

DESIGN DESIGNATION

AADT - 2019 = 125
 AADT - 2039 = 213
 DHV = 10%
 T = 10%
 V = 45 MPH

FUNCTIONAL CLASSIFICATION - RURAL LOCAL

NEW RIGHT OF WAY AND
 NEW TEMPORARY EASEMENT

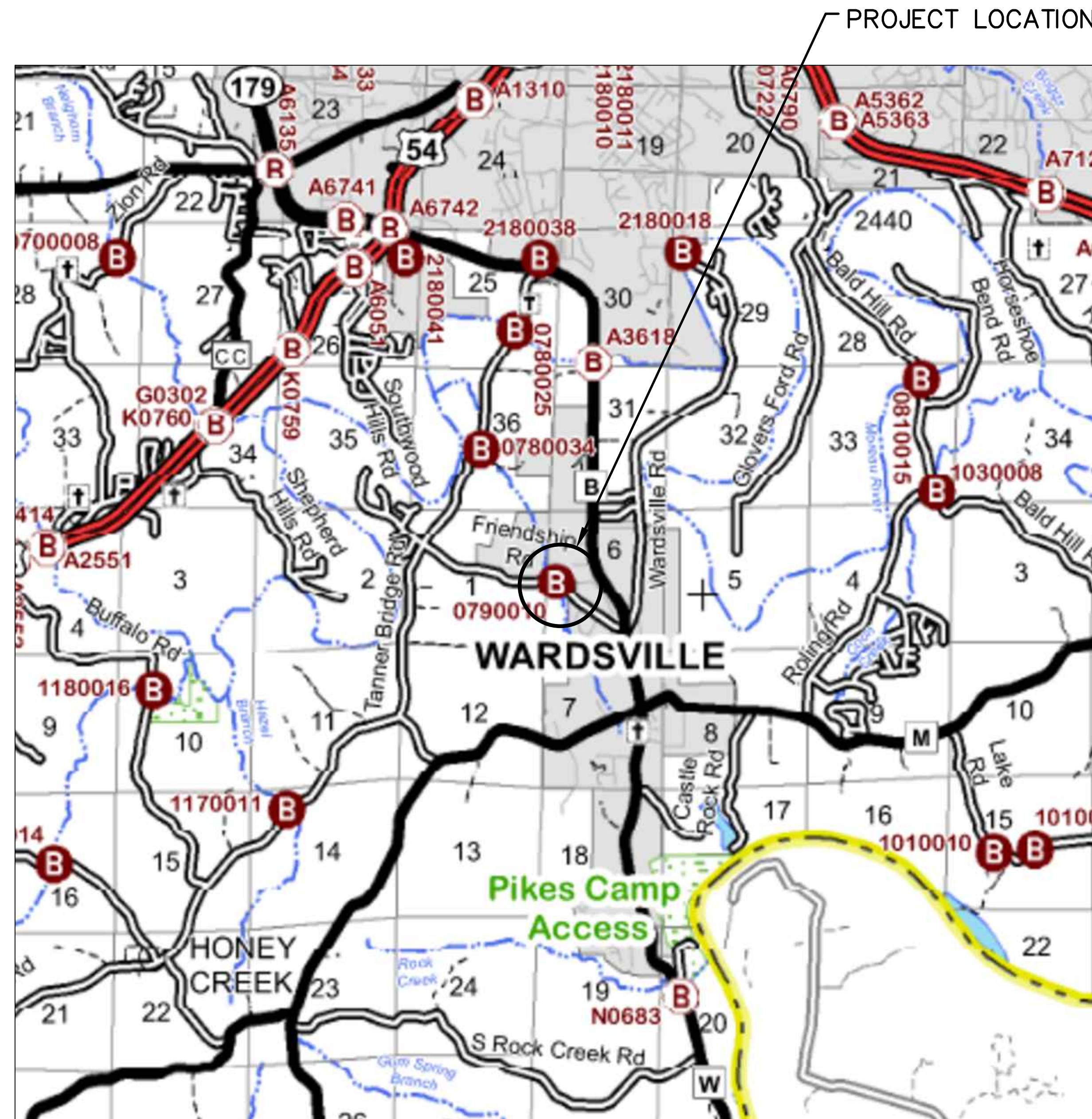
PLANS FOR PROPOSED
 FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
 REPLACEMENT
 OVER HERBRANDT BRANCH
 SECTION 6, TOWNSHIP 43 NORTH, RANGE 11 WEST
 COLE COUNTY, MISSOURI

INDEX OF SHEETS

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CONVENTIONAL SYMBOLS

- IRON PIN SET (TYPICAL)
GREAT RIVER 2001011476
- IRON PIN FOUND, AS NOTED
- ✕ CUT CROSS
- ▲ RIGHT OF WAY MARKER
- STONE
- △ CONTROL POINT
- ◆ PERMANENT BENCHMARK
- - - CONTOUR MAJOR
- - - CONTOUR MINOR
- DECIDUOUS TREE, SIZE AS NOTED
- CONIFER TREE, SIZE AS NOTED
- BUSH, SIZE AS NOTED
- LIGHT POLE
- POWER POLE
- ELECTRIC RISER
- ELECTRIC BOX
- ELECTRIC METER
- GUY WIRE ANCHOR
- PEDESTAL, AS NOTED
- SANITARY SEWER CLEAN OUT
- SEPTIC TANK
- TELEPHONE RISER
- GAS VALVE
- GAS METER
- WELL
- WATER METER
- WATER VALVE
- FIRE HYDRANT
- WATER HYDRANT
- MAIL BOX
- SIGN
- POST
- FLAG POLE
- CABLE TV RISER
- SANITARY SEWER LINE
- FENCE CHAIN-LINK
- WIRE
- WOOD
- ELECTRIC LINE
- UNDERGROUND ELECTRIC LINE
- TELEPHONE LINE
- UNDERGROUND TELEPHONE LINE
- CABLE TV LINE
- GAS LINE
- WATER LINE
- GAS & WATER LINE
- FIBER OPTIC LINE
- TREE LINE



UTILITIES

WATER:
 MISSOURI AMERICAN WATER CO.
 CONTACT: DOUGLAS PATRICK
 573-606-6380
 Douglas.patrick@amwater.com

ELECTRIC:
 THREE RIVERS ELECTRIC COOP
 CONTACT: TED NEUNER
 573-644-9022
 TNeuner@threeriverselectric.com

SANITARY SEWER:
 MISSOURI AMERICAN WATER CO.
 320 HOOVER ROAD
 JEFFERSON CITY, MO 65109
 CONTACT: AARON LACHOWICZ
 573-634-3801
 Aaron.Lachowicz@amwater.com

STORM SEWER:
 COLE COUNTY PUBLIC WORKS
 5055 MONTICELLO ROAD
 JEFFERSON CITY, MO 65109
 CONTACT: MATT PRENGER
 573-636-3614
 MPrenger@colecouny.org

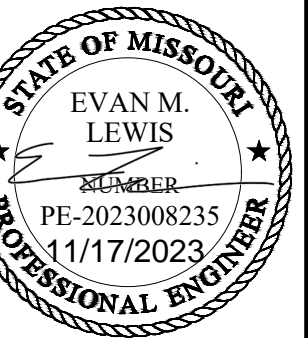
TELEPHONE:
 BRIGHTSPEED (FORMERLY CENTURYLINK)
 CONTACT: GUY HUNTLEY
 573-353-4372
 Guy.A.Huntley@brightspeed.com
 CONTACT: TONJIA BALDWIN
 573-634-1725
 Tonja.Baldwin@brightspeed.com

FIBER:
 CALLABYTE TECHNOLOGY
 CONTACT: MARK VOSS
 573-826-2365
 MVoss@callawayelectric.com

FIBER/TELEPHONE:
 SUDDENLINK
 CONTACT: TIM GOERLITZ
 816-248-6671
 Timothy.Goerlitz@alticeusa.com

LENGTH OF PROJECT

BEGINNING OF PROJECT	STA 0+22.61
END OF PROJECT	STA 2+54.88
APPARENT LENGTH	232.27 FEET



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 PE-2023008235



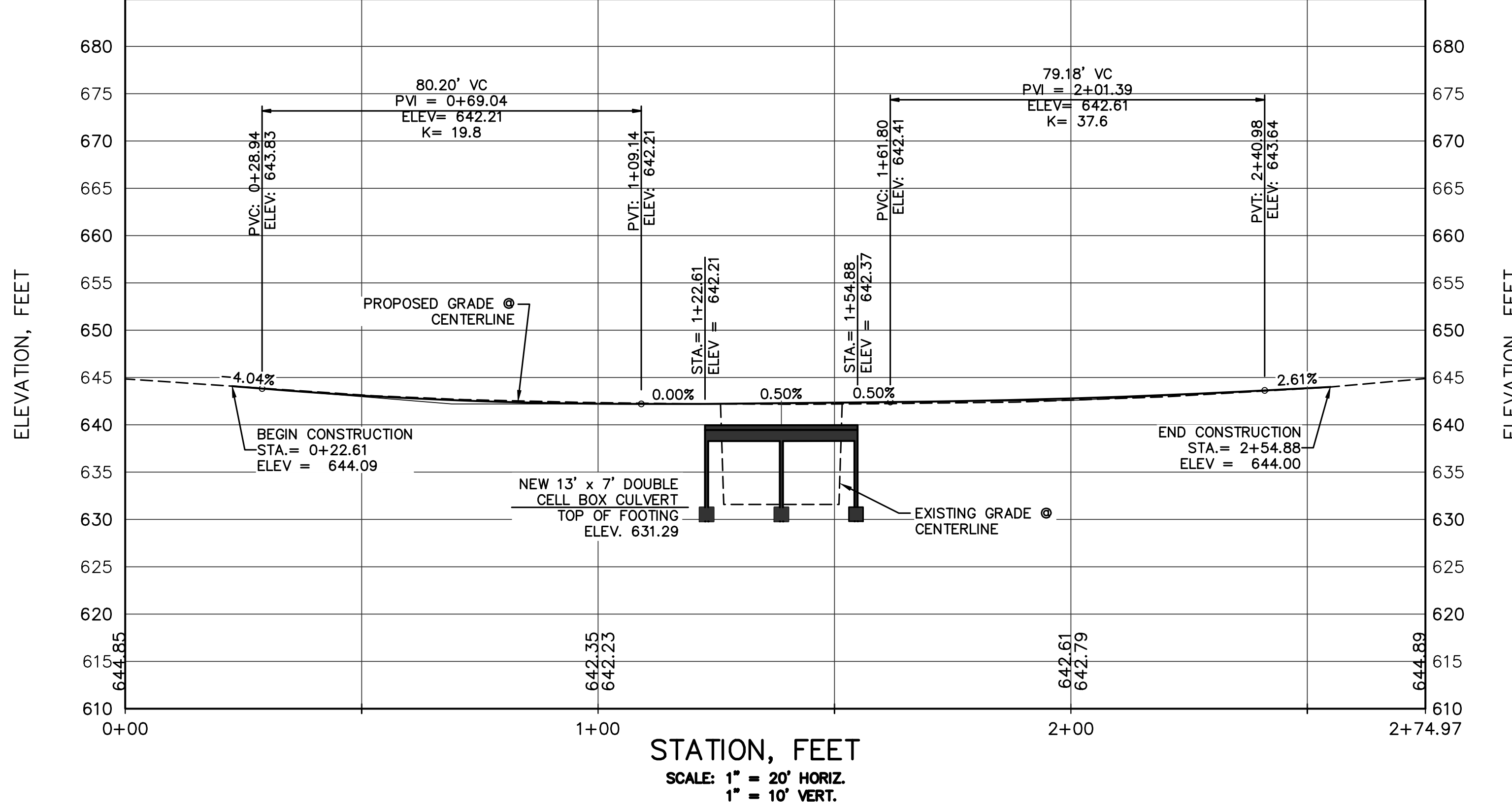
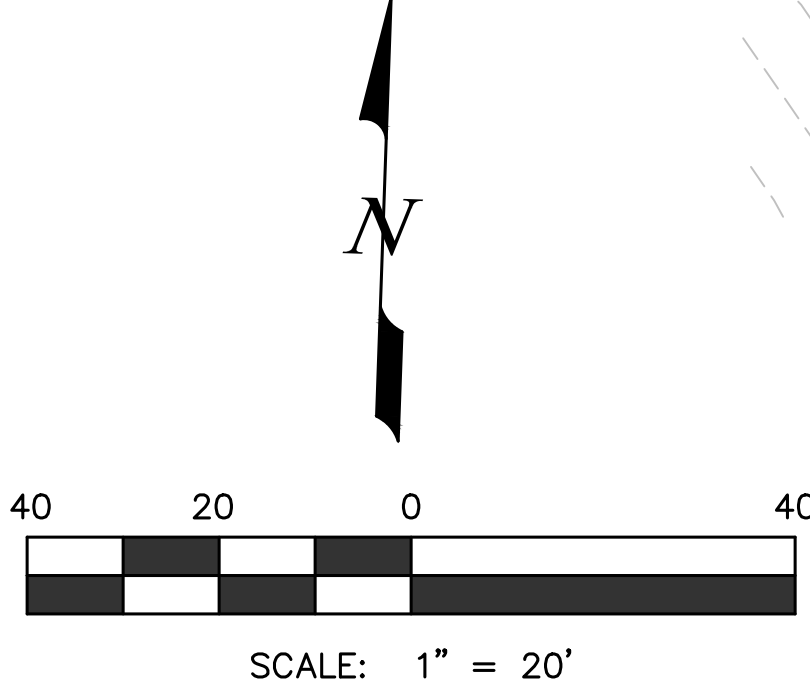
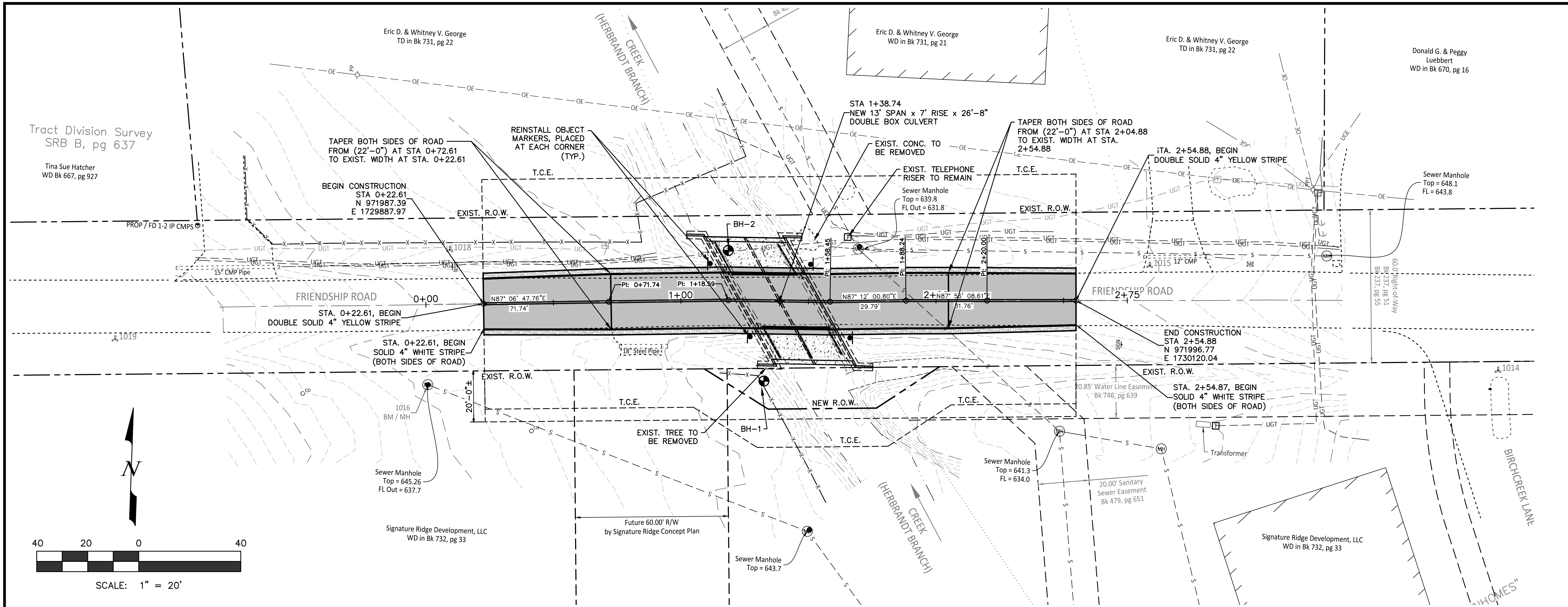
FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
 OVER HERBRANDT BRANCH
 COLE COUNTY, MISSOURI

