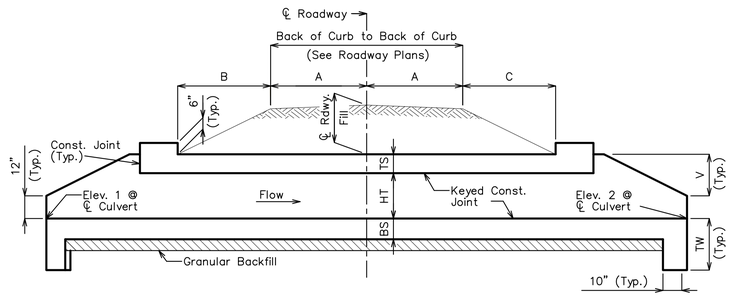
2 (14' x 7') CONCRETE BOX CULVERT

SEC/SUR 16 TWP 45N RGE 13W

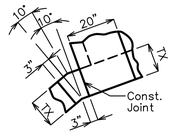


GENERAL ELEVATION A-A

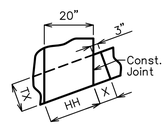
Construction joint key not shown for clarity, see standard plans for details.

If unsuitable material is encountered, excavation of unsuitable material and furnishing and placing of granular backfill shall be in accordance with Sec 206.

For layout and dimensions of reinforcement, see standard plans.



DETAIL A



DETAIL B

PLAN OF LAYOUT DIMENSIONS

Top Slab Reinforcement												Bottom Slab Reinforcement										Wall Reinforcement				
A1 Bars		J3 Bars				H1 Bars			H2 Bars			A2 Bars		J4 Bars				H3 Bars			B1 Bars		B2 Bars		
Sz.	Spa.	Sz.	Spa.	C1	K2 HT=7'	Sz.	Spa.	C5	Sz.	Spa.	C6	Sz.	Spa.	Sz.	Spa.	C4	K3 HT=7'	Sz.	Spa.	C7	Sz.	Spa.	Sz.	Spa.	G1
6	8	5	8	69.3	35.0	6	16	137.5	6	16	48.0	5	6	5	6	57.8	92	6	6	63.0	5	12	5	12	12

FOR ADDITIONAL DETAILS OF REINFORCEMENT, SEE BARBILL SHEET 7

Layout Dimensions

Var.	Equation	Dim.	Var.	Equation	Dim.	Var.	Equation	Dim.
S	– – –	14'–0"	K	(S + TI/2)(sec Z)	16'–5½"	BB	(A + B)(sec Z)	20'–3"
HT	– – –	7'–0"	L	AA + BB + CC + DD + EE	90'–2⅝"	CC	(A + C)(sec Z)	18'–11⅜"
TS	– – –	1'–3"	M	N(cos 20°)	4⅛"	DD	R + M + N + 20"	23'–4⅛"
BS	– – –	12"	N	3" + TX(tan 10°)	4⅝"	EE	E(sec Z)	19'–2⅝"
TX	– – –	8"	O	I + YY	6½"	HH	20"(sec Z)	1'–11"
TI	– – –	8"	P	2V[sec(Z + 20°)]	22'–3¾"	II	20"(cos Z)	1'–5⅝"
A	– – –	12'–0"	Q	TX(cos 20°)	7½"	KK	S + TI/2 + U	22'–1⅜"
B	– – –	5'–7½"	R	P(cos 20°)	20'–11⅝"	LL	(AA + BB + DD)(cos Z)	45'–4"
C	– – –	4'–6"	T	G(sec Z)	16'–7⅝"	MM	–––	4½"
D	– – –	20'–3⅞"	U	R + M)(tan 20°)	7'–9¼"	QQ	TX(cos Z)	7"
E	G + O + 20"	16'–8½"	V	HT + TS – 12"	7'–3"	RR	P[cos(Z – 20°)]	22'–0⅛"
F	2S + 2TX + TI	30'–0"	W	2A + B + C + D + E + SS	85'–11½"	SS	F(sin Z)	14'–9⅛"
G	2V	14'–6"	X	3" + TX(tan Z)	7½"	TTT	–––	21'–5⅛"
H	(A + C + E)(tan Z)	18'–9¼"	Y	TX (sin 20°)	N/A	YY	TX(sin Z)	3⅞"
I	3"(cos Z)	2⅝"	Z	Skew Angle	29°28'8.3"	TW	Max{3'–4" or (BS + 12")}	3'–4"
J	(AA + BB + DD)(sin Z)	25'–7⅜"	AA	F(tan Z)/2	8'–5½"			

