

The diagram illustrates a cross-section of a bioretention system. Key components and labels include:

- PROP. LOAM AND SEED**: Indicated at the top left and top right slopes.
- 3:1 SIDE SLOPES (TYP.)**: Indicated on the left and right slopes.
- 6" FREEBOARD**: Indicated above the water level.
- ELEV. A**, **ELEV. B**, **ELEV. C**, **ELEV. D**, **ELEV. E**, **ELEV. F**: Various elevation markers.
- 12" (18" MAX.)**: Dimension for the water depth.
- 2" HARDWOOD MULCH**: Layer below the water.
- 12" PVC OVERFLOW STANDPIPE WITH GRATED CAP**: Vertical pipe structure.
- 3/8" PEA GRAVEL FILTER**: Layer below the mulch.
- PROP. 12" PERF. PVC PIPE IN 2' X 2' CRUSHED STONE TRENCH**: Bottom pipe structure.
- 2.00'**: Dimension for the trench width.
- 2.00'**: Dimension for the trench depth.
- 6" MIN.**: Minimum dimension for the trench bottom.
- PROP. PLANT LOCATION AND TYPE AS DIRECTED**: Indicated by arrows pointing to plant symbols.
- PROP. SEDIMENT FOREBAY PER PLAN**: Indicated by an arrow pointing to the sediment forebay area.
- PROP. ENGINEERED SOIL MIX (SEE NOTE 1)**: Indicated by an arrow pointing to the soil mix layer.
- PROP. CONCRETE PAVERS AT BOTTOM OF SEDIMENT FOREBAY**: Indicated by an arrow pointing to the paver layer.

BIORETENTION DESIGN			
LOCATION ID	SURFACE AREA	ELEV. A	ELEV. F
BIORETENTION AREA NO. 1 (STA. 23+00 - STA. 23+50 RT)	210 SF ±	132.00	131.20
BIORETENTION AREA NO. 2	227 SF ±	132.00	131.20

BIORETENTION DESIGN ELEVATIONS							
LOCATION ID	SURFACE AREA	ELEV. A	ELEV. B	ELEV. C	ELEV. D	ELEV. E	ELEV. F
BIORETENTION AREA NO. 1 (STA. 23+00 - STA. 23+50 RT)	210 SF ±	132.00	131.20	130.20	128.00	131.70	129.80
BIORETENTION AREA NO. 2 (STA. 32+00 - 33+00 RT)	327 SF ±	129.00	128.30	127.30	125.10	128.80	126.00

-
- 3" REVEAL
- 1'-0"
- 1'-0"
- 4" LOAM BORROW & SEED
- TOP
- INTERMEDIATE
- 4.75"
- 75°
- TYPE A HMA BERM
- SUBBASE
- FOR PAVEMENT CONSTRUCTION SEE PAVEMENT NOTES
- COMPACTED SUBGRADE

-
- PROP. BERM (TYP.)
- PROP. 3/8" PEA GRAVEL 6" MIN.
- PROP. TRENCH FILLED WITH 2 TO 5 INCH DIAMETER WASHED STONE OR BANK RUN GRAVEL
- PROP. 8" PERF. PVC OBSERVATION WELL WITH SCREW TOP LID
- PROP. 3/8" PEA GRAVEL 6" MIN.
- PROP. LOAM AND SEED
- PROP. SHOULDER
- PROP. HMA SHARED USE PATH
- 4.00'
- 5.50' MIN.
- NOTES:**
1. DO NOT CONSTRUCT INFILTRATION TRENCH UNTIL DRAINAGE AREA HAS BEEN STABILIZED. DIVERSION STRUCTURES SHOULD BE INSTALLED AROUND THE PERIMETER DURING ALL CONSTRUCTION.
 2. DURING AND AFTER EXCAVATION, ALL EXCAVATED MATERIAL SHOULD BE PLACED DOWN STREAM AWAY FROM THE INFILTRATION TRENCH.
 3. LIGHT EARTH-MOVING EQUIPMENT SHOULD BE USED IN THE INFILTRATION TRENCH. USE OF HEAVY EQUIPMENT IS NOT ALLOWED. SOILS IN THE TRENCH FLOOR AND SHOULD BE AVOIDED.
 4. CONSTRUCT INFILTRATION TRENCH IN ACCORDANCE WITH MASSACHUSETTS STORMWATER HANDBOOK (V. 1.0).
 5. SNOW SHOULD NEVER BE STORED IN INFILTRATION TRENCH.

N.T.S.

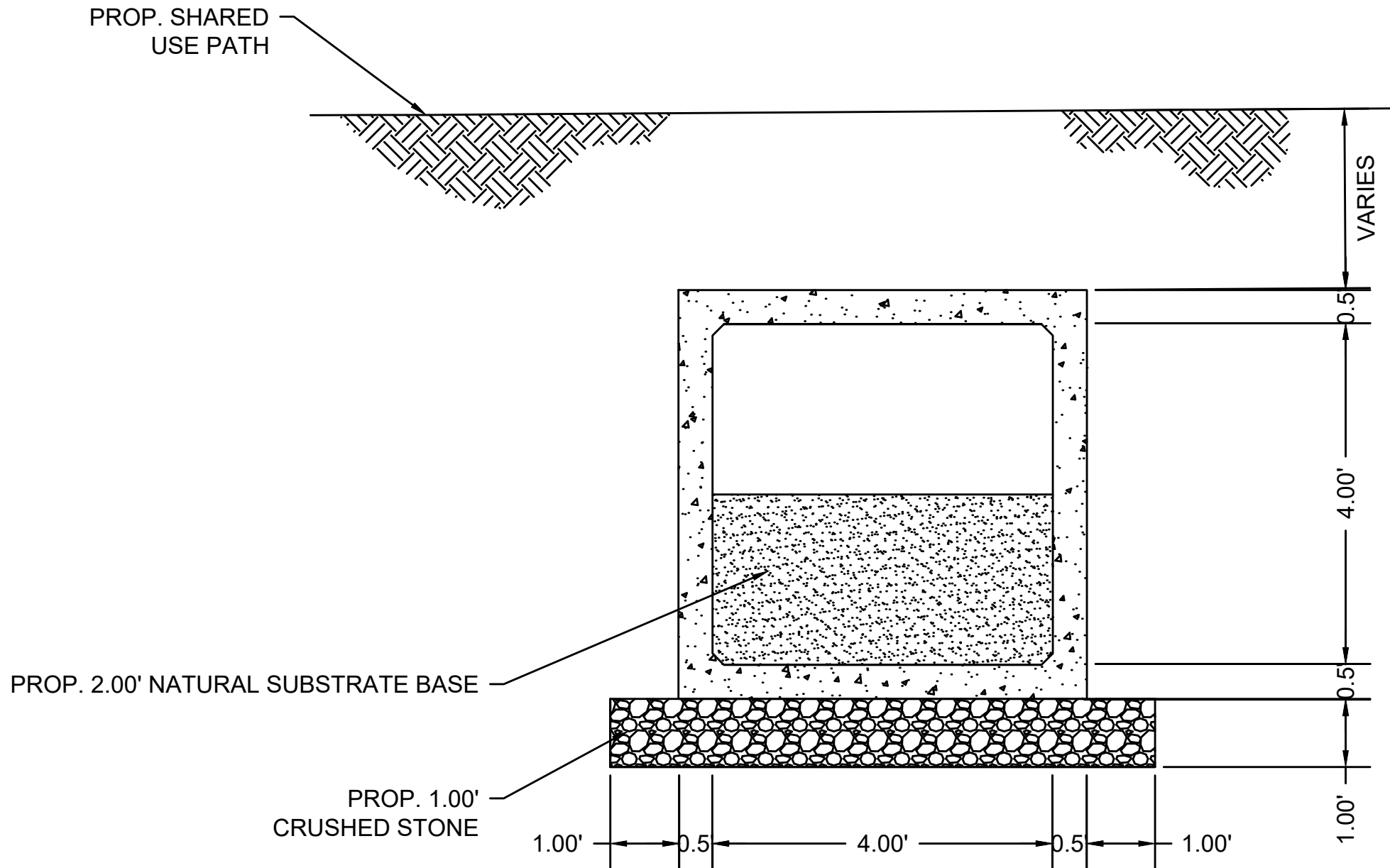
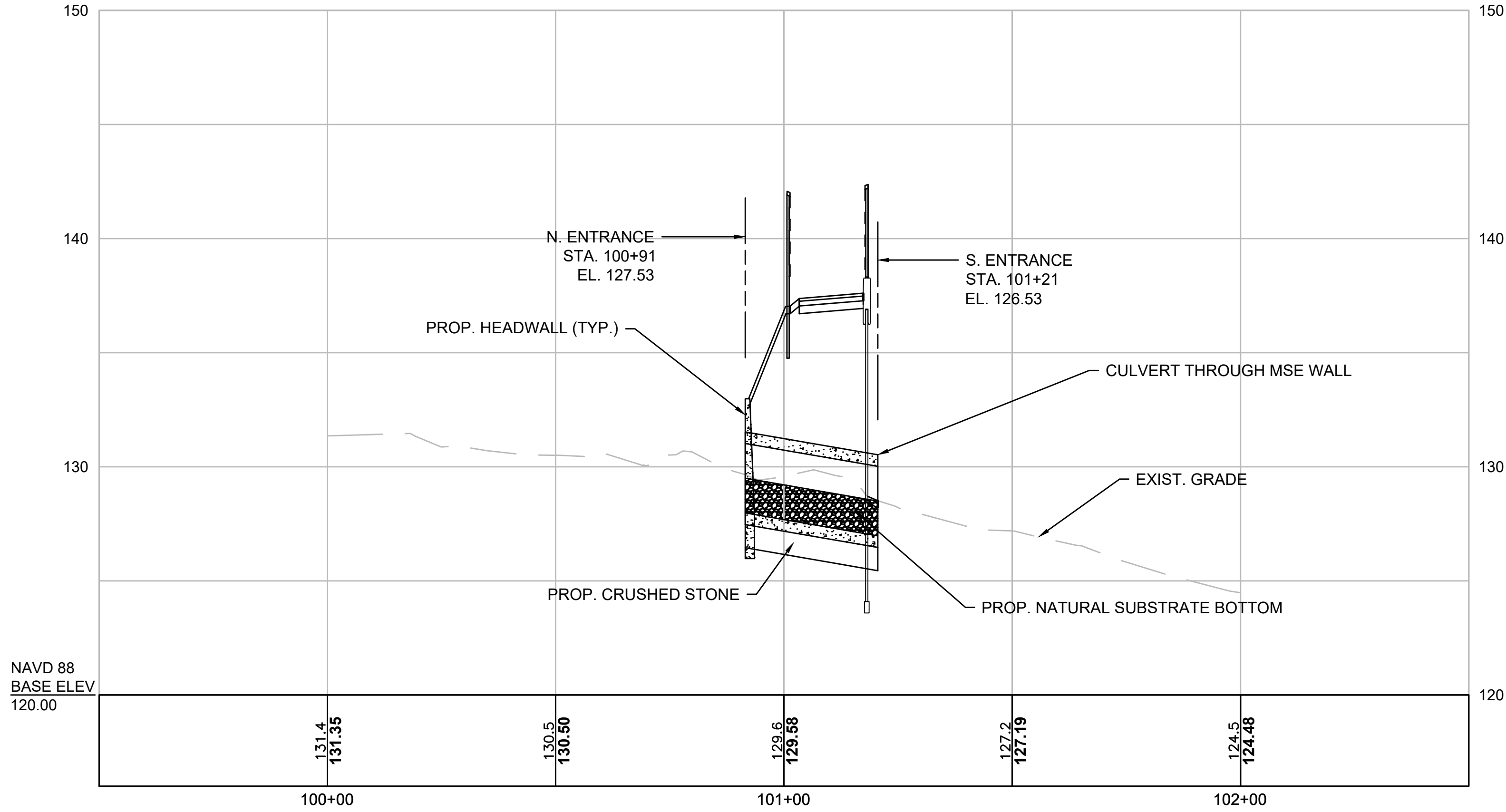
- | HISTORIC MARKER INVENTORY | |
|---------------------------|----------------------------------|
| REFERENCE | DESCRIPTION |
| A1 | SEMAPHORE |
| A2 | BATTERY WELL |
| A3 | TELEPHONE POLE (MISSING) |
| A4 | SIGNAL BOX ON POST (MISSING) |
| 2 | RAILROAD SIGNAL BOX (MISSING) |
| 3 | RAILROAD TELEPHONE BOX (MISSING) |
| 4 | NASHOBA BROOK BRIDGE |
| 5 | FLANGER SIGN (MISSING) |
| 6 | WHISTLE POST |
| A5 | BATTERY WELL |
| 7 | WHISTLE POST |

NOTE: REFERENCE NO.'S WITH AN "A" DESIGNATION ARE HISTORICAL MARKERS ASSOCIATED WITH BRT 2B PROJECT. NUMERICAL DESIGNATIONS REFERENCE THE "PAL" TECHNICAL MEMORANDUM PREVIOUSLY SUBMITTED IN JANUARY, 2008.

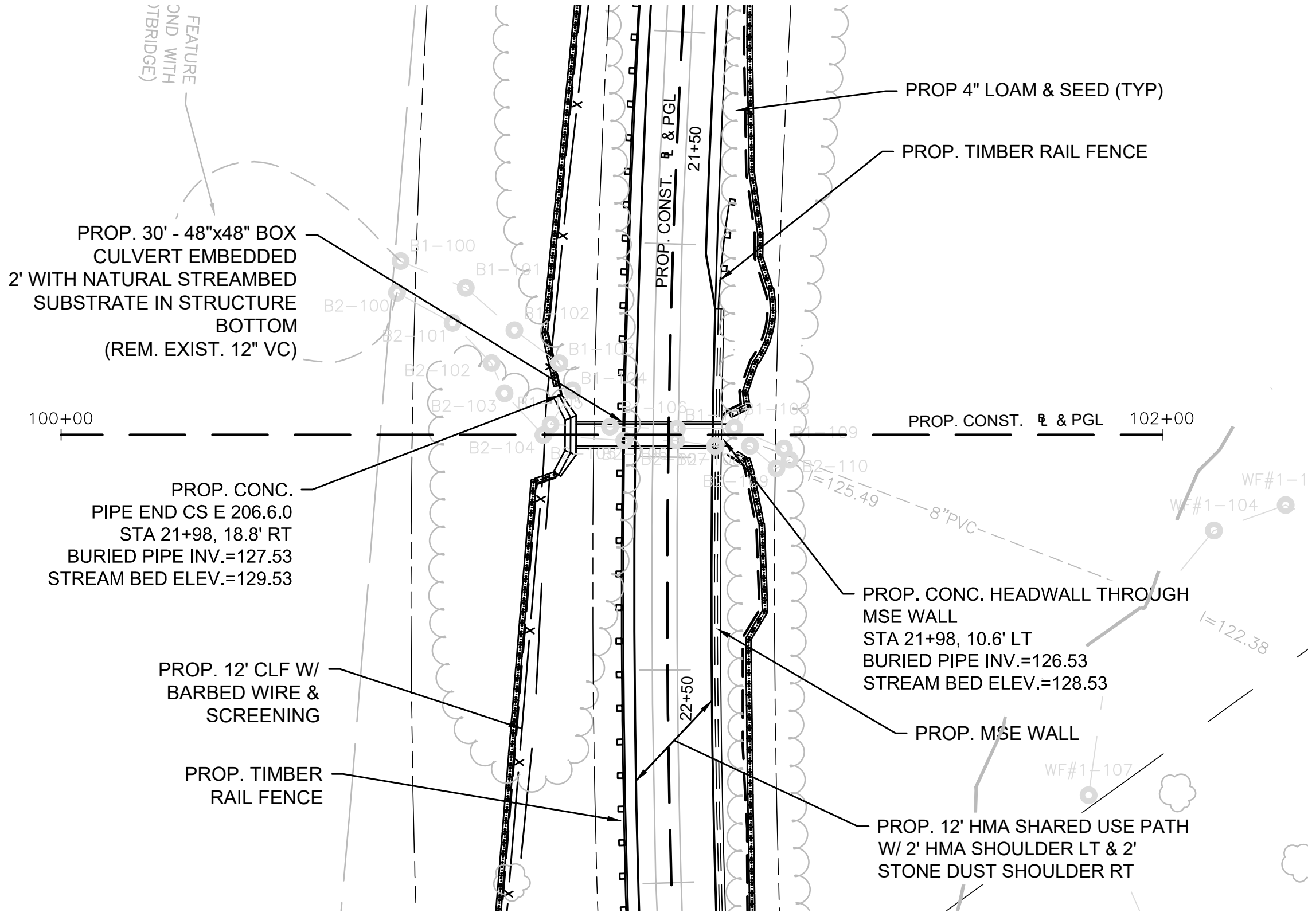
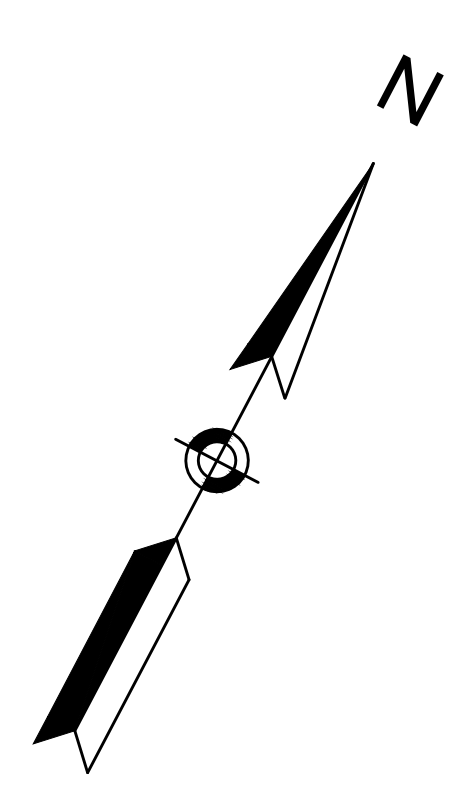
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	82	158
PROJECT FILE NO.		606223	

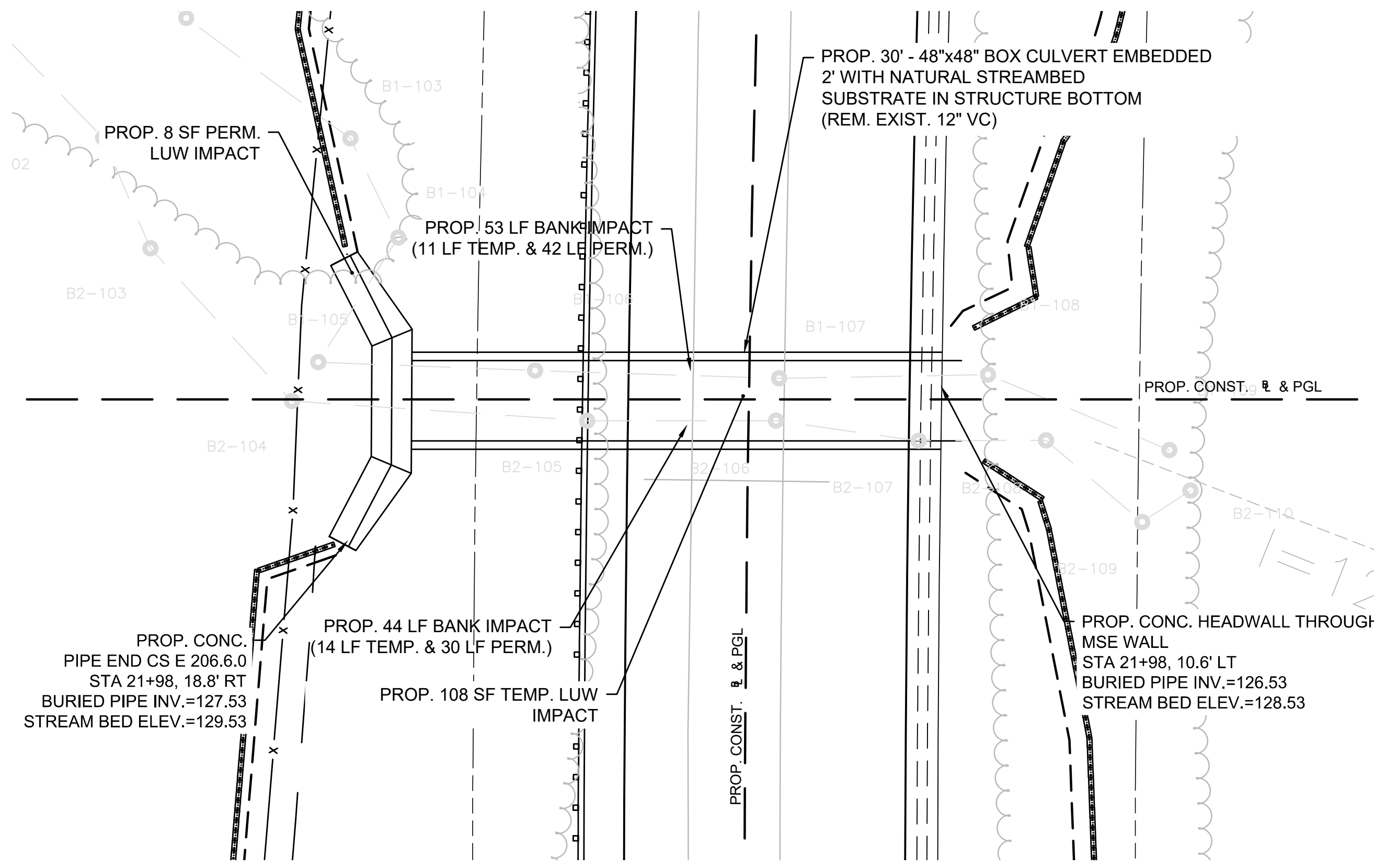
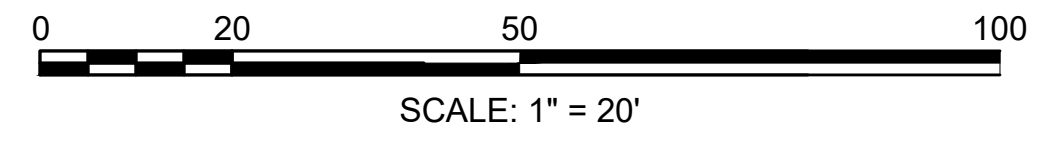
CULVERT DETAILS



SECTION
NTS



PLAN
SCALE: 1" = 20'



RESOURCE AREA LEGEND	
LINE TYPE/HATCH	DESCRIPTION
B#-100 WF#-100	LIMIT OF BANK & BORDERING VEGETATED WETLAND(BVW)
---	LIMIT OF TEMPORARY BANK IMPACT
---	LIMIT OF PERMANENT BANK IMPACT
[Pattern]	TEMPORARY LAND UNDER WATER (LUW) IMPACT
[Pattern]	PERMANENT LAND UNDER WATER (LUW) IMPACT

RESOURCE AREA IMPACTS
SCALE: 1" = 5'

NOTE:
1. SEE BRIDGE PLANS FOR ADDITIONAL DETAIL OF THE CULVERT THROUGH THE MSA WALL.

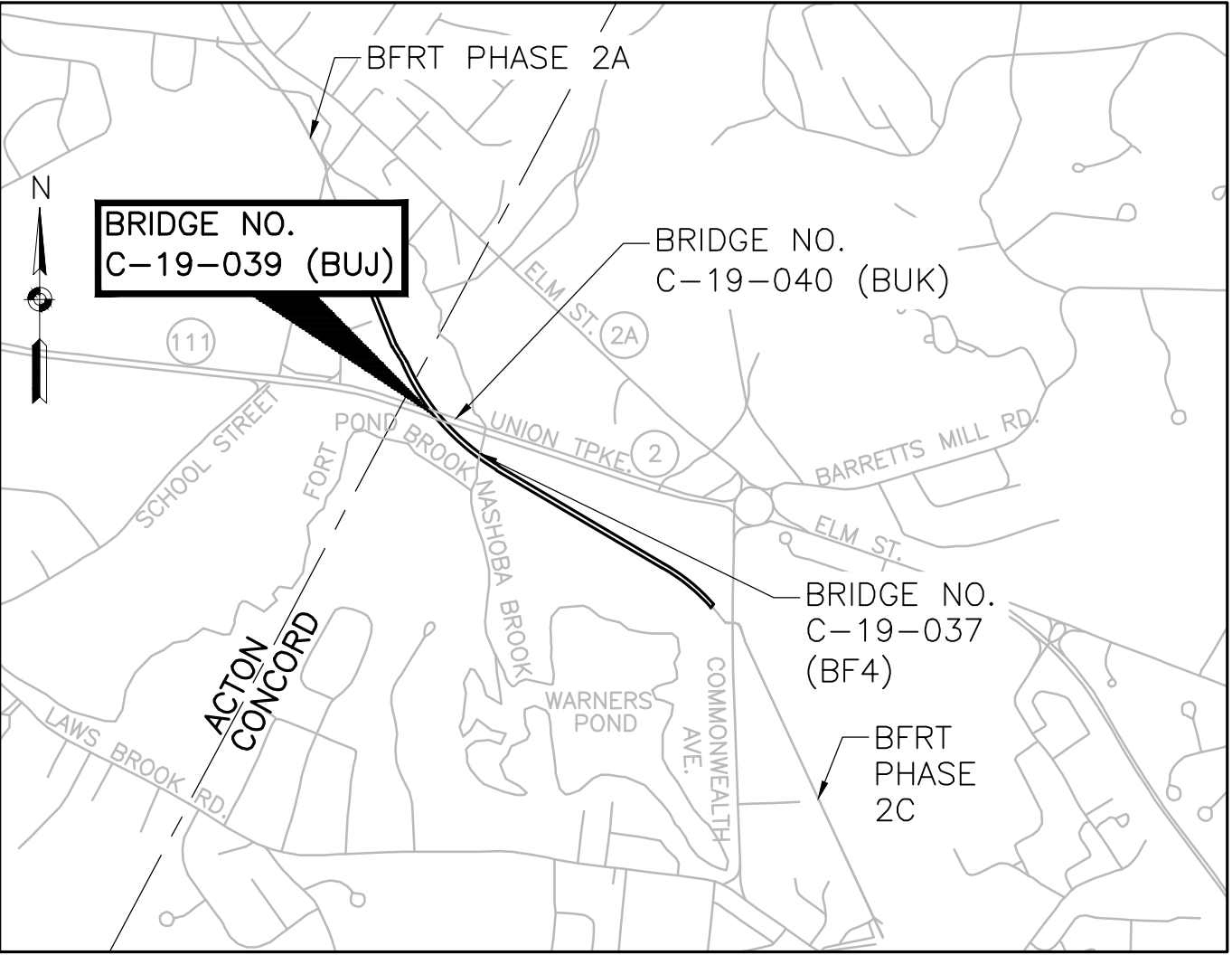
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	83	158
PROJECT FILE NO. 606223			

KEY PLAN, LOCUS MAP,
PROFILES AND QUANTITIES

INDEX OF BRIDGE SHEETS:

1. KEY PLAN, LOCUS MAP, PROFILES AND QUANTITIES
2. GENERAL NOTES AND ESTIMATED QUANTITIES
3. BORING LOGS (1 OF 3)
4. BORING LOGS (2 OF 3)
5. BORING LOGS (3 OF 3)
6. PLAN AND ELEVATION
7. NORTH ABUTMENT PLAN, ELEVATION, AND SECTION
8. SOUTH ABUTMENT PLAN, ELEVATION, AND SECTION
9. END OF DECK, WINGWALLS, AND FOUNDATION DETAILS
10. CURTAIN WALL PLANS AND DETAILS (1 OF 2)
11. CURTAIN WALL PLANS AND DETAILS (2 OF 2)
12. MSE WALL SECTIONS
13. MSE WALL PLAN AND ELEVATION
14. STRIP SEAL JOINT DETAILS
15. ACUTE CORNER & APPROACH SLAB PLANS AND DETAILS
16. END DIAPHRAGM PLAN, ELEVATION, AND SECTION
17. PIER PLAN, ELEVATION, AND DETAILS
18. FRAMING PLAN AND BEAM ELEVATIONS
19. STRUCTURAL STEEL DETAILS
20. TOF ELEVATIONS AND CAMBER TABLE
21. DECK SECTION AND DETAILS
22. BEARING DETAILS
23. RAILING AND PROTECTIVE SCREEN DETAILS
24. TIMBER RAIL TRANSTION



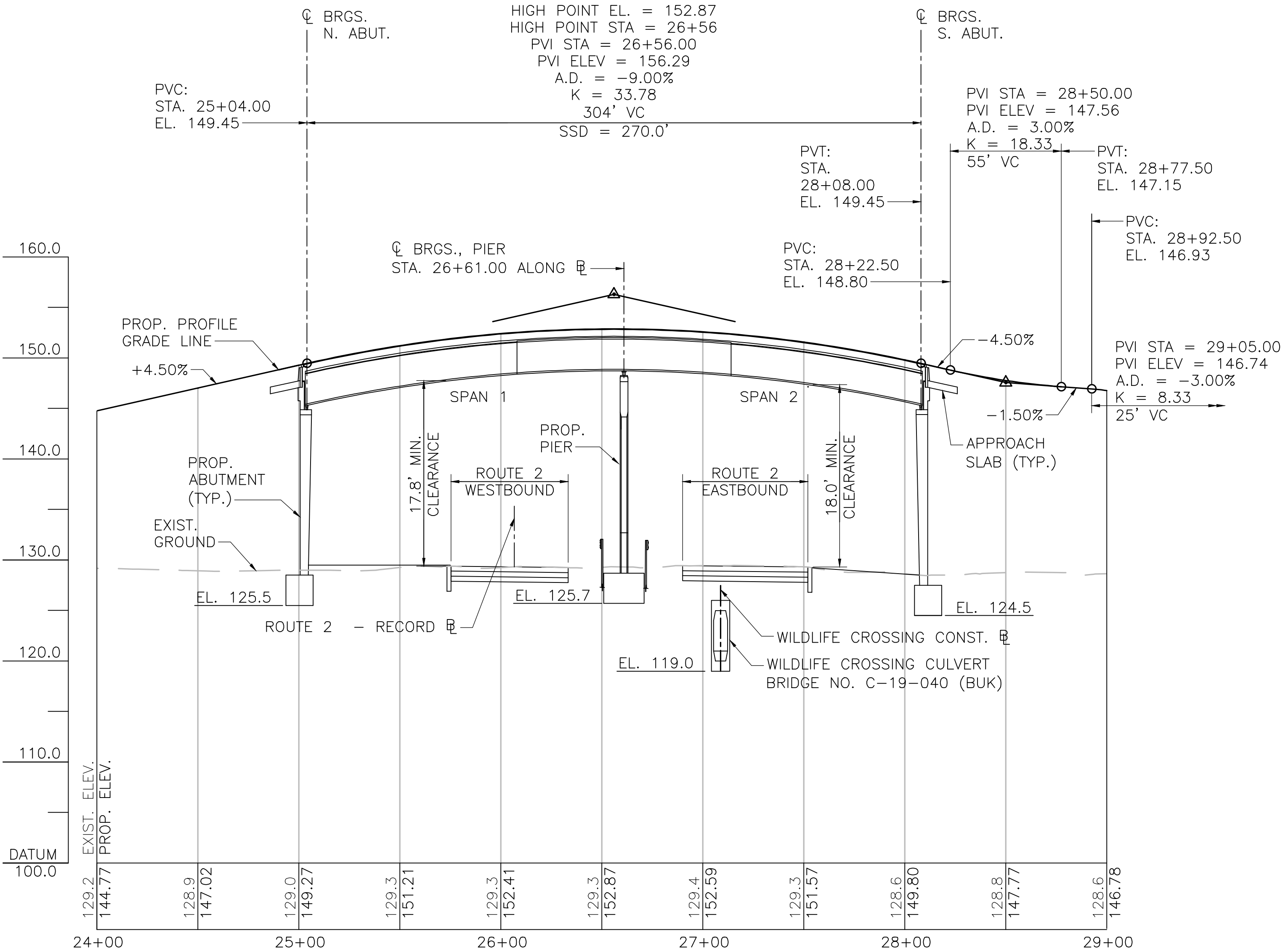
LOCUS

SCALES: 1" = 1500'

KEY PLAN

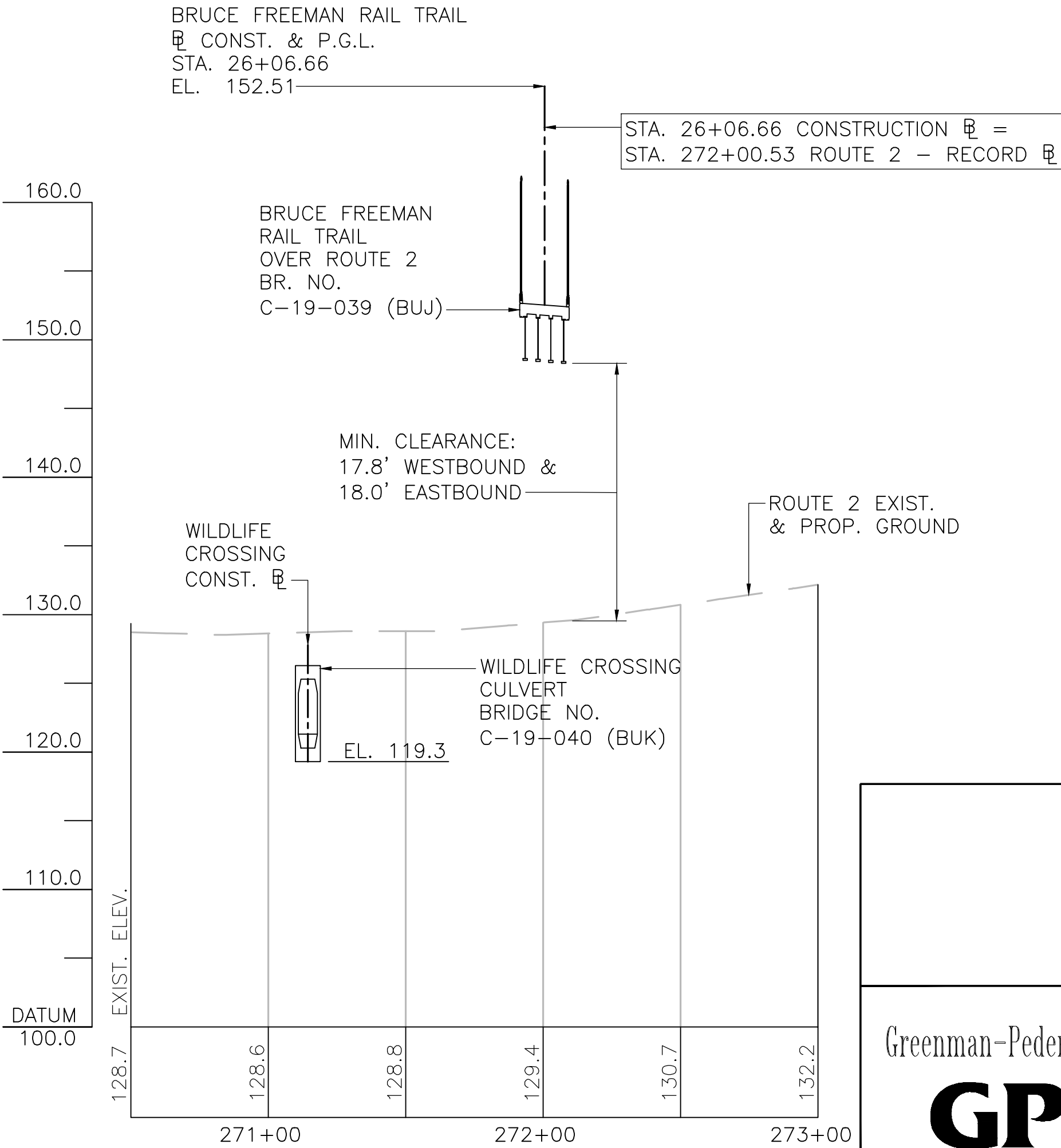
SCALES: 1" = 40'

CURVE DATA - BRUCE FREEMAN RAIL TRAIL (BFRT) CONST. & P.G.L.						
CURVE NO.	BEGIN STATION	END STATION	RADIUS	DELTA	LENGTH	TANGENT
C5	20+75.83	33+33.96	1900.00'	37°56'23"	1258.13'	653.10'



PROFILE - BRUCE FREEMAN RAIL TRAIL CONST. & P.G.L.

SCALES: HORIZ: 1" = 40'
VERT: 1" = 8'



PROFILE - ROUTE 2 RECORD

SCALES: HORIZ: 1" = 40'
VERT: 1" = 8'

Greenman-Pedersen, Inc.
GPI
181 Ballardvale Street, Suite 202
Wilmington, MA 01887

MONTH DD, YYYY ISSUED FOR CONSTRUCTION
massDOT
Massachusetts Department of Transportation
Highway Division
PROPOSED BRIDGE
CONCORD
BRUCE FREEMAN RAIL TRAIL
OVER MA 2 (UNION TURNPIKE)
MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS
TITLE: CHIEF ENGINEER

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	84	158
PROJECT FILE NO. 606223			

GENERAL NOTES AND ESTIMATED QUANTITIES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2014 SPECIFICATIONS OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016, FOR H10 LOADING. DESIGN ALSO IN ACCORDANCE WITH AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR PEDESTRIAN LOADING.

BENCH MARK:

STA. # CON10 (SMC #40)
PUNCHMARK IN RAIL
N 2996046.040 E 681142.400
BFRT 2B @ STA. 26+51.99
2.086' LT ELEV. 128.80

STA. #14 SSM SET
N 2995978.480 E 681184.150
BFRT 2B @ STA. 27+30.02
11.647' RT ELEV. 129.13

ELEVATIONS:

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

MASSDOT SURVEY NOTEBOOKS:

COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM MASSACHUSETTS
DEPARTMENT OF TRANSPORTATION – HIGHWAY DESIGN

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS.
DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:

DESIGN RETURN PERIOD: 1000 YEARS

DESIGN SPECTRA:

$$\begin{aligned}As &= 0.128 \\ Sds &= 0.256 \\ Sd1 &= 0.096\end{aligned}$$

SITE CLASS = D

SEISMIC DESIGN CATEGORY (SDC) = A

ANCHOR BOLTS:

ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60 (EPOXY COATED). UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

<u>MODIFICATION CONDITION</u>	<u>#4 BARS</u>	<u>#5 BARS</u>	<u>#6 BARS</u>
1. NONE	21"	26"	31"
2. 12" OF CONCRETE BELOW BAR	29"	36"	43"
3. COATED BARS, COVER < 3DB, OR CLEAR SPACING < 6DB	31"	39"	46"
4. COATED BARS, ALL OTHER CASES	25"	31"	37"
5. CONDITION 2. AND 3.	35"	44"	53"
6. CONDITION 2. AND 4.	34"	43"	51"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES

(1)	(2)	(3)	TO BE USED IN CONSTRUCTION OF:
4000	1½	565	ABUTMENTS, FOOTINGS, APPROACH SLABS, WINGWALLS, CURTAIN WALLS
4000	¾	610	ABUTMENT BACKWALLS, KEEPER BLOCKS
4000	¾	585 HP	DECK, END DIAPHRAGMS, PIER CAP, PIER COLUMN, SAFETY CURBS, WINGWALL CAPS

- (1) 28 DAY COMPRESSIVE STRENGTH (PSI)
- (2) MAXIMUM AGGREGATE SIZE (IN.)
- (3) CEMENTITIOUS CONTENT (POUND/C.Y.)

UTILITIES:

THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
BRIDGE EXCAVATION	1445	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	1000	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES & PIPES	520	CY
CRUSHED STONE FOR BRIDGE FOUNDATIONS	30	TON
BRIDGE STRUCTURE, BRIDGE NO. C-19-039 (BUJ)	1	LS
MECHANICALLY STABILIZED EARTH WALL	750	SY
MSE WALL MANUFACTURER'S REPRESENTATIVE	9	DAY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	85	158
PROJECT FILE NO. 606223			

BORING LOGS (1 OF 3)

massDOT New Hampshire Department of Transportation		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. TB-2 Scale 1" = 5'	
City/Town: Concord		Trail Borings				Project File No: 602091		Contract No: 58183	
Project: Route 2 Construction at the Concord Rotary						Date & Time Started: 10-01-09 1:00PM		Total Hours: 4.75	
Groundwater Depth: 4'		Date & Time: 10-02-09 9:45AM				Date & Time Completed: 10-02-09 9:45AM			
Coordinates: N 2996126.0		E 681093.2		Driller's Name: Peter Labossiere Helper's Name: Shawn Burto					
Ground Elevation: 128.0'		Inspector's Name: Derek Lee				Inspector's Company: Lamson Engineering, Inc. for AECOM			
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot				Recovery (Inches)	Field Description		Strata Changes
S-1	0' - 2'	3	3	5	14	12"	Dry, loose, brown, COARSE SAND, some fine sand, trace organic silt.		
S-2	4' - 6'	9	10	13	11	12"	Wet, medium dense, brown, COARSE SAND, trace fine sand.		
S-3	9' - 11'	5	6	7	10	10"	Wet, medium dense, brown, COARSE SAND, trace fine sand.		
S-4	14' - 16'	32	21	17	16	6"	Wet, dense, brown, COARSE SAND, some fine sand, trace inorganic silt.		
S-5	19' - 21'	9	6	12	17	12"	Wet, medium dense, brown, COARSE SAND, some fine sand and gravel, trace inorganic silt.		23'
S-6	24' - 26'	8	5	6	5	12"	Wet, medium dense, gray, FINE SAND, trace inorganic silt.		
S-7	29' - 31'	25	8	8	13	6"	Wet, medium dense, gray, FINE SAND, some fine gravel, weathered bedrock in wash. Top of Possible BEDROCK at 32' Rollerbit to 34'. Retrieved 1'6" boulder, advanced to 36' to sample.		32'
S-8	34' - 35'	13	4						
	36' - 36'8"	41	8/2"			8"	Wet, very dense, gray, FINE SAND, some coarse sand and fine gravel, (fill) Bottom of Exploration = 36'8"		36'8"
Notes: Sample by cathead							Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:		
Penetration Resistance (N) Guide:							Type of Drill Rig: Mobile B-47		
Cohesionless Soils (Sands, Gravels)			Cohesive Soils (Silt, Clays)				Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Signs: Cones: Depth: 33" Arrow-Board: Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30" Core Barrel Type: Size:		
Relative Density	Penetration Resistance		Consistency	Penetration Resistance					
Very Loose	0 - 4		Very Soft	0 - 2					
Loose	4 - 10		Soft	2 - 4					
Medium Dense	10 - 30		Medium Stiff	4 - 8					
Dense	30 - 50		Stiff	8 - 15					
Very Dense	Over 50		Very Stiff	15 - 30					
N=Sum of Second and Third 6" Blow Counts			Hard	Over 30					
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less									

BORING TB-2

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com				Boring No. BB-2B-1 Scale 1" = 5'	
City/Town: Acton Concord			Bridge: Bruce Freeman Rail Trail (Phase II-B)				Project File No: 606223			Contract No: 76859	
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B)			Date & Time: 11-13-14 7:25 am				Date & Time Started: 11-12-14 2:00 pm			Total Hours: 12.5	
Groundwater Depth: 9'			Coordinates: N 2996155		E 681053		Driller's Name: Manlea Thompson		Helper's Name: Donald Palmer		
Ground Elevation: 129.5			Inspector's Name: Weijie Dong				Inspector's Company: Lamson Engineering, Corp., for *				
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description				Strata Changes
S-1	0' - 2'	2	3	5	3	14"	Dry, loose, brown, FINE TO COARSE SAND, some inorganic silt.				
S-2	5' - 7'	7	9	14	16	13"	Dry, medium dense, brown, FINE SAND, some coarse sand, trace inorganic silt.				
S-3	10' - 12'	8	13	15	16	10"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.				13'6"
S-4	15' - 16'	7	9	11	11	5"	Wet, medium dense, brown-red, FINE SAND and inorganic silt.				16'
S-4A	16' - 17'					4"	Wet, medium dense, gray, FINE SAND, trace inorganic silt.				
S-5	20' - 22'	3	3	5	5	17"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.				25'
S-6	25' - 26'	2	4	4	4	8"	Wet, loose, brown, FINE SAND, some inorganic silt.				26'
S-6A	26' - 27'					8"	Wet, loose, gray, FINE SAND, some inorganic silt, trace clay.				28'6"
S-7	30' - 32'	21	22	24	15	12"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.				33'
C-1	34' - 39'	4	2	2	3	2	Top of possible BEDROCK at 33' Advanced rollerbit to 34' and began coring. Hard very weathered, moderately fractured GRANITE. Percent Recovery = 80%				
C-2	39' - 44'	2	1	1	1	1	No recovery, very weathered GRANITE. Rollerbit to 45', telescoped 3" casing to sample.				
S-8	45' - 45'11"	34	86/5"			9"	Moist, very dense, gray, possible weathered BEDROCK.				
S-9	50' - 50'2"	120/2"				2"	Moist, very dense, brown, FINE TO MEDIUM GRAVEL, trace inorganic silt (weathered possible bedrock) Advanced rollerbit to 55'				55'
Remarks: * AECOM (Consultants) Boring terminated due to not being able to advanced corebarrell down the hole. Boring terminated without coring another 5 foot run to compensate for the no recovery obtained from C-2; enough information was obtained for the design engineer. Installed monitoring well at 20'							Protective Device - Stand: Box: Well Depth: 20' Solid Pipe: 13' Stick Up Pipe: 3' Screen Pipe: 10'				
Penetration Resistance (N) Guide:							Type of Drill Rig: CME 550X				
Cohesionless Soils (Sands, Gravels)				Cohesive Soils (Silt, Clays)			Arrow-Board: Signs: Cones:				
Relative Density		Penetration Resistance		Consistency		Penetration Resistance		Casing: HW Size: 4" Amt: 39'			
Very Loose		0 - 4		Very Soft		0 - 2		Casing: NW Size: 3" Amt: 45'			
Loose		4 - 10		Soft		2 - 4		Hammer Weight: 300 lbs. Fall: 30"			
Medium Dense		10 - 30		Medium Stiff		4 - 8		Sampler Type: S/S Size: 1 3/8"			
Dense		30 - 50		Stiff		8 - 15		Automatic Hammer Weight:			
Very Dense		Over 50		Very Stiff		15 - 30		Safety Hammer Weight: 140 lbs.			
N=Sum of Second and Third 6" Blow Counts				Hard		Over 30		Donut Hammer Weight: Fall: 30"			
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"				

BORING BB-2B-1

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS: TB-2
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2014.
7. BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	86	158
PROJECT FILE NO. 606223			

BORING LOGS (2 OF 3)

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038		Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. TB-3 Scale 1" = 5'	
City/Town: Concord		Trail Borings		Project File No: 602091	
Project: Route 2 Construction at the Concord Rotary		Date & Time Started: 10-09-09 7:00AM		Contract No: 58183	
Groundwater Depth: 9'		Date & Time: 10-09-09 2:00PM		Total Hours: 7	
Coordinates: N 2996037.7 E 681166.5		Driller's Name: Peter Labossiere		Helper's Name: Jack Lefebvre	
Ground Elevation: 129.0'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM	
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	3 4 3 5	16"	Dry, loose, brown, COARSE SAND AND FINE SAND, trace organic silt.	
S-2	4' - 6'	14 9 7 7	12"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-3	9' - 11'	7 5 6 6	8"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-4	14' - 16'	7 7 12 13	12"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	13'
S-5	19' - 21'	13 19 8 11	6"	Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.	
S-6	24' - 26'	16 13 12 6	7"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	
S-7	29' - 31'	4 3 3 5	12"	Wet, loose, gray, FINE SAND, some inorganic silt.	
S-8	34' - 36'	14 13 15 15	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	33'
S-9	39' - 40'	70 67	10"	Wet, very dense, gray, FINE SAND AND COARSE SAND, some inorganic silt, (till).	37'
S-10	44' - 44'6"	120/6"	6"	Wet, very dense, gray, FINE SAND, some inorganic silt, trace coarse sand, (till).	49'
S-11	49' - 49'8"	51 70/2"	8"	Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt, trace bedrock pieces in tip of spoon. Top of BEDROCK at 50'. Began coring at 50'.	50'
C-1	50' - 55'	3 4 4 3 4	39"	Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 78%	
C-2	55' - 60'	3 3 2 3 3	29"	Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 48% Bottom of Exploration = 60'	60'
Notes: Sample by cathod				Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe: Type of Drill Rig: Mobile B-47	
Penetration Resistance (N) Guide:				Casing Type: HW Size: 4" Signs: Hammer Weight: 300Lbs. Cones: 6 Fall: 30" Depth: 45" Arrow-Board:	
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silt, Clays)		Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30"	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance		
Very Loose	0 - 4	Very Soft	0 - 2		
Loose	4 - 10	Soft	2 - 4		
Medium Dense	10 - 30	Medium Stiff	4 - 8		
Dense	30 - 50	Stiff	8 - 15		
Very Dense	Over 50	Very Stiff	15 - 30		
N=Sum of Second and Third 6" Blow Counts		Hard Over 30			
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less				Core Barrel Type: NX Size: 2.15"	

BORING TB-3

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038		Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. BB-2B-2 Scale 1" = 5'	
City/Town: Acton Concord		Bridge: Bruce Freeman Rail Trail (Phase II-B)		Project File No: 606223	
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B)		Date & Time Started: 11-25-14 7:30 am		Contract No: 76859	
Groundwater Depth: 8'		Date & Time: 11-25-14 2:15 am		Total Hours: 7	
Coordinates: N 2996044 E 681118		Driller's Name: Manlea Thompson		Helper's Name: Donald Palmer	
Ground Elevation: 129.7		Inspector's Name: Weijie Dong		Inspector's Company: Lamson Engineering, Corp. for *	
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery (Inches)	Field Description	Strata Changes
S-1	0' - 2'	2 5 6 6	10"	TOPSOIL Dry, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	3"
S-2	5' - 7'	3 3 5 7	8"	Moist, loose, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-3	10' - 12'	5 7 6 7	14"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.	
S-4	15' - 17'	7 10 9 10	11"	Wet, medium dense, gray, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	
S-5	20' - 22'	9 11 13 16	15"	Wet, medium dense, brown, FINE TO COARSE SAND and fine to medium gravel, some inorganic silt.	19'
S-6	25' - 26'	5 6 5 5	7"	Wet, medium dense, brown, FINE SAND and inorganic silt.	23'
S-6A	26' - 27'		7"	Wet, loose, gray, FINE SAND and inorganic silt.	26'
S-7	30' - 32'	10 10 16 19	6"	Wet, medium dense, gray, COARSE TO FINE SAND and fine to medium gravel, trace inorganic silt.	30'
S-8	35' - 36'4"	42 55 65/4"	16"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	32'6"
S-9	40' - 41'3"	37 67 53/3"	12"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	
S-10	45' - 46'4"	28 40 80/4"	15"	Wet, very dense, gray, FINE TO COARSE SAND, some fine to medium gravel, some inorganic silt (Till.)	46'4"
S-11	50' - 50'2"	120/2"	0"	No Recovery	
S-12	55' - 55'8"	86 34/2"	4"	Wet, very dense, brown-white INORGANIC SILT and fine sand, some fine gravel, trace weathered bedrock.	
S-13	60' - 60'3"	120/3"	2"	Wet, very dense, brown-gray, weathered BEDROCK.	
S-14	65' - 65'4"	120/4"	3"	Wet, very dense, brown-gray weathered BEDROCK. Bottom of Exploration = 65'4"	65'4"
Remarks: * AECOM (Consultants)				Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe: Type of Drill Rig: CME 550X Arrow-Board: Signs: 2 Cones: 20	
Penetration Resistance (N) Guide:				Casing: HW Size: 4" Amt: 65'	
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silt, Clays)		Hammer Weight: 300 lbs. Fall: 30"	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance	Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140 lbs. Donut Hammer Weight: Fall: 30"	
Very Loose	0 - 4	Very Soft	0 - 2		
Loose	4 - 10	Soft	2 - 4		
Medium Dense	10 - 30	Medium Stiff	4 - 8		
Dense	30 - 50	Stiff	8 - 15		
Very Dense	Over 50	Very Stiff	15 - 30		
N=Sum of Second and Third 6" Blow Counts		Hard Over 30			
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less				Core Barrel Type: Size:	

BORING BB-2B-2

NOTES:

- FOR LOCATION OF BORINGS, SEE SHEET 1.
- FOR BORING NOTES, SEE SHEET 3.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	87	158
PROJECT FILE NO. 606223			

BORING LOGS (3 OF 3)

massDOT New Hampshire Department of Transportation		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring # HB-4 Scale 1" = 5'		
City/Town: Concord		Highway Borings				Project File No: 602091		Contract No: 58183		
Project: Route 2 Construction at the Concord Rotary		Date & Time Started: 10-02-09 1:15PM				Total Hours: 5.25				
Groundwater Depth: 11'		Date & Time: 10-05-09 10:30AM				Date & Time Completed: 10-05-09 10:30AM				
Coordinates: N 2995951.8 E 681198.7		Driller's Name: Roger Burne				Helper's Name: Patrick Schofield				
Ground Elevation: 128.2'		Inspector's Name: Christopher Cheu				Inspector's Company: Lamson Engineering, Inc. for AECOM				
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description		Strata Changes	
S-1	0' - 2'	4	3	4	5	5"	TOPSOIL * 2"			
							Dry, loose, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.			
S-2	4' - 6'	5	5	9	9	12"	Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt.			
S-3	9' - 11'	5	5	5	5	18"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.			
S-4	14' - 16'	7	9	10	11	15"	Wet, medium dense, grey, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.		14'	
S-5	19' - 21'	9	11	13	12	18"	Wet, medium dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.			
S-6	24' - 26'	19	15	9	10	15"	Wet, medium dense, grey, FINE SAND, some inorganic silt, trace clay lenses.		24'	
S-7	29' - 31'	29	22	23	27	12"	Wet, dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.		28'6"	
S-8	34' - 34'9"	44	120/3"			9"	Wet, very dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.		34'9"	
							Encountered BOULDER 34'9" to 35'. Advanced Rollerbit to 38'. Top of BEDROCK at 38'. Began coring.		38'	
C-1	38' - 43'	4	5	3	4	5	27"	Severely fractured, white/ black, GRANITE, trace quartz lenses. Percent Recovery= 45% Bottom of Exploration= 43'		43'
Notes: Stopped coring at 5' per order of on-site engineer due to having obtained sufficient information. Well installed at 15'. 4 bags sand/ 1 cement. Sample by cathead.							Protective Device - Stand: Box: Stick Depth: 15' Solid Pipe: 8' Well Up Pipe: 3' Screen Pipe: 10'			
Penetration Resistance (N) Guide:							Type of Drill Rig: Diedrich-50			
Cohesionless Soils (Sands, Gravels)				Cohesive Soils (Silt, Clays)			Casing Type: HW Size: 4" Solid Pipe: 8" Hammer Weight: 300Lbs. Signs:			
Relative Density	Penetration Resistance		Consistency	Penetration Resistance		Fall: 30" Cones: 7				
Very Loose	0 - 4		Very Soft	0 - 2		Depth: 34" Arrow-Board:				
Loose	4 - 10		Soft	2 - 4		Sampler Type: S/S Size: 1 3/8"				
Medium Dense	10 - 30		Medium Stiff	4 - 8		Automatic Hammer Weight:				
Dense	30 - 50		Stiff	8 - 15		Safety Hammer Weight: 140Lbs.				
Very Dense	Over 50		Very Stiff	15 - 30		Donut Hammer Weight:				
N=Sum of Second and Third 6" Blow Counts				Hard		Over 30		Fall: 30"		
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"			

BORING HB-4

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com				Boring No. BB-2B-3 Scale 1" = 5'		
City/Town: Acton Concord			Bridge: Bruce Freeman Rail Trail (Phase II-B)			Project File No: 606223			Contract No: 76859			
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B)			Date & Time: 11-18-14 11:00 am			Date & Time Started: 11-17-14 8:00 am			Total Hours: 10.5			
Groundwater Depth: 7'			Coordinates: N 2995941 E 681254			Driller's Name: Manlea Thompson			Helper's Name: Donald Palmer			
Ground Elevation: 128.5			Inspector's Name: Weijie Dong			Inspector's Company: Lamson Engineering, Corp., for *						
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description				Strata Changes	
S-1	0' - 2'	3	3	3	2	12"	Moist, loose, black, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.				36"	
S-2	5' - 7'	4	6	6	8	17"	Moist, medium dense, brown COARSE TO FINE SAND, trace inorganic silt.					
S-3	10' - 12'	5	6	8	8	19"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel, trace inorganic silt.				33'	
S-4	15' - 17'	8	9	12	13	17"	Wet, medium dense, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.					
S-5	20' - 22'	12	10	9	10	10"	Wet, medium dense, gray FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.				48'	
S-6	25' - 27'	6	8	10	12	4"	Wet, medium dense, gray-brown, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.					
S-7	30' - 32'	10	9	10	10	13"	Wet, medium dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine gravel.				48'	
S-8	35' - 35'3"	120/3"				2"	Top of weathered BEDROCK at 33'. Advanced casing and roller bit through weathered bedrock to 35'. Moist, very dense, gray FINE TO COARSE SAND and fine to coarse gravel, trace inorganic silt (weathered bedrock). Roller bit through weathered bedrock and began coring.					
C-1	38' - 43'	5	5	4	4	5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%				48'
C-2	43' - 48'	4	5	5	4	5	60"	Hard, fresh, sound, gray GRANITE. Percent Recovery = 100%				
Remarks: * AECOM (Consultants) Set monitoring well at 17'							Protective Device - Stand: Box: Well Depth: 17' Solid Pipe: 10' Stick Up Pipe: 3' Screen Pipe: 10'					
Penetration Resistance (N) Guide:							Type of Drill Rig: CME 550X					
Cohesionless Soils (Sands, Gravels)				Cohesive Soils (Silt, Clays)			Arrow-Board: Signs: Cones:					
Relative Density		Penetration Resistance		Consistency		Penetration Resistance		Casing: PW Size: 5" Amt: 34'				
Very Loose		0 - 4		Very Soft		0 - 2		Hammer Weight: 300 lbs. Fall: 30"				
Loose		4 - 10		Soft		2 - 4		Sampler Type: S/S Size: 1 3/8"				
Medium Dense		10 - 30		Medium Stiff		4 - 8		Automatic Hammer Weight:				
Dense		30 - 50		Stiff		8 - 15		Safety Hammer Weight: 140 lbs.				
Very Dense		Over 50		Very Stiff		15 - 30		Donut Hammer Weight: Fall: 30"				
N=Sum of Second and Third 6" Blow Counts				Hard		Over 30		Core Barrel Type: NX Size: 2.15"				
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less												

BORING BB-2B-3

massDOT Highway		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. TB-6 Scale 1" = 5'	
City/Town: Concord		Trail Borings				Project File No: 602091		Contract No: 58183	
Project: Route 2 Construction at the Concord Rotary				Date & Time Started: 10-05-09 11:25AM		Total Hours: 4			
Groundwater Depth: 10'		Date & Time: 10-06-09 7:00AM		Date & Time Completed: 10-06-09 7:30AM					
Coordinates: N 2995897.9		E 681269.9		Driller's Name: Peter Labossiere Helper's Name: Jack Lefebvre					
Ground Elevation: 128.2'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM					
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot				Recovery (Inches)	Field Description		Strata Changes
S-1	0' - 2'	4	6	7	7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.		
S-2	4' - 6'	4	2	2	4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.		4'
S-3	9' - 11'	12	12	11	9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.		9'
S-4	14' - 16'	13	9	9	11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.		
S-5	19' - 21'	7	13	8	13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.		
S-6	24' - 26'	17	11	7	5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.		24'
S-7	29' - 31'	18	8	21	100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.		
C-1	32' - 37'	4	5	14	5	6	54"	Top of BEDROCK at 32'. Began coring. Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%	32'
							Bottom of Exploration = 37'		37'
Notes: Sample by cathead							Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:		
Penetration Resistance (N) Guide:							Type of Drill Rig: Mobile B-47		
Cohesionless Soils (Sands, Gravels)				Cohesive Soils (Silt, Clays)			Signs:		
Relative Density		Penetration Resistance		Consistency		Penetration Resistance		Cones:	
Very Loose		0 - 4		Very Soft		0 - 2			
Loose		4 - 10		Soft		2 - 4			
Medium Dense		10 - 30		Medium Stiff		4 - 8			
Dense		30 - 50		Stiff		8 - 15			
Very Dense		Over 50		Very Stiff		15 - 30			
N=Sum of Second and Third 6" Blow Counts				Hard		Over 30			
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"		

BORING TB-6

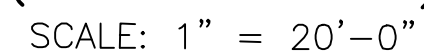
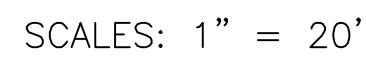
NOTES:

- FOR LOCATION OF BORINGS, SEE SHEET 1.
- FOR BORING NOTES, SEE SHEET 3.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

LOCATION:	SKEW ANGLE:
NORTH ABUTMENT	52°22'26"
PIER	57°6'30"
SOUTH ABUTMENT	61°32'28"

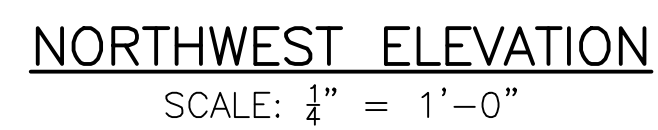
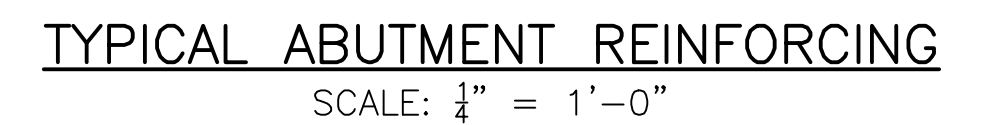
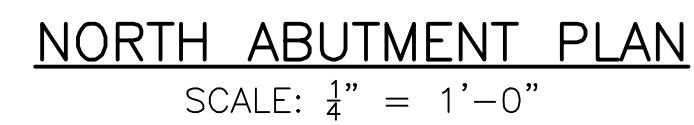
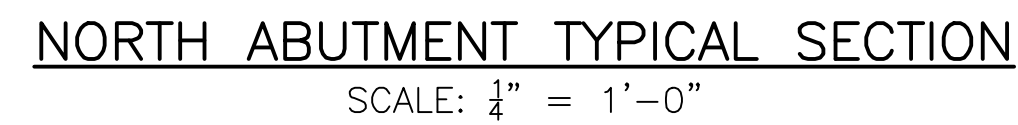
FOR BRIDGE RAIL END POST SPACING, SEE
BRIDGE SHEET 24 OF 24.



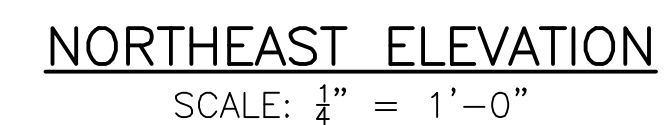
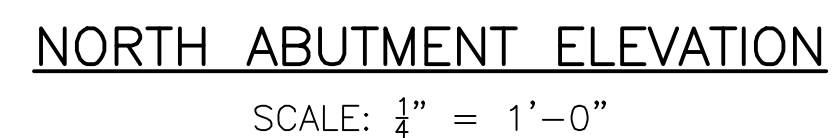
ALL ROADWAY DIMENSIONAL INFORMATION IS BASED
ON SURVEY FOR ROUTE 2, ALL DIMENSIONS SHALL
BE CONFIRMED BY CONTRACTOR IN THE FIELD.

SHEET 6 OF 24 SHEETS BRIDGE NO. C-19-039 (BUJ)

606223_BR(C19039)_07-11_14-16.DWG Plotted on 1-Feb-2019 9:37 AM

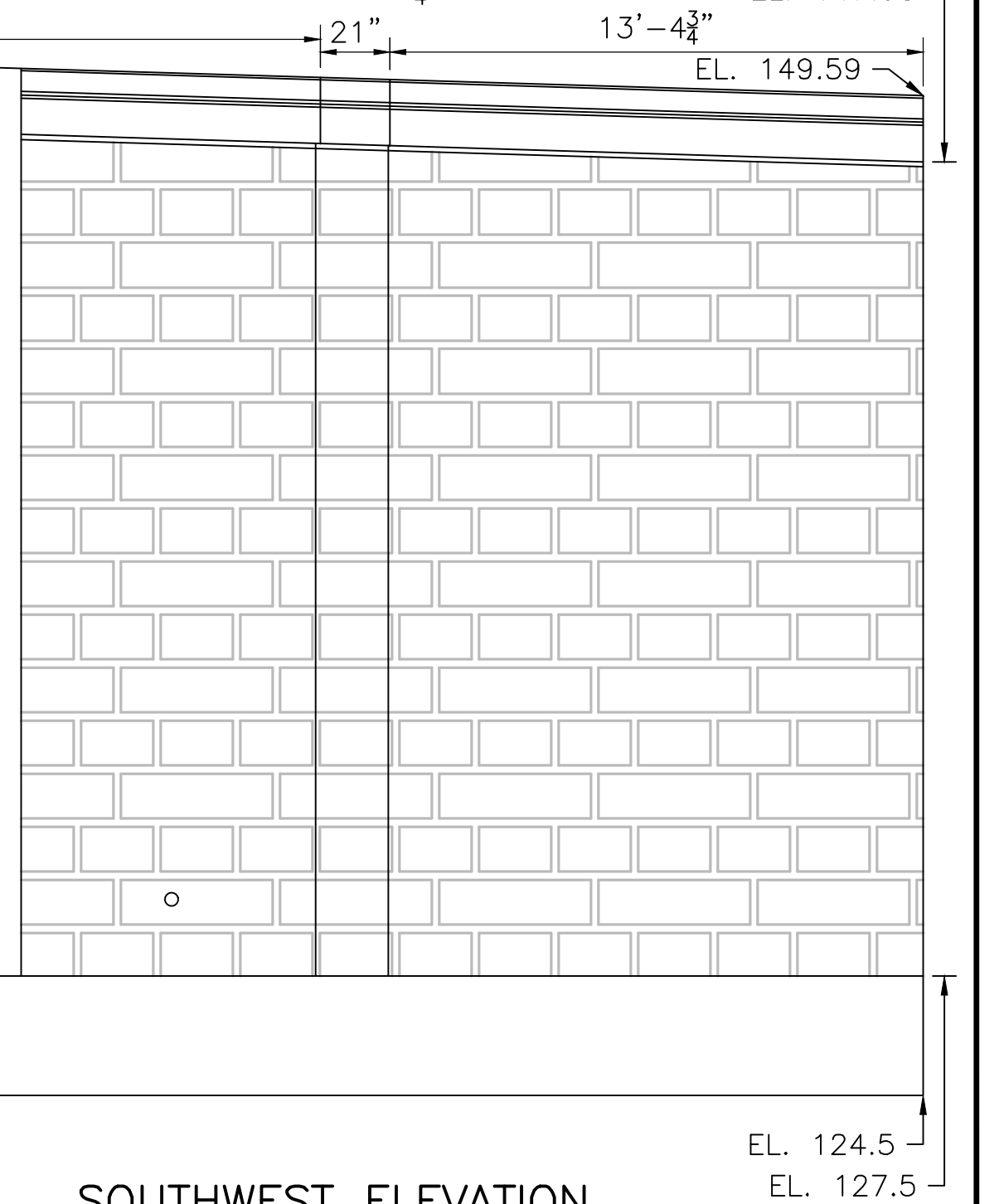


1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ϕ WEEP HOLES 10'-0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 4000 PSI, $1\frac{1}{2}$ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE.



SHEET 7 OF 24 SHEETS BRIDGE NO. C-19-039 (BUJ)

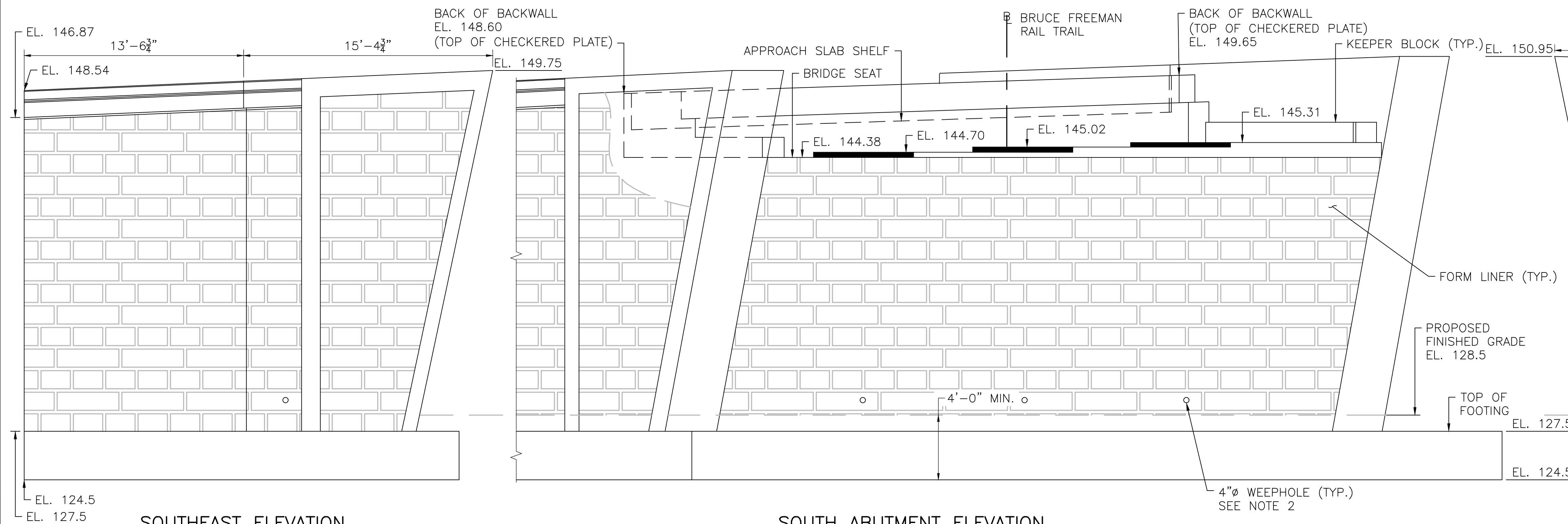
SCALE: $\frac{1}{4}" = 1'-0"$



SCALE: $\frac{1}{4}'' = 1'-0''$



SCALE: $\frac{1}{4}" = 1'-0"$



SCALE: $\frac{1}{4}" = 1'-0"$

SCALE: $\frac{1}{4}'' = 1'-0''$

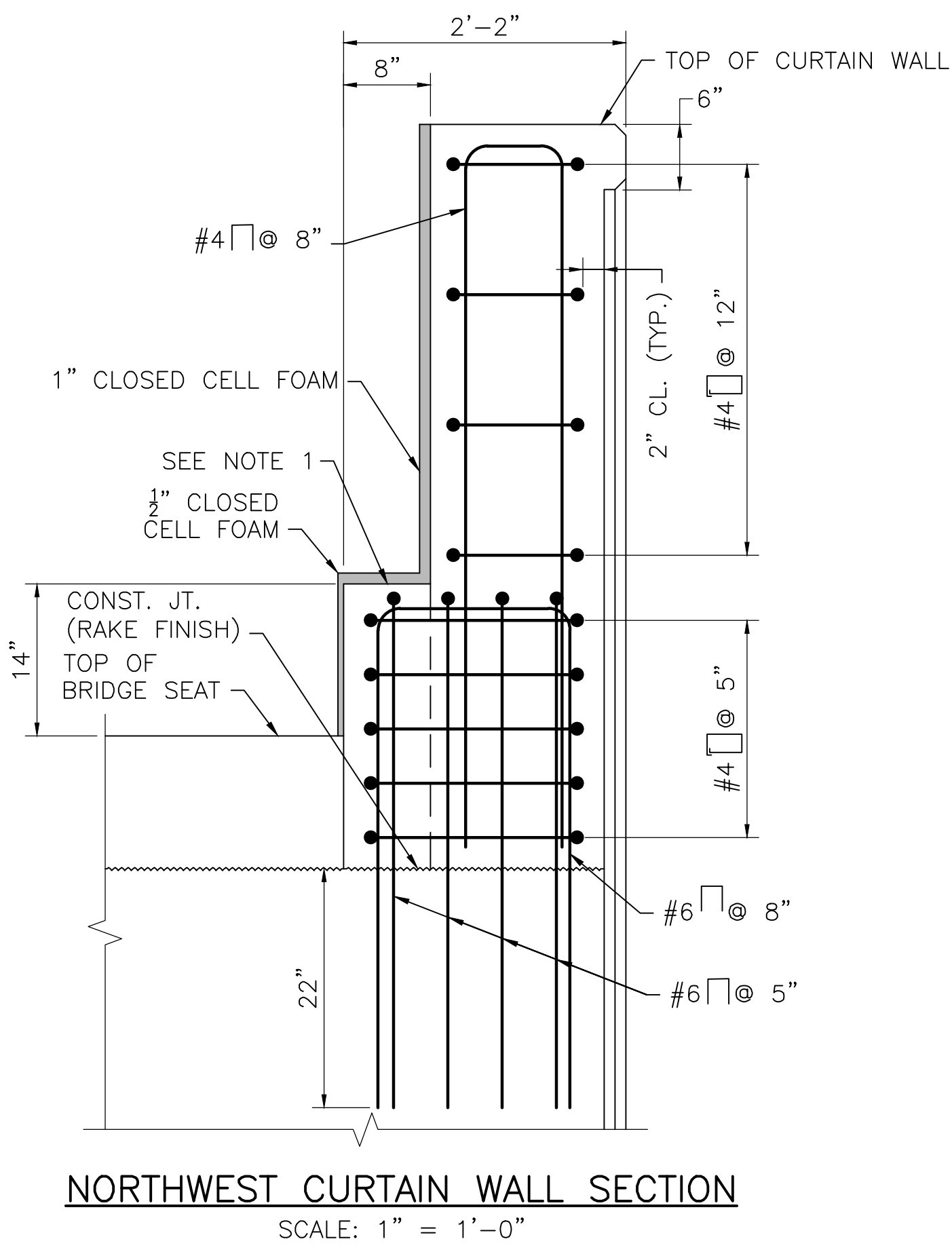
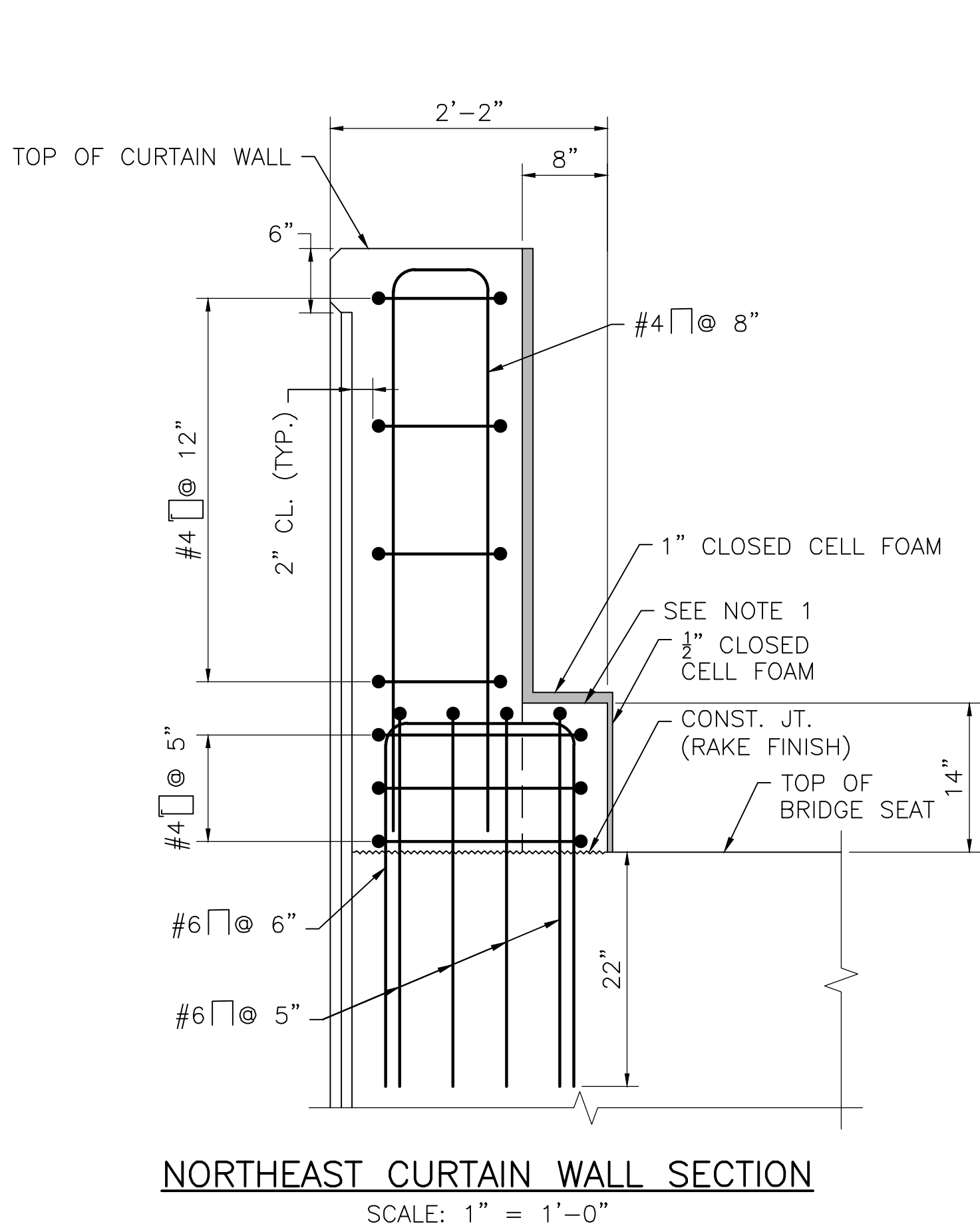
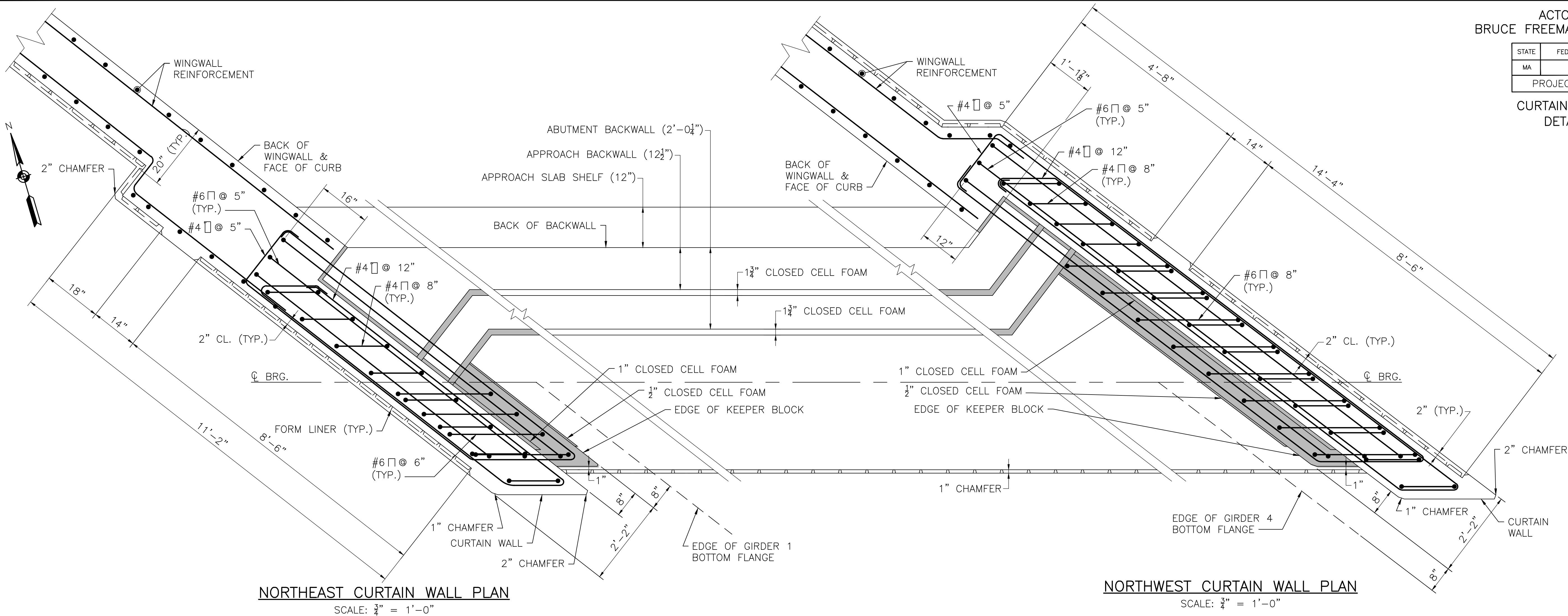
1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ϕ WEEP HOLES 10'-0" O.C. (JUST ABOVE PROTECTIVE COURSE). PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
3. ALL CONCRETE SHALL BE 4000 PSI, $1\frac{1}{2}$ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE.

- FACTORED BEARING RESISTANCE = 9.60 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	92	158
PROJECT FILE NO. 606223			

CURTAIN WALL PLANS AND
DETAILS (1 OF 2)

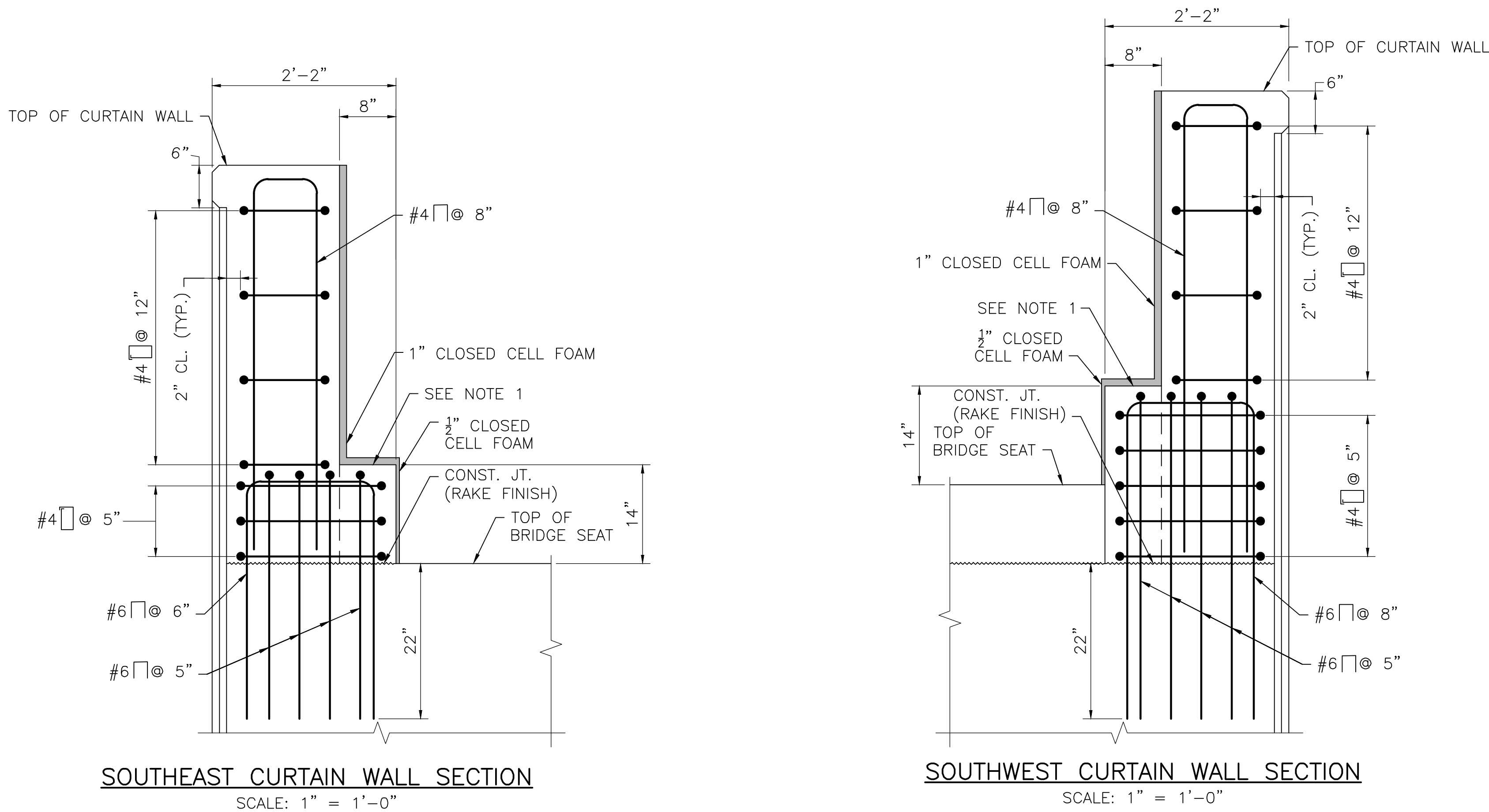
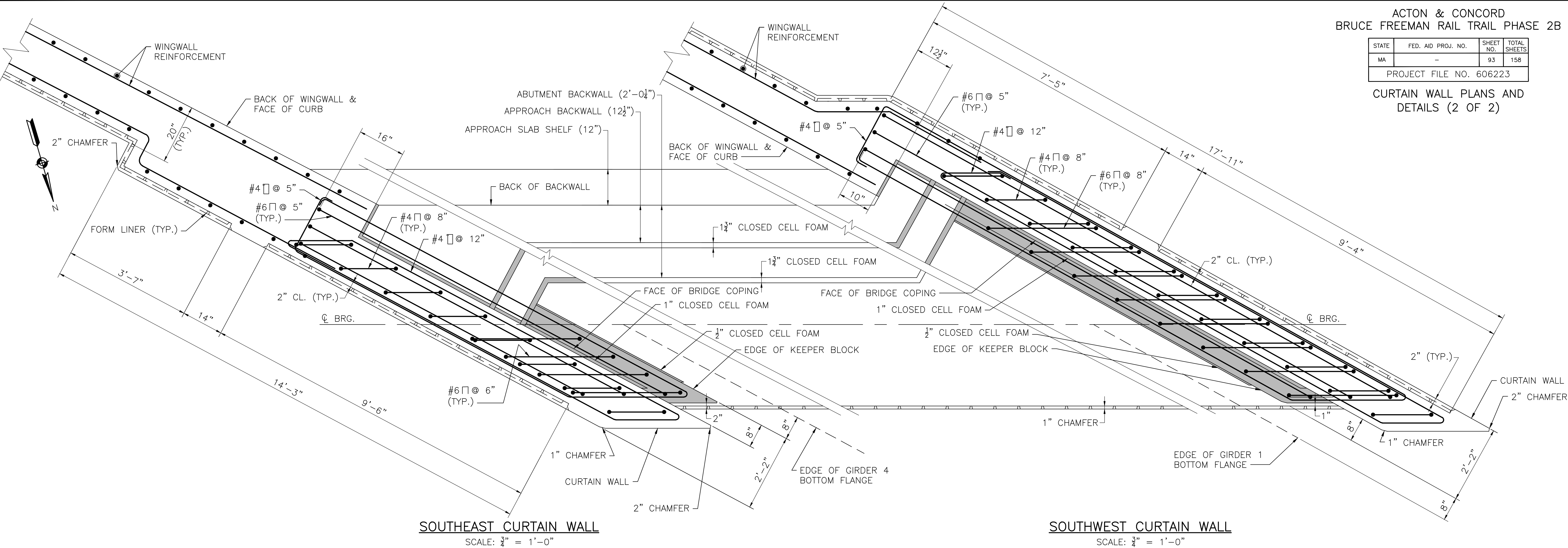


- NOTES:**
1. TOP OF KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.
 2. ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	93	158
PROJECT FILE NO. 606223			

CURTAIN WALL PLANS AND
DETAILS (2 OF 2)



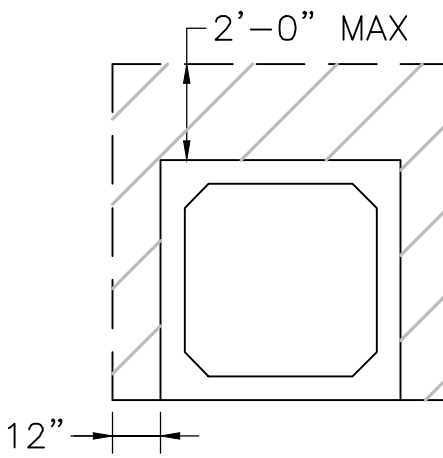
- NOTES:**
1. TOP OF KEEPER BLOCK SHALL BE TROWELED SMOOTH PARALLEL TO PROFILE GRADE.
 2. ABUTMENT REINFORCEMENT BELOW CONSTRUCTION JOINT HAS BEEN OMITTED FOR CLARITY.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	94	158
PROJECT FILE NO. 606223			

MSE WALL SECTIONS

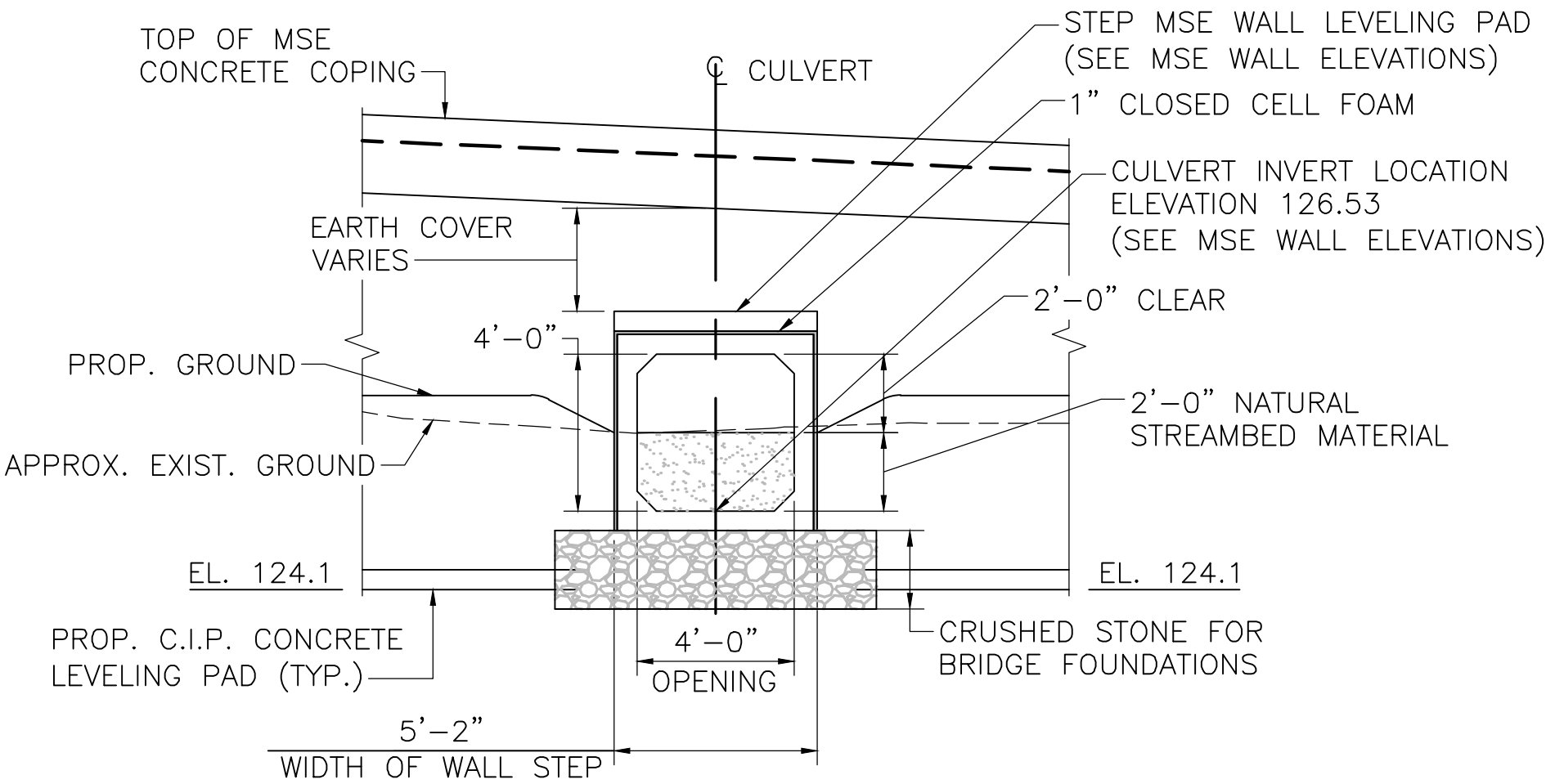
NOTE:
SEE HIGHWAY SHEETS FOR ADDITIONAL CULVERT DETAILS.