COVER SHEET

DATE: 2023-11-17

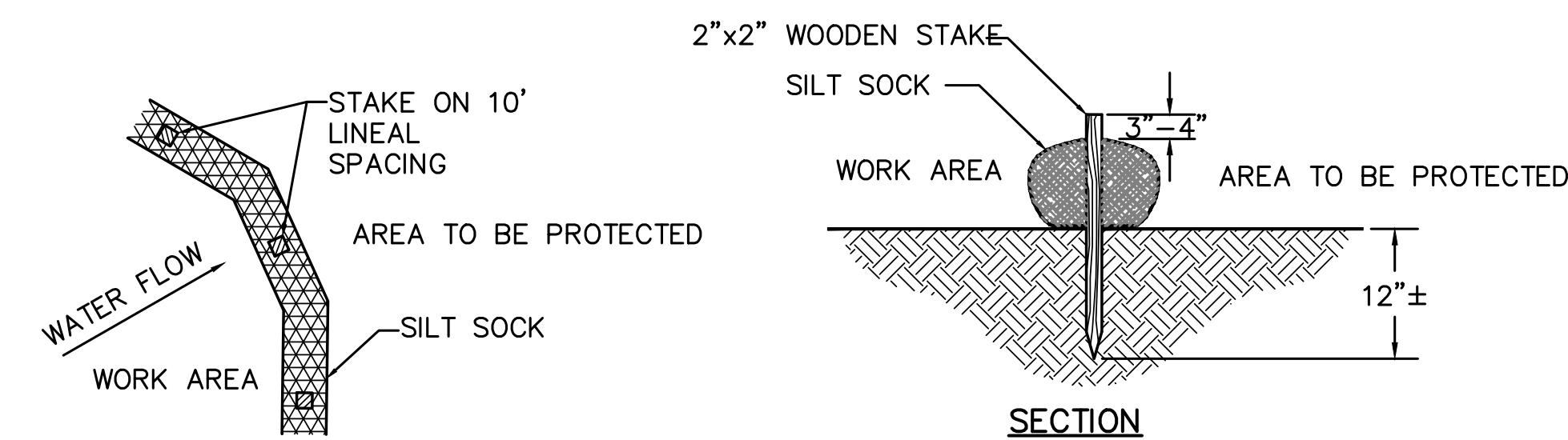
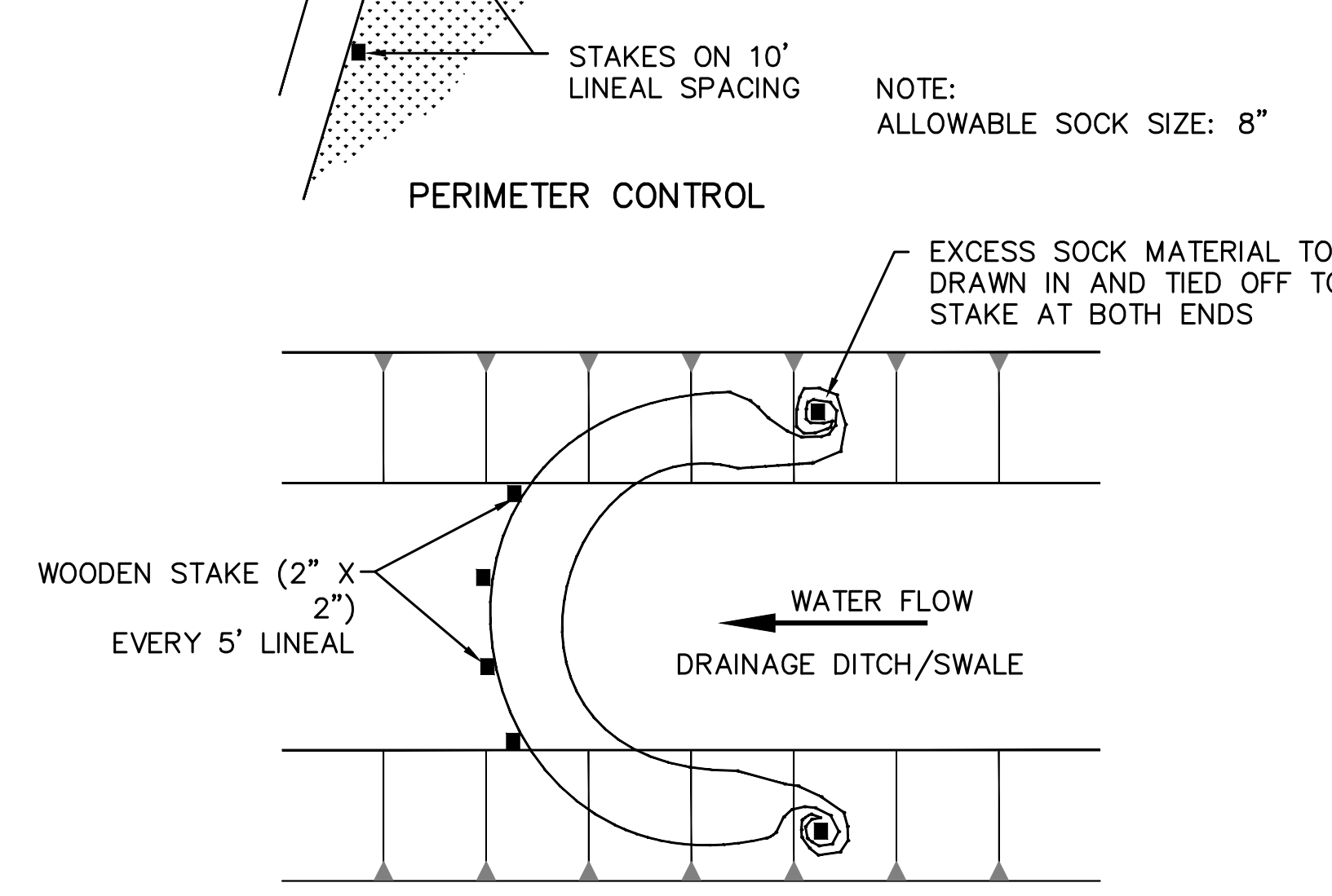
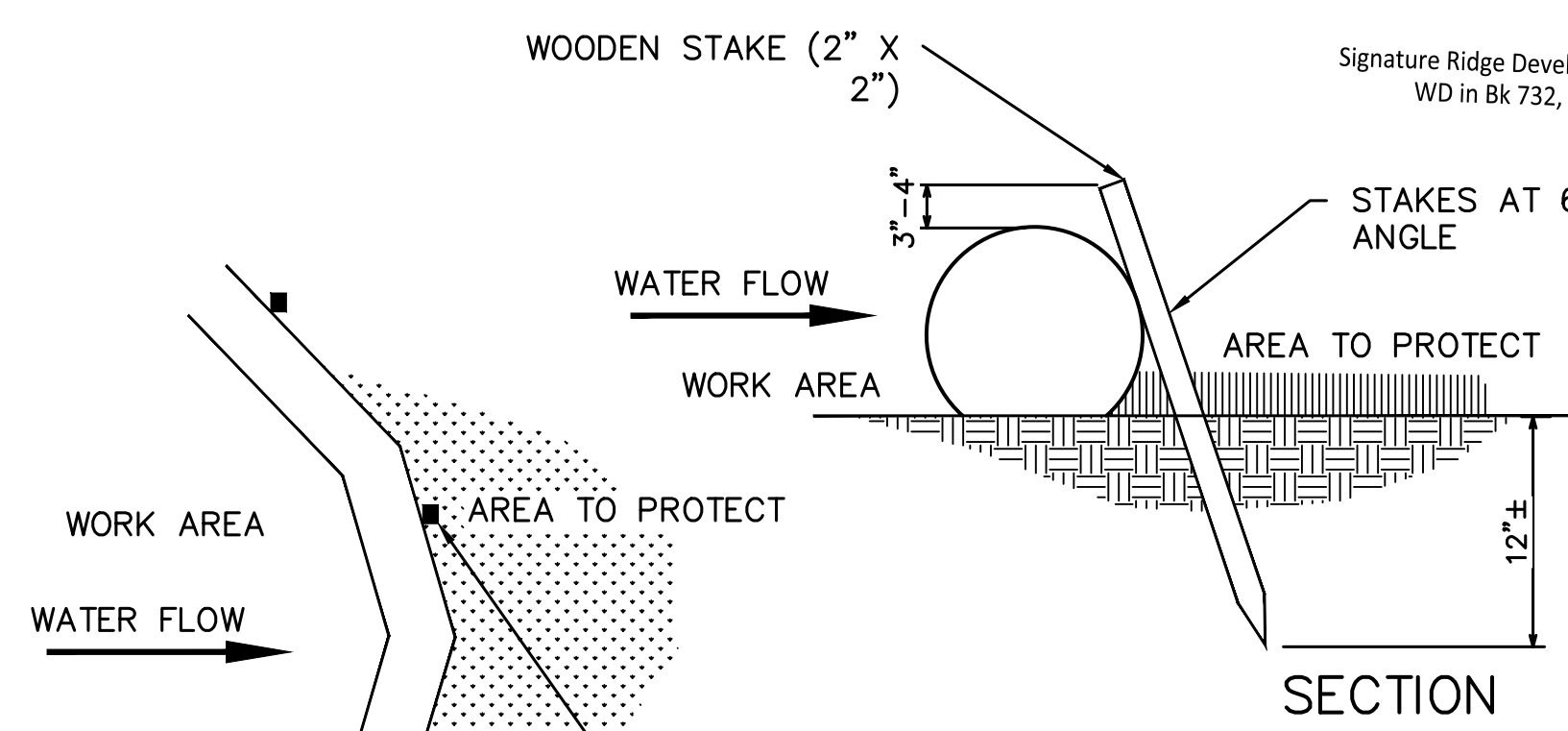
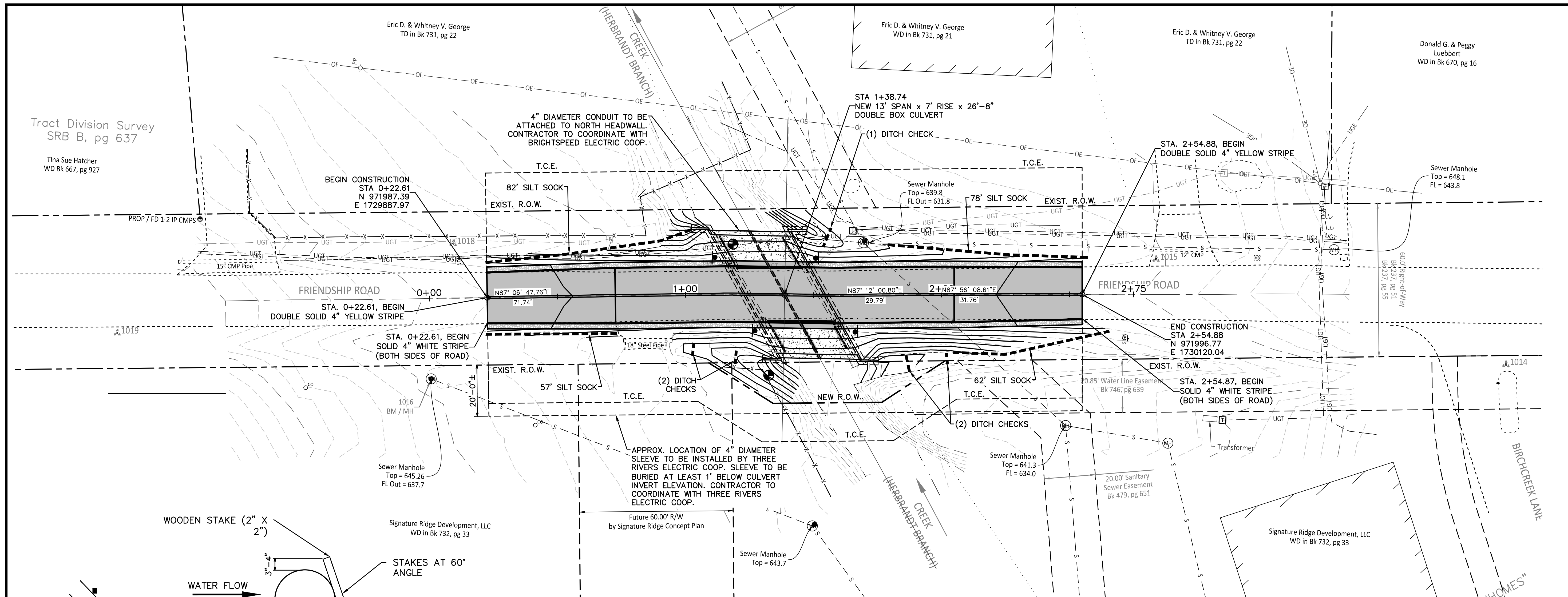
JOB NUMBER: 4745_Civil

SHEET
 C1



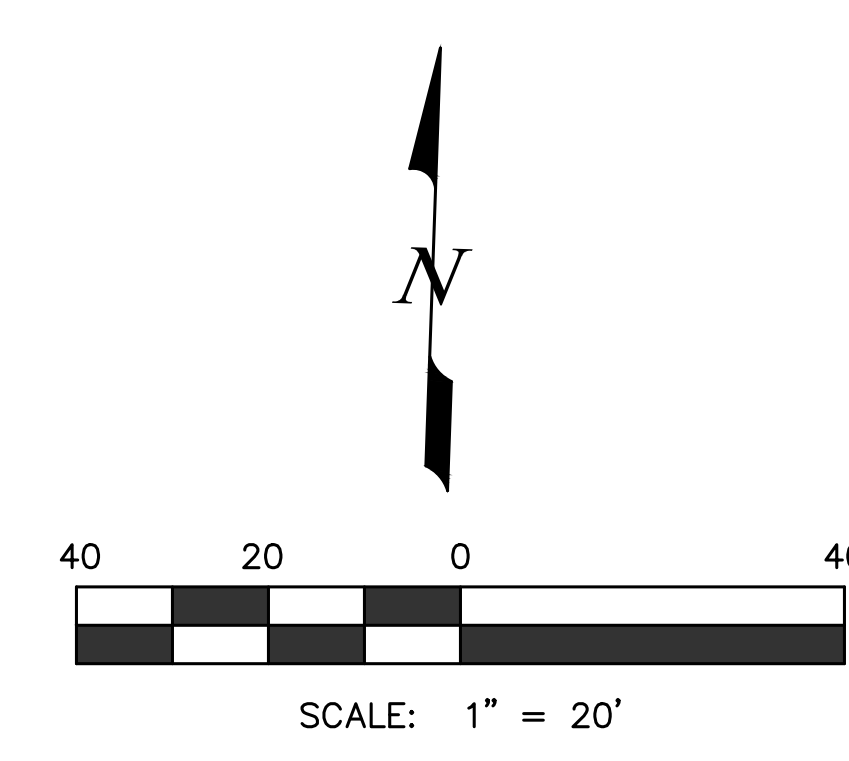
- NOTES:**
- EXIST. POWER POLE AND OVERHEAD ELECTRIC TO REMAIN, COORDINATE WITH UTILITY COMPANY.
 - EXIST. UNDERGROUND TELEPHONE, TELEPHONE ATTACHED TO BRIDGE, ETC. WITHIN THE PROJECT AREA SHALL BE RELOCATED UNLESS OTHERWISE NOTED, COORDINATE WITH UTILITY COMPANY.
 - SEWER MANHOLES AND LINES SHALL REMAIN IN PLACE AND PROTECTED AT ALL TIMES.
 - TREES SHALL REMAIN UNLESS OTHERWISE NOTED, AND SHALL NOT BE DISTURBED.
 - BRIGHTSPEED UNDERGROUND LINE TO BE RELOCATED AND ATTACHED TO NORTH SIDE OF CULVERT HEADWALL. SEE SHEET C4 FOR LOCATION.

Date	
Revision/Issue	
No.	1
EVAN M. LEWIS PE-2023008235 PE-2023008235 11/17/2023	
EVAN M. LEWIS PE-2023008235	
Great River Engineering, Missouri State Certificate of Authority Numbers: Engineering: 2000156865, Land Surveying: 2001011476, Landscape Architecture: 2007015673	
FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI	
ROADWAY PLAN & PROFILE	
DATE: 2023-11-17 JOB NUMBER: 4745_Civil	
SHEET C3	



- NOTES**
1. SILT SOCK COMPOST/SOIL/ROCK/SEED FILL TO MEET APPLICATION REQUIREMENTS.
 2. SILT SOCK DEPICTED IS FOR MINIMUM SLOPES. GREATER SLOPES MAY REQUIRE LARGER SOCKS PER THE ENGINEER.
 3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
 4. SILT SOCK TO BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.
 5. INSPECT SILT SOCK AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.