Elevations

Upstream (Elev. 1) = 589.08
Downstream (Elev. 2) = 589.08
Pr. Gr. at Tie Sta. = 598.45

Fill Heights

℄ Rdwy at ℄ Culvert = 1'–1½" ft.
Design (All units) = Max values 1 ft to 2 ft

Estimated Quantities

			Final
Removal of Bridges	lump sum	1	
Class B–1 Concrete (Culverts–Bridge)	cu. yard	222.3	
Reinforcing Steel (Culverts–Bridge)	pound	28580	

General Notes:

Design Specifications:
2010 AASHTO LRFD Bridge Design Specifications and 2010 Interim Revisions

Design Loading:
Vehicular = HL–93 minus lane load, Earth = 120 lb/cf
Equivalent Fluid Pressure = 30 lb/cf (min.), 60 lb/cf (max.)

Design Unit Stresses:
Class B–1 Concrete (Box Culvert) f'c = 4,000 psi
Reinforcing Steel (Grade 60) fy = 60,000 psi

Miscellaneous:
When alternate precast concrete box sections are used, the minimum distance from inside face of headwalls to precast sections measured along the shortest wall shall be 3 feet. Reinforcement and dimensions for wings and headwalls shall be in accordance with Missouri Standard Plans.

Channel bottom shall be graded within the right–of–way for transition of channel bed to culvert openings. Channel banks shall be tapered to match culvert openings.

B.M. PT. 509
N; 1683067.8107
E; 1024234.4742
ELEV. 601.24

CULVERT: HIGH POINT ROAD OVER MEADOWS CREEK

TIE STA. 10+31.20

STD. 703.37
STD. 703.44
STD. 703.46
STD. 703.47
STD. 703.60
STD. 706.35

Note: This drawing is not to scale. Follow dimensions.

BY | DESCRIPTION | DATE | #

Bartlett & West
1719 SOUTHRIDGE DRIVE, SUITE 100- JEFFERSON CITY, MO 65109
PHONE: 573.634.3161
CERTIFICATE OF AUTHORITY NO. 000107
www.bartlettwest.com

CULVERT GEOMETRY
HIGH POINT ROAD STA. 10+31.20

HIGH POINT ROAD BOX CULVERT REPLACEMENT
FEDERAL PROJECT NO. BRO-B026(24)
COLE COUNTY, MISSOURI

STATE OF MISSOURI
TIMOTHY D. LEAF
NUMBER PE-2012000778
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

SEALED DATE:	10-9-2020
DESIGNED BY:	TDL
DRAWN BY:	TAA
APPROVED BY:	AKJ
DESIGN PROJ:	15937.700
DATE:	OCTOBER 2020
DRAWING NO:	
SHEET NO:	1 of 2

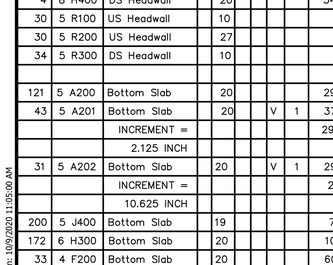
Last edit on: 10/9/2020 11:01 AM by: TDL01295 Drawing Name: C:\pwdata\topeka01\d01295\dms64413\15937.700_Bridge Plan and Elevation.dwg Layout Name: Culvert Plan and Elevation Plotted By: TDL01295 Plotted on: 10/9/2020 11:04:57 AM

BAR IS ONE INCH ON OFFICIAL DRAWINGS. 0 1" IF NOT ONE INCH, ADJUST SCALE ACCORDINGLY.