NOTE:
HATCHED AREA INDICATES LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES.

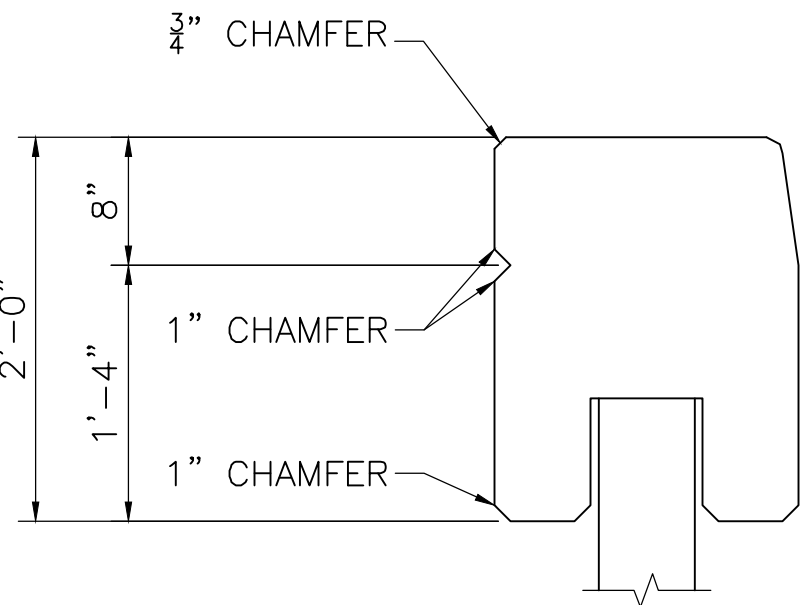
LIMITS OF GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES

SCALE: 1/4" = 1'-0"



CONCRETE CULVERT FOR DRAINAGE

SCALE: 1/4" = 1'-0"

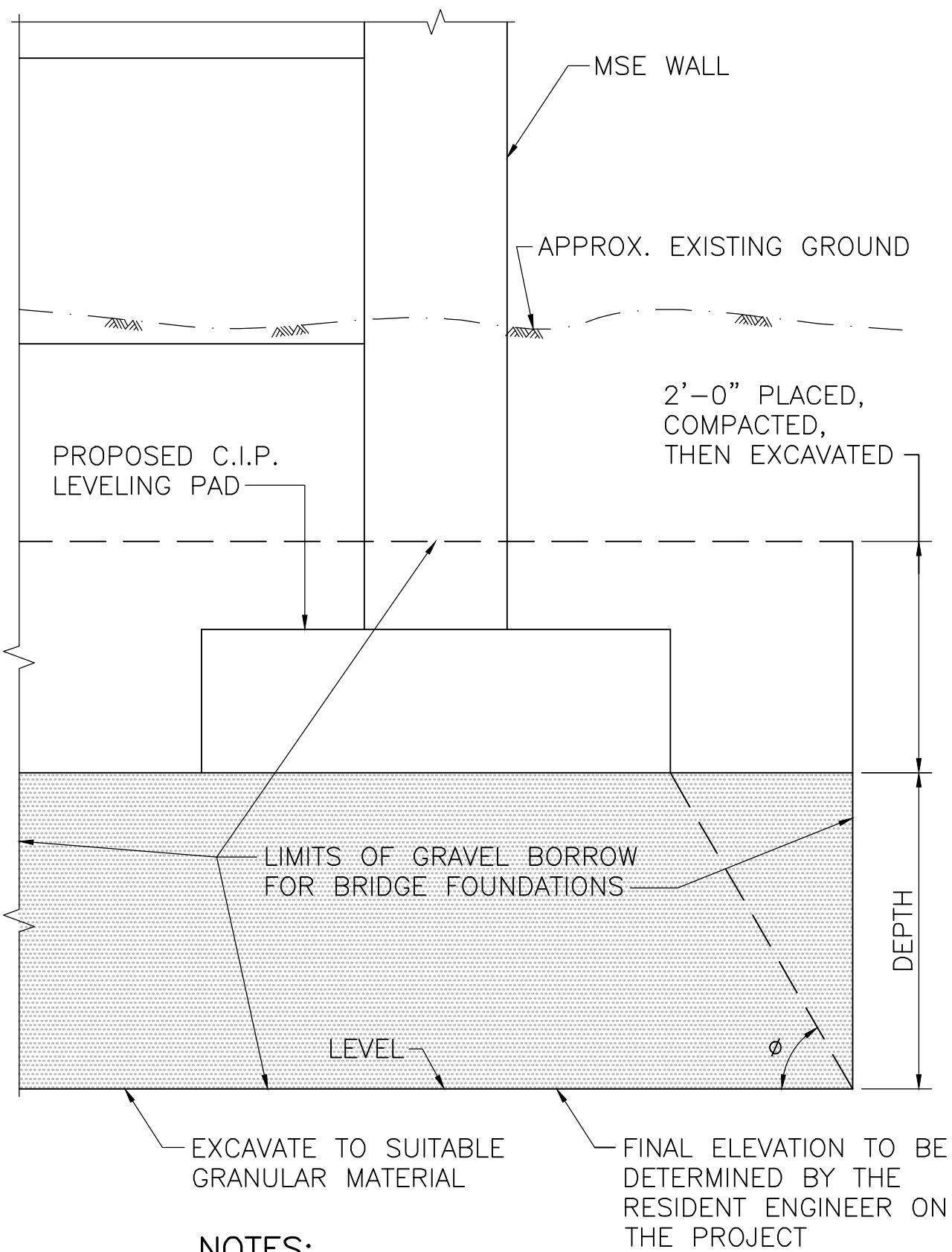


MSE CAP DETAIL

SCALE: 1" = 1'-0"

MSE NOTES:

- UNSUITABLE SOILS SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW FOR BRIDGE FOUNDATIONS AS DETERMINED BY THE ENGINEER.
- REFER TO SPECIAL PROVISIONS FOR THE FOLLOWING:
 - INFORMATION REGARDING PANELS, JOINTS, FILTER FABRIC AND MSE WALL REQUIREMENTS.
 - DESIGN CRITERIA AND MATERIAL REQUIREMENTS NOT SHOWN ON THESE PLANS.
 - MSE WALL FOUNDATION PREPARATION REQUIREMENTS
 - EXCAVATION PAYMENT LIMITS



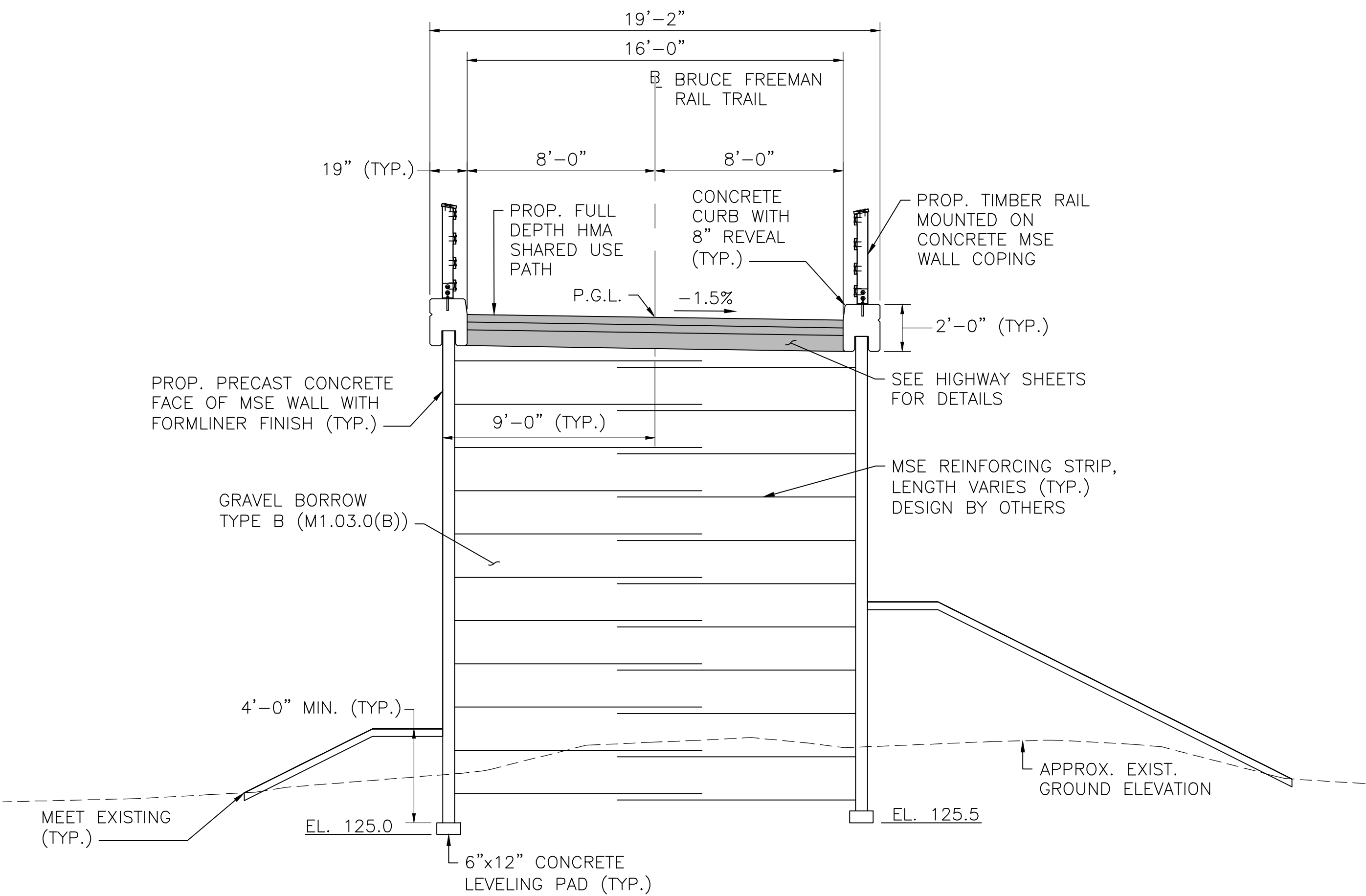
NOTES:

- $\phi = 45^\circ$ FOR DEPTH OF 5'-0" OR LESS.
 $\phi = 60^\circ$ FOR DEPTH OVER 5'-0".
- SAME TREATMENT IS TO BE USED AT ENDS OF WALLS, PIERS, AND ABUTMENTS.

LIMITS OF GRAVEL BORROW FOR BRIDGE FOUNDATIONS

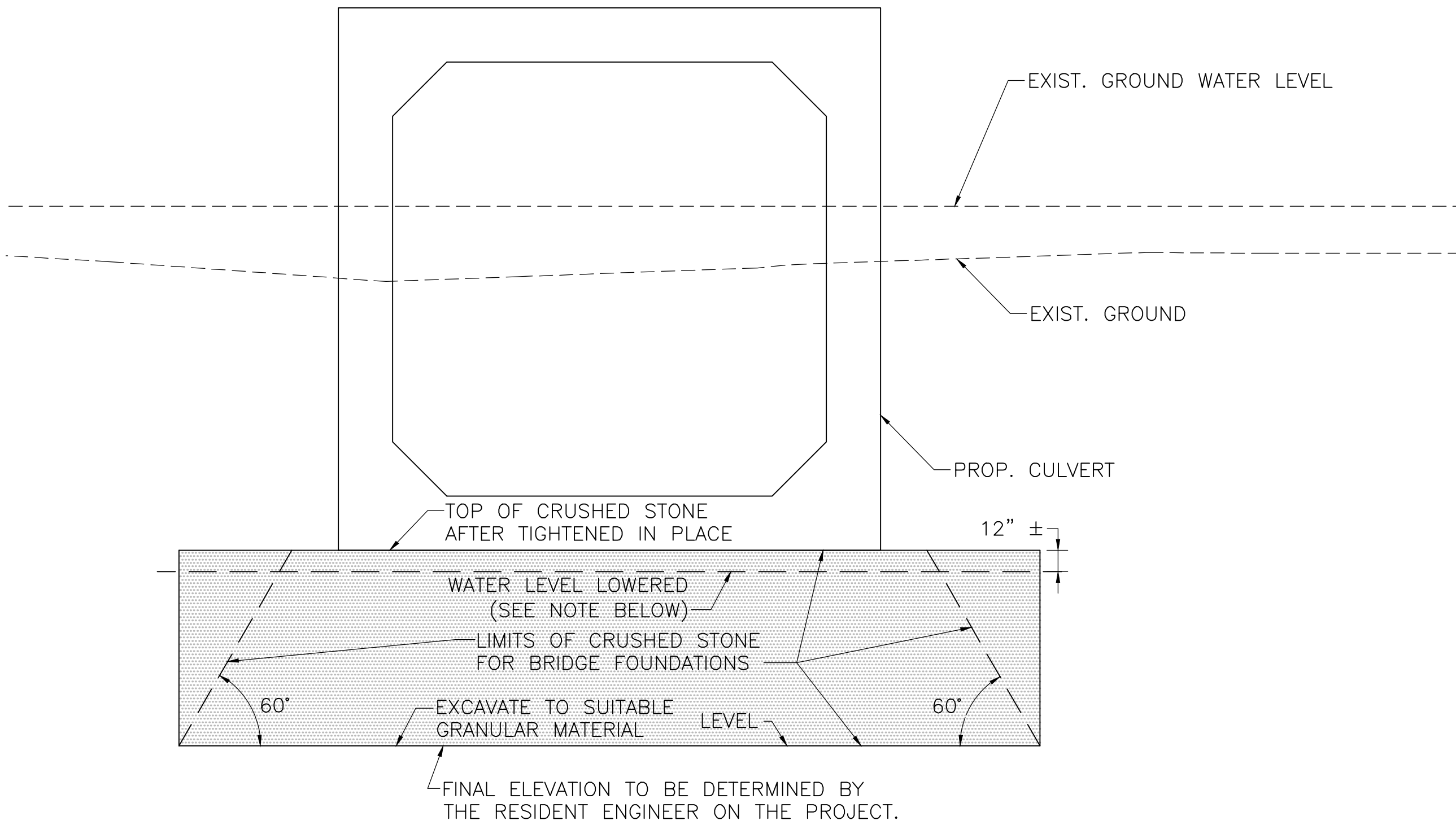
NOT TO SCALE

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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USE ONLY PRINTS OF LATEST DATE	



NORTH MSE WALL APPROACH SECTION
(LOOKING SOUTH, STA. 24+50)

SCALE: 1/4" = 1'-0"



NOTE:

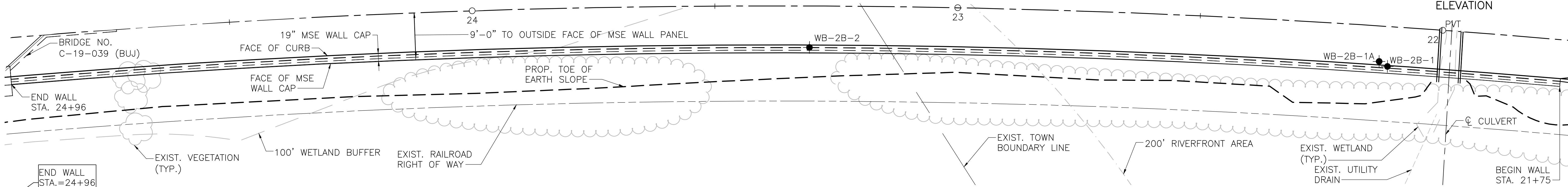
LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPECIFICATIONS).

LIMITS OF CRUSHED STONE FOR BRIDGE FOUNDATIONS

NOT TO SCALE

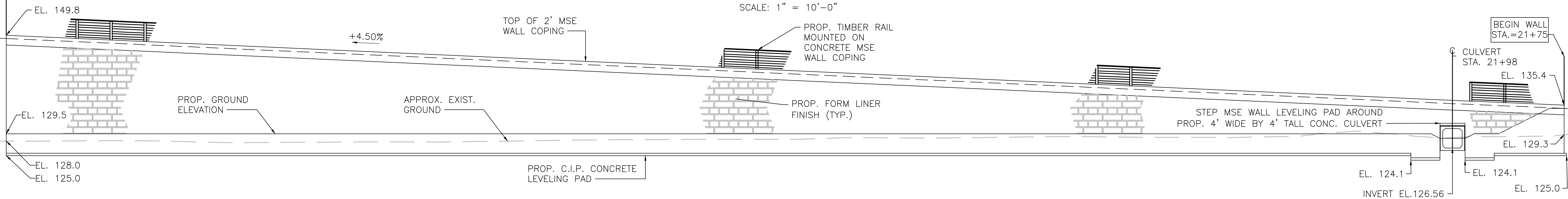
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	95	158
PROJECT FILE NO. 606223			

MSE WALL PLAN AND
ELEVATION



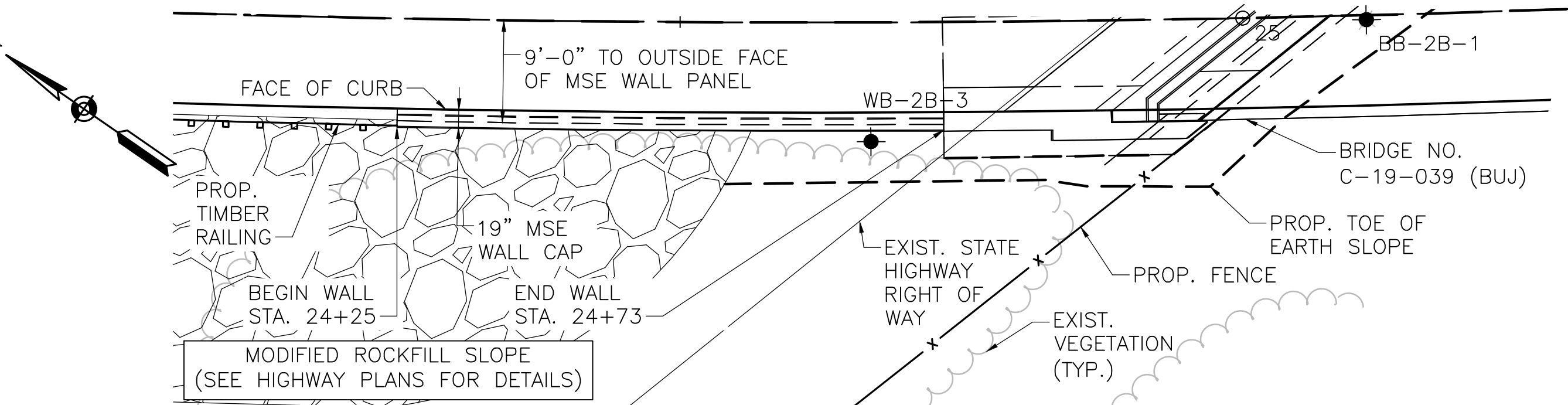
NORTHEAST MSE WALL PLAN

SCALE: 1" = 10'-0"



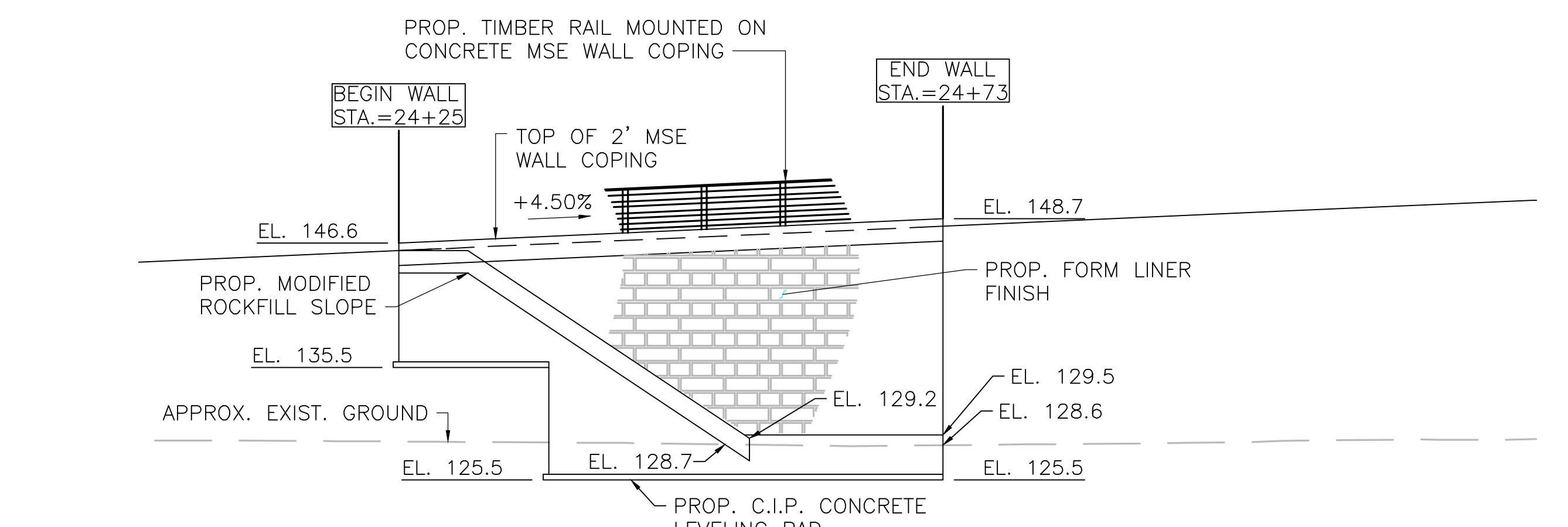
NORTHEAST MSE WALL ELEVATION

SCALE: 1" = 10'-0"



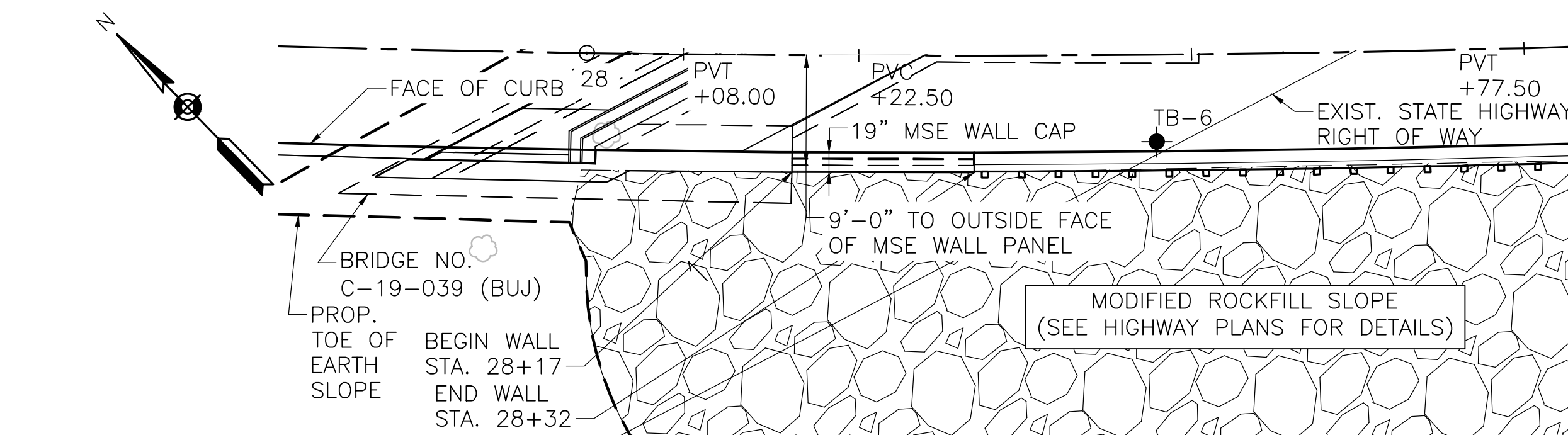
NORTHWEST MSE WALL PLAN

SCALE: 1" = 10'-0"



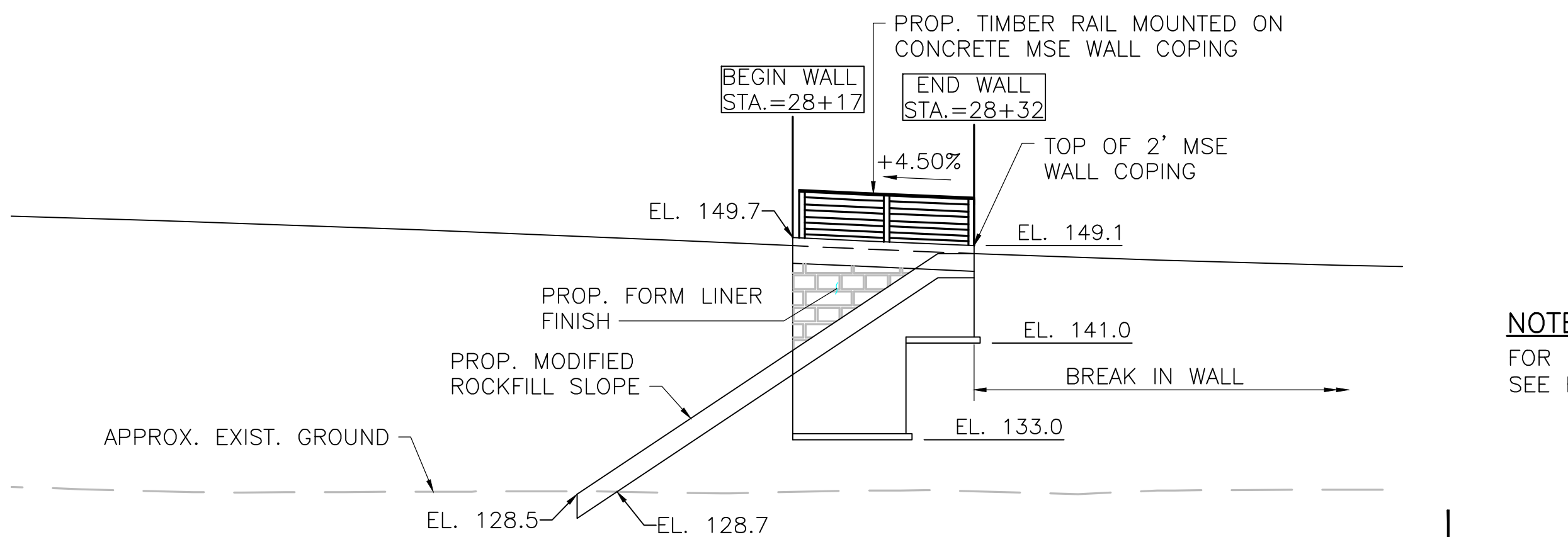
NORTHWEST MSE WALL ELEVATION

SCALE: 1" = 10'-0"



SOUTHWEST MSE WALL PLAN

SCALE: 1" = 10'-0"



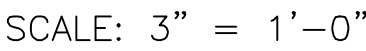
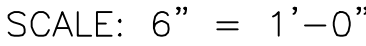
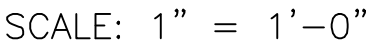
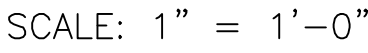
SOUTHWEST MSE WALL ELEVATION

SCALE: 1" = 10'-0"

NOTE:
FOR SOUTHEAST MSE WALL PLAN AND ELEVATION,
SEE BRIDGE C-19-037 (BF4) PLANS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

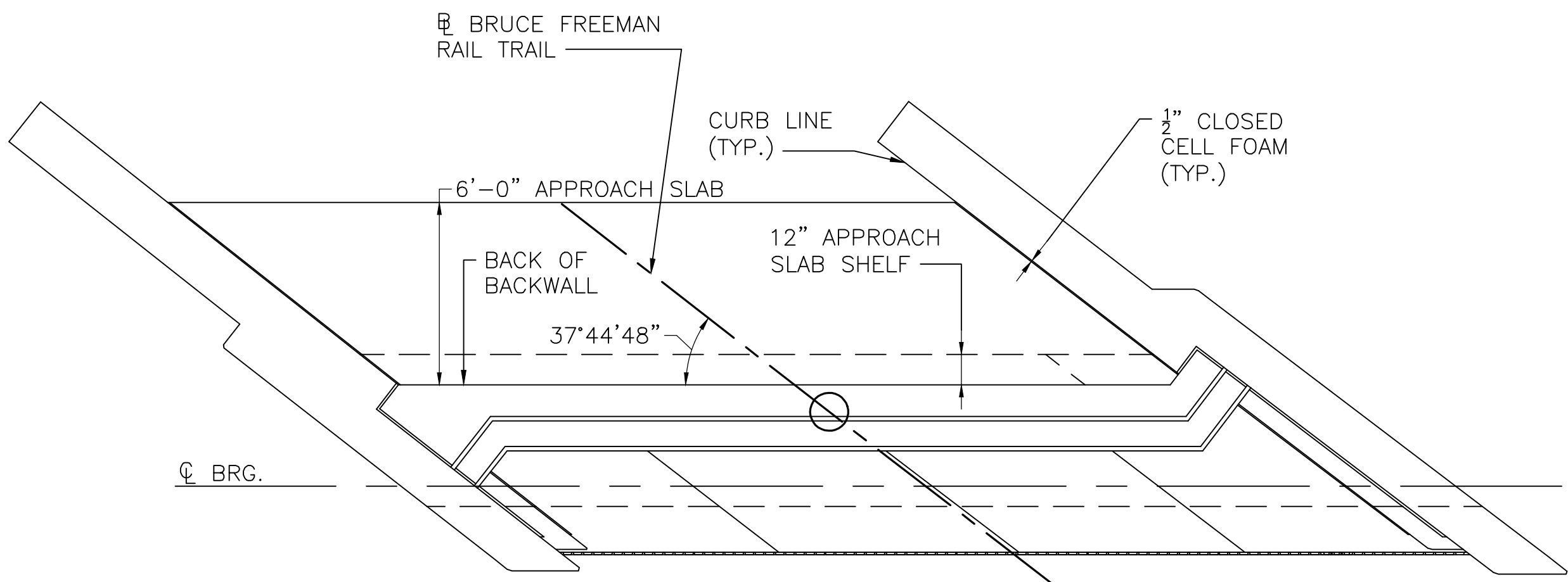
1. THE DETAILS SHOWN HERE ARE INTENDED AS A GENERAL GUIDE FOR A TYPICAL GLANDULAR TYPE STRIP SEAL JOINT SYSTEM. SHOP DRAWINGS WHICH INCLUDE DETAILS OF THE GLAND SHAPE, STEEL EXTRUSION SHAPE, WELDING PROCEDURE SPECIFICATIONS, ANCHOR ARRANGEMENT, TEMPERATURE CORRECTION REQUIREMENTS, AND TEMPORARY SUPPORT DETAILS SHALL BE SUBMITTED FOR APPROVAL OF THE ENGINEER ACCORDING TO THE STANDARD SPECIFICATIONS.
2. ALL STRUCTURAL STEEL COMPONENTS SHALL CONFORM TO AASHTO M270 GRADE 36. AFTER THE COMPLETION OF ALL WELDING OPERATIONS STEEL PLATE ASSEMBLIES SHALL BE HOT-DIP GALVANIZED.
3. ELASTOMERIC CONCRETE BLOCKOUT SHALL BE SANDBLASTED, CLEANED WITH COMPRESSED OIL LESS AIR, AND PRIMED WITH BONDING COMPOUND PRIOR TO CASTING ELASTOMERIC CONCRETE.
4. NEOPRENE STRIP SEAL SHALL BE BONDED TO STEEL EXTRUSION WITH APPROVED ADHESIVE.
5. INSTALL CONTINUOUS NEOPRENE STRIP SEAL IN THE FIELD. SPLICING OF SEAL IS NOT PERMITTED.
6. PRIOR TO PLACEMENT OF SAFETY CURB CONCRETE, LUBRICATE STAINLESS STEEL SCREWS WITH GRAPHITE AND SET SECURELY IN PLACE. MACHINE SCREWS TO BE TEMPORARILY REMOVED AFTER CONCRETE HAS ATTAINED FINAL SET.
7. NO WELDING OF PORTIONS OF STEEL EXTRUSIONS IN DIRECT CONTACT WITH NEOPRENE SEAL SHALL BE PERMITTED.



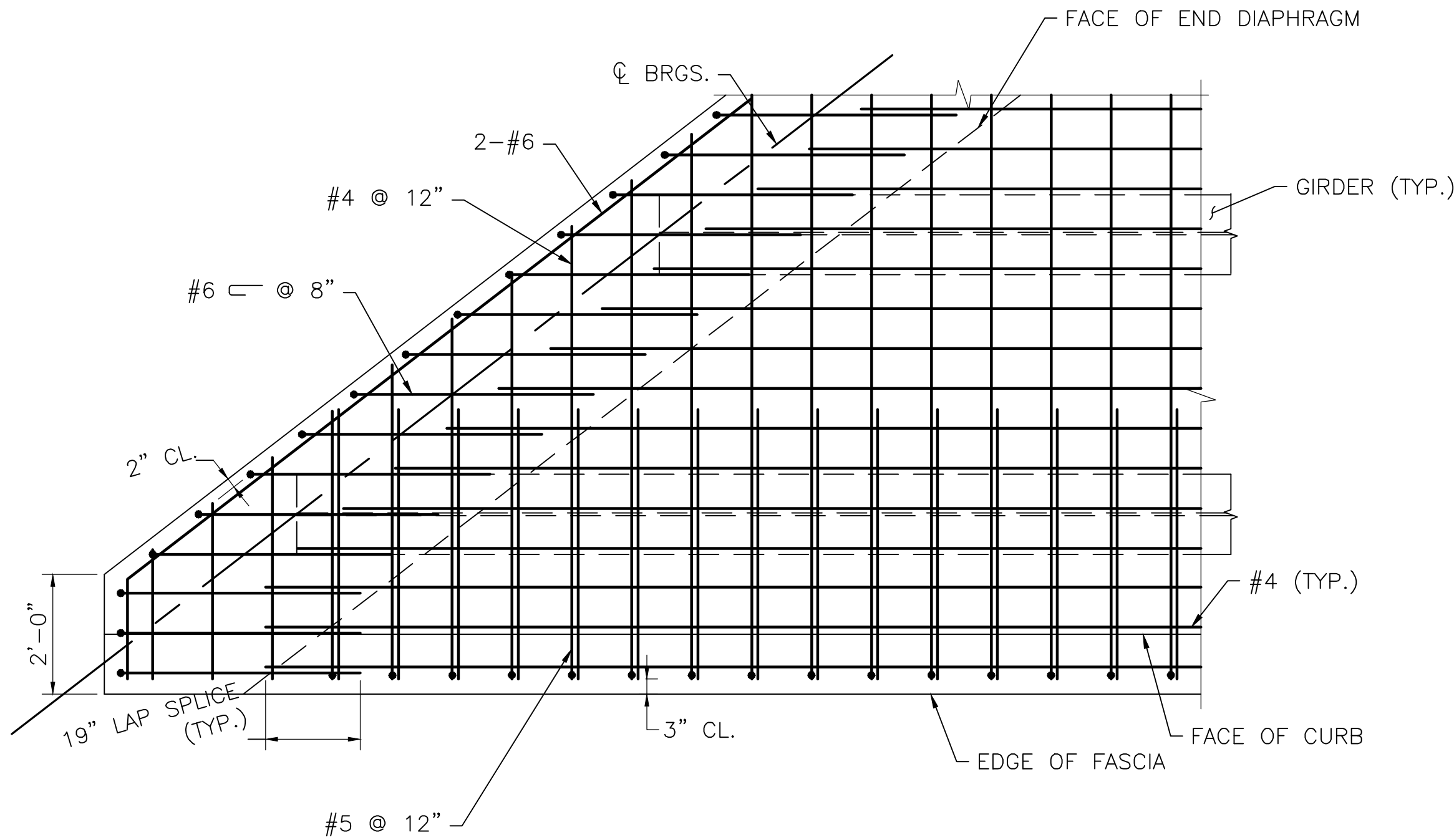
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	97	158
PROJECT FILE NO. 606223			

ACUTE CORNER & APPROACH SLAB
PLANS AND DETAILS

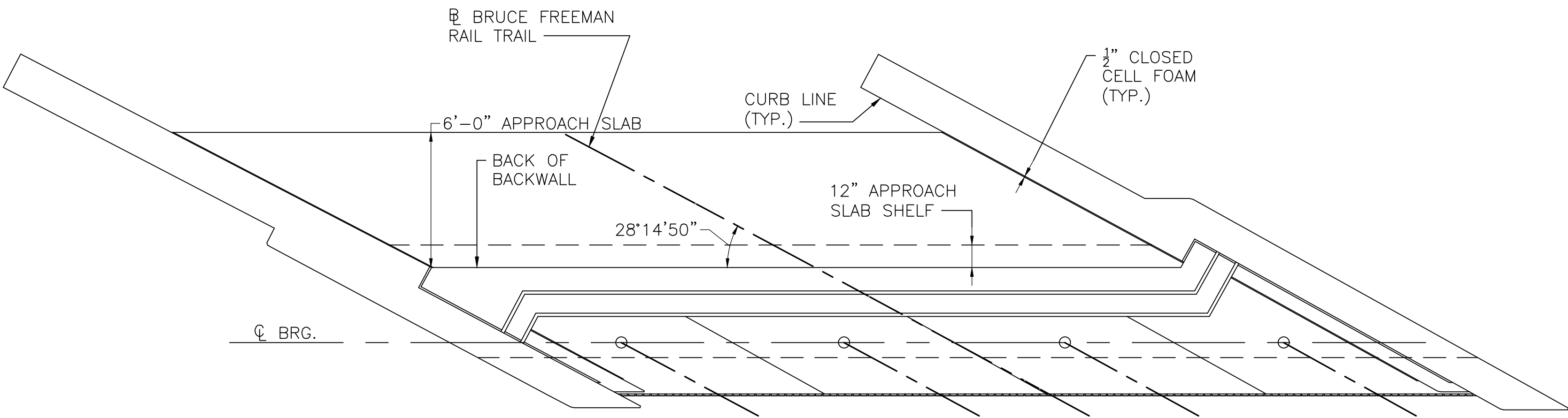


NORTH APPROACH SLAB PLAN
SCALE: $\frac{1}{4}$ " = 1'-0"

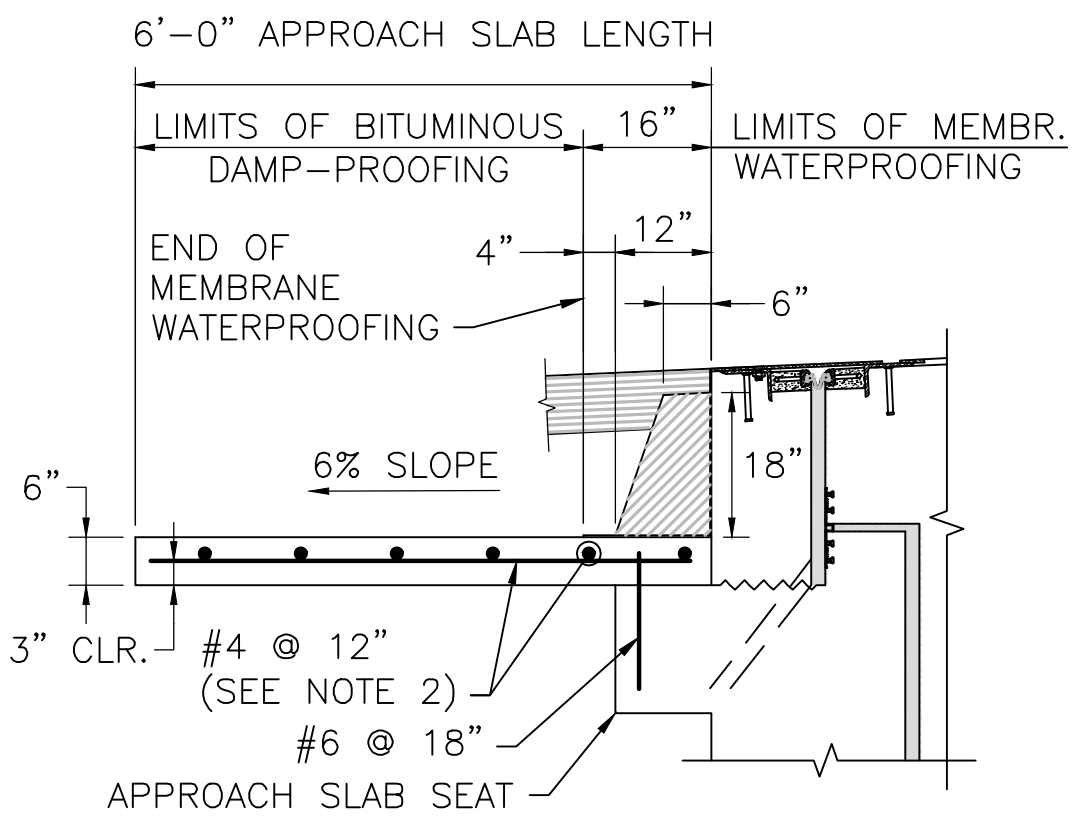


PLAN AT ACUTE CORNER
SCALE: $\frac{1}{2}$ " = 1'-0"

NOTE:
NORTHWEST CORNER SHOWN
SOUTHEAST CORNER SIMILAR



SOUTH APPROACH SLAB PLAN
SCALE: $\frac{1}{4}$ " = 1'-0"



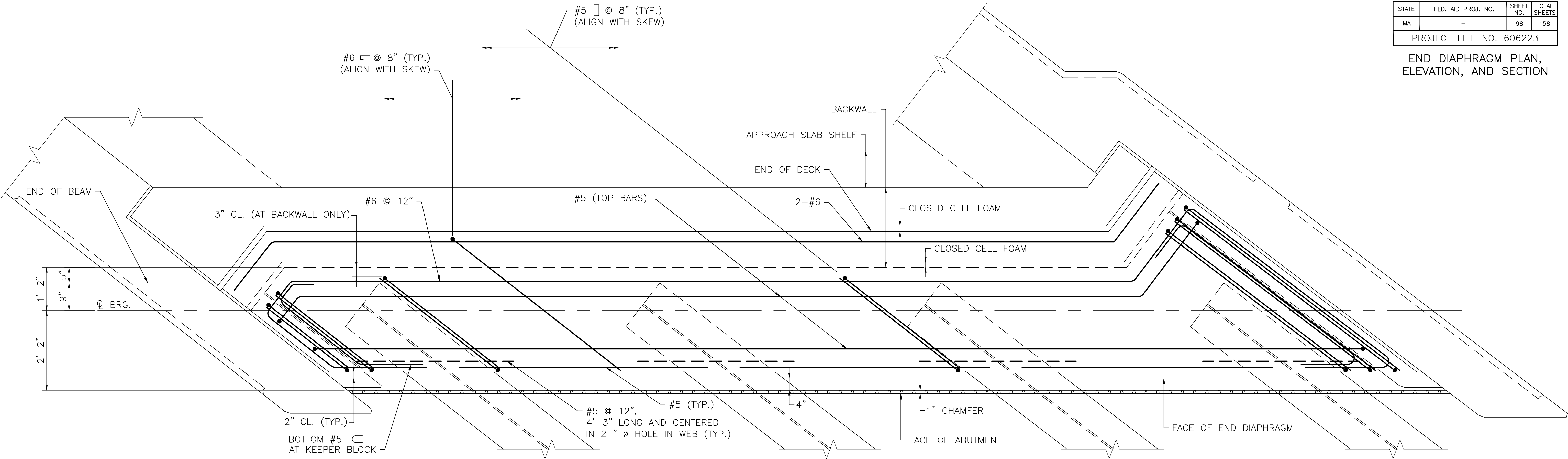
- NOTES:
- APPROACH SLAB TO BE 4000 PSI, $1\frac{1}{2}$ IN, 565 CEMENT CONCRETE.
 - PLACE LONGITUDINAL REINFORCEMENT PERPENDICULAR TO ABUTMENT.
PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

MODIFIED APPROACH SLAB TYPICAL SECTION
SCALE: $\frac{1}{2}$ " = 1'-0"

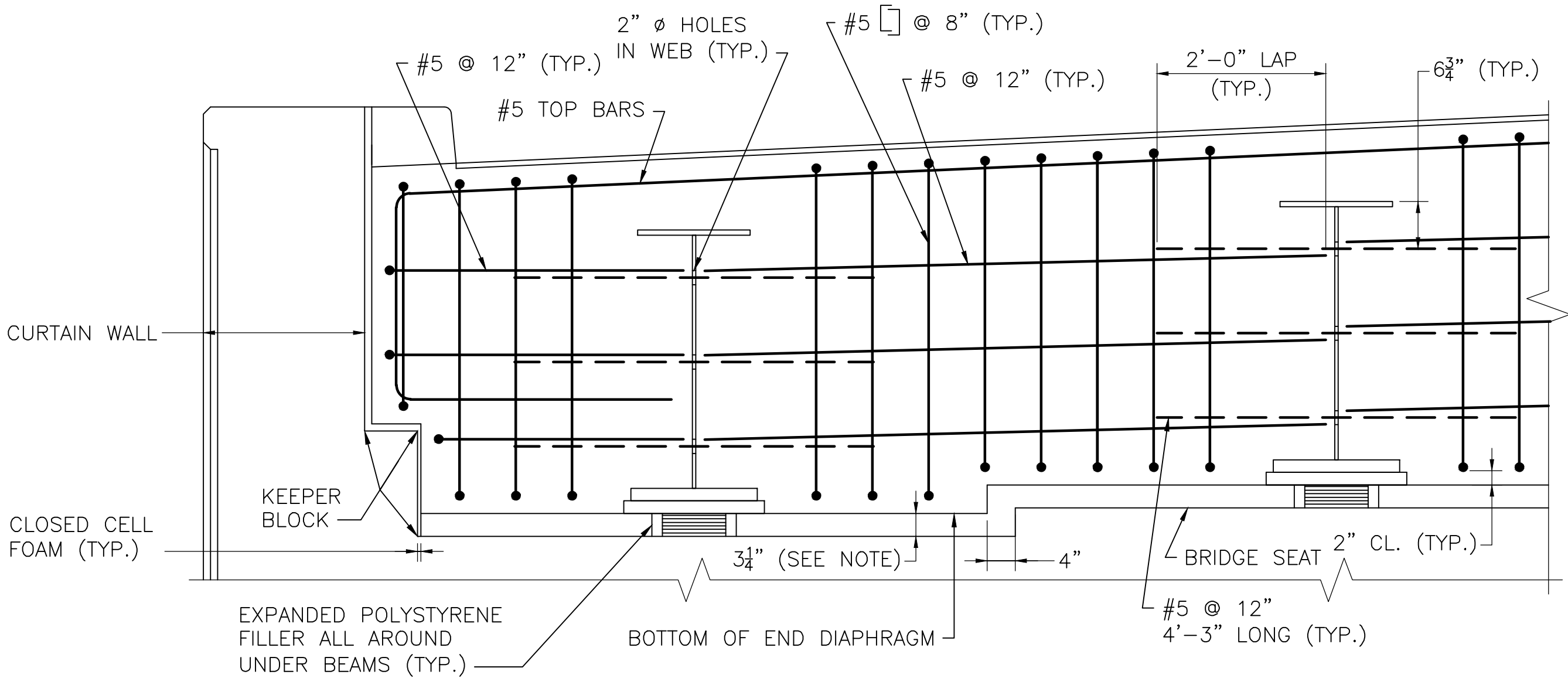
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	98	158
PROJECT FILE NO. 606223			

END DIAPHRAGM PLAN,
ELEVATION, AND SECTION

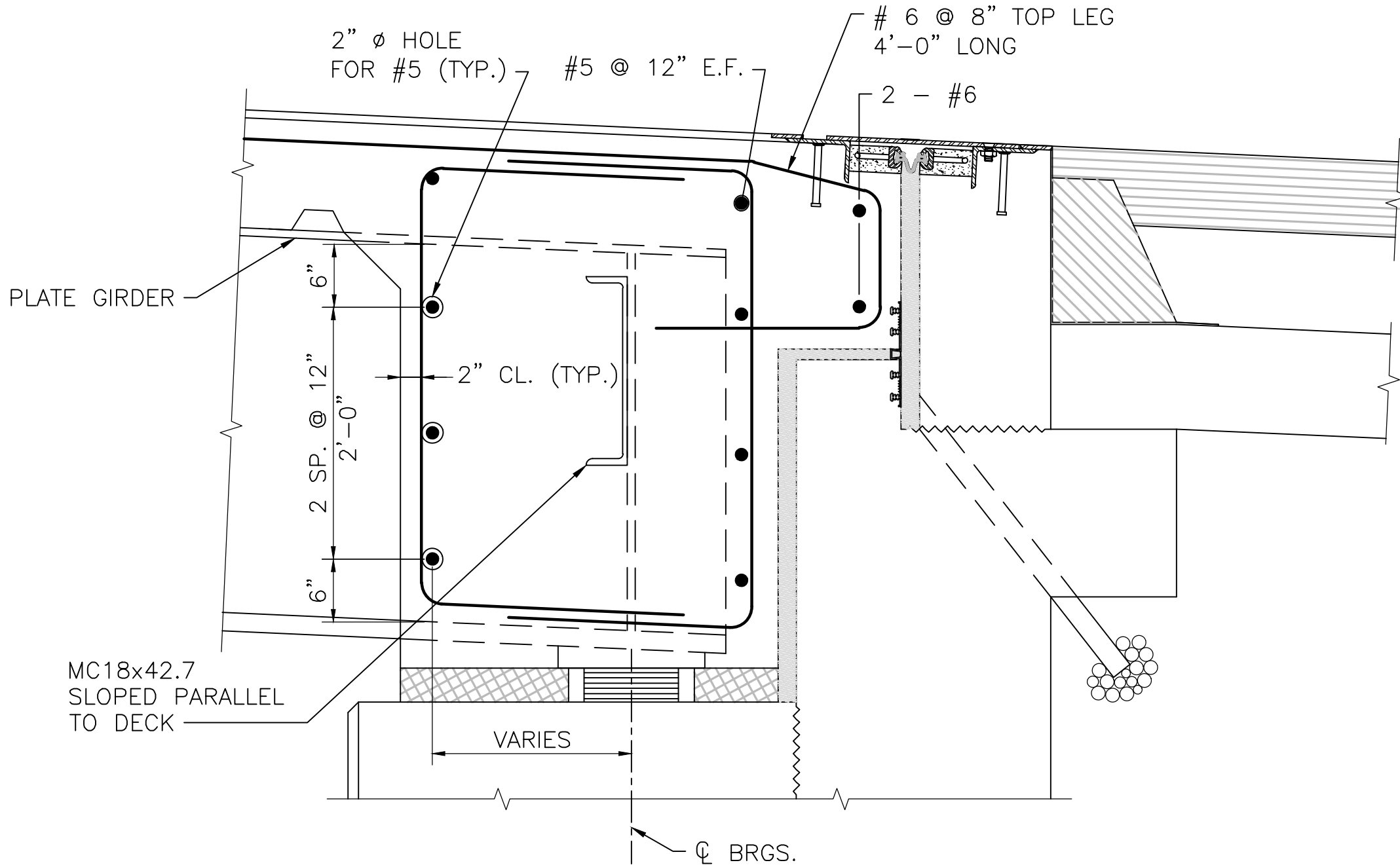


TYPICAL END DIAPHRAGM PLAN
SCALE: 3/4" = 1'-0"



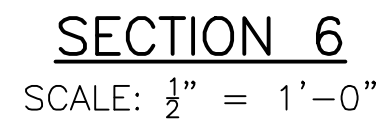
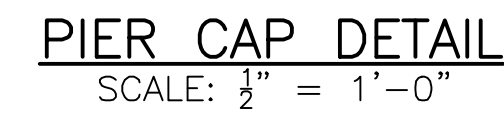
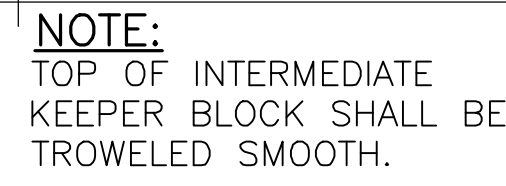
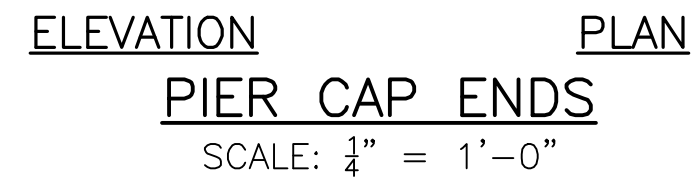
AT KEEPER BLOCK/CURTAIN WALL
TYPICAL INTERIOR BAY
NOTES:
1. CONTRACTOR MAY USE EXPANDED POLYSTYRENE FILLER OR A REMOVABLE FORM TO FORM THE BOTTOM OF THE END DIAPHRAGM.

TYPICAL END DIAPHRAGM ELEVATION
SCALE: 3/4" = 1'-0"

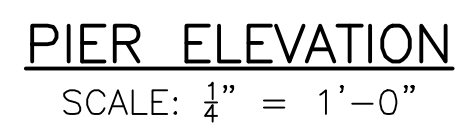


DETAILS AT ABUTMENT - ROADWAY SECTION
SCALE: 1" = 1'-0"

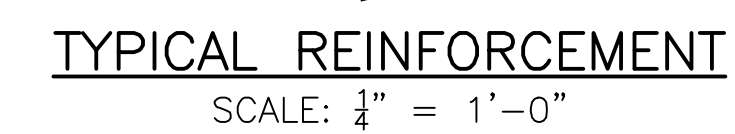
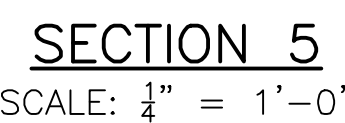
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	



- PLAN OF KEEPER BLOCK
SCALE: $\frac{1}{2}" = 1'-0"$



4000 PSI, 1 1/2 IN, 565 CEMENT CONCRETE

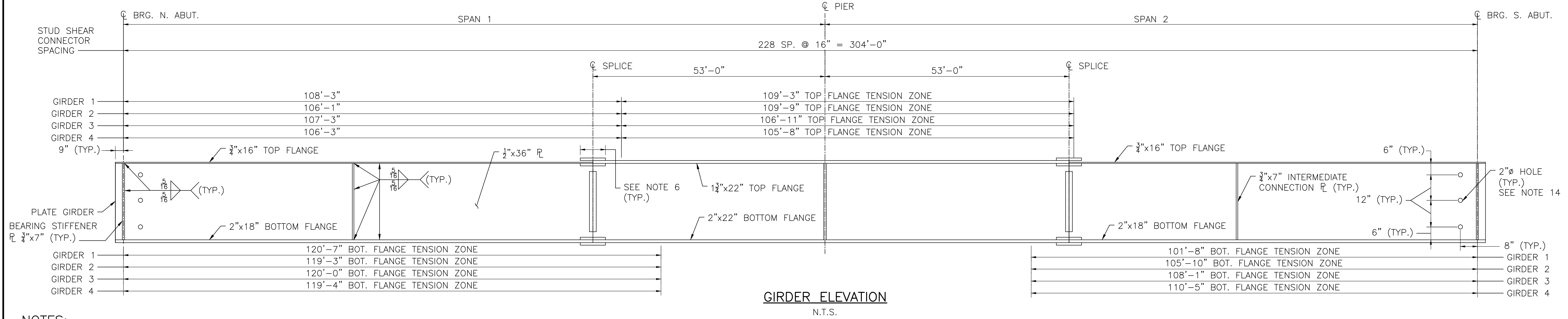
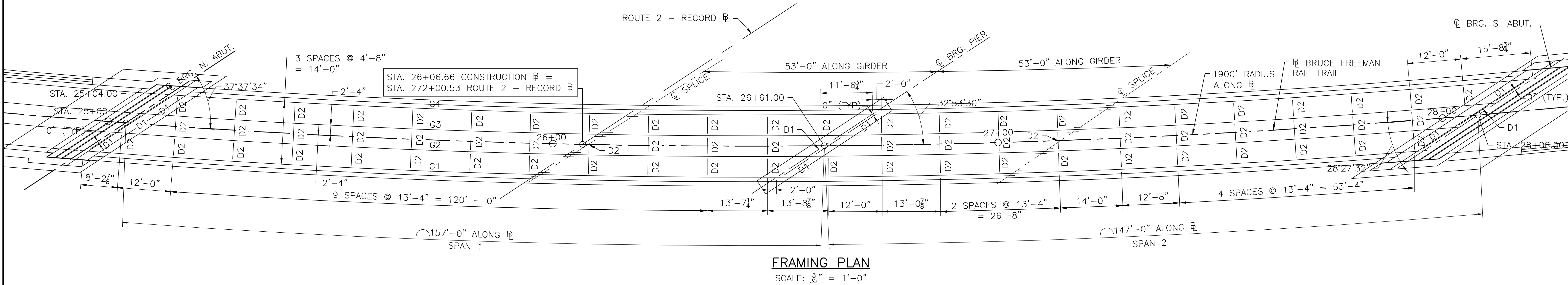


MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	100	158
PROJECT FILE NO. 606223			

FRAMING PLAN AND BEAM ELEVATIONS



NOTES:

- D1= MC18x42.7 (TYP. END DIAPHRAGM)
D2= MC18x42.7 (TYP. INTERMEDIATE DIAPHRAGM)
- SEE SHEET 20 FOR DIAPHRAGM AND SPLICE DETAILS.
- THE MAIN LOAD CARRYING MEMBERS ARE GIRDERS 1 THROUGH 4.
- ALL STEEL SHALL CONFORM TO AASHTO M 270 GRADE 50. ALL GIRDERS SHALL BE METALIZED WITH ZINC ALUMINUM WIRE (6 - 8 MILS) AND COATED WITH AN APPROPRIATE SEALER (ZONE 1).
- FOR CAMBER TABLES SEE SHEET 21.
- FOR PLACEMENT OF STUD SHEAR CONNECTORS OVER THE SPLICE, SEE SPLICE DETAIL ON SHEET 20.
- GIRDER TENSION ZONE DIMENSIONS SHOWN ARE ORIENTED NORTH TO SOUTH.
- CHANGE IN SPLICE LOCATION AND/OR ADDITIONAL FIELD SPLICES SHALL BE DESIGNED BY A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF MASSACHUSETTS AND SUBMITTED FOR APPROVAL BY THE ENGINEER OF RECORD.
- ALL BEARING STIFFENERS/END CONNECTION PLATES SHALL BE PLUMB.
- ALL INTERMEDIATE STIFFENERS SHALL BE PERPENDICULAR TO THE WEB AND TO THE GIRDER FLANGES.

- END OF GIRDERS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS WILL BE PLUMB.
- SEE CLIP DETAIL ON SHEET 20.
- BEARING STIFFENER PLATE AT TENSION FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH 5/16" FILLET WELDS, BOTH SIDES OF PLATE.
- 2" HOLE AT END OF GIRDER ARE FOR END DIAPHRAGM REINFORCEMENT.
- AN INTERMEDIATE CONNECTION PLATE WILL BE INSTALLED AT EACH DIAPHRAGM LOCATION, SEE FRAMING PLAN FOR NUMBER AND SPACING.

SPAN LENGTHS			
GIRDER	SPAN 1	SPAN 2	TOTAL
G1	155'-10 3/8"	145'-5 3/4"	301'-4 1/8"
G2	156'-7 3/8"	146'-5 5/8"	303'-1 1/4"
G3	157'-4 3/4"	147'-6 1/4"	304'-11"
G4	158'-2 1/4"	148'-7"	306'-9 1/4"

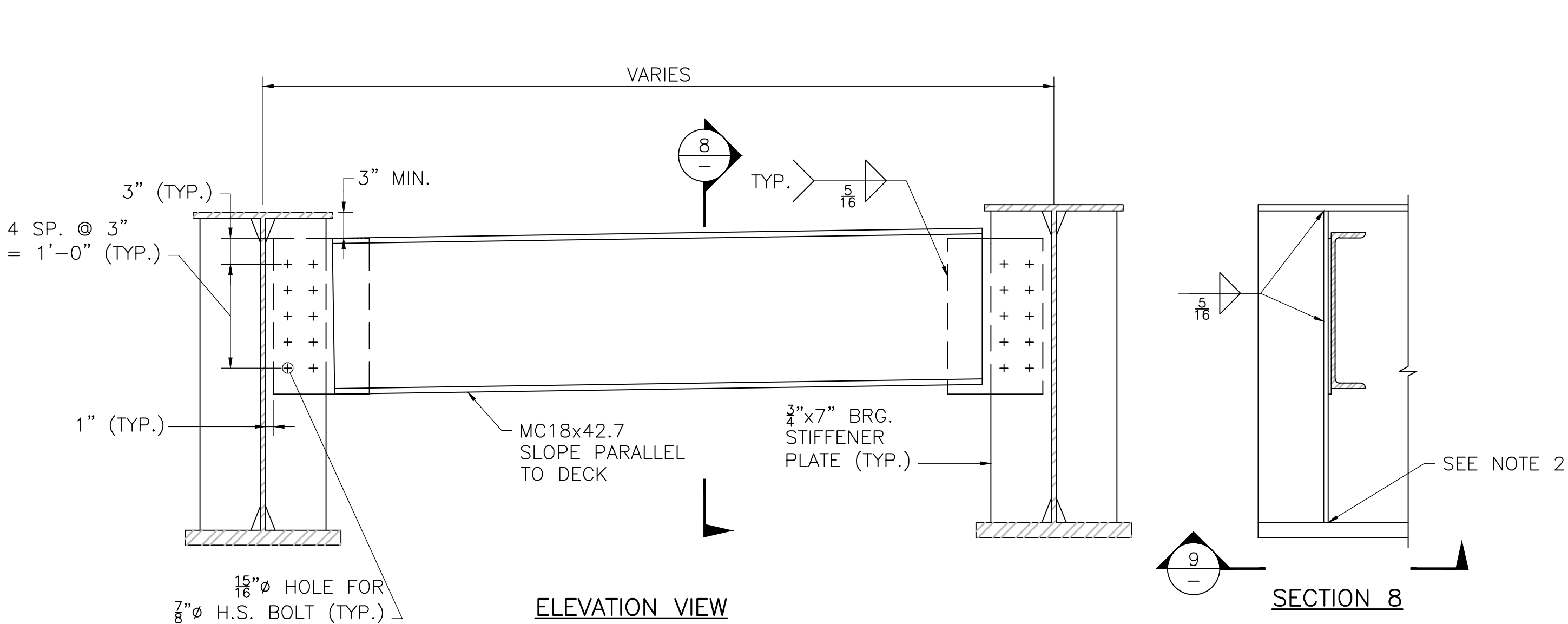
NOTE: GIRDERS ARE CONCENTRIC.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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SHEET 18 OF 24 SHEETS BRIDGE NO. C-19-039 (BUJ)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	101	158
PROJECT FILE NO. 606223			

STRUCTURAL STEEL DETAILS

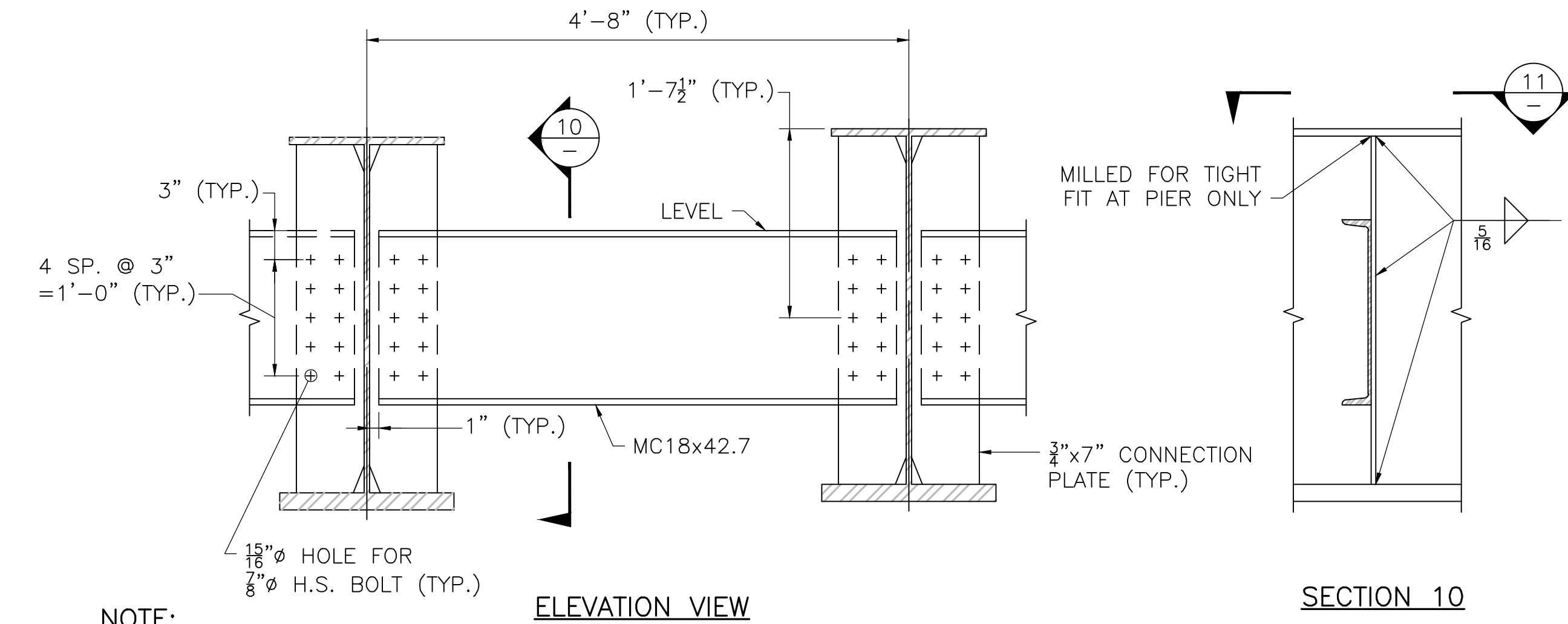


NOTES:

1. SEE CLIP DETAIL ON THIS SHEET.
2. BEARING STIFFENER PLATE AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH 5/16" FILLET WELDS BOTH SIDES OF PLATE.
3. TERMINATE FILLET WELDS 1/2" SHORT OF ALL PLATE ENDS.

END DIAPHRAGM DETAILS

SCALE: 1" = 1'-0"



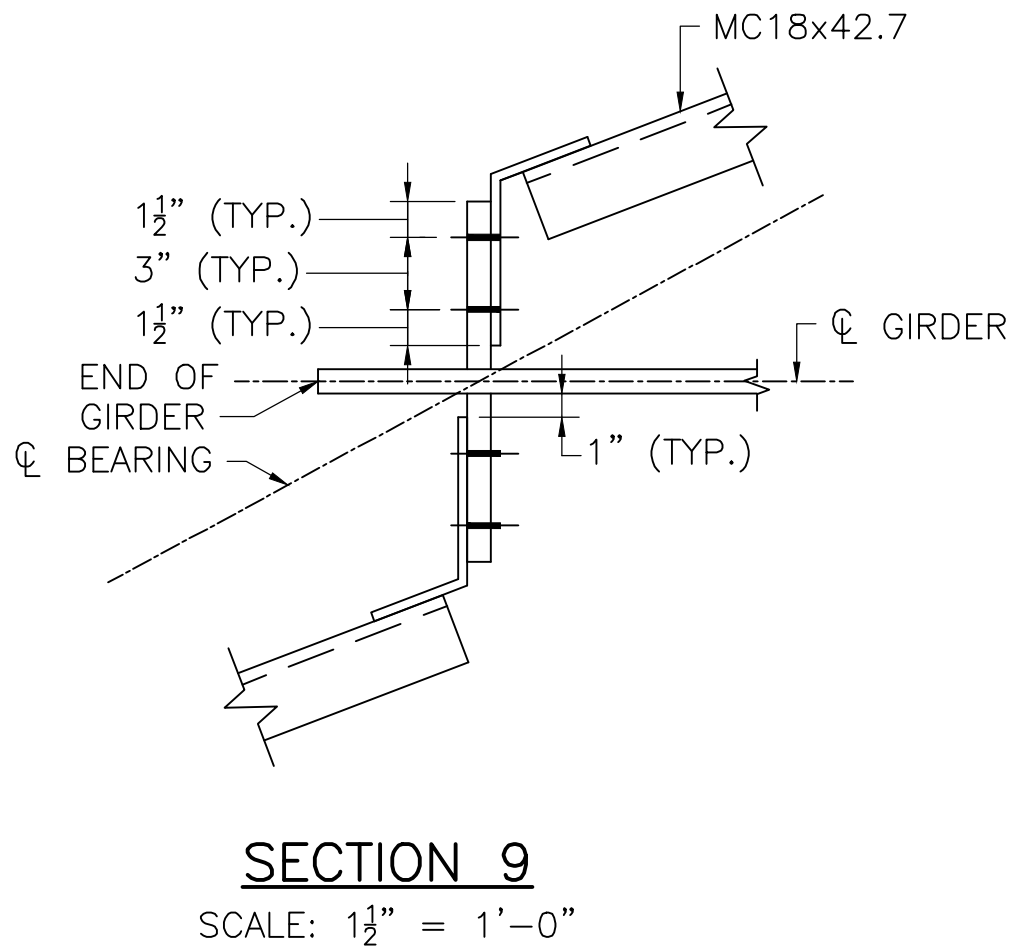
NOTE:

SEE CLIP DETAIL ON THIS SHEET.

ELEVATION VIEW

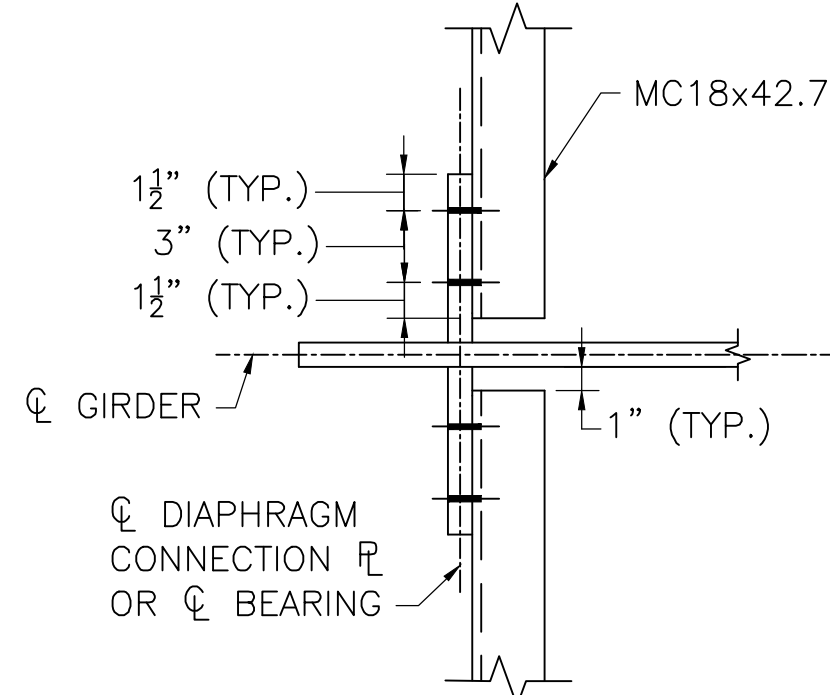
INTERMEDIATE DIAPHRAGM DETAIL - D2

SCALE: 1" = 1'-0"



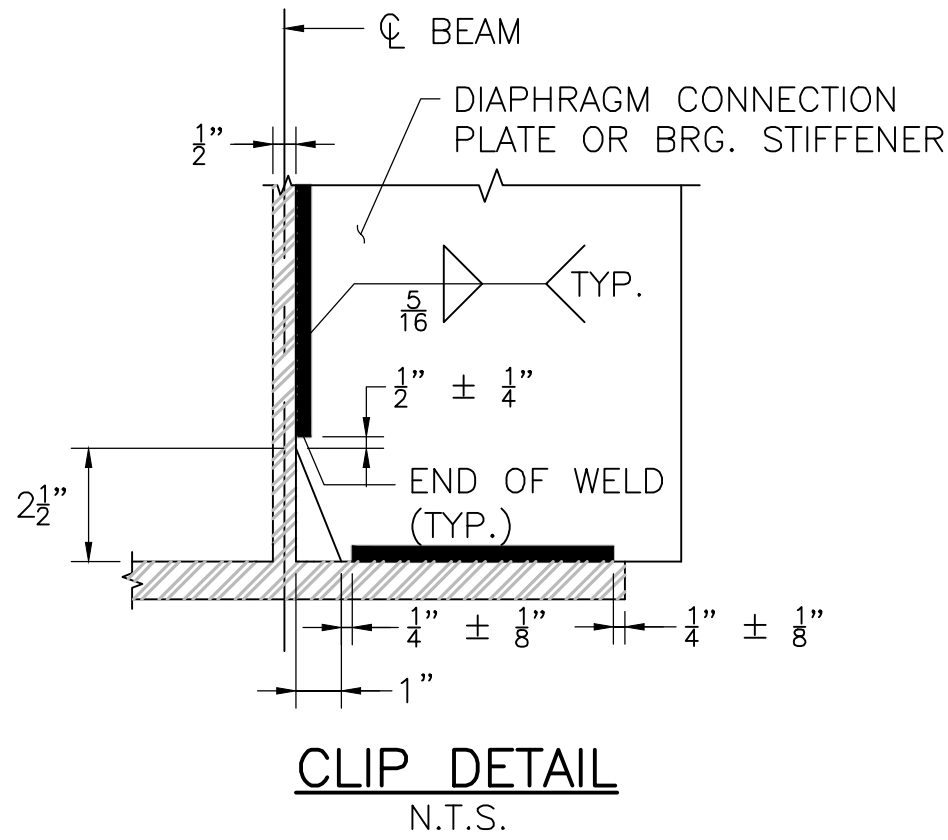
SECTION 9

SCALE: 1 1/2" = 1'-0"



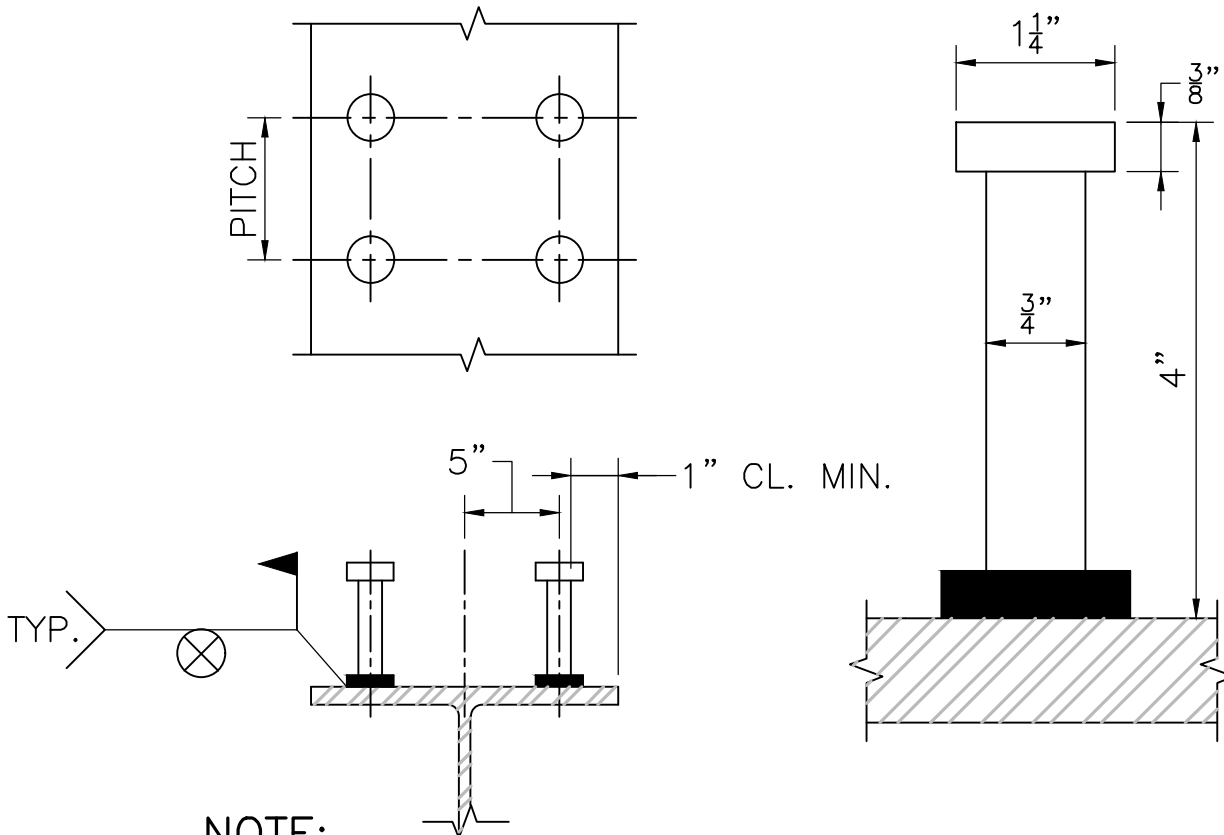
SECTION 11

SCALE: 1 1/2" = 1'-0"



CLIP DETAIL

N.T.S.

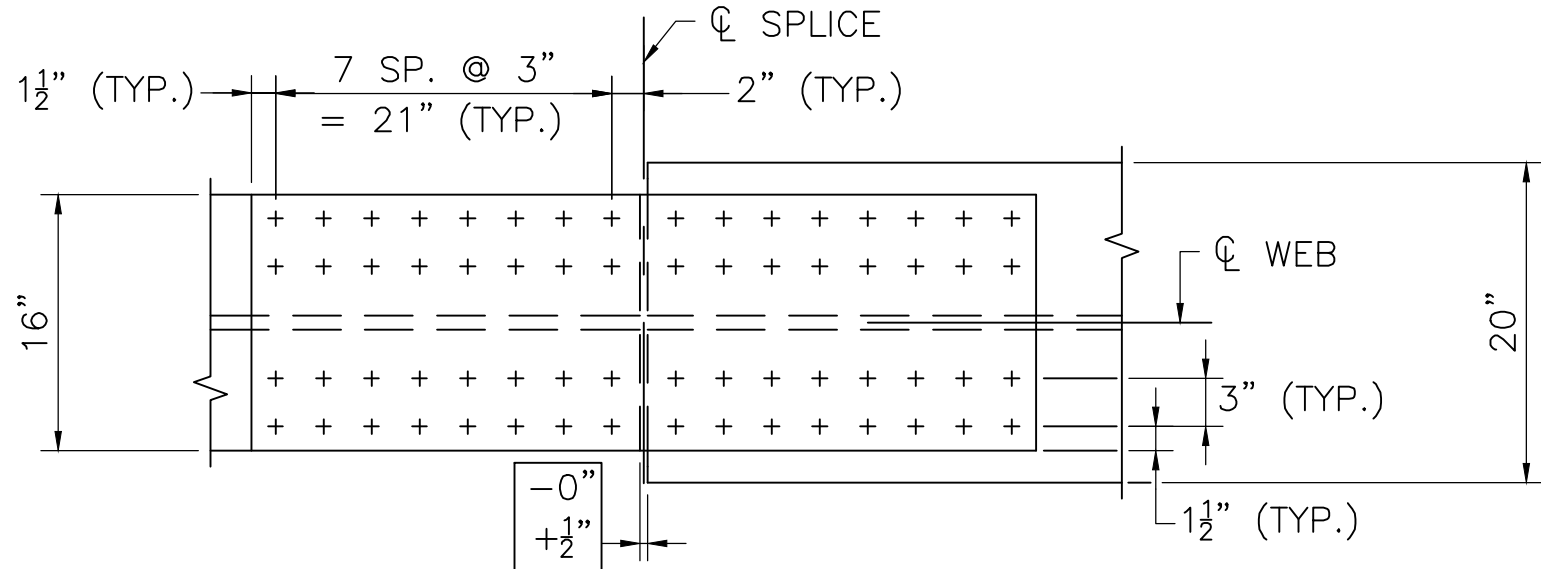


NOTE:

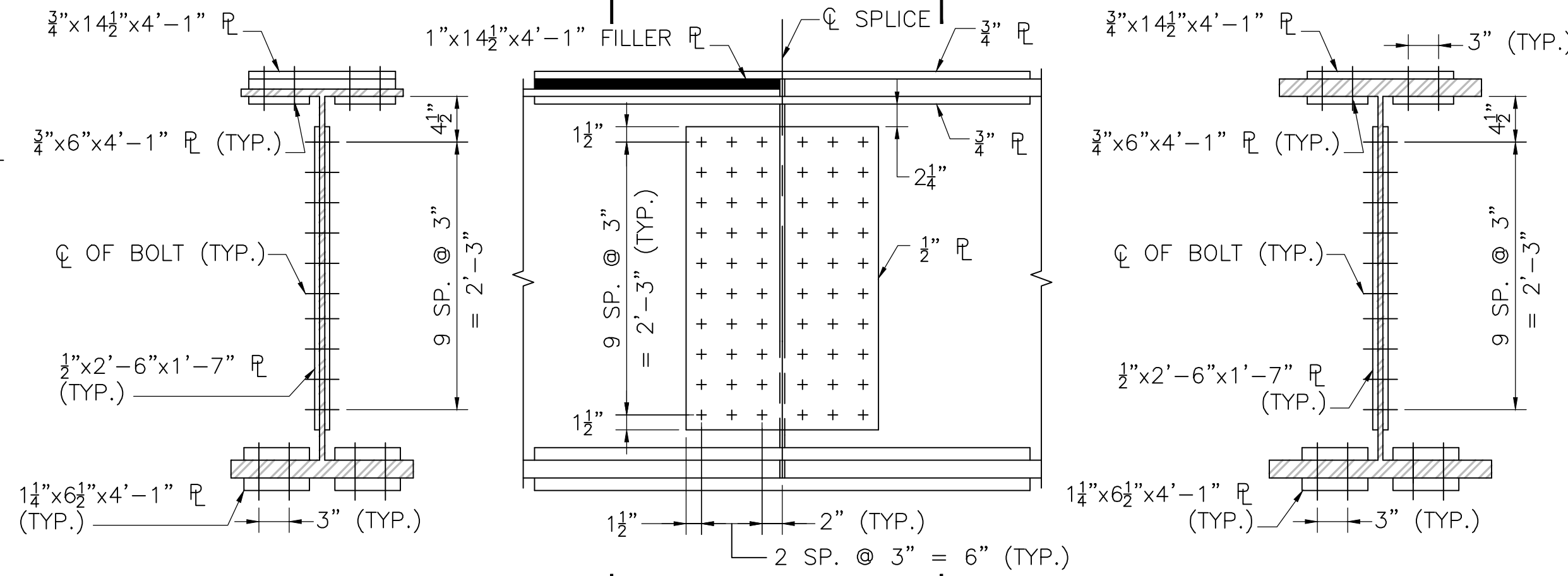
3/4" Ø STUDS MAY BE SUBSTITUTED FOR 3/8" Ø STUDS BY ADJUSTING THE PITCH TO PROVIDE AN EQUIVALENT CROSS-SECTIONAL AREA PER FOOT.