SILT SOCK EROSION CONTROL
NOT TO SCALE



Tract Division Survey
SRB B, pg 637
Tina Sue Hatcher
WD Bk 667, pg 927

Eric D. & Whitney V. George
TD in Bk 731, pg 22

Eric D. & Whitney V. George
WD in Bk 731, pg 21

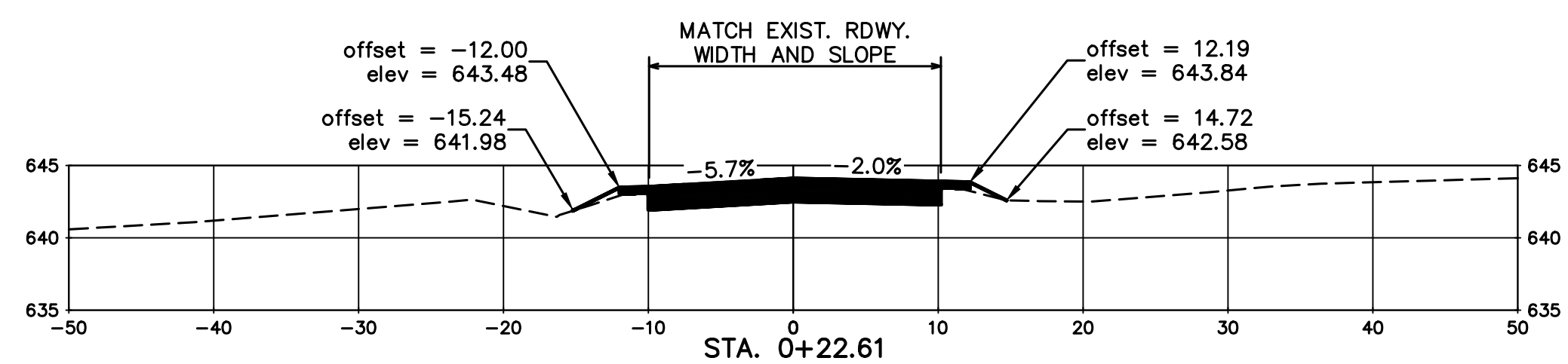
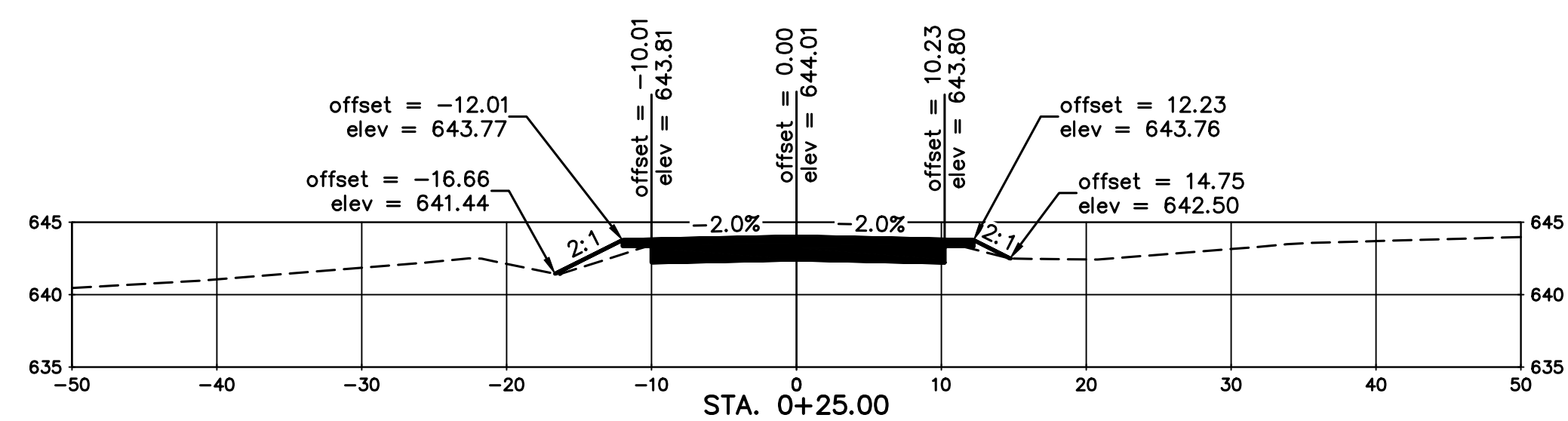
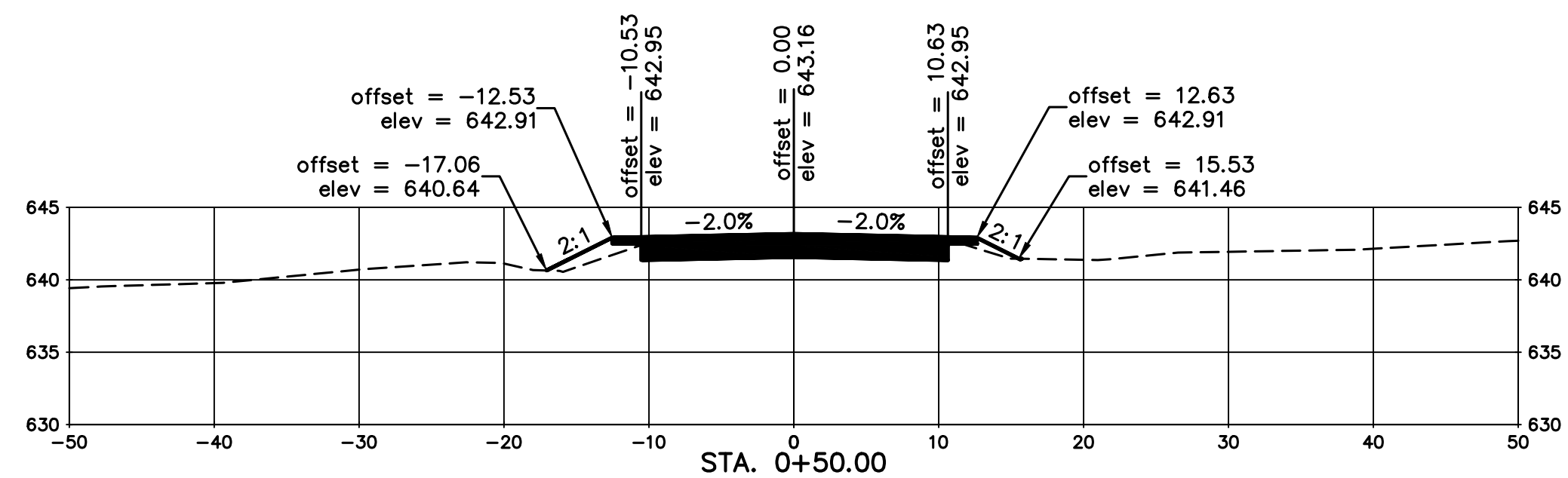
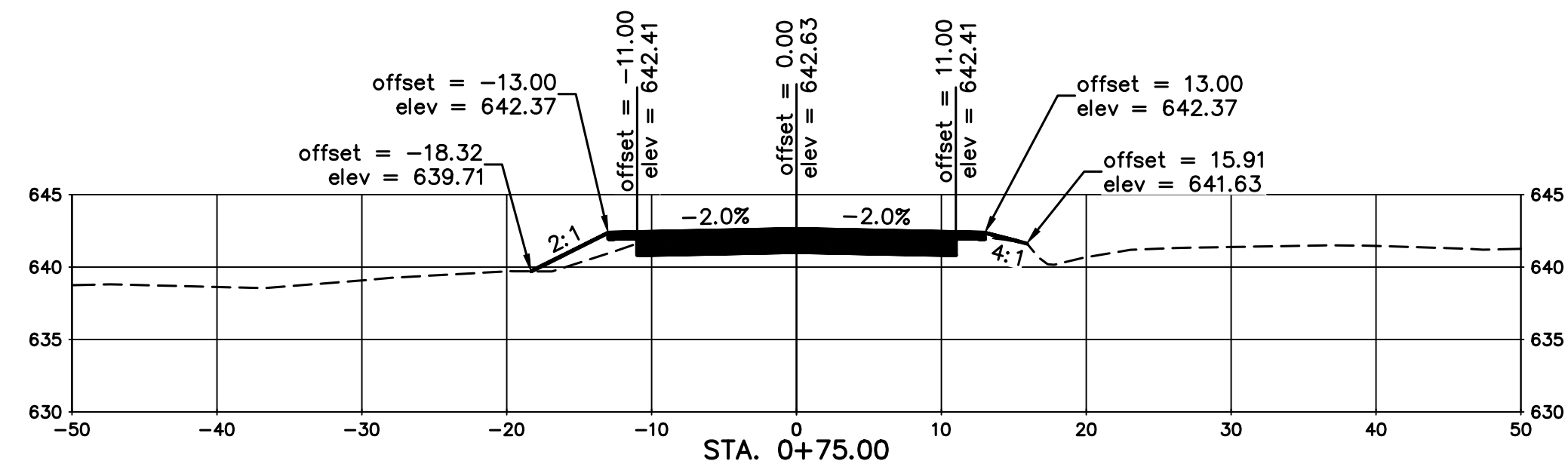
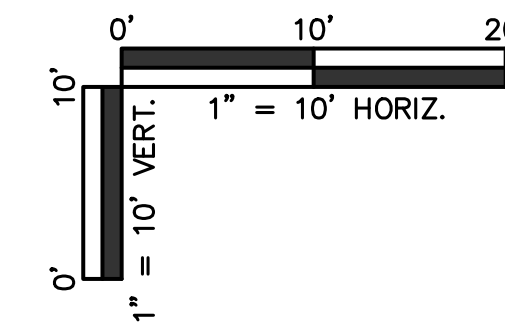
Eric D. & Whitney V. George
TD in Bk 731, pg 22

Donald G. & Peggy
Luebbert
WD in Bk 670, pg 16

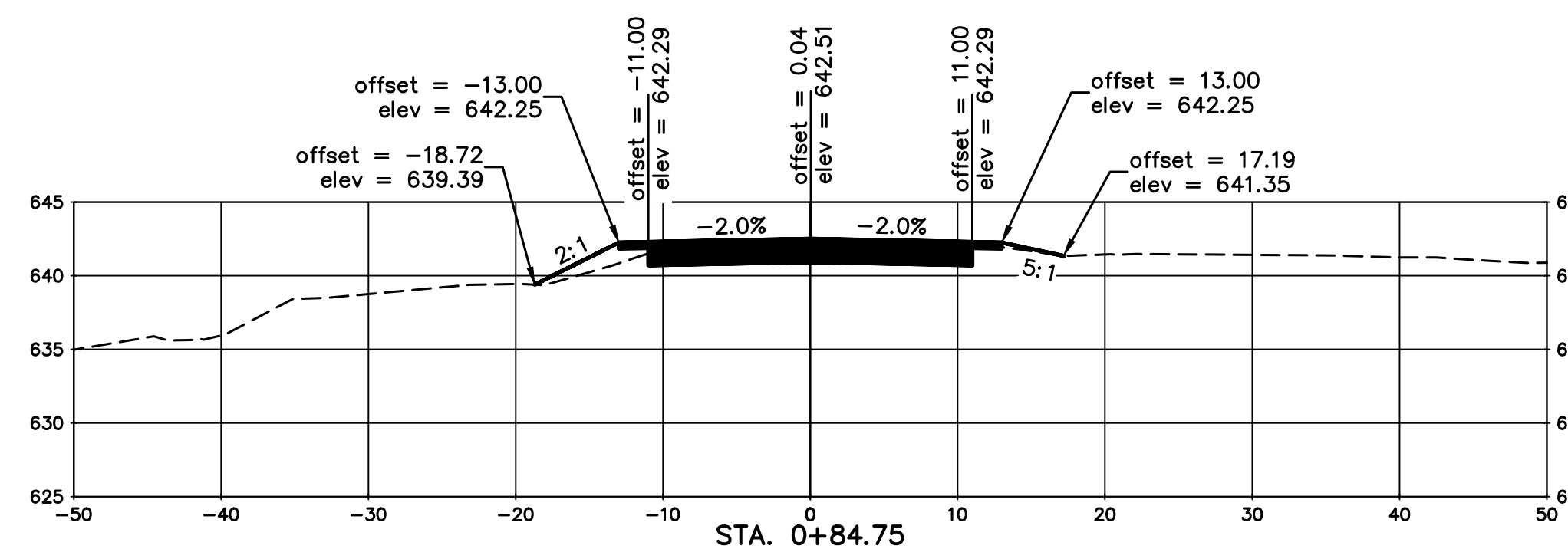
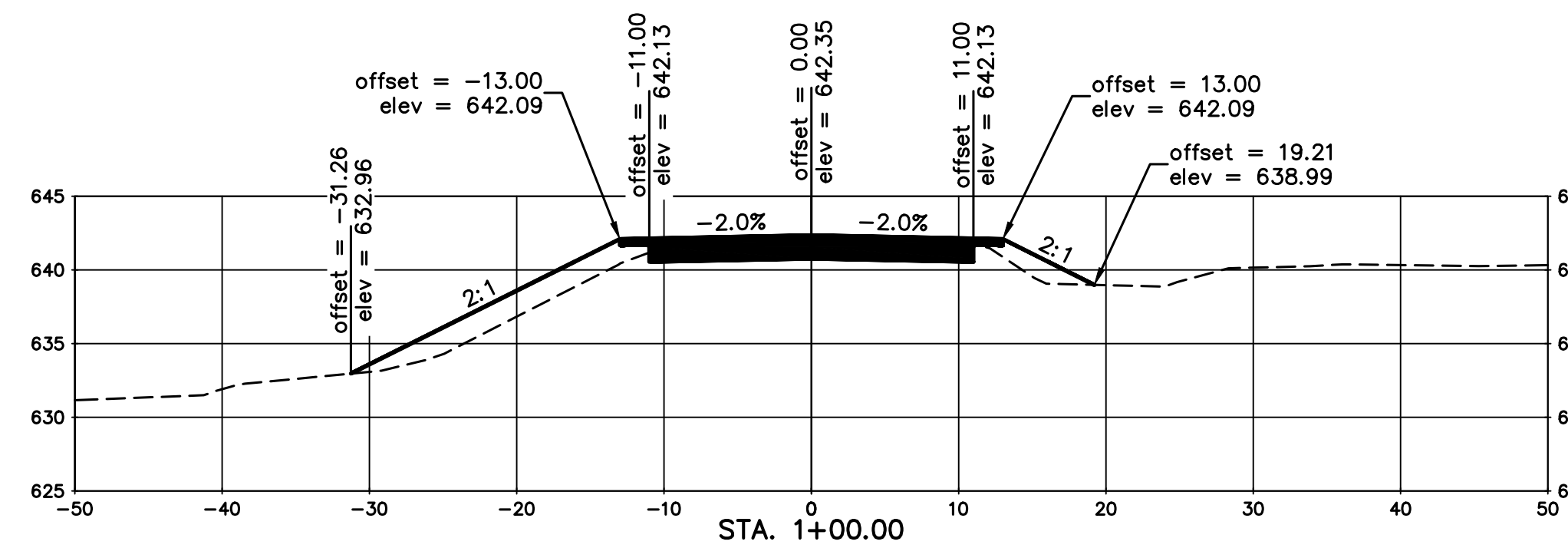
Signature Ridge Development, LLC
WD in Bk 732, pg 33

Signature Ridge Development, LLC
WD in Bk 732, pg 33

Date	
Revision/Issue	
No.	
<p>25 YEARS</p> <p>Great River Engineering, Missouri State Certificates of Authority Numbers: Engineering: 2000156865, Land Surveying: 2001011476, Landscape Architecture: 2007015673</p>	
<p>FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI</p>	
<p>GRADING PLAN & EROSION CONTROL</p>	
<p>DATE: 2023-11-17 JOB NUMBER: 4745_Civil</p>	
<p>SHEET C4</p>	



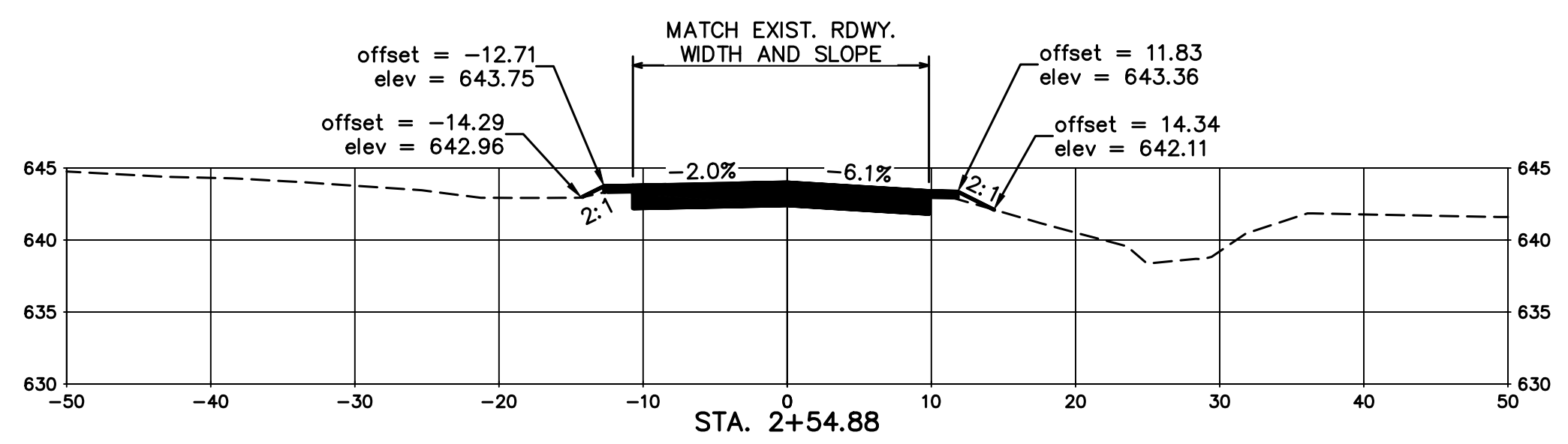
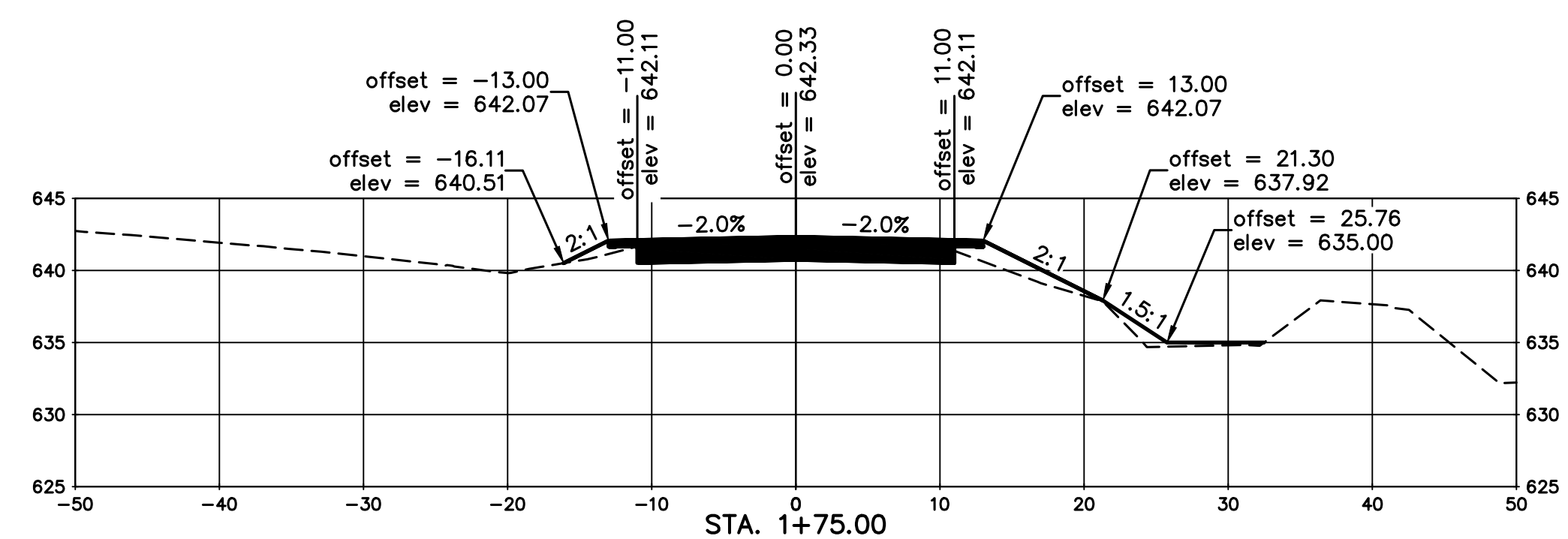
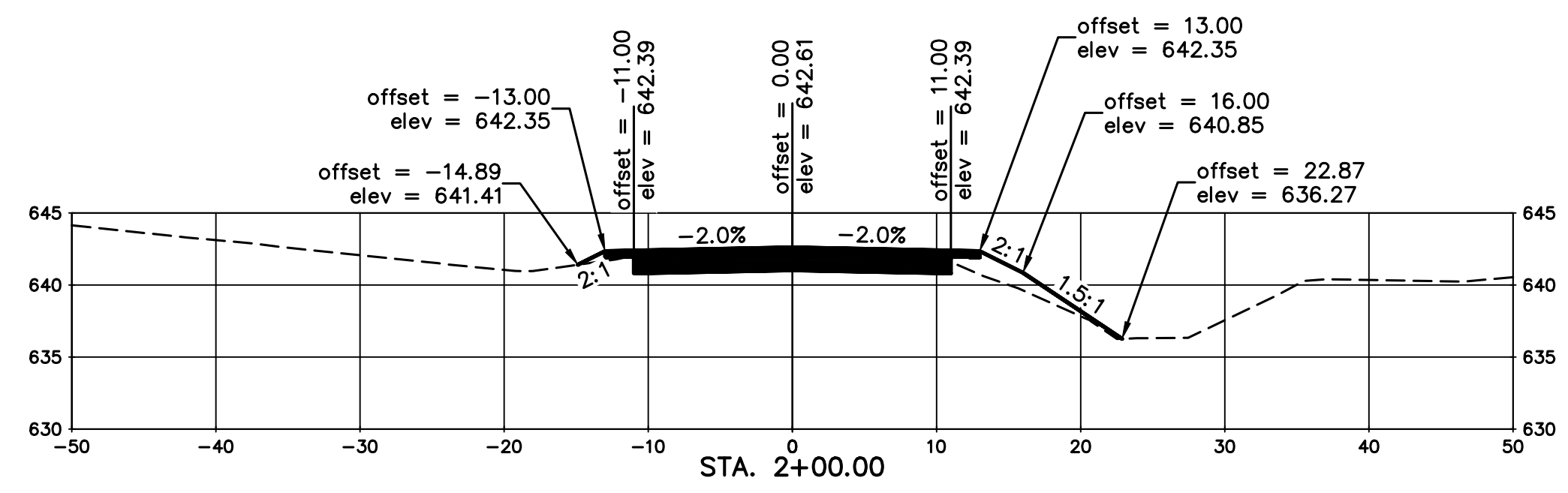
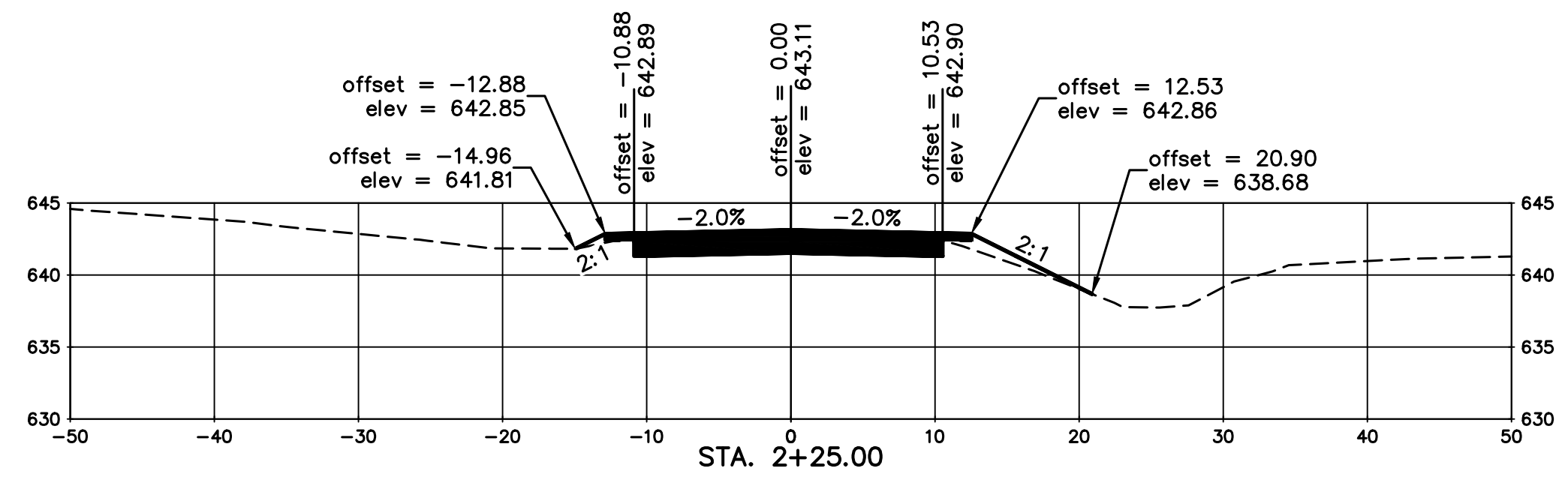
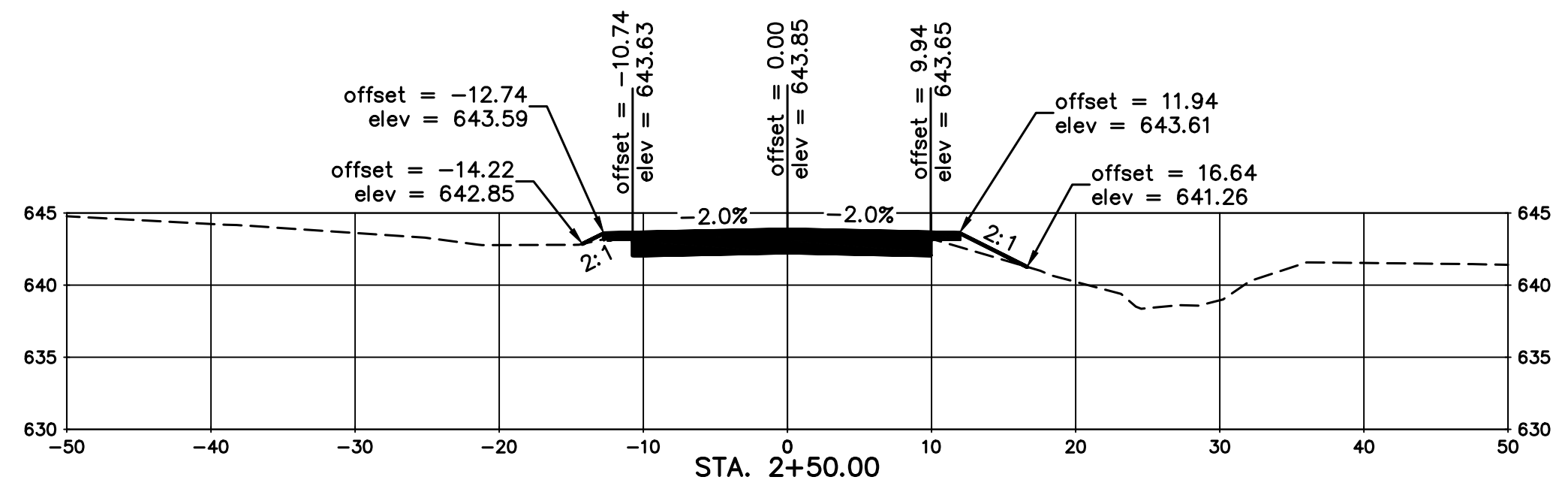
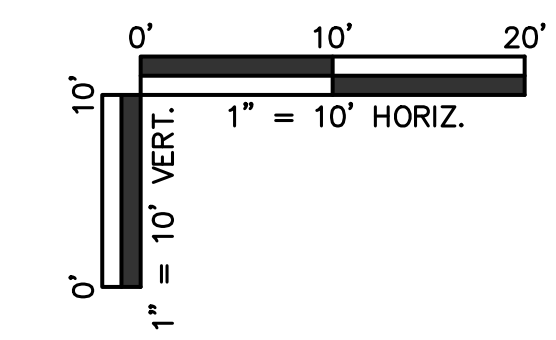
SECTIONS 1+22.61 THRU 1+54.88
NOT SHOWN DUE TO BRIDGE