BILL OF REINFORCING STEEL

NO. REQ'D.	MARK NO. SIZE	MARK	LOCATION	EPOXY (E)	SHAPE NO.	STIRRUP (S)	SUBSTR. (X)	VARIES (V)	NO. EACH	DIMENSIONS B FT.	B IN.	C FT.	C IN.	D FT.	D IN.	E FT.	E IN.	F FT.	F IN.	H FT.	H IN.	K FT.	K IN.	NOMINAL LENGTH FT.IN.	ACTUAL LENGTH FT.IN.	WEIGHT LBS.
64	6	A100	Top Slab		20					29	9.000													29 9	29 9	2860
23	6	A101	Top Slab		20			V	1	28	10.000													28 10	28 10	
			INCREMENT =							2	11.000													2 11	2 11	548
			14.125 INCH																							
148	5	J300	Top Slab		19					2	11.000	5	9.250											8 8	8 7	1325
36	6	H100	Top Slab		20					22	11.000													22 11	22 11	1239
35	6	H200	Top Slab		20					8	0.000													8 0	8 0	421
26	4	F100	Top Slab		20			V	1	59	4.000													59 4	59 4	
			INCREMENT =							42	10.000													42 10	42 10	887
			7.875 INCH																							
25	4	F101	Top Slab		20			V	1	58	11.500													59 0	59 0	
			INCREMENT =							43	1.500													43 2	43 2	853
			7.875 INCH																							
2	8	D100	US Headwall		20					29	9.000													29 9	29 9	159
2	9	D200	US Headwall		20					9	0.000													9 0	9 0	61
2	8	D300	DS Headwall		20					34	2.000													34 2	34 2	182
2	9	D400	DS Headwall		20					9	2.000													9 2	9 2	62
4	8	H400	DS Headwall		20					34	2.000													34 2	34 2	365
30	5	R100	US Headwall		10							10.500		18.000										3 3	3 0	94
30	5	R200	US Headwall		27						17.000	16.125		5.875		2	2.375			4.125		4.125		5 5	5 3	164
34	5	R300	DS Headwall		10							17.000		18.000										4 4	4 1	145
121	5	A200	Bottom Slab		20					29	9.000													29 9	29 9	3755
43	5	A201	Bottom Slab		20			V	1	37	5.000													37 5	37 5	
			INCREMENT =							29	10.000													29 10	29 10	1508
			2.125 INCH																							
31	5	A202	Bottom Slab		20			V	1	29	0.000													29 0	29 0	
			INCREMENT =							2	6.000													2 6	2 6	509
			10.625 INCH																							
200	5	J400	Bottom Slab		19					7	8.000	4	9.750											12 6	12 4	2573
172	6	H300	Bottom Slab		20					10	6.000													10 6	10 6	2713
33	4	F200	Bottom Slab		20					60	0.000													60 0	60 0	1323
3	4	F201	US Bott Slab		15						19.125	22	1.000							6.500		18.000		23 8	23 8	47
26	4	F202	Bottom Slab		20			V	1	39	10.000													39 10	39 10	
			INCREMENT =							23	4.500													23 5	23 5	549
			7.875 INCH																							
2	4	F203	Bottom Slab		20			V	1	26	0.500													26 1	26 1	
			INCREMENT =							23	4.000													23 4	23 4	33
			33.000 INCH																							
3	4	F204	Bottom Slab		20			V	1	34	8.000													34 8	34 8	
			INCREMENT =							28	9.000													28 9	28 9	64
			35.500 INCH																							
2	4	F205	Bottom Slab		20			V	1	39	10.000													39 10	39 10	
			INCREMENT =							37	4.500													37 5	37 5	52
			29.000 INCH																							
104	5	B100	Int. Wall		10							12.000		8 10.000										10 10	10 7	1148
102	5	B200	Ext. Wall		10							12.000		8 10.000										10 10	10 7	1126
7	4	F300	Ext. Wall		20					59	3.000													59 3	59 3	277
7	4	F301	Ext. Wall		20					42	8.000													42 8	42 8	200
10	4	F302	Int. Wall		20					51	0.000													51 0	51 0	341
5	4	F400	Flared Wing		15			V	1	2	0.625	20	8.500							23.125		8.375		22 9	22 8	
			INCREMENT =							2	0.625	6	4.125							23.125		8.375		8 5	8 4	52
			43.000 INCH																							