STUD SHEAR CONNECTORS

N.T.S.



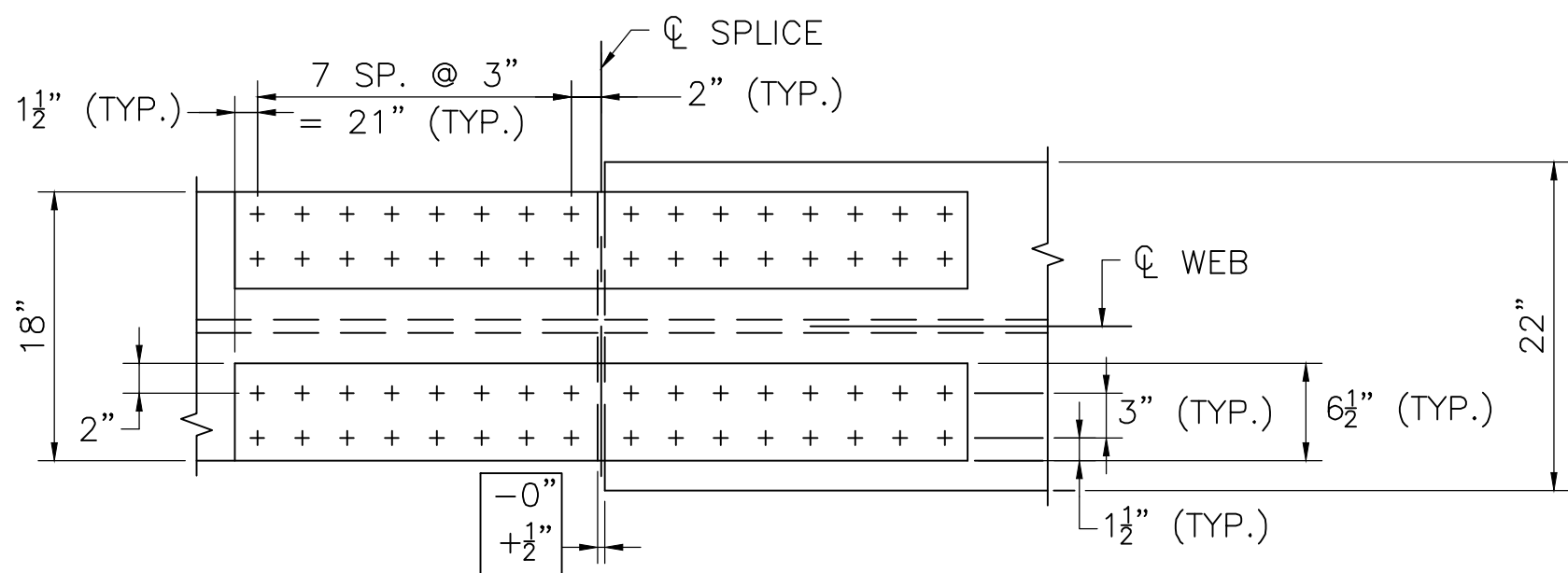
TOP FLANGE



SECTION 12

ELEVATION

SECTION 13



BOTTOM FLANGE

NOTES:

1. BOLTED FIELD SPLICES SHALL BE CONSIDERED SLIP-CRITICAL CONNECTIONS WITH CLASS C FAYING SURFACES.
2. + DENOTES 7/8" Ø AASHTO M 164 HIGH STRENGTH BOLT IN 1 1/8" Ø HOLE.
3. ONE ROW OF STUD SHEAR CONNECTORS SHALL BE PLACED ALONG THE CENTERLINE OF THE TOP FLANGE SPLICE PLATE.

BOLTED FIELD SPLICE DETAILS

SCALE: 1" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	102	158
PROJECT FILE NO. 606223			

TOF ELEVATIONS & CAMBER TABLE

GIRDER NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE									
	INCREASING STATIONS									
	℄ BRG. N. ABUT	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG. PIER	
1	148.21 ft	149.36 ft	150.35 ft	151.11 ft	151.63 ft	151.92 ft	152.04 ft	152.06 ft	152.03 ft	
2	148.55 ft	149.67 ft	150.60 ft	151.31 ft	151.79 ft	152.05 ft	152.16 ft	152.15 ft	152.11 ft	
3	148.89 ft	149.96 ft	150.84 ft	151.51 ft	151.95 ft	152.19 ft	152.26 ft	152.24 ft	152.16 ft	
4	149.22 ft	150.24 ft	151.08 ft	151.71 ft	152.12 ft	152.32 ft	152.37 ft	152.31 ft	152.21 ft	

GIRDER NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE									
	INCREASING STATIONS									
	℄ BRG. PIER	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	℄ BRG. S. ABUT	
1	152.03 ft	152.01 ft	151.96 ft	151.85 ft	151.63 ft	151.26 ft	150.72 ft	150.02 ft	149.17 ft	
2	152.11 ft	152.06 ft	151.98 ft	151.82 ft	151.55 ft	151.12 ft	150.53 ft	149.77 ft	148.88 ft	
3	152.16 ft	152.09 ft	151.97 ft	151.77 ft	151.45 ft	150.97 ft	150.33 ft	149.51 ft	148.56 ft	
4	152.21 ft	152.10 ft	151.95 ft	151.70 ft	151.34 ft	150.81 ft	150.11 ft	149.23 ft	148.24 ft	

NOTES:

1. AFTER THE BEAMS ARE ERECTED BUT BEFORE THE FORMS ARE BUILT, ELEVATIONS ON TOP OF THE FLANGE OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.
2. SEE FORM NOTES ON SHEET 22.

TOP OF FORM ELEVATIONS

CAMBER TABLE (INCHES)												
GIRDER NO.		℄ BRG. N. ABUT	SPAN NO. 1									
			0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	℄ BRG. PIER
1	STEEL DL DEFLECTION	0.00	1.32	2.45	3.24	3.59	3.47	2.94	2.13	1.26	0.48	0.00
	CONC. DL DEFLECTION	0.00	2.67	4.94	6.50	7.16	6.88	5.78	4.15	2.42	0.92	0.00
	S.D.L. DEFLECTION	0.00	0.22	0.40	0.53	0.59	0.58	0.50	0.36	0.22	0.08	0.00
	VERT. CURVE CAMBER	0.00	3.73	6.74	8.90	10.19	10.64	10.22	8.95	6.82	3.84	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.93	14.53	19.17	21.53	21.56	19.43	15.60	10.72	5.33	0.00
2	STEEL DL DEFLECTION	0.00	1.25	2.29	2.98	3.25	3.11	2.60	1.87	1.09	0.41	0.00
	CONC. DL DEFLECTION	0.00	2.52	4.61	5.98	6.49	6.16	5.11	3.63	2.09	0.79	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.37	0.49	0.53	0.51	0.43	0.31	0.18	0.07	0.00
	VERT. CURVE CAMBER	0.00	3.90	6.94	9.12	10.42	10.86	10.42	9.12	6.95	3.91	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.87	14.21	18.56	20.70	20.64	18.57	14.94	10.31	5.18	0.00
3	STEEL DL DEFLECTION	0.00	1.16	2.11	2.73	2.97	2.83	2.36	1.68	0.96	0.34	0.00
	CONC. DL DEFLECTION	0.00	2.35	4.25	5.48	5.93	5.60	4.63	3.27	1.85	0.65	0.00
	S.D.L. DEFLECTION	0.00	0.19	0.34	0.44	0.49	0.46	0.39	0.28	0.16	0.06	0.00
	VERT. CURVE CAMBER	0.00	3.97	7.06	9.27	10.59	11.03	10.59	9.26	7.06	3.97	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.67	13.76	17.92	19.97	19.92	17.97	14.49	10.02	5.02	0.00
4	STEEL DL DEFLECTION	0.00	1.05	1.93	2.51	2.75	2.62	2.18	1.54	0.87	0.30	0.00
	CONC. DL DEFLECTION	0.00	2.13	3.89	5.05	5.49	5.19	4.28	2.99	1.66	0.56	0.00
	S.D.L. DEFLECTION	0.00	0.17	0.31	0.41	0.45	0.43	0.36	0.25	0.14	0.05	0.00
	VERT. CURVE CAMBER	0.00	4.03	7.17	9.40	10.75	11.20	10.75	9.40	7.16	4.03	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	7.38	13.30	17.37	19.43	19.44	17.56	14.19	9.83	4.94	0.00

CAMBER TABLE (INCHES)												
GIRDER NO.		℄ BRG. PIER	SPAN NO. 2									
			0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	℄ BRG. S. ABUT
1	STEEL DL DEFLECTION	0.00	-0.06	0.17	0.57	1.01	1.38	1.57	1.52	1.20	0.67	0.00
	CONC. DL DEFLECTION	0.00	-0.12	0.34	1.12	2.01	2.79	3.20	3.11	2.47	1.37	0.00
	S.D.L. DEFLECTION	0.00	-0.01	0.03	0.11	0.18	0.24	0.27	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.36	5.97	7.84	8.96	9.33	8.96	7.84	5.97	3.36	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.18	6.52	9.63	12.16	13.74	14.00	12.72	9.85	5.51	0.00
2	STEEL DL DEFLECTION	0.00	0.00	0.27	0.68	1.10	1.45	1.60	1.51	1.18	0.65	0.00
	CONC. DL DEFLECTION	0.00	0.00	0.54	1.34	2.21	2.92	3.25	3.09	2.42	1.34	0.00
	S.D.L. DEFLECTION	0.00	0.00	0.05	0.12	0.20	0.25	0.27	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.42	6.08	7.98	9.12	9.50	9.12	7.98	6.08	3.42	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.43	6.94	10.12	12.63	14.12	14.24	12.84	9.89	5.52	0.00
3	STEEL DL DEFLECTION	0.00	0.05	0.35	0.77	1.20	1.53	1.67	1.56	1.22	0.67	0.00
	CONC. DL DEFLECTION	0.00	0.10	0.69	1.53	2.40	3.09	3.39	3.19	2.49	1.37	0.00
	S.D.L. DEFLECTION	0.00	0.01	0.06	0.14	0.21	0.27	0.29	0.26	0.20	0.11	0.00
	VERT. CURVE CAMBER	0.00	3.48	6.19	8.13	9.29	9.67	9.28	8.11	6.17	3.46	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.64	7.30	10.57	13.11	14.56	14.62	13.13	10.08	5.61	0.00
4	STEEL DL DEFLECTION	0.00	0.10	0.44	0.89	1.34	1.67	1.79	1.66	1.28	0.70	0.00
	CONC. DL DEFLECTION	0.00	0.19	0.86	1.75	2.66	3.36	3.63	3.39	2.63	1.44	0.00
	S.D.L. DEFLECTION	0.00	0.02	0.08	0.16	0.24	0.29	0.31	0.28	0.21	0.12	0.00
	VERT. CURVE CAMBER	0.00	3.52	6.26	8.21	9.36	9.72	9.30	8.08	6.08	3.28	0.00
	ADDITIONAL CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL CAMBER	0.00	3.83	7.64	11.01	13.59	15.04	15.03	13.42	10.20	5.53	0.00

CAMBER TABLE

NOTE:

ALL CAMBER DIMENSIONS ARE INCHES.

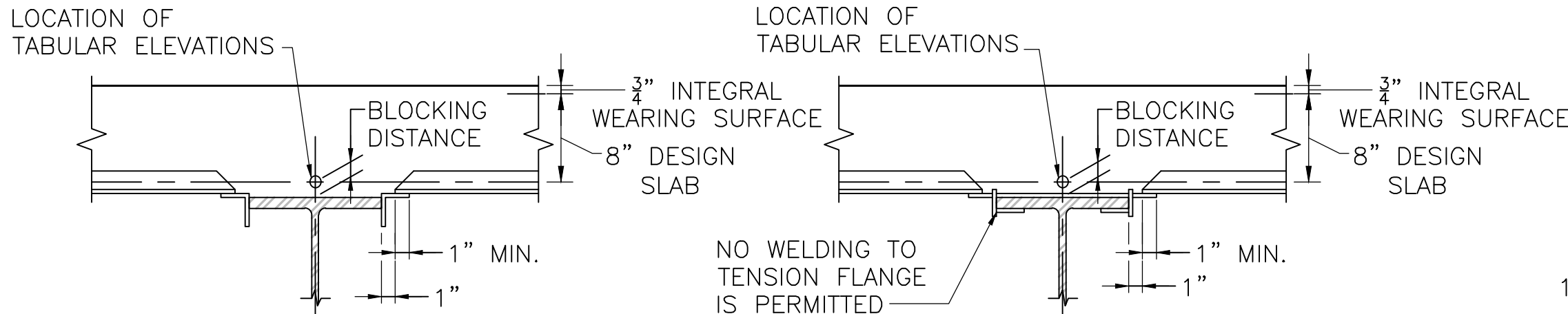
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	103	158
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DECK SECTION AND DETAILS

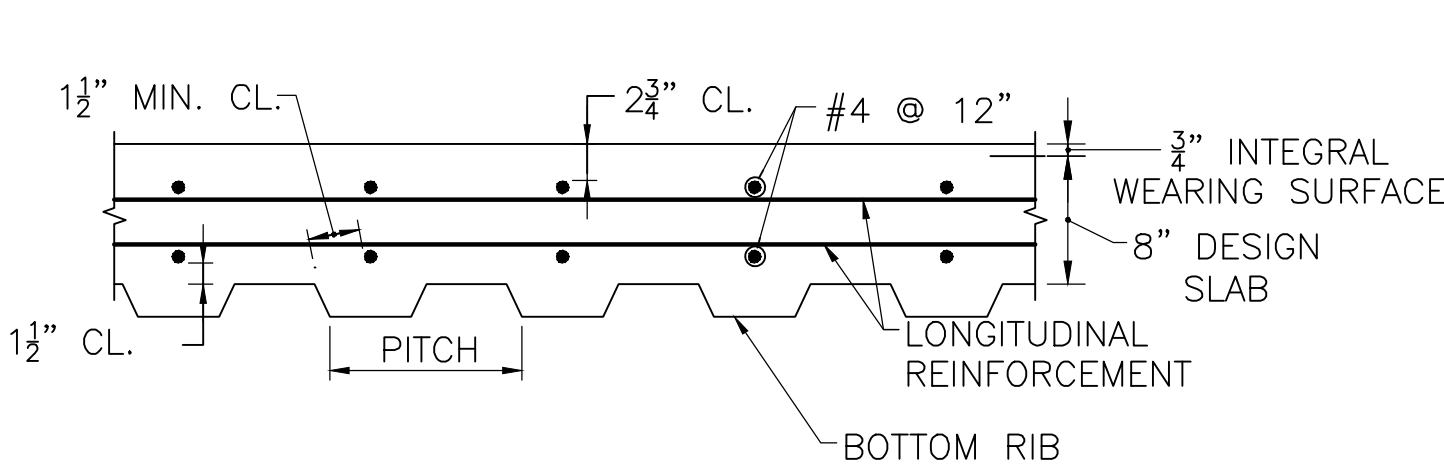
FORM NOTES:

- SET TOP OF FORMS AT ELEVATIONS GIVEN IN TABLE.
- FILL THE VALLEYS OF THE S.I.P. FORM WITH EXPANDED POLYSTYRENE (EPS).
- FORM ENDS SHALL BE CRIMPED CLOSED IN A TAPERED MANNER. TAPER THE EPS FILL AND SEPARATE END CLOSURE PIECES WILL NOT BE ALLOWED.
- SUPPORT ANGLES SHALL BE PLACED IN THE "LEG DOWN" POSITION WHERE POSSIBLE. WHERE "LEG UP" POSITION IS NECESSARY, THE UPPER MOST PORTION OF THE ANGLE SHALL NOT PROJECT MORE THAN 1" ABOVE THE TOP FLANGE. THE CONTRACTOR SHALL HAVE AN ASSORTMENT OF ANGLES OF VARIOUS SIZES AVAILABLE ON THE SITE TO CONFORM TO THIS REQUIREMENT.
- CONTRACTOR SHALL DESIGN AND DETAIL ALL ELEMENTS OF THE FORMING SYSTEM AND SHALL SUBMIT TO THE ENGINEER FOR APPROVAL.
- IN CASES WHERE STANDARD 2" OR 3" DEEP S.I.P. FORMS DO NOT SATISFY DESIGN REQUIREMENTS AN ALTERNATIVE FORMING SYSTEM CONSISTING OF DEEPER S.I.P. FORMS OR REMOVABLE FORMS SHALL BE DESIGNED AND DETAILS BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL. THE DESIGN THICKNESS OF THE SLAB SHALL NOT BE REDUCED.
- S.I.P. FORMS MAY NOT BE USED WITHIN A DISTANCE OF 4'-0" ON BOTH SIDES OF THE DECK TRANSVERSE CONSTRUCTION JOINTS.



HAUNCH DETAIL AT
NON-TENSION FLANGE AREA

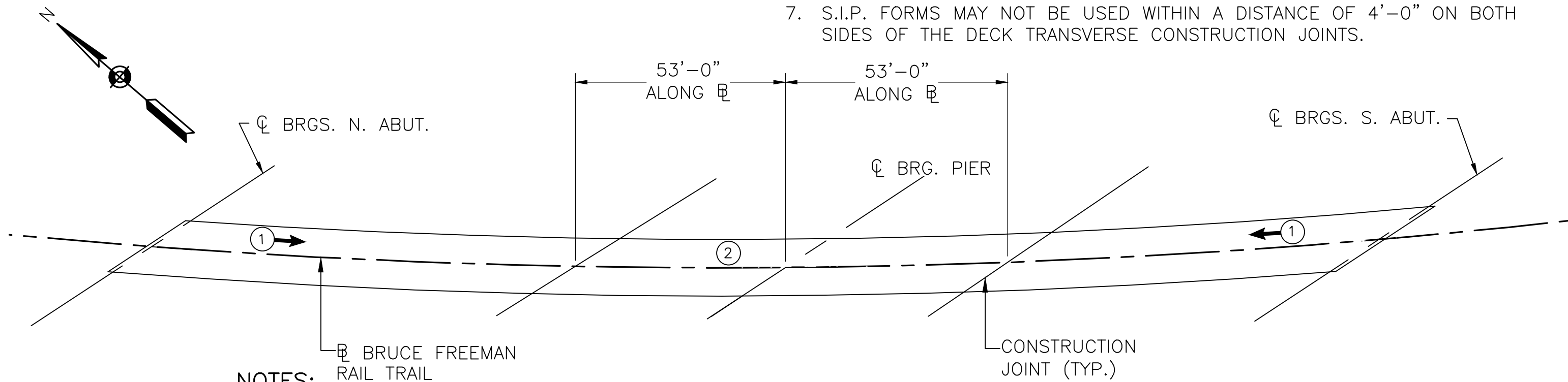
HAUNCH DETAIL AT
TENSION FLANGE AREA



STAY-IN-PLACE FORM

FORM DETAILS
NOT TO SCALE

REMOVABLE FORM



NOTES:

- INDICATES POSITIVE MOMENT REGION
- INDICATES NEGATIVE MOMENT REGION
- INDICATES DIRECTION OF PLACEMENT

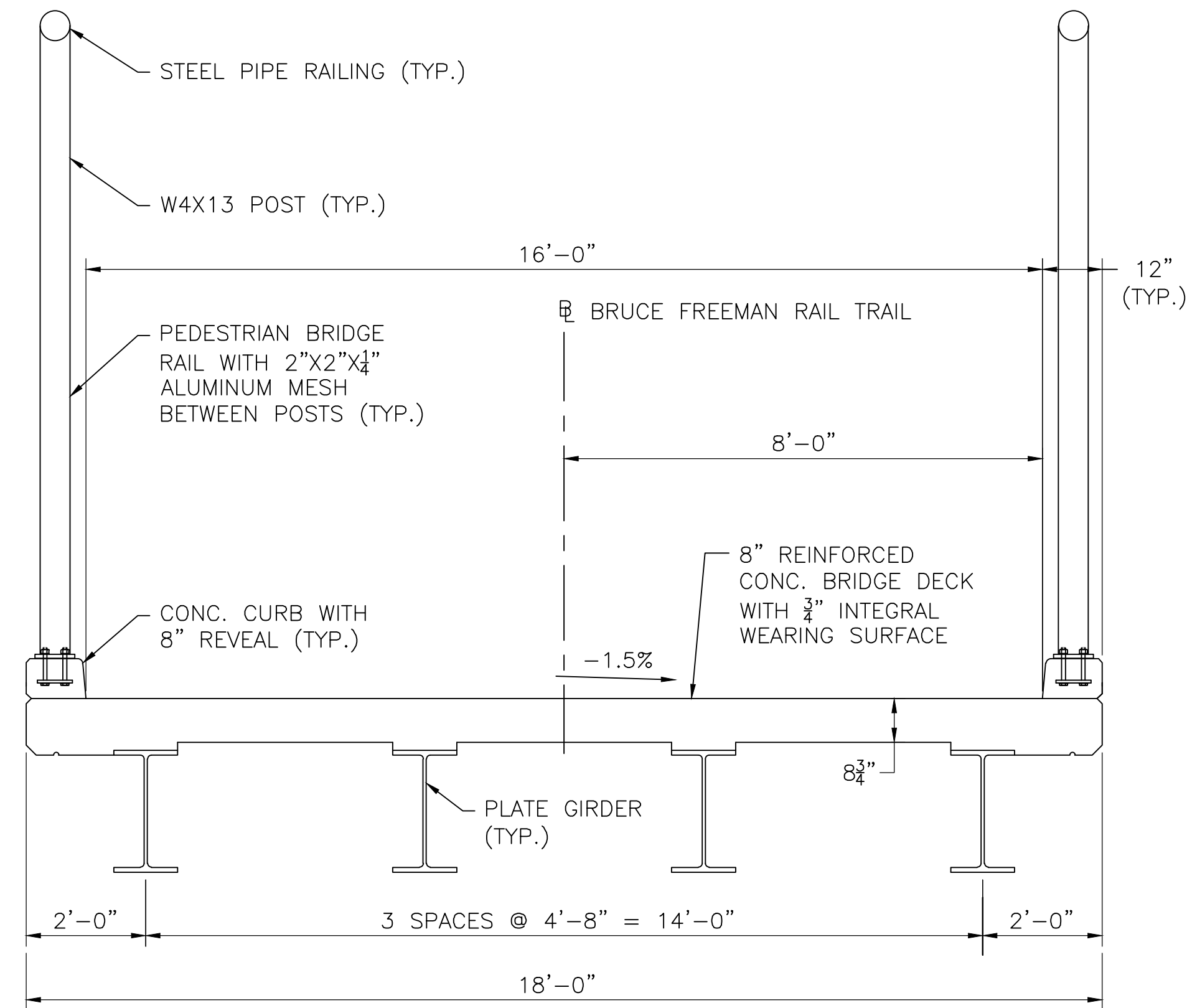
DECK PLACEMENT SEQUENCE
NOT TO SCALE

SAFETY CURB NOTES:

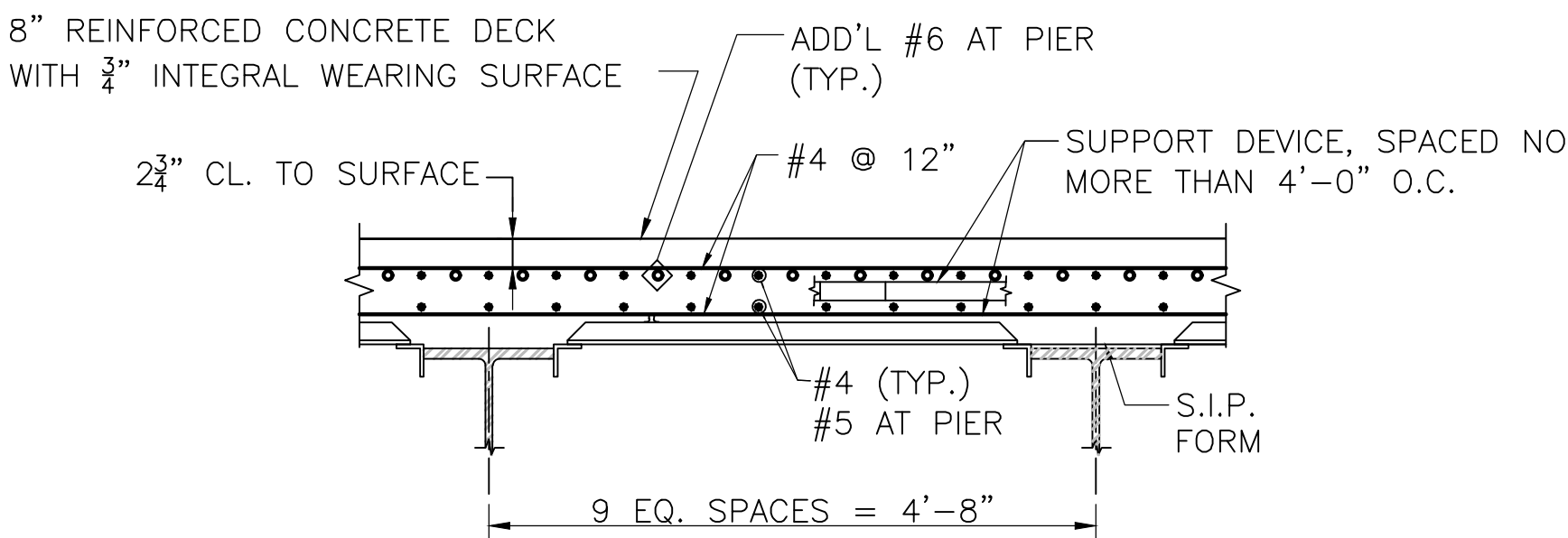
- METHACRYLATE CRACK SEALER SHALL BE APPLIED AFTER SAFETY CURB CURING PERIOD IS COMPLETE AND IN ACCORDANCE WITH REQUIREMENTS OF MANUFACTURER AND THE STANDARD SPECIFICATIONS.
- BEFORE SEALING, THE CONCRETE AT THE INTERFACE OF DECK AND CURB SHALL BE SWEEPED CLEAN AND BLOWN OFF USING OIL FREE COMPRESSED AIR IMMEDIATELY PRIOR TO APPLYING THE SEALER.
- APPLY 1/4" HIGH BEAD OF SILICONE CAULKING COMPOUND ABOUT 1/4" FROM THE FACE OF CURB.
- METHACRYLATE SHALL THEN BE POURED INTO THE 1/4" WIDE GAP BETWEEN THE FACE OF CURB AND THE BEAD OF CAULK.

CONSTRUCTION JOINT NOTES:

- BRIDGE DECK SLAB SHALL BE PLACED IN ACCORDANCE WITH THE PLACEMENT SEQUENCE SHOWN ON THE PLANS. THE CONTRACTOR MAY PLACE THE ENTIRE DECK IN ONE CONTINUOUS OPERATION WITHOUT CONSTRUCTION JOINTS WITH THE APPROVAL OF THE ENGINEER PROVIDED THAT THE INITIAL SET ($F_c = 500$ PSI) OF ALL CONCRETE DOES NOT OCCUR UNTIL AFTER THE COMPLETION OF THE PLACEMENT. AN APPROVED RETARDER SHALL BE USED, WHEN NECESSARY, TO RETAIN THE WORKABILITY OF THE CONCRETE. IF MULTIPLE PLACEMENTS ARE MADE, POSITIVE MOMENT REGIONS SHALL BE PLACED PRIOR TO NEGATIVE MOMENT REGIONS AND A MINIMUM OF 72 HOURS SHALL PASS BETWEEN PLACEMENTS.
- THE SURFACE OF THE PREVIOUSLY CAST CONCRETE SHALL BE BLAST CLEANED, ROUGHENED, WETTED WITH CLEAN WATER, AND THEN FLUSHED WITH A MORTAR COMPOSED OF EQUAL PARTS OF THE CEMENT AND SAND SPECIFIED FOR THE NEW CONCRETE, BEFORE NEW CONCRETE IS PLACED ADJACENT THERETO. NEW CONCRETE SHALL BE PLACED BEFORE MORTAR HAS TAKEN INITIAL SET.
- IN LIEU OF THE MORTAR, AN EPOXY ADHESIVE SUITABLE FOR BONDING FRESH CONCRETE TO HARDENED CONCRETE FOR LOAD BEARING APPLICATIONS MAY BE USED. THE EPOXY ADHESIVE SHALL CONFORM TO AASHTO M 235 TYPE V AND SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- DOWEL BAR SPLICERS SHALL BE USED WHERE USE OF LAP SPLICES IS NOT FEASIBLE.



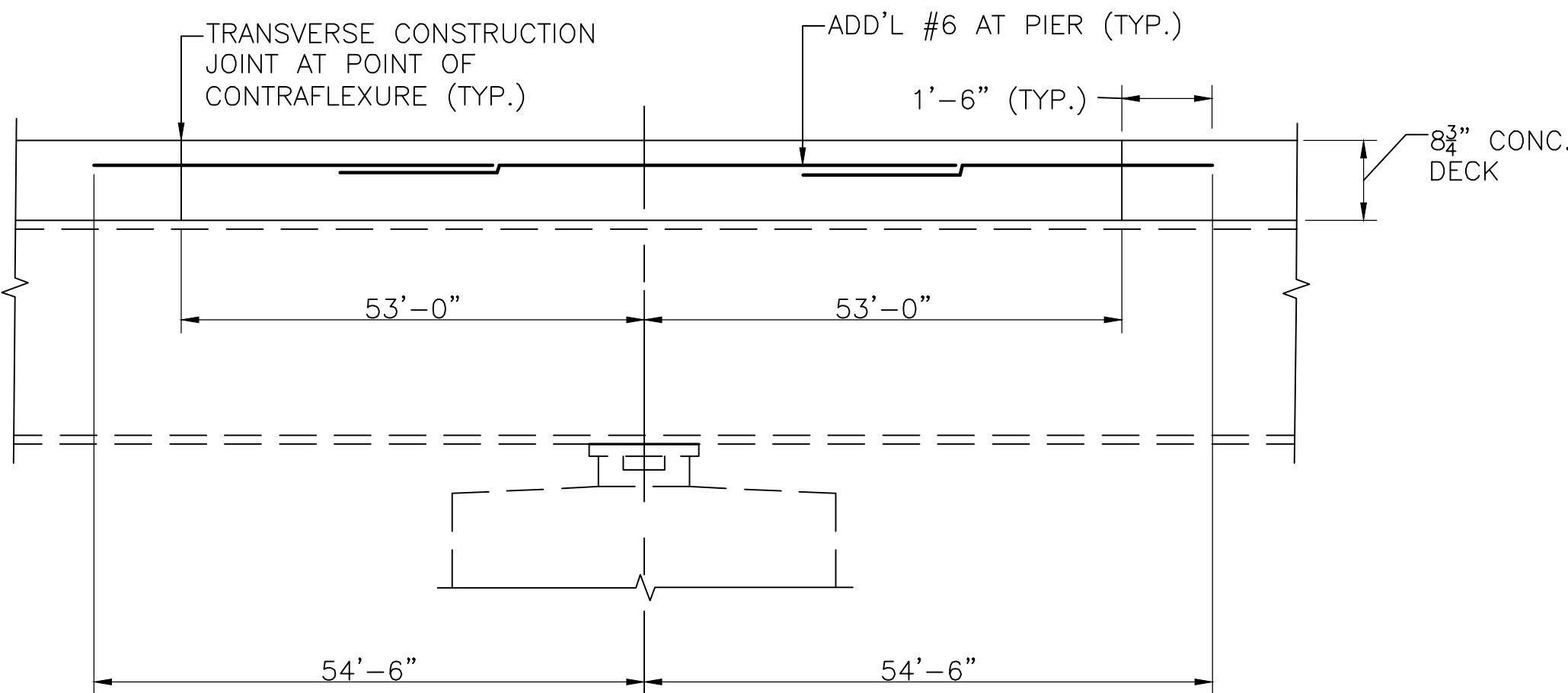
TYPICAL BRIDGE DECK SECTION
SCALE: 1/2" = 1'-0"



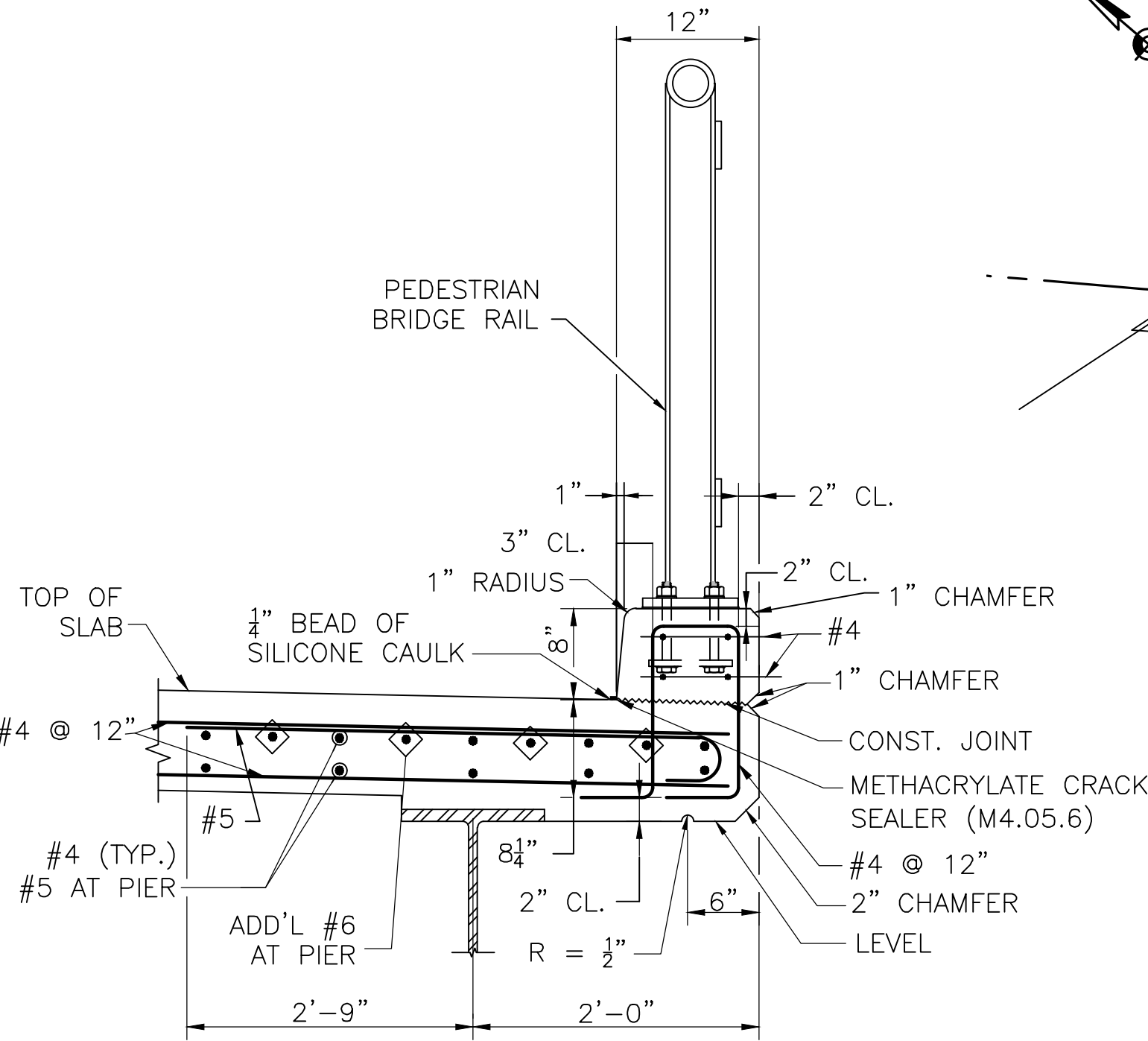
NOTES:

- ROADWAY DECK SLAB SHALL BE 4000 PSI, 3/4 IN, 585 HP CEMENT CONCRETE.
- LONGITUDINAL REINFORCEMENT SHALL BE PLACED PARALLEL TO THE CL OF CONSTRUCTION. TRANSVERSE (PRIMARY) REINFORCEMENT SHALL BE PLACED PERPENDICULAR TO THE CL OF CONSTRUCTION.
- ALL REINFORCEMENT AND SUPPORT DEVICES SHALL BE COATED.
- BRIDGE DECK SHALL BE GROOVED TRANSVERSELY USING MULTI-BLADE SELF-PROPELLED SAWCUTTING EQUIPMENT.

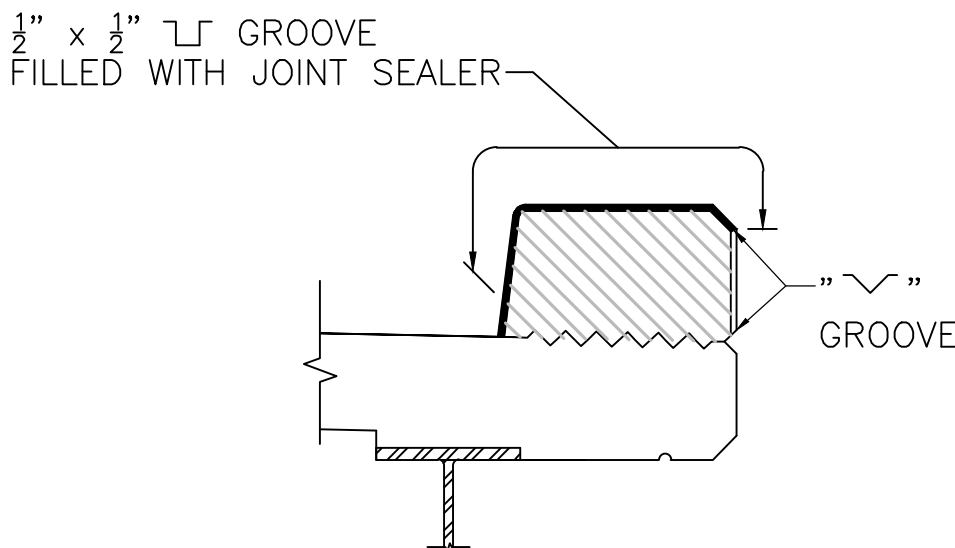
TYPICAL DECK REINFORCEMENT
SCALE: 3/4" = 1'-0"



TYPICAL DECK REINFORCEMENT AT PIER
NOT TO SCALE



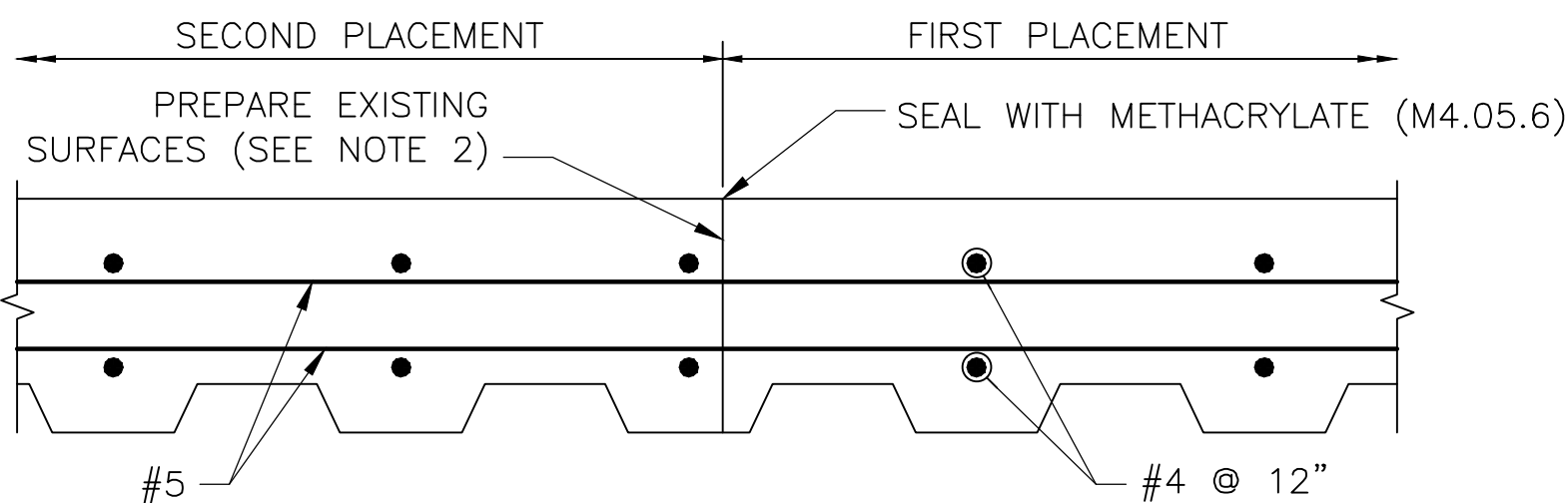
SECTION THRU SAFETY CURB
SCALE: 1" = 1'-0"



SAFETY CURB NOTES:

- ALL CONCRETE ABOVE SLAB SHALL BE POURED IN ALTERNATING SECTIONS WITH NOT LESS THAN 3 DAYS BETWEEN POURS.
- DO NOT CARRY LONGITUDINAL BARS THROUGH THE PARAFFIN JOINTS. END THE REINFORCEMENT 2" CLEAR OF JOINT.
- JOINT SHALL BE SQUARE TO FACE OF CURB

SAFETY CURB DETAIL
SCALE: 3/4" = 1'-0"



TRANSVERSE CONSTRUCTION JOINT
DETAIL IN DECK SLAB
SCALE: 1 1/2" = 1'-0"

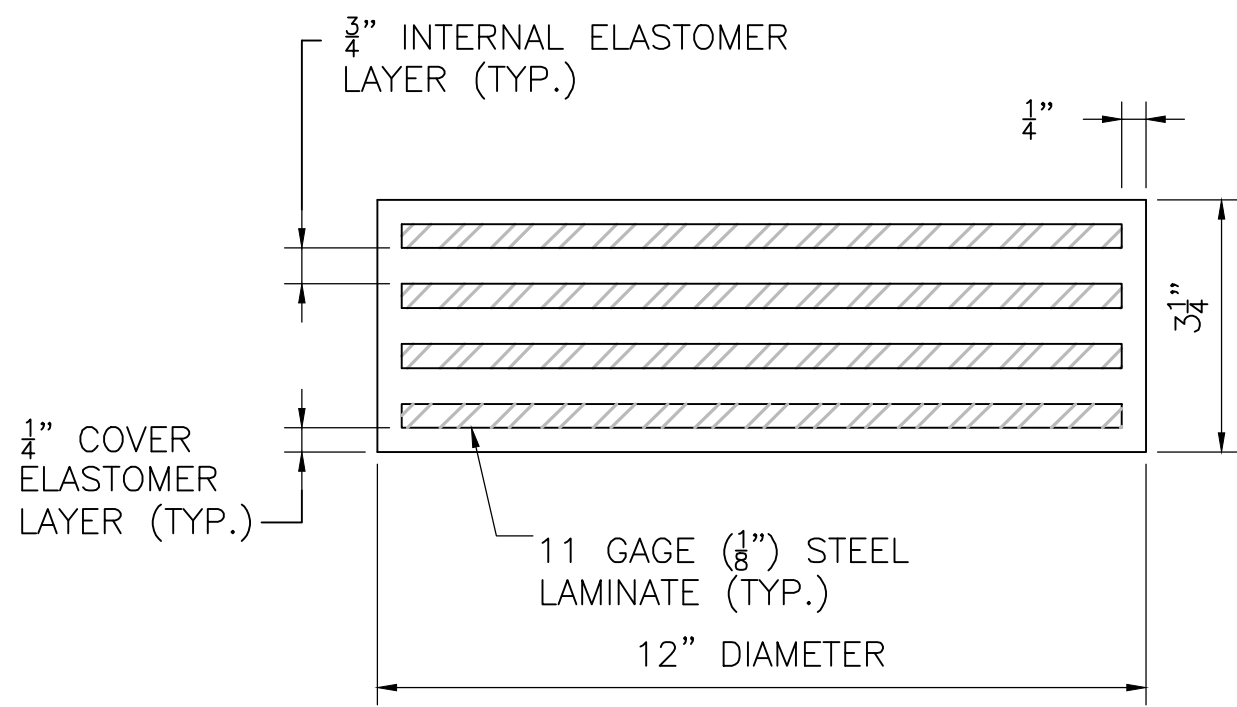
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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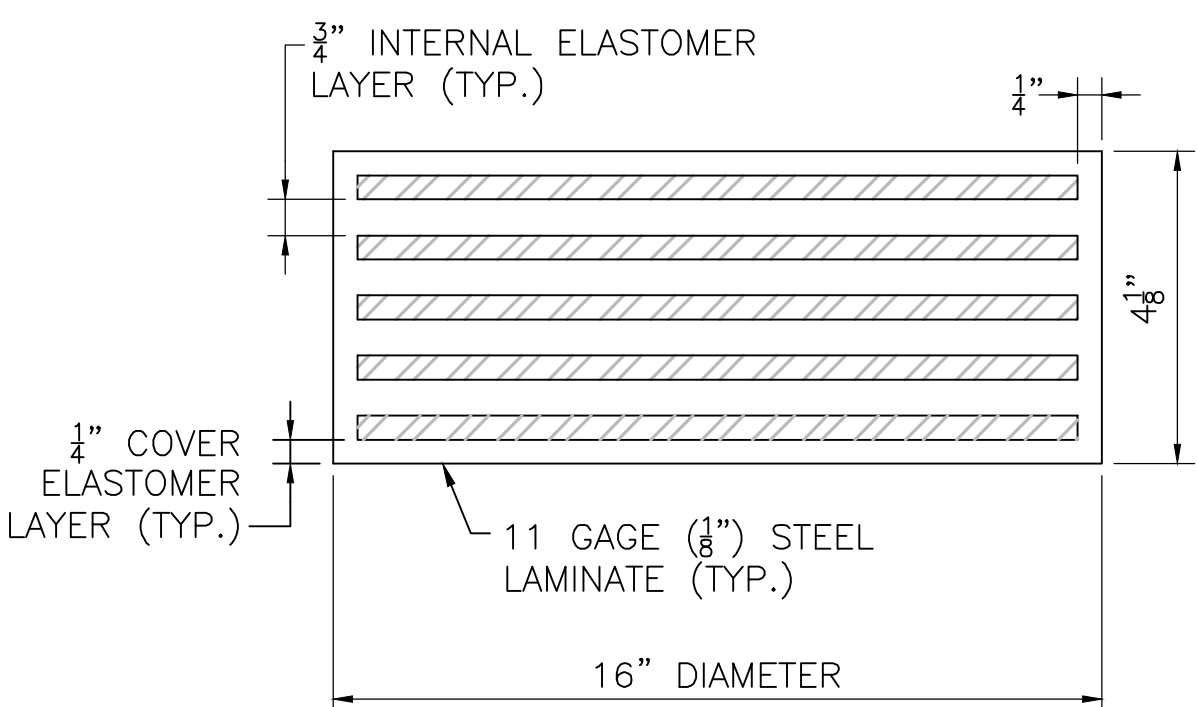
BEARING DETAILS

NOTES:

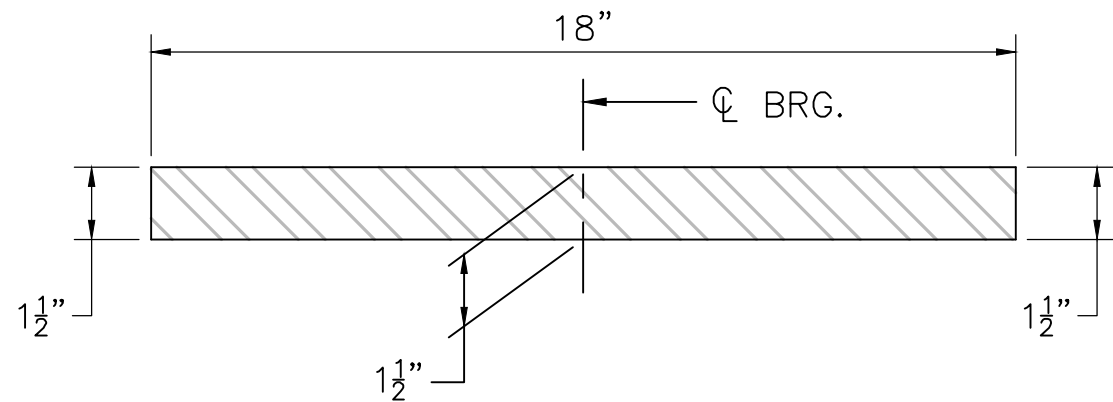
- ELASTOMER SHALL HAVE A HARDNESS OF 60 DUROMETER.
- STEEL LAMINATES SHALL CONFORM TO ASTM A 1011 GRADE 36.
- THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD LOCATED AT THE ABUTMENTS IS 121.30 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 1.073 KSI.
- THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD LOCATED AT THE PIER IS 285.04 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 1.418 KSI.
- ELASTOMERIC BEARING PAD SHALL NOT BE VULCANIZED TO THE SOLE PLATE.



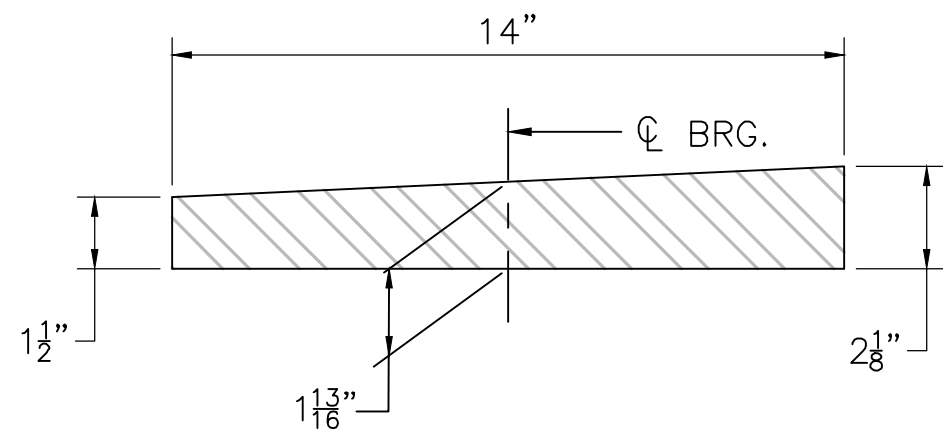
TYPICAL ELASTOMERIC BEARING PAD AT ABUTMENTS
NOT TO SCALE



TYPICAL ELASTOMERIC BEARING PAD AT PIER
NOT TO SCALE



TYPICAL SOLE PLATE DETAIL AT PIER
SCALE: 3" = 1'-0"

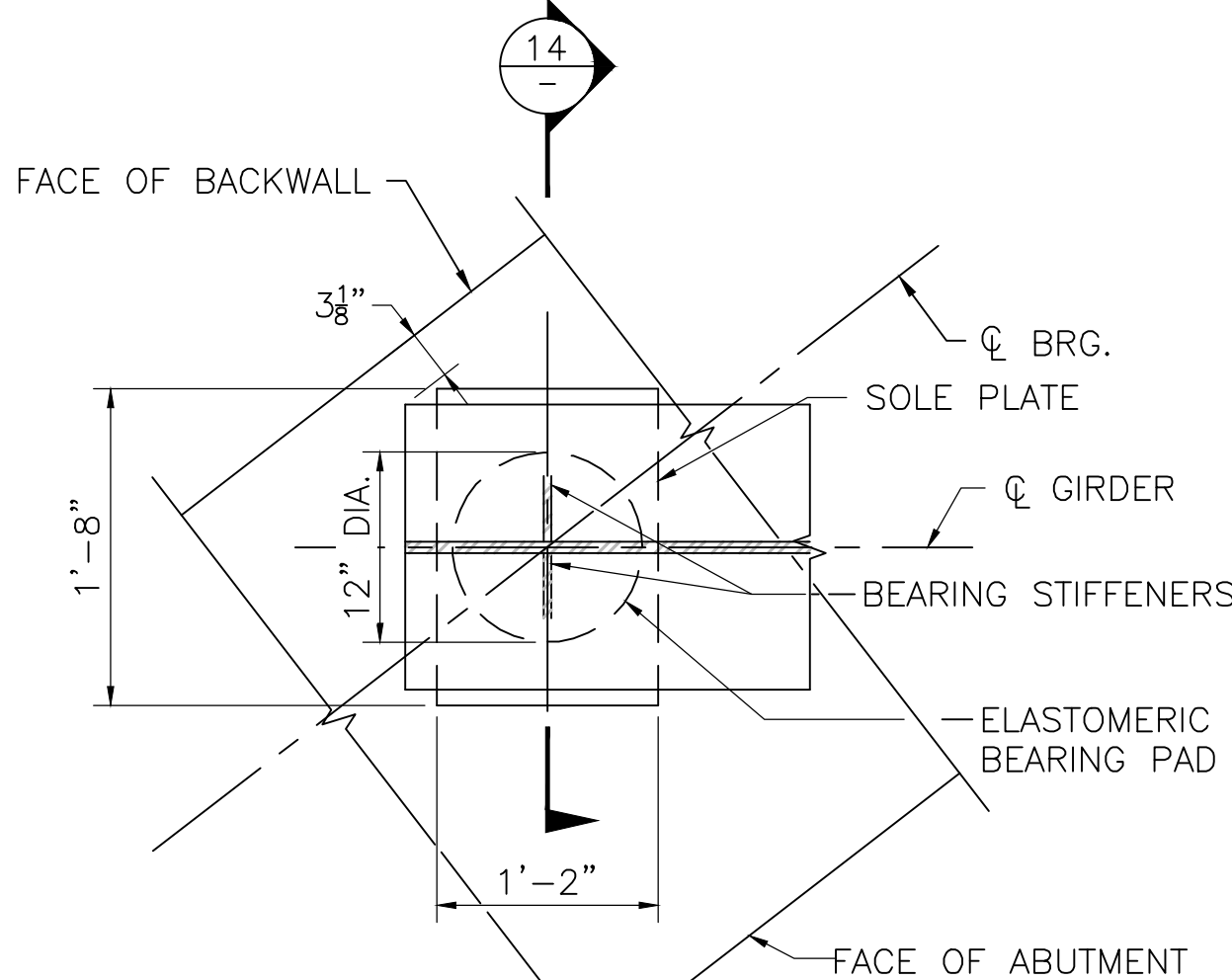


TYPICAL SOLE PLATE DETAIL AT ABUTMENTS
SCALE: 3" = 1'-0"

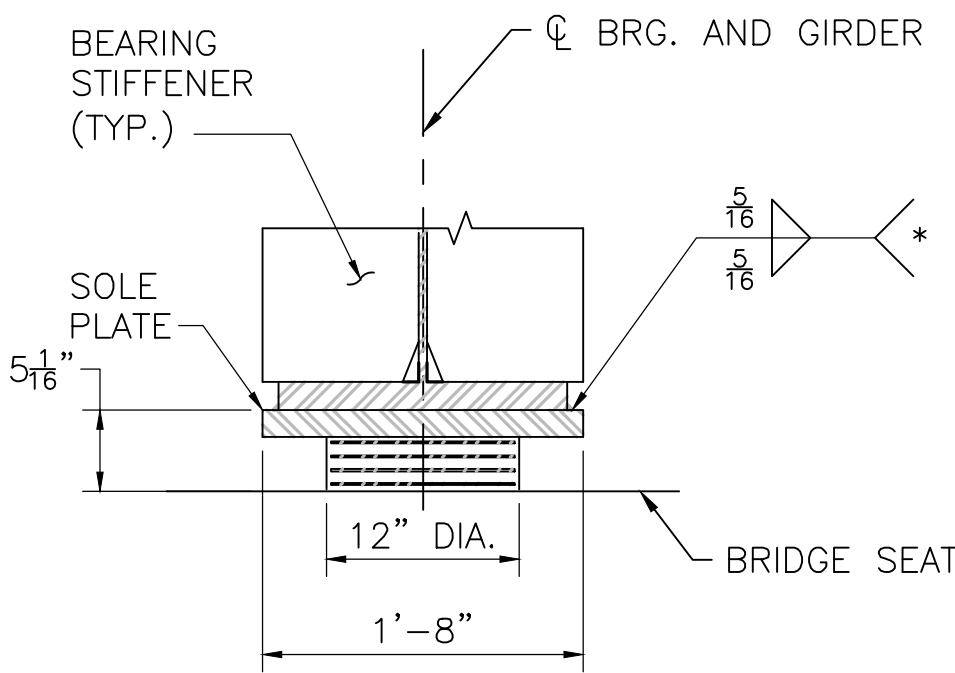
BEARING NOTES:

- STEEL SOLE PLATE SHALL CONFORM TO AASHTO M 270 GRADE 36 AND SHALL BE HOT-DIP GALVANIZED.
- CENTER THE ELASTOMERIC PAD UNDER THE SOLE PLATE DURING BEAM ERECTION.
- BEAMS SHALL BE ERECTED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 50 °F AND 77 °F. IF BEAMS ARE ERECTED AT OTHER AMBIENT TEMPERATURES, THEY WILL HAVE TO BE JACKED AND THE ELASTOMERIC BEARINGS RECENTERED WHEN THE TEMPERATURE RETURNS TO THAT RANGE.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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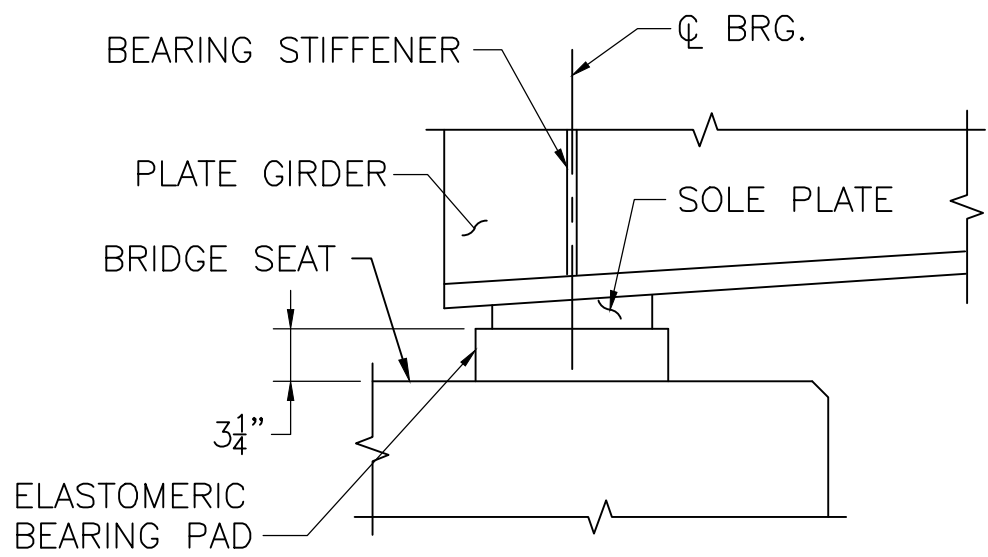


PLAN
SCALE: 1" = 1'-0"

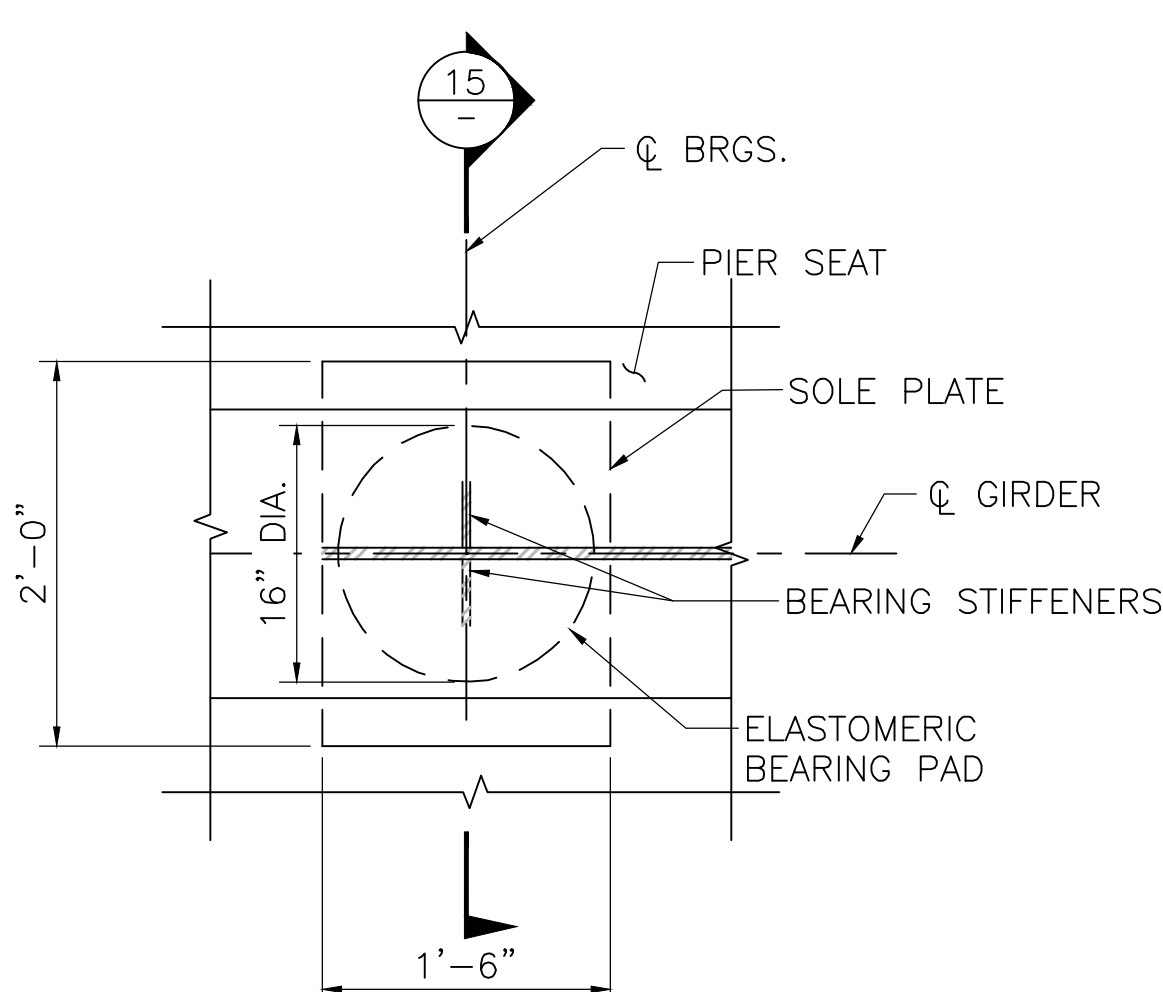


(*) - WELDS SHALL TERMINATE 1/4" FROM EDGE OF PLATE.

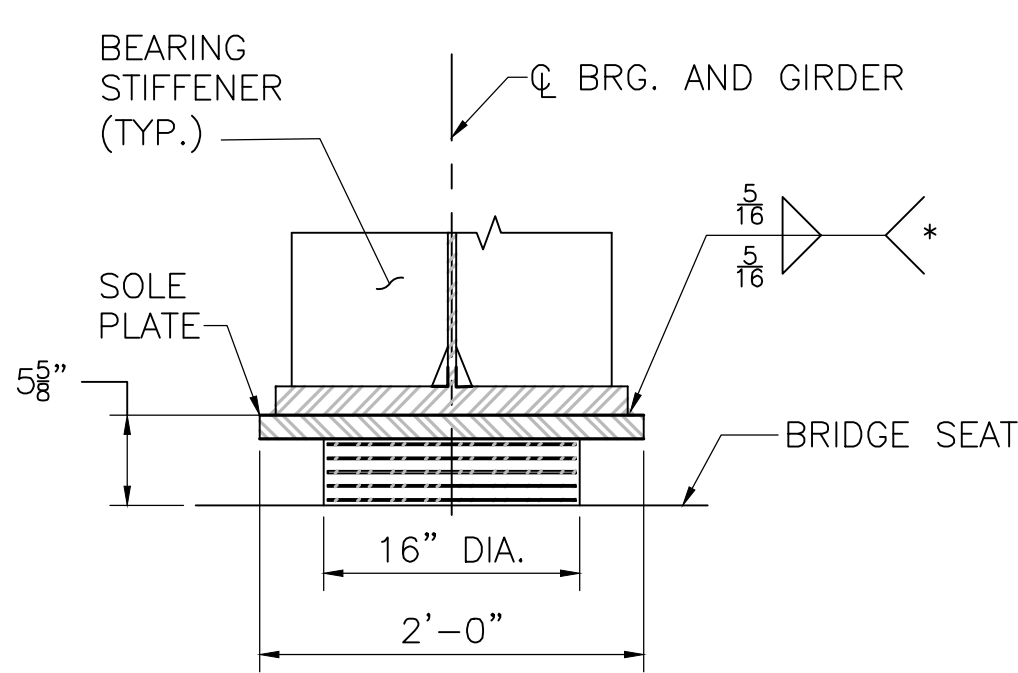
SECTION 14
SCALE: 1" = 1'-0"



ELEVATION
SCALE: 1" = 1'-0"

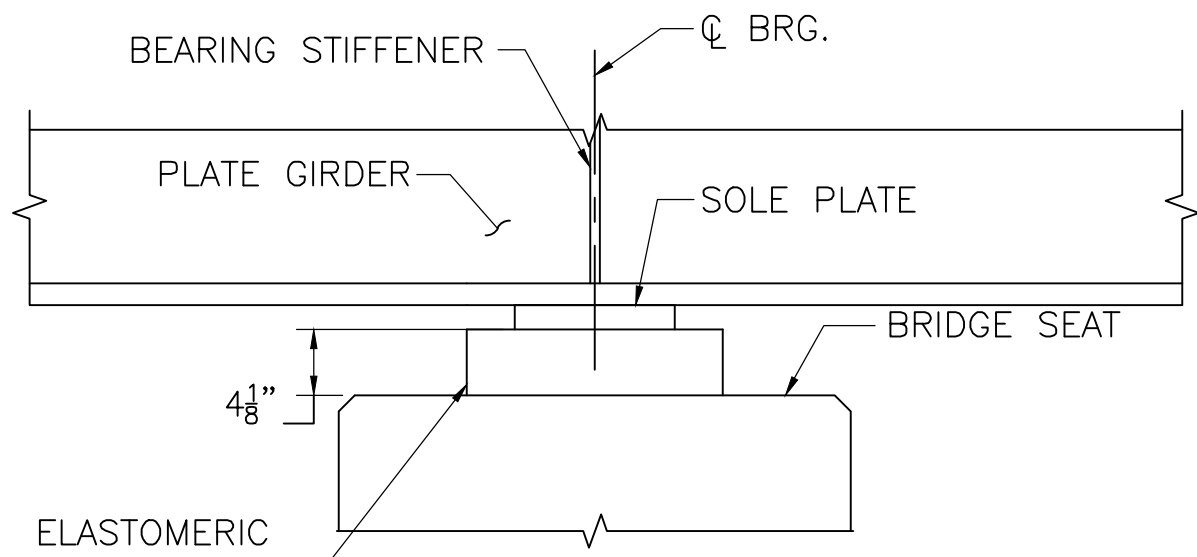


PLAN
SCALE: 1" = 1'-0"



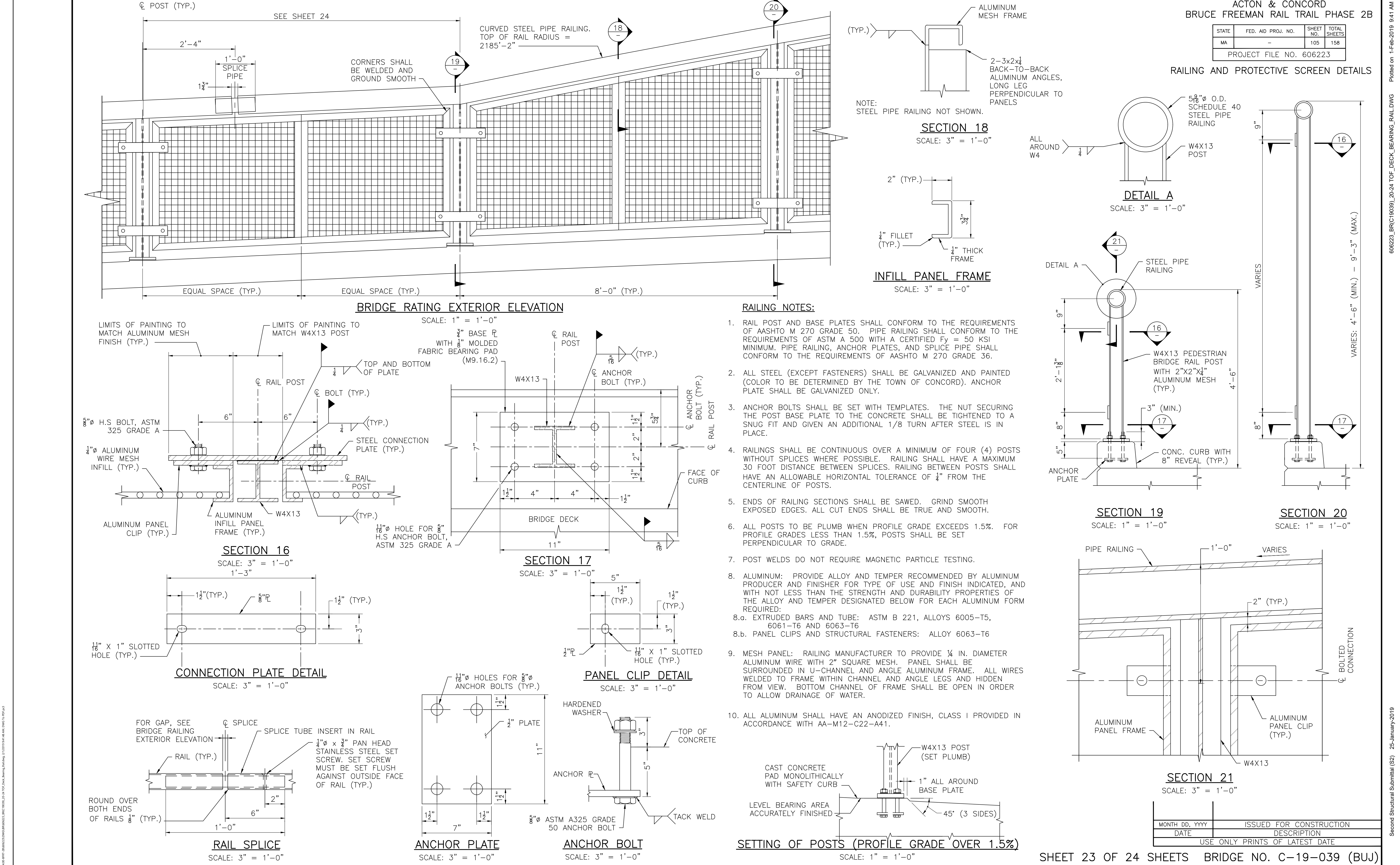
(*) - WELDS SHALL TERMINATE 1/4" FROM EDGE OF PLATE.

SECTION 15
SCALE: 1" = 1'-0"



ELEVATION
SCALE: 1" = 1'-0"

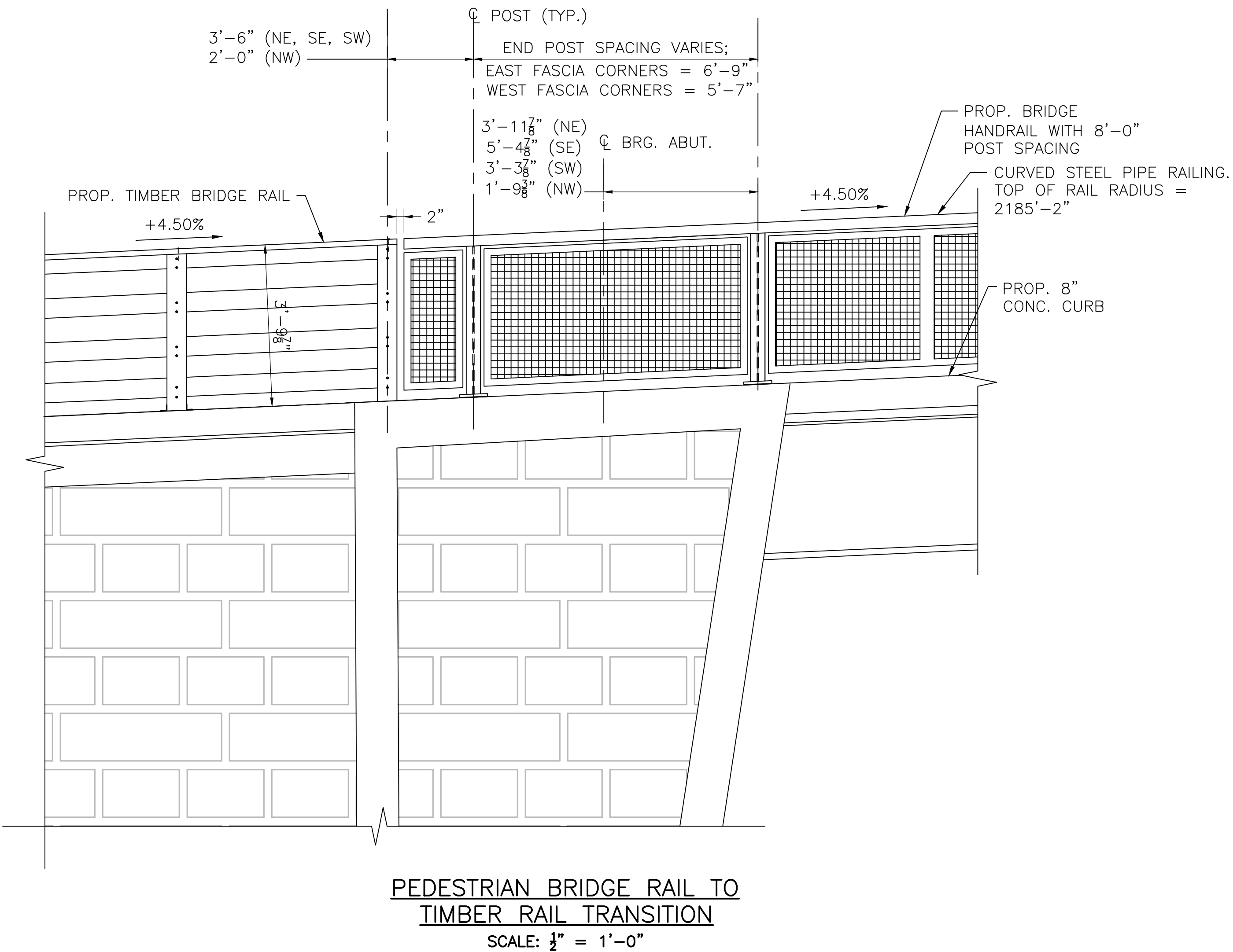
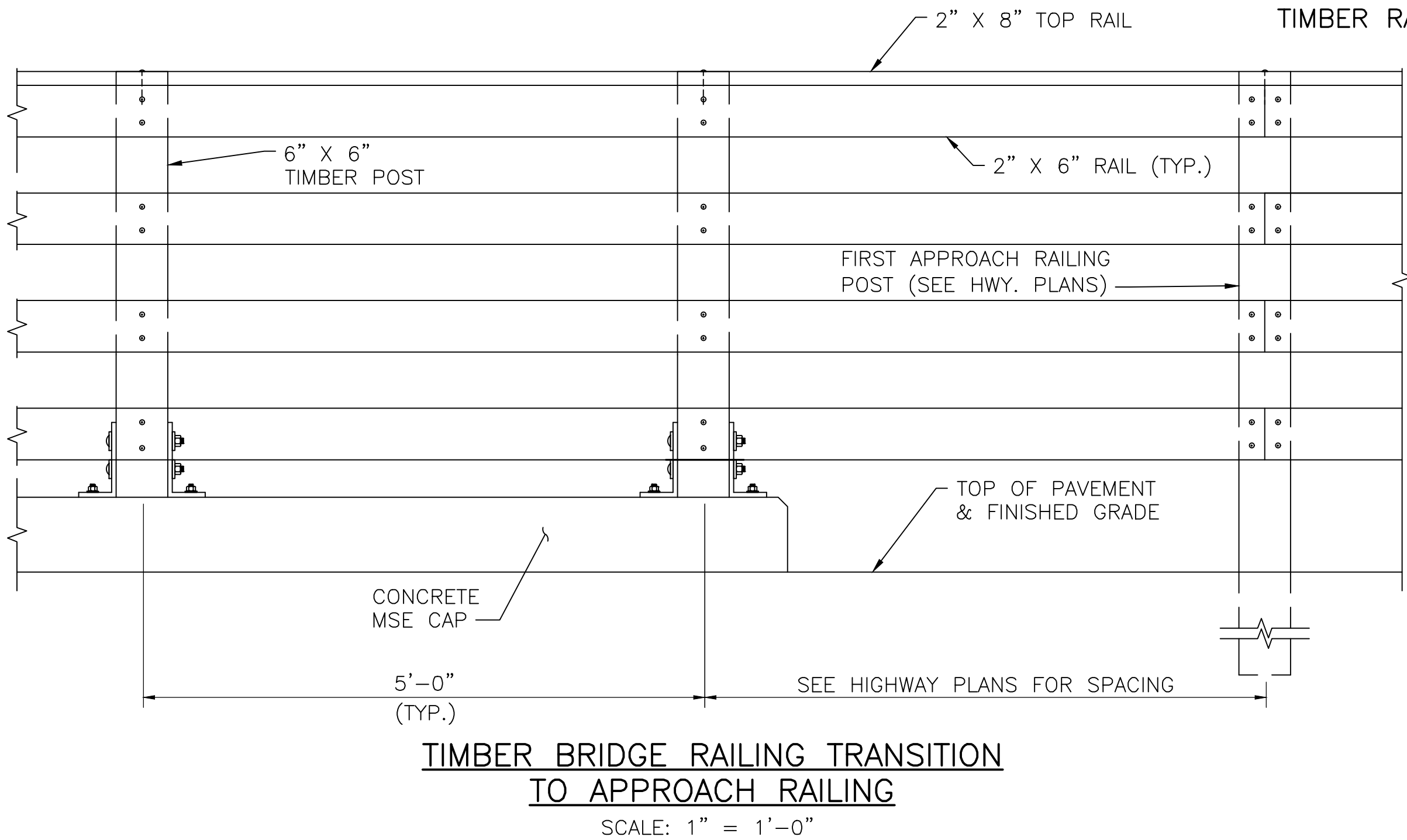
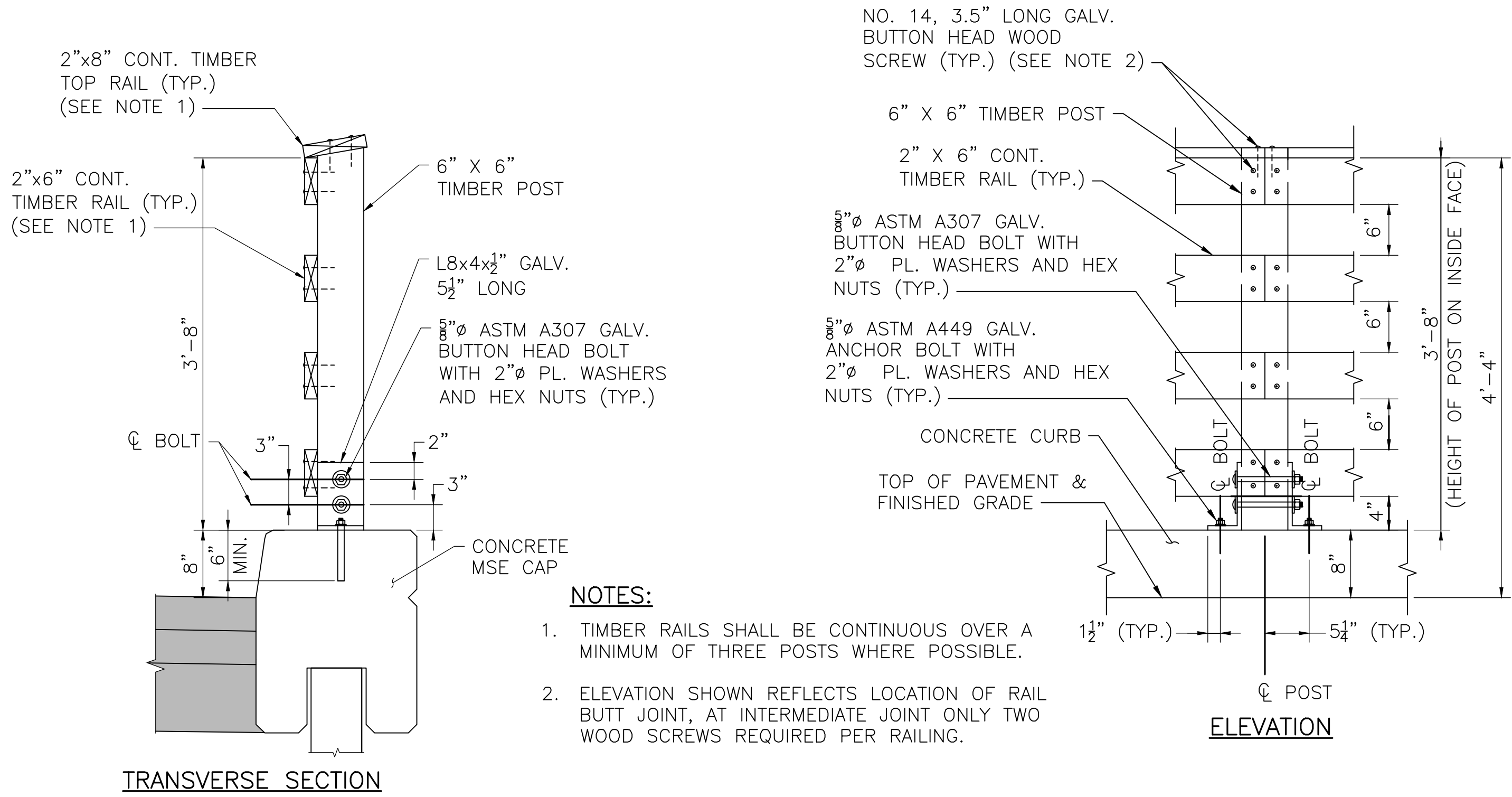
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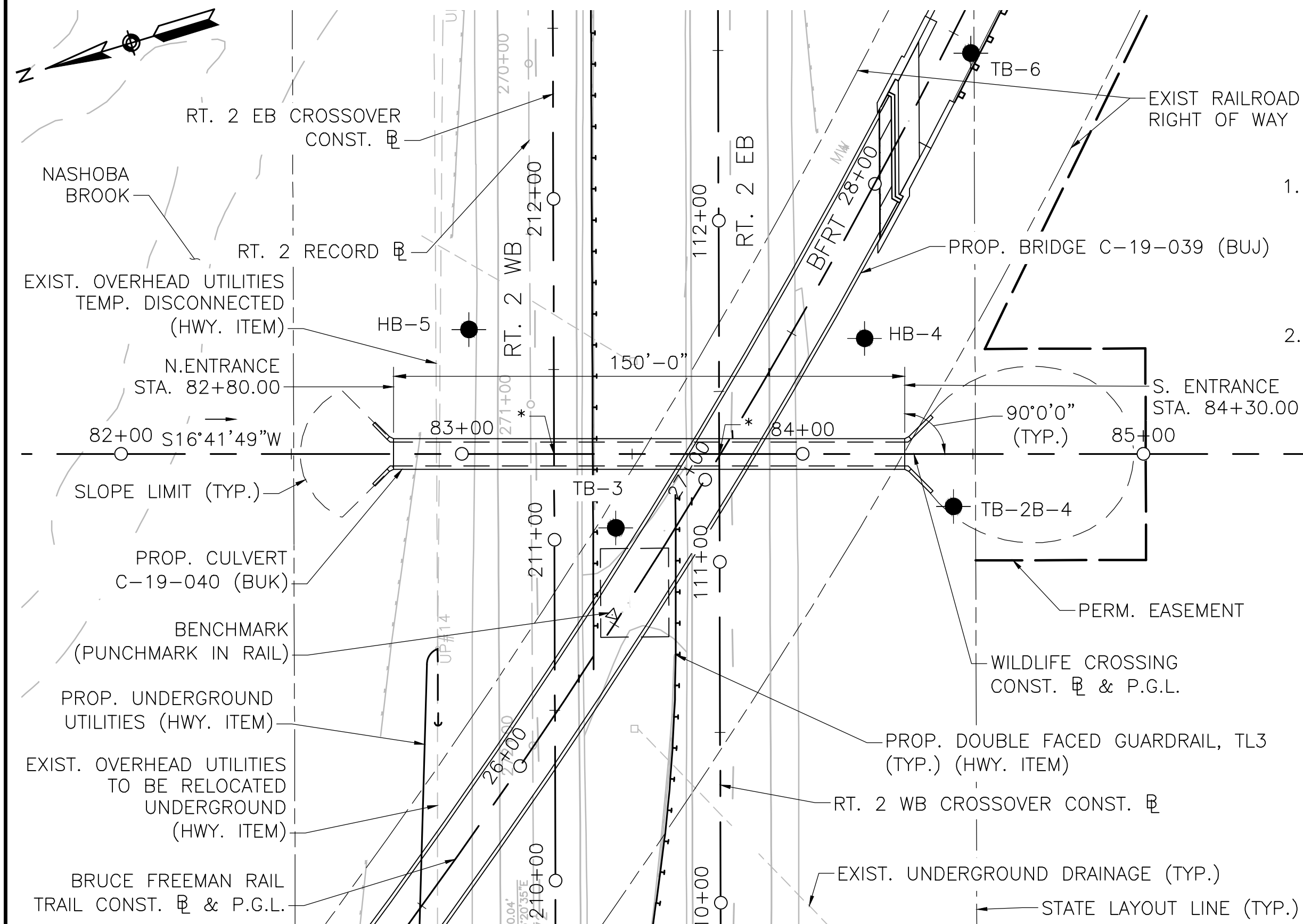
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	106	158
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606223_BR(C19039)_20-24 TOF_DECK_BEARING_RAIL.DWG Plotted on 1-Feb-2019 9:41 AM

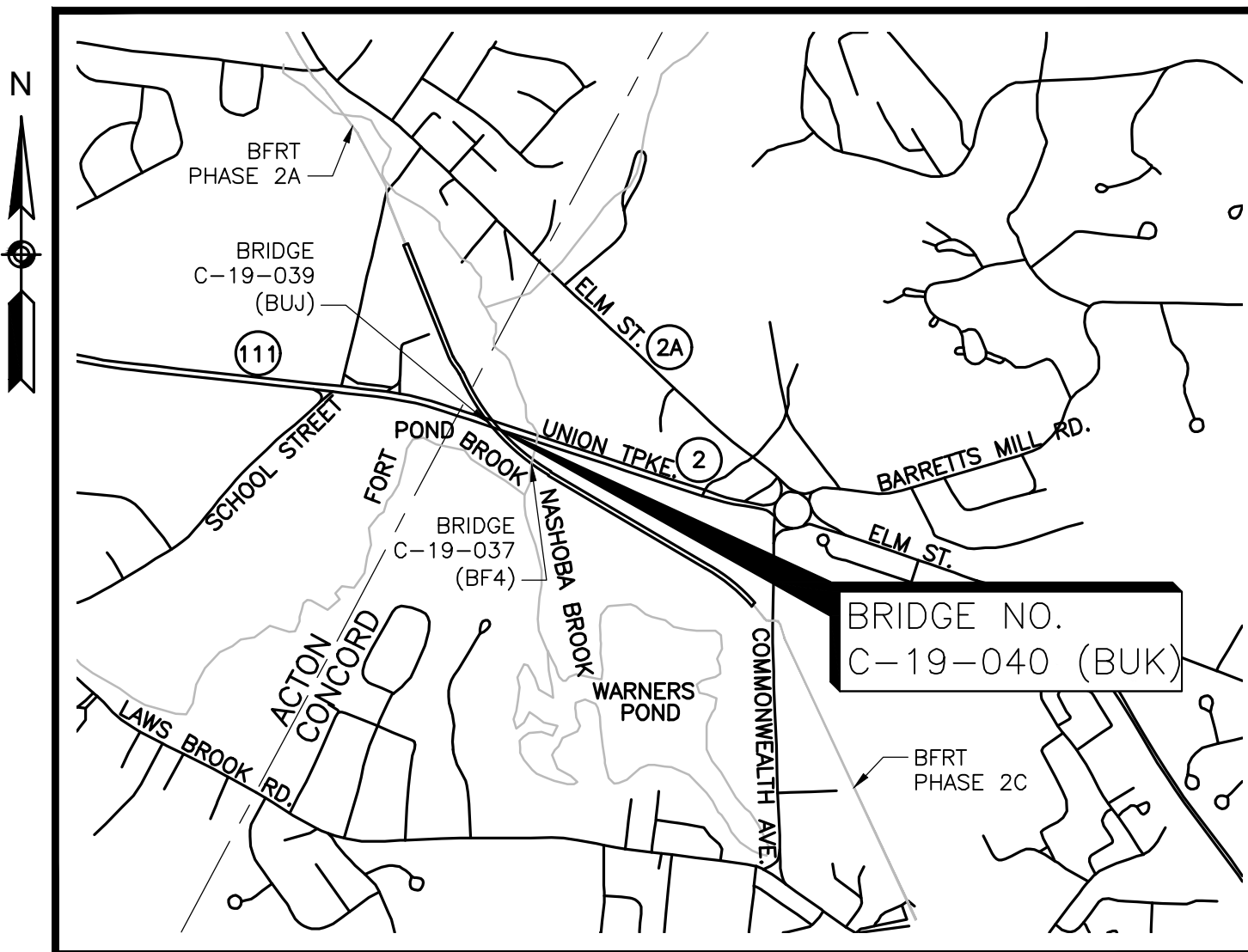
Second Structural Submittal (S2) 25-January-2019



MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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USE ONLY PRINTS OF LATEST DATE	



- NOTES:**
- RT. 2 EB & WB CROSSOVER BASELINES ARE SHOWN SINCE THEY WILL BE IN PLACE DURING CULVERT CONSTRUCTION. REFER TO CONSTRUCTION STAGING PLANS FOR ADDITIONAL DETAILS.
 - ROUTE 2 RECORD BASELINE IS SHOWN FOR REFERENCE ONLY.