Date	
Revision/Issue	
No.	
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<small>Great River Engineering, Missouri State Certificate of Authority Numbers: Engineering: 2000156865, Land Surveying: 2001011476, Landscape Architecture: 2007015673</small>	

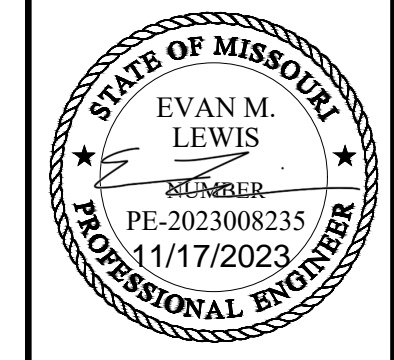
CROSS SECTIONS

FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
OVER HERBRANDT BRANCH
COLE COUNTY, MISSOURI



EARTHWORK QUANTITIES
 CUT = 29 CY } NO ADJUSTMENT HAS BEEN MADE FOR SHRINKAGE OR SWELL
 FILL = 143 CY }

Date	
Revision/Issue	
No.	1



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 PE-2023008235



FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
 OVER HERBRANDT BRANCH
 COLE COUNTY, MISSOURI




CROSS SECTIONS

DATE: 2023-11-17
 JOB NUMBER: 4745_Civil

SHEET
 C6

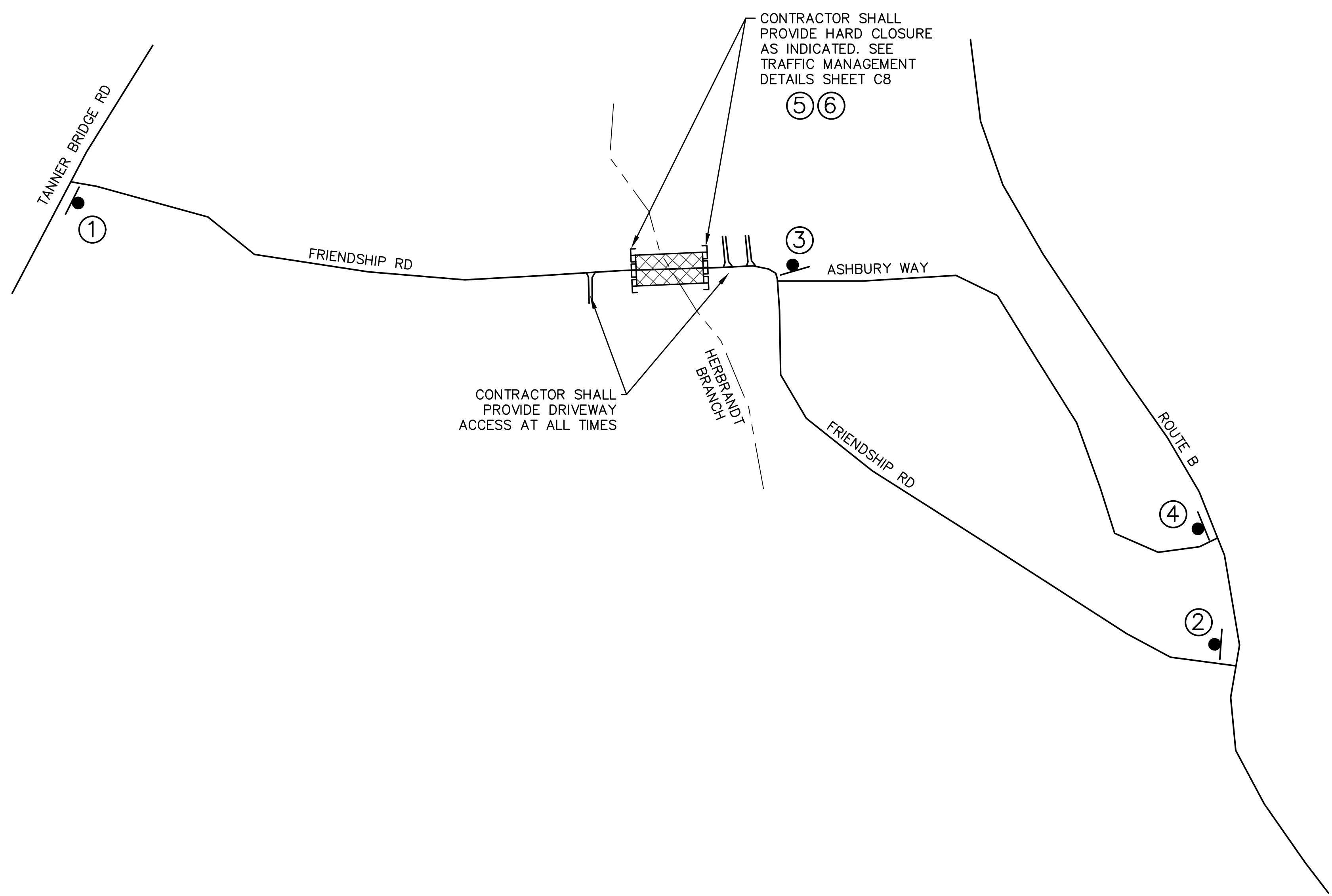


TRAFFIC CONTROL LEGEND

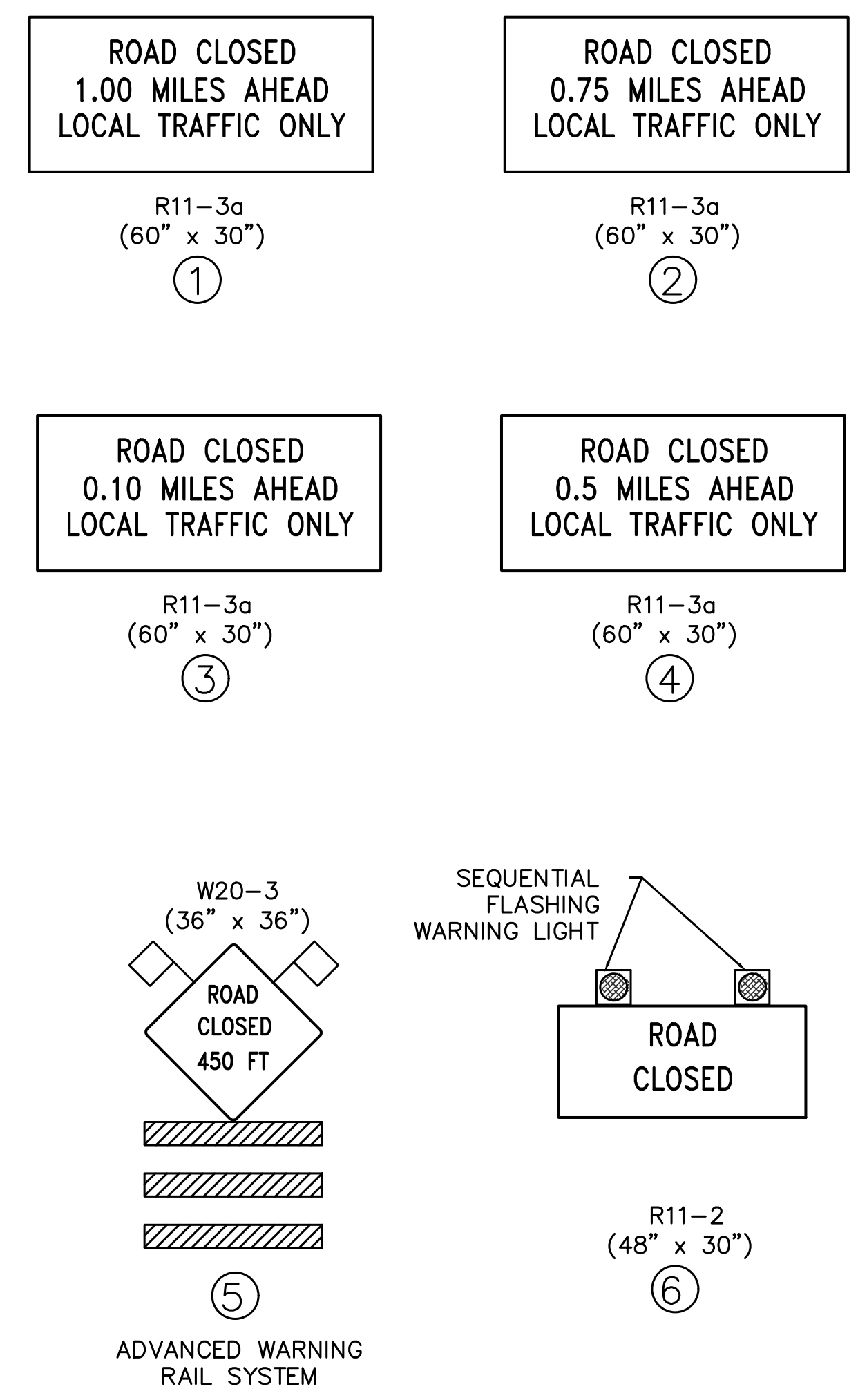
-  SIGN (SINGLE SIDED)
-  TYPE 3 BARRICADE
-  WORK AREA

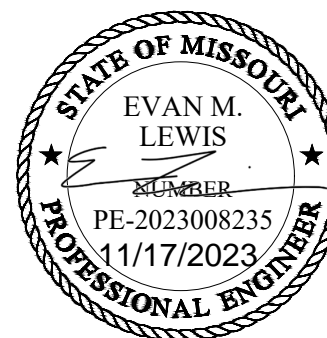
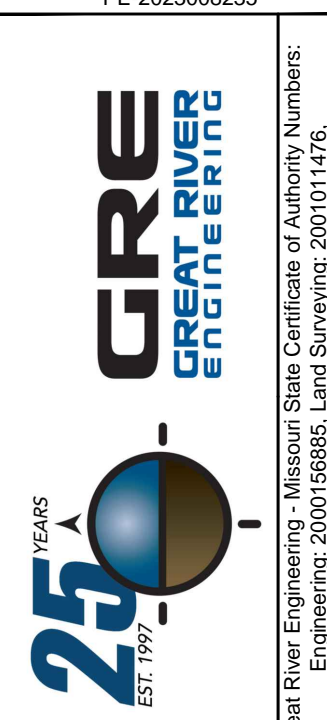
NOTE:
 ALL SIGNS SHOULD BE PLACED APPROX. 500' APART, OR AS DIRECTED BY THE COUNTY. USE IN PLACE ALL SIGNS WHICH DO NOT CONFLICT WITH THIS PLAN. COVER AND/OR REMOVE CONFLICTING SIGNS.