NO. REQ'D.	MARK NO. SIZE	MARK	LOCATION	EPOXY (E)	SHAPE NO.	STIRRUP (S)	SUBSTR. (X)	VARIES (V)	NO. EACH	DIMENSIONS B FT.	B IN.	C FT.	C IN.	D FT.	D IN.	E FT.	E IN.	F FT.	F IN.	H FT.	H IN.	K FT.	K IN.	NOMINAL LENGTH FT.IN.	ACTUAL LENGTH FT.IN.	WEIGHT LBS.
15	4	F401	US Wing Wall		20			V	3	21	7.000													21 7	21 7	
			INCREMENT =							7	9.000													7 9	7 9	147
			41.500 INCH																							
20	4	F402	DS Wing Wall		20			V	4	17	2.000													17 2	17 2	
			INCREMENT =							6	6.000													6 6	6 6	158
			32.000 INCH																							
8	7	J100	US Wing Wall		15					3	11.000	22	6.500									15.000	3 8.500	26 6	26 5	432
12	7	J101	DS Wing Wall		15					3	10.875	18	1.000									18.750	3 7.000	22 0	22 0	540
22	4	J500	Flared Wing		19			V	1	8	11.000	4	9.750											13 9	13 8	
			INCREMENT =							2	1.125	4	9.750											6 11	6 10	151
			3.875 INCH																							
21	4	J501	US Wing Wall		19			V	1	8	10.000	4	9.750											13 8	13 7	
			INCREMENT =							2	0.000	4	9.750											6 10	6 9	143
			4.125 INCH																							
32	4	J502	DS Wing Wall		19			V	2	8	10.750	4	9.750											13 9	13 7	
			INCREMENT =							2	4.375	4	9.750											7 2	7 1	221
			5.250 INCH																							
4	7	J600	Flared Wing		15					4	2.125	23	4.500									15.500	3 11.625	27 7	27 6	225
22	5	G100	Flared Wing		20			V	1	8	11.000													8 11	8 11	
			INCREMENT =							2	1.125													2 1	2 1	126
			3.875 INCH																							
63	5	G101	US Wing Wall		20			V	3	8	10.000													8 10	8 10	
			INCREMENT =							2	0.000													2 0	2 0	356
			4.125 INCH																							
64	5	G102	DS Wing Wall		20			V	4	8	10.750													8 11	8 11	
			INCREMENT =							2	4.375													2 4	2 4	375
			5.250 INCH																							
24	4	E100	Toe Wall		20			V	12	4	5.000													4 5	4 5	
			INCREMENT =							4	0.000													4 0	4 0	67
			5.000 INCH																							
			TOTALS																							
4																										
5																										
6																										
7																										
8																										
9																										
			TOTAL																							
			TOTAL	E																						

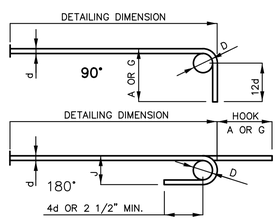


STIRRUP HOOK DIMENSIONS

GRADES 40 – 50 – 60 KSI

BAR SIZE	D (IN.)	90° HOOK A OR G	135 °HOOK A OR G	135 °HOOK APPROX. H
#4	2"	4 1/2"	4 1/2"	3"
#5	2 1/2"	6"	5 1/2"	3 3/4"
#6	4 1/2"	12"	8"	4 1/2"

NOTE: UNLESS OTHERWISE NOTED DIAMETER "D" IS THE SAME FOR ALL BENDS AND HOOKS ON A BAR.