LOCUS
SCALE: 1" = 1500'

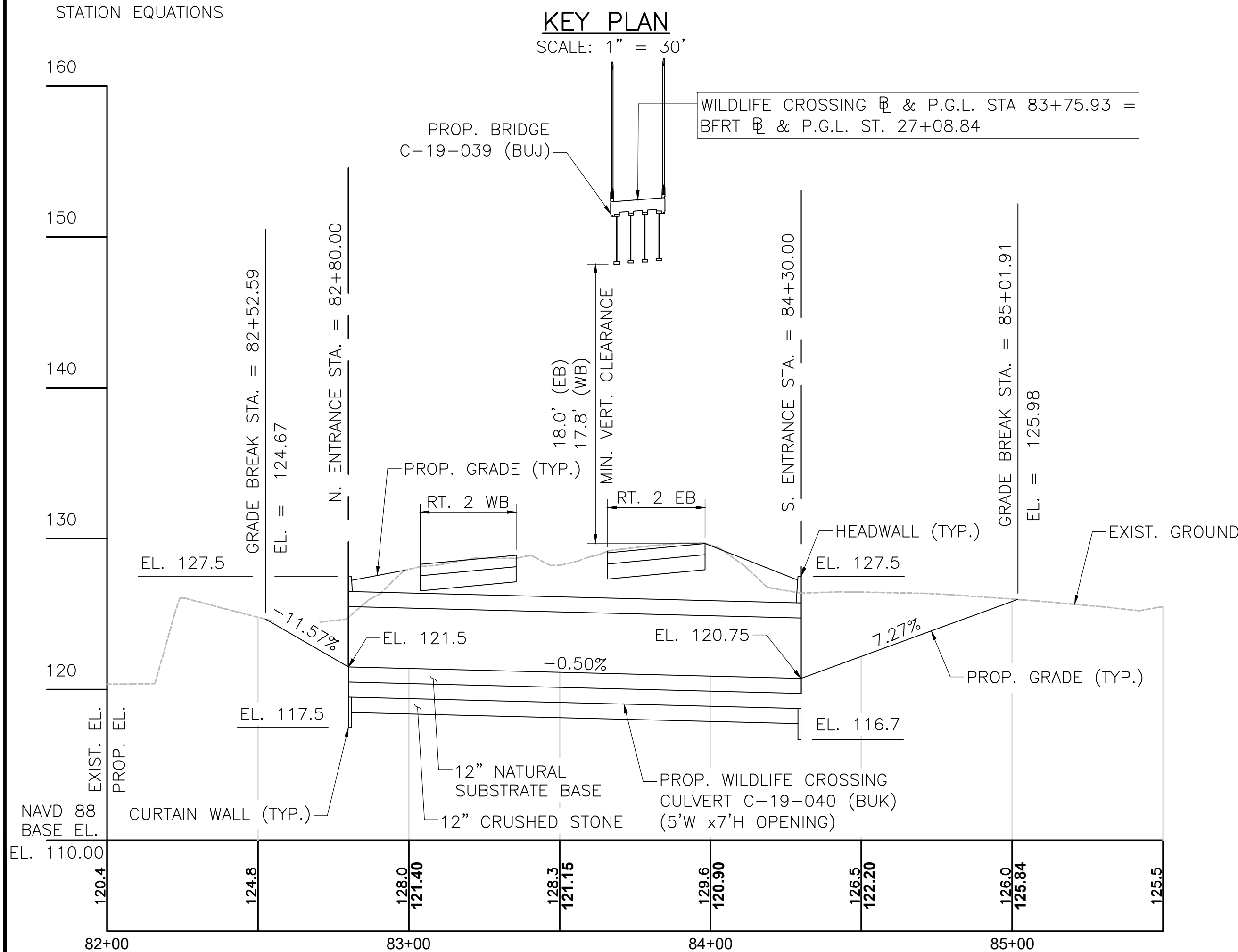
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	107	158
PROJECT FILE NO. 606223			

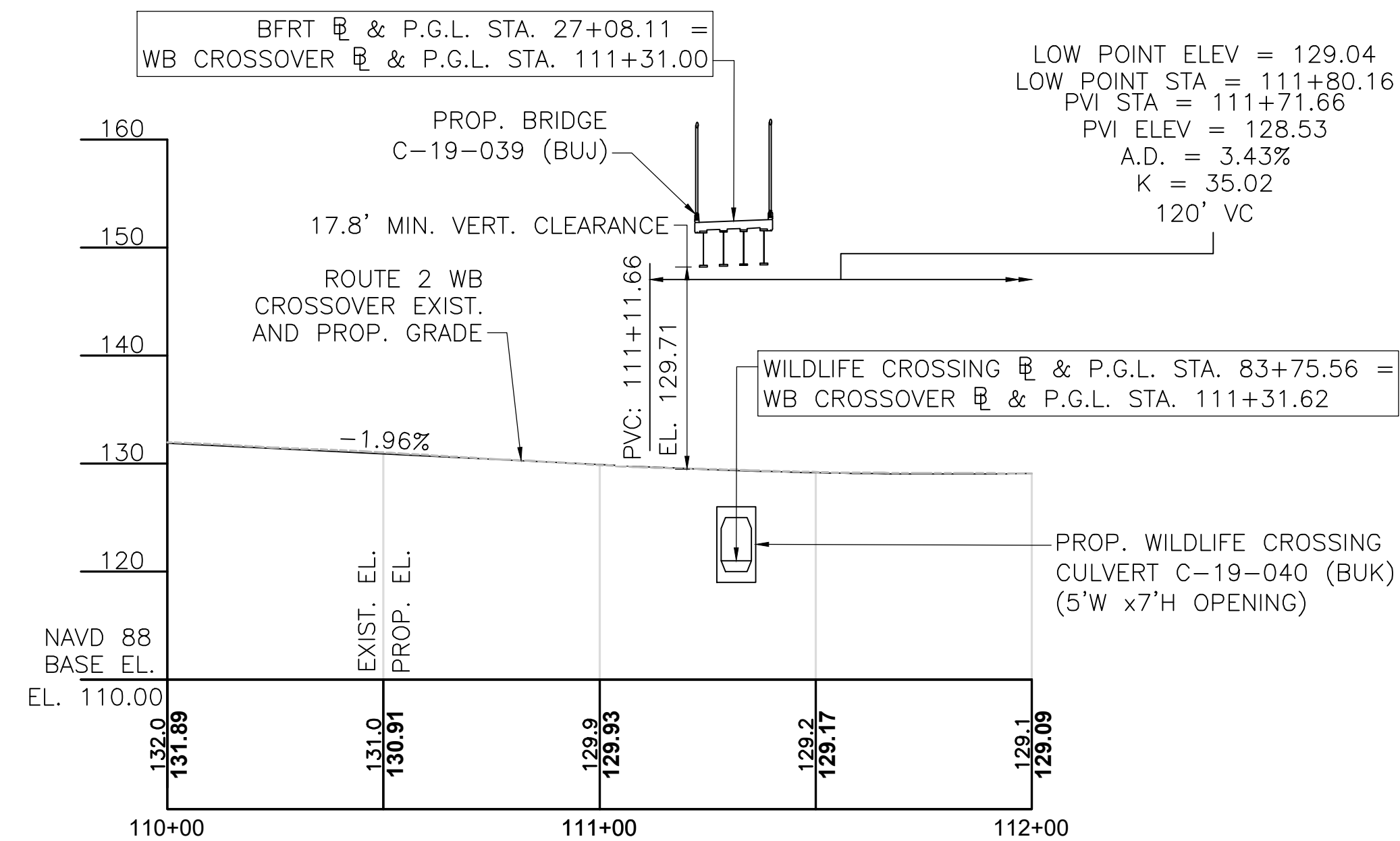
KEY PLAN, LOCUS MAP
& PROFILES

INDEX OF BRIDGE SHEETS

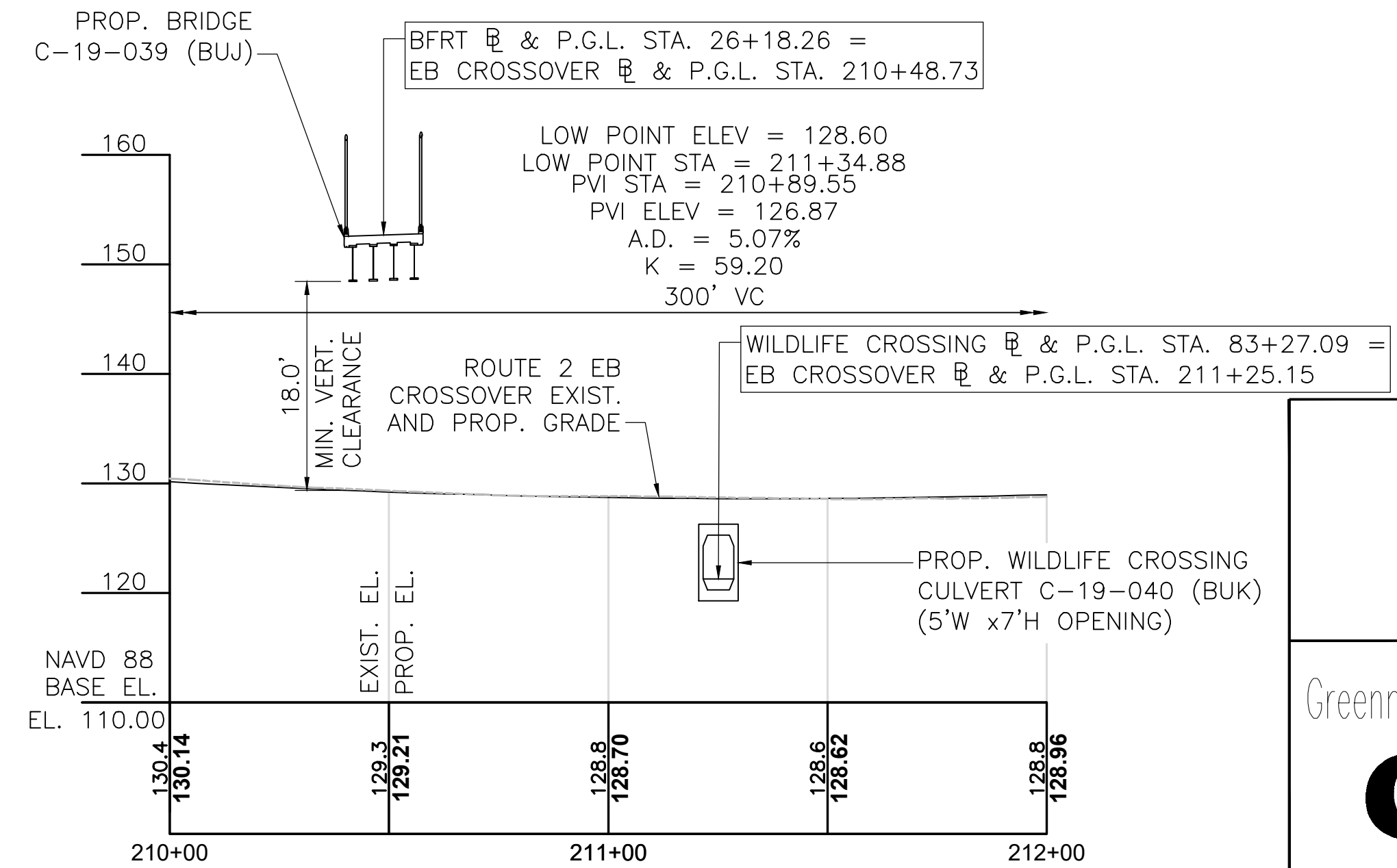
- KEY PLAN, LOCUS MAP & PROFILES
- GENERAL NOTES & QUANTITIES
- BORING LOGS
- BORING LOGS
- PLAN AND LONGITUDINAL SECTION
- CULVERT CROSS SECTION, ELEVATION, & DETAILS



**PROFILE ALONG WILDLIFE CROSSING
CONST. & P.G.L.**
SCALE: HORZ: 1" = 30'
VERT: 1" = 6'



PROFILE ALONG RT. 2 WB CROSSOVER
SCALE: HORZ: 1" = 30'
VERT: 1" = 12'



PROFILE ALONG RT. 2 EB CROSSOVER
SCALE: HORZ: 1" = 30'
VERT: 1" = 12'

Greenman-Pedersen, Inc.

GPI

181 Ballardvale Street, Suite 202
Wilmington, MA 01887

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

10 PARK PLAZA BOSTON, MASS

MONTH DD, YYYY

ISSUED FOR CONSTRUCTION

PROPOSED BRIDGE
CONCORD

MA 2 (UNION TURNPIKE)
OVER WILDLIFE CROSSING

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

TITLE: CHIEF ENGINEER

GENERAL NOTES

DESIGN:
IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS, 7TH EDITION WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016 FOR HL-93 LOADING.

MASSDOT BENCH MARK:
PUNCHMARK IN RAIL
N2996046.040 E681142.400
WILDLIFE CROSSING @ STA. 83+44.10 47.11' RT
EL. 128.80

ELEVATIONS:
ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE:
TO BE PLACED ON THE OUTSIDE FACES OF BOTH CULVERT HEADWALLS, CENTERED HORIZONTALLY AND VERTICALLY ON THE HEADWALLS. A SHEET SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF THE CONTRACT COMPLETION AS OF THE DATE THE CULVERT IS CAST. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

MASSDOT SURVEY NOTEBOOKS:
COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM MASSDOT.

SCALES:
SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZED PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

FOUNDATIONS:
FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:
ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:
DESIGN RETURN PERIOD: 1000 YEARS

DESIGN SPECTRA:

As = 0.128
Sds = 0.256
Sp1 = 0.096

SITE CLASS = D

SEISMIC DESIGN CATEGORY (SDC) = A

REINFORCEMENT:
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60 (EPOXY COATED). UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	21"	26"	31"
2. 12" OF CONCRETE BELOW BAR	29"	36"	43"
3. COATED BARS, COVER < 3db, OR CLEAR SPACING < 6db	31"	39"	46"
4. COATED BARS, ALL OTHER CASES	25"	31"	37"
5. CONDITION 2. AND 3.	35"	44"	53"
6. CONDITION 2. AND 4.	34"	43"	51"

IF THE ABOVE BARS ARE SPACED 6" OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES:

(1) (2) (3) TO BE USED IN CONSTRUCTION OF:

4000 1½ 565 WINGWALLS, HEADWALLS, CURTAIN WALLS, CULVERT TO WINGWALL CLOSURE POURS

- (1) 28 DAY COMPRESSIVE STRENGTH (PSI)
(2) MAXIMUM AGGREGATE SIZE (INCH)
(3) CEMENTITIOUS CONTENT (POUNDS/C.Y.)

ROUTE 2 STAGED CONSTRUCTION:
STAGED CONSTRUCTION IS REQUIRED FOR CULVERT INSTALLATION BENEATH ROUTE 2. REFER TO HIGHWAY PLANS AND SPECIAL PROVISIONS FOR SPECIFIC DETAILS AND RESTRICTIONS PERTINENT TO STAGED CONSTRUCTION AND ROADWAY CLOSURES.

PRECAST BOX CULVERT:
THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS PREPARED IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS FOR HL-93 LOADING FOR APPROVAL BY THE ENGINEER. THE DESIGN COMPUTATIONS SHALL CONSIDER ALL LOADINGS AS ARE APPROPRIATE DURING FABRICATION, SHIPMENT, ERECTION, CONSTRUCTION, AND IN THE FINAL CONDITION BASED UPON THESE CONSTRUCTION DRAWINGS.

THE DIMENSIONS PROVIDED ARE SHOWN TO ESTABLISH THE SIZE OF THE PROPOSED OPENING. THE WIDTH AND THICKNESS OF THE PROPOSED UNITS MAY VARY DEPENDING UPON THE MANUFACTURER'S SPECIFICATIONS, PROVIDED THAT THE OPENING SIZE AND BURIED DEPTH ARE MAINTAINED.

THE BOX OPENING SHALL BE AS SHOWN ON THE PLANS. THE END CULVERT UNITS SHALL BE BEVELED TO PROVIDE A VERTICALLY SQUARE OPENING. THE CONTRACTOR SHALL DETERMINE THE CONFIGURATION OF THE SEGMENTS OF THE PRECAST CULVERT AS LONG AS THE LIMITS OF THE CULVERT REMAIN IN THE LOCATION SHOWN ON THE PLANS. ANY MODIFICATIONS TO THE GEOMETRY WILL REQUIRE APPROVAL FROM THE ENGINEER PRIOR TO FABRICATION.

THE CONTRACTOR SHALL SUBMIT FOR APPROVAL A COMPLETE DESIGN OF THE BOX CULVERT UNITS BASED ON THE ASSUMED GEOMETRY SHOWN. THE FACTORED BEARING RESISTANCE IS 9.1 KSF WHICH IS A PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45, AS OUTLINED IN THE GEOTECHNICAL REPORT.

THE MINIMUM 28 DAY CONCRETE COMPRESSIVE STRENGTH FOR THE PRECAST BOX CULVERT UNITS SHALL BE 5000 PSI. A MASSDOT PRE-APPROVED CONCRETE MIX SHALL BE USED.

ALL SHOP DRAWINGS AND DESIGN CALCULATIONS SHALL BE STAMPED BY A MASSACHUSETTS REGISTERED PROFESSIONAL ENGINEER.

REFER TO ITEM 995.011 OF THE SPECIAL PROVISIONS FOR FURTHER REQUIREMENTS AND CLARIFICATIONS.

UTILITIES:
THE CONTRACTOR SHALL LOCATE AND PROTECT FROM DAMAGE ALL EXISTING UTILITIES.

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
BRIDGE EXCAVATION	680	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	225	CY
CRUSHED STONE FOR BRIDGE FOUNDATIONS	115	TON
CONTROL OF WATER – STRUCTURE NO. C-19-040	1	LS
CULVERT STRUCTURE, CULVERT NO. C-19-040 (BUK)	1	LS

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	108	158
PROJECT FILE NO. 606223			

GENERAL NOTES & QUANTITIES

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	109	158
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BORING LOGS

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038 Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring # HB-5 Scale 1" = 5'	
City/Town: Concord	Highway Borings		Contract No: 58183
Project: Route 2 Construction at the Concord Rotary	Date & Time Started: 10-08-09 7:50AM	Total Hours: 4	
Groundwater Depth: 9' 6"	Date & Time: 10-08-09 11:30AM		
Coordinates: N 2996062.2	E 681234.6	Driller's Name: Peter Labossiere	Helper's Name: Jack Lefebvre
Ground Elevation: 130.2'	Inspector's Name: Derek Lee	Inspector's Company: Lamson Engineering, Inc. for AECOM	
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot	Recovery Inches Field Description Strata Changes
S-1	0' - 2'	6 6 7 6	19" Dry, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-2	4' - 6'	4 3 5 5	18" Dry, loose, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-3	9' - 11'	7 3 4 6	10" Wet, loose, brown, COARSE SAND, trace inorganic silt.
S-4	14' - 16'	7 7 8 10	8" Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.
S-5	19' - 21'	7 8 10 5	12" Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.
S-6	24' - 26'	11 9 8 9	10" Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-7	29' - 31'	3 4 6 4	14" Wet, loose, grey, FINE SAND, some inorganic silt.
S-8	34' - 36'	6 10 5 12	15" Wet, medium dense, grey, FINE SAND AND INORGANIC SILT.
S-9	39' - 40'8"	34 35 36 84/2"	12" Wet, very dense, grey, COARSE SAND AND FINE GRAVEL, some fine sand, trace inorganic silt. Top of BEDROCK at 42'. Began coring.
C-1	42' - 47'	3 2 1 2 3	32" Hard, white, GRANTINE, some weathering. Percent Recovery= 53% Bottom of Exploration= 47"
Notes: Changed location, moved boring prior to drilling from 2996067.2, E681234.6 to N2996062.2, E681234.6, boring relocated up hill. Sample by cathead.			
Penetration Resistance (N) Guide:		Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:	
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silt, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less		Core Barrel Type: NX Size: 2.15"	

BORING HB-5

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038 Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. TB-3 Scale 1" = 5'	
City/Town: Concord	Trail Borings		Contract No: 58183
Project: Route 2 Construction at the Concord Rotary	Date & Time Started: 10-09-09 7:00AM	Total Hours: 7	
Groundwater Depth: 9'	Date & Time: 10-09-09 2:00PM		
Coordinates: N 2996037.7	E 681166.5	Driller's Name: Peter Labossiere	Helper's Name: Jack Lefebvre
Ground Elevation: 129.0'	Inspector's Name: Derek Lee	Inspector's Company: Lamson Engineering, Inc. for AECOM	
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot	Recovery (Inches) Field Description Strata Changes
S-1	0' - 2'	3 4 3 5	16" Dry, loose, brown, COARSE SAND AND FINE SAND, trace organic silt.
S-2	4' - 6'	14 9 7 7	12" Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-3	9' - 11'	7 5 6 6	8" Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-4	14' - 16'	7 7 12 13	12" Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.
S-5	19' - 21'	13 19 8 11	6" Wet, medium dense, grey, COARSE SAND, some fine gravel, trace fine sand.
S-6	24' - 26'	16 13 12 6	7" Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-7	29' - 31'	4 3 3 5	12" Wet, loose, gray, FINE SAND, some inorganic silt.
S-8	34' - 36'	14 13 15 15	10" Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.
S-9	39' - 40'	70 67	10" Wet, very dense, gray, FINE SAND AND COARSE SAND, some inorganic silt, (fill).
S-10	44' - 44'6"	120/6"	6" Wet, very dense, gray, FINE SAND, some inorganic silt, trace coarse sand, (fill).
S-11	49' - 49'8"	51 70/2"	8" Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt, trace bedrock pieces in tip of spoon. Top of BEDROCK at 50'. Began coring at 50'.
C-1	50' - 55'	3 4 4 3 4	39" Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 78%
C-2	55' - 60'	3 3 2 3 3	29" Medium hard, highly weathered, highly fractured, gray/brown, SCHIST. Percent Recovery = 48% Bottom of Exploration = 60'
Notes: Sample by cathead		Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:	
Penetration Resistance (N) Guide:		Type of Drill Rig: Mobile B-47	
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Silt, Clays)	
Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium Dense	10 - 30	Medium Stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very Dense	Over 50	Very Stiff	15 - 30
N=Sum of Second and Third 6" Blow Counts		Hard	Over 30
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less		Core Barrel Type: NX Size: 2.15"	

BORING TB-3

BORING LOGS

BORING NOTES:

1. LOCATION OF BORINGS SHOWN ON THE PLAN THUS:  TB-2
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2014.
7. BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
9. THE DEPTHS AS SHOWN ON THE ORIGINAL BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS BY THE ENGINEER.

NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	110	158
PROJECT FILE NO. 606223			

BORING LOGS

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038		Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. TB-6 Scale 1" = 5'					
City/Town: Concord		Trail Borings		Project File No: 602091 Contract No: 58183					
Project: Route 2 Construction at the Concord Rotary				Date & Time Started: 10-05-09 11:25AM Total Hours: 4					
Groundwater Depth: 10'		Date & Time: 10-06-09 7:00AM		Date & Time Completed: 10-06-09 7:30AM					
Coordinates: N 2995897.9		E 681269.9		Driller's Name: Peter Labossiere Helper's Name: Jack Lefebvre					
Ground Elevation: 128.2'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM					
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot		Recovery (Inches)	Field Description	Strata Changes			
S-1	0' - 2'	4	6	7	7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.		
S-2	4' - 6'	4	2	2	4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.	4'	
S-3	9' - 11'	12	12	11	9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.	9'	
S-4	14' - 16'	13	9	9	11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.		
S-5	19' - 21'	7	13	8	13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.	24'	
S-6	24' - 26'	17	11	7	5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.		
S-7	29' - 31'	18	8	21	100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.	32'	
C-1	32' - 37'	4	5	14	5	6	54"	Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%	37'
							Bottom of Exploration = 37'		
Notes: Sample by cathead							Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe: Type of Drill Rig: Mobile B-47		
Penetration Resistance (N) Guide:							Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Depth: 30" Arrow-Board: Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: 140Lbs. Fall: 30"	Signs: Cones:	
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Sils, Clays)		Relative Density		Penetration Resistance	Consistency	Penetration Resistance	
Very Loose		0 - 4		Very Soft		0 - 2			
Loose		4 - 10		Soft		2 - 4			
Medium Dense		10 - 30		Medium Stiff		4 - 8			
Dense		30 - 50		Stiff		8 - 15			
Very Dense		Over 50		Very Stiff		15 - 30			
N=Sum of Second and Third 6" Blow Counts				Hard		Over 30			
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"		

BORING TB—6

massDOT NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038		Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring # HB-4 Scale 1" = 5'						
City/Town: Concord		Highway Borings		Project File No: 602091		Contract No: 58183				
Project: Route 2 Construction at the Concord Rotary				Date & Time Started: 10-02-09 1:15PM		Total Hours: 5.25				
Groundwater Depth: 11'		Date & Time: 10-05-09 10:30AM		Date & Time Completed: 10-05-09 10:30AM						
Coordinates: N 2995951.8		E 681198.7		Driller's Name: Roger Burne		Helper's Name: Patrick Schofield				
Ground Elevation: 128.2'		Inspector's Name: Christopher Cheu		Inspector's Company: Lamson Engineering, Inc. for AECOM						
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot			Recovery Inches	Field Description	Strata Changes			
S-1	0' - 2'	4	3	4	5	5"	TOPSOIL Dry, loose, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.	* 2"		
S-2	4' - 6'	5	5	9	9	12"	Moist, medium dense, light brown, FINE TO COARSE SAND, some inorganic silt.			
S-3	9' - 11'	5	5	5	5	18"	Wet, medium dense, brown, FINE TO COARSE SAND, trace fine to medium gravel, trace inorganic silt.			
S-4	14' - 16'	7	9	10	11	15"	Wet, medium dense, grey, FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, trace inorganic silt.	14'		
S-5	19' - 21'	9	11	13	12	18"	Wet, medium dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.			
S-6	24' - 26'	19	15	9	10	15"	Wet, medium dense, grey, FINE SAND, some inorganic silt, trace clay lenses.	24'		
S-7	29' - 31'	29	22	23	27	12"	Wet, dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.	28'6"		
S-8	34' - 34'9"	44	120/3"			9"	Wet, very dense, brown/ grey, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt. Encountered BOULDER 34'9" to 35'. Advanced Rollerbit to 38'. Top of BEDROCK at 38'. Began coring.	34'9"		
C-1	38' - 43'	4	5	3	4	5	27"	Severely fractured, white/ black, GRANITE, trace quartz lenses. Percent Recovery= 45%	38'	
							Bottom of Exploration= 43'	43'		
Notes: Stopped coring at 5' per order of on-site engineer due to having obtained sufficient information. Well installed at 15'. 4 bags sand/ 1 cement. Sample by cathead.							Protective Device - Stand: Box: Well Depth: 15' Solid Pipe: 8' Stick Up Pipe: 3' Screen Pipe: 10' Type of Drill Rig: Diedrich- 50			
Penetration Resistance (N) Guide:							Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Depth: 34' Arrow-Board:	Signs: Cones: 7		
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Sils, Clays)					Relative Density	Penetration Resistance	Consistency	Penetration Resistance
Very Loose		0 - 4					Very Soft		0 - 2	
Loose		4 - 10					Soft		2 - 4	
Medium Dense		10 - 30					Medium Stiff		4 - 8	
Dense		30 - 50					Stiff		8 - 15	
Very Dense		Over 50					Very Stiff		15 - 30	
N=Sum of Second and Third 6" Blow Counts							Hard		Over 30	
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"			

BORING HB—4

BORING LOGS

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com				Boring No. TB-2B-4 Scale 1" = 5'	
City/Town: Acton - Concord		Bridge: Bruce Freeman Rail Trail (Phase II-B)				Project File No: 606223		Contract No: 76859			
Project: Bruce Freeman Rail Trail Route 2 (Phase II-B)		Date & Time Started: 11-14-14 12:00 pm				Total Hours: 3.5					
Groundwater Depth: 6.4'		Date & Time: 11-14-14 3:15 pm		Date & Time Completed: 11-14-14 3:30 pm							
Coordinates: N 2995941		E 681144		Driller's Name: Manlea Thompson		Helper's Name: Donald Palmer					
Ground Elevation: 126.5		Inspector's Name: Weijie Dong				Inspector's Company: Lamson Engineering, Corp., for *					
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description				Strata Changes
S-1	0' - 2'	2	3	4	4	18"	TOPSOIL Moist, loose, red-brown FINE TO COARSE SAND, some inorganic silt, trace fine gravel.				5"
S-2	5' - 7'	6	4	5	6	14"	Wet, loose, brown FINE TO COARSE SAND, trace fine gravel, trace inorganic silt.				4'
S-3	10' - 11'	4	5	14	14	8"	Wet, loose, brown, FINE SAND, trace inorganic silt.				11'
S-3A	11' - 12'					6"	Wet, medium dense, brown, COARSE TO FINE SAND, trace fine gravel.				
S-4	15' - 17'	9	7	11	13	15"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.				
S-5	20' - 22'	8	8	8	8	13"	Wet, medium dense, brown, FINE TO COARSE SAND, some fine to medium gravel, trace inorganic silt.				
S-6	25' - 27'	9	8	8	6	10"	Wet, medium dense, gray, FINE TO COARSE SAND, some fine to coarse gravel, trace inorganic silt.				
S-7	30' - 31'8"	7	7	30	80/2"	9"	Wet, dense, gray, FINE TO COARSE SAND and fine to medium gravel, trace inorganic silt.				
S-8	35' - 37'	28	47	51	54	19"	Wet, very dense, gray, FINE TO COARSE SAND, some inorganic silt, trace fine to medium gravel.				37"
Bottom of Exploration = 37"											
Remarks: * AECOM (Consultants)							Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:				
Penetration Resistance (N) Guide:							Type of Drill Rig: CME 550X				
Cohesionless Soils (Sands, Gravels)					Cohesive Soils (Sils, Clays)					Arrow-Board: Signs: Cones:	
Relative Density	Penetration Resistance				Consistency	Penetration Resistance				Casing: HW Size: 4" Amt: 35"	
Very Loose	0 - 4				Very Soft	0 - 2				Hammer Weight: 300 lbs. Fall: 30" Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140 lbs. Donut Hammer Weight: Fall: 30"	
Loose	4 - 10				Soft	2 - 4					
Medium Dense	10 - 30				Medium Stiff	4 - 8					
Dense	30 - 50				Stiff	8 - 15					
Very Dense	Over 50				Very Stiff	15 - 30					
N=Sum of Second and Third 6" Blow Counts					Hard	Over 30					
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: Size:				

BORING TB—2B—4

NOTES:

- FOR LOCATION OF BORINGS, SEE SHEET 1.
- FOR BORING NOTES, SEE SHEET 3.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

SHEET 4 OF 6 SHEETS BRIDGE NO. C—19—040 (BUK)

Printed on 4-Feb-2019 10:46 AM

606223_BR03_04(C19040)-BORINGS.DWG

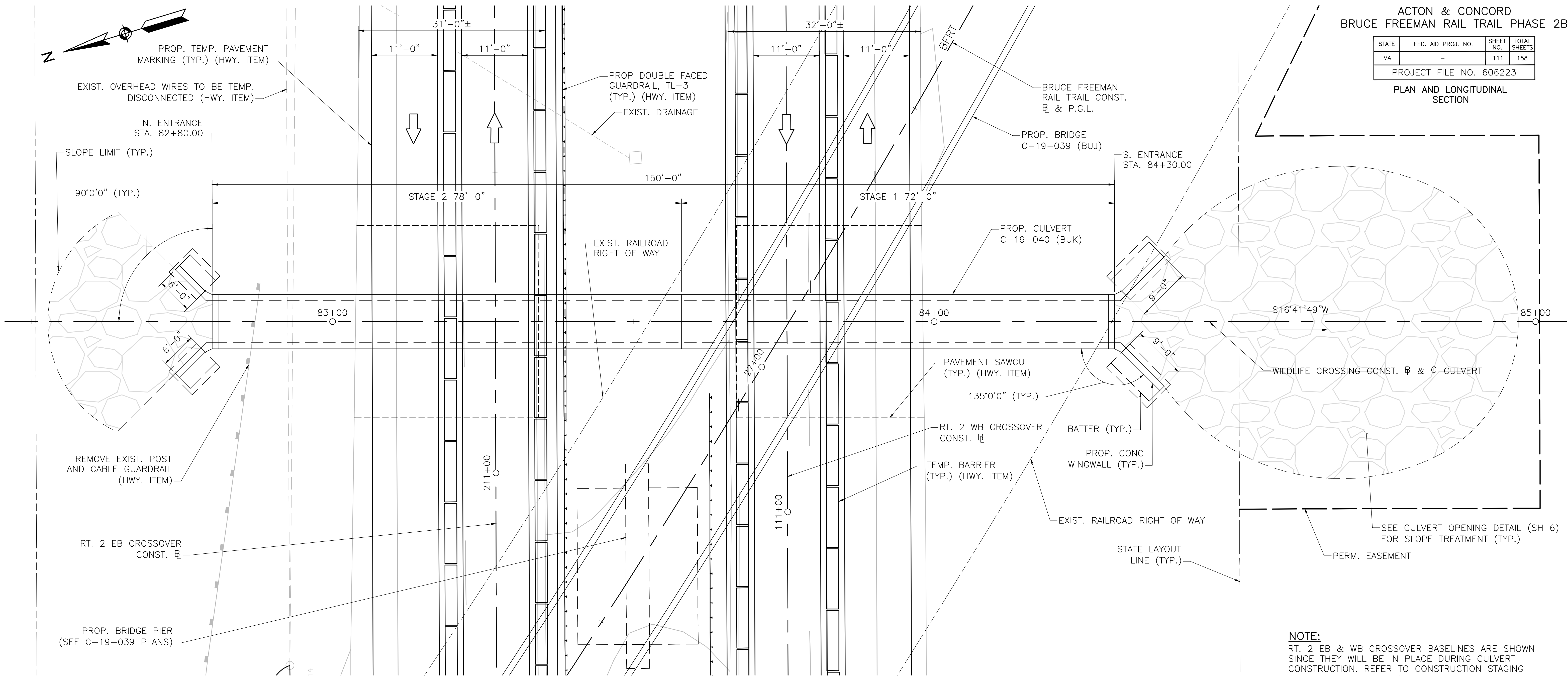
Second Structural Submittal (S2) 28-Jan-2019

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	111	158

PROJECT FILE NO. 606223

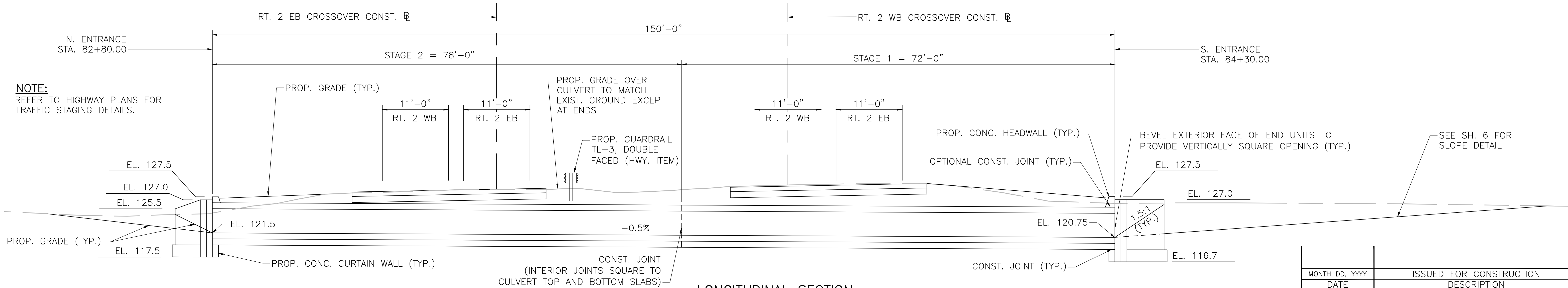
PLAN AND LONGITUDINAL
SECTION



NOTE:
RT. 2 EB & WB CROSSOVER BASELINES ARE SHOWN SINCE THEY WILL BE IN PLACE DURING CULVERT CONSTRUCTION. REFER TO CONSTRUCTION STAGING PLANS (HIGHWAY PLANS) FOR ADDITIONAL DETAILS.

PLAN

SCALE: $\frac{1}{8}" = 1'-0"$



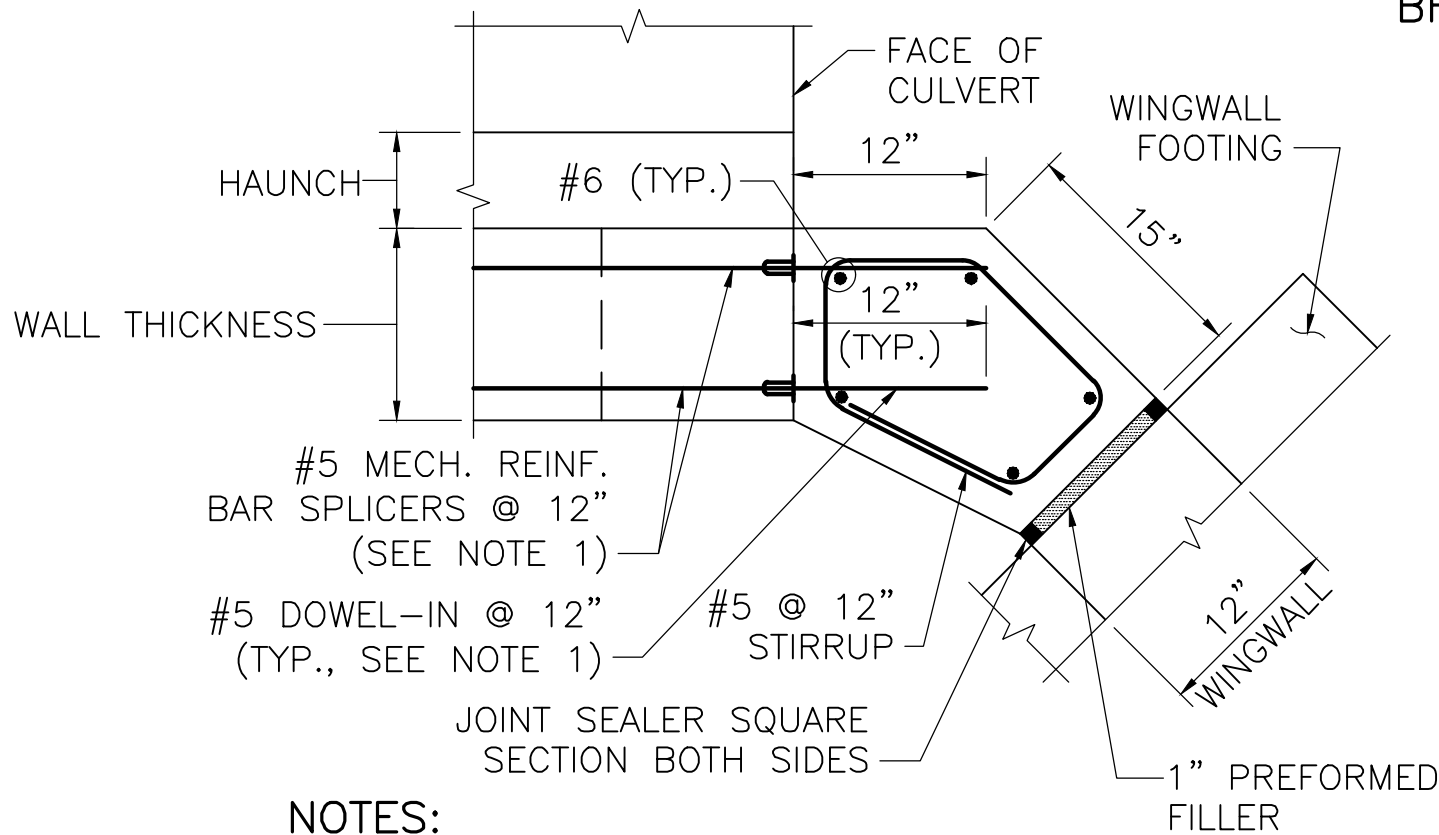
LONGITUDINAL SECTION

SCALE: $\frac{1}{8}" = 1'-0"$

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	112	158
PROJECT FILE NO. 606223			

CULVERT CROSS SECTION,
ELEVATION, & DETAILS

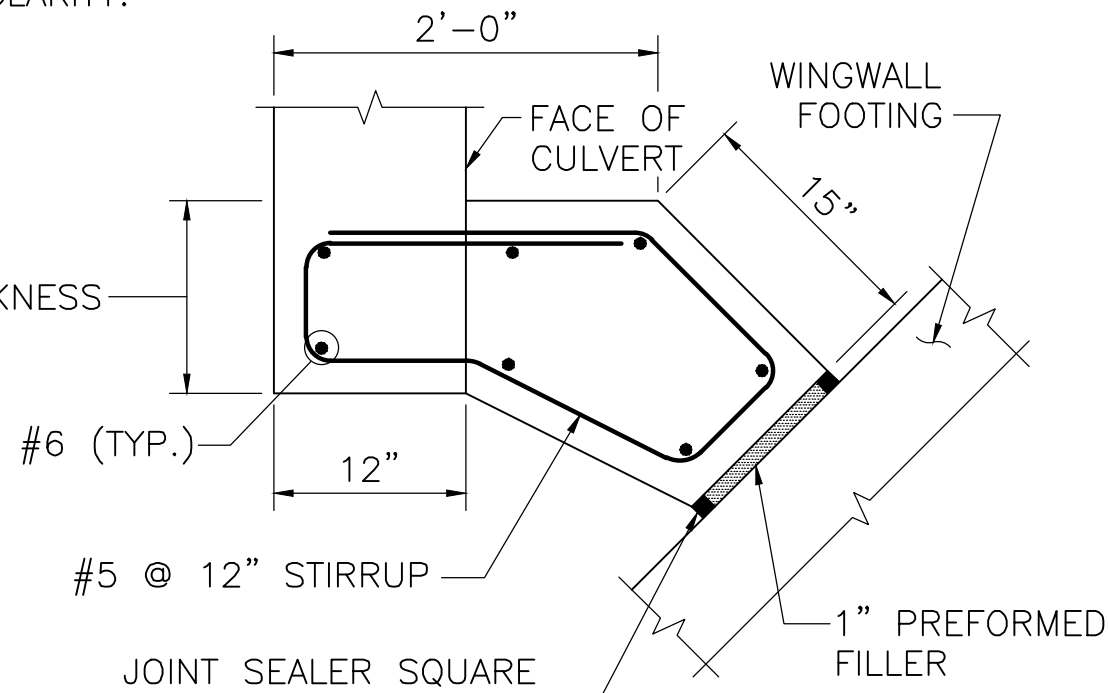


NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG, FOR MECHANICAL REINFORCING BAR SPlicERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

SECTION 1

SCALE: 1" = 1'-0"

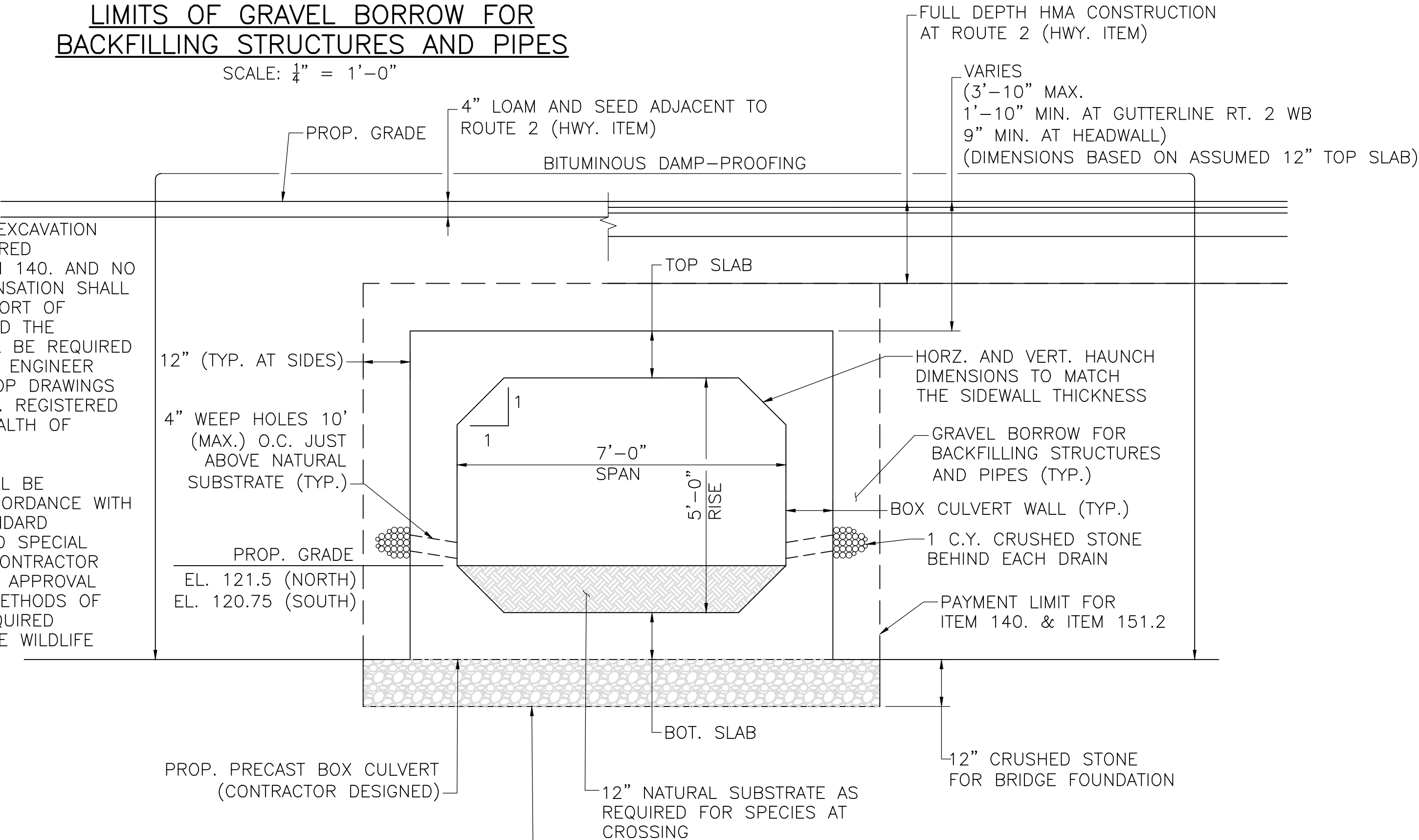


SECTION 2

SCALE: 1" = 1'-0"

BOX CULVERT
LIMITS OF GRAVEL BORROW FOR
BACKFILLING STRUCTURES AND PIPES

SCALE: 1/4" = 1'-0"



BOX CULVERT CROSS SECTION

SCALE: 1/2" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

WINGWALL NOTES:

1. 4" Ø WEEP HOLES (JUST ABOVE FOOTING). PROVIDE 1 WEEP HOLE PER WALL, CENTERED ALONG WALL LENGTH. PROVIDE 1 CUBIC YARD OF CRUSHED STONE AT EACH END OF WEEP HOLE.
2. ALL CONCRETE SHALL BE 4000 PSI, 1 1/2 IN, 565 CEMENT CONCRETE.
3. THE FACTORED BEARING PRESSURE = 3.0 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

FACTORED BEARING RESISTANCE = 3.6 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.55.
4. CRUSHED STONE REQUIRED BEYOND PAYMENT LIMIT SHALL BE CONSIDERED INCIDENTAL TO WATER CONTROL ITEM 991.1.

FACTORED BEARING RESISTANCE = 3.6 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.55.

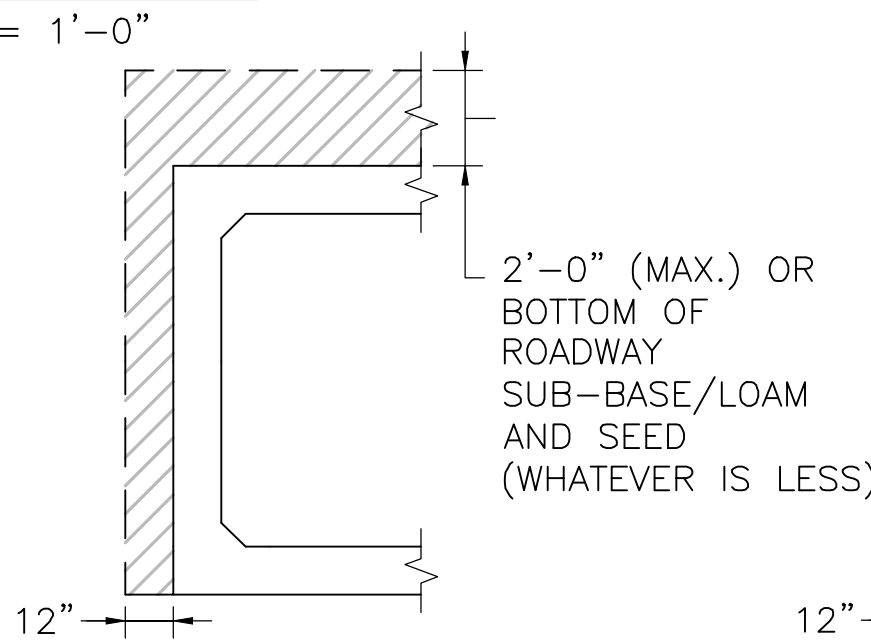
CRUSHED STONE REQUIRED BEYOND PAYMENT LIMIT SHALL BE CONSIDERED INCIDENTAL TO WATER CONTROL ITEM 991.1.

NOTES:

1. THE CONTRACTOR MAY SUBSTITUTE #5 J DOWELS, FOR MECHANICAL REINFORCING BAR SPlicERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.
3. THE CONTRACTOR HAS THE OPTION TO PRECAST THE HEADWALL INTEGRALLY WITH THE CULVERT. IF CAST INTEGRALLY THE 5" WATERSTOP IS NOT REQUIRED.
4. THE PROPOSED SLOPE OVER THE NORTH END OF THE CULVERT PARALLEL TO ROUTE 2 SHALL BE GRADED AT A MAXIMUM SLOPE OF 10H:1V.

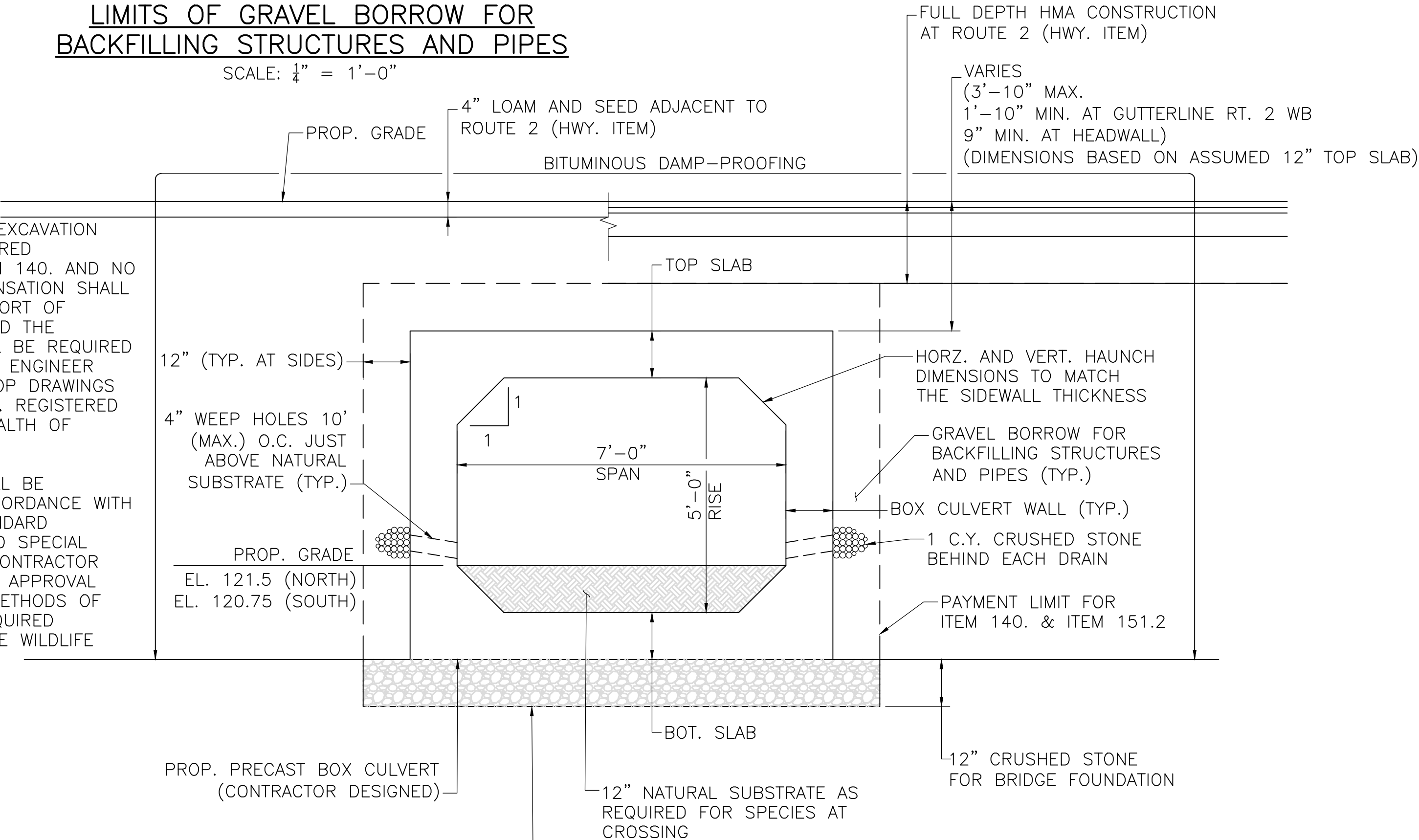
CULVERT END DETAIL

SCALE: 1" = 1'-0"



BOX CULVERT
LIMITS OF GRAVEL BORROW FOR
BACKFILLING STRUCTURES AND PIPES

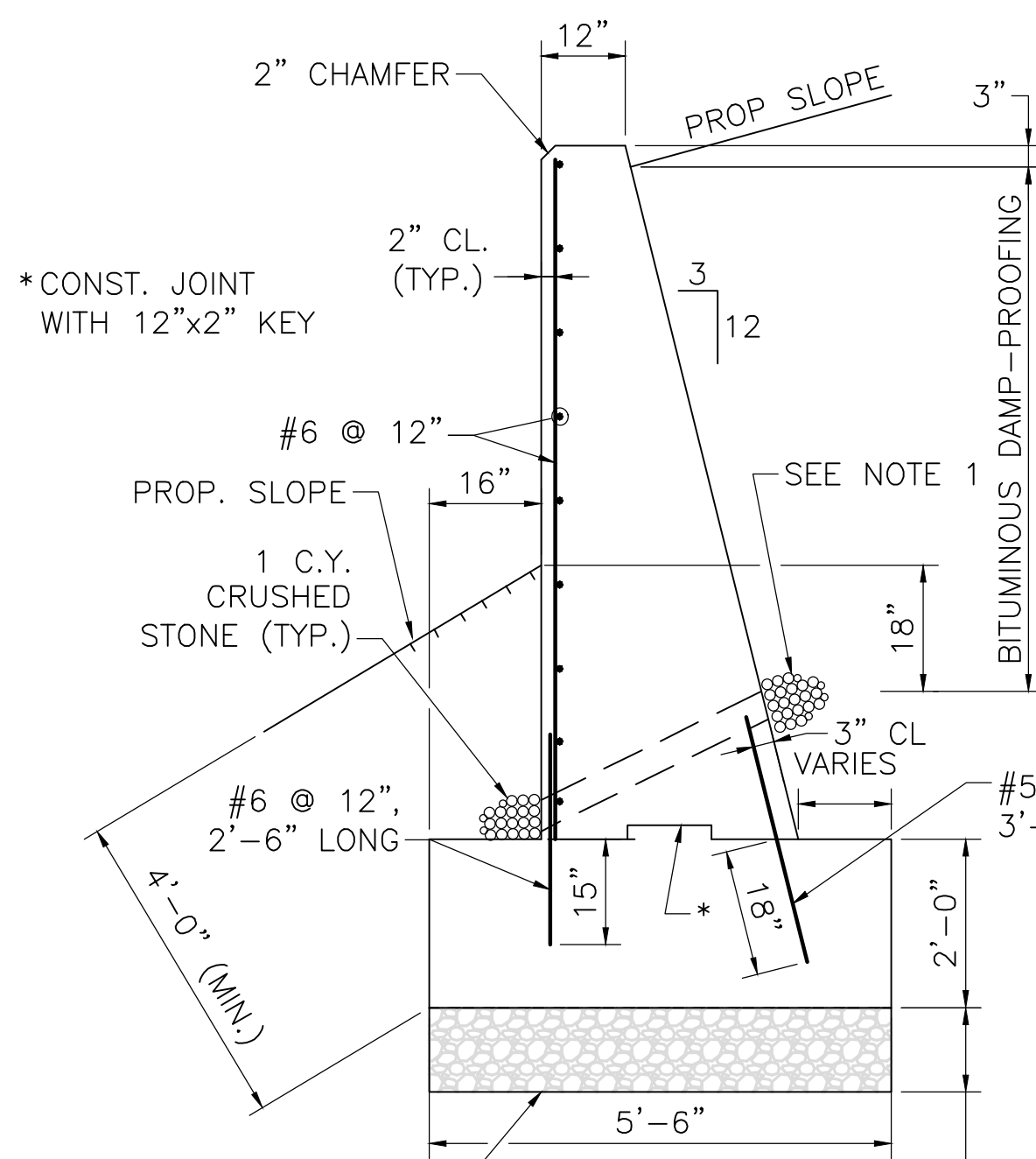
SCALE: 1/4" = 1'-0"



BOX CULVERT CROSS SECTION

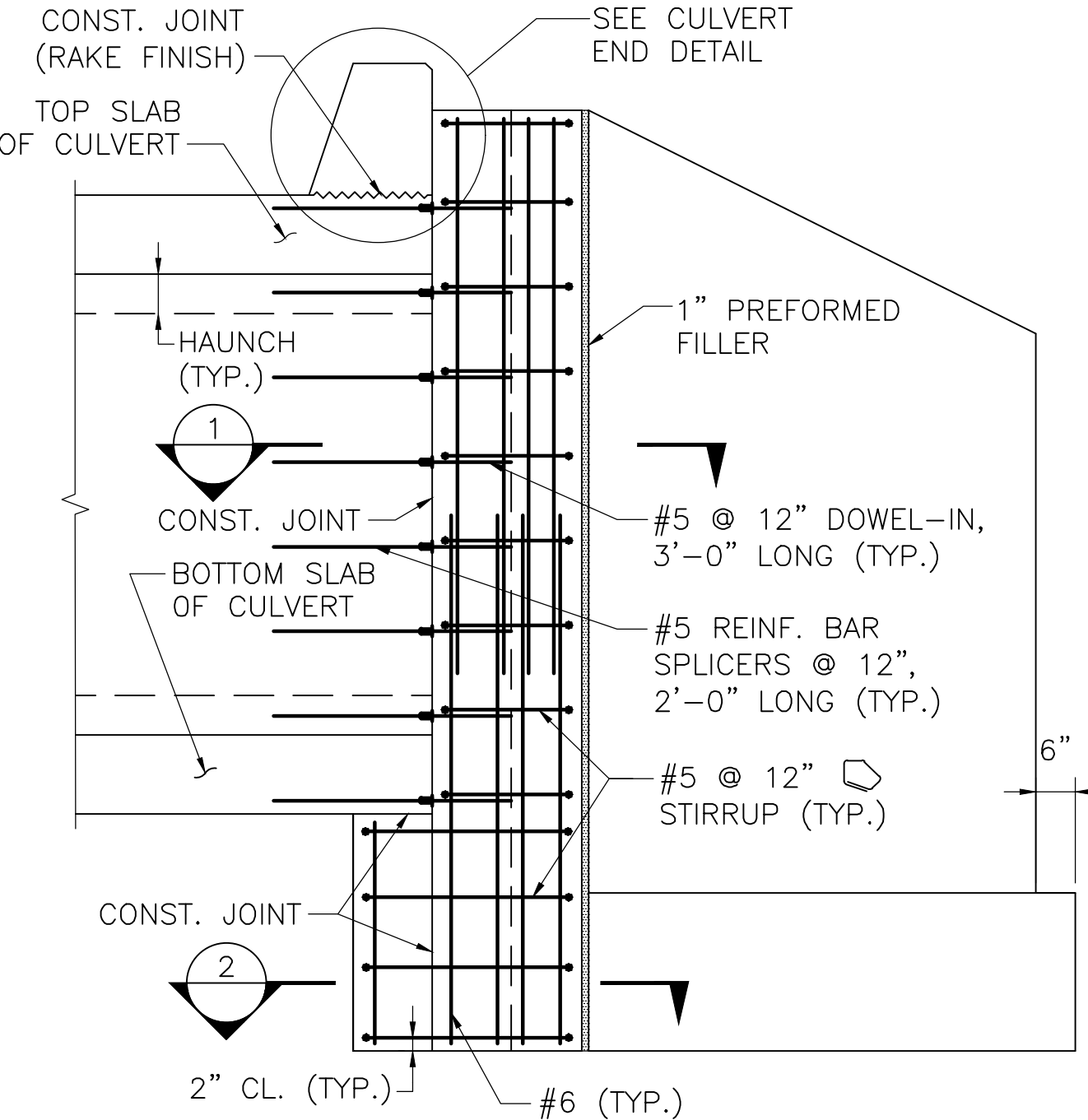
SCALE: 1/2" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	



WINGWALL SECTION

SCALE: 1/2" = 1'-0"



NOTES:

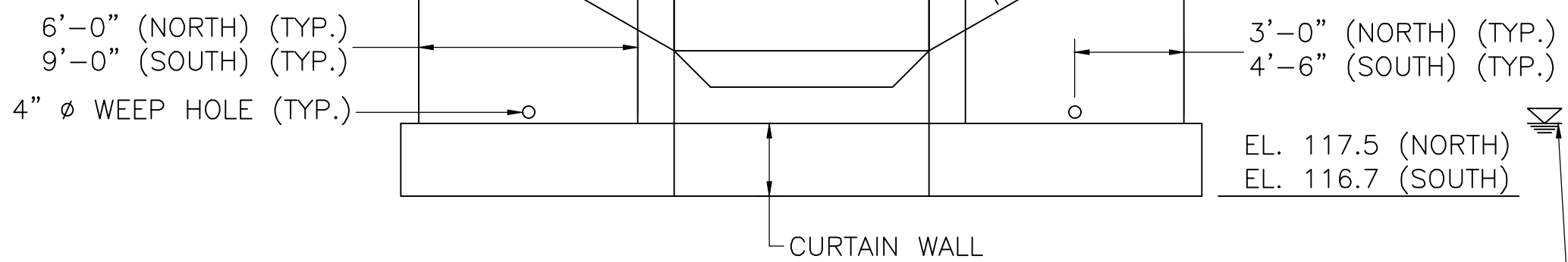
1. THE CONTRACTOR MAY SUBSTITUTE #5 DOWELS, 3'-0" LONG FOR MECHANICAL REINFORCING BAR SPlicERS AND THREADED REBARS.
2. CULVERT REINFORCEMENT IS NOT SHOWN FOR CLARITY.

SECTION AT WINGWALL

SCALE: 1/2" = 1'-0"

NOTE:

SOUTH ELEVATION SIMILAR



BOX CULVERT NORTH DEVELOPED ELEVATION

SCALE: 1/4" = 1'-0"

CULVERT NOTES:

1. THE CULVERT IS CONTRACTOR DESIGNED AND THE FACTORED BEARING PRESSURE AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS WILL BE DETERMINED BY THE CONTRACTOR.
2. FACTORED BEARING RESISTANCE = 9.1 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.45
3. REFER TO SPECIAL PROVISIONS FOR PRECAST CULVERT JOINT AND JOINT SEALING REQUIREMENTS.

NOTE:

CRUSHED STONE REQUIRED BEYOND PAYMENT LIMIT SHALL BE CONSIDERED INCIDENTAL TO WATER CONTROL ITEM 991.1

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	113	158
PROJECT FILE NO. 606223			

KEY PLAN, LOCUS MAP
& PROFILES

INDEX OF BRIDGE SHEETS

1. KEY PLAN, LOCUS MAP & PROFILES
2. GENERAL NOTES & QUANTITIES
3. BORING LOGS
4. PLAN & ELEVATION
5. WEST ABUTMENT PLAN & ELEVATION
6. EAST ABUTMENT PLAN & ELEVATION
7. MSE WALL PLANS & ELEVATIONS
8. ABUTMENT DETAILS (1 OF 2)
9. ABUTMENT DETAILS (2 OF 2)
10. WALL DETAILS
11. APPROACH SLAB PLAN & DETAILS
12. FRAMING PLAN & STRUCTURAL STEEL DETAILS
13. DECK & TIMBER RAILING DETAILS
14. BEARING DETAILS

NOTE:

FOR GENERAL NOTES AND QUANTITIES, SEE SHEET 2.

HYDRAULIC DESIGN DATA:

DRAINAGE AREA:.....20.3 SQUARE MILES
DESIGN FLOOD DISCHARGE:.....845 CUBIC FEET PER SECOND
DESIGN FLOOD FREQUENCY:.....100 YEARS
DESIGN FLOOD VELOCITY:.....3.90 FEET PER SECOND
DESIGN FLOOD ELEVATION:.....123.8 FEET, NAVD

BASE (100-YEAR) FLOOD DATA

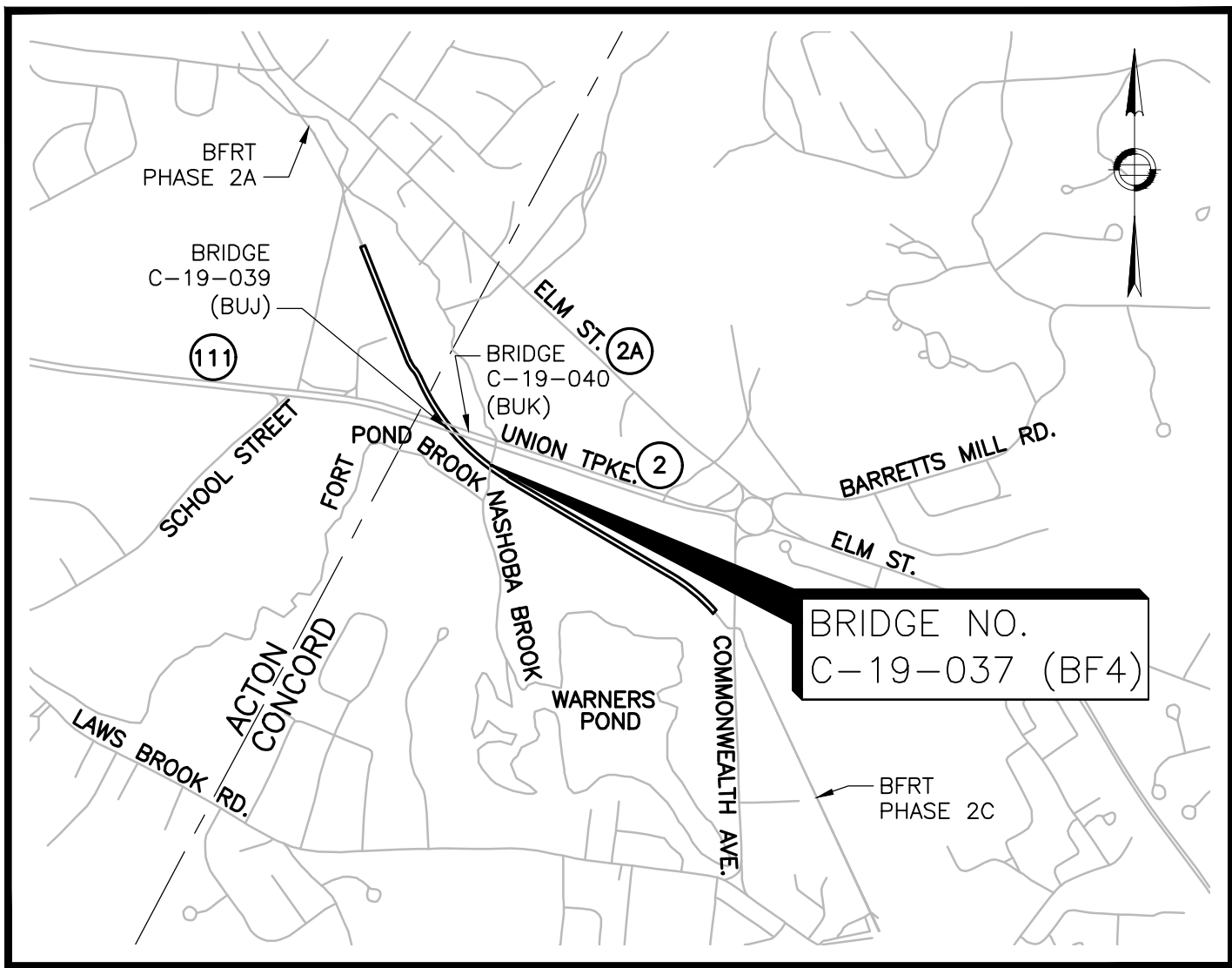
BASE FLOOD DISCHARGE:.....845 CUBIC FEET PER SECOND
BASE FLOOD ELEVATION:.....123.8 FEET, NAVD

DESIGN AND CHECK SCOUR DATA

DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY:.....25 YEARS
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY:.....50 YEARS

FLOOD OF RECORD

THERE IS NO FLOOD OF RECORD FOR NASHOBA BROOK.



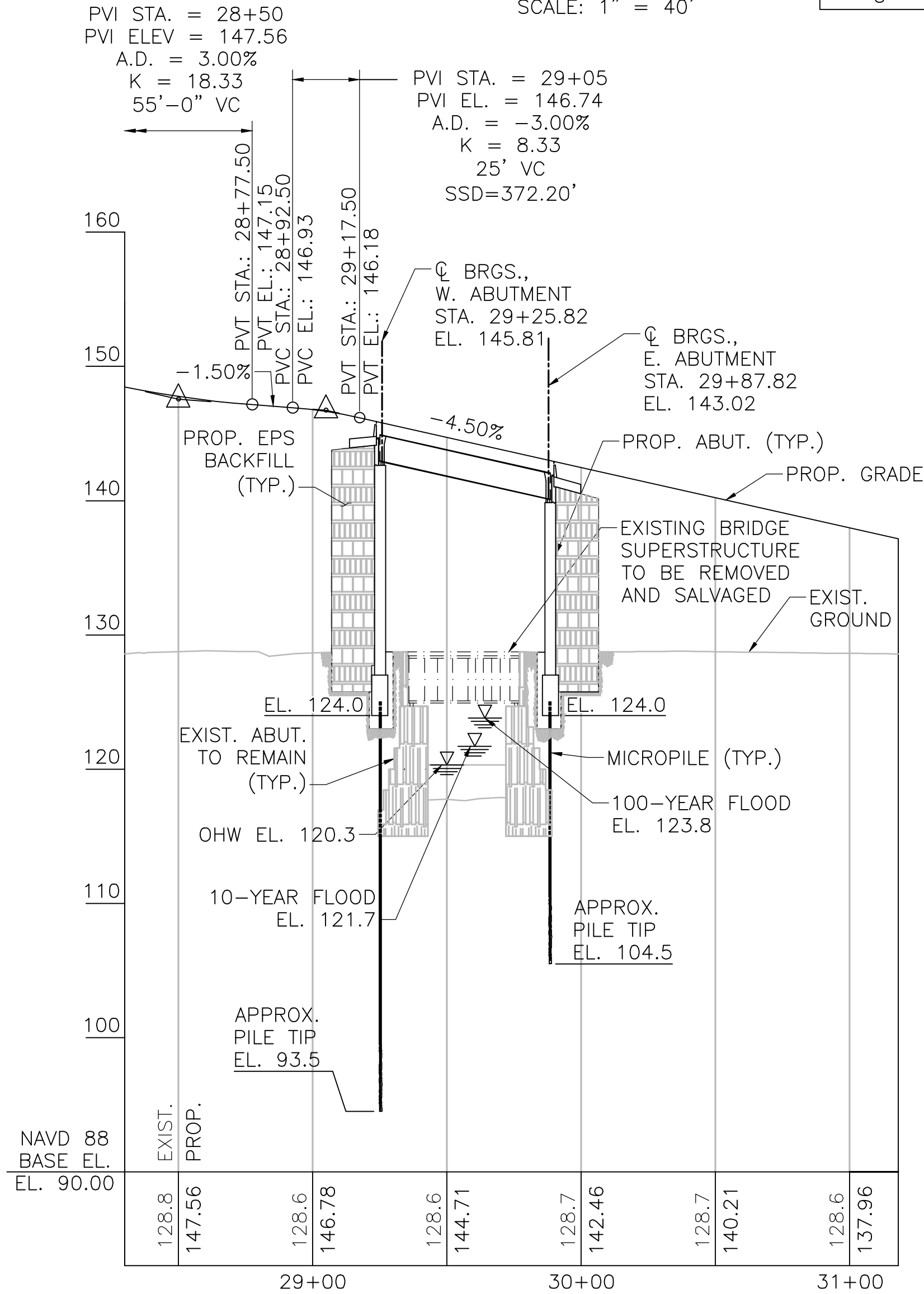
LOCUS

SCALE: 1" = 1500'

CURVE DATA - BRUCE FREEMAN RAIL TRAIL CONST. & P.G.L.					
CURVE NO.	BEGIN STA.	END STA.	RADIUS	DELTA	LENGTH
5	20+75.83	33+33.96	1900.00'	37°56'23"	1258.13'

KEY PLAN

SCALE: 1" = 40'

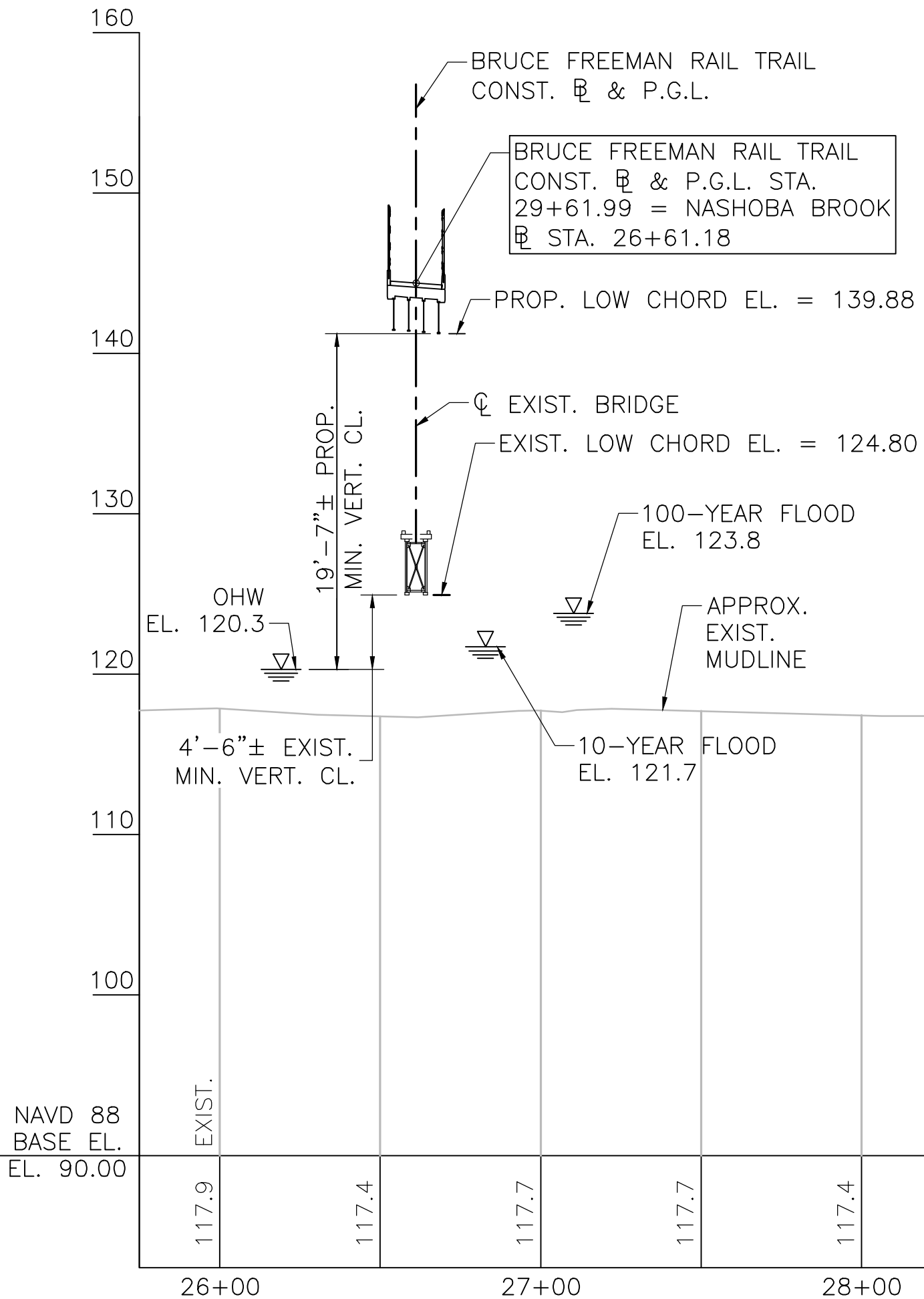


PROFILE ALONG BRUCE FREEMAN RAIL TRAIL

CONST. & P.G.L.

HORIZ. SCALE: 1" = 40'

VERT. SCALE: 1/8" = 1'



PROFILE ALONG NASHOBA BROOK &

HORIZ. SCALE: 1" = 40'

VERT. SCALE: 1/8" = 1'

Greenman-Pedersen, Inc.

GPI

181 Ballardvale Street, Suite 202
Wilmington, MA 01887

MONTH DD, YYYY ISSUED FOR CONSTRUCTION



PROPOSED BRIDGE
CONCORD

BRUCE FREEMAN RAIL TRAIL
OVER NASHOBA BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

TITLE: CHIEF ENGINEER

SHEET 1 OF 14 SHEETS BRIDGE NO. C-19-037 (BF4)

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	—	114	158
PROJECT FILE NO. 606223			

GENERAL NOTES & QUANTITIES

GENERAL NOTES

DESIGN:

IN ACCORDANCE WITH THE 2014 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2016 AND THE 2009 AASHTO LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES WITH INTERIM SPECIFICATIONS THROUGH 2015 FOR PEDESTRIAN LOADING OF 90 PSF AND H10 LOADING.

EXISTING BRIDGE PLANS:

PLANS OF THE EXISTING BRIDGE DO NOT EXIST. THE CONTRACTOR SHALL TAKE ALL REQUIRED MEASUREMENTS OF THE EXISTING STRUCTURE TO APPROPRIATELY BID THE REMOVAL OF SUPERSTRUCTURE ITEM.

MASSDOT BENCH MARK:

BENCHMARK #1072 IRON PIN
N2995801.24 E681364.41 EL. 124.85 STA. 29+81.08 16.72' RT

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

MASSDOT SURVEY NOTEBOOKS:

COPIES OF ELECTRONIC SURVEY FILES MAY BE OBTAINED FROM THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION—HIGHWAY DIVISION.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

SEISMIC GROUND SHAKING HAZARD:

DESIGN RETURN PERIOD: 1000 YEAR

DESIGN SPECTRA:

AS = 0.128
SDS = 0.256
SD1 = 0.096

SITE CLASS = D

SEISMIC DESIGN CATEGORY (SDC) = A

ANCHOR BOLTS:

ALL ANCHOR BOLTS SHALL BE SET BY TEMPLATE BEFORE THE CONCRETE IS PLACED.

REINFORCEMENT:

REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60 AND BE EPOXY COATED. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION:

	#4 BARS	#5 BARS
1. NONE	21"	26"
2. 12 INCHES OF CONCRETE BELOW BAR	29"	36"
3. COATED BARS, COVER <3db, OR CLEAR SPACING < 6db	31"	39"
4. COATED BARS, ALL OTHER CASES	25"	31"
5. CONDITION 2 AND 3	35"	44"
6. CONDITION 2 AND 4	34"	43"

IF THE ABOVE BARS ARE SPACED 6 INCHES OR MORE ON CENTER, THE LAP LENGTH SHALL BE 80% OF THE LAP LENGTH GIVEN ABOVE. ALL OTHER BARS SHALL BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

CONCRETE MIXES

(1)	(2)	(3)	
4000	1½"	565	PILE CAPS, ABUTMENT & WINGWALL STEMS, CURTAIN WALLS & APPROACH SLABS
4000	¾"	610	KEEPER BLOCKS & BACKWALLS
4000	¾"	585 HP	DECK, END DIAPHRAGMS & CURBS
(1)	28 DAY COMPRESSIVE STRENGTH (PSI)		
(2)	MAXIMUM AGGREGATE SIZE (INCH)		
(3)	CEMENTITIOUS CONTENT (POUNDS/CY)		

ESTIMATED QUANTITIES
(NOT GUARANTEED)

ITEM DESCRIPTION	QUANTITY	UNIT
REMOVAL OF SUPERSTRUCTURE OF BRIDGE NO. C-19-037	1	LS
HANDLING AND TRANSPORTATION OF SUPERSTRUCTURE OF BRIDGE NO. C-19-037	1	LS
BRIDGE EXCAVATION	740	CY
GRAVEL BORROW FOR BRIDGE FOUNDATION	635	CY
GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	30	CY
SUPERPAVE BRIDGE SURFACE COURSE - 9.5 (SSC-B-9.5)	10	TON
SUPERPAVE BRIDGE PROTECTIVE COURSE - 9.5 (SPC-B-9.5)	10	TON
SAWING & SEALING JOINTS IN ASPHALT PAVEMENT AT BRIDGES	32	FT
DRILLED MICROPILES	380	FT
MICROPILE VERIFICATION LOAD TEST	1	EA
MICROPILE PROOF LOAD TEST	2	EA
BRIDGE STRUCTURE, BRIDGE NO. C-19-037 (BF4)	1	LS
MECHANICALLY STABILIZED EARTH WALL	605	SY
MSE WALL MANUFACTURER'S REPRESENTATIVE	8	DAY
EXPANDED POLYSTYRENE	260	CY
EPS MANUFACTURER'S REPRESENTATIVE	5	DAY

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	115	158
PROJECT FILE NO. 606223			

BORING LOGS

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com				Boring No. TB-6	
City/Town: Concord		Trail Borings		Project File No: 602091		Contract No: 58183		Scale 1" = 5'			
Project: Route 2 Construction at the Concord Rotary						Date & Time Started: 10-05-09 11:25AM		Total Hours: 4			
Groundwater Depth: 10'		Date & Time: 10-06-09 7:00AM		Date & Time Completed: 10-06-09 7:30AM							
Coordinates: N 2995897.9		E 681269.9		Driller's Name: Peter Labossiere Helper's Name: Jack Lefebvre							
Ground Elevation: 128.2'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM							
Sample Number	Depth Range (Feet)	Blow Counts per 6" Coring Times Minute Per Foot				Recovery (Inches)	Field Description			Strata Changes	
S-1	0' - 2'	4	6	7	7	6"	Dry, medium dense, brown, COARSE SAND AND FINE SAND, some fine gravel, trace organic silt.				
S-2	4' - 6'	4	2	2	4	16"	Dry, very loose, brown, FINE SAND, some coarse sand, trace inorganic silt.			4'	
S-3	9' - 11'	12	12	11	9	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.			9'	
S-4	14' - 16'	13	9	9	11	10"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.				
S-5	19' - 21'	7	13	8	13	8"	Wet, medium dense, grey, COARSE SAND, some fine sand, trace inorganic silt.				
S-6	24' - 26'	17	11	7	5	12"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some inorganic silt.			24'	
S-7	29' - 31'	18	8	21	100	8"	Wet, medium dense, grey, COARSE SAND AND FINE SAND, some fine gravel, trace inorganic silt.				
C-1	32' - 37'	4	5	14	5	6	54"	Top of BEDROCK at 32'. Began coring. Grey, moderately weathered, SCHIST INTO GREY GRANITE. Percent Recovery= 90%			32'
							Bottom of Exploration = 37'			37'	
Notes: Sample by cathead							Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe: Type of Drill Rig: Mobile B-47				
Penetration Resistance (N) Guide:						Casing Type: HW Size: 4" Hammer Weight: 300Lbs. Fall: 30" Depth: 30" Arrow-Board: Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140Lbs. Donut Hammer Weight: Fall: 30"					
Cohesionless Soils (Sands, Gravels)		Cohesive Soils (Sills, Clays)									
Relative Density	Penetration Resistance	Consistency	Penetration Resistance								
Very Loose	0 - 4	Very Soft	0 - 2								
Loose	4 - 10	Soft	2 - 4								
Medium Dense	10 - 30	Medium Stiff	4 - 8								
Dense	30 - 50	Stiff	8 - 15								
Very Dense	Over 50	Very Stiff	15 - 30								
N=Sum of Second and Third 6" Blow Counts		Hard		Over 30							
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less										Core Barrel Type: NX Size: 2.15"	

BORING TB-6

SCALE: 1" = 5'

BORING NOTES:

- LOCATION OF BORINGS SHOWN ON THE PLAN THUS: BB-1
- BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 3/8" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
- ALL BORINGS WERE MADE IN OCTOBER 2009 AND NOVEMBER 2009.
- BORINGS WERE MADE BY NEW HAMPSHIRE BORING, INC. LOCATED AT 1215 WEST CHESTNUT STREET, BROCKTON, MA 02301.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.
- THE DEPTHS AS SHOWN ON THE BORING LOGS HAVE BEEN CONVERTED TO ELEVATIONS.