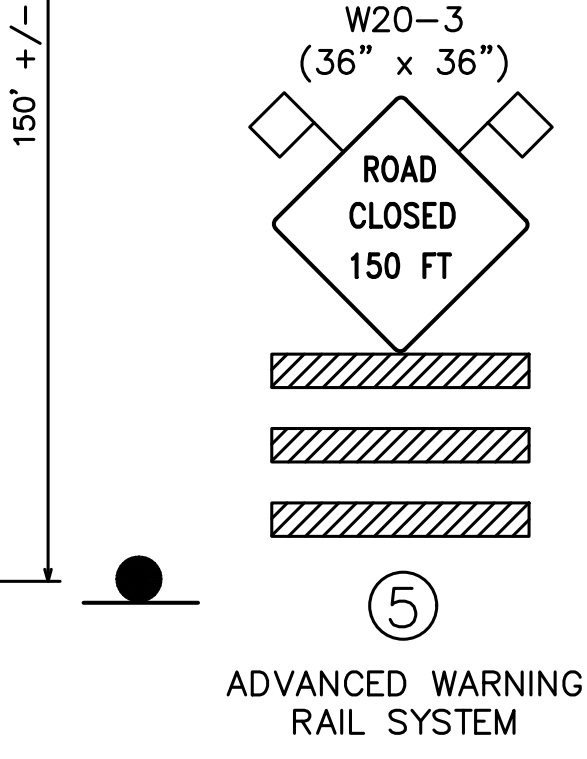
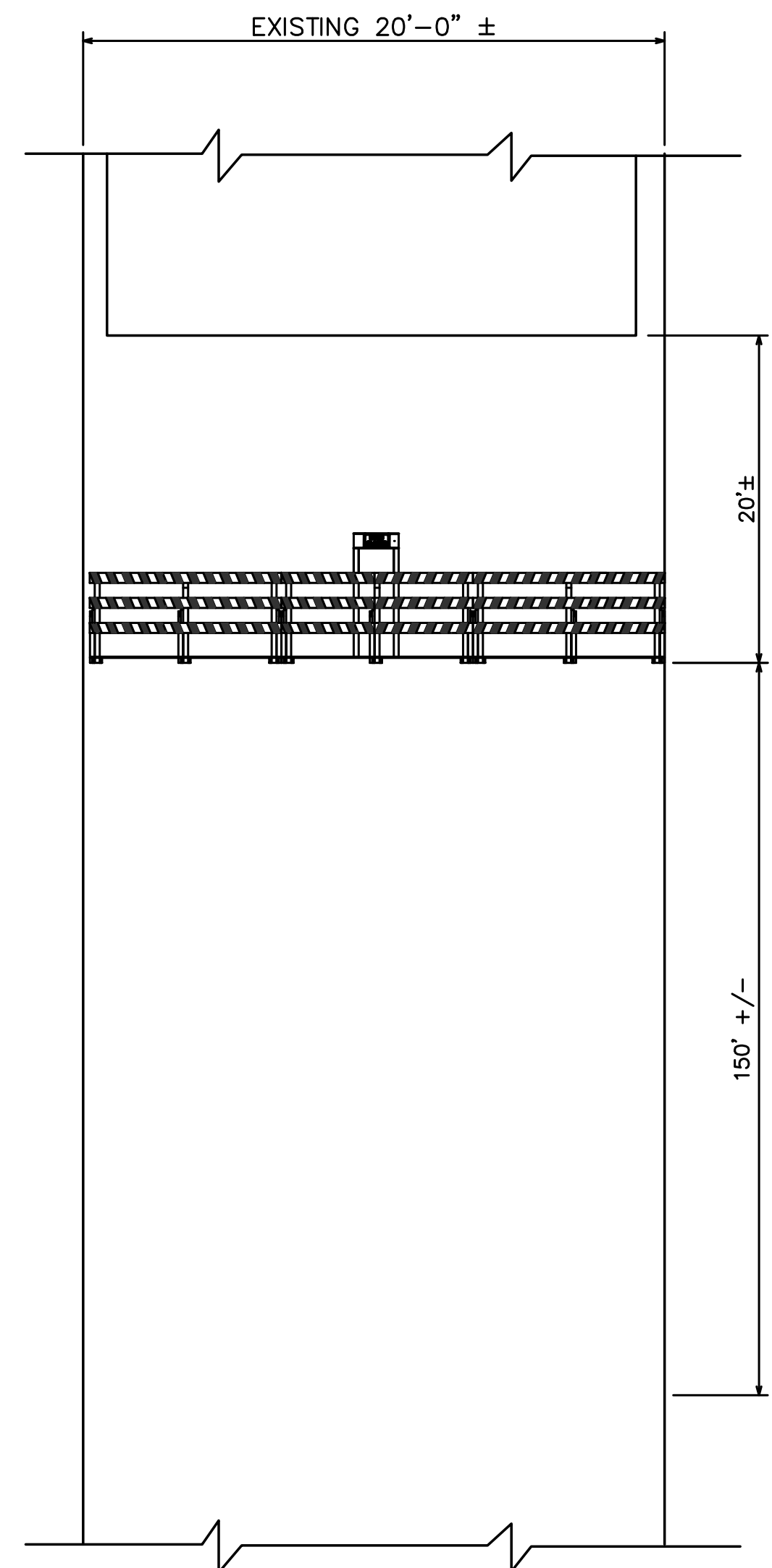
SEE MISSOURI STANDARD PLANS DRAWING 616.10 "TEMPORARY TRAFFIC CONTROL DEVICES" FOR DETAILS NOT SHOWN.



TRAFFIC MANAGEMENT PLAN

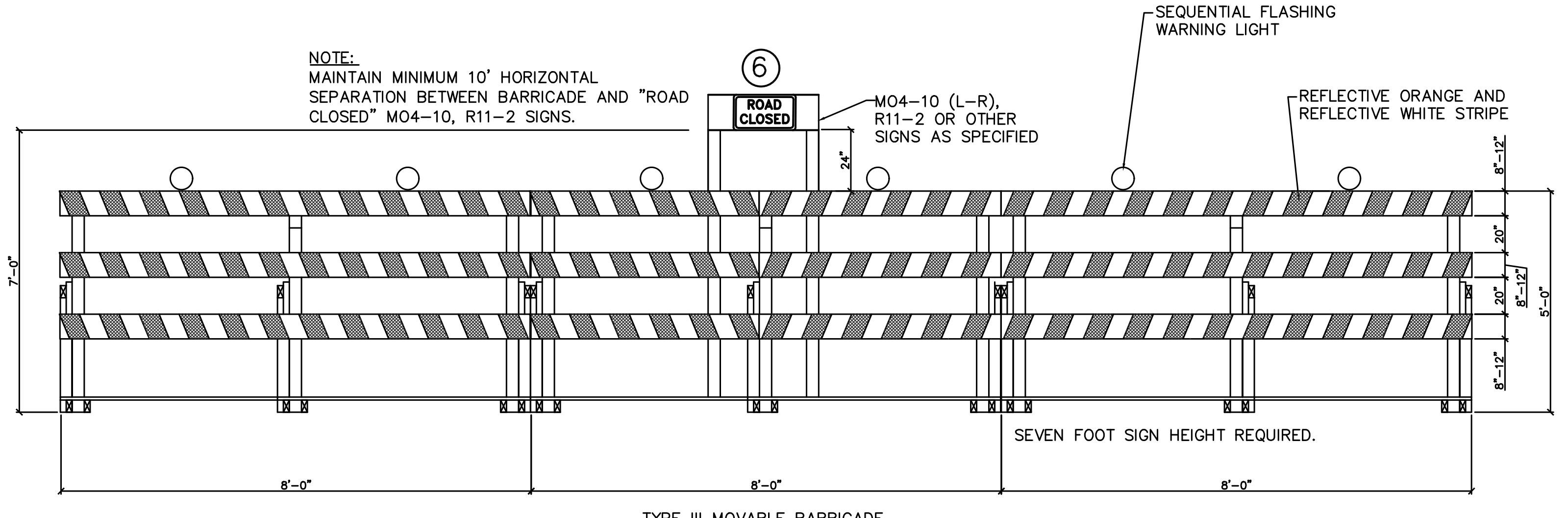


Date							
Revision/Issue							
No.	1	2	3	4	5	6	7
							
							
FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI				TRAFFIC MANAGEMENT PLAN			
DATE: 2023-11-17 JOB NUMBER: 4745_Civil							
SHEET C7							



TYPICAL HARD CLOSURE

- TRAFFIC CONTROL NOTES:**
1. ALL CONSTRUCTION SIGNS AND BARRICADES MUST BE UTILIZED AND MAINTAINED IN COMPLIANCE WITH PART VI OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, 2020 EDITION, OR LATEST REVISION THEREOF.
 2. ALL EXISTING SIGNS SHALL BE MAINTAINED AND RELOCATED WHEN NECESSARY. SIGNING SHALL BE INSTALLED PRIOR TO OPENING ANY SECTION OF THE ROADWAY FOR TRAFFIC.
 3. SIGNAGE SHOWN SHALL REMAIN IN PLACE FOR THE PROJECT DURATION AND BE MODIFIED AS NECESSARY AND AS DIRECTED BY THE COUNTY.
 4. ANY ALTERNATE TRAFFIC CONTROL PLAN MUST BE APPROVED IN WRITING BY THE COUNTY PRIOR TO IMPLEMENTATION.
 5. SIGN ⑥ MOUNTED ON TYPE 3 BARRICADES SHALL BE LIGHTWEIGHT.
 6. ACCESS TO LOCAL PROPERTIES WITHIN THE WORK ZONE SHALL BE MAINTAINED AT ALL TIMES AND COORDINATED WITH PROPERTY OWNER.



- NOTES:**
1. ALL SIGNS TO MEET MoDOT STANDARD SPECIFICATIONS FOR REFLECTIVITY AND OTHER DETAILS. ALL SIGNAGE TO MEET MUTCD REQUIREMENTS. SHOULD CONFLICTS EXIST BETWEEN MoDOT AND MUTCD FOLLOW MUTCD.
 2. ALL REFLECTORIZED SURFACES SHALL BE TYPE 1 SHEETING UNLESS OTHERWISE INDICATED. NO DIRECT PAYMENT WILL BE MADE FOR RELOCATION OF BARRICADES. NO PAYMENT WILL BE MADE FOR RELOCATING SIGNS ON MOVABLE BARRICADES WHICH ARE TO BE RELOCATED UNLESS THE SIGN LEGEND IS TO BE CHANGED. STRIPES SHALL SLOPE DOWNWARD TOWARD THE SIDE WHICH TRAFFIC IS TO PASS.
 3. ALL SEQUENTIAL FLASHING WARNING LIGHTS SHALL COMPLY WITH MoDOT STANDARD SPECIFICATION SECTION 1063.6.

TYPE 3 BARRICADE WITH SEQUENTIAL FLASHING WARNING LIGHTS

Date	
Revision/Issue	
No.	◀◀◀◀◀◀
<p>FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI</p>	
<p>TRAFFIC MANAGEMENT DETAILS</p>	
DATE:	2023-11-17
JOB NUMBER:	4745_Civil
<p>SHEET C8</p>	



BORING NUMBER BH-1

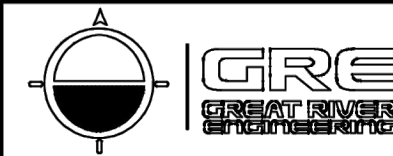
PAGE 1 OF 1

CLIENT Cole County PROJECT NAME Friendship Road Culvert
 PROJECT NUMBER 4728 PROJECT LOCATION Friendship Road over Herbrandt Branch
 DATE STARTED 7/13/23 COMPLETED 7/13/23 GROUND ELEVATION _____ HOLE SIZE 4
 DRILLING CONTRACTOR Great River Engineering GROUND WATER LEVELS:
 DRILLING METHOD Solid Stem Auger AT TIME OF DRILLING ---
 LOGGED BY A. Brantley CHECKED BY CG AT END OF DRILLING ---
 NOTES _____ AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		TOPSOIL, GRASS COVERED BLACK LEAN CLAY, MOIST, MEDIUM FIRM										
		BLACK LEAN CLAY, MOIST, MEDIUM FIRM										
		DARK BROWN SANDY LEAN CLAY WITH CHERT, MOIST, STIFF										
5		CHERT COBBLES										
		JEFFERSON CITY DOLOMITE, MODERATELY HARD, MODERATELY WEATHERED										

Bottom of borehole at 9.2 feet.

G:\GEO\TECH\BH\COLUMNS - GINT STD\US.GDT - 7/20/23.08.16 - Z:\SHARED\DISCIPLINES\GEO\TECH\GINT\CLIPROJECTS\4745 FRIENDSHIP ROAD.GPJ



BORING NUMBER BH-2

PAGE 1 OF 1

CLIENT Cole County PROJECT NAME Friendship Road Culvert
 PROJECT NUMBER 4728 PROJECT LOCATION Friendship Road over Herbrandt Branch
 DATE STARTED 7/13/23 COMPLETED 7/13/23 GROUND ELEVATION _____ HOLE SIZE 4
 DRILLING CONTRACTOR Great River Engineering GROUND WATER LEVELS:
 DRILLING METHOD Hollow Stem Auger AT TIME OF DRILLING ---
 LOGGED BY A. Brantley CHECKED BY CG AT END OF DRILLING ---
 NOTES _____ AFTER DRILLING ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
									LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
0		JEFFERSON CITY DOLOMITE, MODERATELY HARD, MODERATELY WEATHERED										
		ROCK CORE COMPRESSIVE STRENGTH: 10,180 PSI BREAK	RC	80 (58)								

Bottom of borehole at 5.0 feet.

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Date	
Revision/Issue	
No.	1
	2
	3
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PE-2023008235

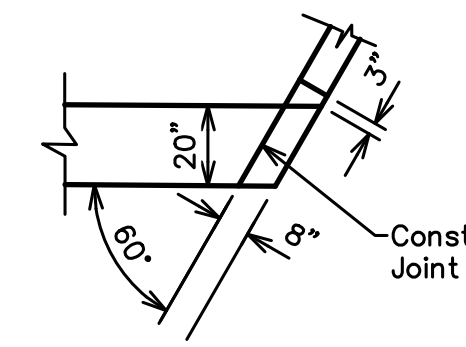
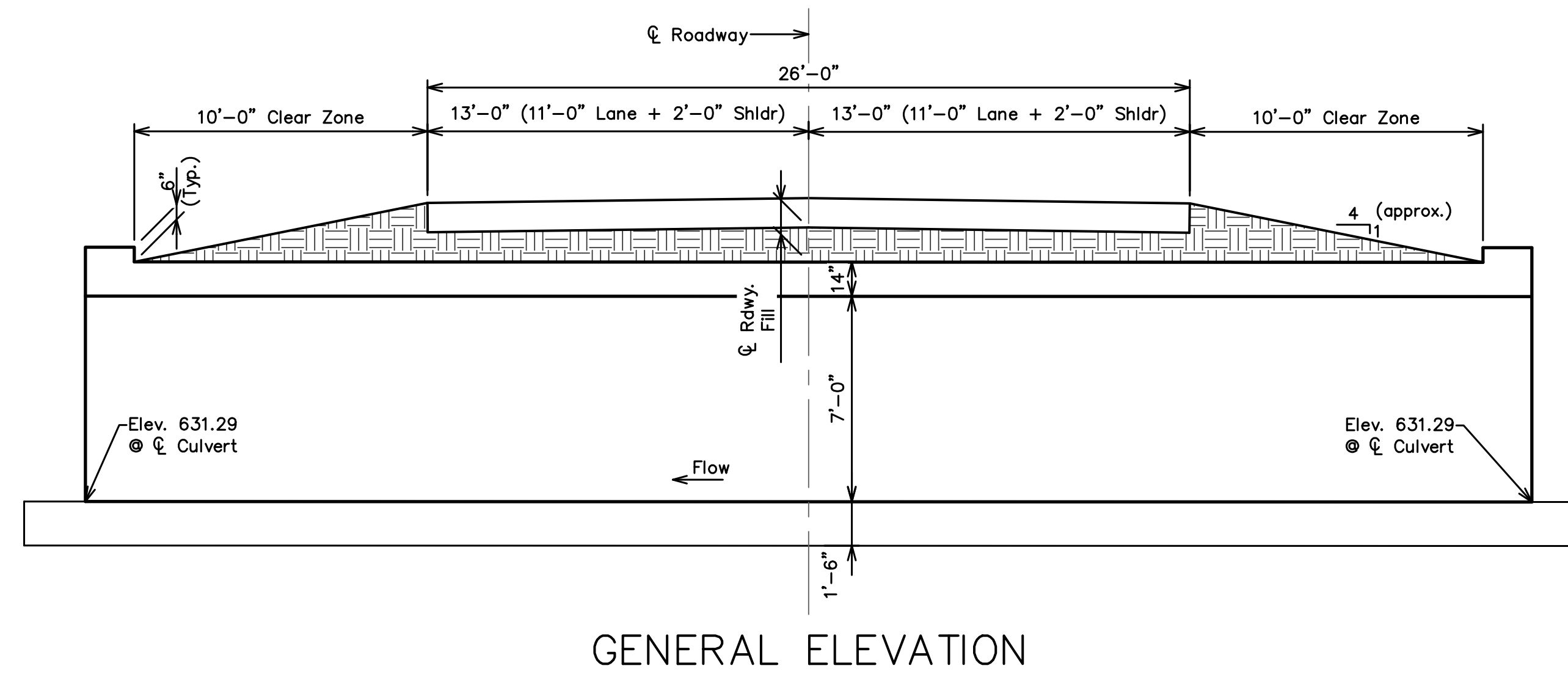


FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
 OVER HERBRANDT BRANCH
 COLE COUNTY, MISSOURI

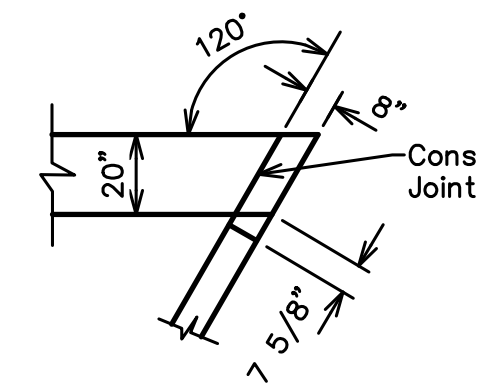
TRAFFIC MANAGEMENT DETAILS

DATE: 2023-11-17
 JOB NUMBER: 4745_Civil

SHEET
C8



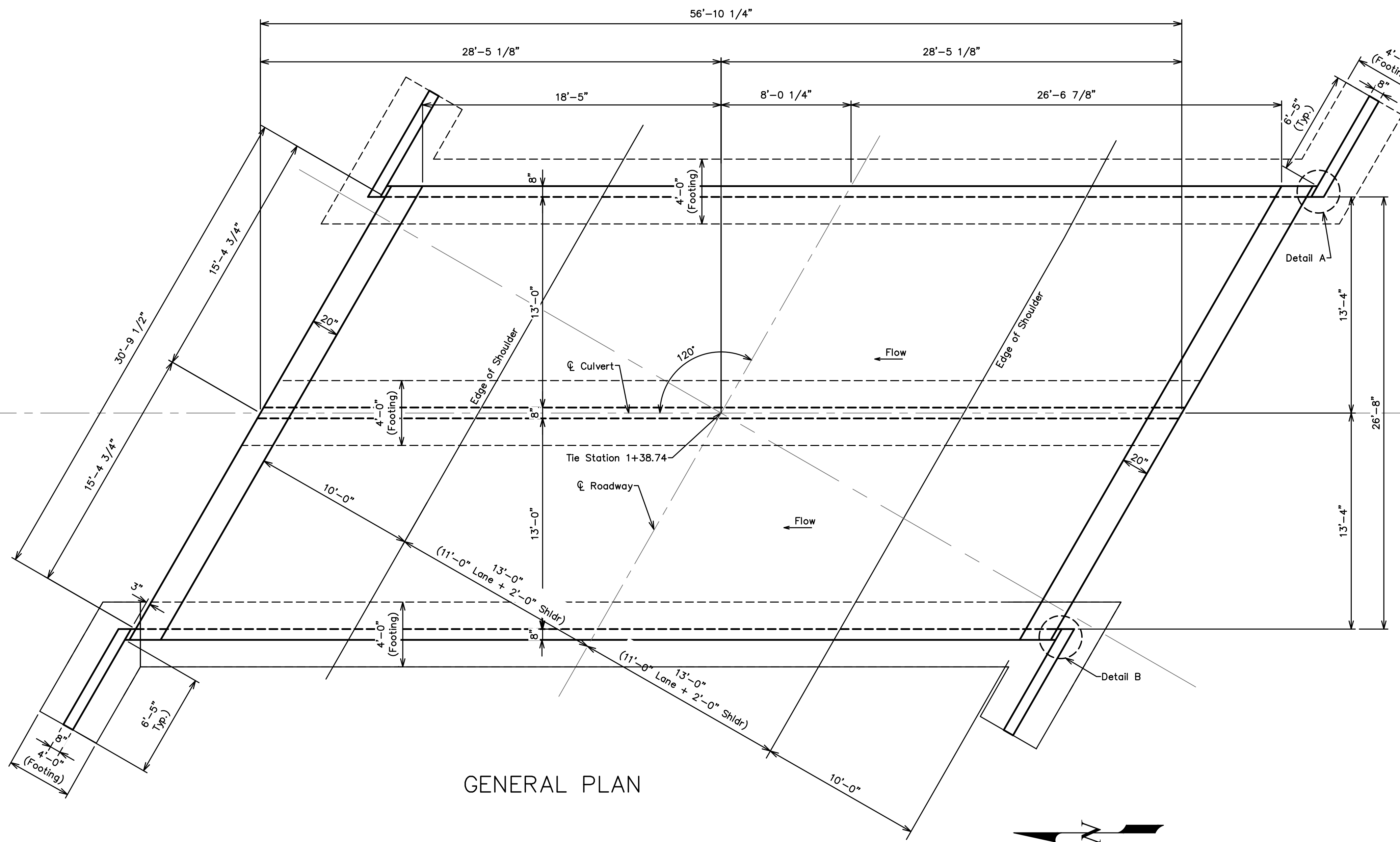
DETAIL A



DETAIL B

Estimated Quantities		
Item		Total
Class 4 Excavation	cu. yard	145
Class 4 Excavation in Rock	cu. yard	45
Removal of Existing Structures	lump sum	1
Class B-1 Concrete (Culverts-Bridge)	cu. yard	150
Reinforcing Steel (Culverts-Bridge)	pound	21,184

Hydrologic Data	
Drainage Area	= 1.1 sq. mi.
Design Flood Frequency	= 100 years
Design Flood Discharge	= 1600 cfs
Design Flood (D.F.) Elevation	= 642 feet
Estimate Backwater	= -0.5 feet
Average Velocity Thru Opening	= 9.4 ft/s
Freeboard (50-year)	
Freeboard	= 0 feet
Roadway Overtopping	
Overtopping Flood Discharge	= 1830 cfs
Overtopping Flood Frequency	= 200 years
Overtopping Flood Elevation	= 642.5 feet



GENERAL PLAN

GENERAL NOTES:

Design Specifications:

2014 A.A.S.H.T.O. LRFD Bridge Design Specifications (7th Ed.)

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

Reinforcing Steel:

Minimum clearance to reinforcing steel shall be 1 1/2", unless otherwise shown.