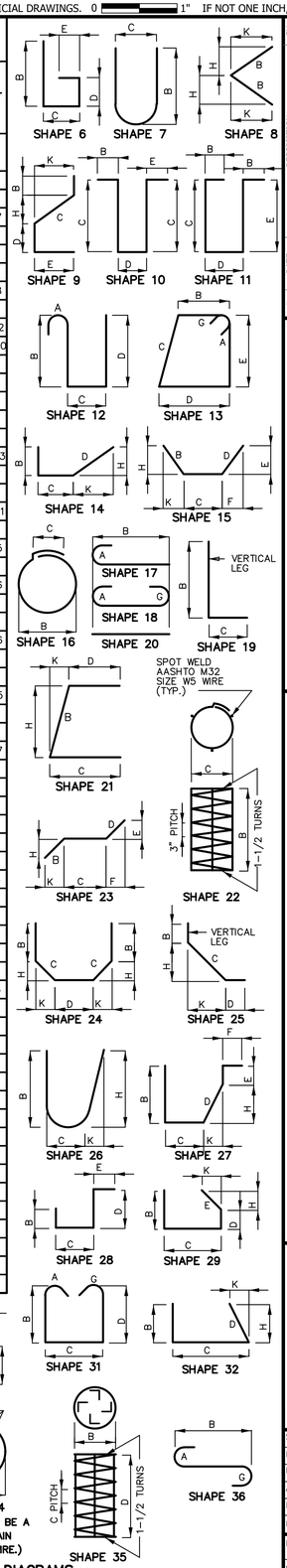


END HOOK DIMENSIONS

BAR SIZE	D (IN.)	ALL GRADES 180° HOOKS A OR G	180° HOOKS J	90° HOOKS A OR G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	12"
#7	5 1/4"	10"	7"	14"
#8	6"	11"	8"	16"
#9	9 1/2"	15"	11 3/4"	19"
#10	10 3/4"	17"	13 1/4"	22"
#11	12"	19"	14 3/4"	2'-0"
#14	18 1/4"	2'-3"	21 3/4"	2'-7"

NOTE:
ALL STANDARD HOOKS AND BENDS OTHER THAN 180 DEGREE ARE TO BE BENT WITH SAME PROCEDURE AS FOR 90 DEGREE STANDARD HOOKS.
HOOKS AND BENDS SHALL BE IN ACCORDANCE WITH THE PROCEDURES AS SHOWN ON THIS SHEET.
E = EPOXY COATED REINFORCEMENT.
S = STIRRUP.
X = BAR IS INCLUDED IN SUBSTRUCTURE QUANTITIES.
V = BAR DIMENSIONS VARY IN EQUAL INCREMENTS BETWEEN DIMENSIONS SHOWN ON THIS LINE AND THE FOLLOWING LINE.
NO. EA. = NUMBER OF BARS OF EACH LENGTH.
NOMINAL LENGTHS ARE BASED ON OUT TO OUT DIMENSIONS SHOWN IN BENDING DIAGRAMS AND ARE LISTED FOR FABRICATORS USE. (NEAREST INCH)
ACTUAL LENGTHS ARE MEASURED ALONG CENTERLINE BAR TO THE NEAREST INCH.
PAYWEIGHTS ARE BASED ON ACTUAL LENGTHS.
FOUR ANGLE OR CHANNEL SPACERS ARE REQUIRED FOR EACH COLUMN SPIRAL. SPACERS ARE TO BE PLACED ON INSIDE OF SPIRALS. LENGTH AND WEIGHT OF COLUMN SPIRALS DO NOT INCLUDE SPLICES OR SPACERS.
REINFORCING STEEL (GRADE 60) FY = 60,000 PSI.

Note: This drawing is not to scale. Follow dimensions.



BENDING DIAGRAMS

BY | DESCRIPTION | DATE | #

Bartlett&West
1719 SOUTHRIDGE DRIVE, SUITE 100- JEFFERSON CITY, MO 65109
PHONE: 573.634.3181
CERTIFICATE OF AUTHORITY NO. 000167
www.bartlettwest.com

BARBILL

HIGH POINT ROAD BOX CULVERT REPLACEMENT
FEDERAL PROJECT NO. BRO-B026(24)
COLE COUNTY, MISSOURI

STATE OF MISSOURI
TIMOTHY D. LEAF
NUMBER PE-2012000778
PROFESSIONAL ENGINEER
THIS SHEET HAS BEEN SIGNED, SEALED AND DATED ELECTRONICALLY.

SEALED DATE:	10-9-2020
DESIGNED BY:	TDL
DRAWN BY:	TAA
APPROVED BY:	AKJ
DESIGN PROJ:	15937.700
DATE:	OCTOBER 2020
DRAWING NO:	
SHEET NO:	2 of 2

Last edit on: 10/9/2020 11:01 AM by: TDL01295 Drawing Name: c:\pwdata\topeka01\data\tdl01295\dms644131\15937.700_Bridge Plan and Elevation.dwg Layout Name= Barbill Plotted By: TDL01295 Plotted on: 10/9/2020 11:05:09 AM