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. BB-1		
						Scale 1" = 5'				
City/Town: Concord		Bridge: Bridge Borings				Project File No: 602091		Contract No: 58183		
Project: Route 2 Construction at the Concord Rotary				Date & Time Started: 10-02-09 10:45AM		Total Hours: 9				
Groundwater Depth: 10'		Date & Time: 10-05-10 7:00PM		Date & Time Completed: 10-05-10 11:15AM						
Coordinates: N 2995843.1200		E 681321.7253		Driller's Name: Peter Labossiere		Helper's Name: Jack Lefebvre				
Ground Elevation: 129.0'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM						
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot				Recovery Inches	Field Description		Strata Changes	
S-1	0' - 2'	4	5	3	5	10"	Dry, loose, brown, COARSE SAND, some fine sand, trace organic silt.			
S-2	4' - 6'	14	4	5	9	8"	Wet, loose, brown, COARSE SAND, some fine gravel, trace fine sand.			
S-3	9' - 11'	12	12	10	9	12"	Wet, medium dense, brown, COARSE SAND, some fine sand, trace inorganic silt.			
S-4	14' - 16'	7	11	15	7	6"	Wet, medium dense, brown, COARSE SAND, some fine sand.			
S-5	19' - 21'	15	26	21	18	10"	Wet, dense, brown, COARSE SAND, some fine gravel, trace fine sand.			
S-6	24' - 25'6"	16	22	98	6'	8"	Wet, very dense, gray, COARSE SAND, some fine sand, trace inorganic silt.		23'	
C-1	29' 29' - 34'	120 6	4	5	6	6	0" 56"	Top of BEDROCK encountered at 29'. Began coring at 29'. Hard, moderately weathered, moderately fractured, pink-white to gray, GRANITE. Percent Recovery = 93%		29'
C-2	34' - 39'	4	6	5	6	6	59"	Hard, fresh, slightly fractured, gray and white GRANITE. Percent Recovery = 98%		
Bottom of Exploration = 39'								39'		
Remarks: Sampling with cathead.						Arrow-Board: Signs: Cones:		Protective Device - Stand: Box: Well Depth: Solid Pipe: Stick Up Pipe: Screen Pipe:		
Penetration Resistance (N) Guide:						Type of Drill Rig: Mobile B-47				
Cohesionless Soils (Sands, Gravels)			Cohesive Soils (Sills, Clays)			Casing HW Size: 4" Depth: 29'				
Relative Density	Penetration Resistance		Consistency	Penetration Resistance		Hammer Weight: 300 lbs. Fall: 30"				
Very Loose	0 - 4		Very Soft	0 - 2		Sampler Type: S/S Size: 1 3/8" Automatic Hammer Weight: Safety Hammer Weight: 140 lbs. Donut Hammer Weight: Fall: 30"				
Loose	4 - 10		Soft	2 - 4						
Medium Dense	10 - 30		Medium Stiff	4 - 8						
Dense	30 - 50		Stiff	8 - 15						
Very Dense	Over 50		Very Stiff	15 - 30						
N=Sum of Second and Third 6" Blow Counts			Hard		Over 30					
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less						Core Barrel Type: NX Size: 2.15"				

BORING BB-1

SCALE: 1" = 5'

NOTE:

FOR LOCATION OF BORINGS, SEE SHEET 1.

		NEW HAMPSHIRE BORING, INC. P.O. Box 165 Derry, NH 03038				Phone: (603)437-1610 Fax: (603) 437-0034 E Mail: nhb@nhboring.com		Boring No. BB-2 Scale 1" = 5'			
City/Town: Concord		Bridge: Bridge Borings		Project File No: 602091		Contract No: 58183					
Project: Route 2 Construction at the Concord Rotary				Date & Time Started: 11-10-09 9:00AM		Total Hours: 6					
Groundwater Depth: 8'		Date & Time: 11-10-09 2:00PM		Date & Time Completed: 11-10-09 3:00PM							
Coordinates: N 2995815.9		E 681385.5		Driller's Name: Peter Labossiere		Helper's Name: Jack Lefebvre					
Ground Elevation: 128'		Inspector's Name: Derek Lee		Inspector's Company: Lamson Engineering, Inc. for AECOM							
Sample Number	Depth Range (Feet)	Blow Counts per 6 Inches Coring Times Minute Per Foot			Recovery Inches	Field Description			Strata Changes		
S-1	0' - 2'	4	4	3	3	12"	Dry, loose, brown, COARSE SAND, some fine sand.				
S-2	4' - 6'	4	3	3	3	18"	Dry, loose, brown, COARSE SAND, some fine sand.				
S-3	9' - 11'	8	6	4	3	10"	Wet, loose to medium dense, COARSE SAND, some fine sand, trace inorganic silt.			13'	
S-4	14' - 16'	20	25	50	30	10"	Wet, very dense, brown, FINE SAND AND COARSE SAND, some inorganic silt.			17'	
C-1	18' - 23'	8	8	7	9	11	47"	Top of BEDROCK at 17'. casing refusal at 17'. Rollerbit to 18' and began coring. Hard, gray, white GNEISS. Percent Recovery = 78%			
C-2	23' - 28'	8	4	5	6	6	60"	Hard, gray, white GNEISS. Percent Recovery = 78%			
Bottom of Exploration = 28'										28'	
Remarks: Sampling with cathead.							Arrow-Board: Signs: Cones:	Protective Device - Stand: Well Depth: Stick Up Pipe:	Box: Solid Pipe: Screen Pipe:		
Penetration Resistance (N) Guide:							Type of Drill Rig: Mobile B-47				
Cohesionless Soils (Sands, Gravels)				Cohesive Soils (Sills, Clays)			Casing HW Size: 4" Depth: 17'				
Relative Density	Penetration Resistance			Consistency	Penetration Resistance		Hammer Weight: 300 lbs.				
Very Loose	0 - 4			Very Soft	0 - 2		Fall: 30"				
Loose	4 - 10			Soft	2 - 4		Sampler Type: S/S Size: 1 3/8"				
Medium Dense	10 - 30			Medium Stiff	4 - 8		Automatic Hammer Weight:				
Dense	30 - 50			Stiff	8 - 15		Safety Hammer Weight: 140 lbs.				
Very Dense	Over 50			Very Stiff	15 - 30		Donut Hammer Weight:				
N=Sum of Second and Third 6" Blow Counts				Hard	Over 30		Fall: 30"				
Terms Used for Second Entry of Descriptions: and = 40-50%, some = 10-40%, trace = 10% or less							Core Barrel Type: NX Size: 2.15"				

BORING BB-2

SCALE: 1" = 5'

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	116	158
PROJECT FILE NO. 606223			

EXIST. RAILROAD RIGHT OF WAY

EXIST. SHLO

62'-0"

EXIST. STONE MASONRY ABUT. TO REMAIN

CL BRGS. WEST ABUT.

EXIST. STONE MASONRY ABUT. TO REMAIN

NASHOBA BROOK

EXISTING BRIDGE SUPERSTRUCTURE TO BE REMOVED

CL BRGS. EAST ABUT.

12" CONC. CURB

2'-0" SHOULDER

12"

BB-2

4'-0"

12"

BB-1

4'-0"

12"

12" CURTAIN WALL (TYP.)

5'-0" (TYP.) POST SPACING

PROP. COMPOST AND SEED OVER MODIFIED ROCKFILL SLOPE (HWY. ITEM)

PROP. MICROPILE SUPPORTED ABUT. (TYP.)

18'-0"

BRUCE FREEMAN RAIL TRAIL CONST. & P.G.L. STA. 29+61.99 = NASHOBA BROOK STA. 26+61.18

BRUCE FREEMAN RAIL TRAIL

15" (TYP.)

15" (TYP.)

18" BACKWALL (TYP.)

12" (TYP.)

12"

90'0"0" TO CHORD (TYP.)

CHORD THROUGH ABUTMENT WORKING POINTS

R = 1900'

6'-0" LANE

6'-0" LANE

12" CONC. CURB

2'-0" SHOULDER

CURB LINE

8" APPROACH SLAB SHELF (TYP.)

14'-0" LIMIT OF EPS (TYP.)

6'-0" APPROACH SLAB (TYP.)

W.P. STA. 29+25.82

W.P. STA. 29+87.82

30+00

PROP. MICROPILE (TYP.)

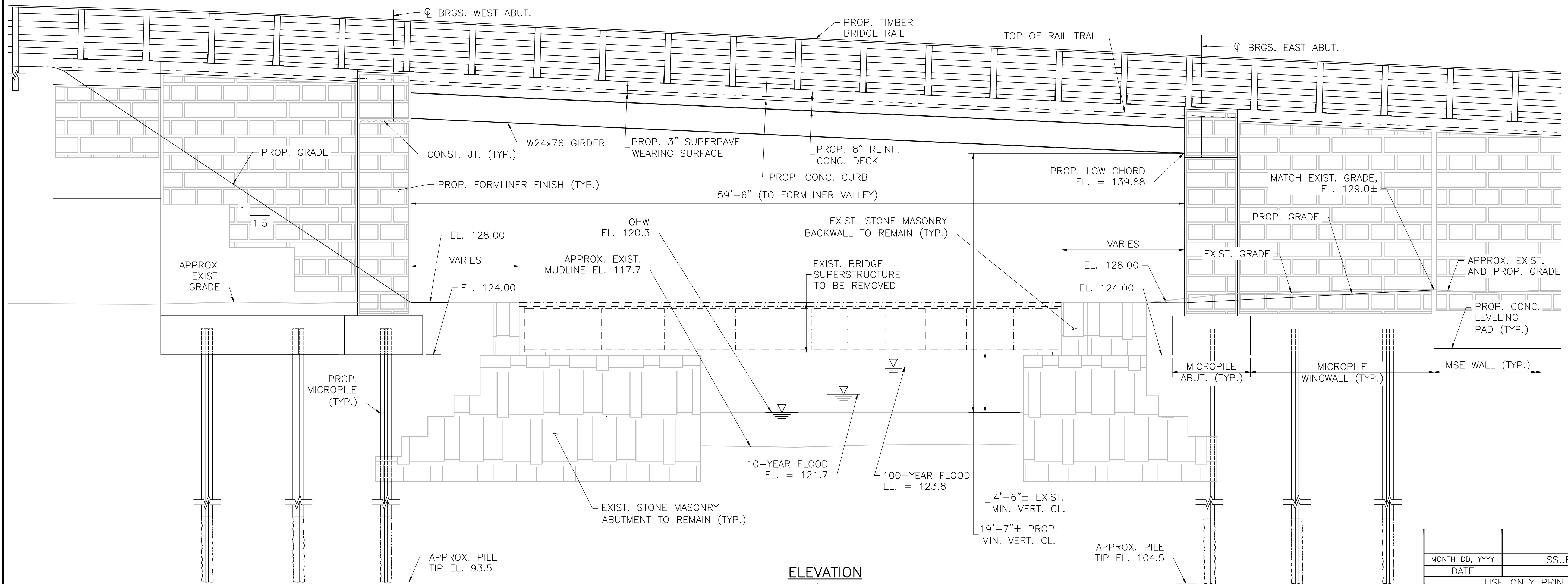
PROP. MICROPILE SUPPORTED WINGWALL (TYP.)

BENCHMARK #1072 IRON PIN EL. 124.85

PLAN

SCALE: 1/4" = 1'-0"

PLAN
SCALE: $\frac{1}{4}" = 1'-0"$



ELEVATION
SCALE: $\frac{1}{4}" = 1'-0"$

SHEET 4 OF 14 SHEETS BRIDGE NO. C-19-037 (BF4)

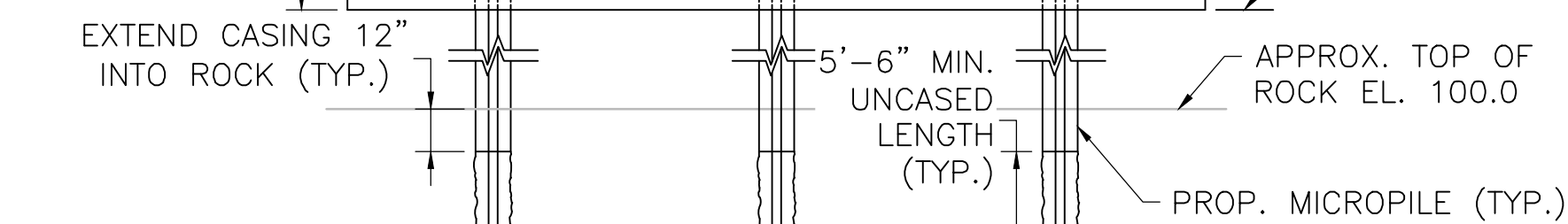
[illegible]

SCALE: $\frac{1}{4}'' = 1'-0''$

MICROPILE NO.	STATION	OFFSET	NORTHING	EASTING
NW 1	29+18.44	8.25' LT	2995861.0134	681332.9178
NW 2	29+11.41	8.25' LT	2995865.6589	681327.6814
SW 1	29+18.69	8.25' RT	2995848.4804	681322.1828
SW 2	29+11.72	8.25' RT	2995853.1249	681316.9455



SCALE: $\frac{1}{4}" = 1'-0"$



SCALE: $\frac{1}{4}" = 1'-0"$

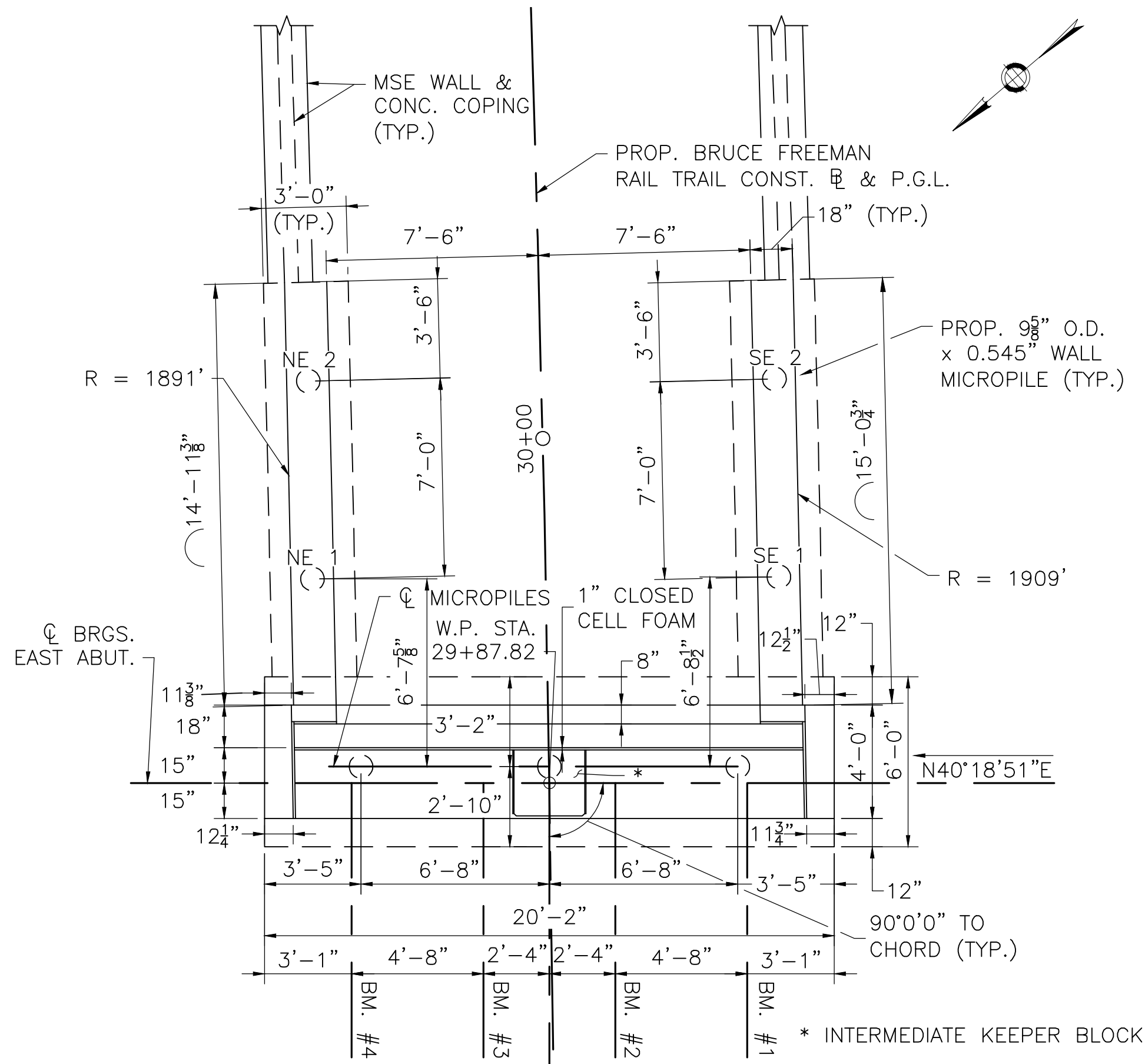


SCALE: $\frac{1}{4}" = 1'-0"$

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	118	158
PROJECT FILE NO. 606223			

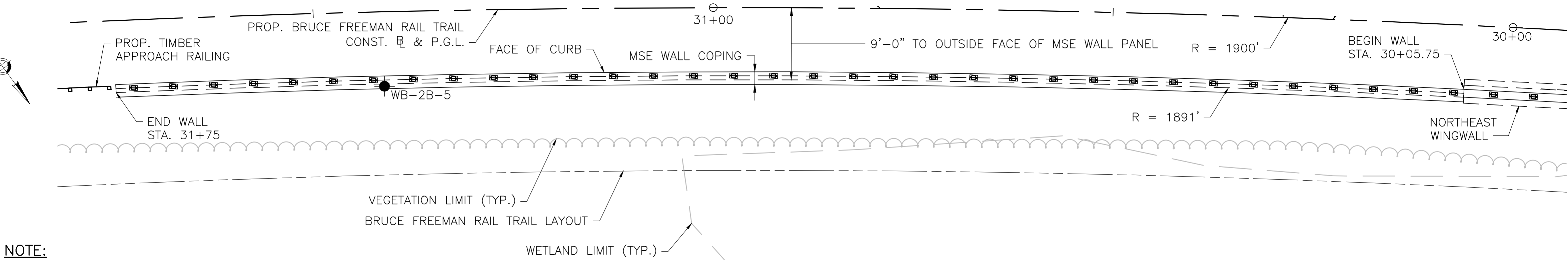
EAST ABUTMENT PLAN &
ELEVATION



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	119	158
PROJECT FILE NO. 606223			

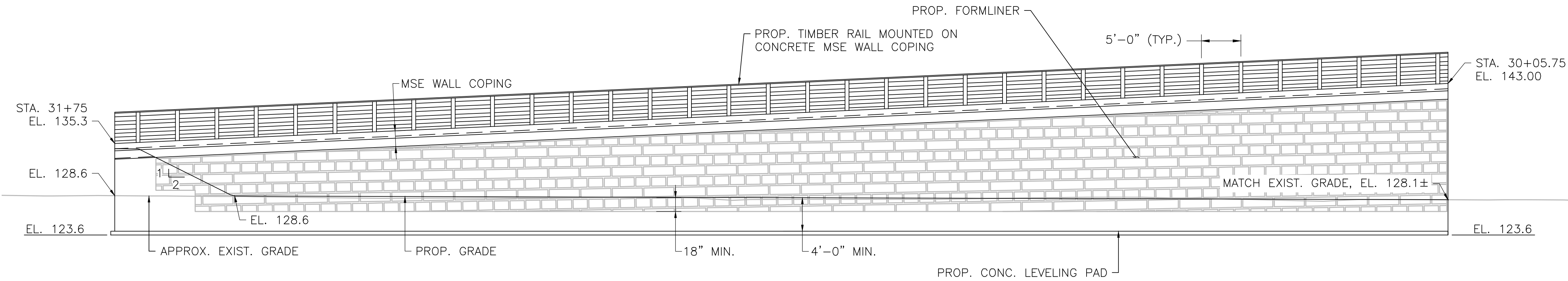
MSE WALL PLANS &
ELEVATIONS



NOTE:
SEE HIGHWAY DRAWINGS FOR WALL BORING LOGS.

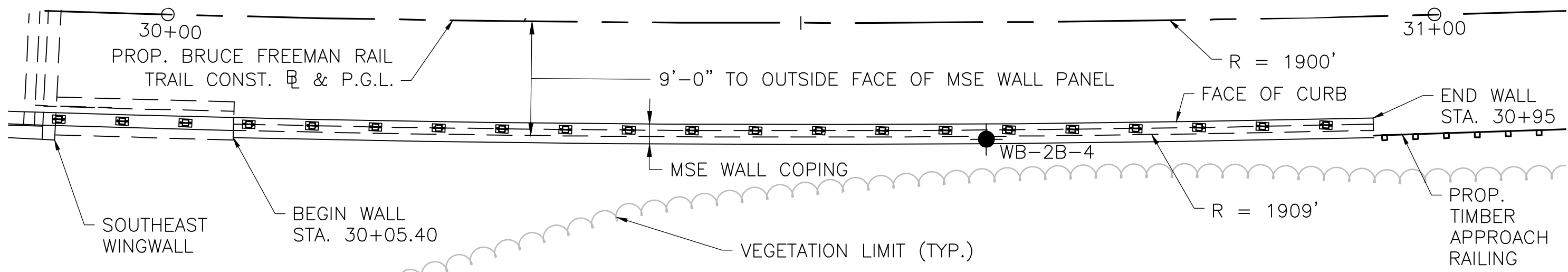
NORTHEAST MSE WALL PLAN

SCALE: 1/8" = 1'-0"



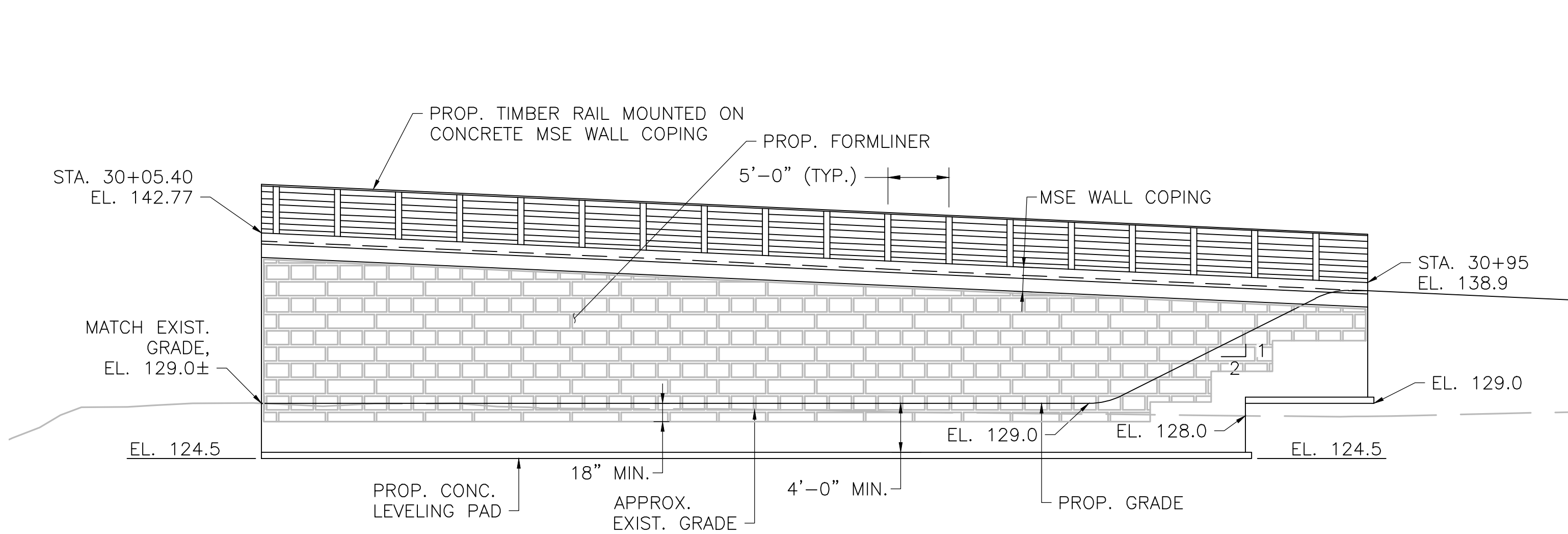
NORTHEAST MSE WALL ELEVATION

SCALE: 1/8" = 1'-0"



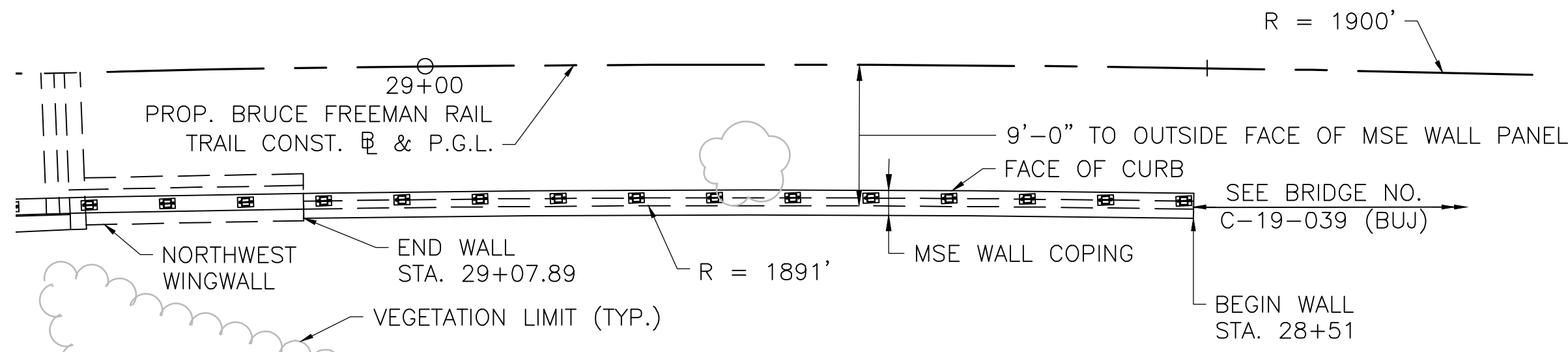
SOUTHEAST MSE WALL PLAN

SCALE: 1/8" = 1'-0"



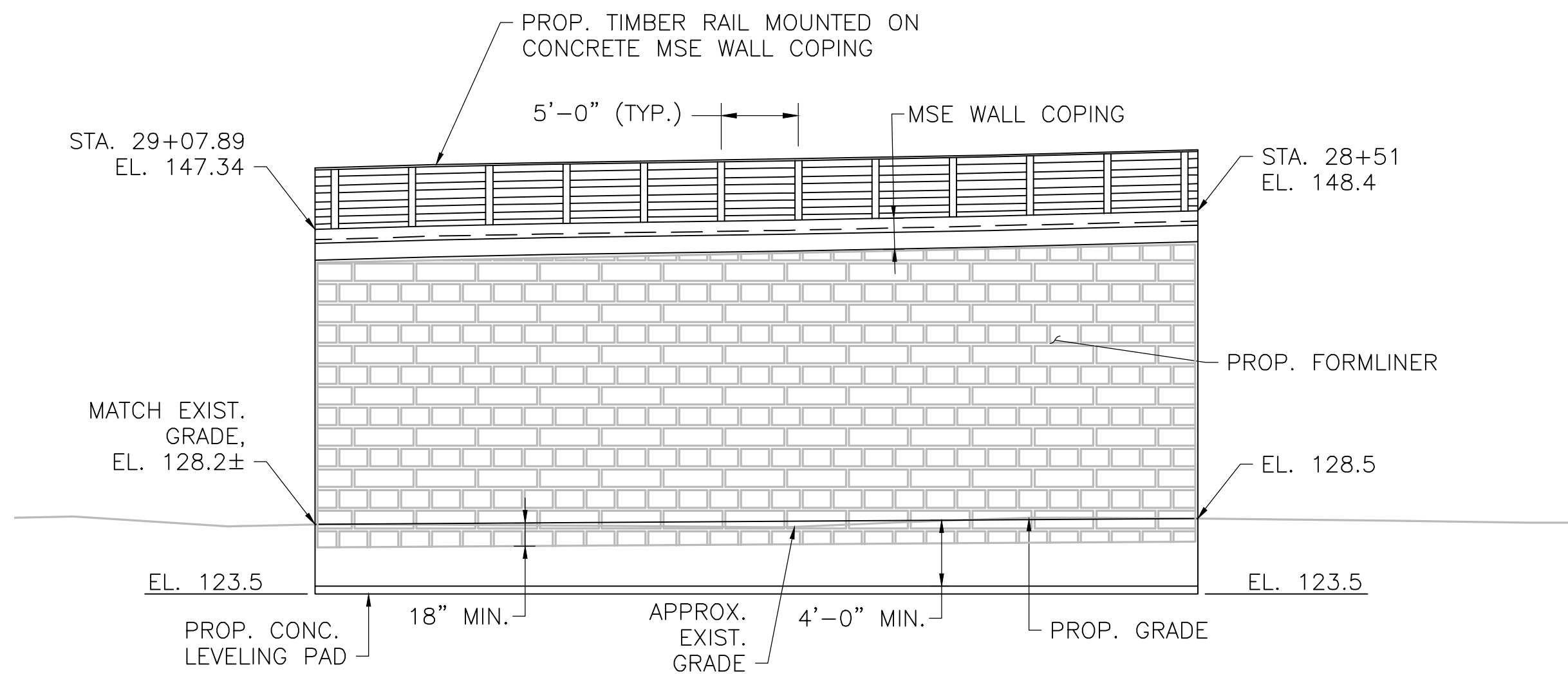
SOUTHEAST MSE WALL ELEVATION

SCALE: 1/8" = 1'-0"



NORTHWEST MSE WALL PLAN

SCALE: 1/4" = 1'-0"



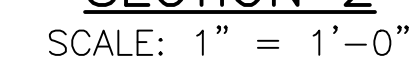
NORTHWEST MSE WALL ELEVATION

SCALE: 1/8" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	



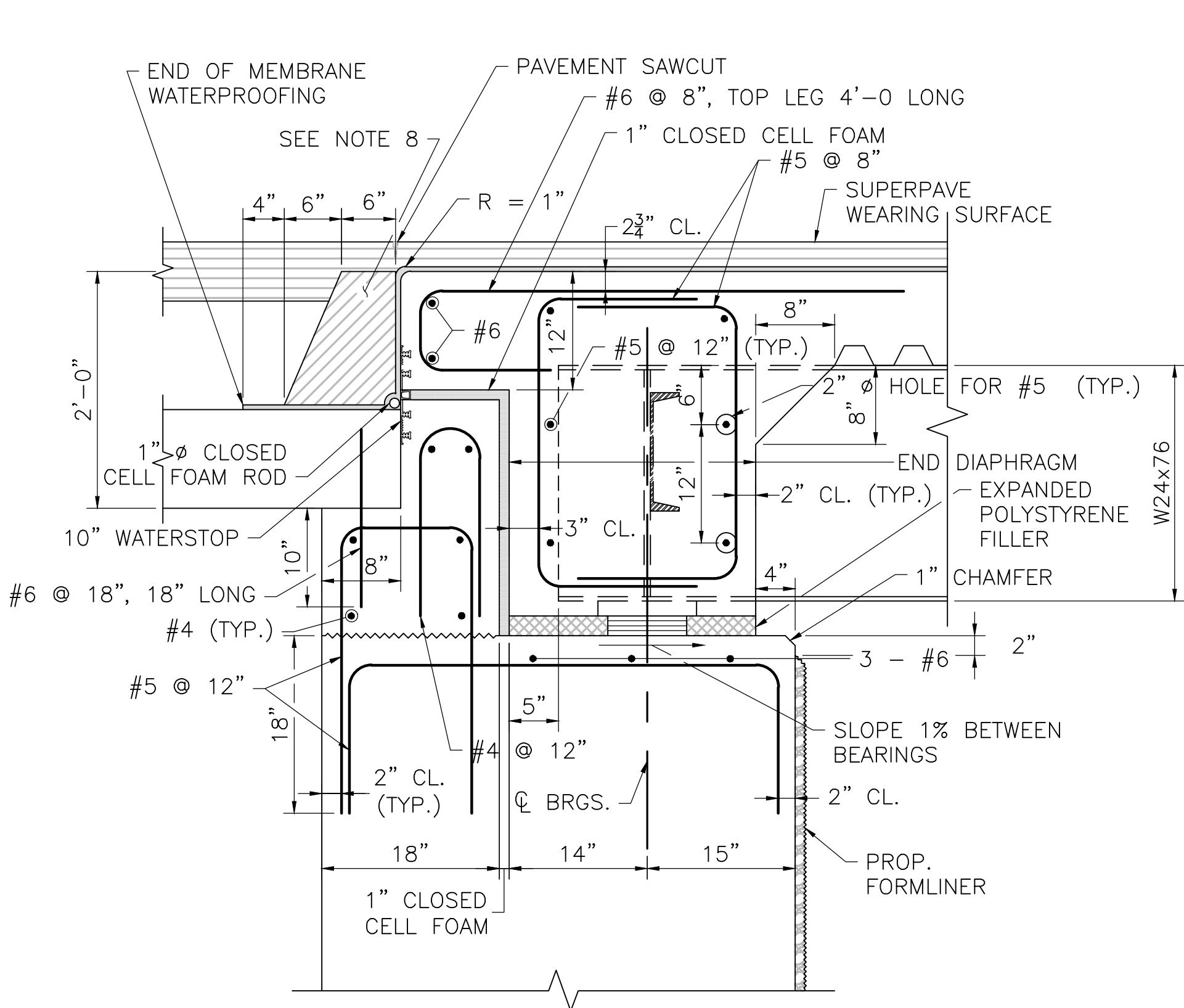
- SCALE: 1" = 1'-0"



- | | |
|--------------------------------|-------------------------|
| | |
| MONTH DD, YYYY | ISSUED FOR CONSTRUCTION |
| DATE | DESCRIPTION |
| USE ONLY PRINTS OF LATEST DATE | |

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	121	158
PROJECT FILE NO. 606223			

ABUTMENT DETAILS (2 OF 2)

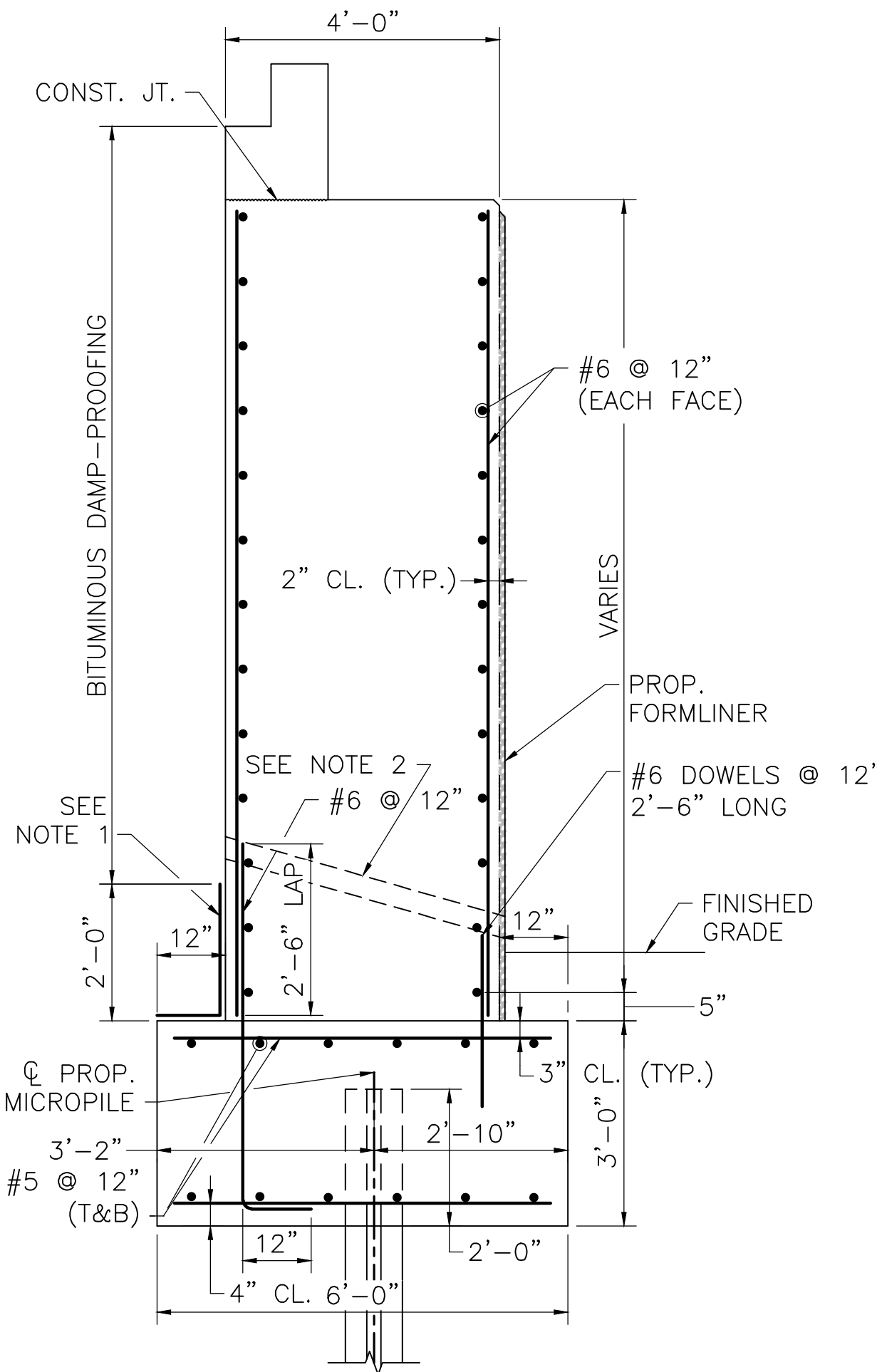


DETAILS AT ABUTMENT - ROADWAY SECTION

SCALE: 1" = 1'-0"

ROADWAY SECTION NOTES:

- ALL REINFORCEMENT SHOWN IN THIS DETAIL SHALL BE COATED.
- ALL BACKWALL CONCRETE ABOVE THE CONSTRUCTION JOINT LOCATED AT THE BRIDGE SEAT SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE. THE CONSTRUCTION JOINT SHALL BE GIVEN A RAKE FINISH WITH A $\frac{1}{4}$ " MINIMUM AMPITUDE.
- TOP OF BACKWALL SHALL BE TROWELED SMOOTH PARALLEL TO THE PROFILE GRADE.
- THE BACKWALL, KEEPER BLOCK, AND CURTAIN WALL CONCRETE MUST BE PLACED AND SUFFICIENTLY CURED PRIOR TO PLACING THE END DIAPHRAGM CONCRETE.
- THE END DIAPHRAGM CONCRETE SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 585 HP CEMENT CONCRETE AND SHALL BE PLACED MONOLITHICALLY WITH THE DECK.
- PRIOR TO PLACING THE END DIAPHRAGM CONCRETE, CLOSED CELL FOAM OF THE SPECIFIED THICKNESSES SHALL BE ATTACHED WITH ADHESIVE TO ALL SURFACES OF THE BACKWALL, KEEPER BLOCKS, AND CURTAIN WALLS AS SHOWN ON THE PLANS. EXPANDED POLYSTYRENE FILLER SHALL BE PLACED UNDER THE BEAM SOLE PLATE AND THE BOTTOM OF THE END DIAPHRAGM SHALL BE FORMED AS SPECIFIED. THE CONTRACTOR SHALL INSURE THAT ALL ABUTMENT CONCRETE IS PROPERLY LINED. END DIAPHRAGM CONCRETE MUST NOT COME IN DIRECT CONTACT WITH ABUTMENT CONCRETE.
- DRAPE MEMBRANE WATERPROOFING OVER CLOSED CELL FOAM BACKER ROD.
- PROTECTIVE COURSE TO BE SUPERPAVE BRIDGE PROTECTIVE COURSE (SPC-B-12.5), PLACED IN 2" LAYERS AND COMPACTED WITH A MECHANICAL HAND-GUIDED TAMPER WITHIN 12 HOURS AFTER PLACING MEMBRANE WATERPROOFING.



TYPICAL ABUTMENT SECTION

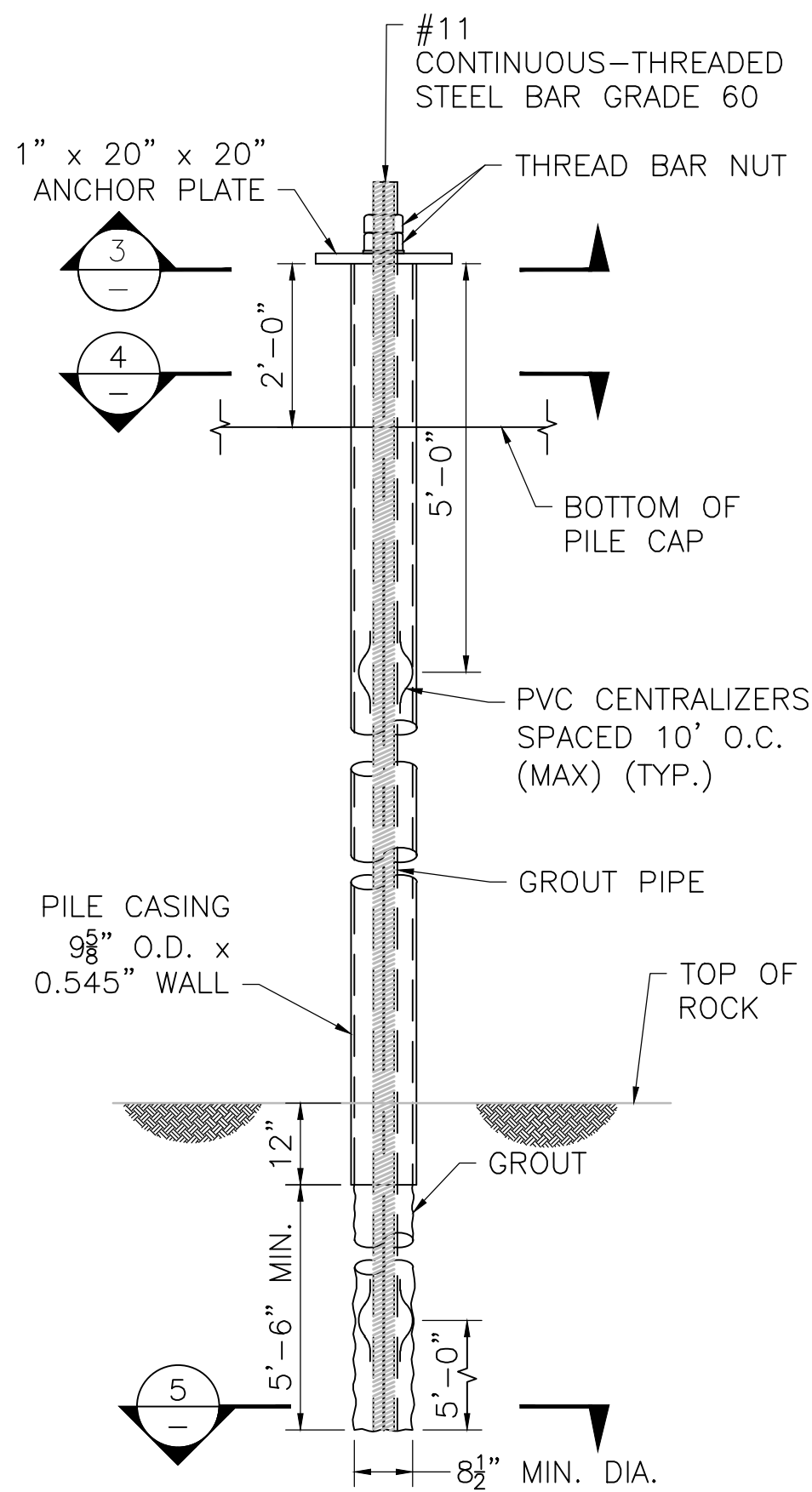
SCALE: $\frac{1}{2}$ " = 1'-0"

ABUTMENT NOTES:

- MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
- 4" ϕ WEEP HOLES 10'-0" O.C. (JUST ABOVE PROTECTIVE COURSE).
- ALL CONCRETE SHALL BE 4000 PSI, $\frac{1}{2}$ IN, 565 CEMENT CONCRETE EXCEPT THE BACKWALL, WHICH SHALL BE 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE.
- THE FACTORED AXIAL DESIGN LOAD PER PILE IS 193 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

THE FACTORED STRUCTURAL RESISTANCE PER PILE IS 198 KIPS AND IS THE PRODUCT OF THE NOMINAL STRUCTURAL RESISTANCE OF 264 KIPS AND A RESISTANCE FACTOR OF 0.75.

- THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 195 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 354 KIPS AND A RESISTANCE FACTOR OF 0.55. THE ESTIMATED TIP ELEVATIONS ARE 93.5 AT THE WEST ABUTMENT AND 104.5 AT THE EAST ABUTMENT.

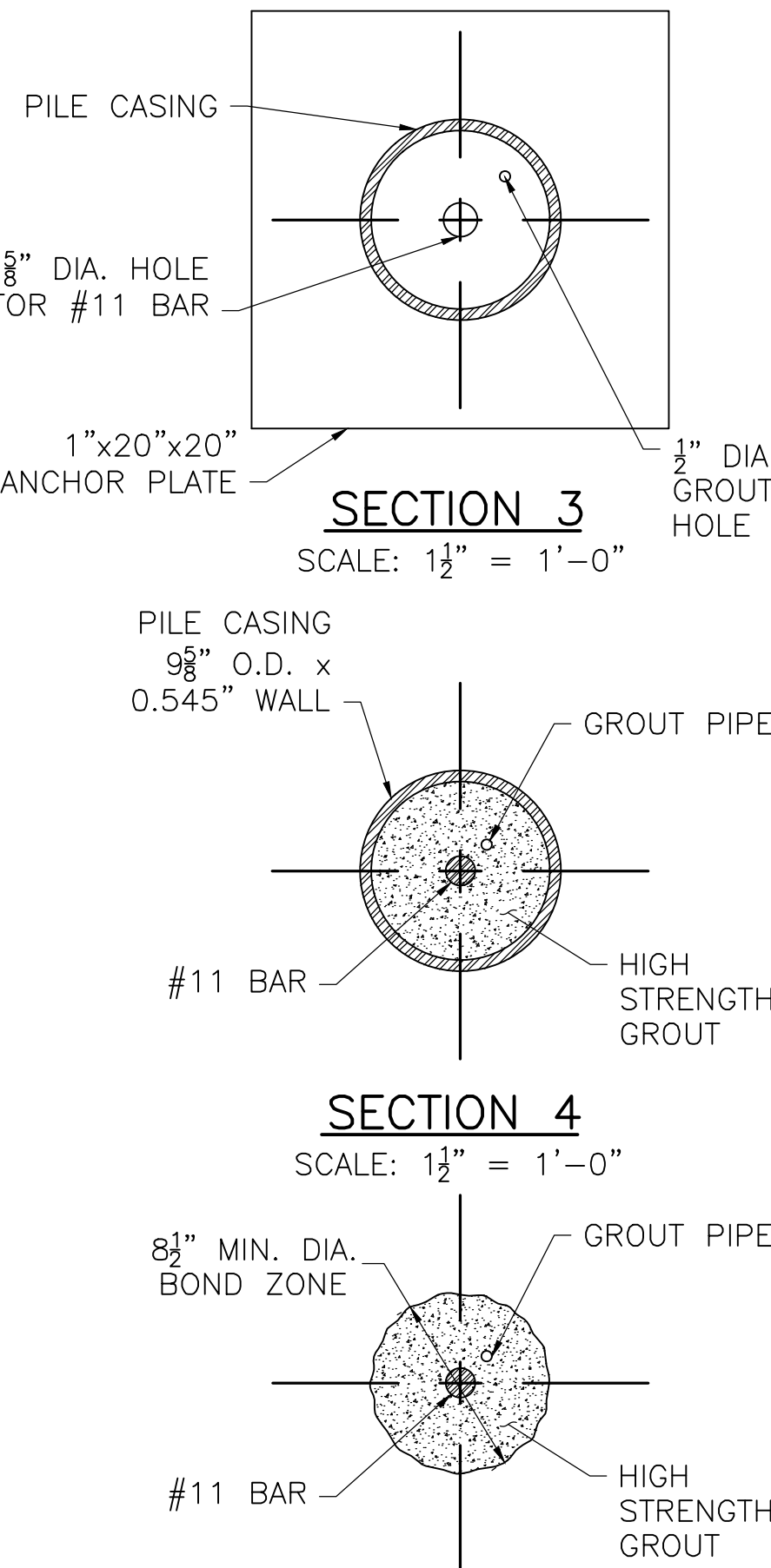


MICROPILE ELEVATION

SCALE: $\frac{1}{2}$ " = 1'-0"

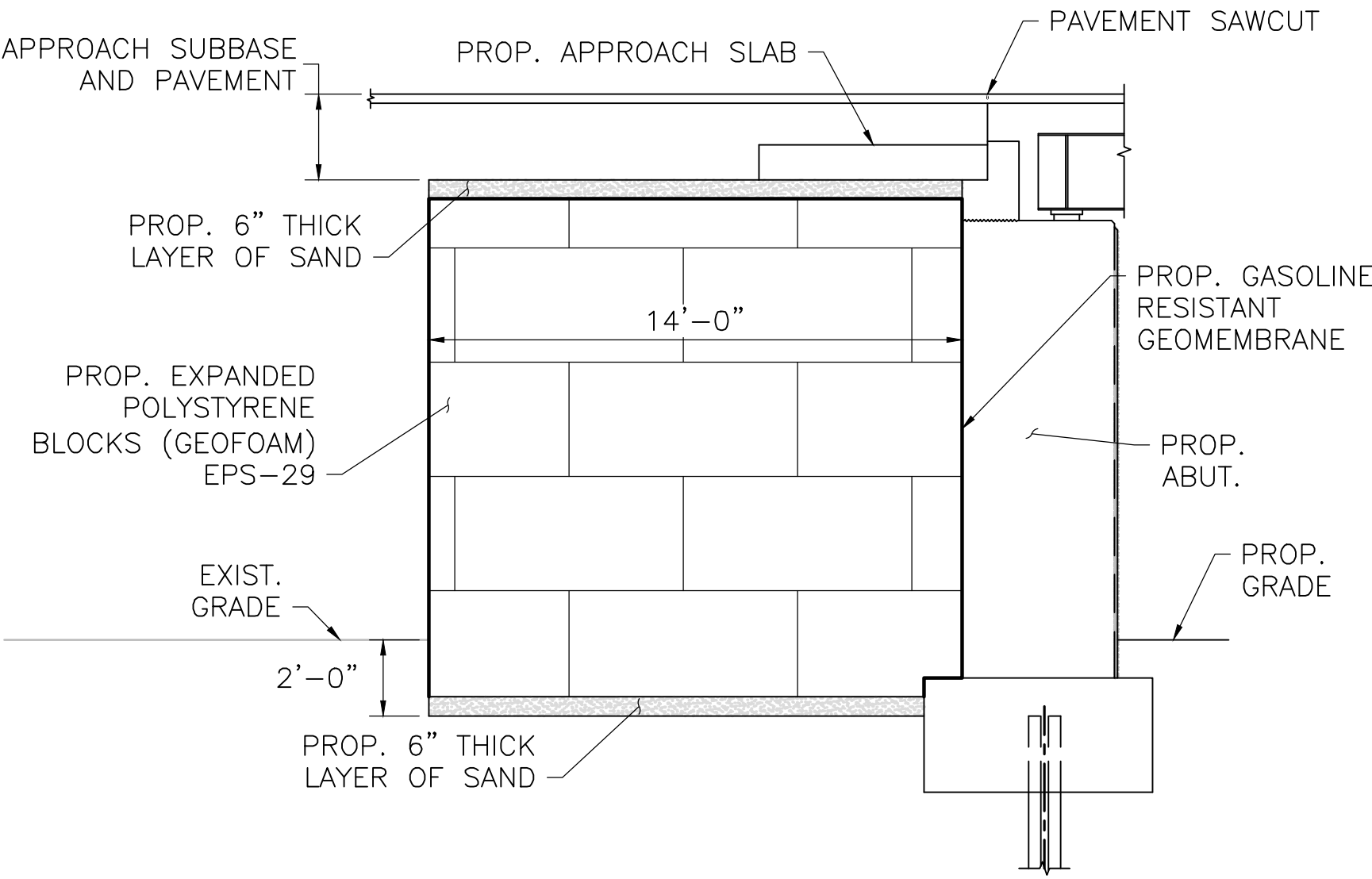
MICROPILE NOTES:

- STEEL CASING SHALL CONFORM TO THE REQUIREMENTS OF API 5L GRADE X52 PSL 2 WHICH HAS A MINIMUM YIELD STRENGTH OF 52,000 PSI.
- ANCHOR PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A709 GRADE 50.
- GROUT SHALL HAVE A MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 5000 PSI AND BE PLACED BY GRAVITY HEAD ONLY.
- CENTRAL REINFORCING BAR SHALL CONFORM TO ASTM A615 GRADE 60 AND BE CONTINUOUSLY THREADED FOR THE ENTIRE BAR LENGTH.
- FOR CASING SPLICE REQUIREMENTS, SEE SPECIAL PROVISIONS.
- PRIOR TO THE START OF THE INSTALLATION OF THE MICROPILES, THE CONTRACTOR SHALL SUBMIT A PILE SCHEDULE, PILE INSTALLATION AND PILE TESTING PLAN FOR REVIEW AND APPROVAL OF THE ENGINEER.



SECTION 5

SCALE: $\frac{1}{2}$ " = 1'-0"



ABUTMENT EPS DETAILS

SCALE: $\frac{1}{4}$ " = 1'-0"

NOTE:
REFER TO SPECIAL PROVISIONS FOR
ADDITIONAL EPS REQUIREMENTS.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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MSE WALL NOTES:

1. THE FACTORED BEARING PRESSURE = 6.07 KSF AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.

FACTORED BEARING RESISTANCE = 6.10 KSF. FACTORED BEARING RESISTANCE IS THE PRODUCT OF THE NOMINAL BEARING RESISTANCE AND A RESISTANCE FACTOR OF 0.65.

2. THE SOIL REINFORCEMENT LENGTH SHALL BE AS A MINIMUM 70% OF THE DESIGN HEIGHT (H) BUT NOT LESS THAN 8'-0".



SCALE: $\frac{1}{2}" = 1'-0"$

WINGWALL NOTES:

1. MEMBRANE WATERPROOFING AND 8"x16"x2", 4000 PSI, $\frac{3}{4}$ IN, 610 CEMENT CONCRETE BLOCKS LAID IN MORTAR OR OTHER WATERPROOFING PROTECTIVE COURSE, MIN. 2" THICK AS SPECIFIED IN MHD STANDARD SPECIFICATIONS.
2. 4" ϕ WEEP HOLES 10'-0" O.C. (JUST ABOVE PROTECTIVE COURSE).
3. ALL CONCRETE SHALL BE 4000 PSI, $1\frac{1}{2}$ IN, 565 CEMENT CONCRETE.
4. THE FACTORED AXIAL DESIGN LOAD PER PILE IS 193 KIPS AS PER AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS STRENGTH I LOAD COMBINATION.
5. THE FACTORED GEOTECHNICAL PILE RESISTANCE IS 195 KIPS AND IS THE PRODUCT OF THE NOMINAL GEOTECHNICAL RESISTANCE OF 354 KIPS AND A RESISTANCE FACTOR OF 0.55. THE ESTIMATED TIP ELEVATIONS ARE 93.5 AT THE WEST WINGWALLS AND 104.5 AT THE EAST WINGWALLS.



SCALE: $\frac{3}{4}" = 1'-0"$



SCALE: $\frac{1}{4}" = 1'-0"$

EPS NOTES:

11. DUE TO THE CURVATURE OF THE TRAIL AND THE WINGWALLS, THE CONTRACTOR HAS THE OPTION TO TERMINATE THE EPS 6" FROM THE BACK OF THE PROPOSED WINGWALLS AND INSTALL THE EPS WITH A VERTICAL FACE. IF THIS OPTION IS CHOSEN, THE VOID SHALL BE FILLED WITH COMPACTED SAND FILL.

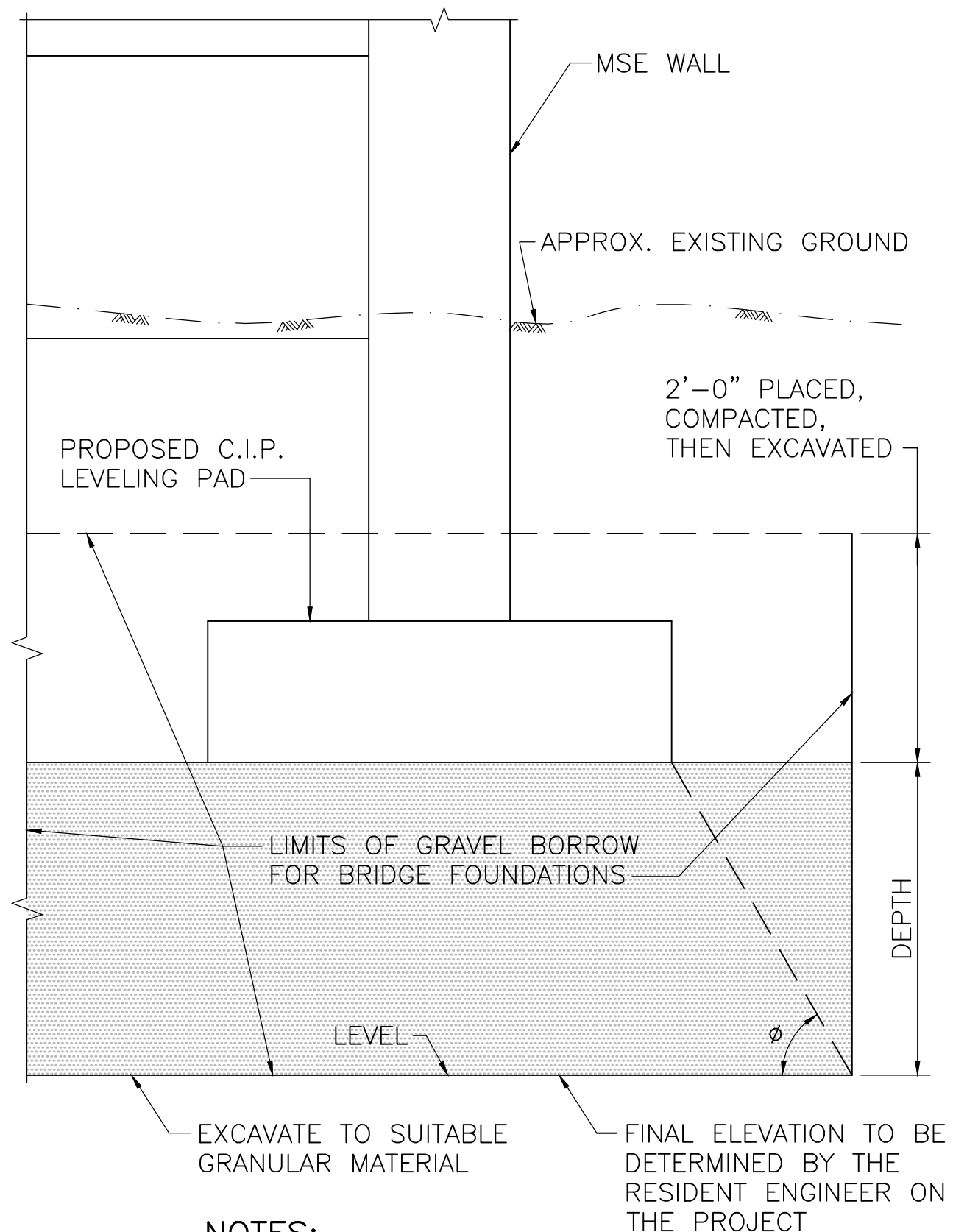
2. REFER TO SPECIAL PROVISIONS FOR ADDITIONAL EPS REQUIREMENTS.



SCALE: $\frac{3}{8}" = 1'-0"$

MSE NOTES:

1. UNSUITABLE SOILS SHALL BE REMOVED AND REPLACED WITH GRAVEL BORROW FOR BRIDGE FOUNDATIONS AS DETERMINED BY THE ENGINEER.
2. REFER TO SPECIAL PROVISIONS FOR THE FOLLOWING:
 - INFORMATION REGARDING PANELS, JOINTS, FILTER FABRIC AND MSE WALL REQUIREMENTS.
 - DESIGN CRITERIA AND MATERIAL REQUIREMENTS NOT SHOWN ON THESE PLANS.
 - MSE WALL FOUNDATION PREPARATION REQUIREMENTS
 - EXCAVATION PAYMENT LIMITS



NOTES:

1. $\phi = 45^\circ$ FOR DEPTH OF 5'-0" OR LESS.
 $\phi = 60^\circ$ FOR DEPTH OVER 5'-0".
2. SAME TREATMENT IS TO BE USED AT ENDS OF WALLS, PIERS, AND ABUTMENTS.

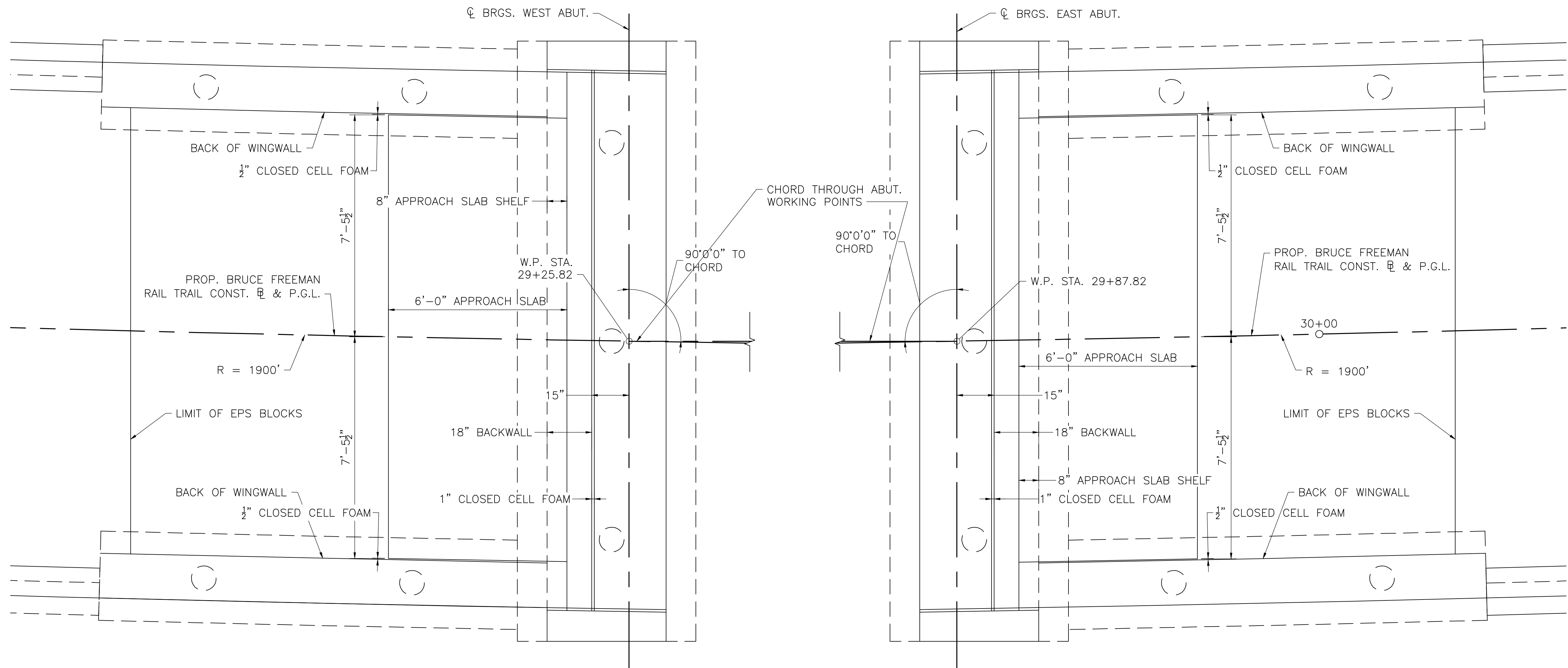
LIMITS OF GRAVEL BORROW FOR BRIDGE FOUNDATIONS

NOT TO SCALE

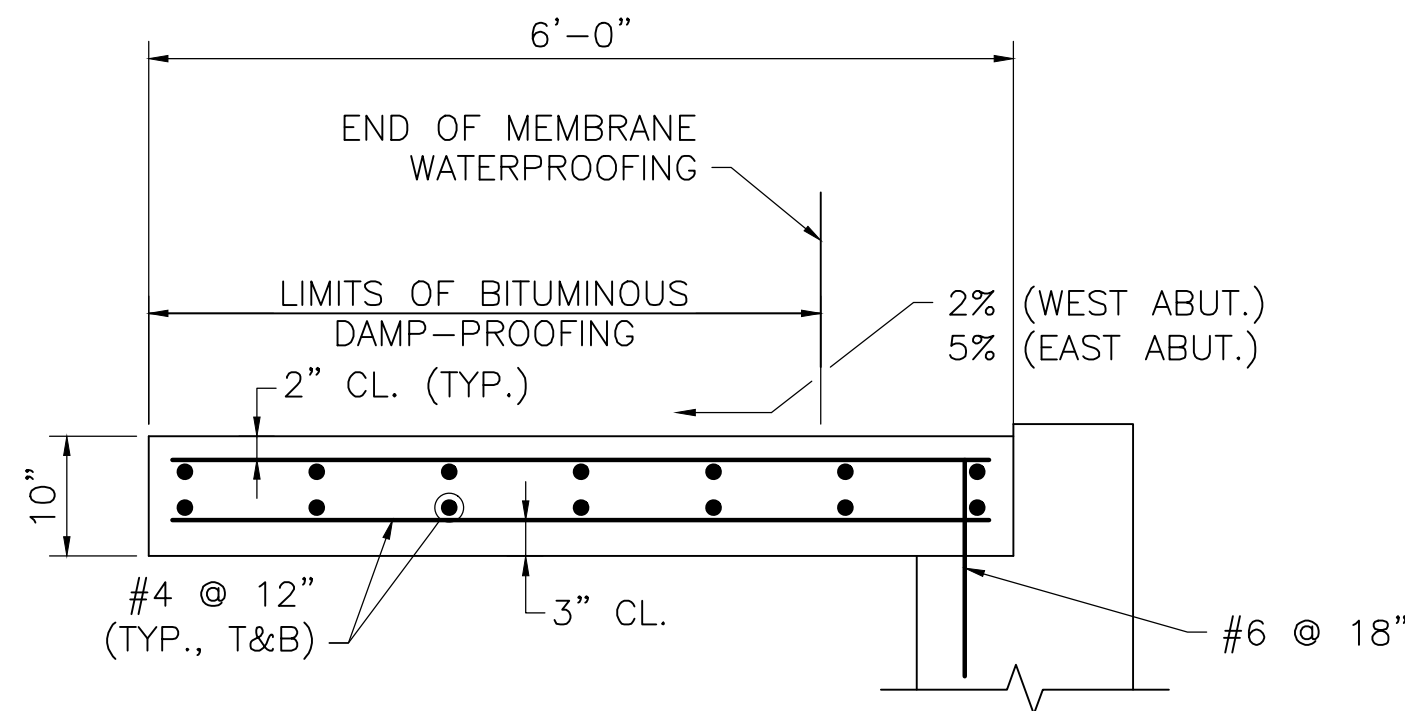
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	123	158
PROJECT FILE NO. 606223			

APPROACH SLAB PLAN &
DETAILS



APPROACH SLAB PLAN
SCALE: 1/2" = 1'-0"



NOTES:

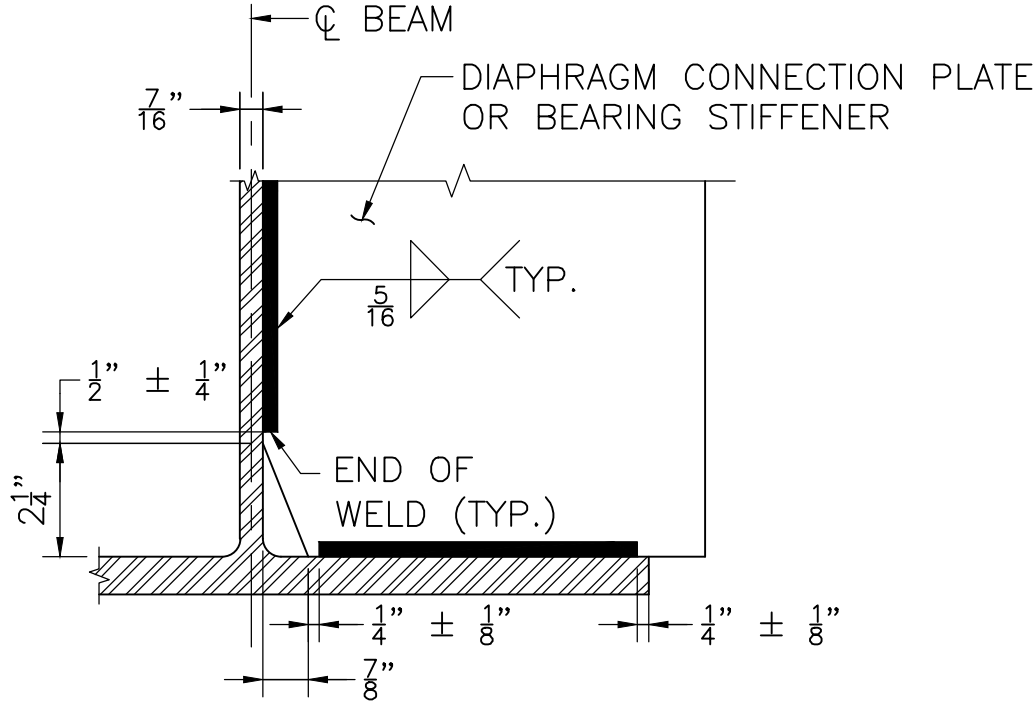
- APPROACH SLAB TO BE 4000 PSI, 1 1/2 IN, 565 CEMENT CONCRETE.
- PLACE LONGITUDINAL REINFORCEMENT PARALLEL TO THE CL OF CONSTRUCTION. PLACE TRANSVERSE REINFORCEMENT PARALLEL TO ABUTMENT.

APPROACH SLAB DETAILS
SCALE: 3/8" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

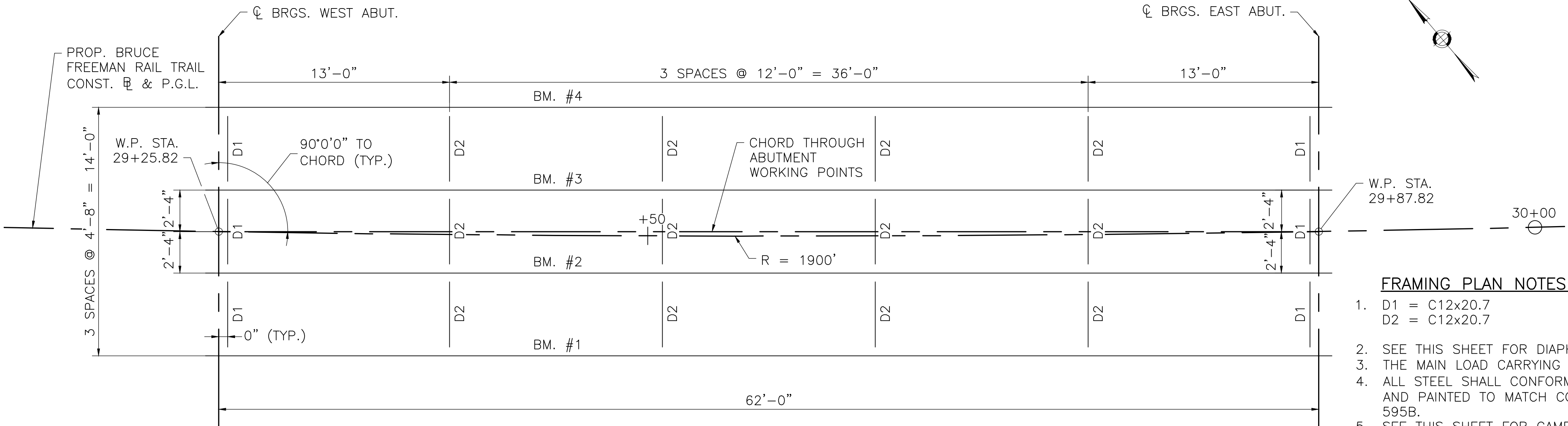
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	124	158
PROJECT FILE NO. 606223			

FRAMING PLAN & STRUCTURAL
STEEL DETAILS



CLIP DETAIL
NOT TO SCALE

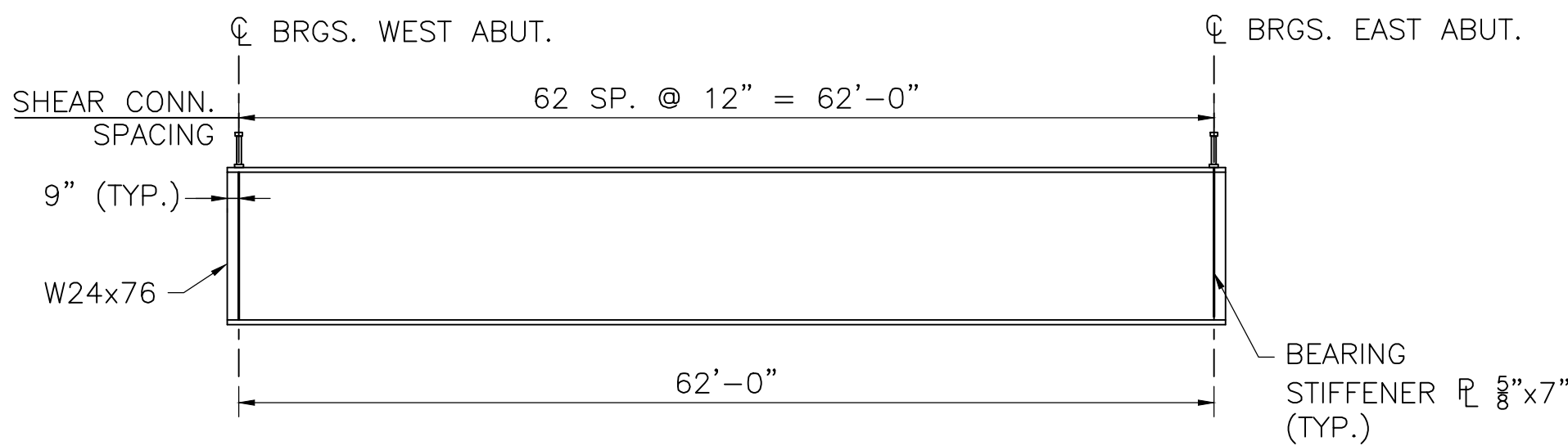
NOTE:
AT STIFFENER LOCATIONS, MODIFY THE PLATE ATTACHMENT TO THE FLANGES AS SHOWN IN THE TYPICAL STIFFENER ATTACHMENTS ON THIS SHEET.



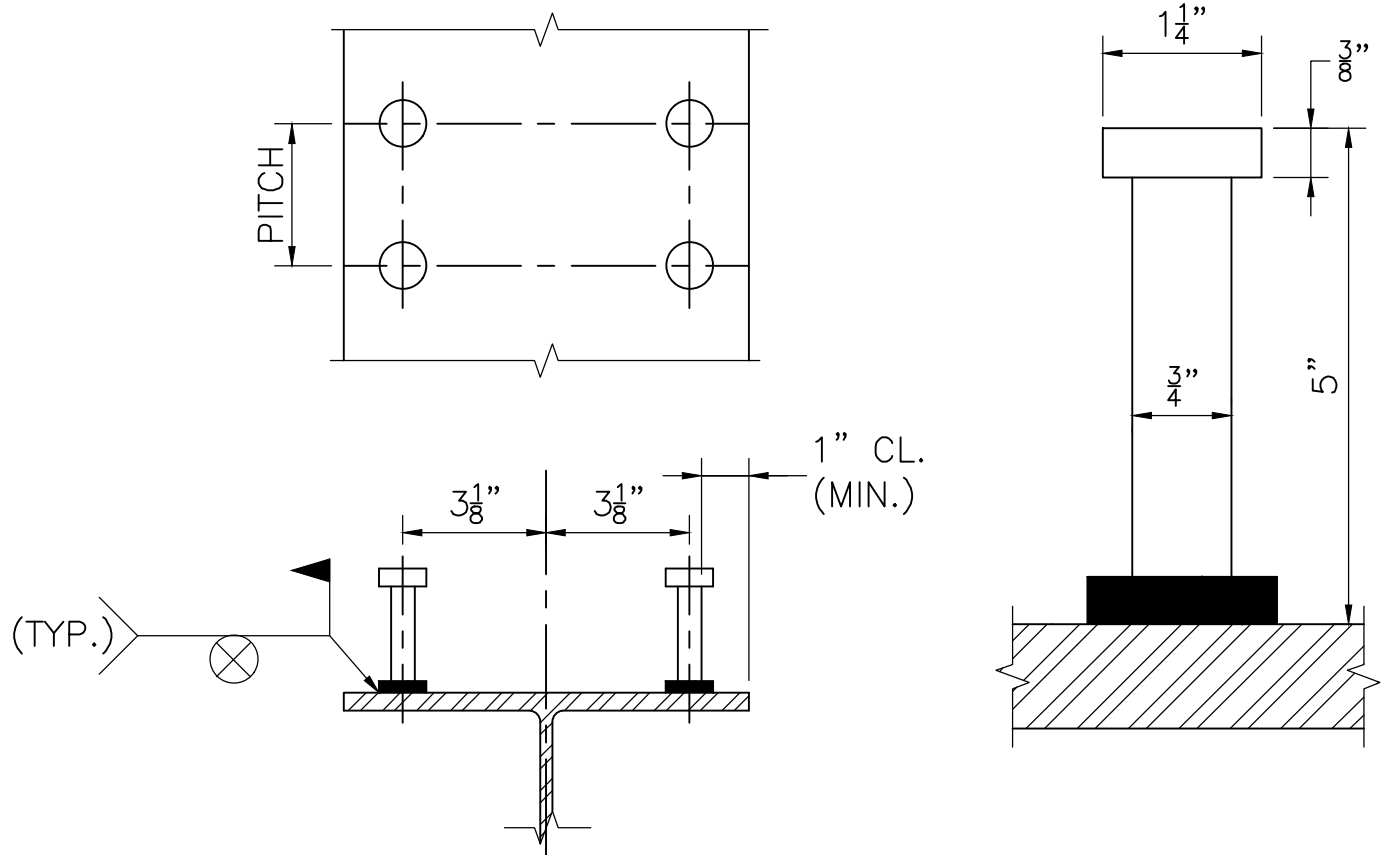
FRAMING PLAN
SCALE: 1/4" = 1'-0"

FRAMING PLAN NOTES:

- D1 = C12x20.7
D2 = C12x20.7
- SEE THIS SHEET FOR DIAPHRAGM DETAILS.
- THE MAIN LOAD CARRYING MEMBERS ARE BM. #1 THROUGH BM. #4.
- ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50 (GALVANIZED) AND PAINTED TO MATCH COLOR CHIP NO. 16495 OF FEDERAL STANDARD 595B.
- SEE THIS SHEET FOR CAMBER TABLE.
- FOR SHEAR STUD SPACING, SEE BEAM ELEVATION (THIS SHEET).



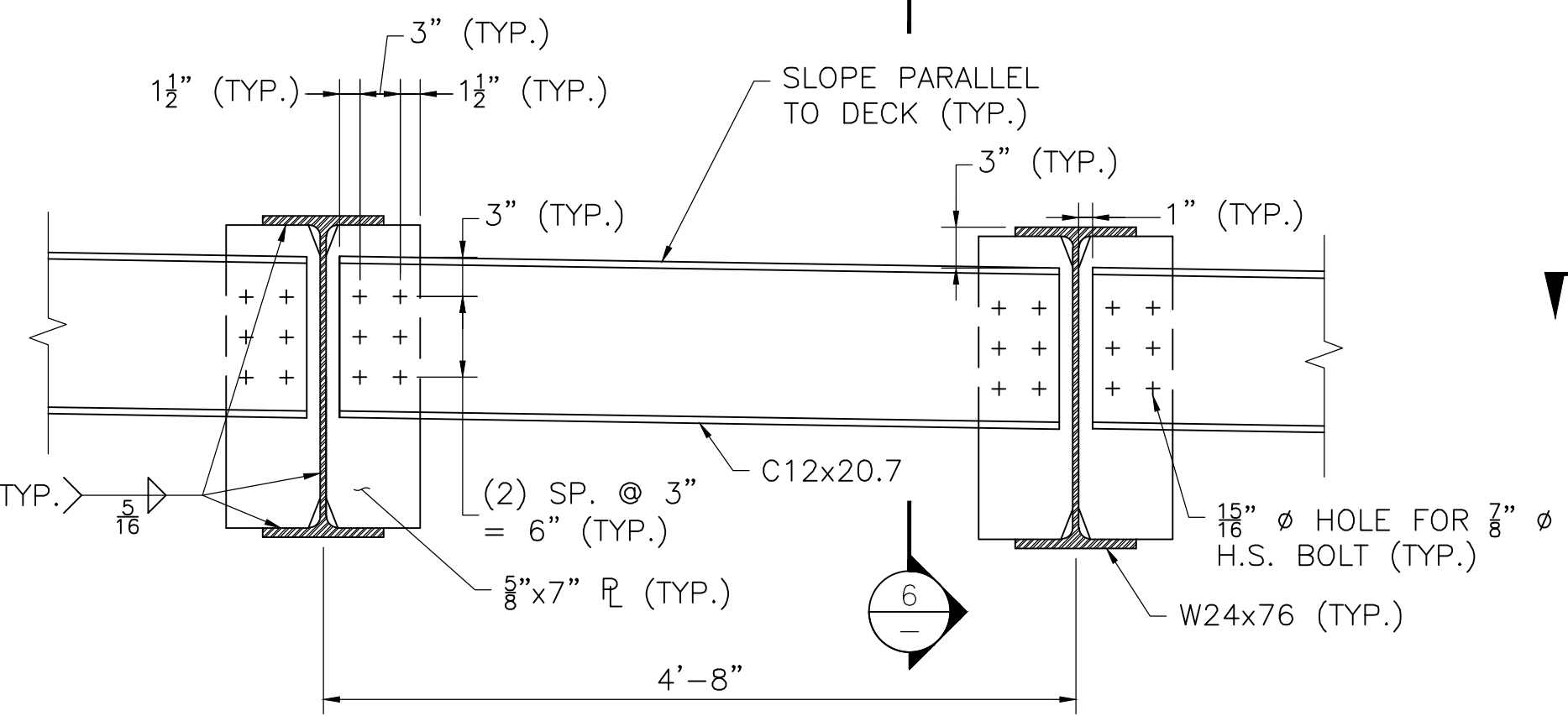
BEAM ELEVATION
HORIZ. SCALE: 1" = 10'-0"
VERT. SCALE: 1/2" = 1'-0"



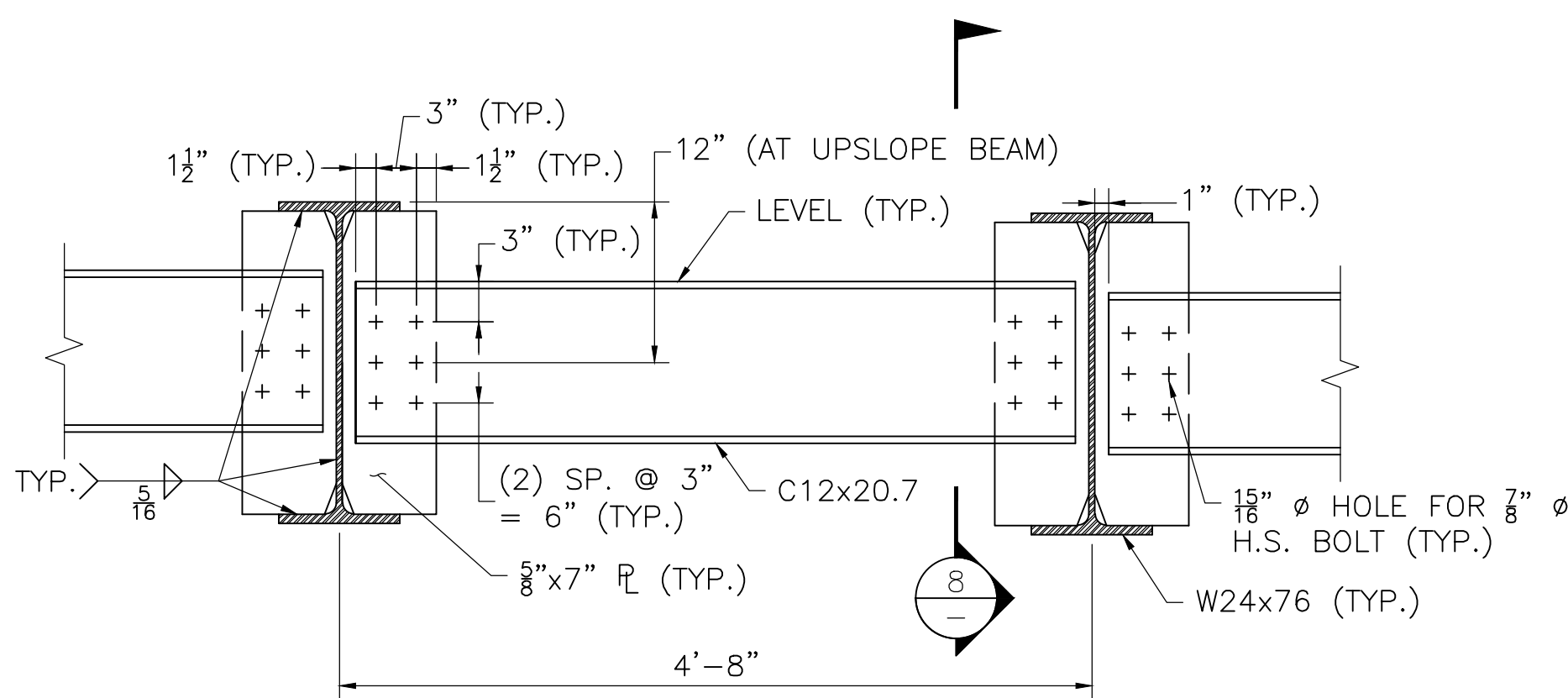
NOTE:
5/8" Ø STUDS MAY BE SUBSTITUTED FOR 3/4" Ø STUDS BY ADJUSTING THE PITCH TO PROVIDE AN EQUIVALENT CROSS-SECTIONAL AREA PER FOOT.