Traffic Handling:

Structure to be closed during construction. Traffic to be maintained on other routes during construction. See roadway plans for traffic control.

Excavation:

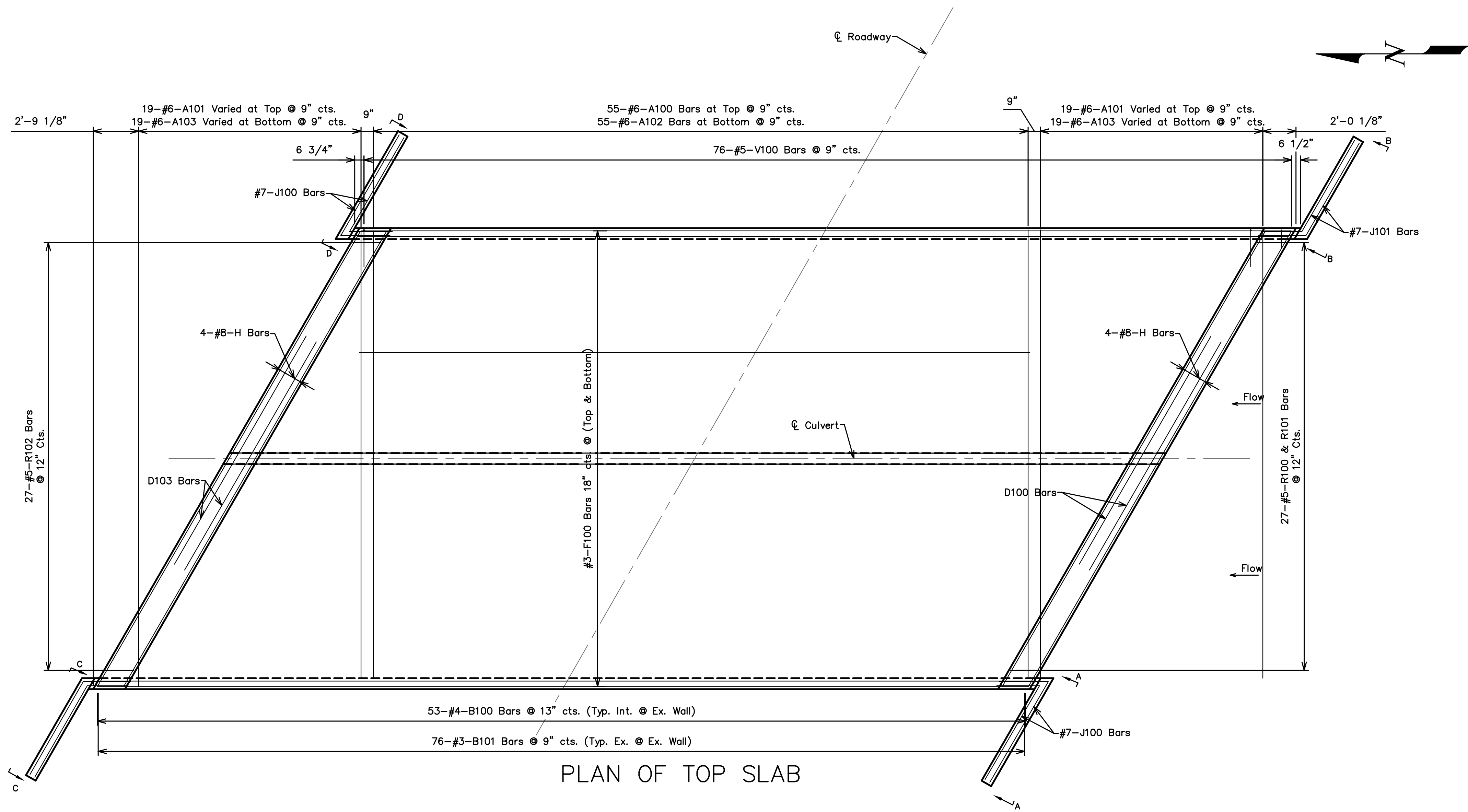
If unsuitable material is encountered, excavation of unsuitable material and placing of granular backfill shall be in accordance with Sec. 206.

If rock is encountered, excavate rock 6 inches below bottom of slab and backfill with suitable material for culverts on rock in accordance with Sec. 206.

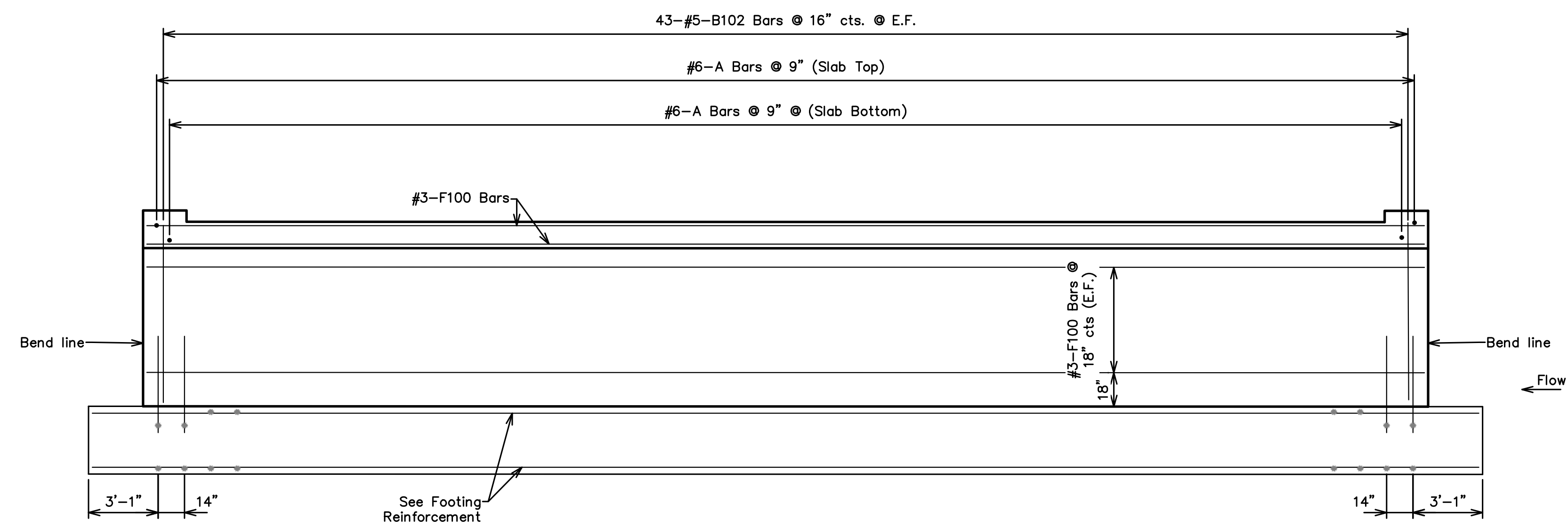
Select Granular Backfill material is to be in accordance with Missouri Standard Specifications Sec. 1010.

Payment for removal of inherently unsound material will be made at the contract unit price for Class 4 Excavation. The contractor will be reimbursed for the delivered cost of granular backfill when approved by the engineer in accordance with Sec. 206.6.

Date									
Revision/Issue	No.	1	2	3	4	5	6	7	8
FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI									
BOX CULVERT DETAILS									
DATE: 2023-11-17									
JOB NUMBER: 4745_Civil									
SHEET 51									



PLAN OF TOP SLAB



SECTION AT INTERIOR WALL

General Notes:

For Sections thru Barrel, Wings and Headwalls, see Sheet S4.

Construction Joint Key not shown for clarity in plan and elevation.

Beveled headwall shall be located at upstream end.

The footing shall be embedded into rock 18 inches at the actual elevation the top of competent rock is encountered for the footing. Contractor shall scratch test bedrock for soundness. Drill 2" diameter holes a minimum of 5 feet deep at a maximum of 15-foot intervals. This work will be considered incidental to bid item "Class 4 Excavation in Rock".

Date	
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Revision/Issue	
No.	



EVAN M. LEWIS
PE-2023008235



FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
OVER HERBRANDT BRANCH
COLE COUNTY, MISSOURI

BOX CULVERT DETAILS

DATE: 2023-11-17
JOB NUMBER: 4745_Civil

SHEET
S2

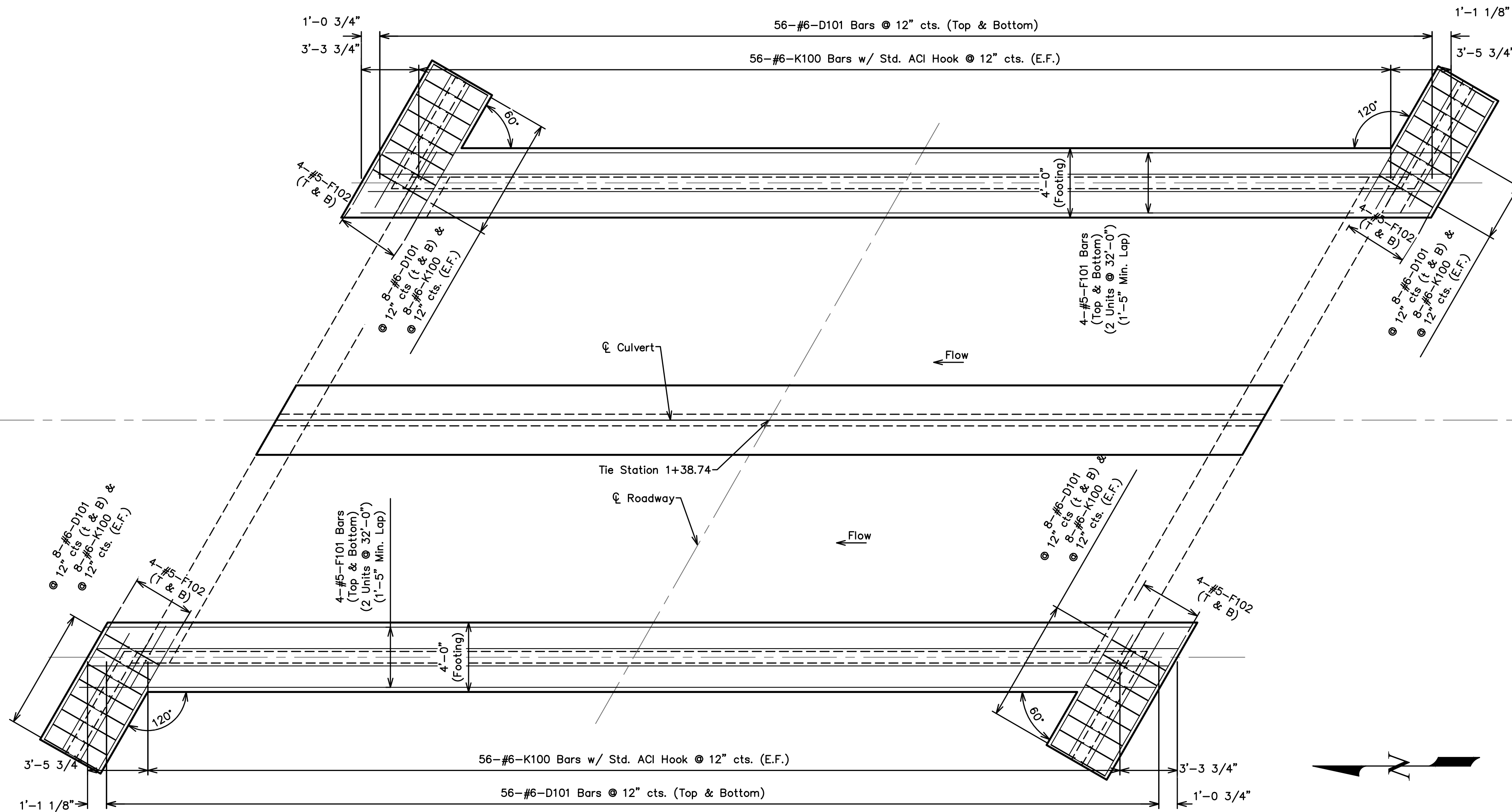
General Notes:

For Sections thru Barrel, Wings and Headwalls, see Sheet S4.

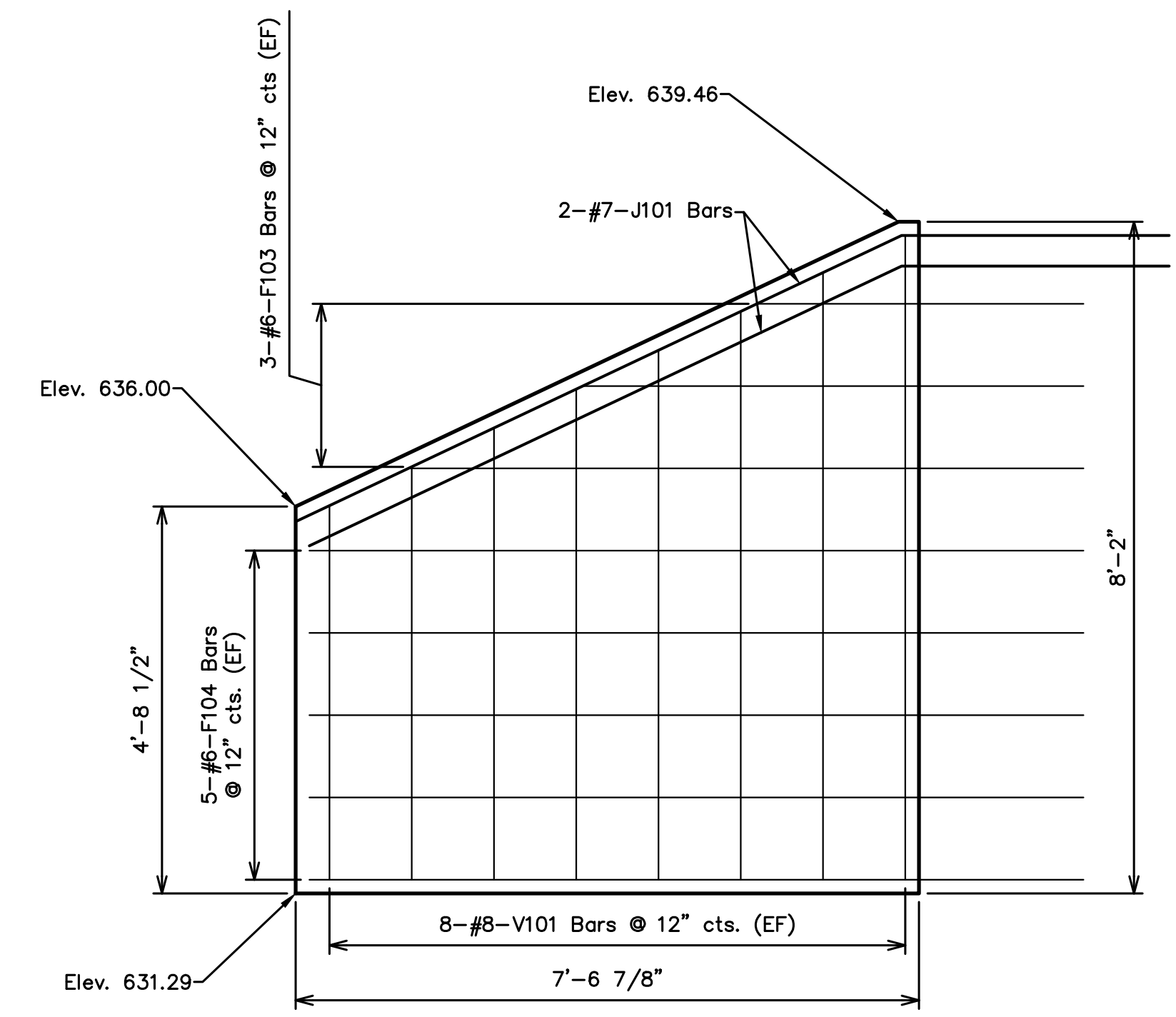
Construction Joint Key not shown for clarity in plan and elevation.

Beveled headwall shall be located at upstream end.

