

By brand and source.

Method of Approval:

- Preformed rubber gaskets accepted on manufacturer certification and independent lab test reports. Bitumen/butyl rubber gaskets must meet the requirements of ASTM C 990. Tubular cross-section, closed cellular gaskets must meet the physical requirements of ASTM D 1056 (Type 2, Class C, Grade 1) and the chemical requirements of ASTM C 990. A test report indicating compliance with these requirements must be submitted.
- Sufficient sample to perform the specification testing must be submitted. Materials submitted for testing shall be accompanied by a Safety Data Sheet (SDS), actual lot/batch certified analysis, and product literature. This product literature should include, as a minimum, such items as: installation procedures, weather restrictions to use, primer requirements, etc.
- After approval for inclusion in the Qualified Products List, samples may be taken at random from shipments. Non-conformance of any material may be cause for the product to be removed from the Qualified Products List.

The manufacturer of privately labeled products must be disclosed.

No information contained in these lists is to be used for promotional purposes.

Bidco C-56 Sealant

Remains flexible and forms a permanent bond to a wide variety of substrates including concrete, metals and plastics



Bidco C-56 Joint Sealant is custom engineered to meet the most exacting standards of the precast concrete industry. C-56 remains flexible and forms a permanent bond to a wide variety of substrates including concrete, metals and plastics.

Adhesion and cohesion at the time of installation are excellent and actually improve after the joint has been formed and placed into service. This sealant is designed not to shrink, oxidize or harden and has excellent resistance to temperature extremes, acid and alkaline environments.

C-56 Joint Sealant is designed to fully comply with current ASTM Standards and Specifications as required by Federal, State, and Local agencies for use by the precast concrete industry and contractors.

PRODUCT FEATURES:

Available in strip or coil form

Crush-proof packaging

Non-stick, non-tear plastic backing

PRIMARY APPLICATIONS:

Concrete Pipe

Septic Tanks

Wet Wells

Box Culverts

Utility Vaults

Burial Vaults

Sanitary & Storm Sewer Manholes

Concrete Wall Panel Systems

BIDCO C-56 MEETS OR EXCEEDS:

Federal Specifications SS-S-210 A "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form

AASHTO Designation M-198 75 I, Type B, Flexible Plastic Gasket (Bitumin)

ASTM Designation C-990

COILS

Width & Length (inches/mm)	Cross Section (inches/mm)	Pieces Per Ctn.	L.F. Per Per Ctn./Meters	Pallet Size # of ctns./lbs./kg
.5" x 21.0'/ 13 mm x 6400 mm	oval	10	210/64 m	45 ctns./24 lbs./11 kg
.75" x 14.5'/ 19 mm x 4420 mm	.66 x .66/ 16.8 mm x 16.8 mm	10	145/44.2 m	45 ctns./36 lbs./16 kg
1.0" x 14.5'/ 25 mm x 4420 mm	.88 x .88/ 22.4 mm x 22.4 mm	8	116/35.4 m	45 ctns./50 lbs./23 kg
1.25" x 14.5'/ 32 mm x 4420 mm	.875 x 1.375/ 22.2 mm x 34.9 mm	5	72.5/22.1 m	45 ctns./49 lbs./22 kg
1.5" x 10.0'/ 38 mm x 3048 mm	1.125 x 1.50/ 28.6 mm x 38.1 mm	5	50/15.2 m	45 ctns./47 lbs./21 kg
2.0" x 10.0'/ 51 mm x 3048 mm	1.50 x 2.0625/ 38.1 mm x 52.4 mm	4	40/12.1 m	45 ctns./68 lbs./31 kg

SURFACE PREPARATION

Joint surfaces should be clean and dry. Due to the high adhesive quality of Bidco C-56 Sealant, priming of the joint surface is usually not required. In case of wet or unusually demanding applications, it is recommended that an adhesive primer be applied to the joint surface and allowed to dry before application of the Sealant.

INSTALLATION INSTRUCTIONS

The size (cross-section) of C-56 required for a specific joint is determined by the annular space resulting in a fully sealed joint. The joint must be coupled with sufficient compression to form a proper watertight seal.

C-56 bonds instantly to joint surfaces and to itself. Always butt ends of preformed sealant together. Never overlap!

Leave protective plastic backing on sealant during application and remove when joint is ready for coupling.

TECHNICAL SPECIFICATIONS

Chemical Composition	Specification	Requirement	NPC BIDCO C-56
Content of Hydrocarbon - % by weight	ASTM D4	50 min	Meets or Exceeds
Inert Mineral filler - % by weight	AASHTO T III	30 min	Meets or Exceeds
Volatile Matter - % by weight	ASTM D-6	20 max	Meets or Exceeds
Physical properties	Specification	Requirement	NPC BIDCO C-56
Specific Gravity	ASTM D-71	1.15 - 1.40	Meets or Exceeds
Ductility	ASTM D-113	5.0 min.	Meets or Exceeds
Softening point	ASTM D-36	320° min.	Meets or Exceeds
Penetration @ 77° F	ASTM D-217	50 - 210	Meets or Exceeds



TRELLEBORG

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