STUD SHEAR CONNECTORS
NOT TO SCALE

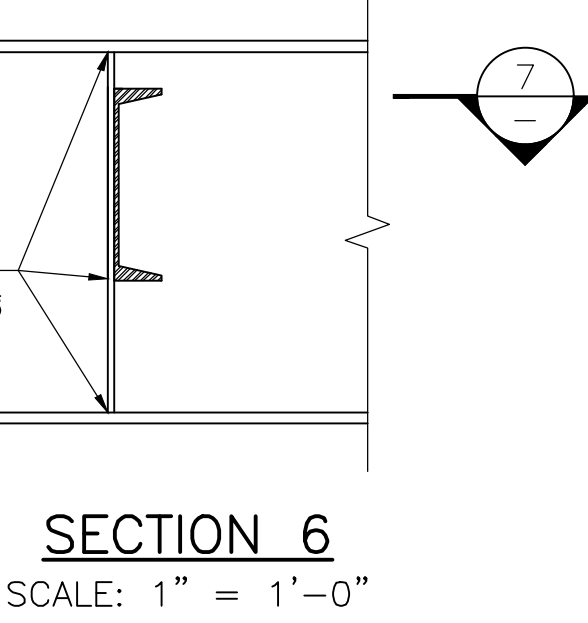
CAMBER TABLE (INCHES)												
BM. NO.		℄ BRG. W. ABUT	SPAN NO. 1									℄ BRG. E. ABUT
			0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	
1	STEEL DL DEFLECTION	0.00	0.16	0.29	0.38	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.90	1.64	2.21	2.62	2.75	2.63	2.25	1.64	0.90	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.49	0.58	0.61	0.58	0.50	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.42	2.60	3.55	4.28	4.61	4.28	3.61	2.60	1.42	0.00
2	STEEL DL DEFLECTION	0.00	0.16	0.29	0.39	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.88	1.61	2.17	2.57	2.69	2.57	2.21	1.61	0.88	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.48	0.57	0.60	0.57	0.49	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.39	2.56	3.50	4.21	4.54	4.22	3.55	2.56	1.39	0.00
3	STEEL DL DEFLECTION	0.00	0.16	0.29	0.39	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.87	1.57	2.12	2.52	2.64	2.52	2.16	1.57	0.87	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.36	0.49	0.58	0.60	0.58	0.49	0.36	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.38	2.53	3.46	4.17	4.49	4.17	3.51	2.53	1.38	0.00
4	STEEL DL DEFLECTION	0.00	0.16	0.29	0.38	0.46	0.48	0.46	0.39	0.29	0.16	0.00
	CONC. DL DEFLECTION	0.00	0.85	1.54	2.08	2.47	2.59	2.47	2.12	1.54	0.85	0.00
	S.D.L. DEFLECTION	0.00	0.20	0.37	0.50	0.59	0.62	0.59	0.51	0.37	0.20	0.00
	VERT. CURVE CAMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	ADDITIONAL CAMBER	0.00	0.16	0.31	0.47	0.62	0.78	0.62	0.47	0.31	0.16	0.00
	TOTAL CAMBER	0.00	1.37	2.51	3.43	4.13	4.46	4.14	3.48	2.51	1.37	0.00



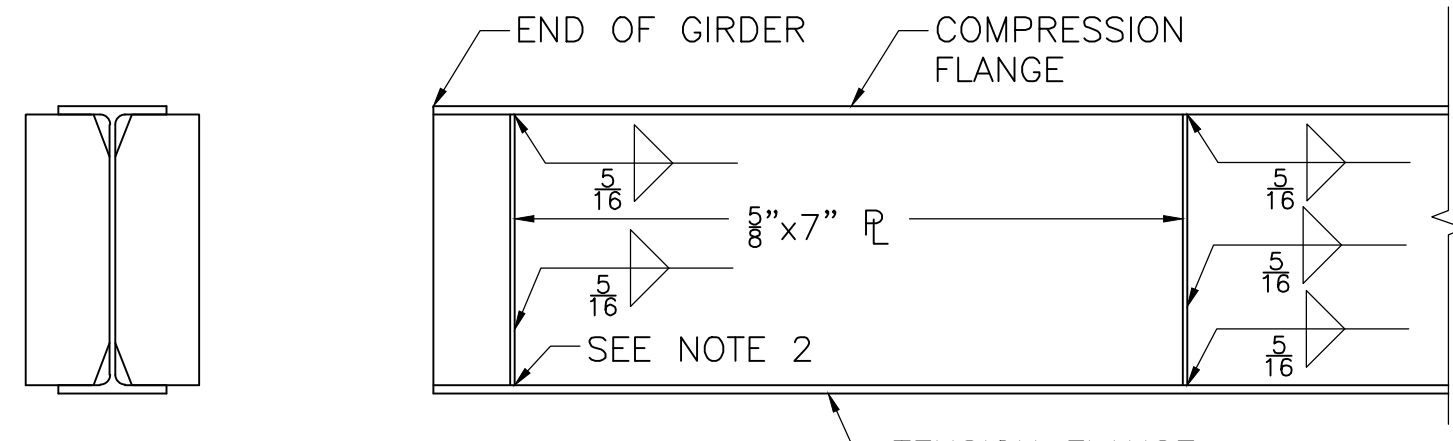
END DIAPHRAGM (D1) DETAILS
SCALE: 1" = 1'-0"



INTERMEDIATE DIAPHRAGM (D2) DETAILS
SCALE: 1" = 1'-0"



SECTION 6
SCALE: 1" = 1'-0"



SECTION 7
SCALE: 1 1/2" = 1'-0"

SECTION

END BEARING

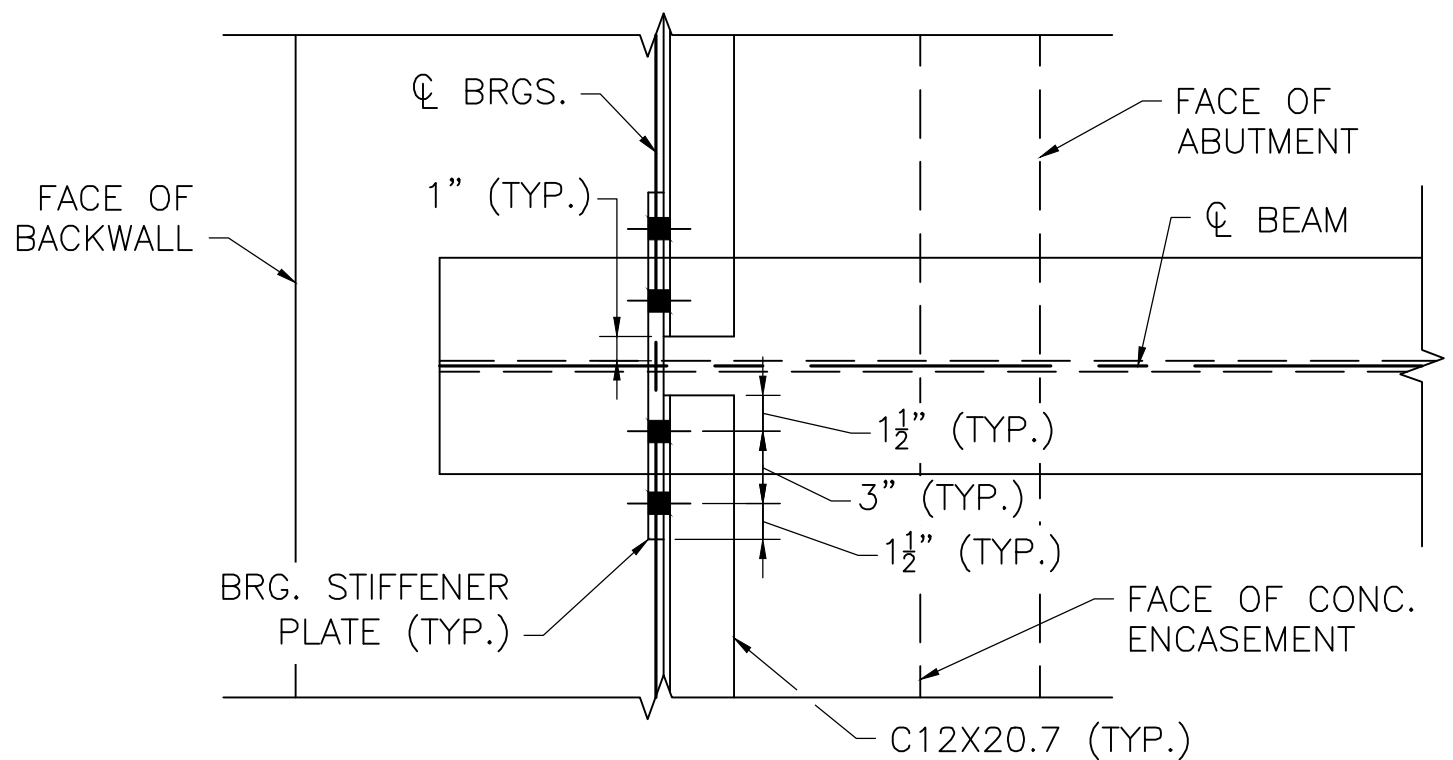
INTERMEDIATE DIAPHRAGM

STIFFENER ATTACHMENT DETAILS

SCALE: 3/4" = 1'-0"

NOTES:

- SEE CLIP DETAIL ON THIS SHEET.
- BEARING STIFFENER PLATE AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH 1/8" FILLET WELDS BOTH SIDES OF PLATE.
- ALL INTERMEDIATE STIFFENERS SHALL BE PERPENDICULAR TO THE WEB AND TO THE GIRDER FLANGES.
- ALL BEARING STIFFENERS SHALL BE PLUMB.
- ENDS OF BEAMS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS WILL BE PLUMB.



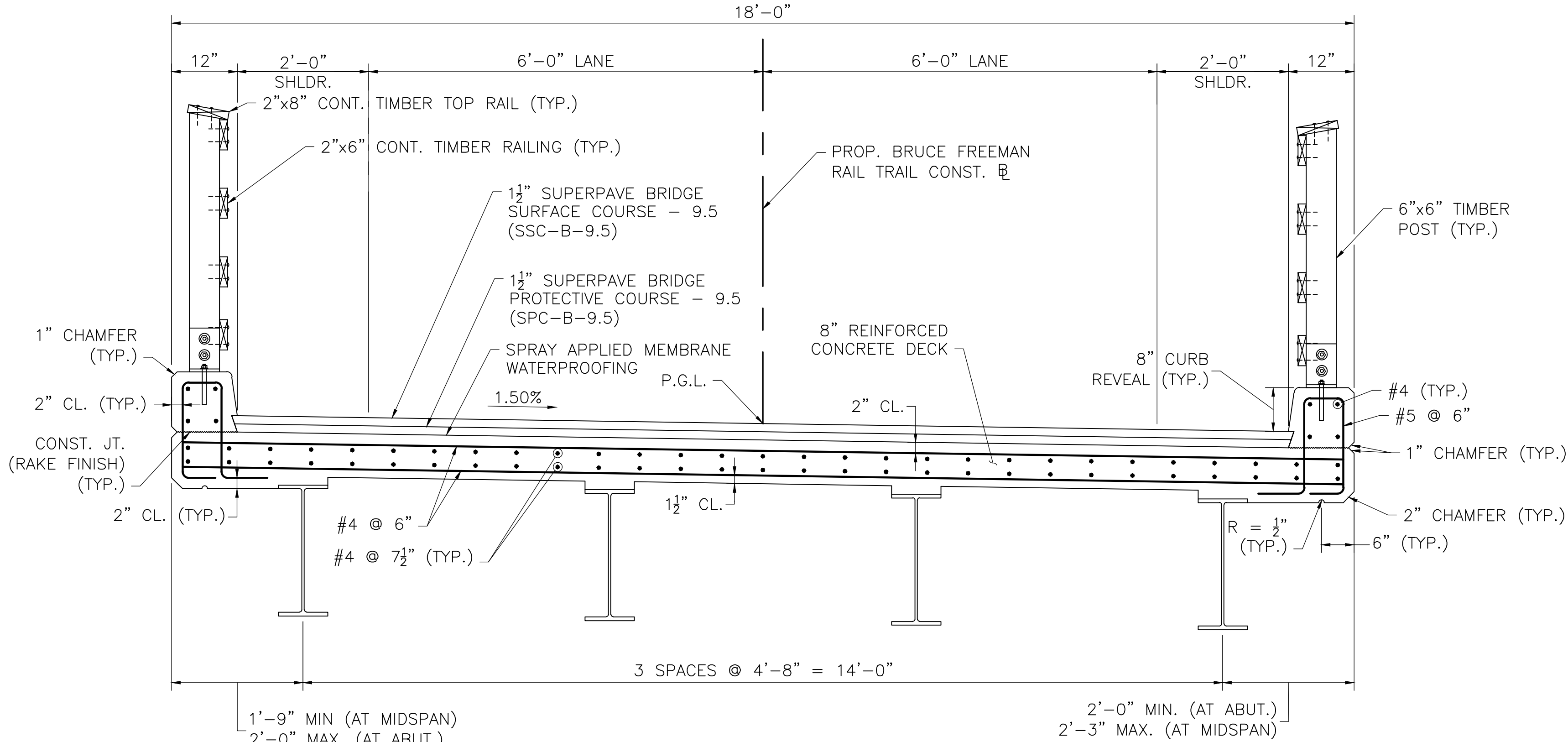
SECTION 7

SCALE: 1 1/2" = 1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	125	158
PROJECT FILE NO. 606223			

DECK & TIMBER
RAILING DETAILS



PROPOSED CROSS SECTION
SCALE: 3/4" = 1'-0"

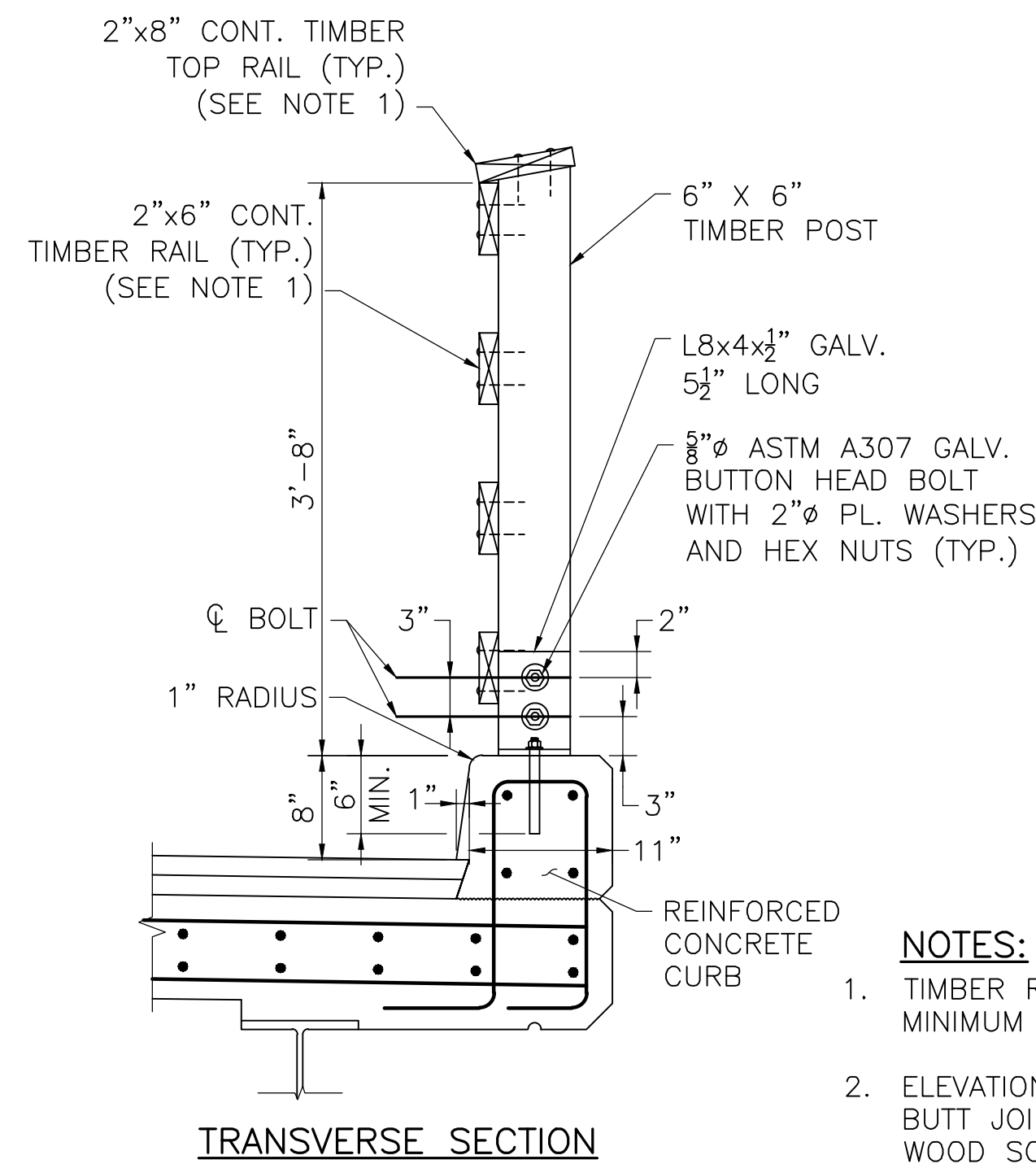
BEAM NO.	TOP OF FORM ELEVATIONS FOR DECK SLAB PRIOR TO PLACEMENT OF CONCRETE								
	CL BRG. W. ABUT.	1/8 PT.	1/4 PT.	3/8 PT.	1/2 PT.	5/8 PT.	3/4 PT.	7/8 PT.	CL BRG. E. ABUT.
1	144.78	144.54	144.28	144.00	143.67	143.30	142.89	142.46	142.00
2	144.85	144.61	144.35	144.06	143.74	143.37	142.96	142.52	142.07
3	144.93	144.68	144.42	144.13	143.80	143.43	143.02	142.59	142.13
4	145.00	144.76	144.49	144.20	143.87	143.50	143.09	142.66	142.20

NOTE:

AFTER THE BEAMS ARE ERECTED BUT BEFORE THE FORMS ARE BUILT, ELEVATIONS ON TOP OF THE FLANGE OF THE BEAMS ARE TO BE OBTAINED AT THE POINTS INDICATED IN THE TABLE. THE DIFFERENCE BETWEEN THE ELEVATIONS OBTAINED AND THOSE SHOWN IN THE TABLE GIVES THE ACTUAL BLOCKING DISTANCE FROM THE TOP OF BEAM TO THE BOTTOM OF THE SLAB AT CENTER LINE OF BEAM.

NOTES:

- CONCRETE DECK SLAB AND CURB SHALL BE 4000 PSI, 3/4 IN., 585 HP CEMENT CONCRETE.
- LONGITUDINAL REINFORCEMENT SHALL BE PLACED PARALLEL TO THE CL OF CONSTRUCTION. TRANSVERSE (PRIMARY) REINFORCEMENT SHALL BE PLACED PERPENDICULAR TO THE CL OF CONSTRUCTION.
- ALL REINFORCEMENT AND SUPPORT DEVICES SHALL BE COATED.
- THE FINISHED SURFACE OF BRIDGE DECK SHALL BE SMOOTH AND WITHOUT ANY PROJECTIONS THAT COULD PUNCTURE THE MEMBRANE WATERPROOFING OR DEPRESSION THAT COULD RETAIN WATER.

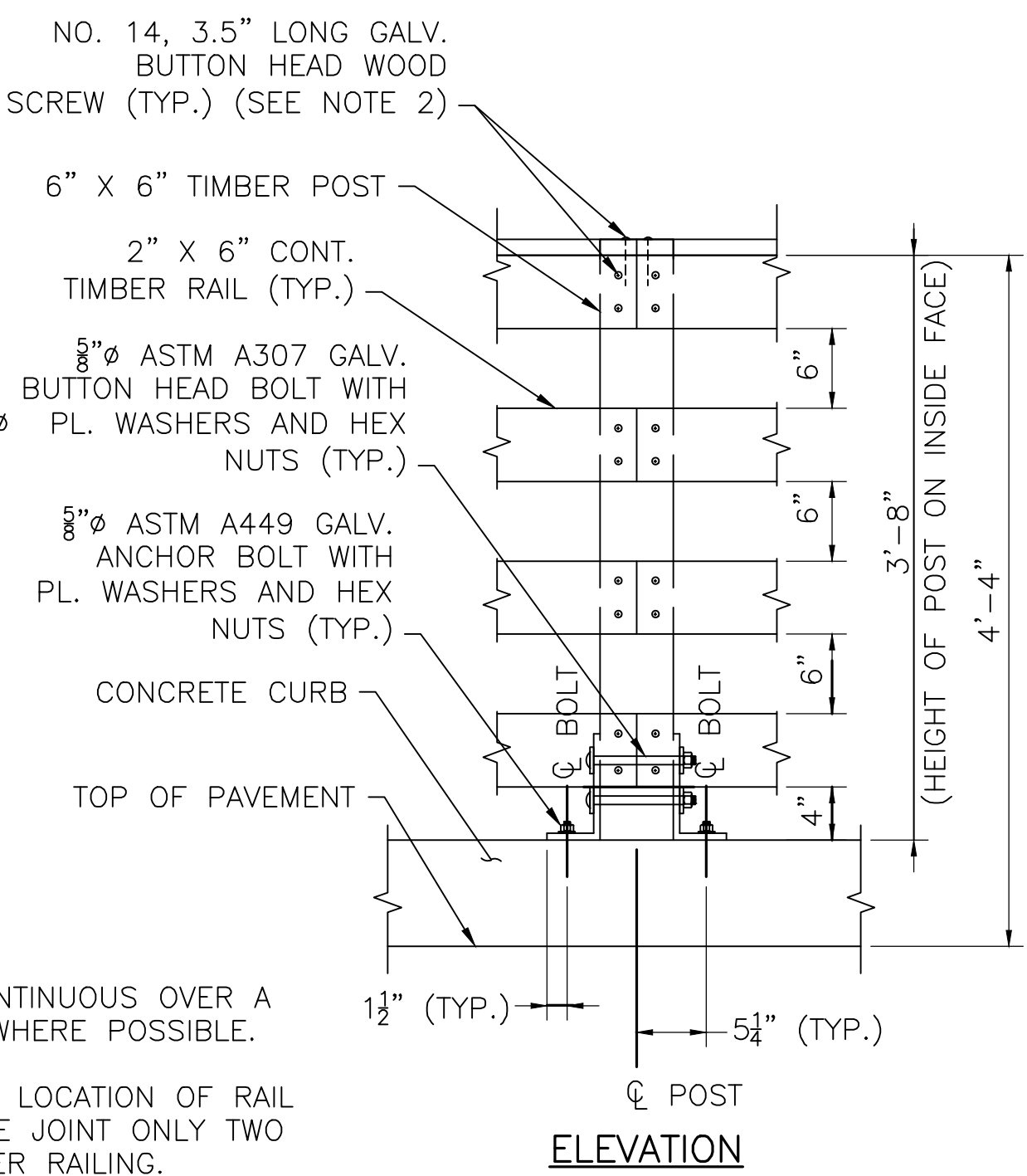


TRANSVERSE SECTION

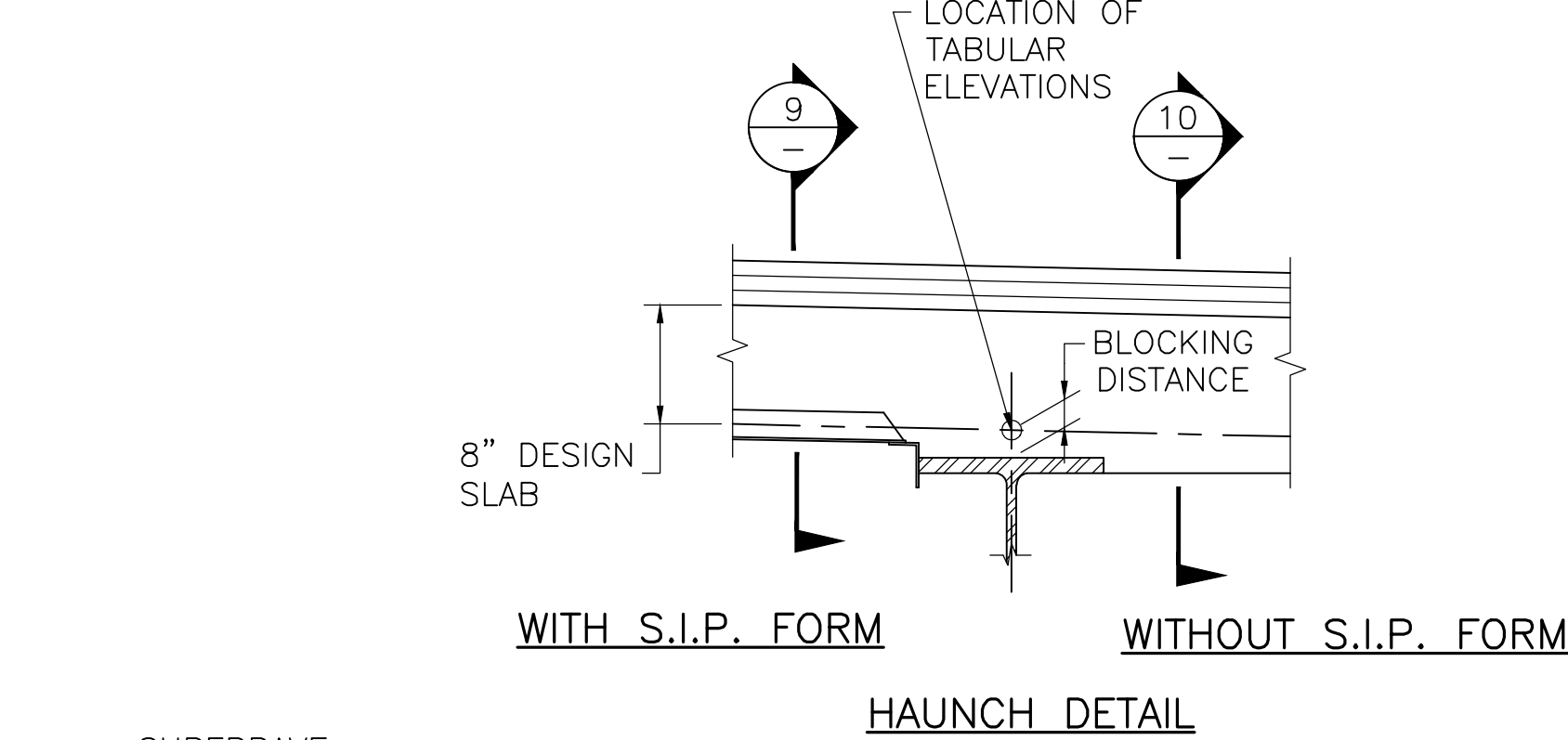
NOTES:

- TIMBER RAILS SHALL BE CONTINUOUS OVER A MINIMUM OF THREE POSTS WHERE POSSIBLE.
- ELEVATION SHOWN REFLECTS LOCATION OF RAIL BUTT JOINT, AT INTERMEDIATE JOINT ONLY TWO WOOD SCREWS REQUIRED PER RAILING.

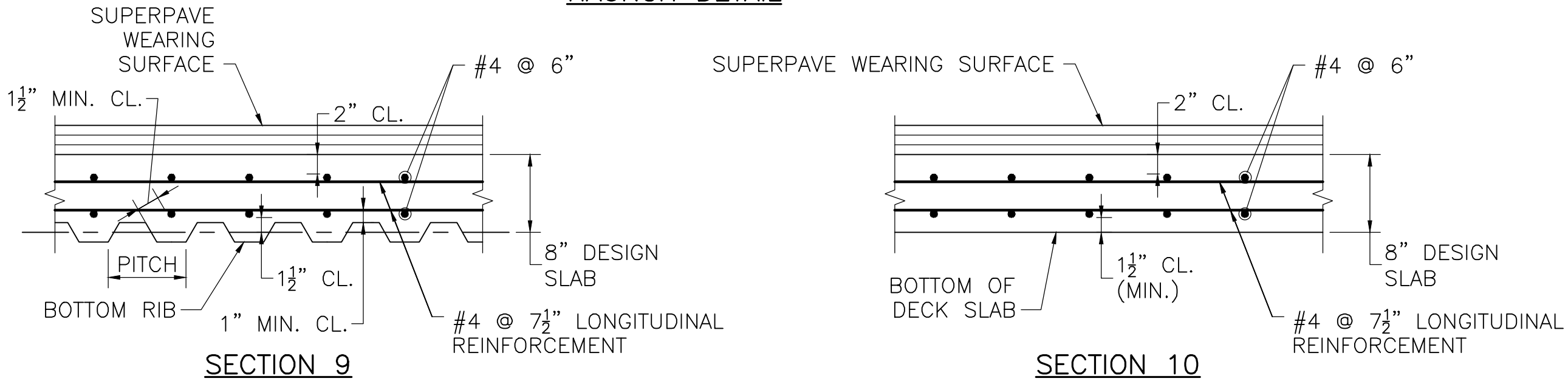
TIMBER BRIDGE RAILING DETAILS
SCALE: 1" = 1'-0"



ELEVATION



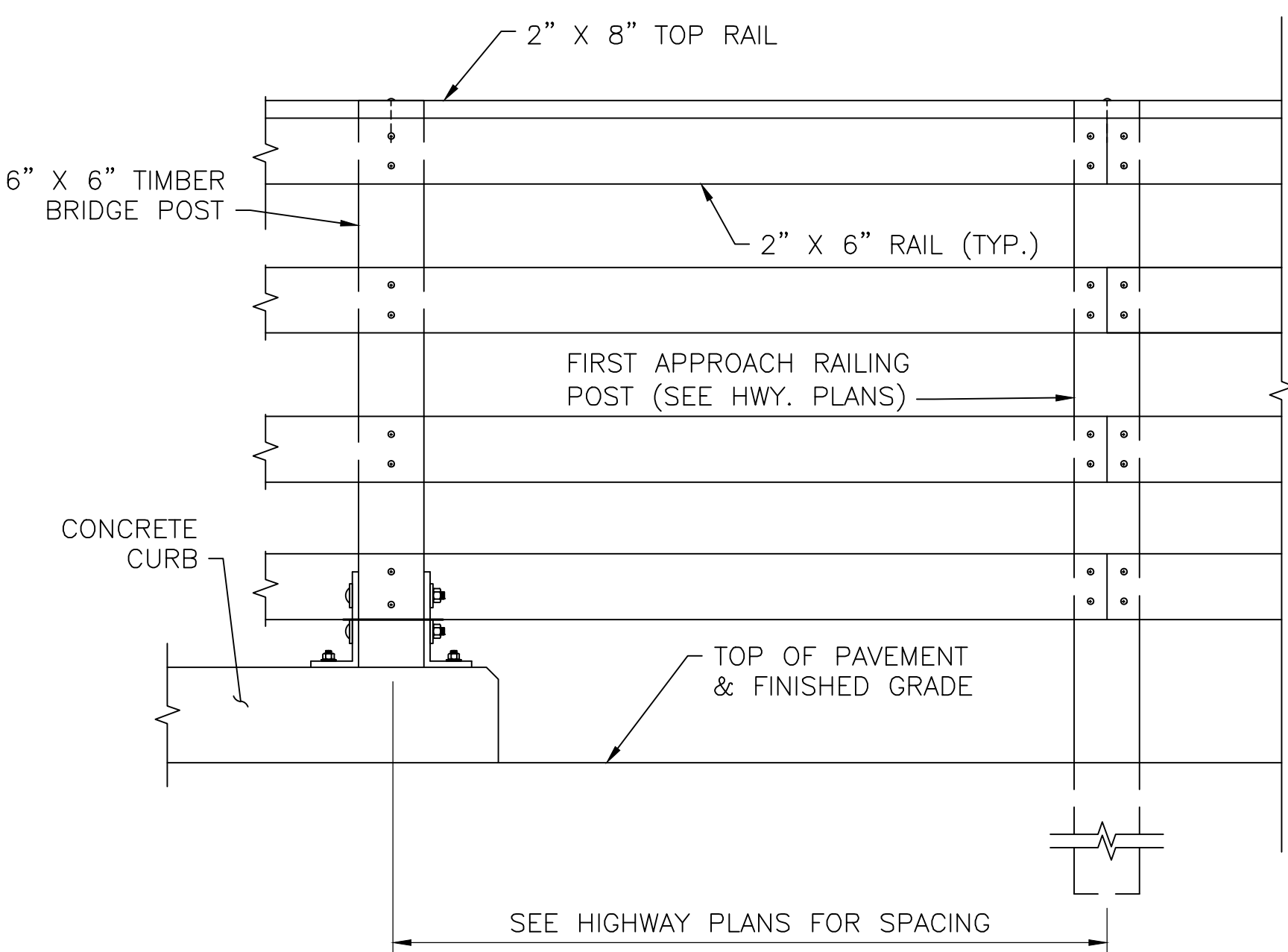
HAUNCH DETAIL



STAY-IN-PLACE FORM DETAILS
NOT TO SCALE

S.I.P. FORM NOTES:

- FOR 2" S.I.P. FORM, SET BOTTOM OF FORM 1" BELOW ELEVATION GIVEN IN TABLE. FOR 3" S.I.P. FORM, SET BOTTOM OF FORM 1 1/2" BELOW TABLE ELEVATIONS.
- FORM ENDS SHALL BE CRIMPED CLOSED IN A TAPERED MANNER. SEPARATE END CLOSURE PIECES WILL NOT BE ALLOWED.
- SUPPORT ANGLES SHALL BE PLACED IN THE "LEG DOWN" POSITION WHERE POSSIBLE. WHERE "LEG UP" POSITION IS NECESSARY, THE UPPER MOST PORTION OF THE ANGLE SHALL NOT PROJECT MORE THAN 1" ABOVE THE TOP FLANGE OR COVER PLATE. THE CONTRACTOR SHALL HAVE AN ASSORTMENT OF ANGLES OF VARIOUS SIZES AVAILABLE ON THE SITE TO CONFORM TO THIS REQUIREMENT.
- ALL MAIN STEEL REINFORCEMENT IN THE LOWER MAT SHALL BE CENTERED OVER THE VALLEY OF THE S.I.P. FORM.
- CONTRACTOR SHALL DESIGN AND DETAIL ALL ELEMENTS OF THE FORMING SYSTEM AND SHALL SUBMIT TO THE ENGINEER FOR APPROVAL.
- IN CASES WHERE STANDARD 2" OR 3" DEEP S.I.P. FORMS DO NOT SATISFY DESIGN REQUIREMENTS AN ALTERNATIVE FORMING SYSTEM CONSISTING OF DEEPER S.I.P. FORMS OR REMOVABLE FORMS SHALL BE DESIGNED AND DETAILED BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER FOR APPROVAL. THE DESIGN THICKNESS OF THE SLAB SHALL NOT BE REDUCED.
- S.I.P. FORMS SHALL NOT BE USED TO FORM OVERHANGS.



TIMBER BRIDGE RAILING TRANSITION
TO APPROACH RAILING

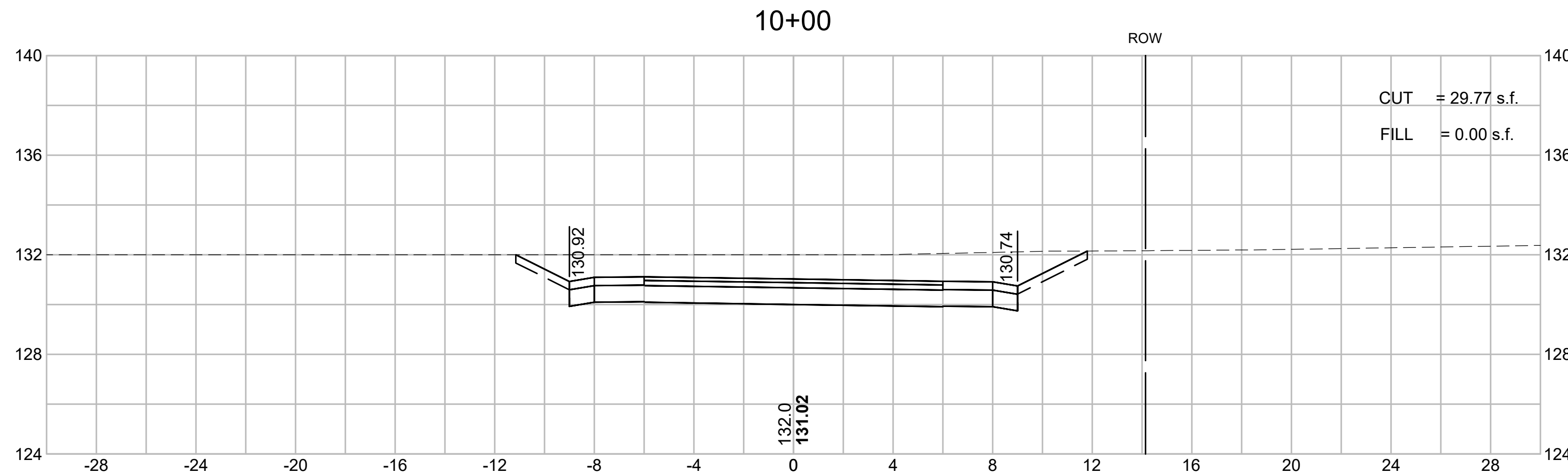
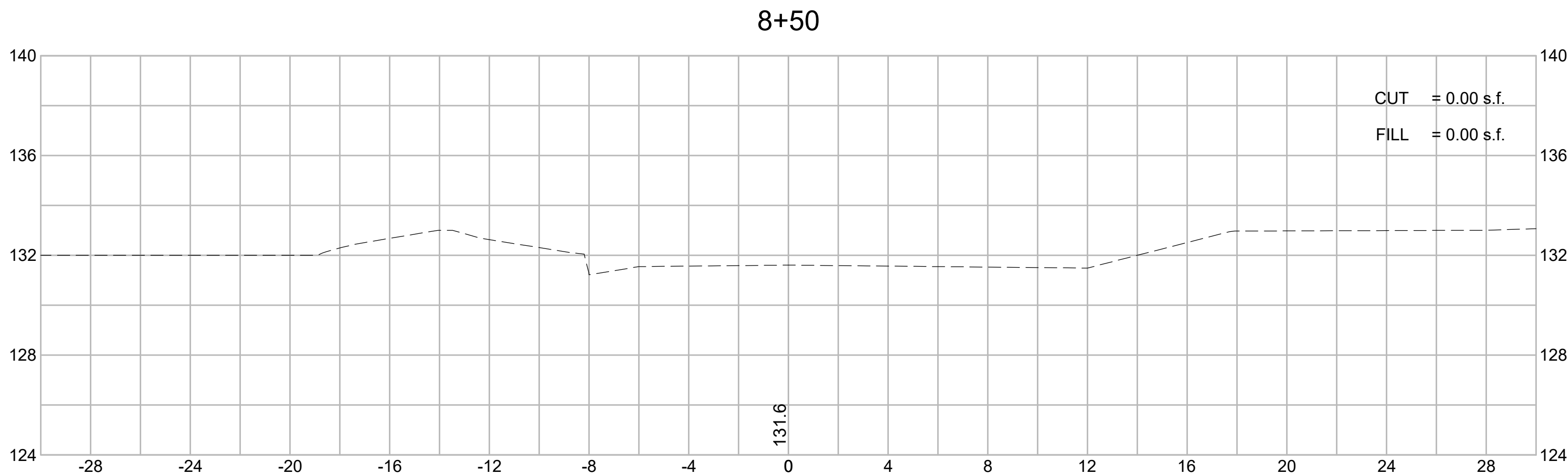
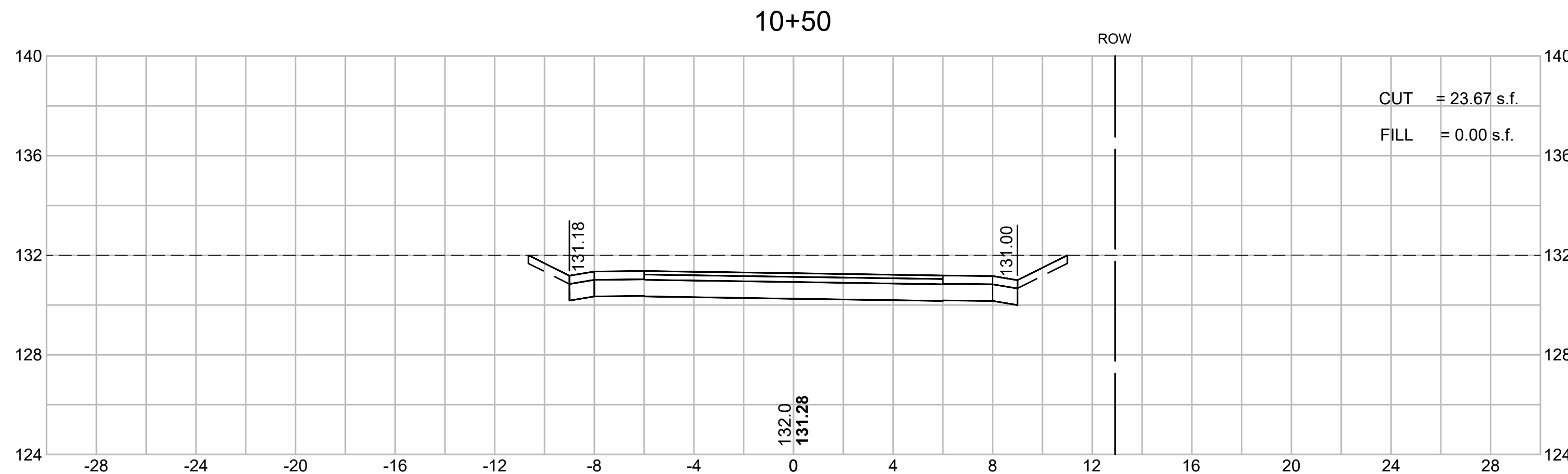
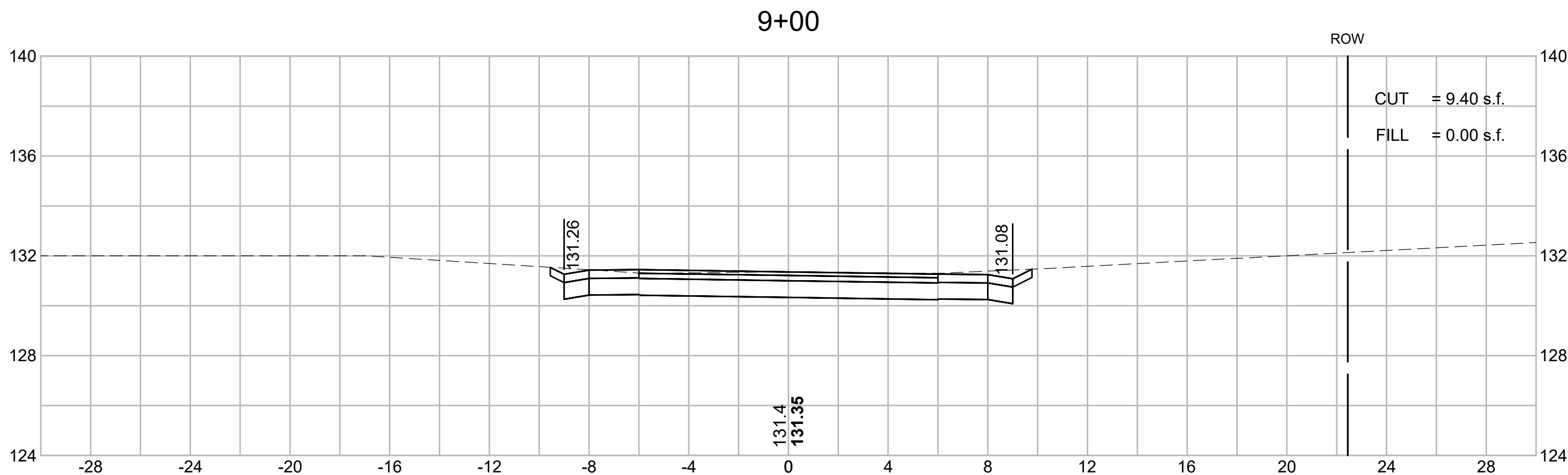
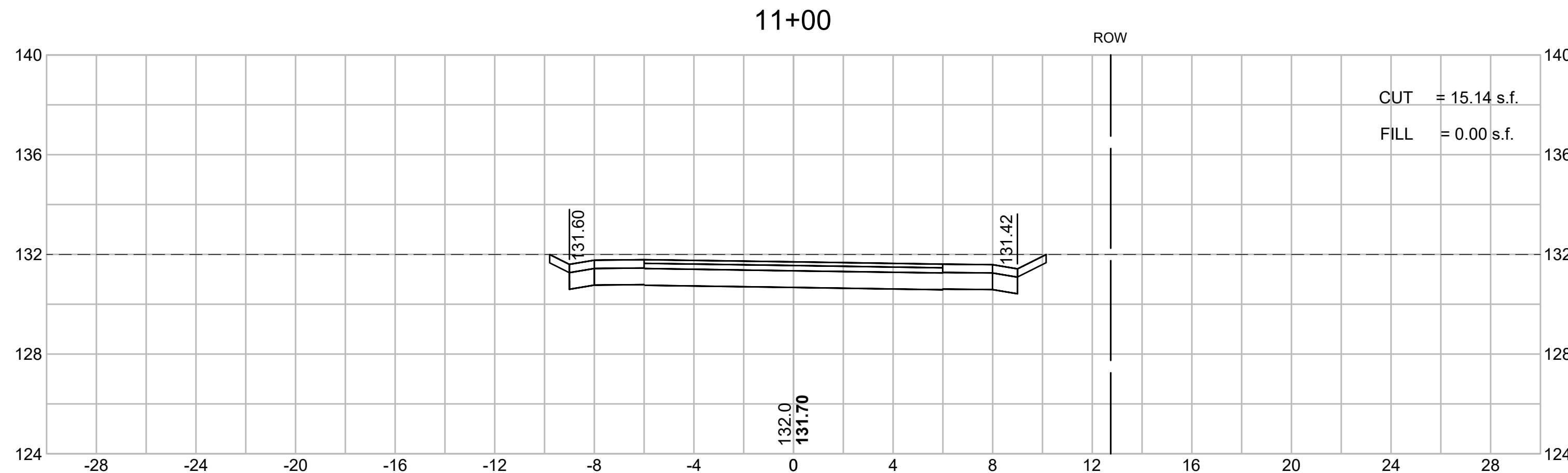
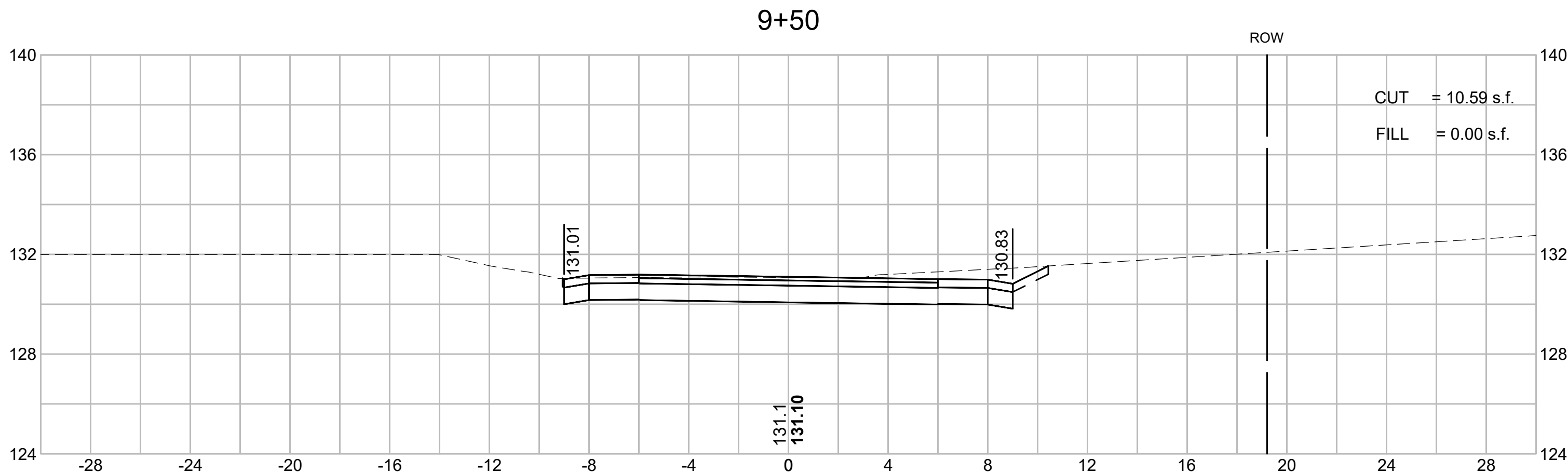
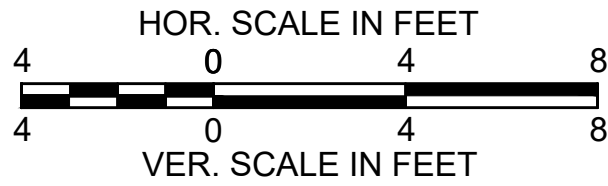
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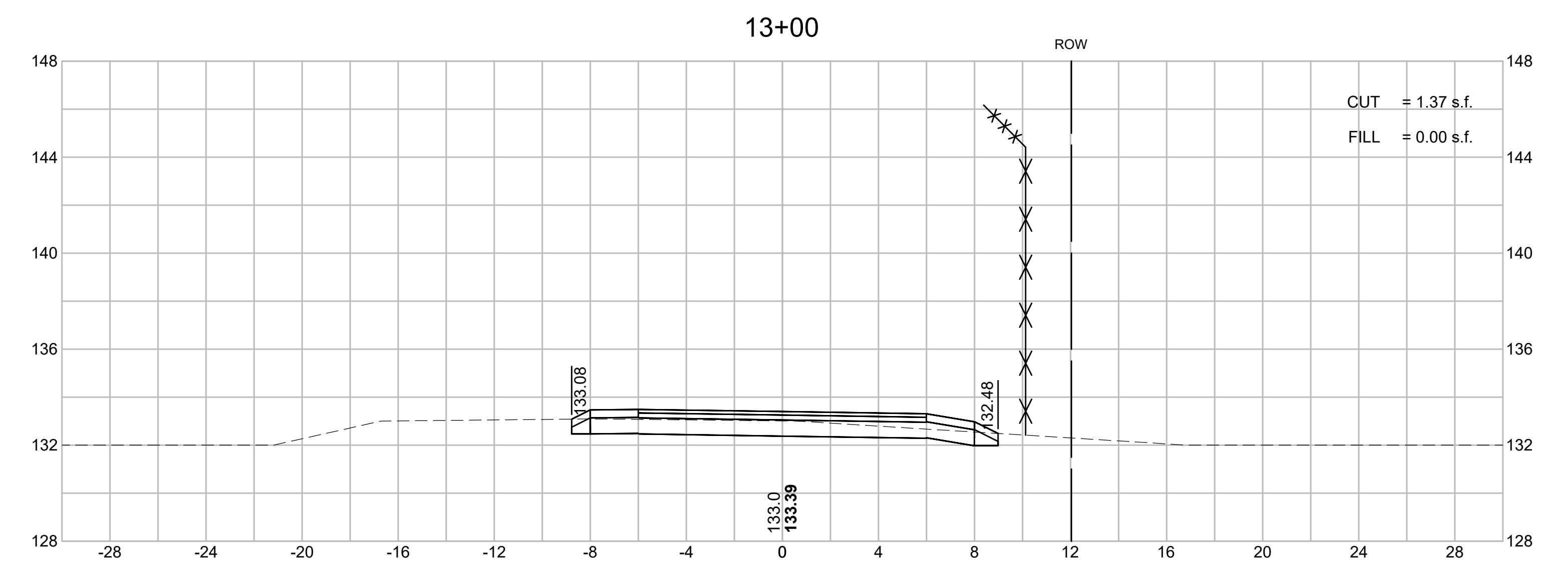
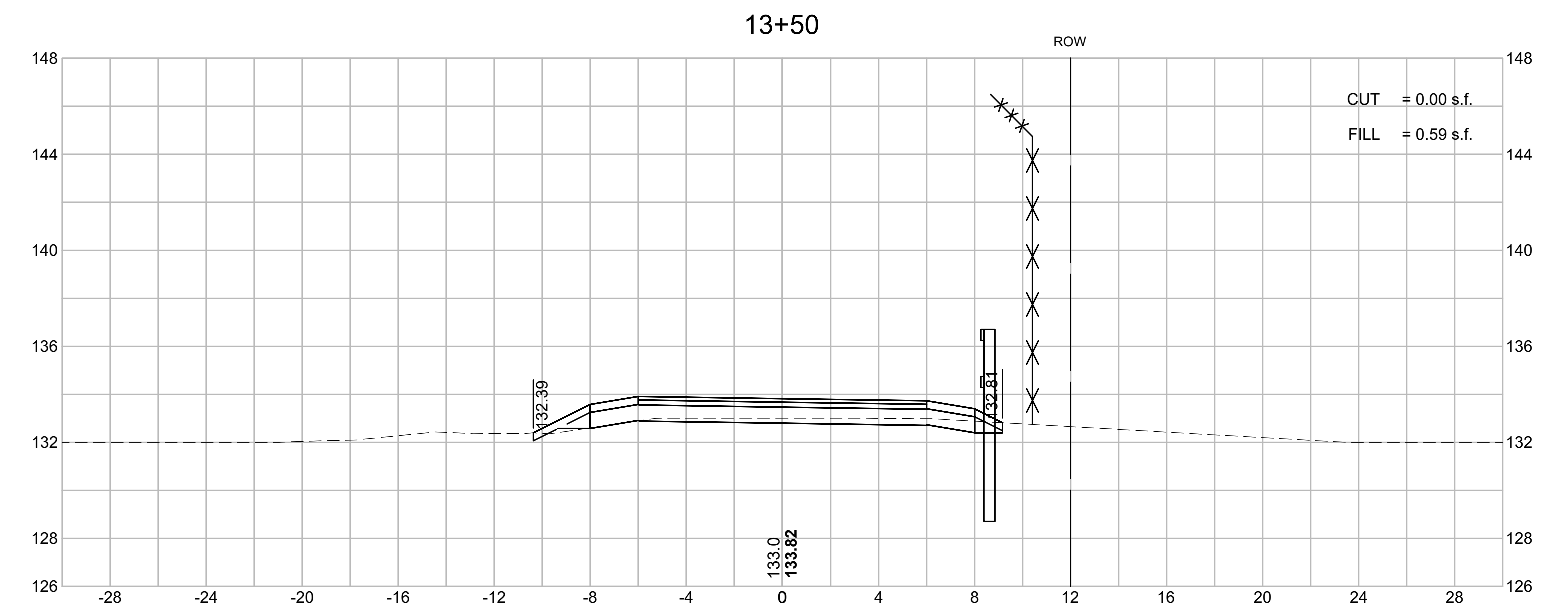
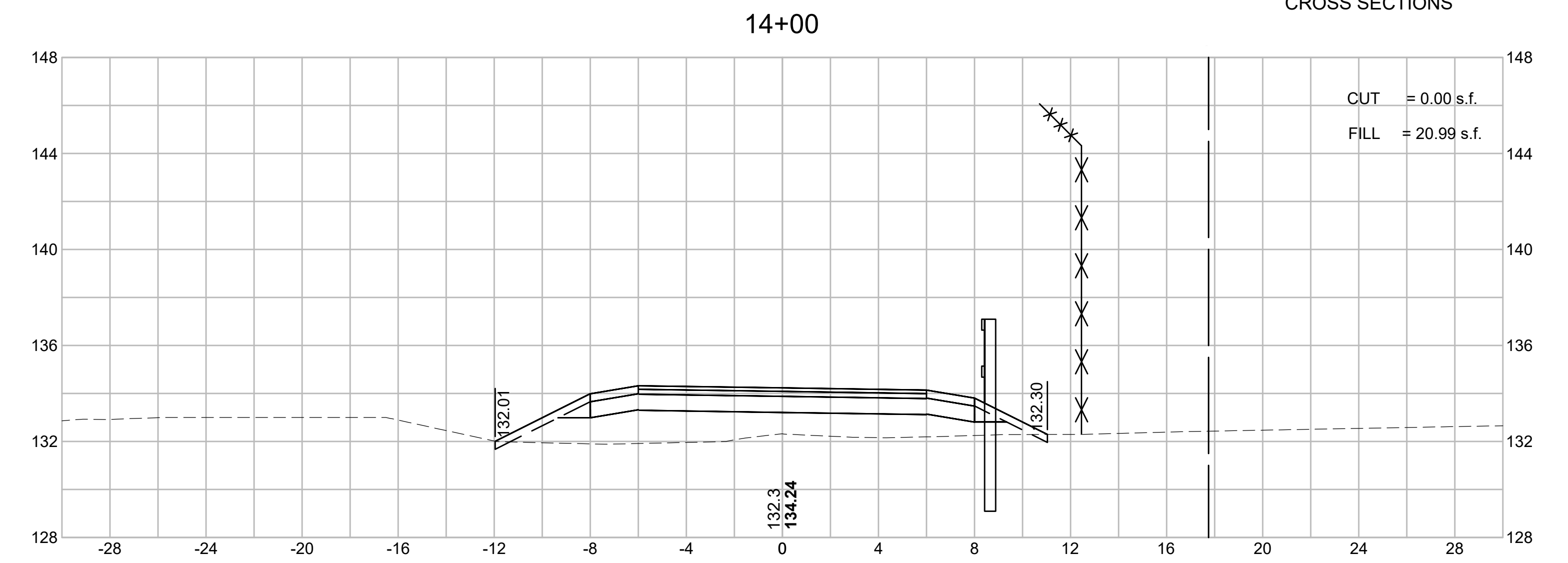
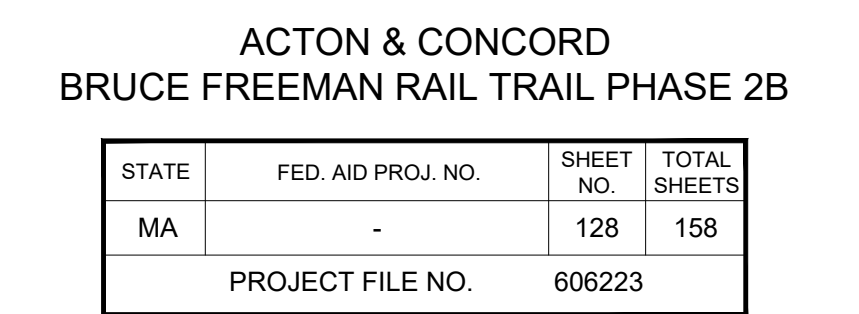
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
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ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	127	158
PROJECT FILE NO.		606223	

CROSS SECTIONS

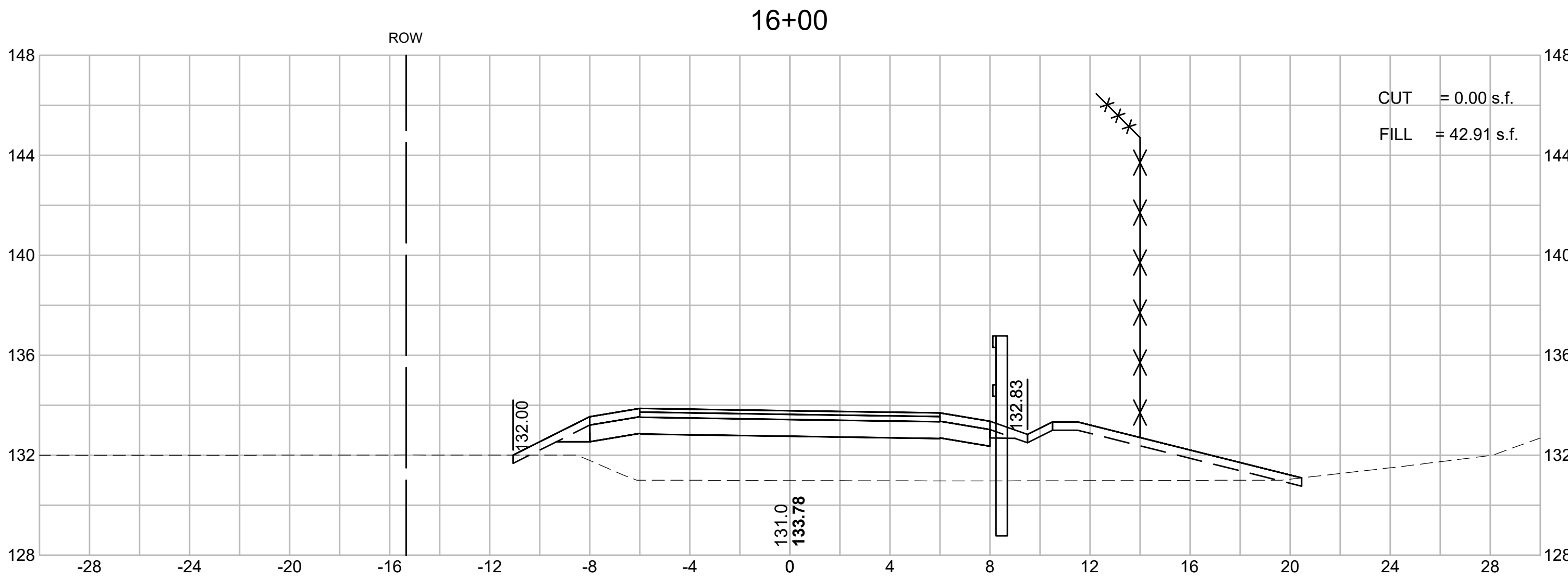
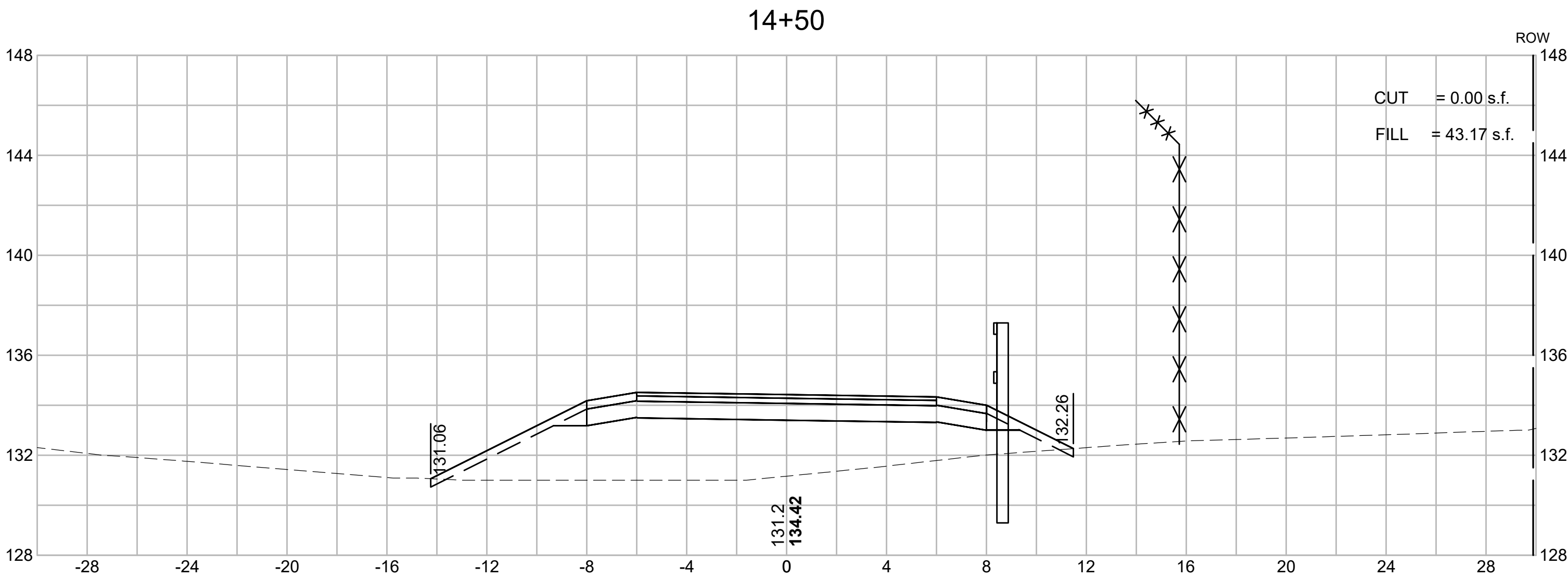
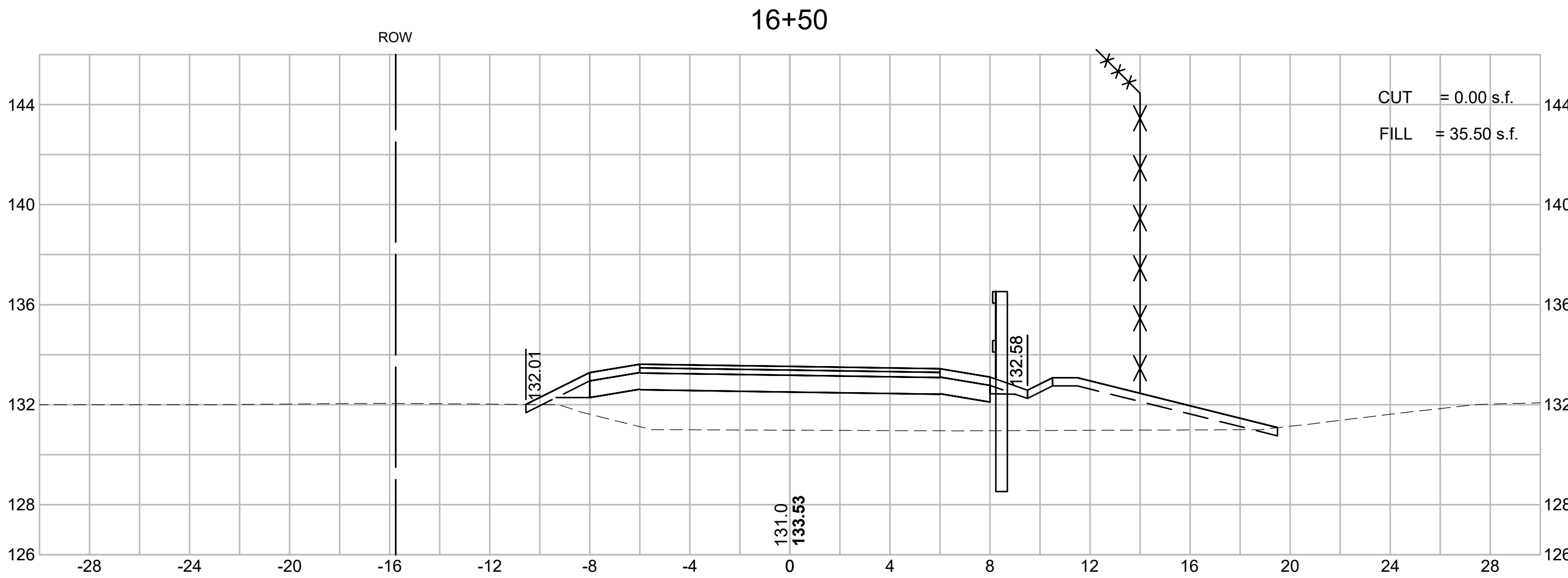
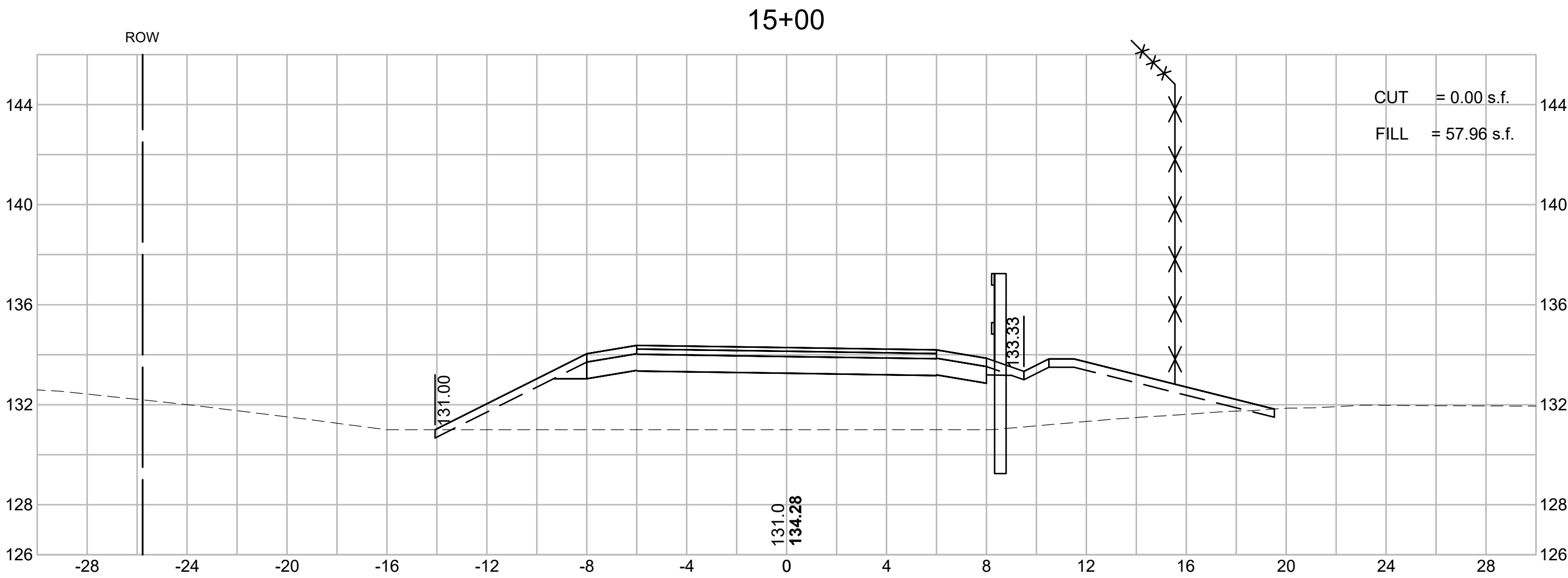
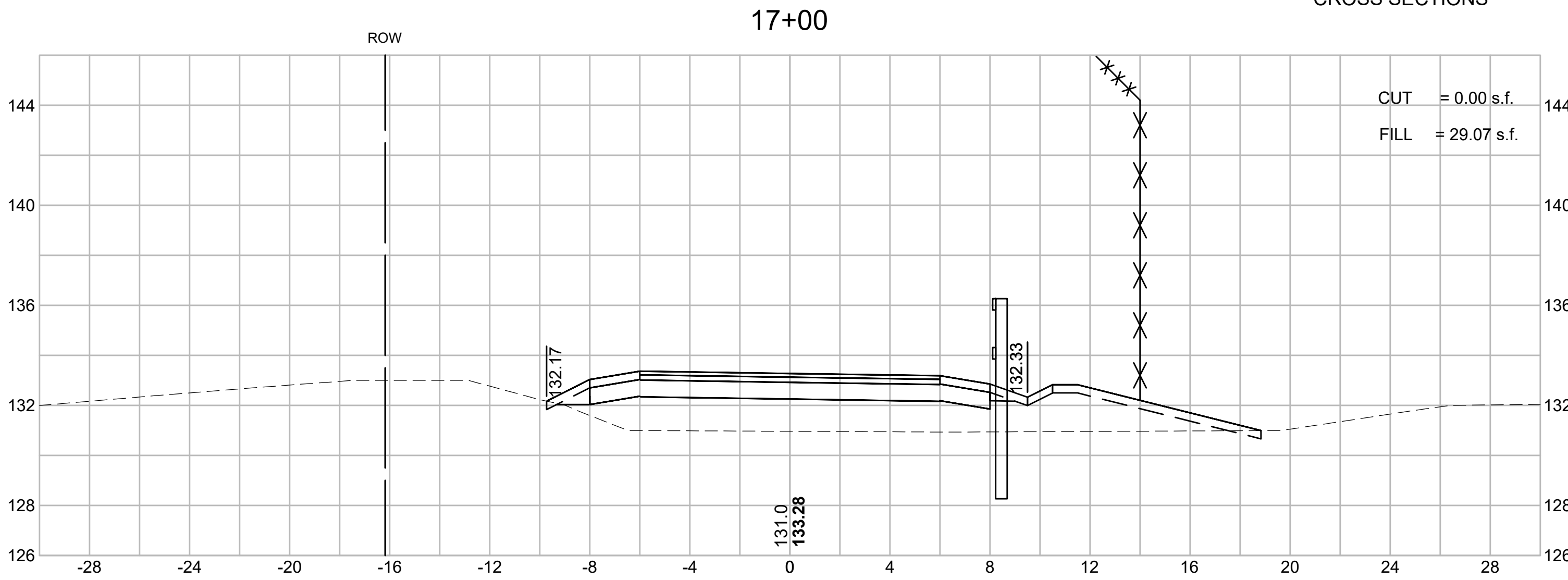
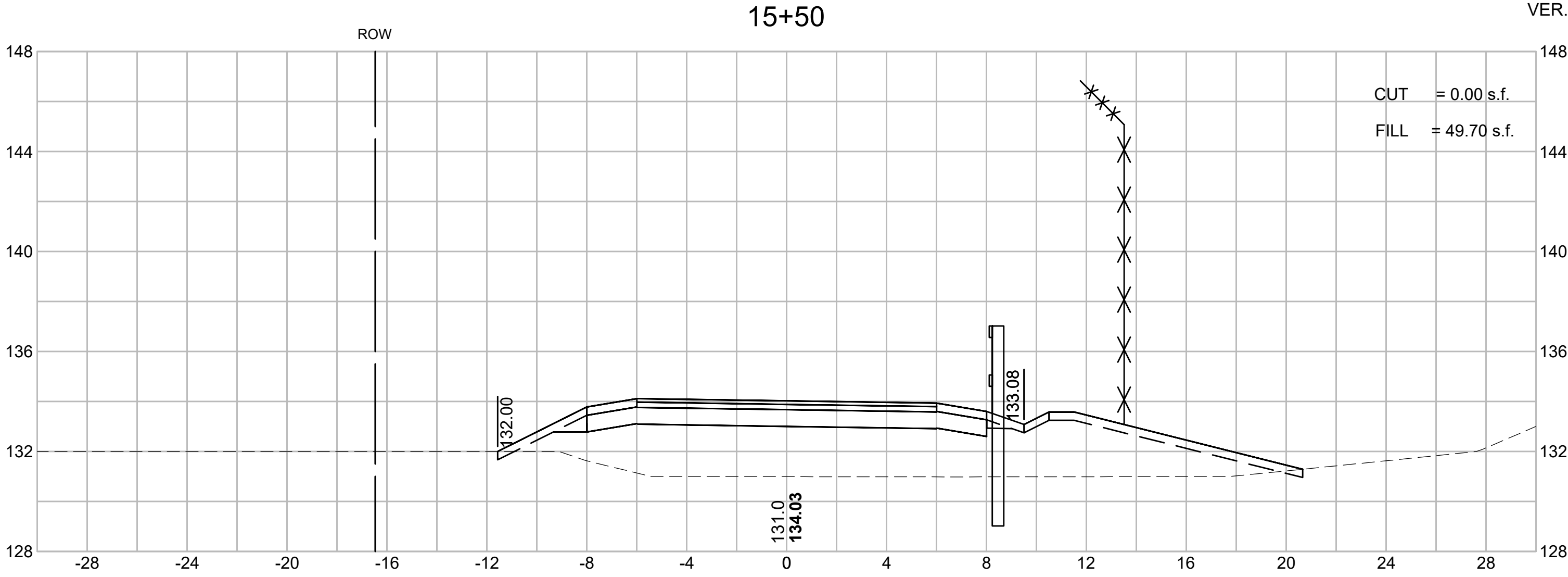
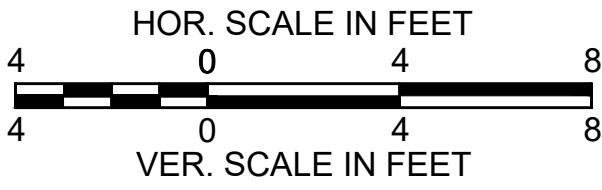


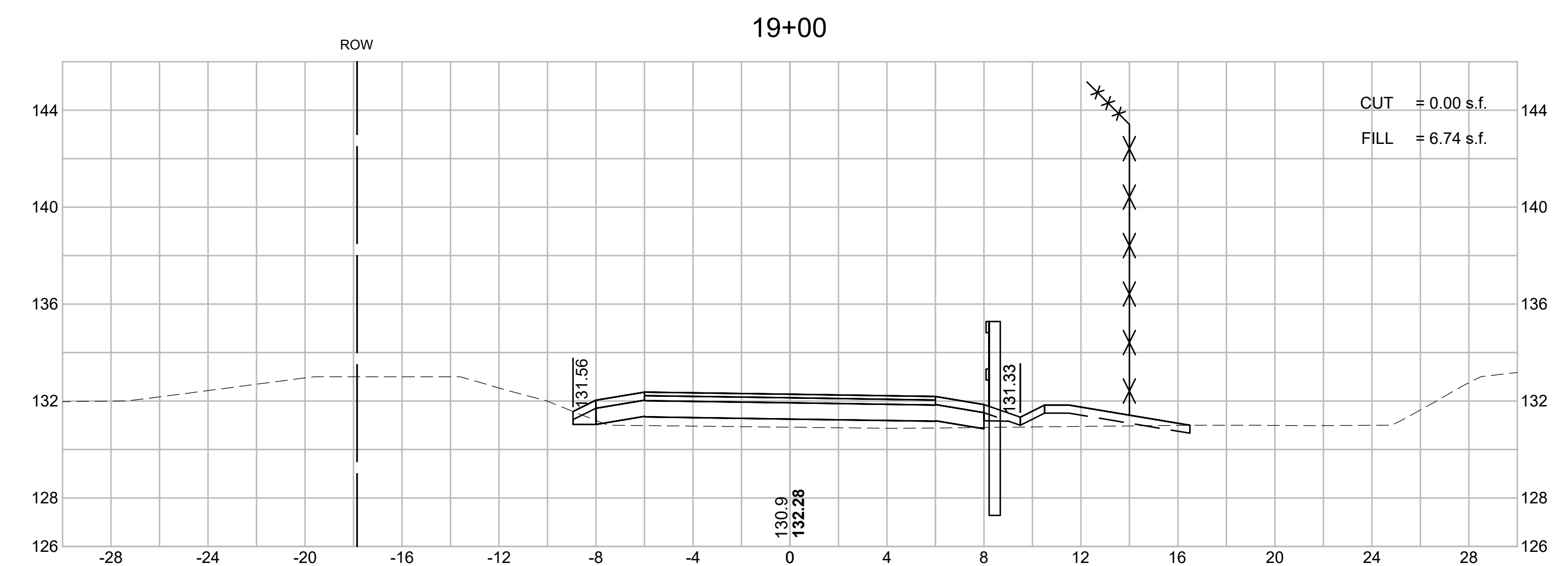
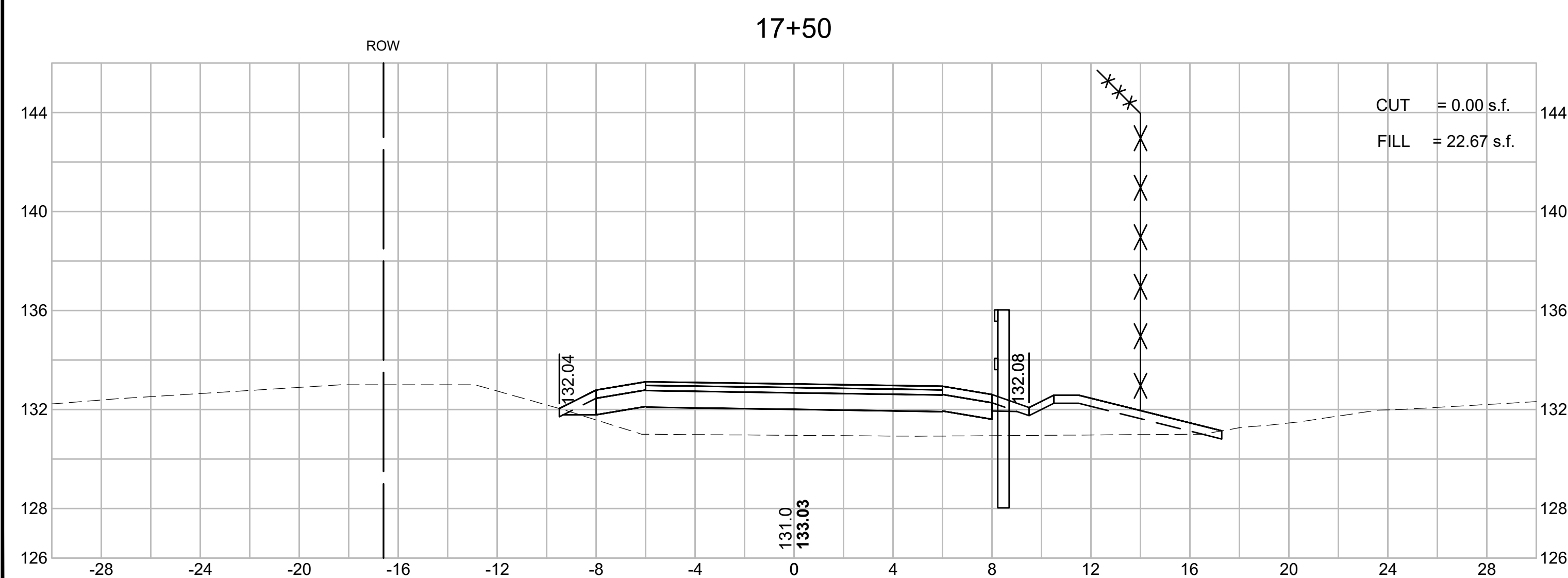
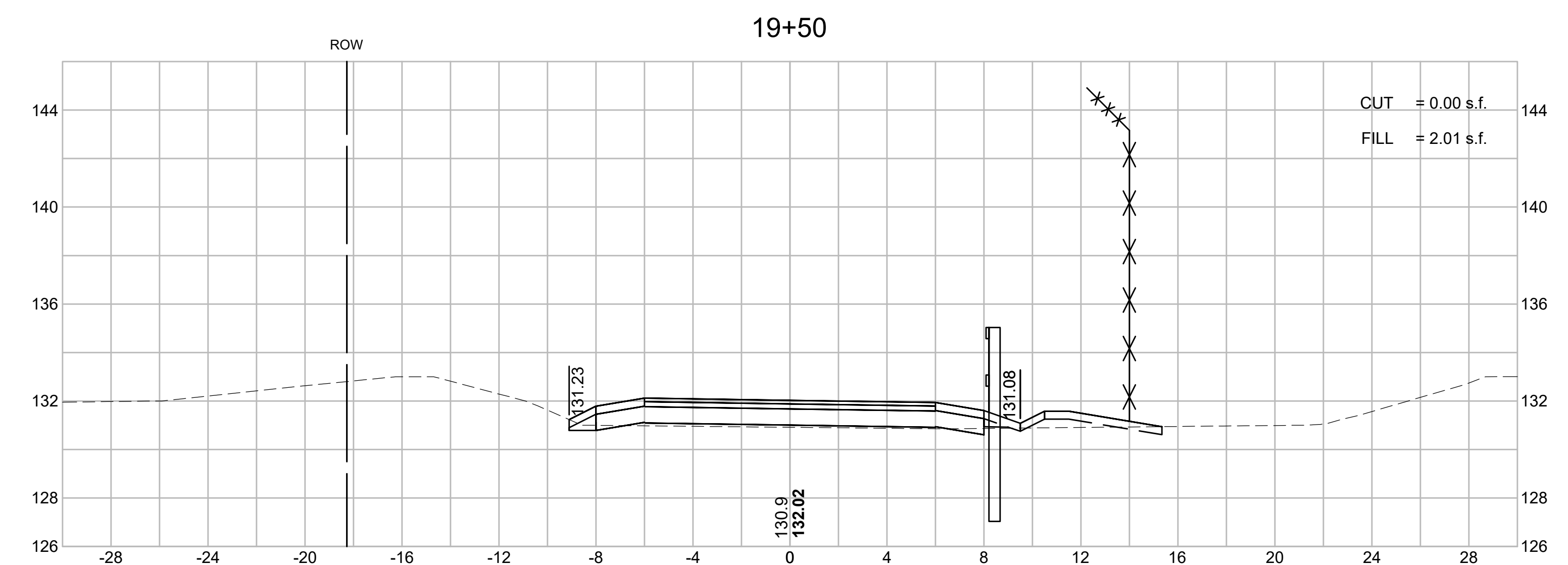
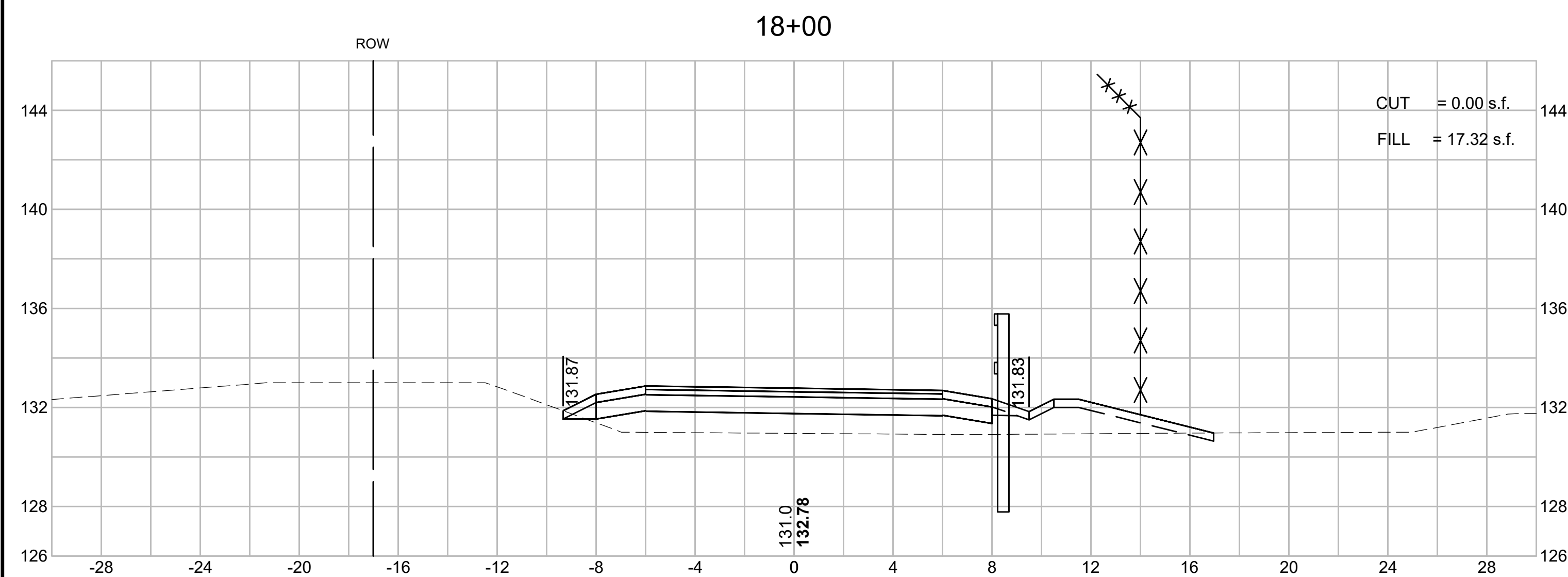
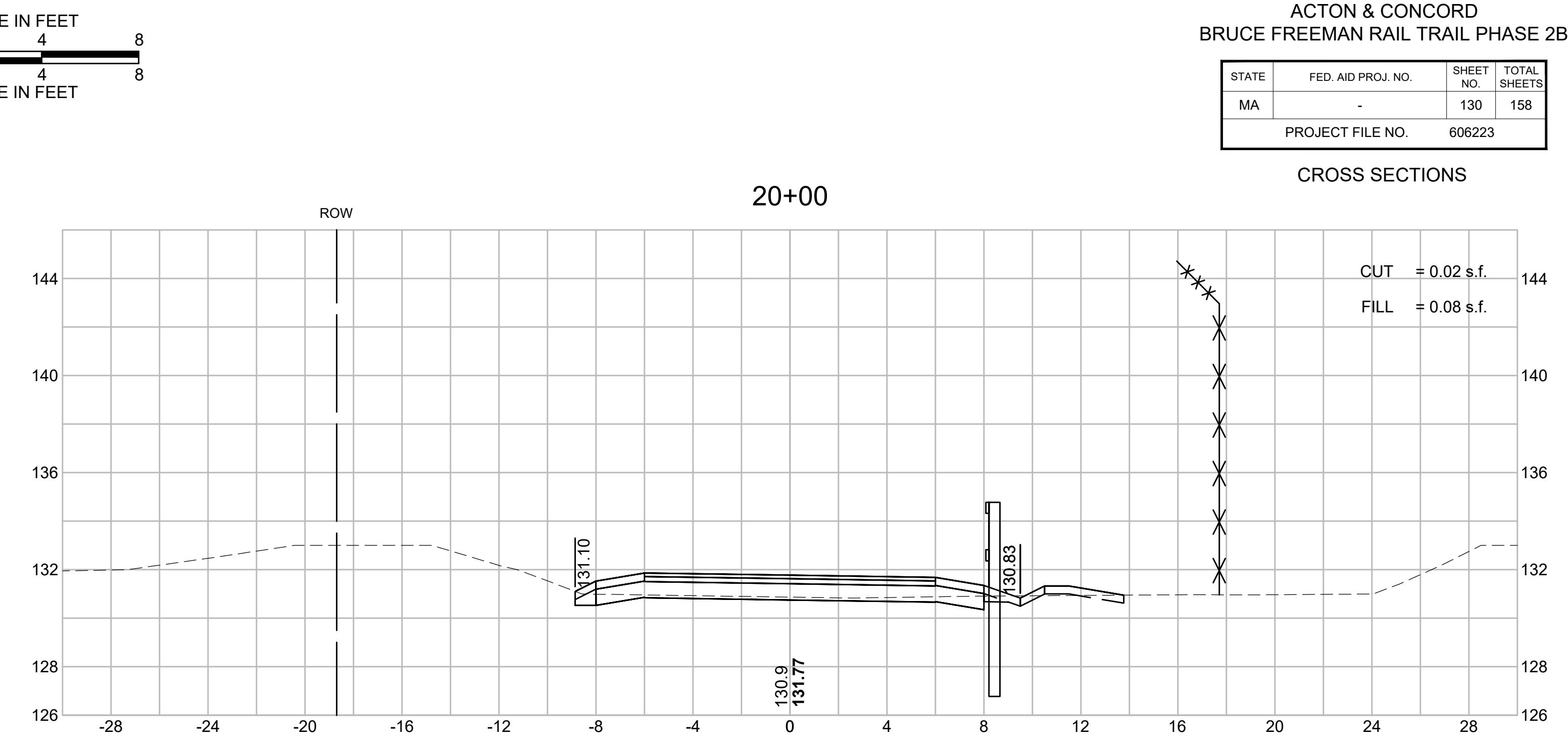
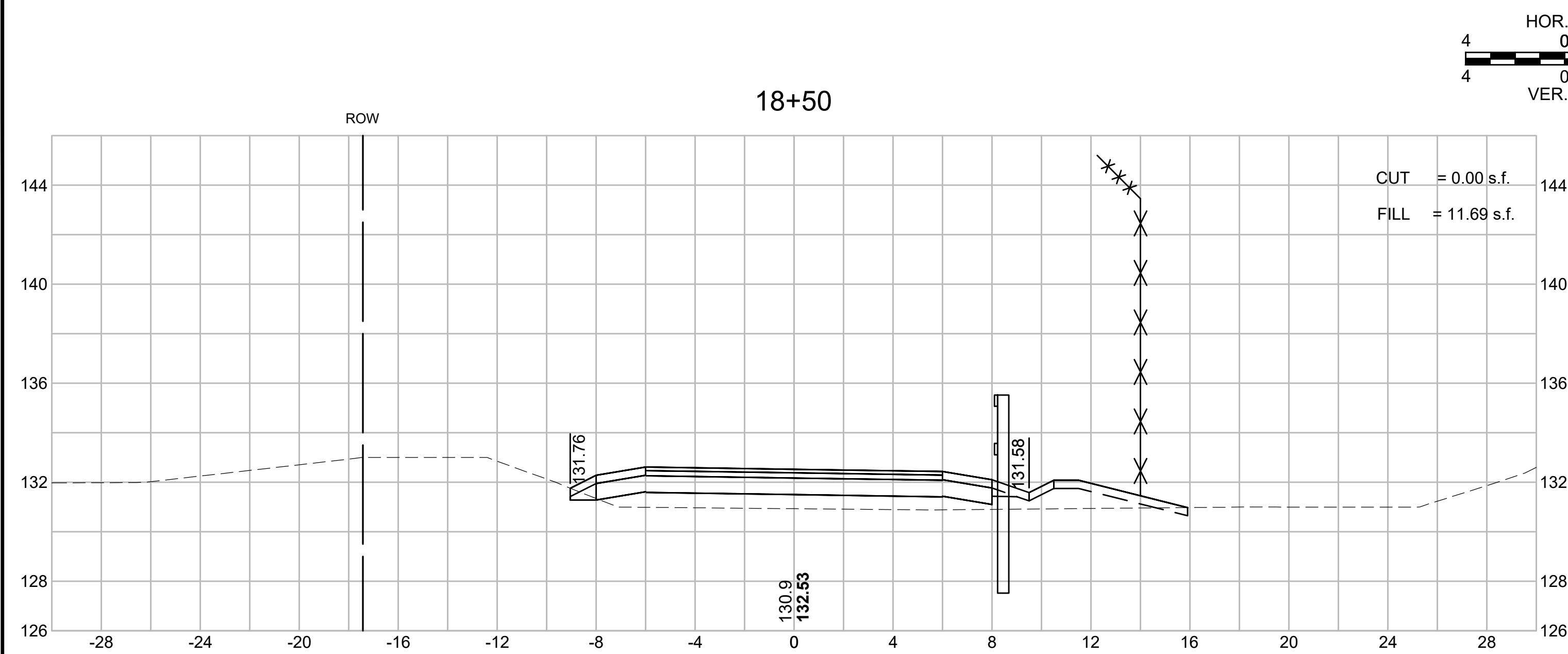