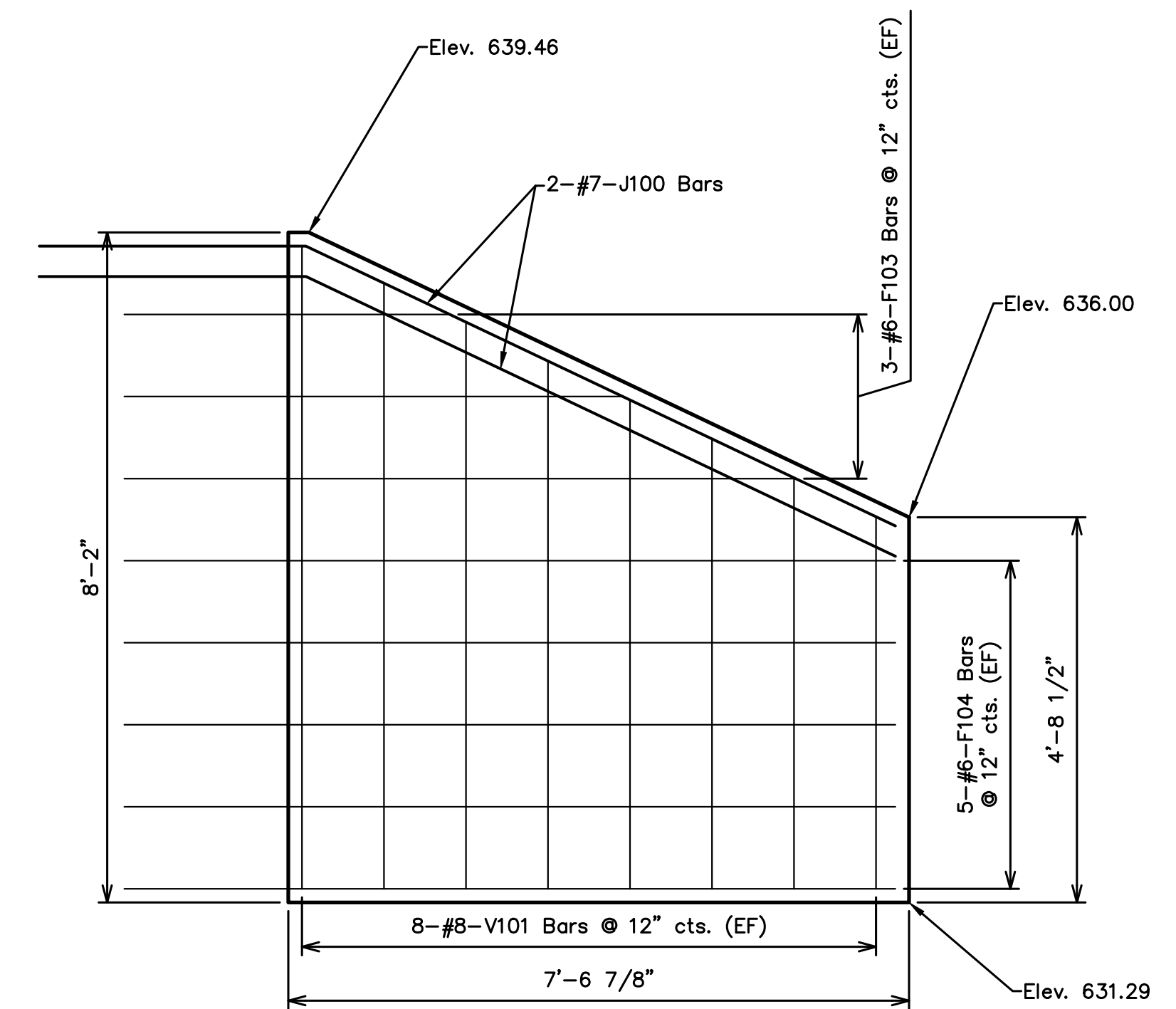
The footing shall be embedded into rock 18 inches at the actual elevation the top of competent rock is encountered for the footing. Contractor shall scratch test bedrock for soundness. Drill 2" diameter holes a minimum of 5 feet deep at a maximum of 15-foot intervals. This work will be considered incidental to bid item "Class 4 Excavation in Rock".



FOOTING REINFORCING



ELEVATION A-A & D-D



ELEVATION B-B & C-C

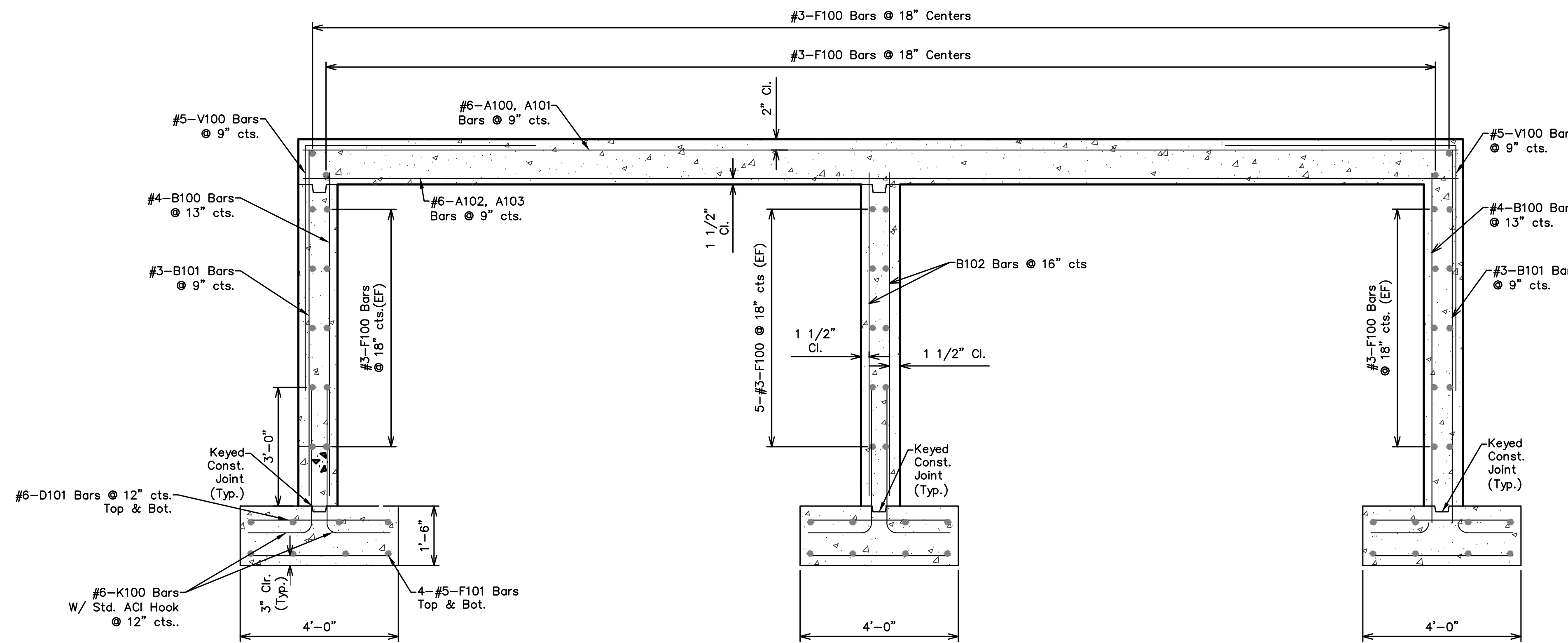
Date	
Revision/Issue	
No.	
<small>Great River Engineering, Missouri State Certificate of Authority Numbers: Engineering: 2007156965, Land Surveying: 201011476, Landscape Architecture: 2007015873</small>	

FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101)
OVER HERBRANDT BRANCH
COLE COUNTY, MISSOURI

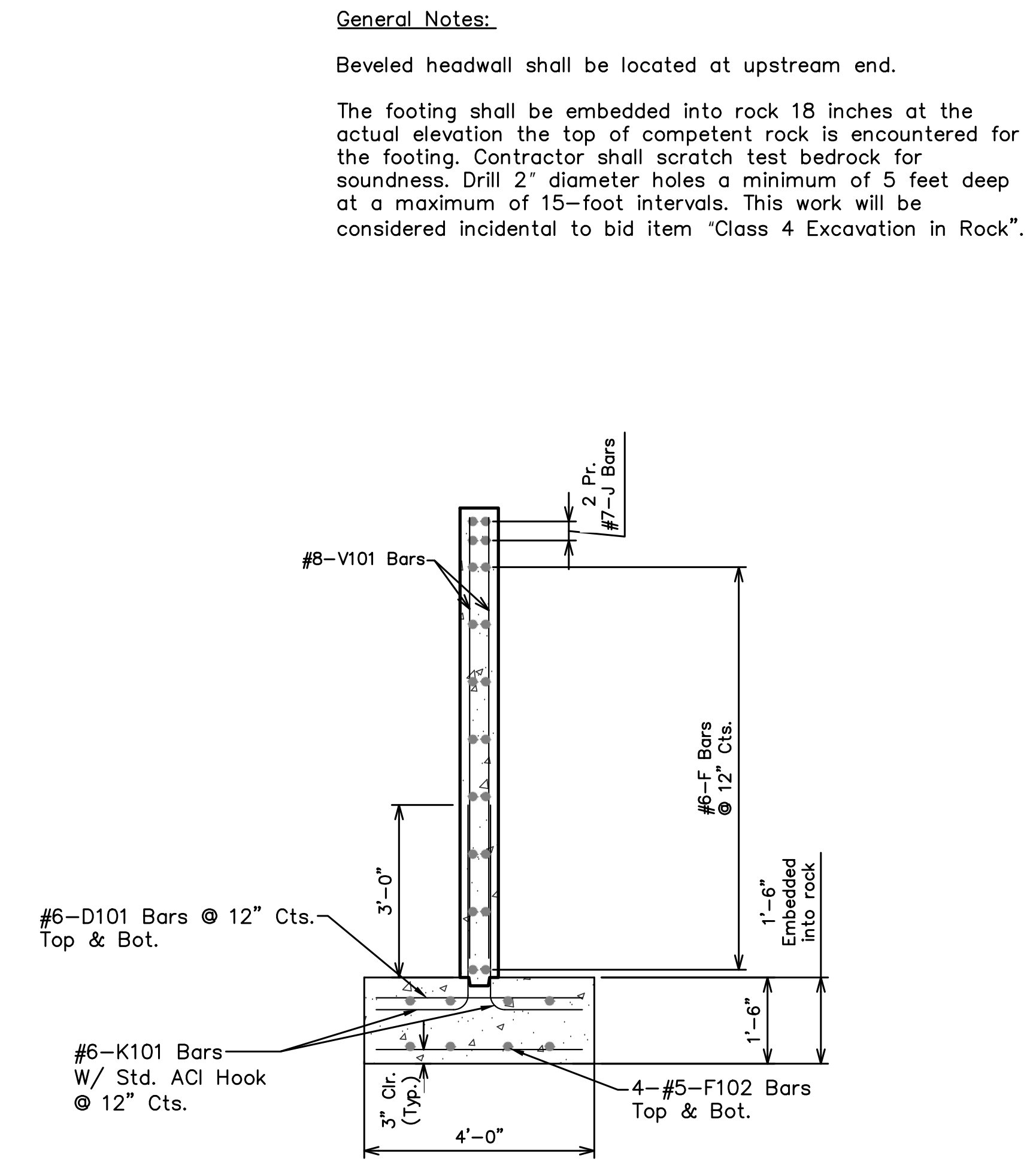
BOX CULVERT DETAILS

DATE: 2023-11-17
JOB NUMBER: 4745_Civil

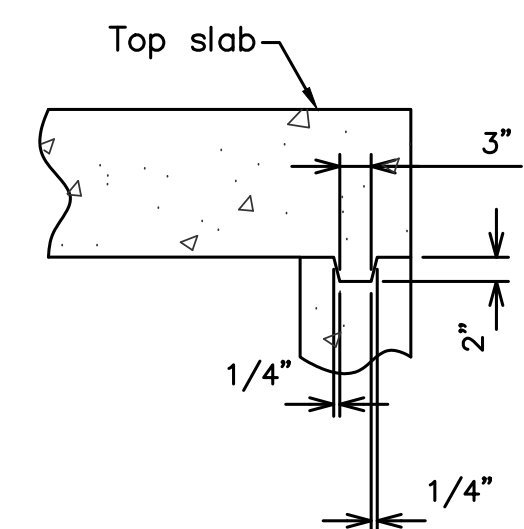
SHEET
S3



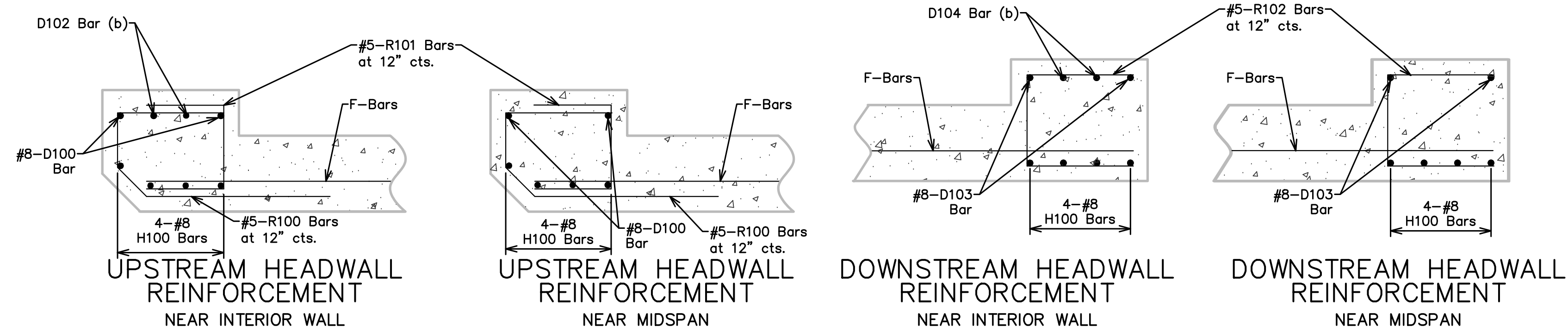
BARREL REINFORCEMENT



WINGS REINFORCEMENT

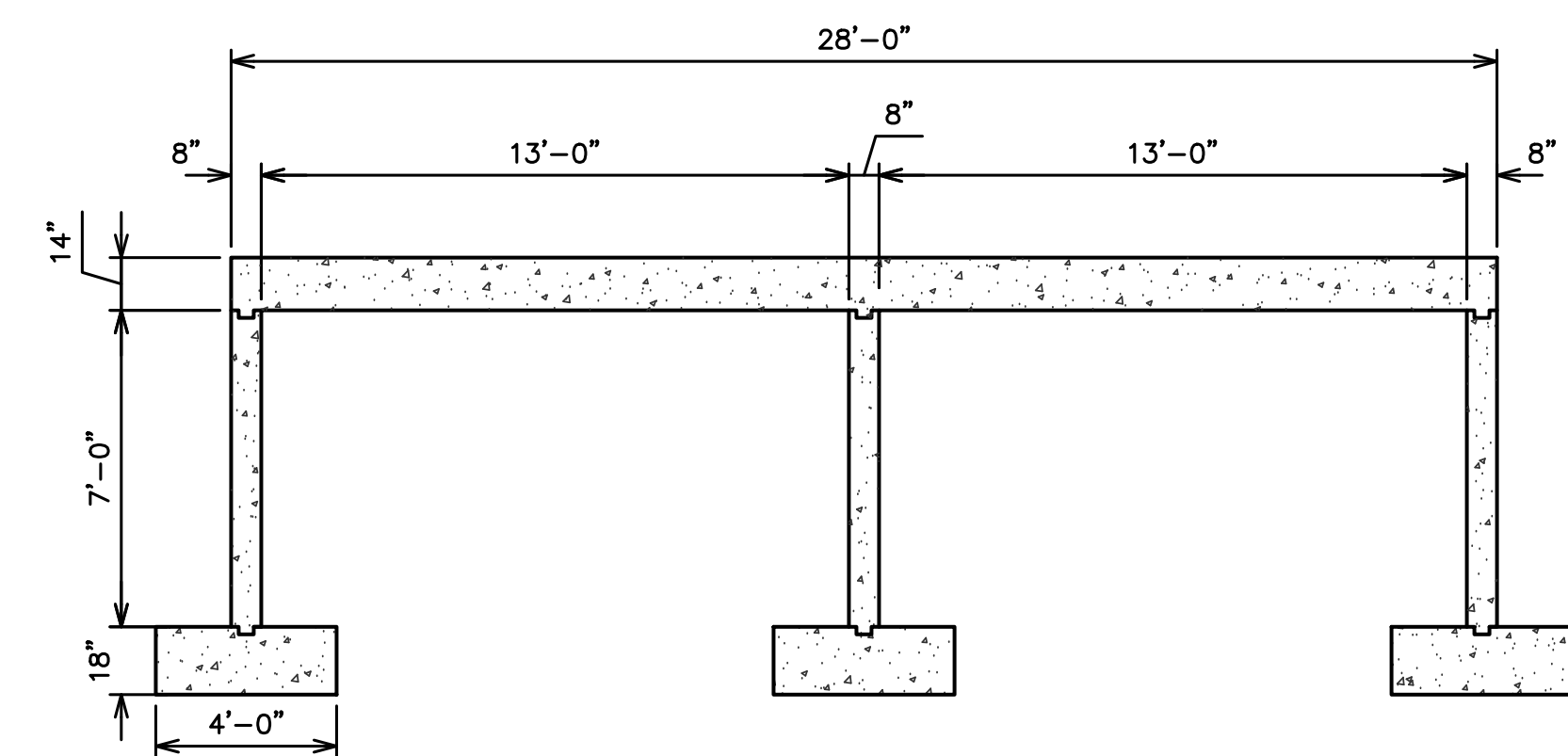


KEYED CONSTRUCTION JOINT



(b) #8 FOR CLEAR SPAN $\leq 10'-0"$
 #9 FOR CLEAR SPAN $\leq 13'-0"$
 NOT REQUIRED FOR CLEAR SPANS $\leq 10'-0"$

if D2 and D4 bars are required, the minimum length each side of \bar{C} wall shall be the greater of 48 bar diameters or $1/4$ clear span. The clear span is parallel to long direction of headwall.