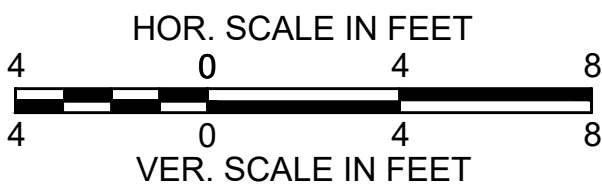
ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	129	158
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CROSS SECTIONS



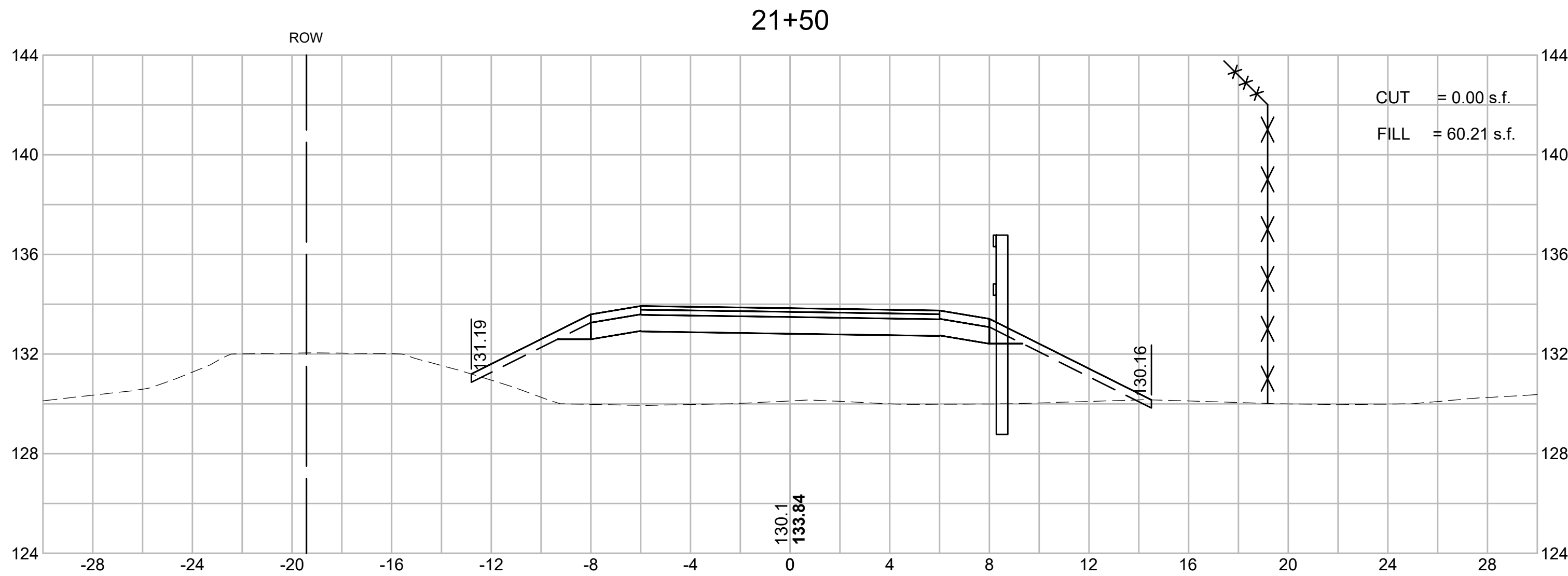
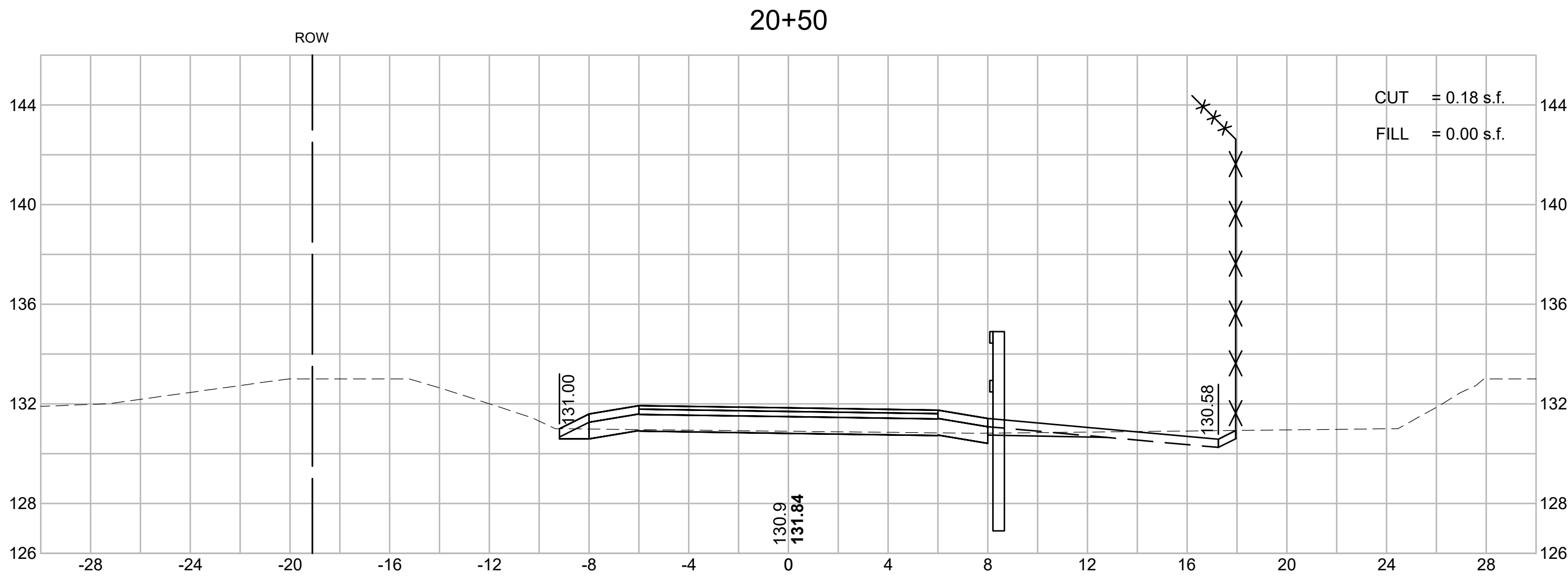
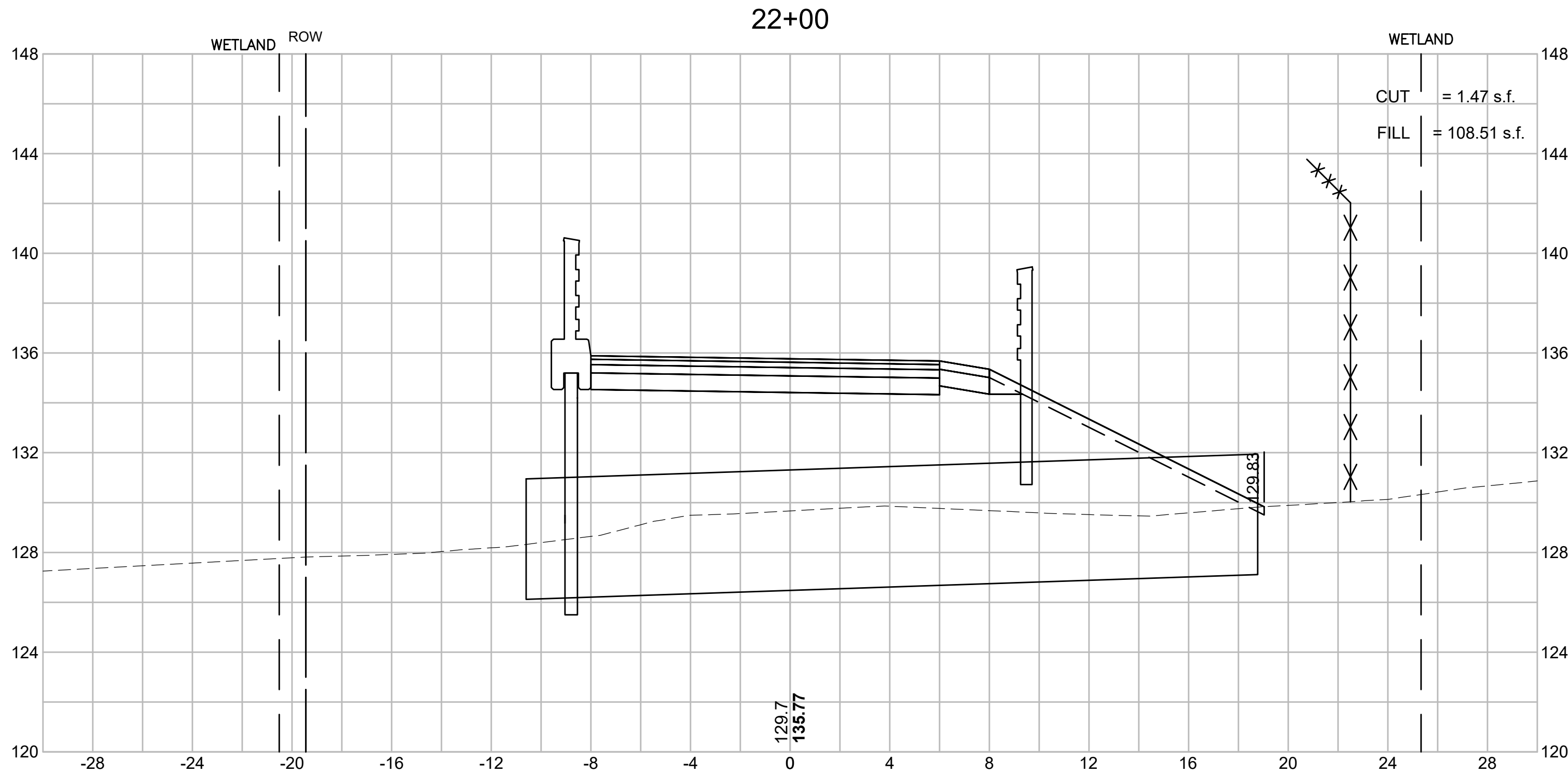
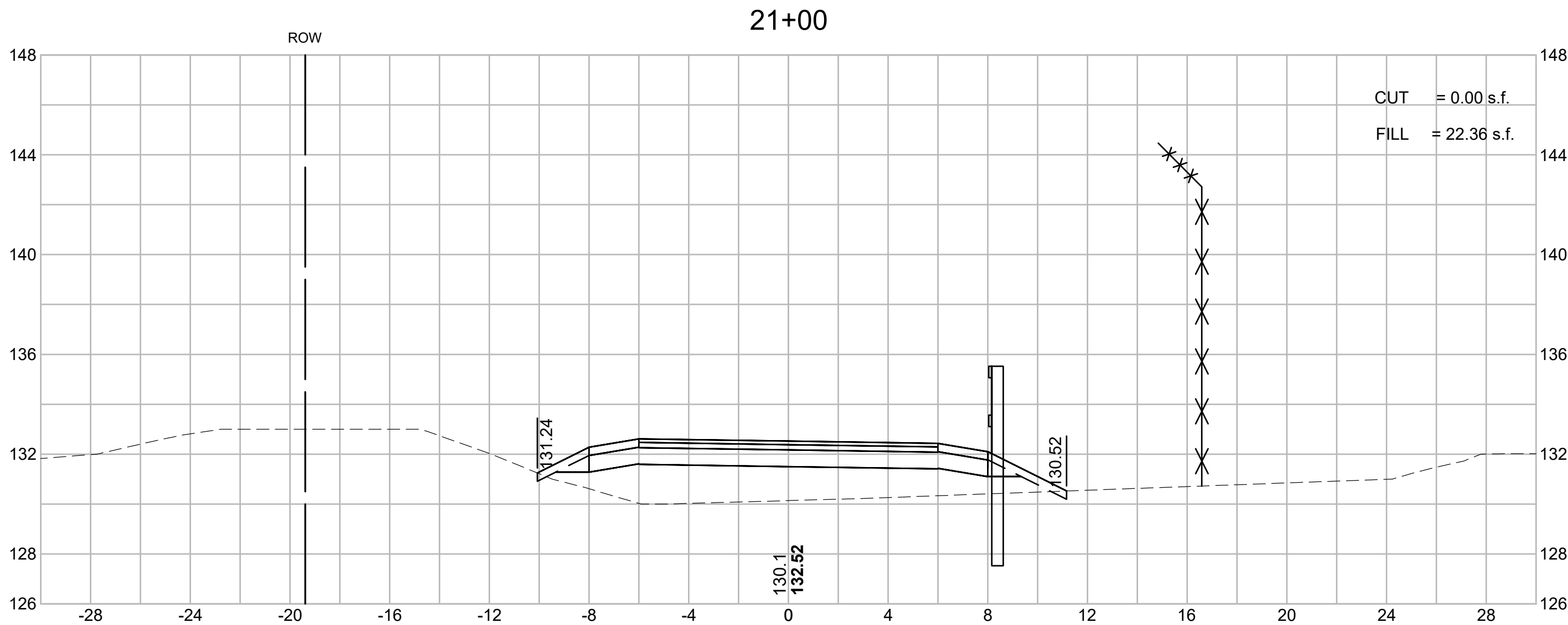




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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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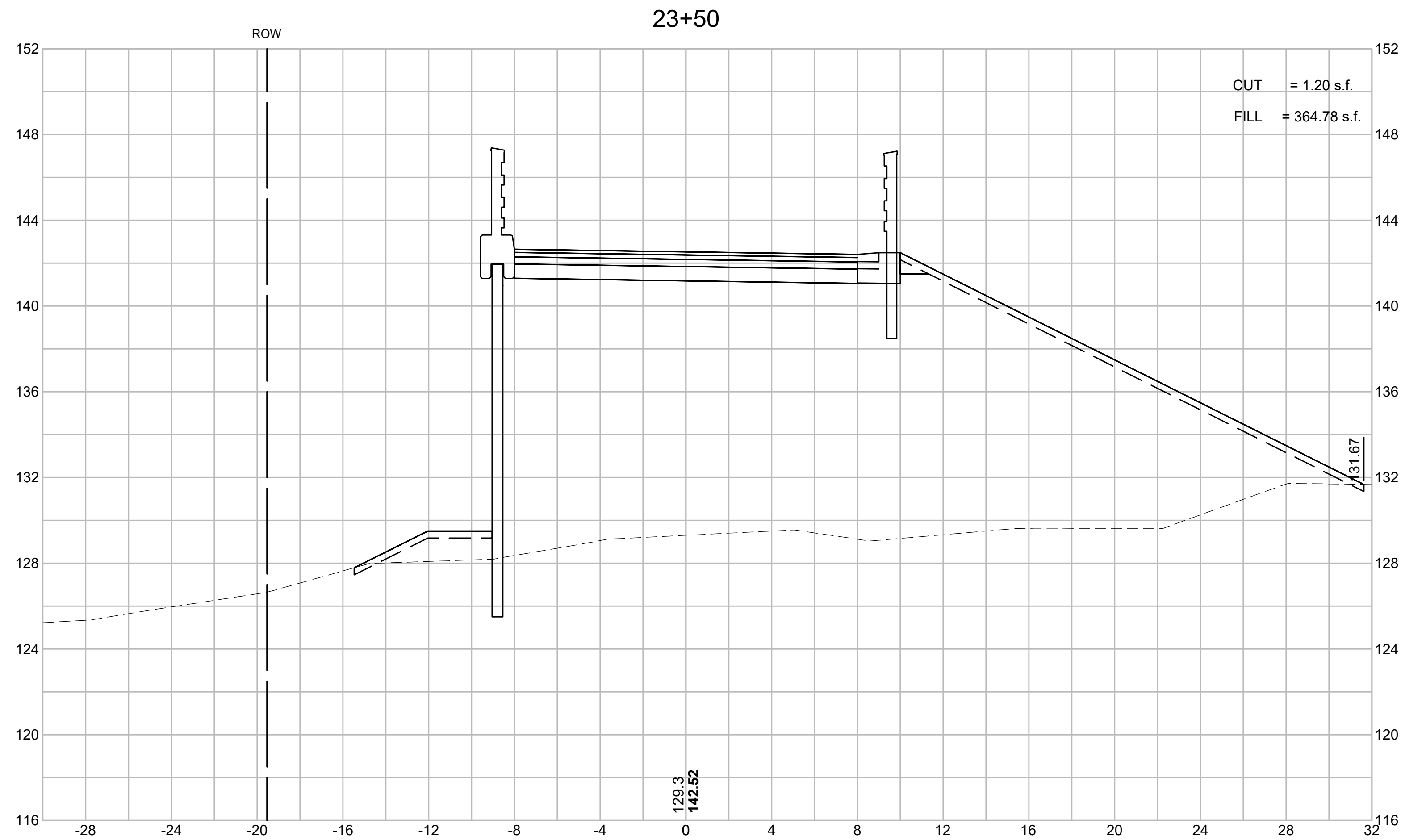
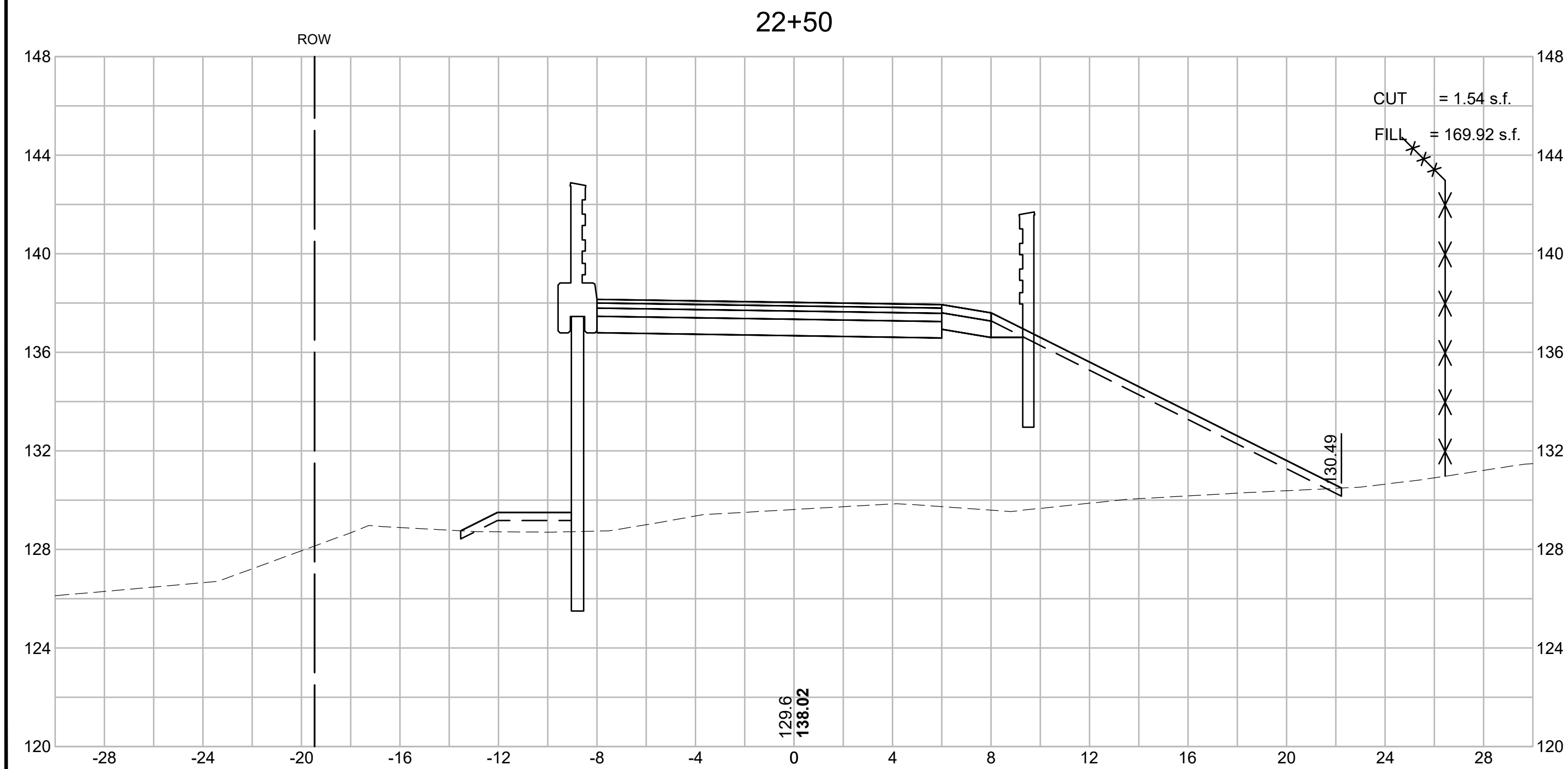
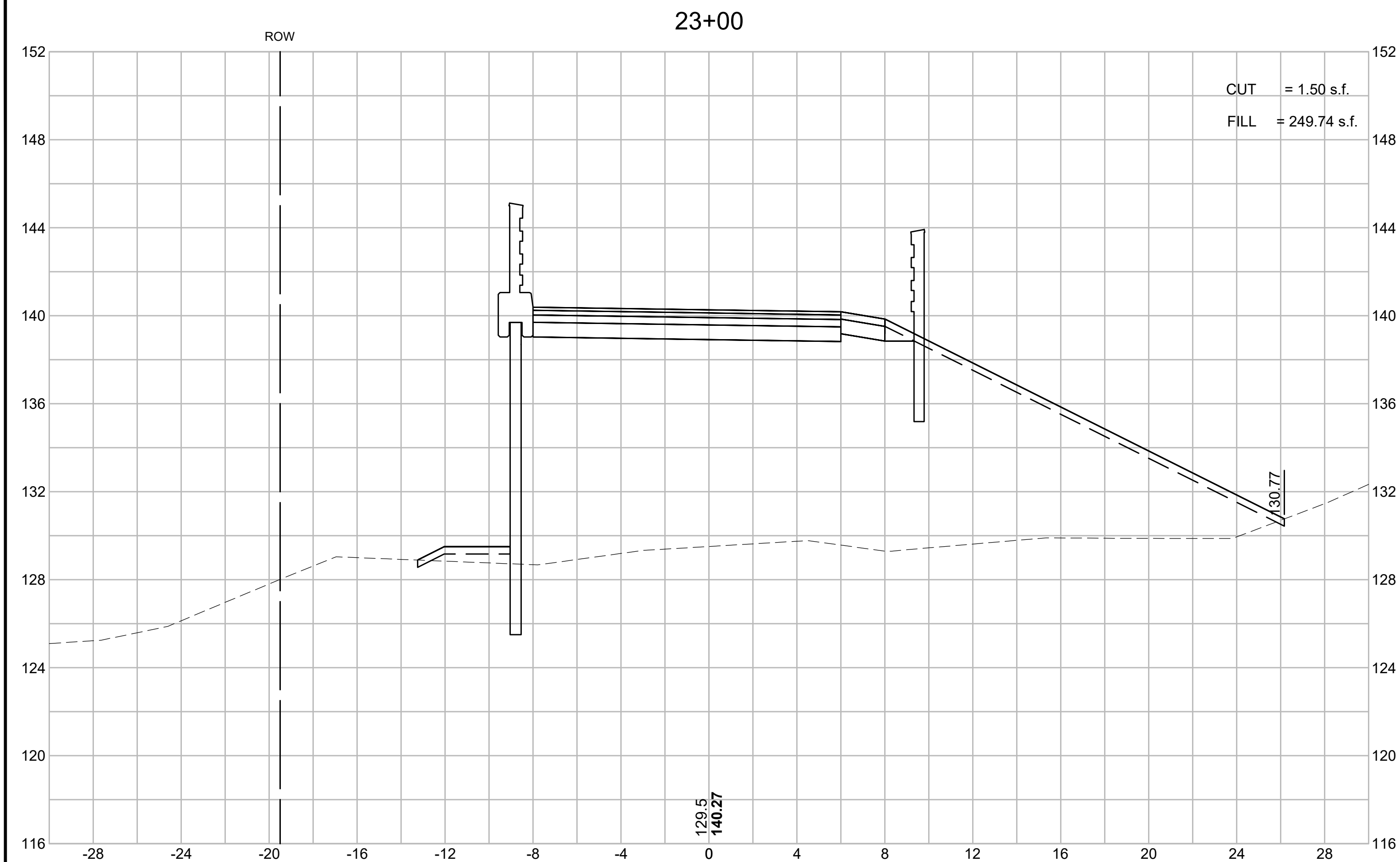
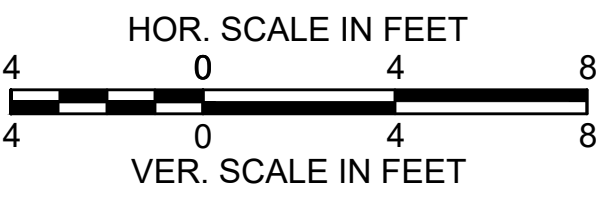
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BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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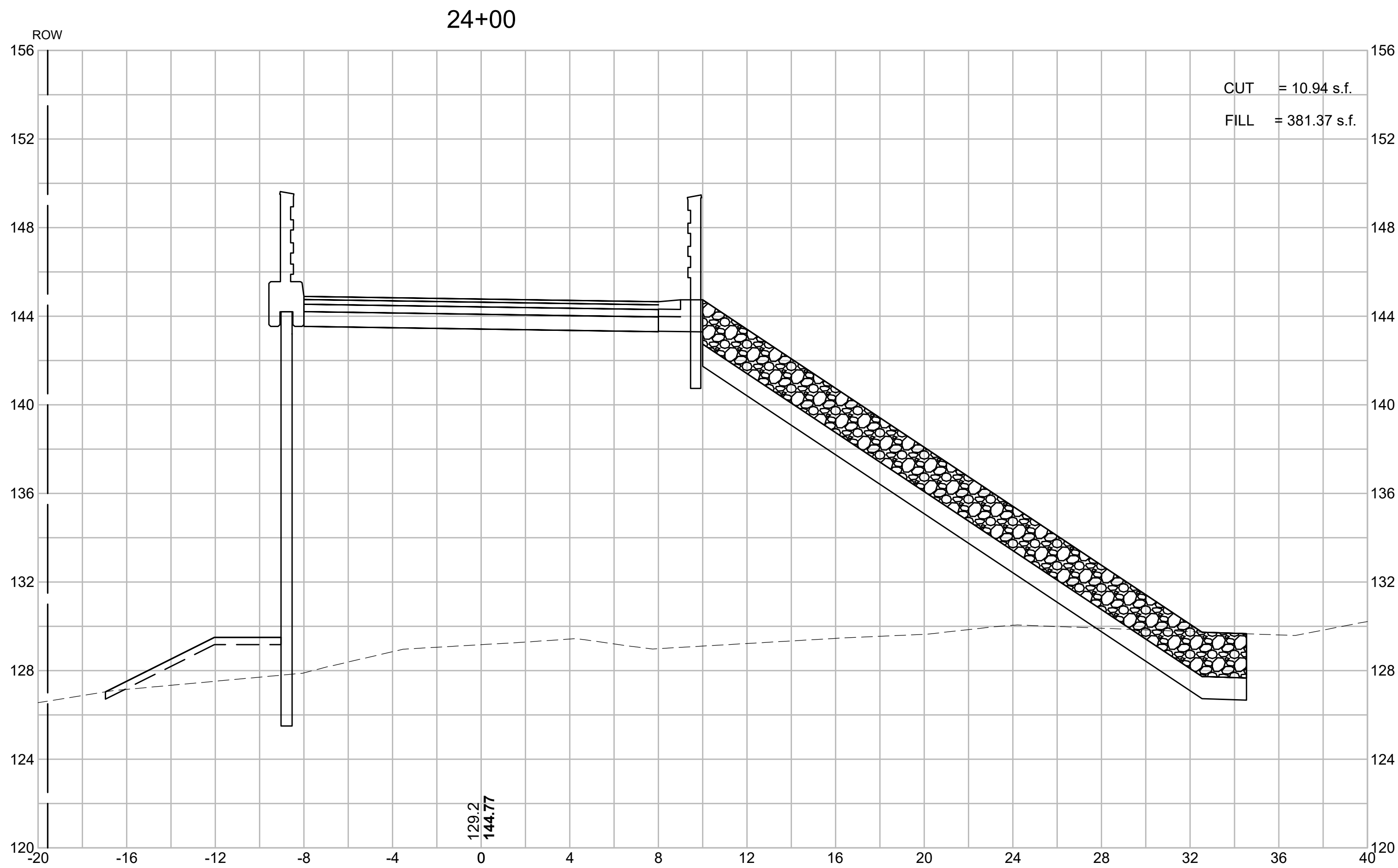
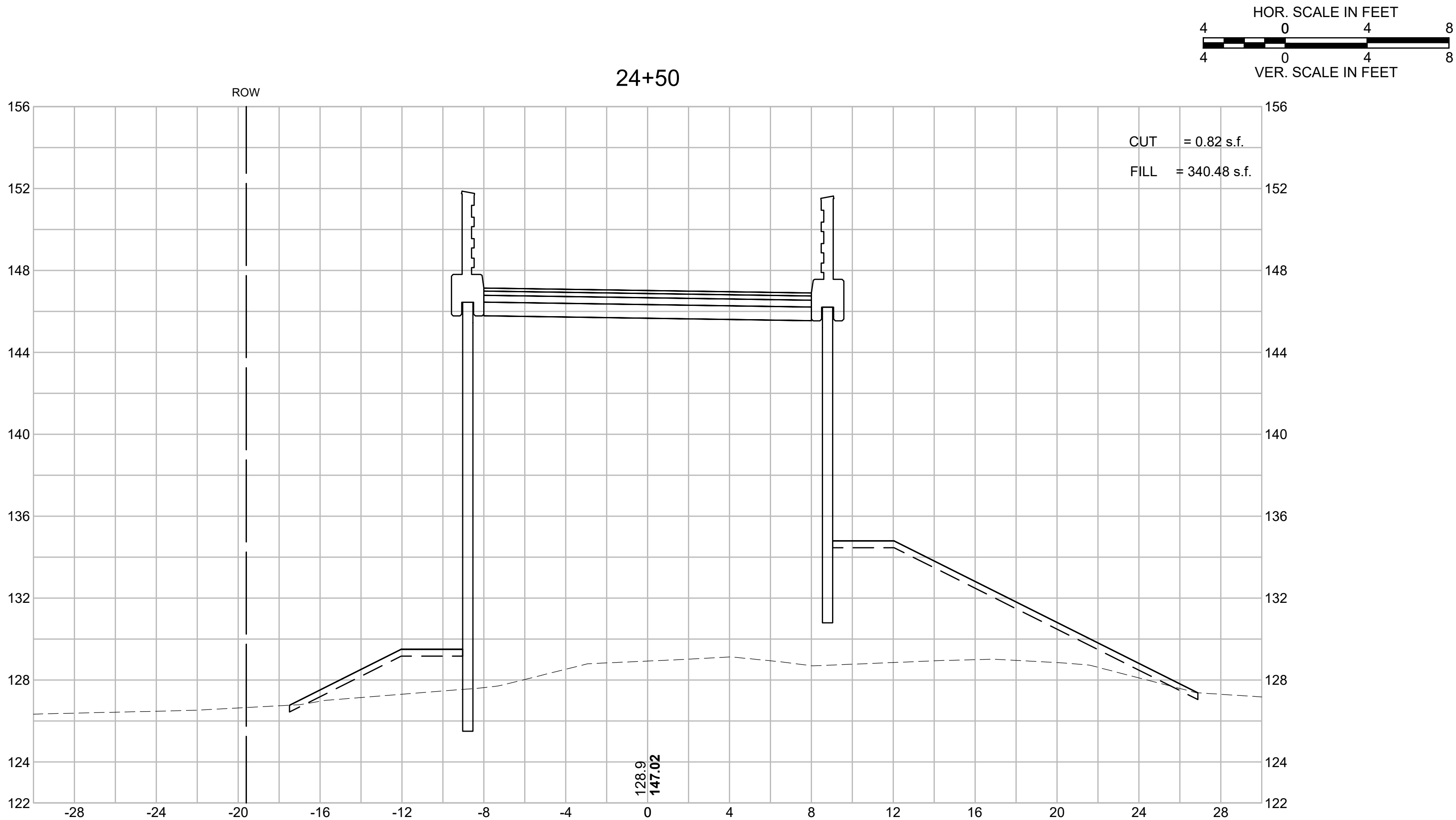
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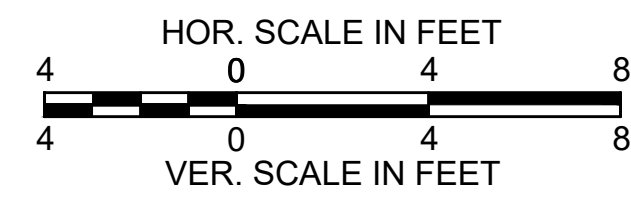


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

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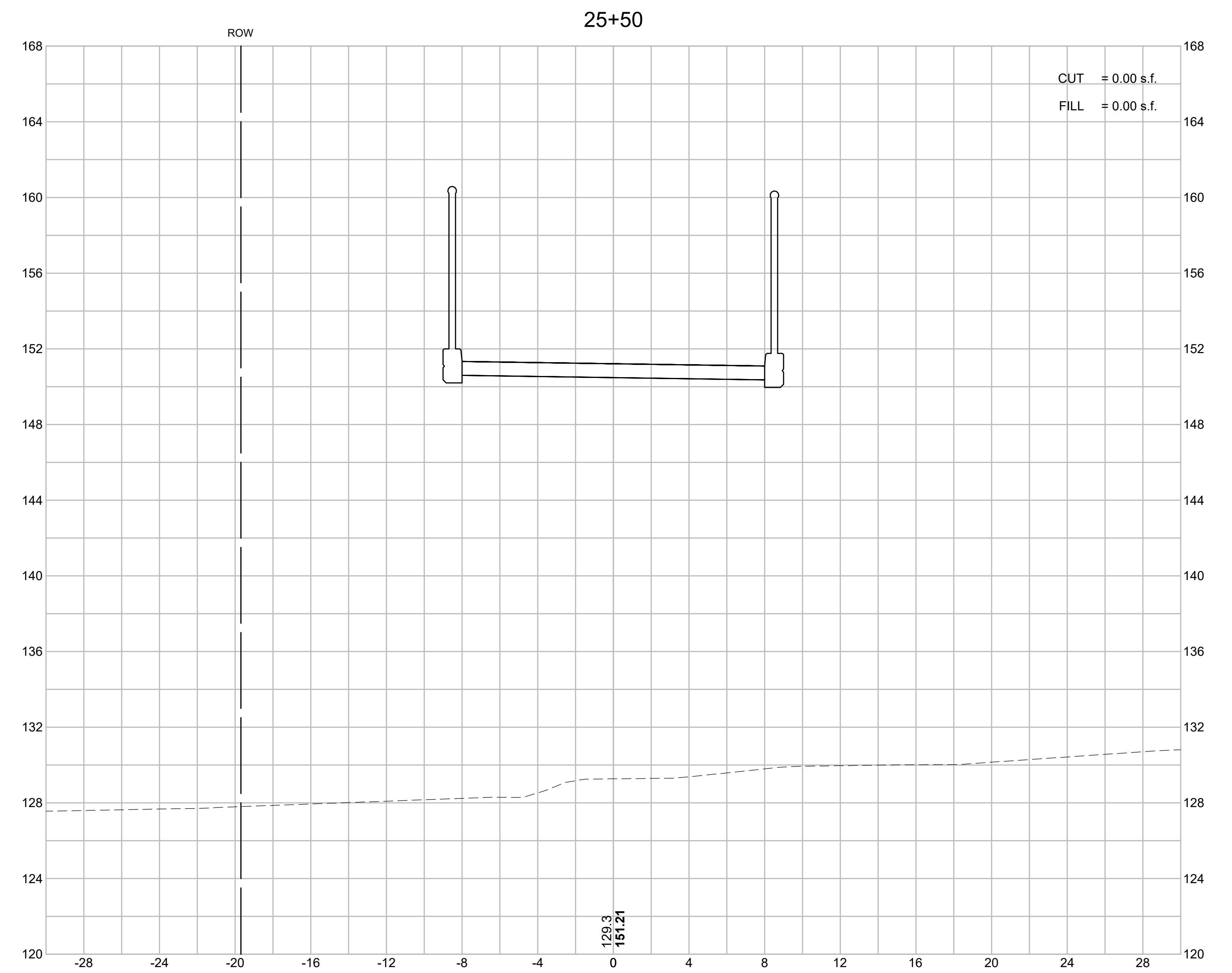
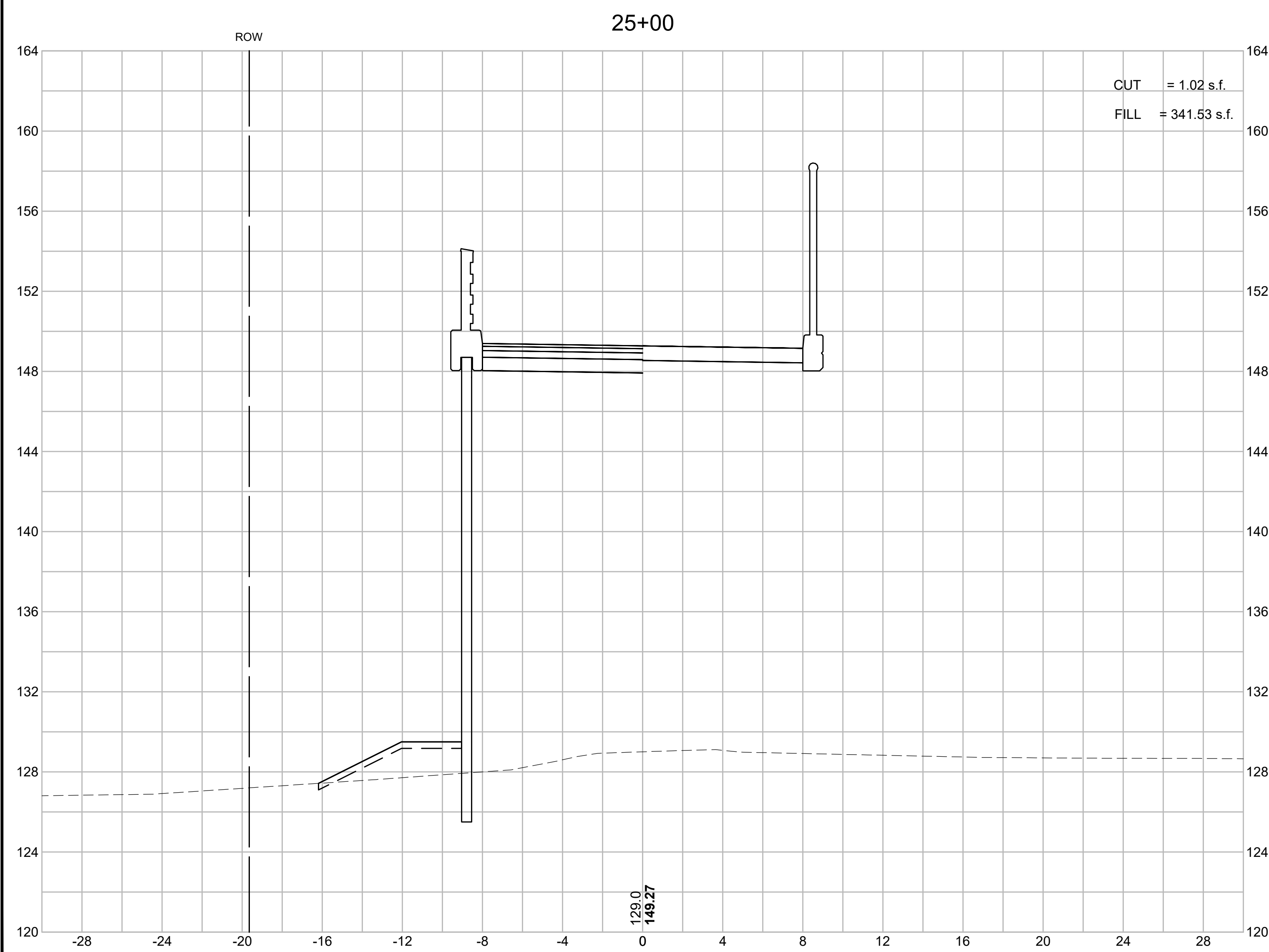


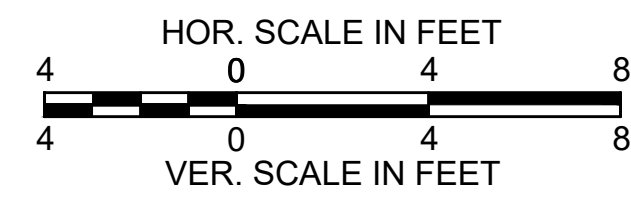


ACTON & CONCORD
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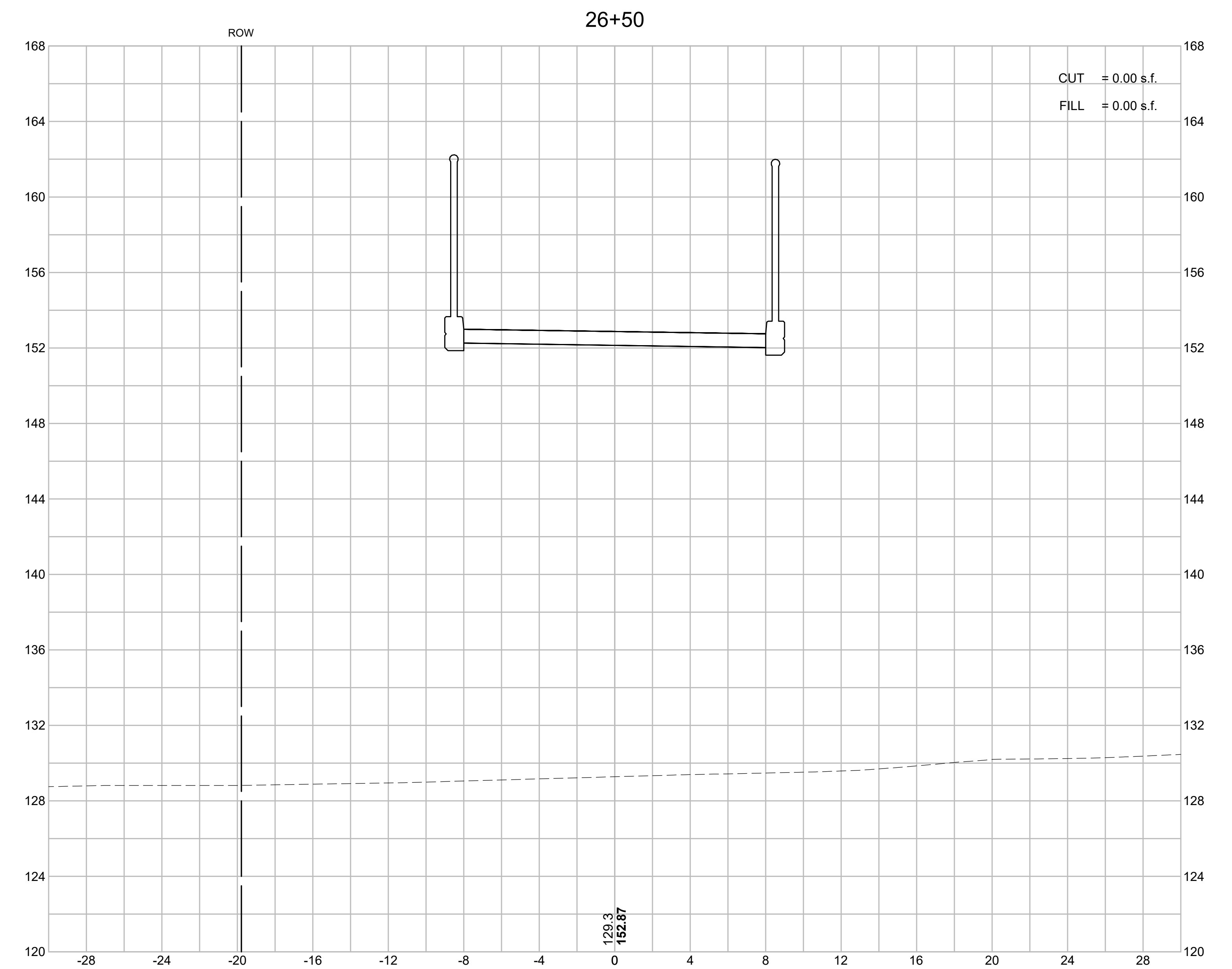
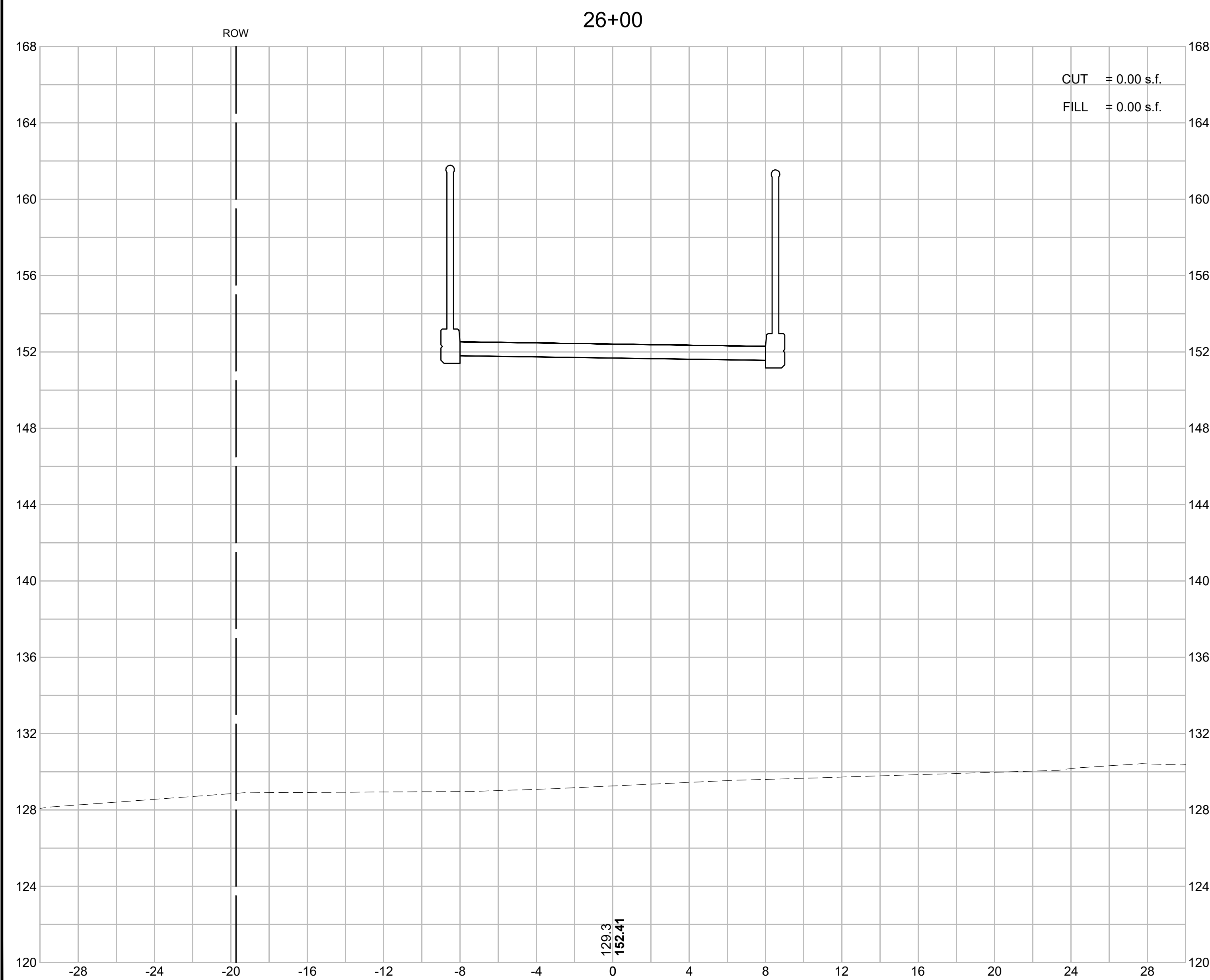


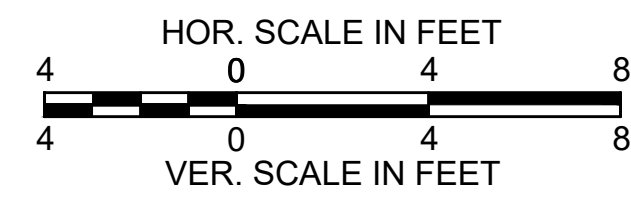


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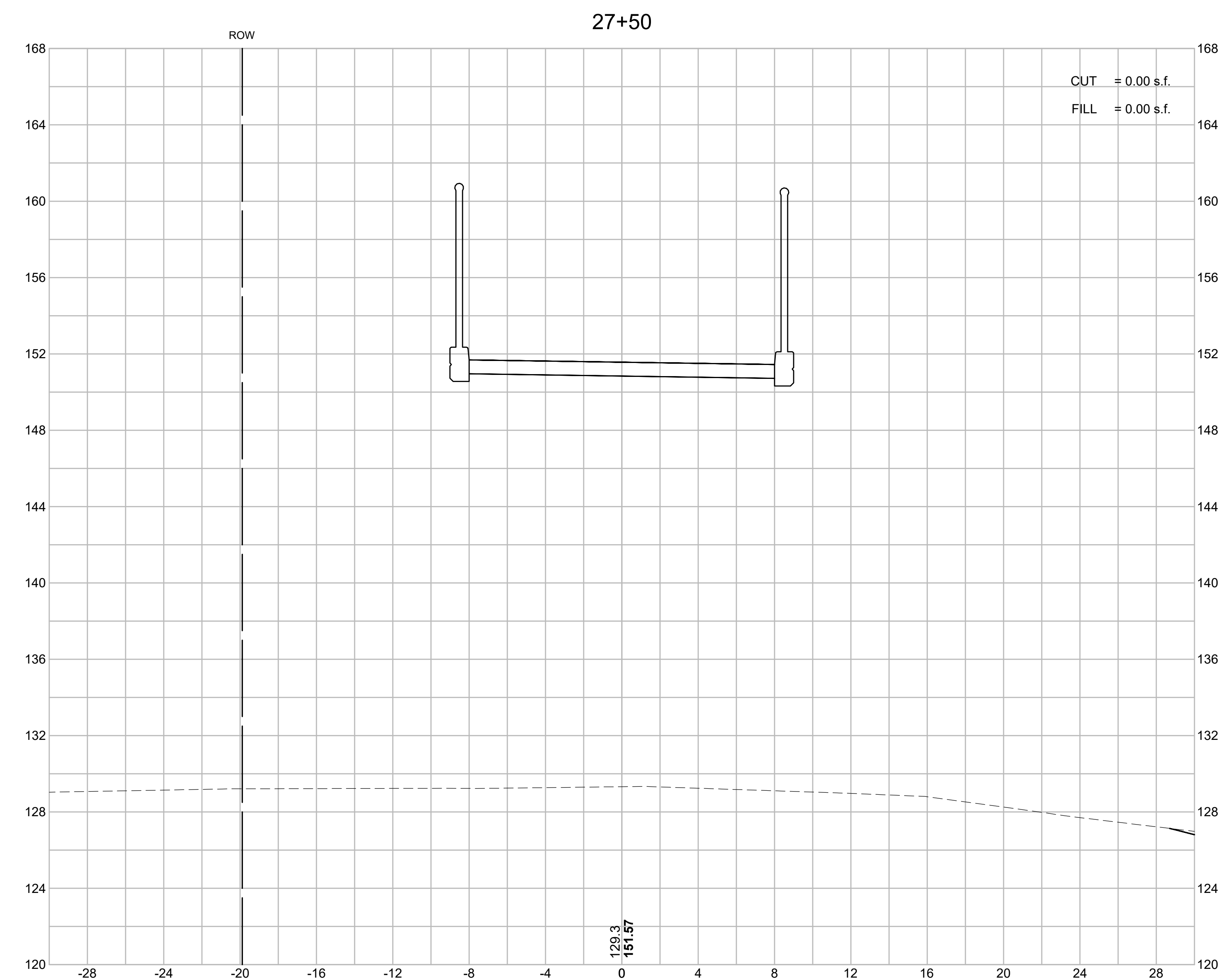
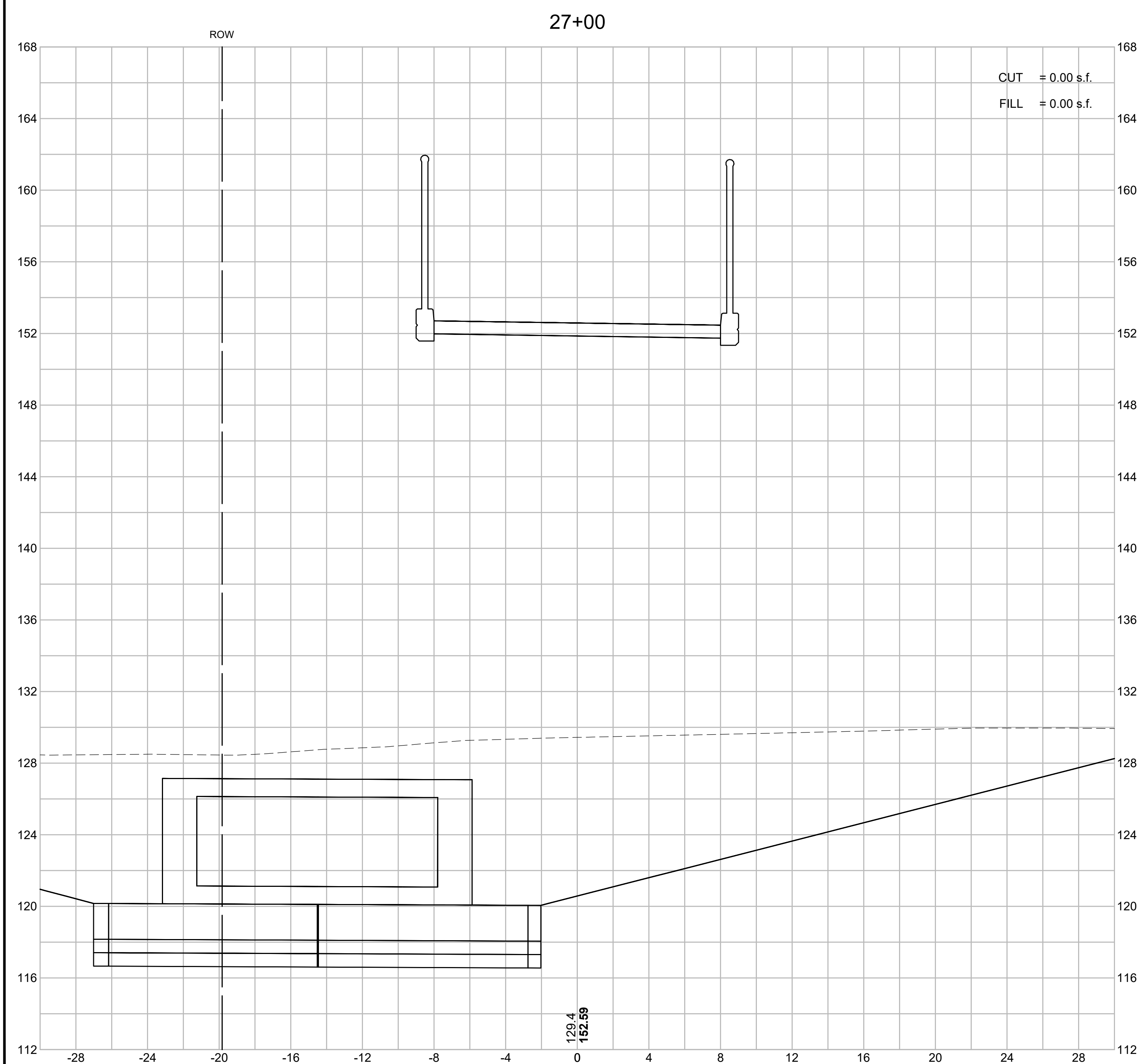


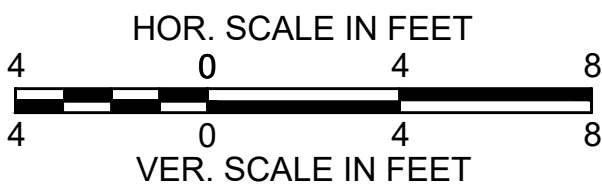


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

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CROSS SECTIONS

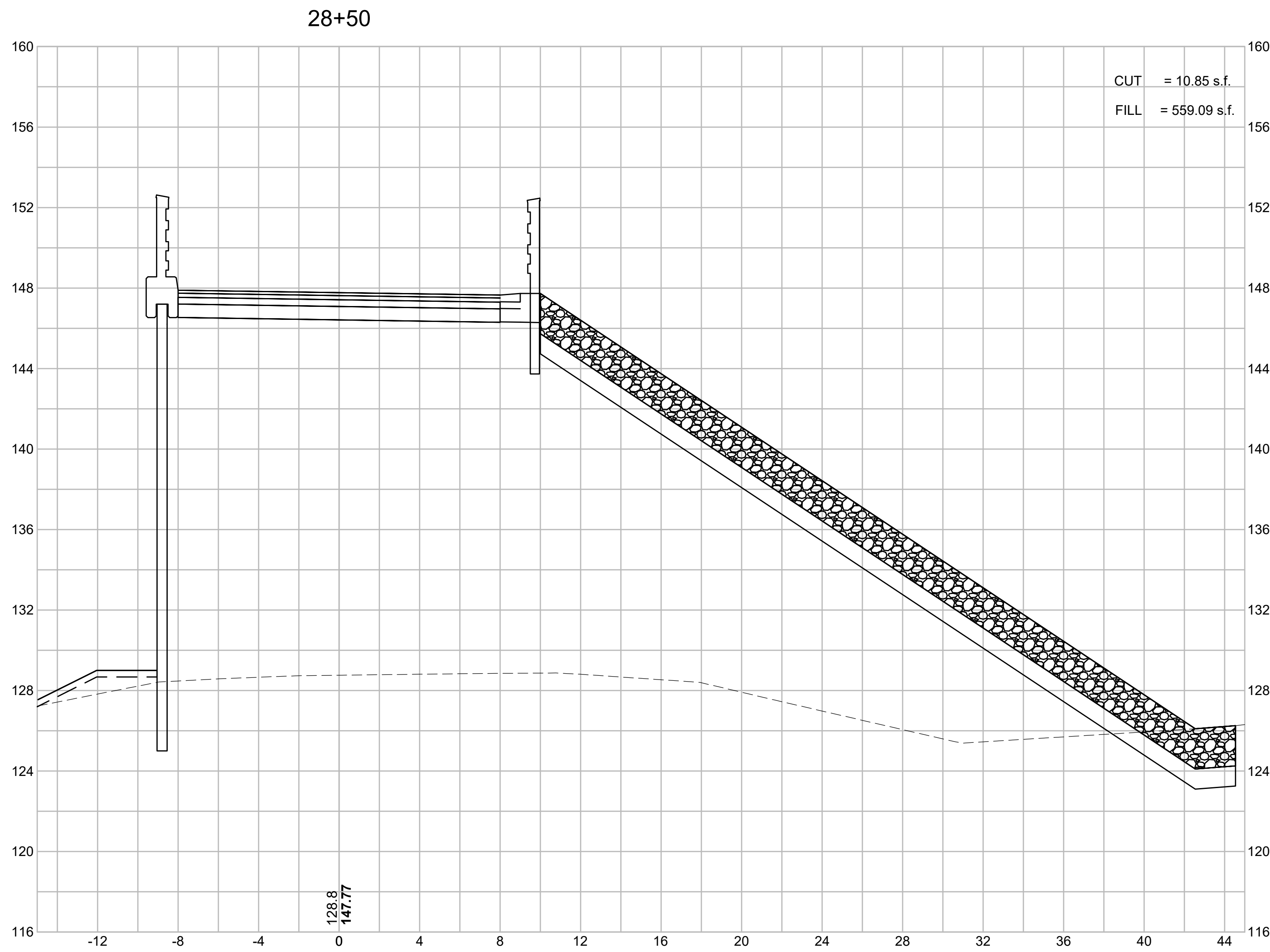
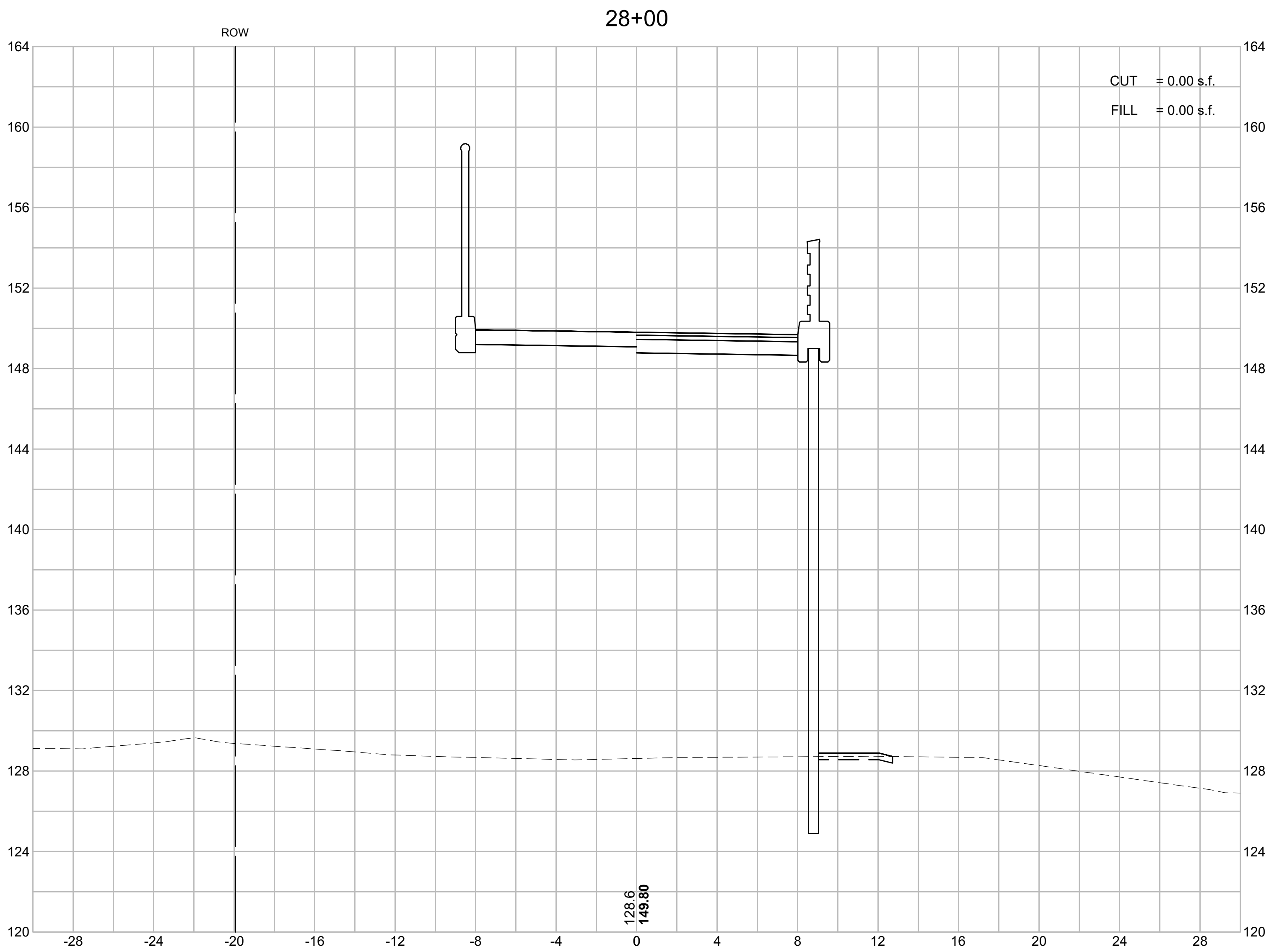




ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

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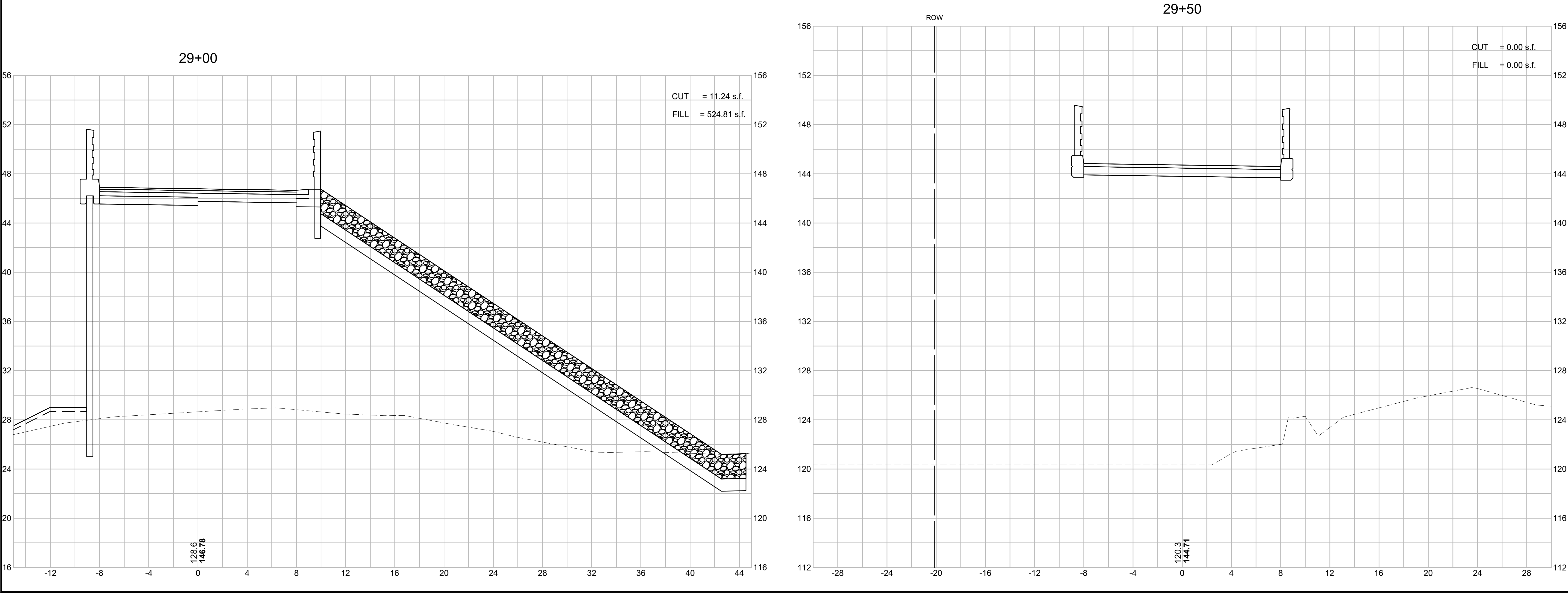
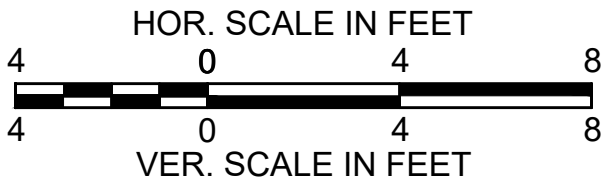
CROSS SECTIONS



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

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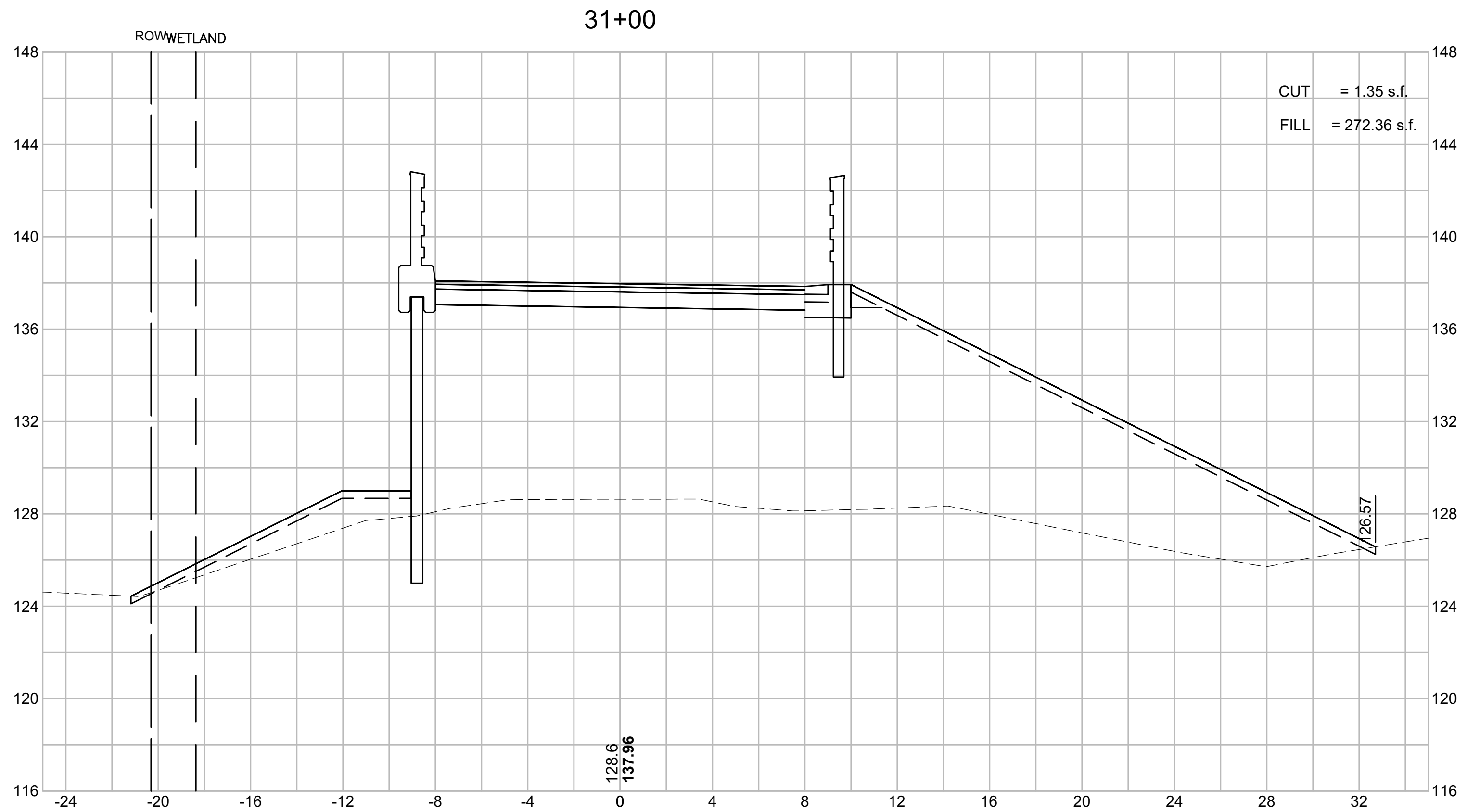
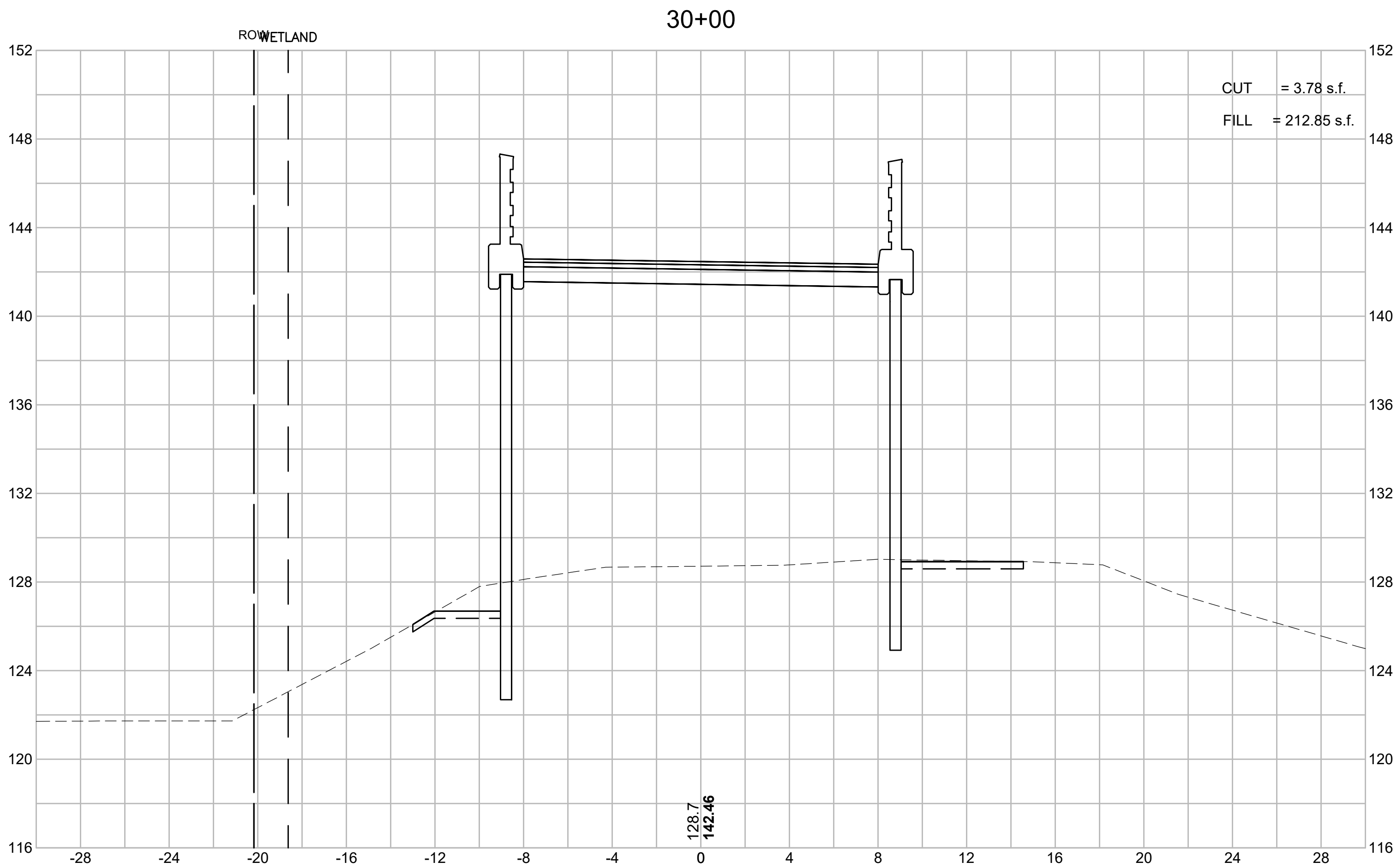
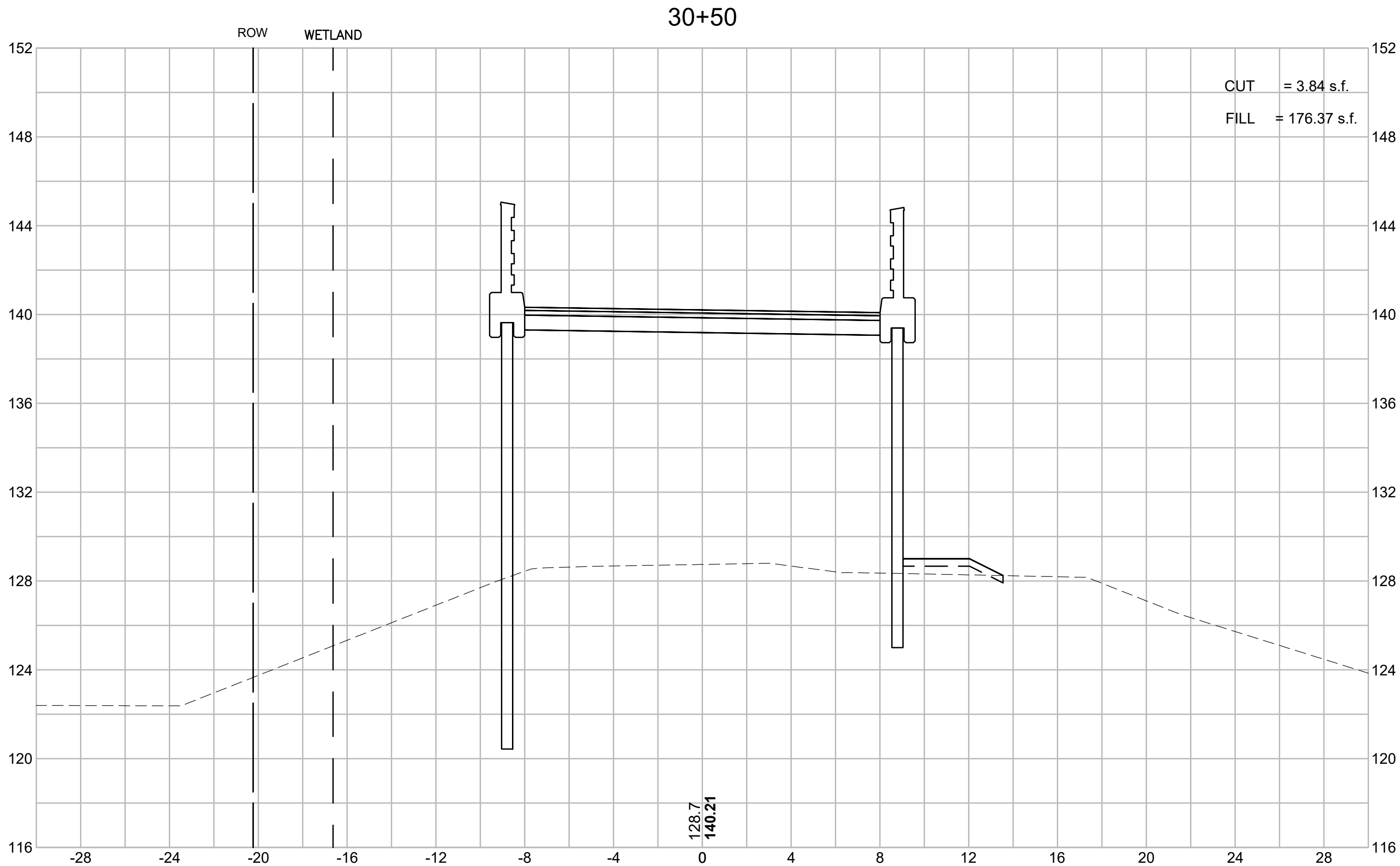
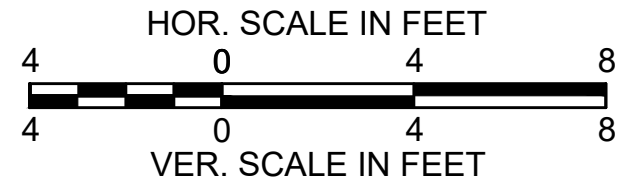
CROSS SECTIONS