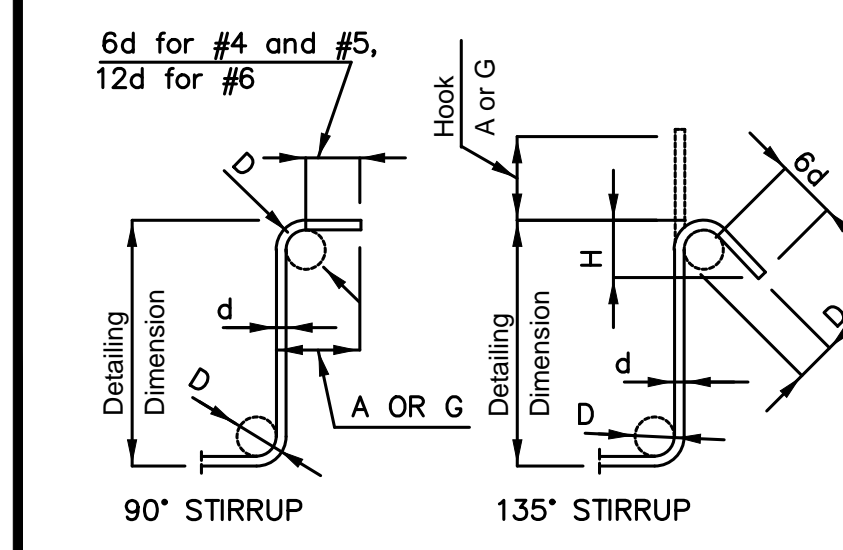
SECTION THRU BARREL

General Notes:
 Beveled headwall shall be located at upstream end.
 The footing shall be embedded into rock 18 inches at the actual elevation the top of competent rock is encountered for the footing. Contractor shall scratch test bedrock for soundness. Drill 2" diameter holes a minimum of 5 feet deep at a maximum of 15-foot intervals. This work will be considered incidental to bid item "Class 4 Excavation in Rock".

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<p>FRIENDSHIP ROAD BOX CULVERT (BRIDGE #07900101) OVER HERBRANDT BRANCH COLE COUNTY, MISSOURI</p>	
<p>BOX CULVERT DETAILS</p>	
DATE:	2023-11-17
JOB NUMBER:	4745_Civil
<p>SHEET S4</p>	

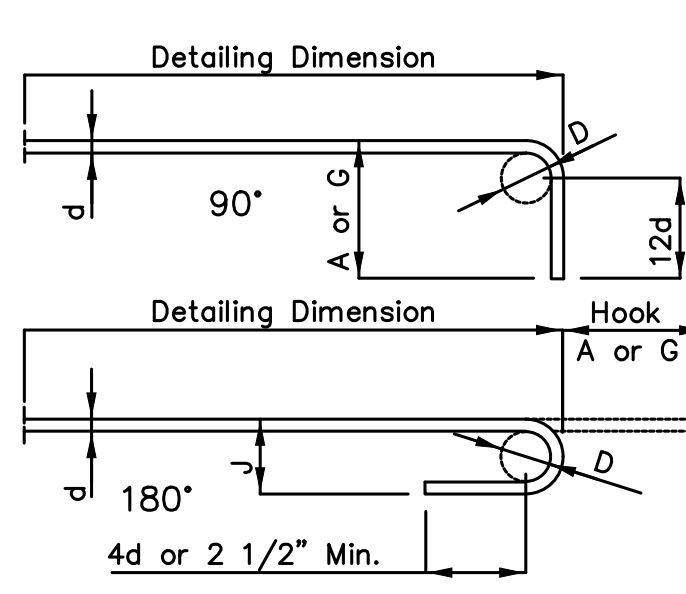
BILL OF REINFORCING STEEL

NO. REQ'D.	MARK NO.	LOCATION	EPOXY (E)	SHAPE NO.	STIRRUP (S)	SUBSTR. (X)	VARIES (V)	NO. EACH	DIMENSIONS												NOMINAL LENGTH	ACTUAL LENGTH	WEIGHT		
									B		C		D		E		F		H					K	
									FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.				FT.	IN.
		BOX CULVERT																							
55	6 A100	TOP OF SLAB	E	20		X			27	8.000							27	8	2286						
38	6 A101	TOP OF SLAB	E	20		X	V	2	2	10.000							2	10	830						
								2	26	3.000							26	3							
55	6 A102	BOTTOM OF SLAB	E	20		X			27	8.000							27	8	2286						
38	6 A103	BOTTOM OF SLAB	E	20		X	V	2	2	10.000							2	10	830						
								2	26	3.000							26	3							
152	4 B100	EXTERIOR WALLS	E	20		X			7	6.000							7	6	762						
106	3 B101	EXTERIOR WALLS	E	20		X			5	8.000							5	8	226						
86	5 B102	INTERIOR WALL	E	20		X			7	10.000							7	10	703						
2	8 D100	HEADWALL	E	20		X			5	2.000							5	2	28						
400	6 D101	FOOTING	E	20		X			3	8.000							3	8	2203						
2	9 D102	HEADWALL	E	20		X			5	2.000							5	2	35						
2	8 D103	HEADWALL	E	20		X			5	2.000							5	2	28						
2	9 D104	HEADWALL	E	20		X			5	2.000							5	2	35						
73	3 F100	SLAB	E	20		X			56	7.000							56	7	1553						
48	5 F101	FOOTING	E	20		X			32	0.000							32	0	1602						
32	5 F102	FOOTING	E	20		X			7	3.000							7	3	242						
24	6 F103	WINGWALL	E	20		X	V	2	3	11.625							4	0	219						
								2	8	2.250							8	2							
40	6 F104	WINGWALL	E	20		X			9	4.875							9	5	566						
16	5 F105	FOOTING	E	20		X			32	0.000							32	0	534						
8	8 H100	HEADWALL	E	20		X			5	2.000							5	2	110						
16	7 J100	WINGWALL	E	23		X			0.000	7	11.500	3	3.000	16.750	2	11.250	0.000	0.000	11	2	365				
400	6 K100	FOOTING	E	19		X			3	8.000	18.000						5	2	3004						
27	5 R100	HEADWALL	E	27		X			17.000	3	1.000	5.750	2	2.500	0.000	4.000	4.000	7	2	192					
27	5 R101	HEADWALL	E	10		X			0.000	10.500	3	5.000	0.000				5	2	138						
27	5 R102	HEADWALL	E	10		X			0.000	10.500	3	5.000	0.000				5	2	138						
152	5 V100	CORNER	E	19		X			5	5.000	2	5.000					7	10	1215						
64	8 V101	WINGWALL	E	20		X	V	2	4	6.500							4	6	1054						
								2	7	10.000							7	10							
		TOTALS																							
3			E																1779						
4			E																762						
5			E																4764						
6			E																12224						
7			E																365						
8			E																1220						
9			E																70						
		TOTAL	E																21184						
		REINFORCING STEEL (CULVERTS-BRIDGES)																							
3			E																1779						
4			E																762						
5			E																4764						
6			E																12224						
7			E																365						
8			E																1220						
9			E																70						
		TOTAL	E																21184						



Bar Size	D (in.)	90° Hook A or G	135° Hook A or G	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"

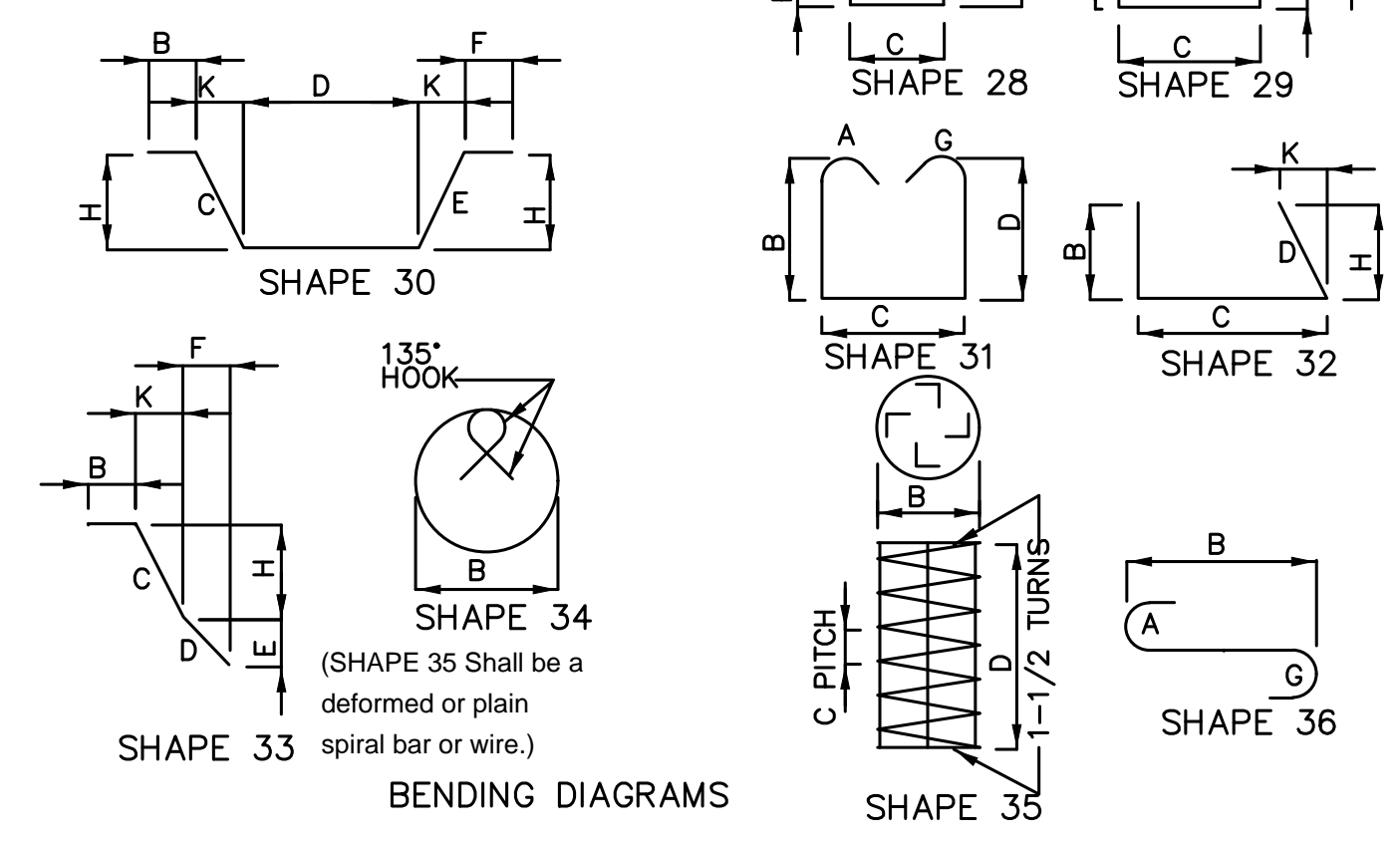
Note: Unless otherwise noted diameter "D" is the same for all bends and hooks on a bar.



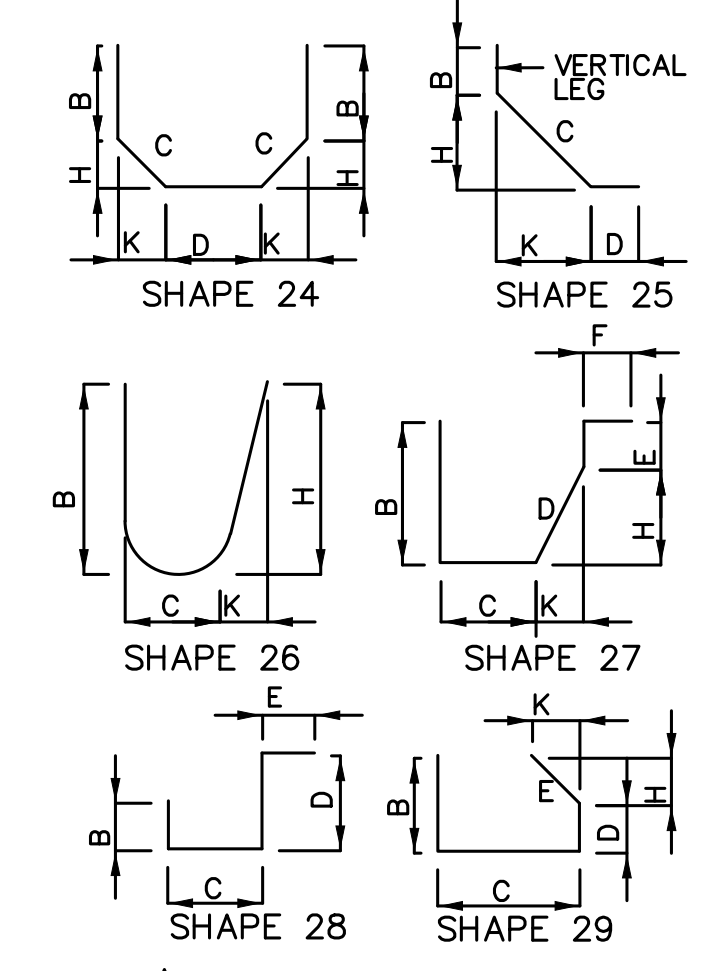
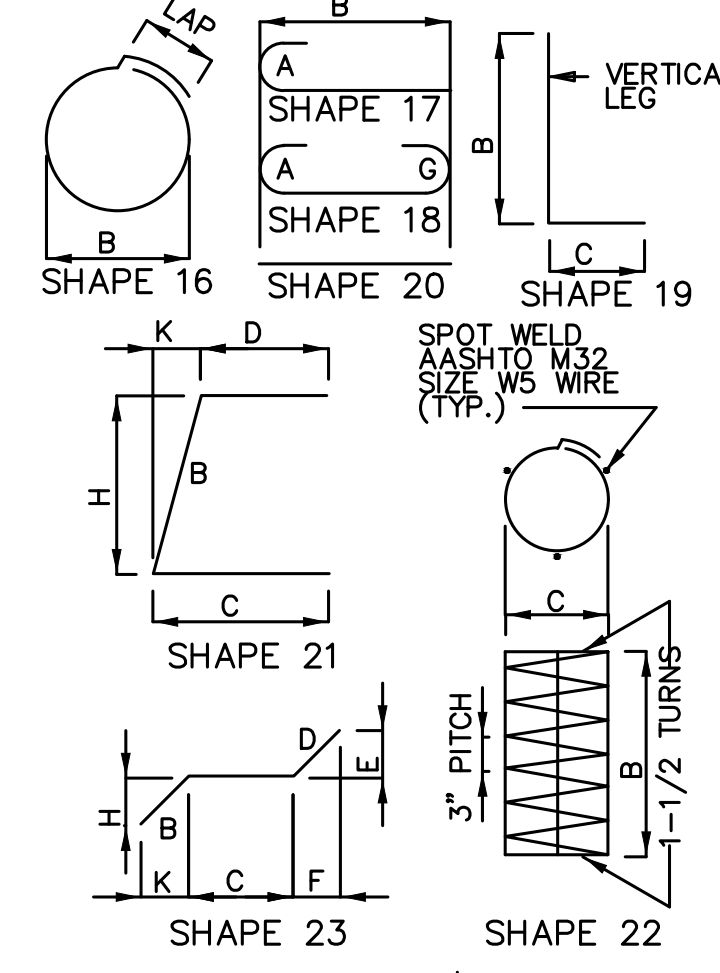
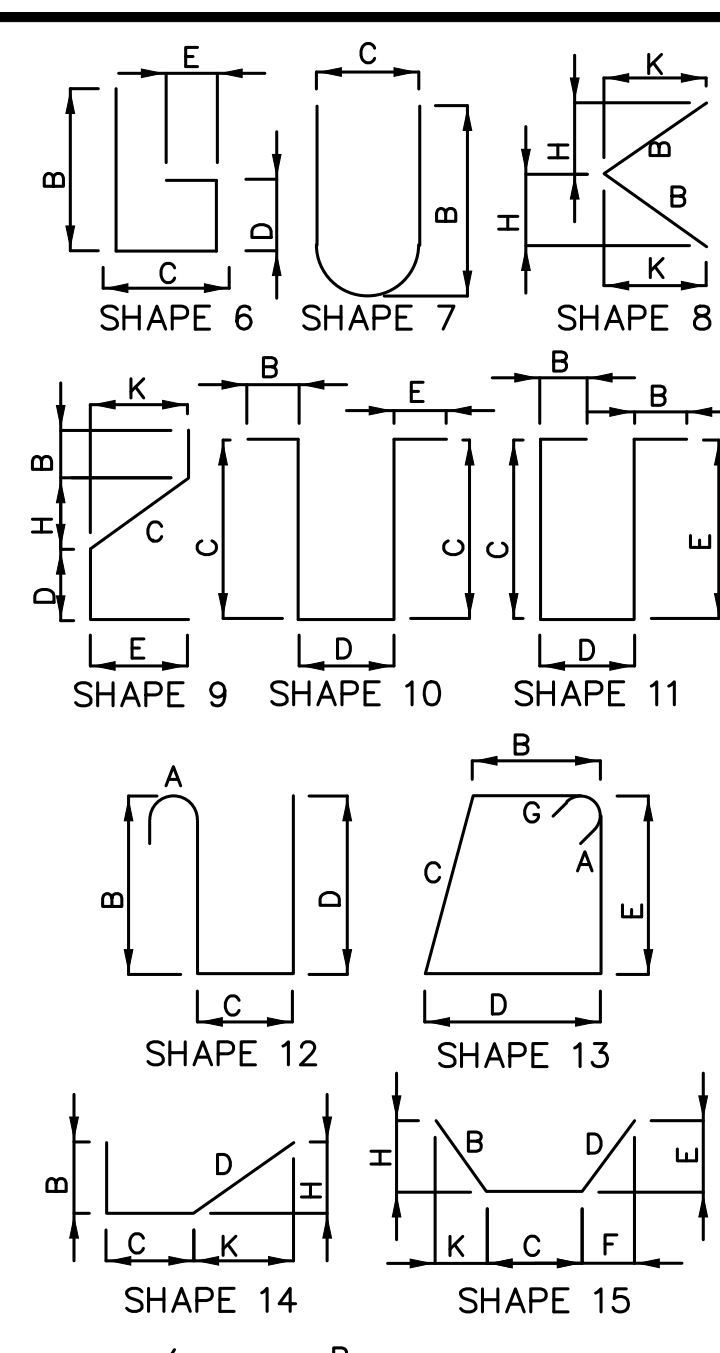
Bar Size	D (in.)	180° Hooks		90° Hooks
		A or G	J	A or G
#3	2 1/4"	5"	3"	6"
#4	3"	6"	4"	8"
#5	3 3/4"	7"	5"	10"
#6	4 1/2"	8"	6"	12"
#7	5 1/4"	10"	7"	14"
#8	6"	11"	8"	16"
#9	9 1/2"	15"	11 3/4"	19"
#10	10 3/4"	17"	13 1/4"	22"
#11	12"	19"	14 3/4"	2'-0"
#14	18 1/4"	2'-3"	21 3/4"	2'-7"

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.
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)
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) $f_y = 60,000$ psi.



Note: This drawing not to scale. Follow dimensions.



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Revision/Issue	
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BILL OF REINFORCING	
DATE: 2023-11-17	
JOB NUMBER: 4745_Civil	
SHEET S5	