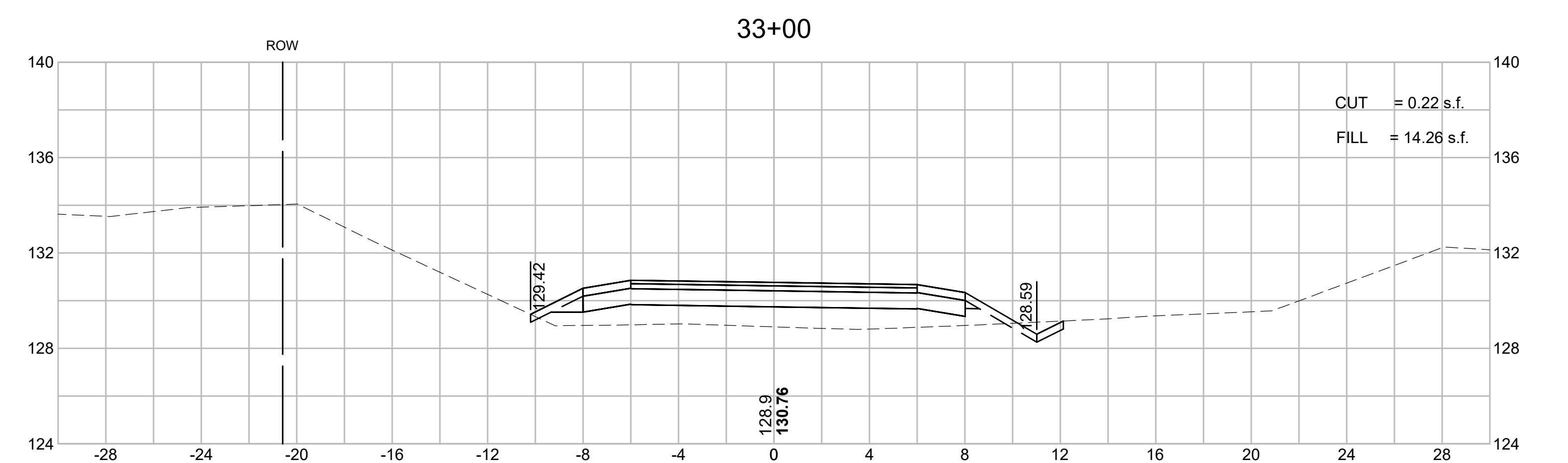
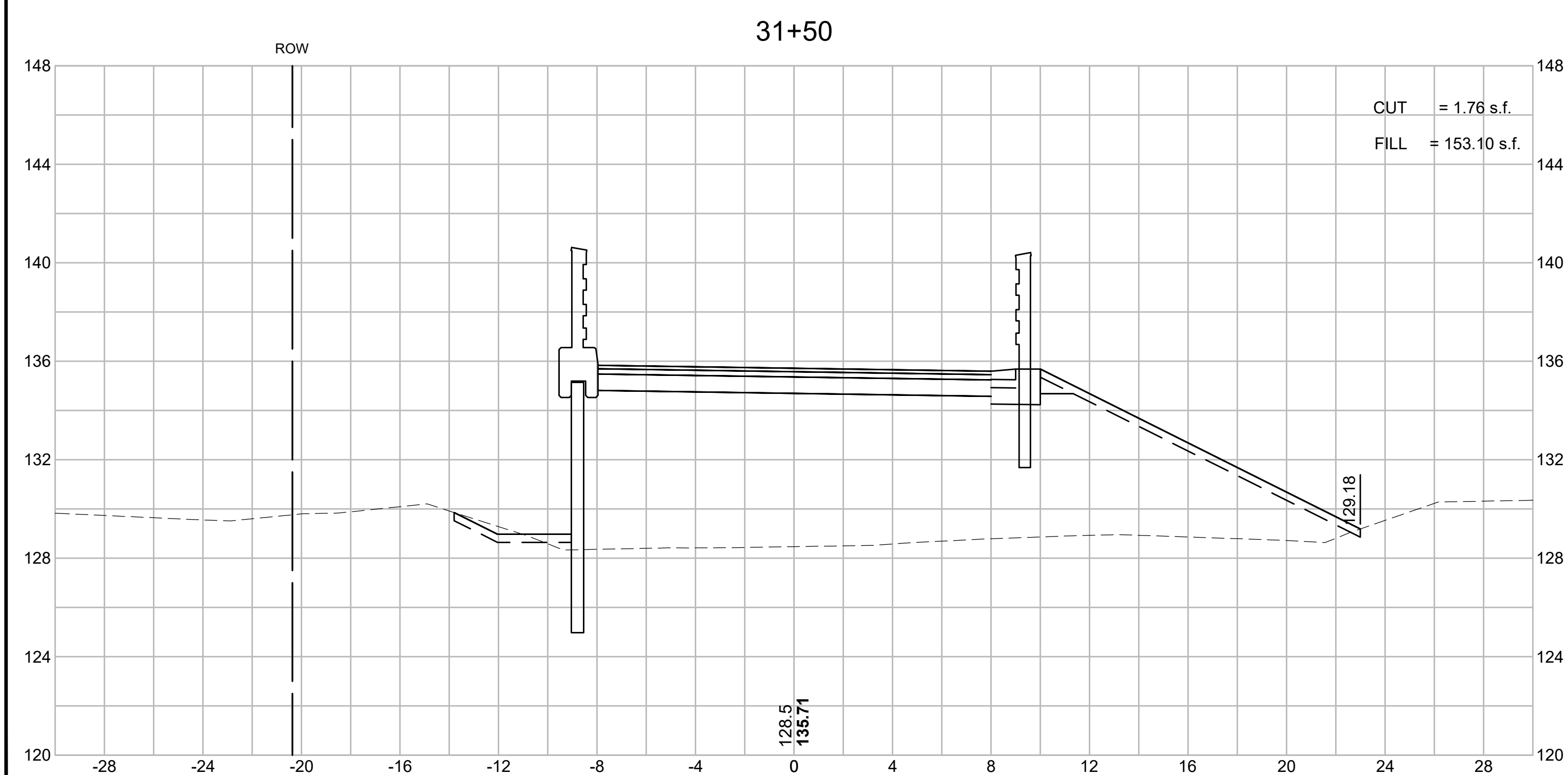
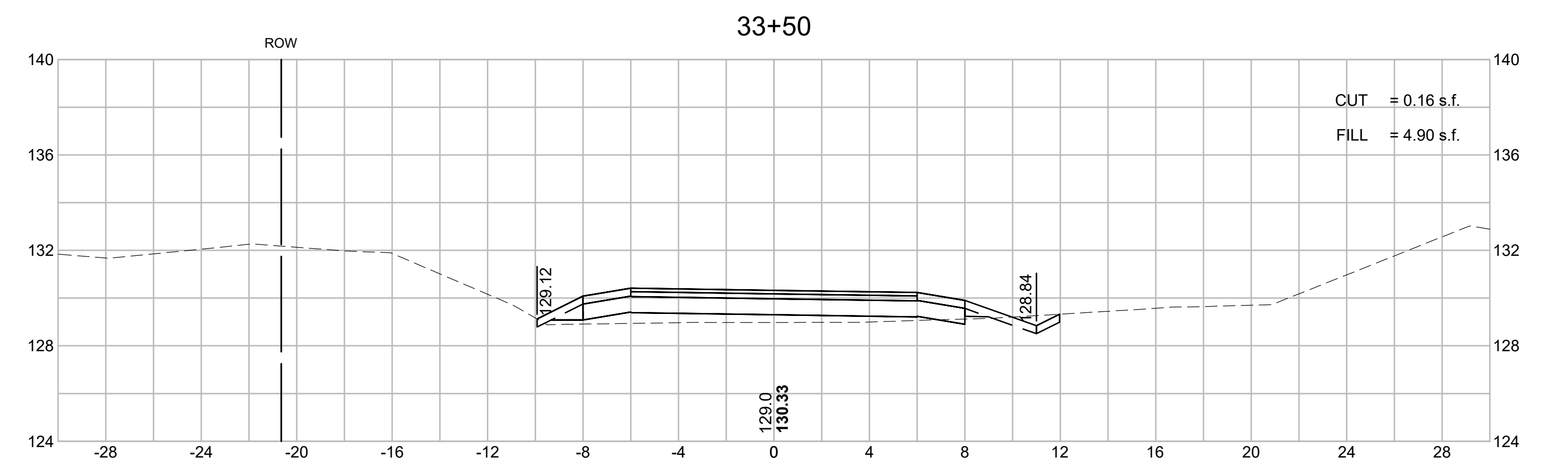
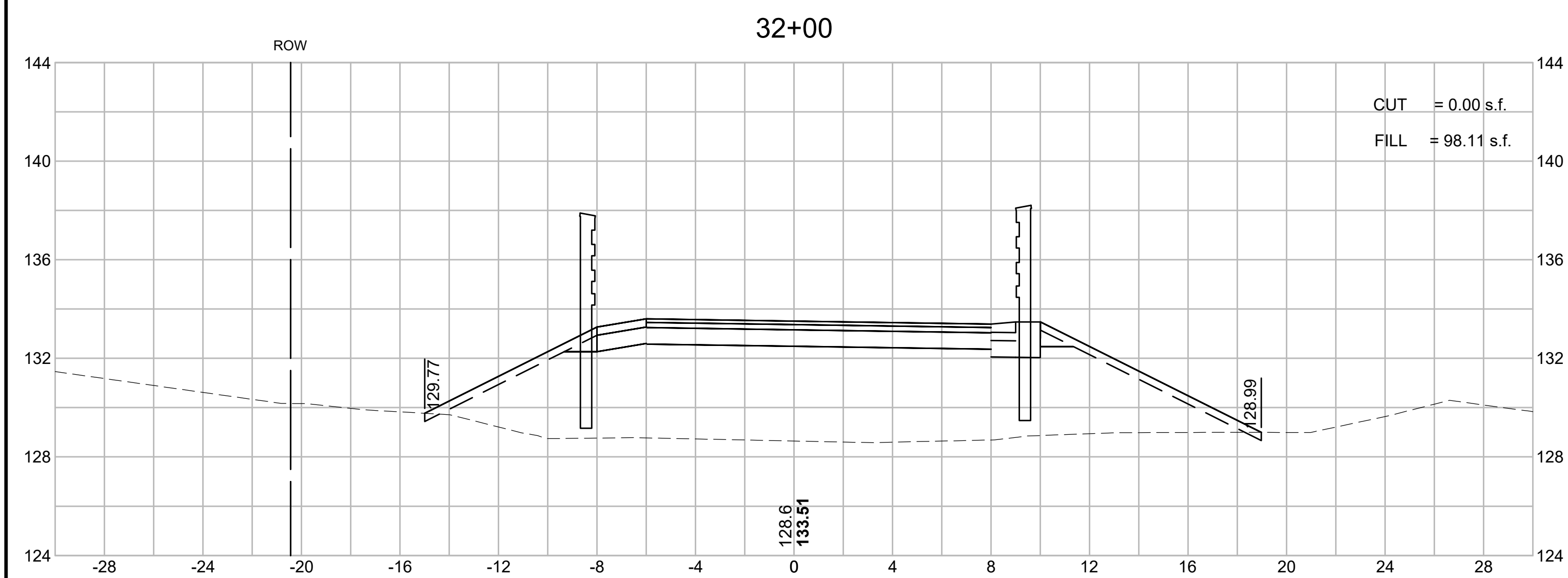
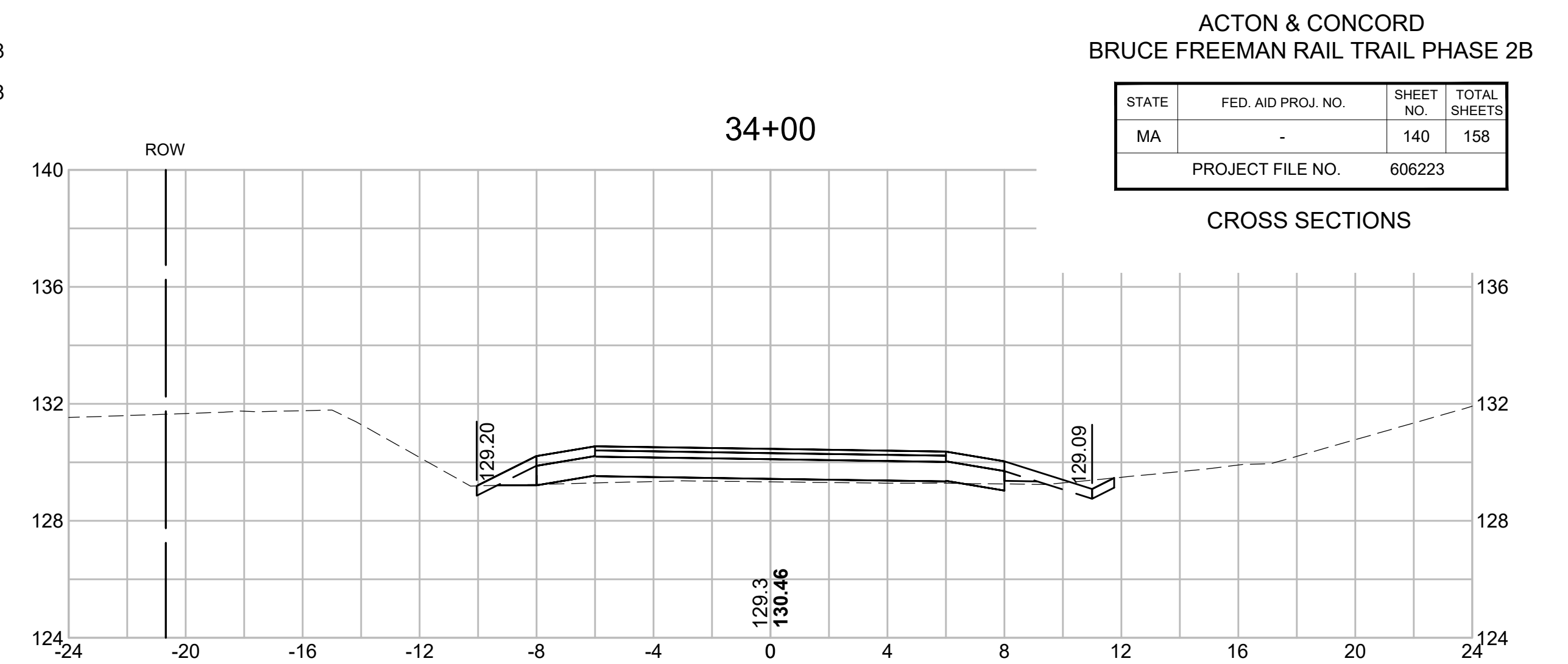
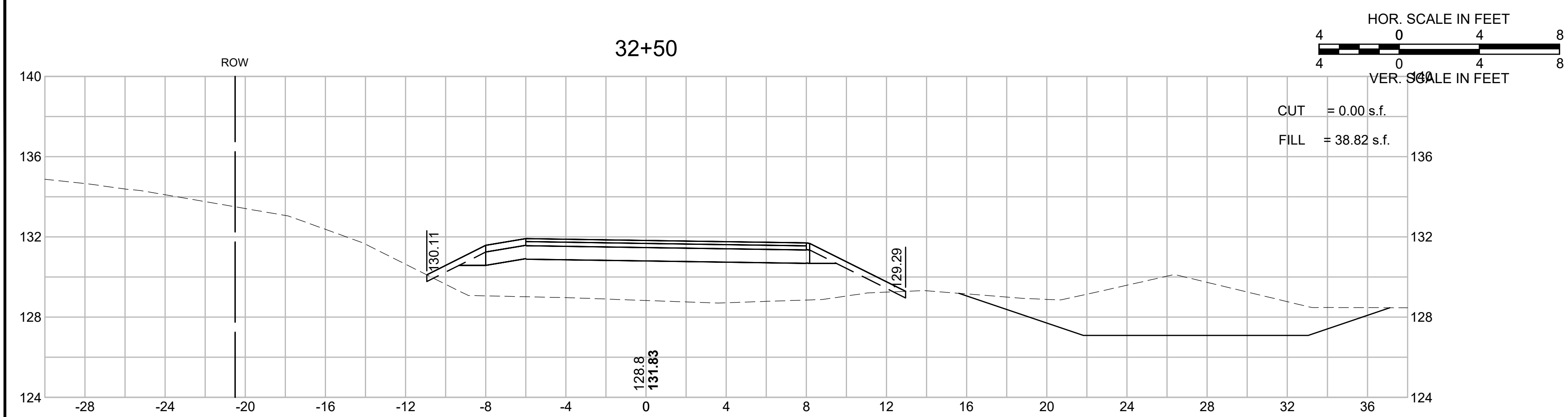


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	139	158
PROJECT FILE NO.		606223	

CROSS SECTIONS

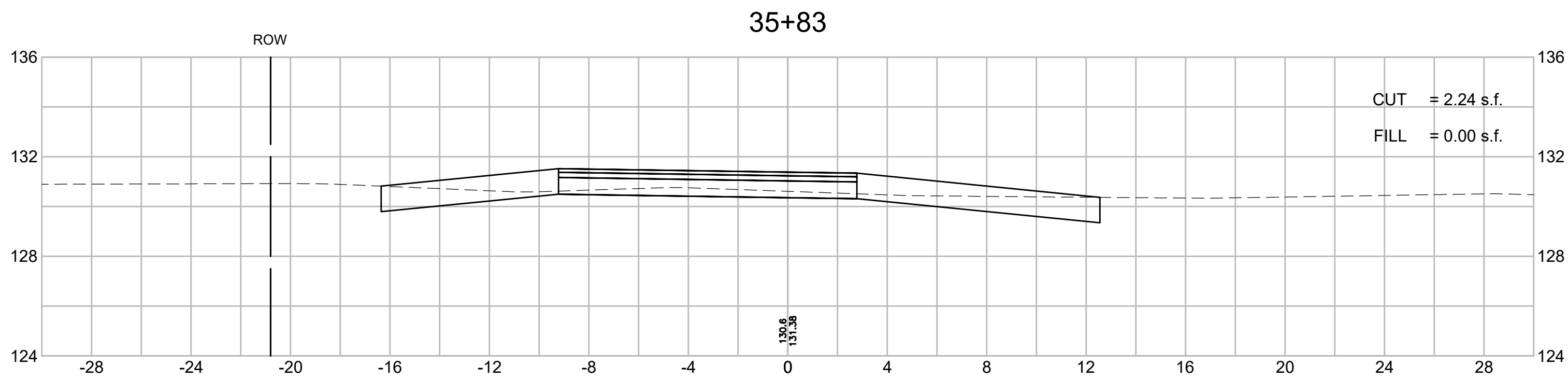
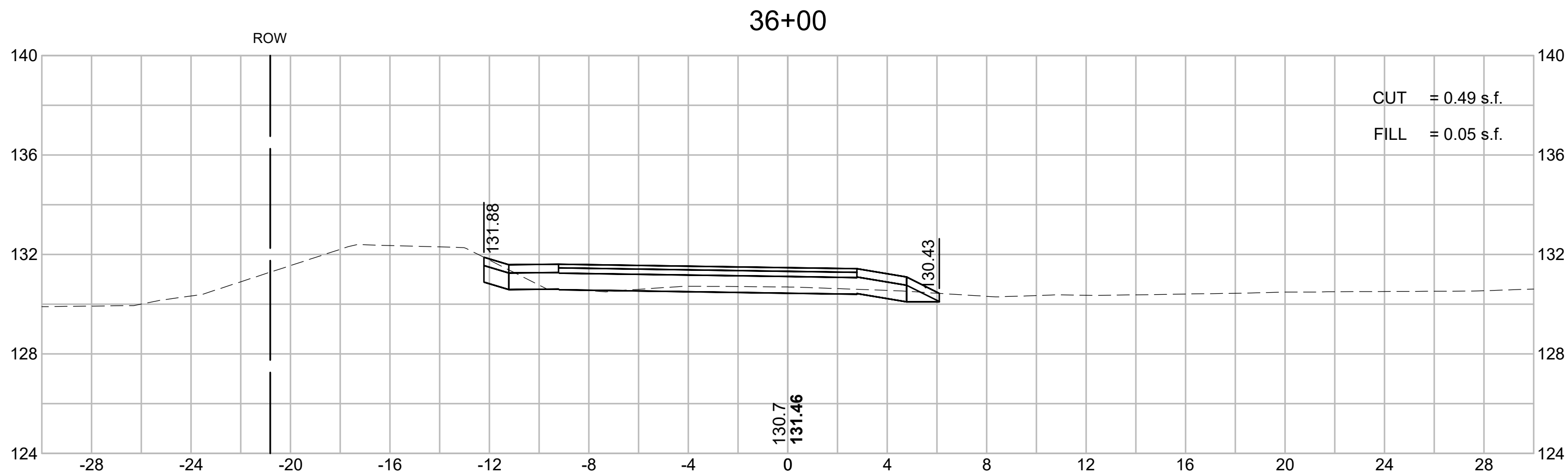
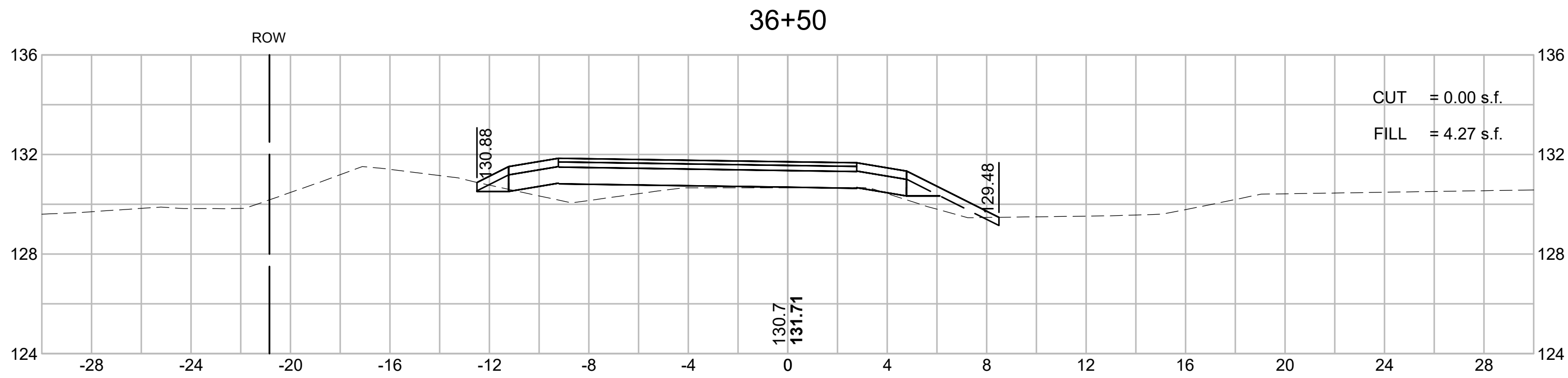
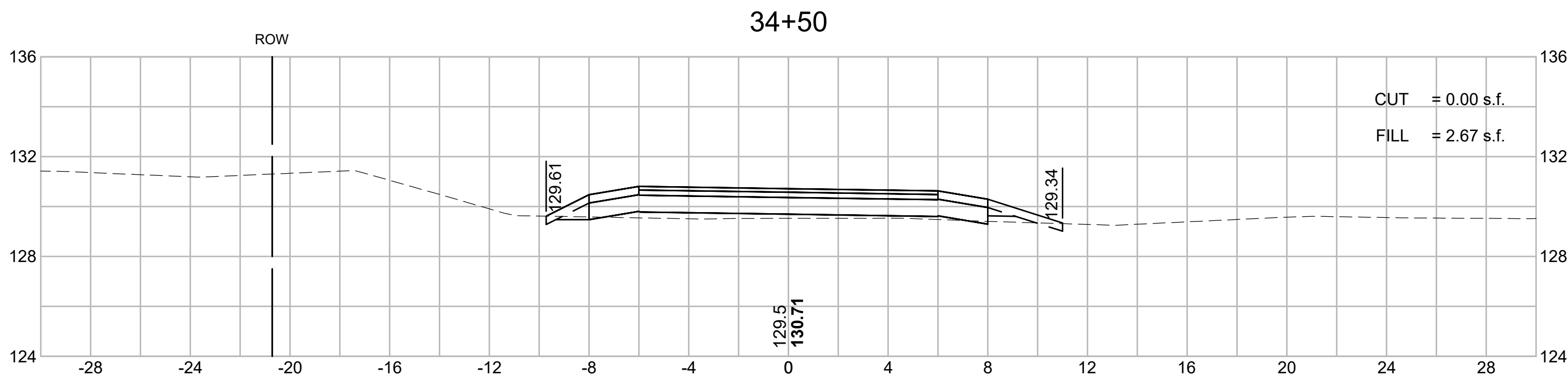
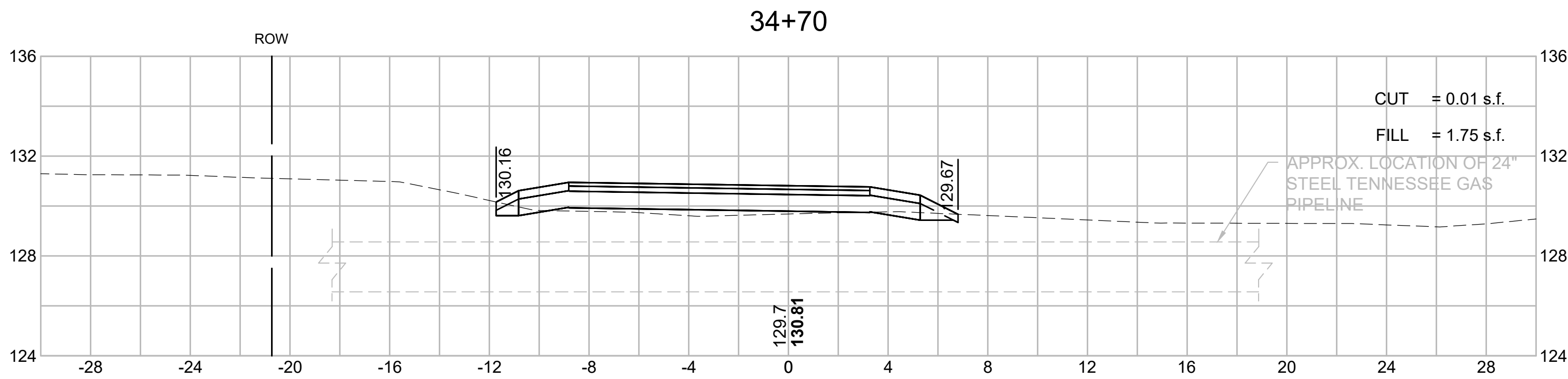
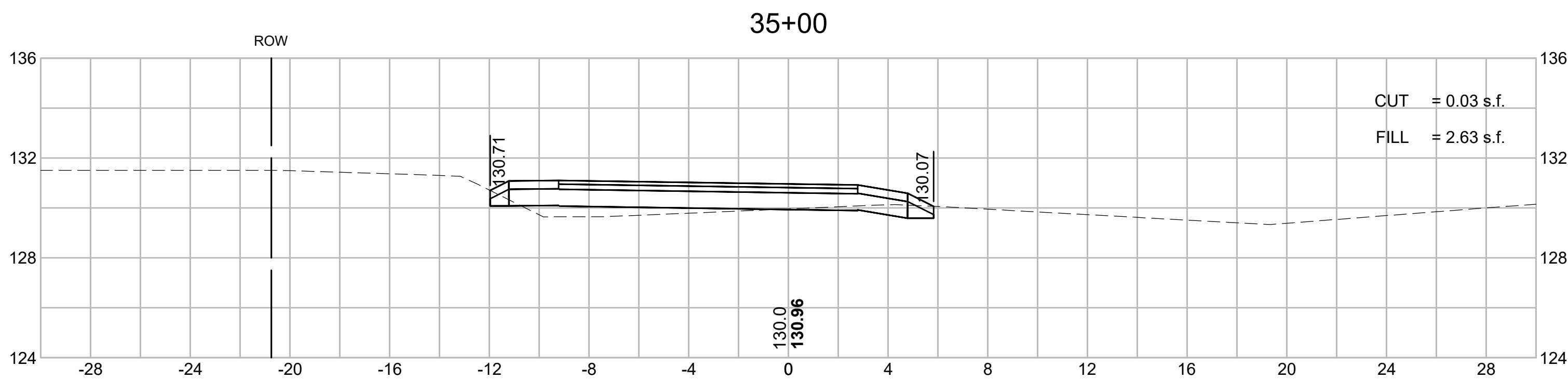
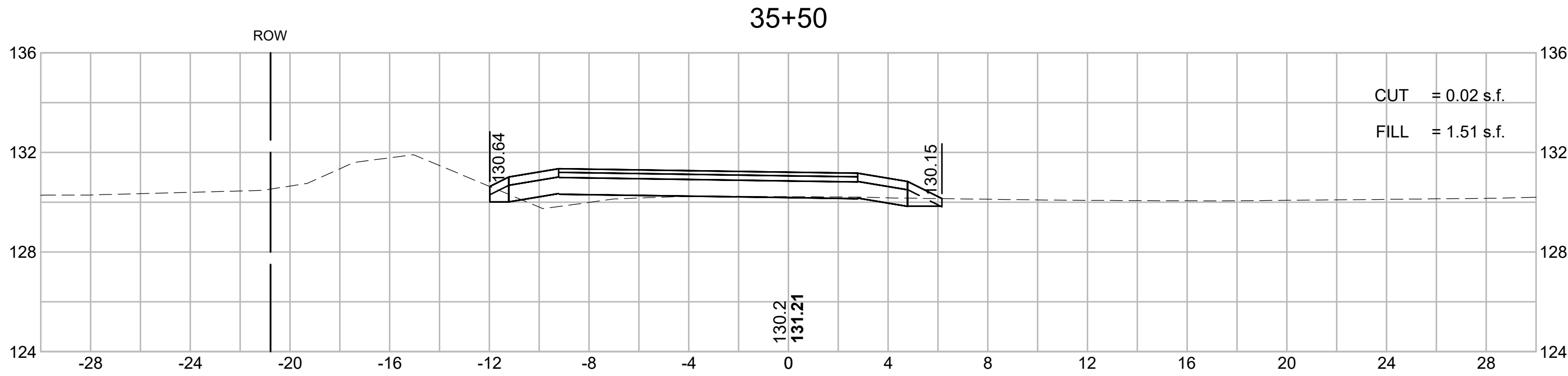
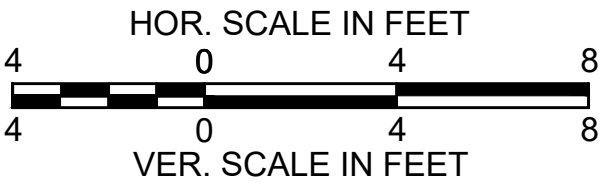




ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	141	158
PROJECT FILE NO.		606223	

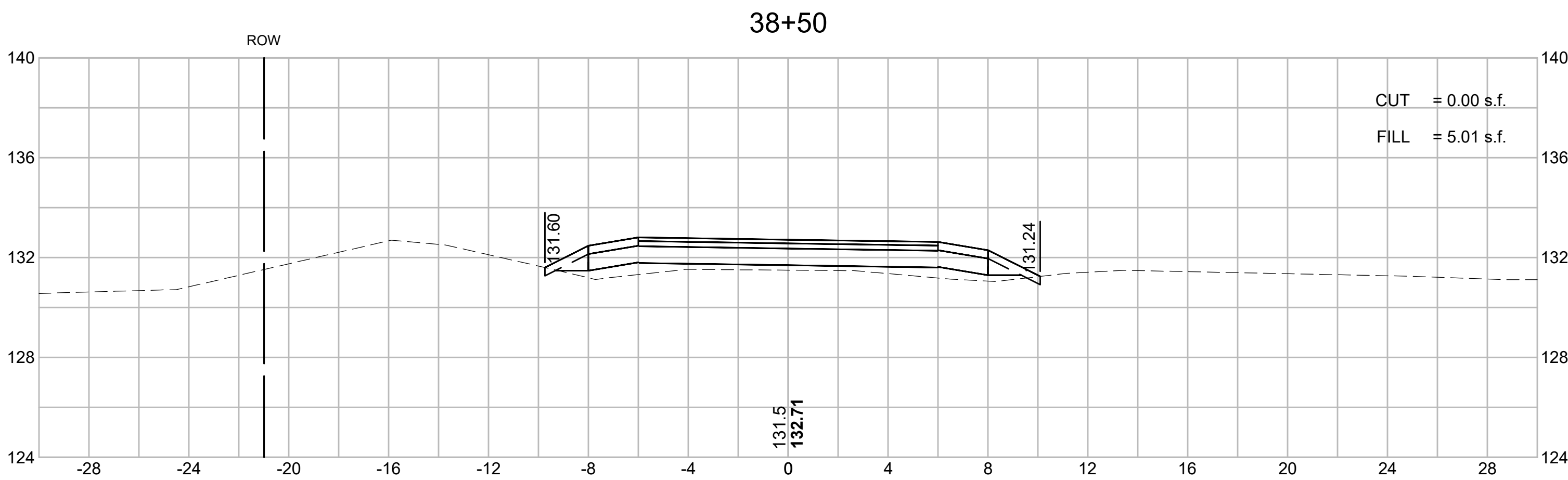
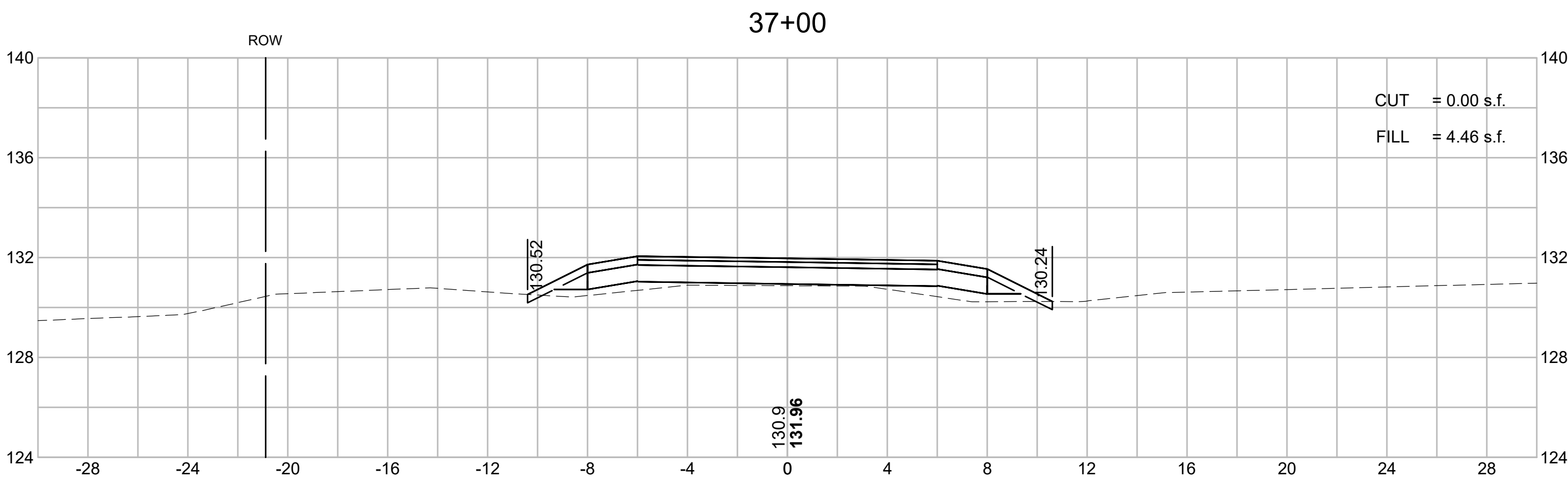
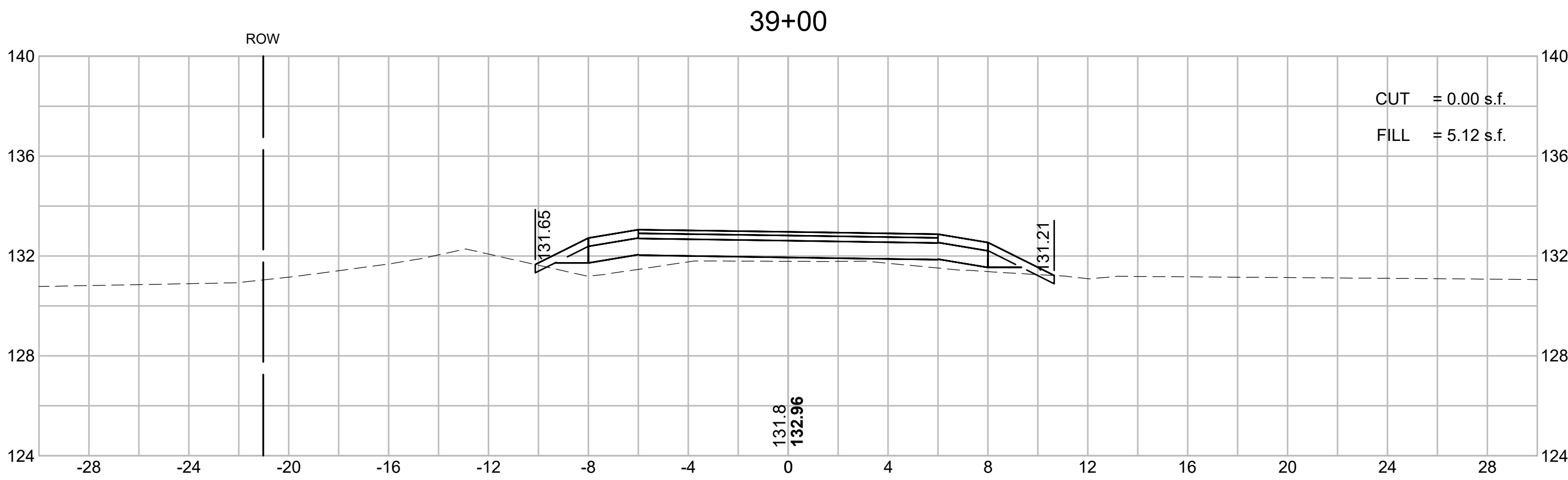
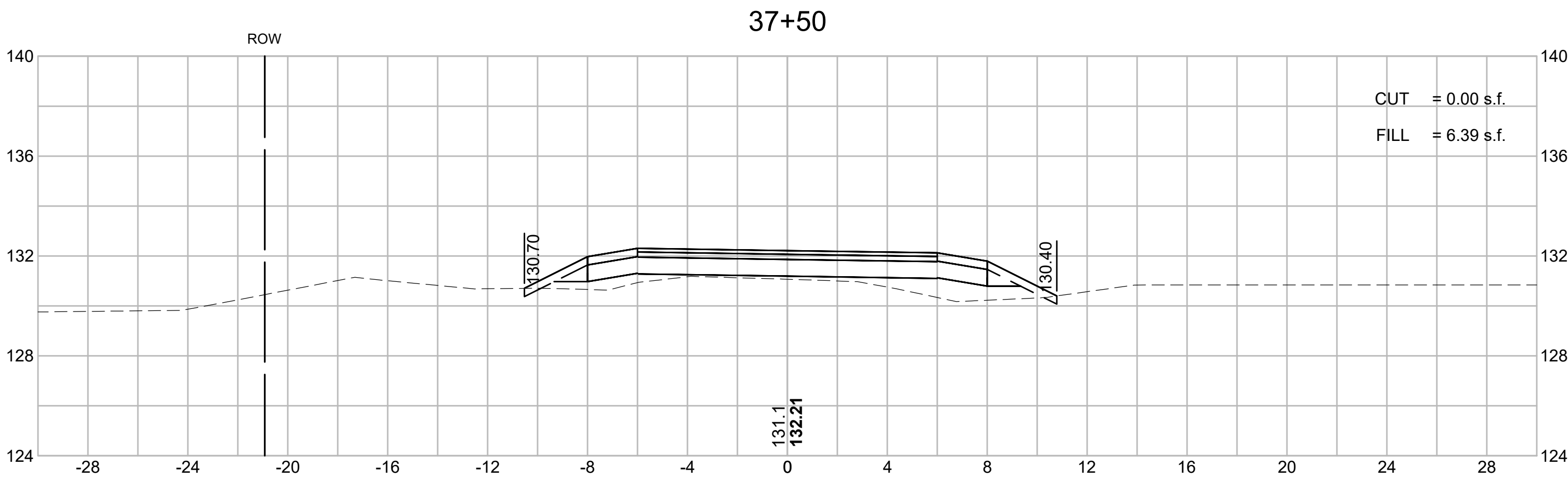
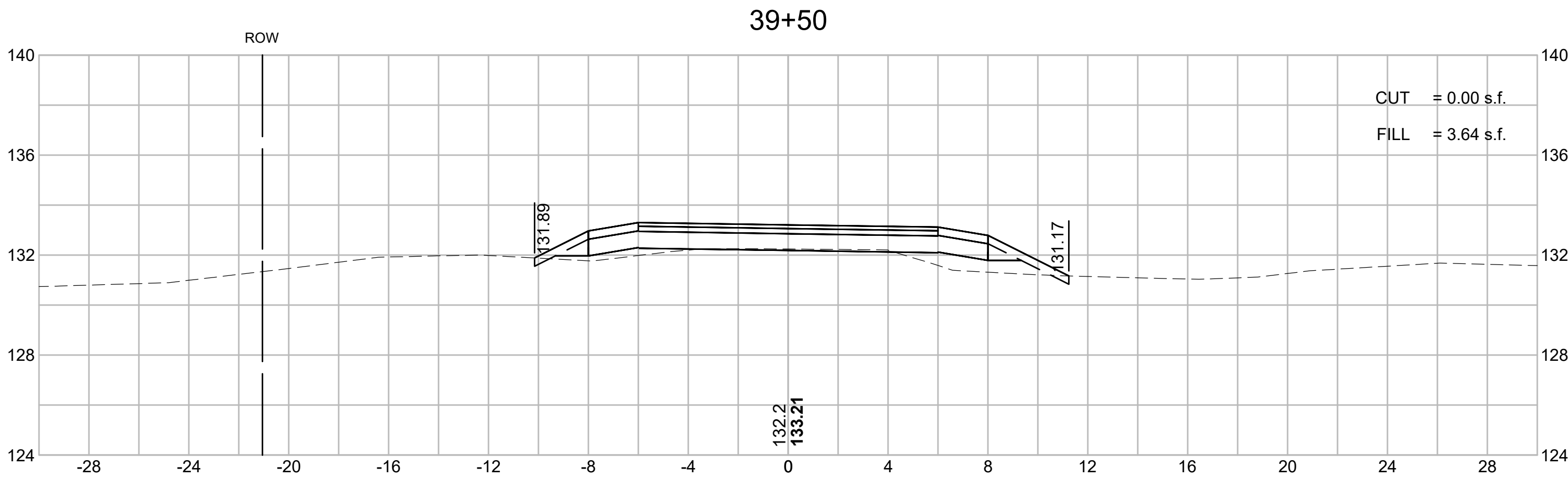
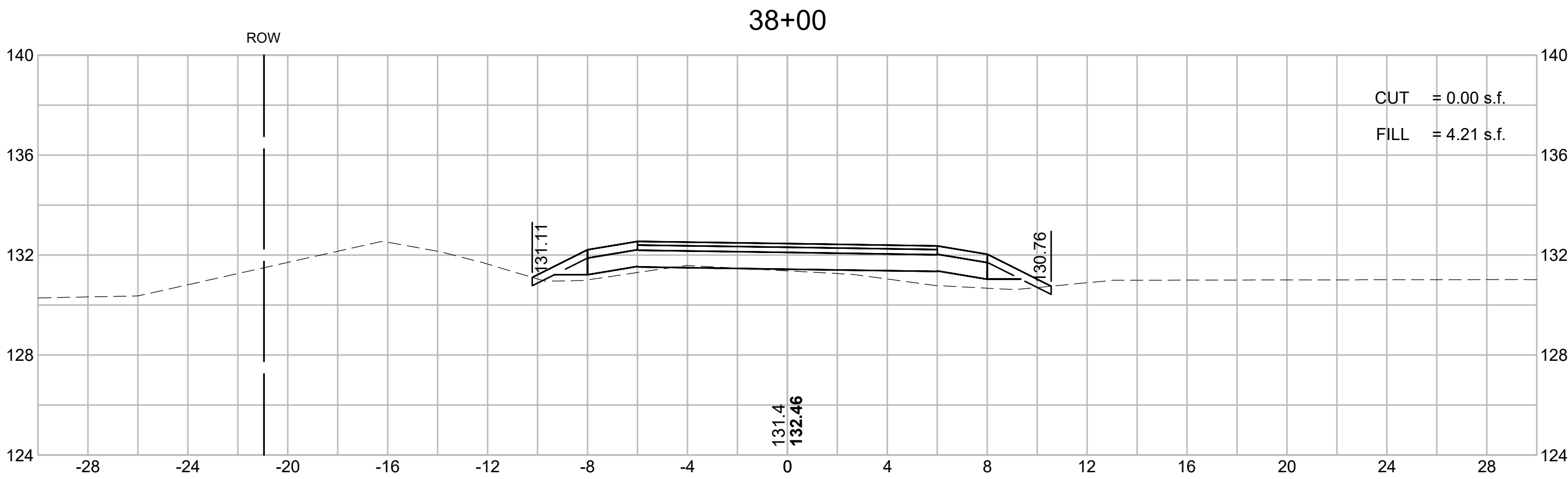
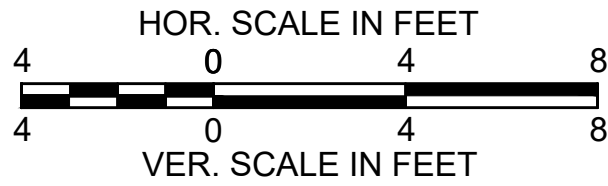
CROSS SECTIONS



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	142	158
PROJECT FILE NO.		606223	

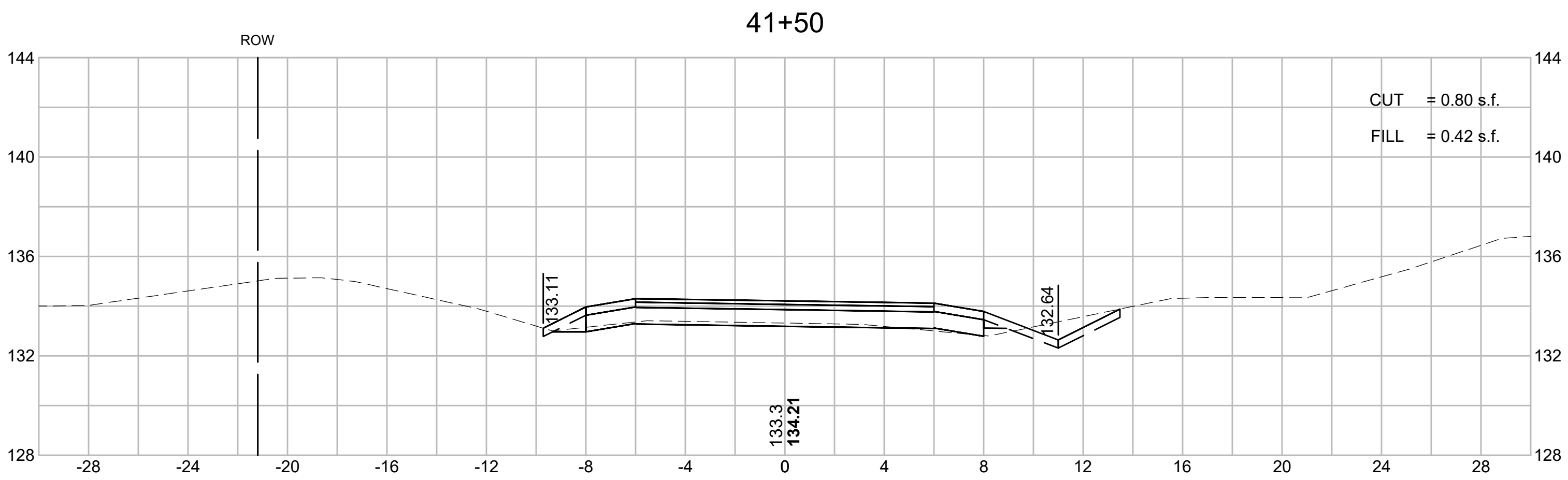
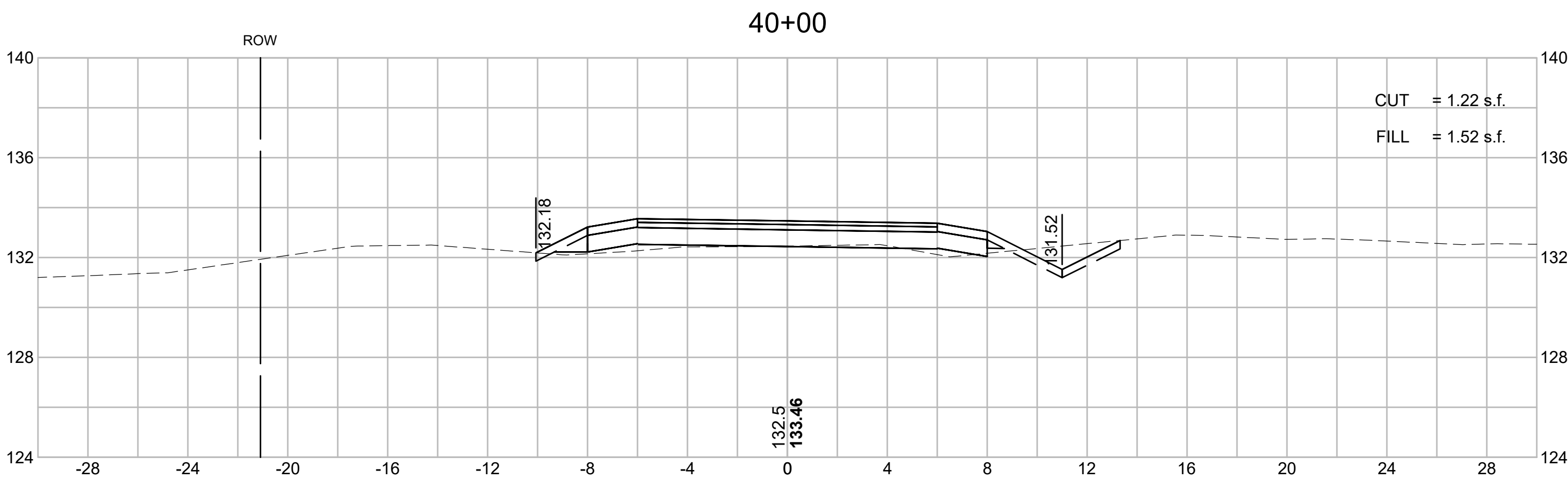
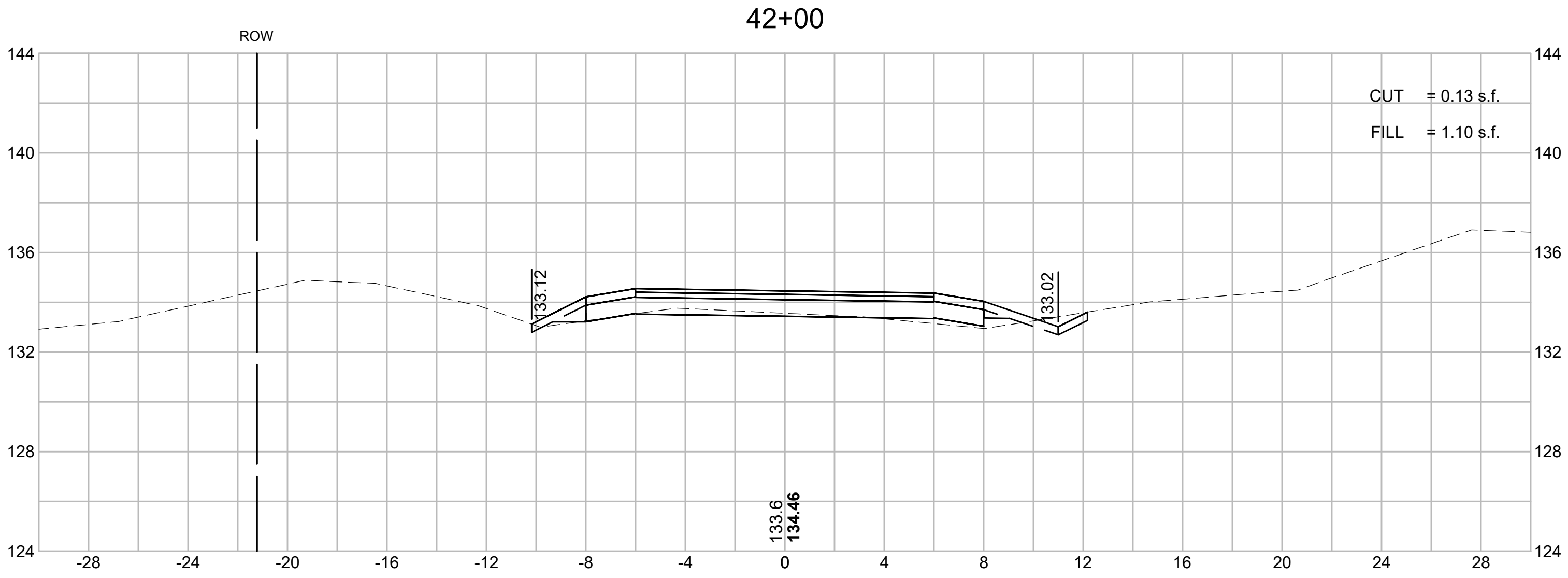
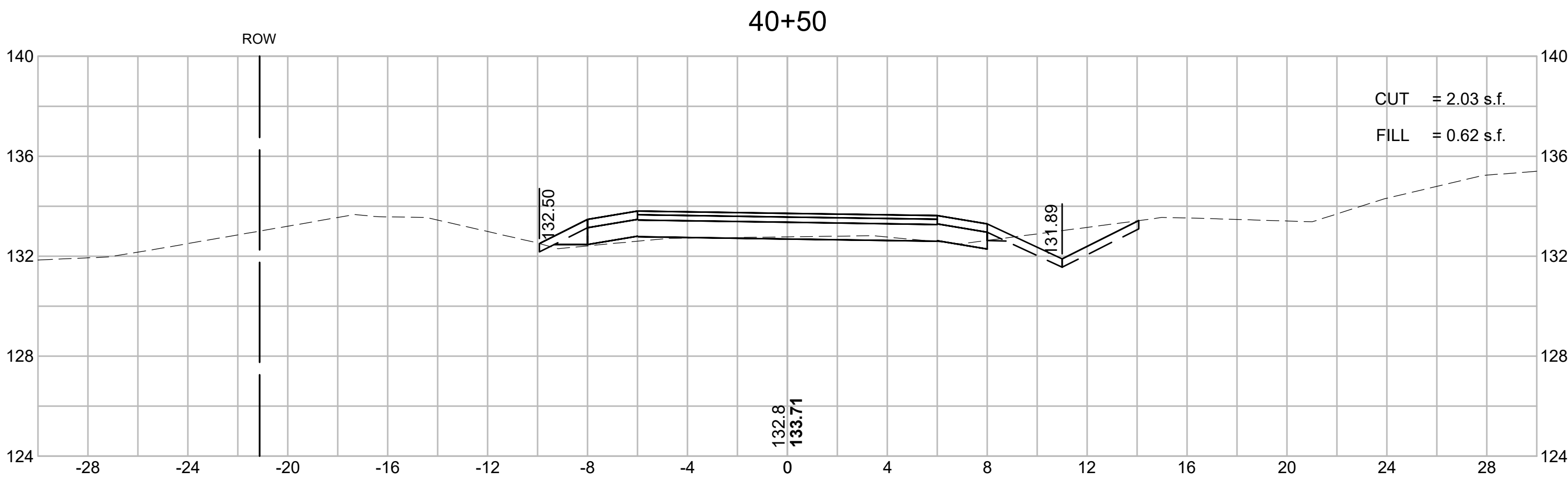
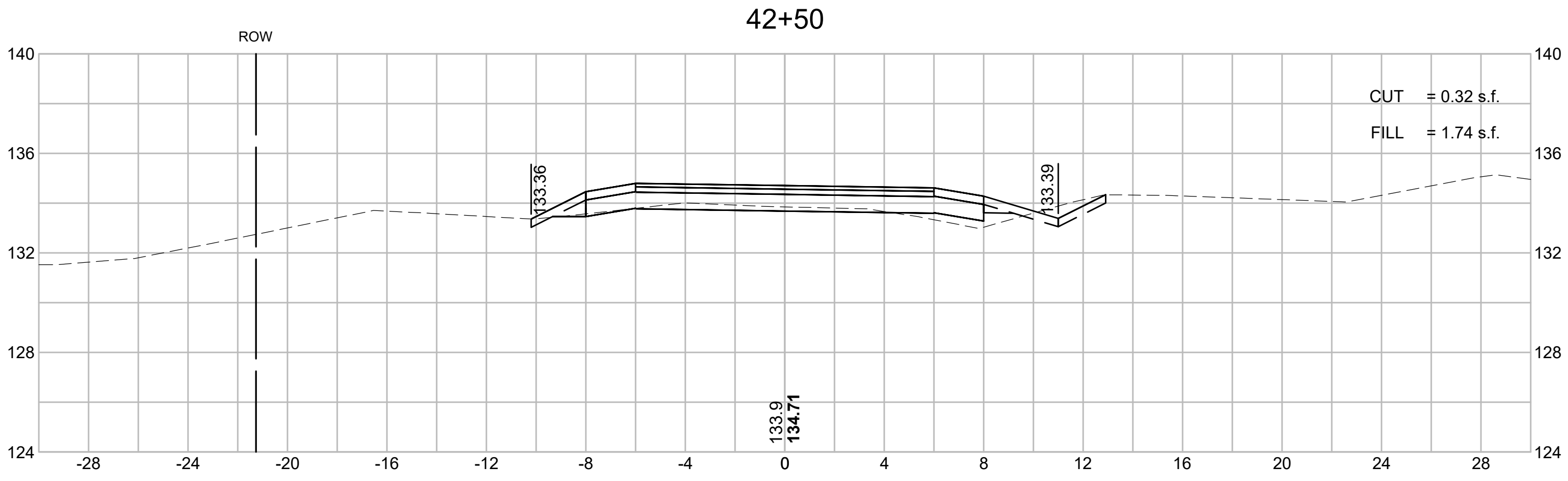
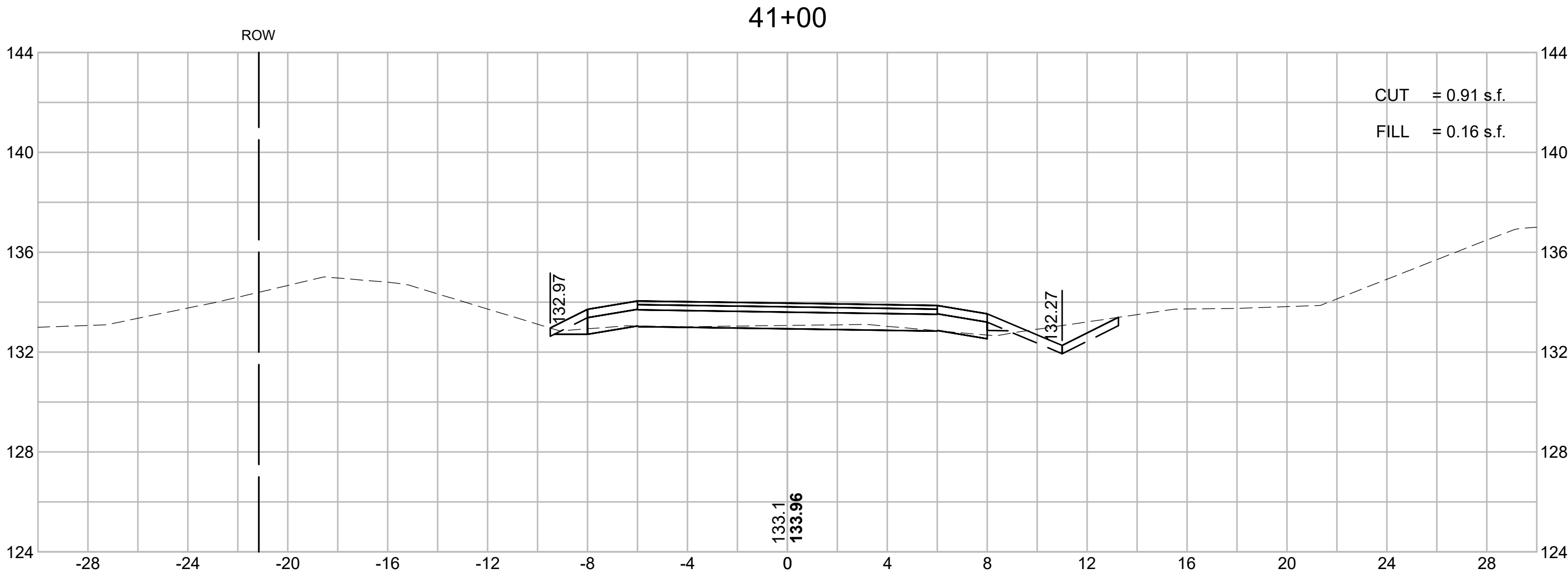
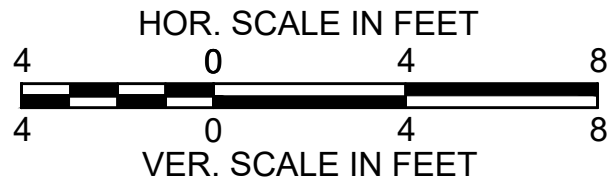
CROSS SECTIONS

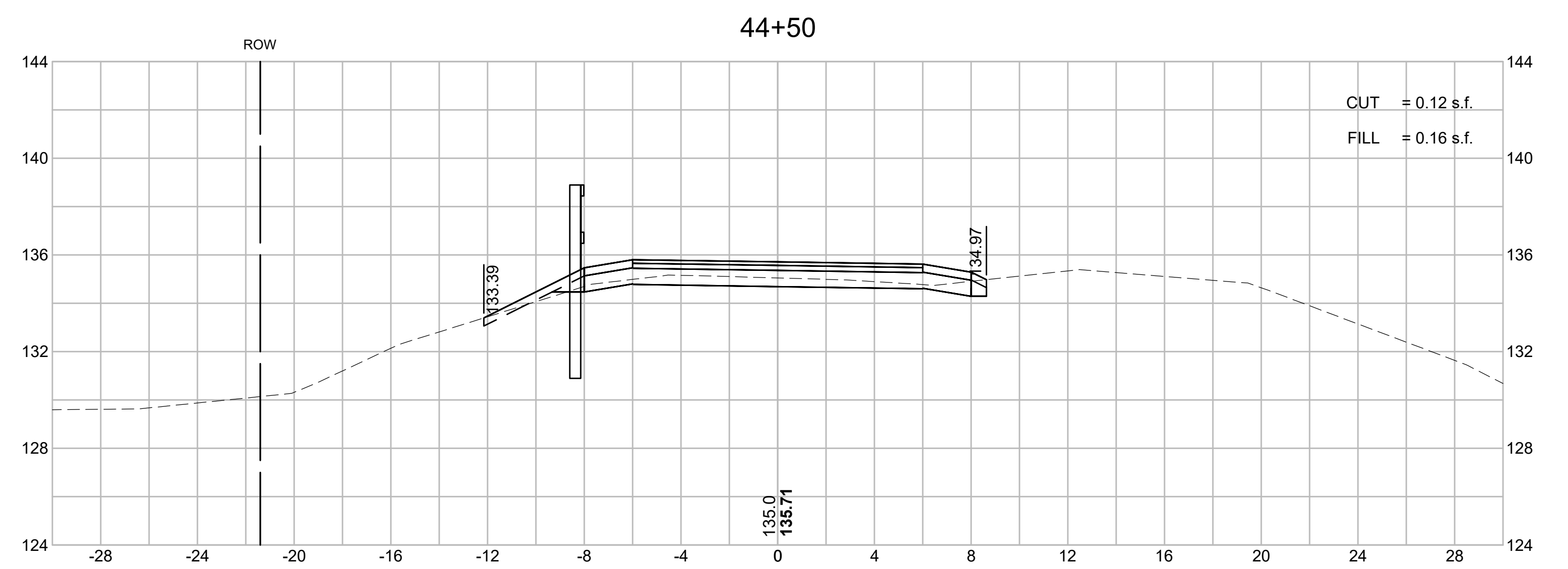
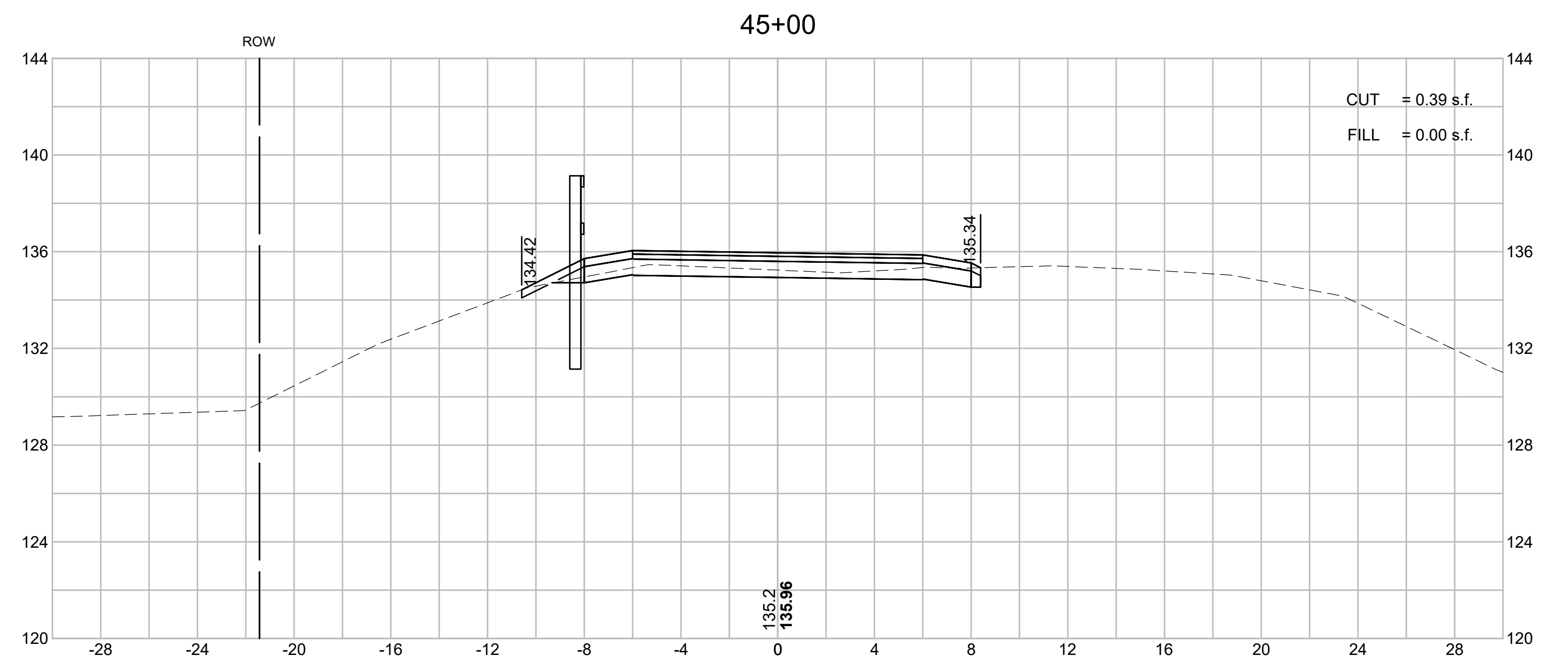
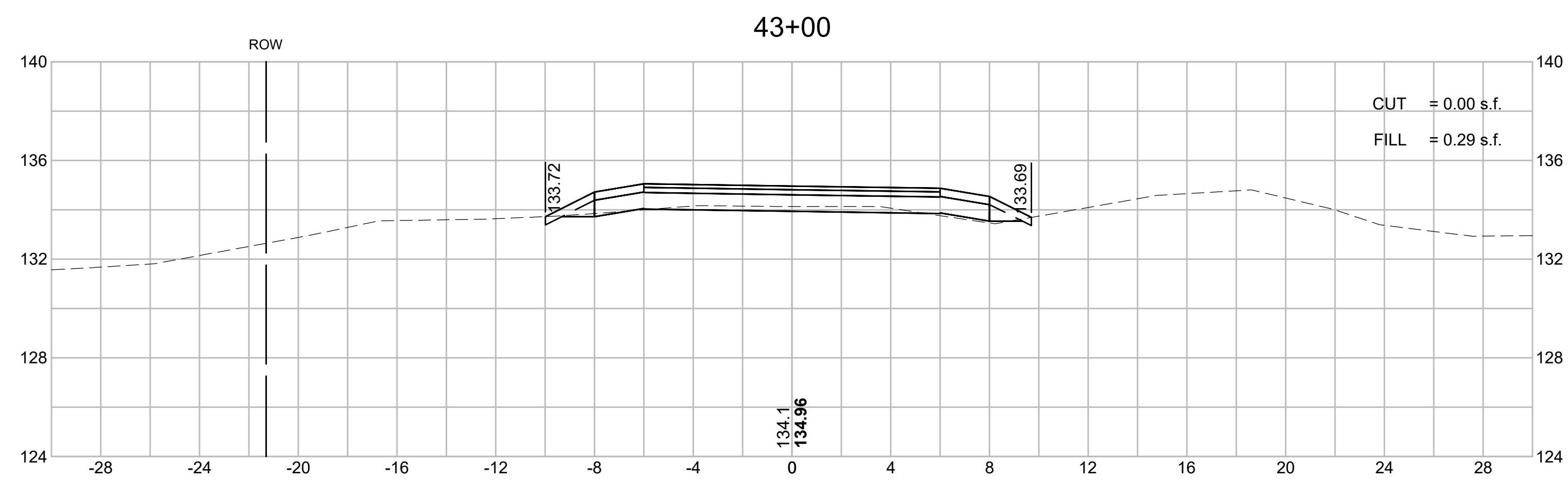
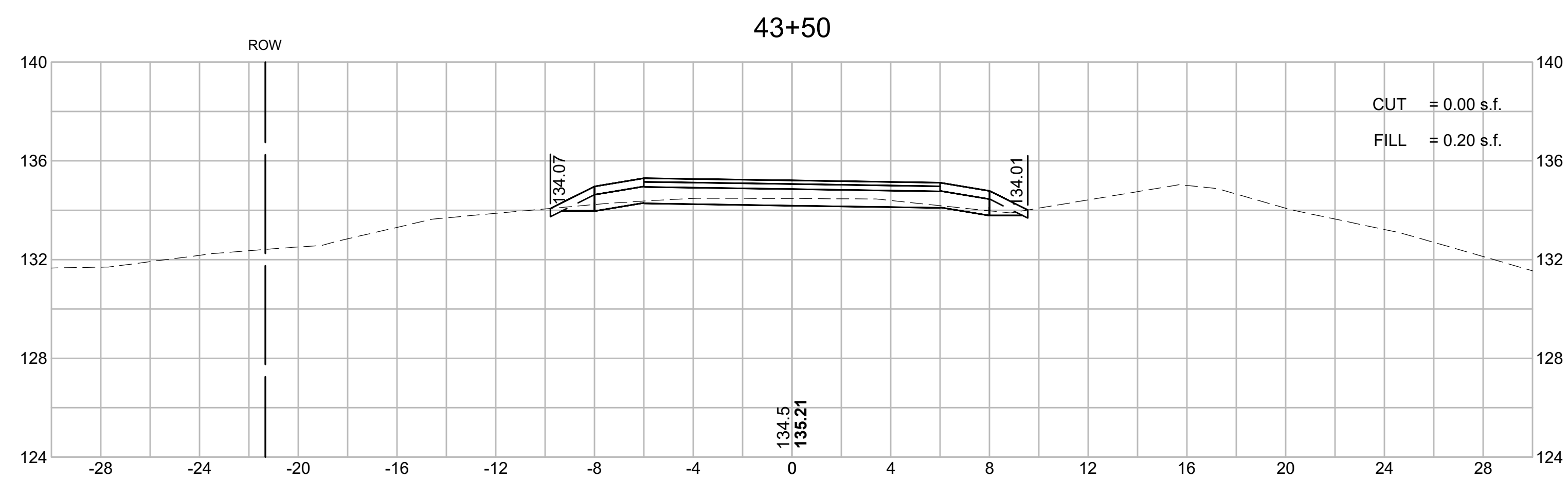
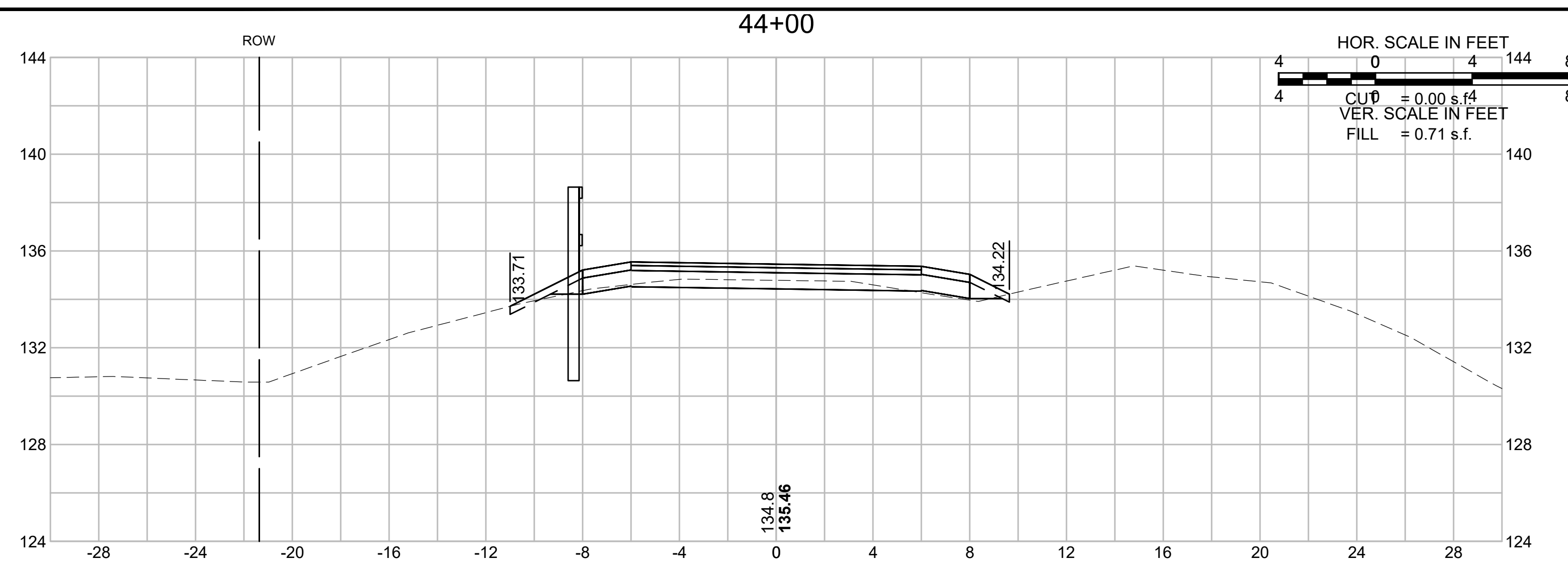


ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	143	158
PROJECT FILE NO.		606223	

CROSS SECTIONS





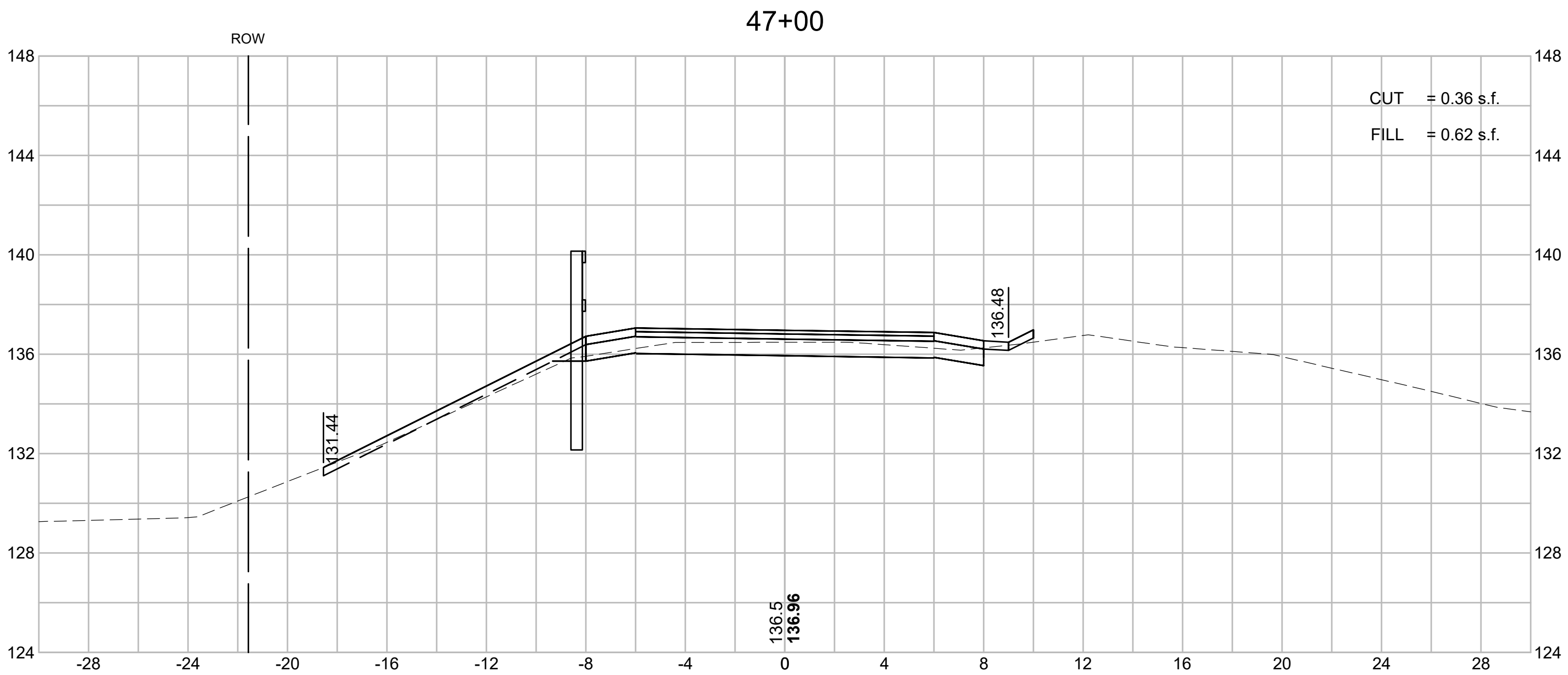
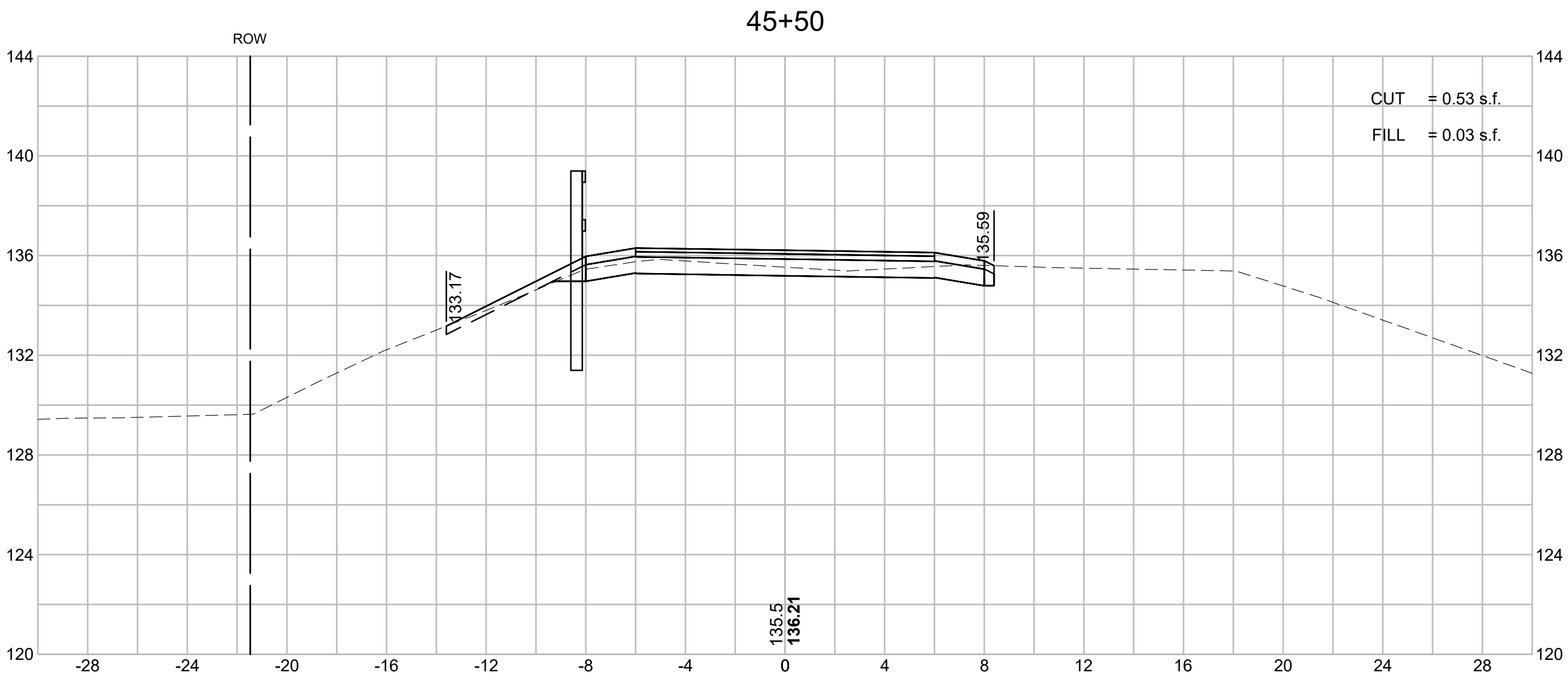
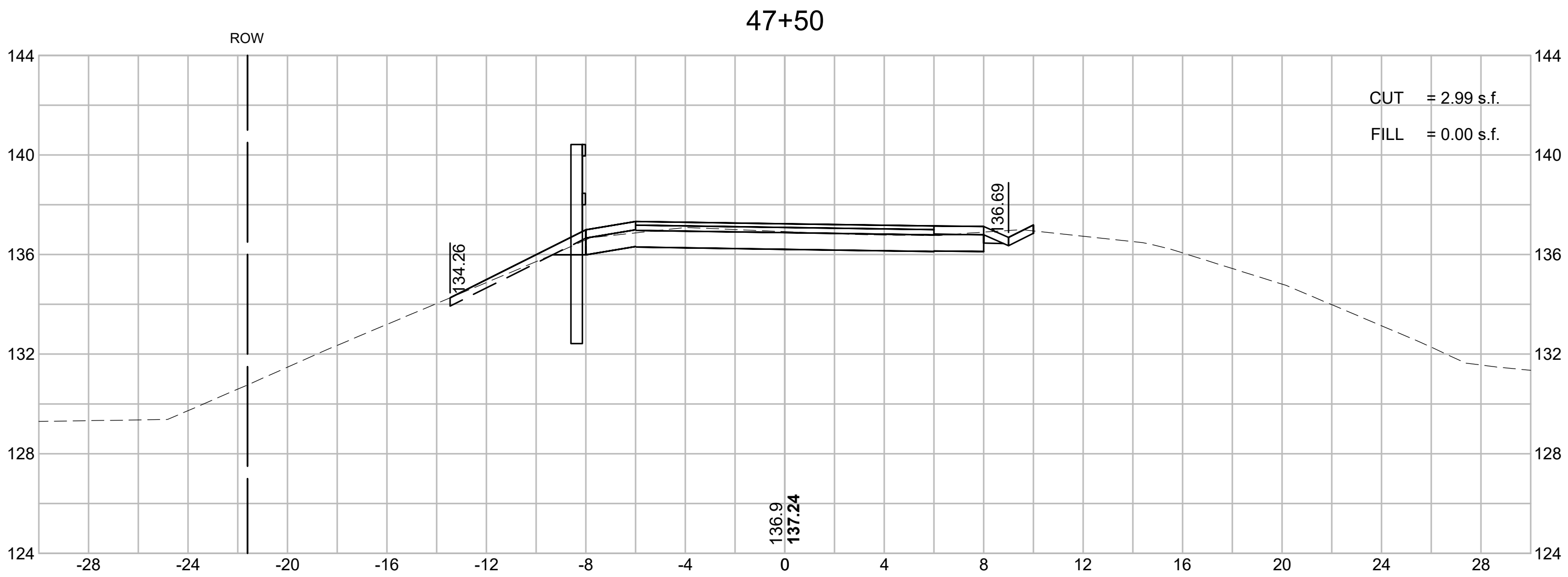
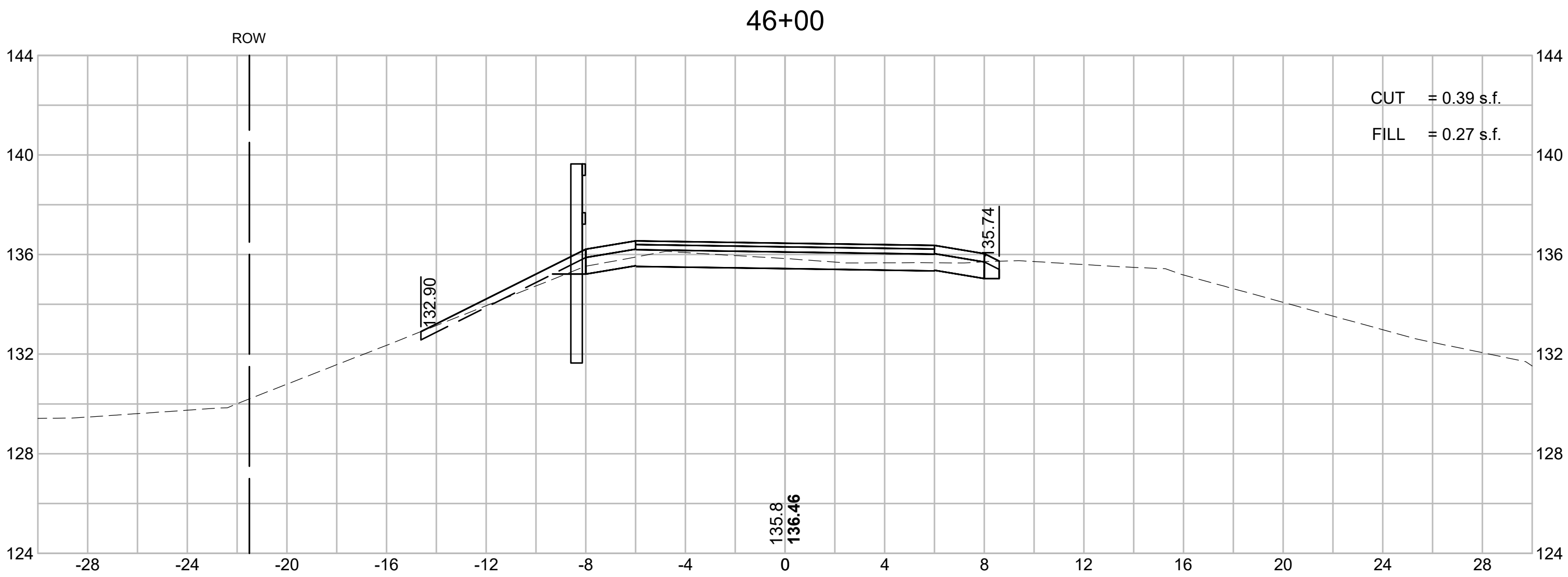
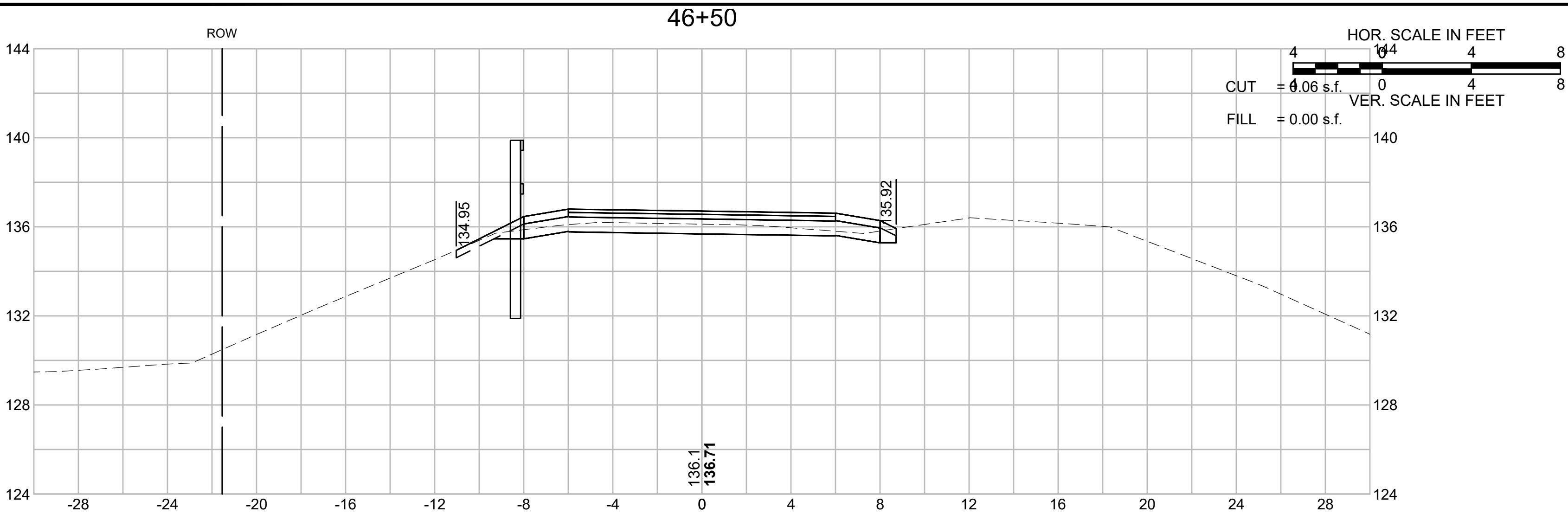
ACTON & CONCORD			
BRUCE FREEMAN RAIL TRAIL PHASE 2B			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	144	158
PROJECT FILE NO.		606223	

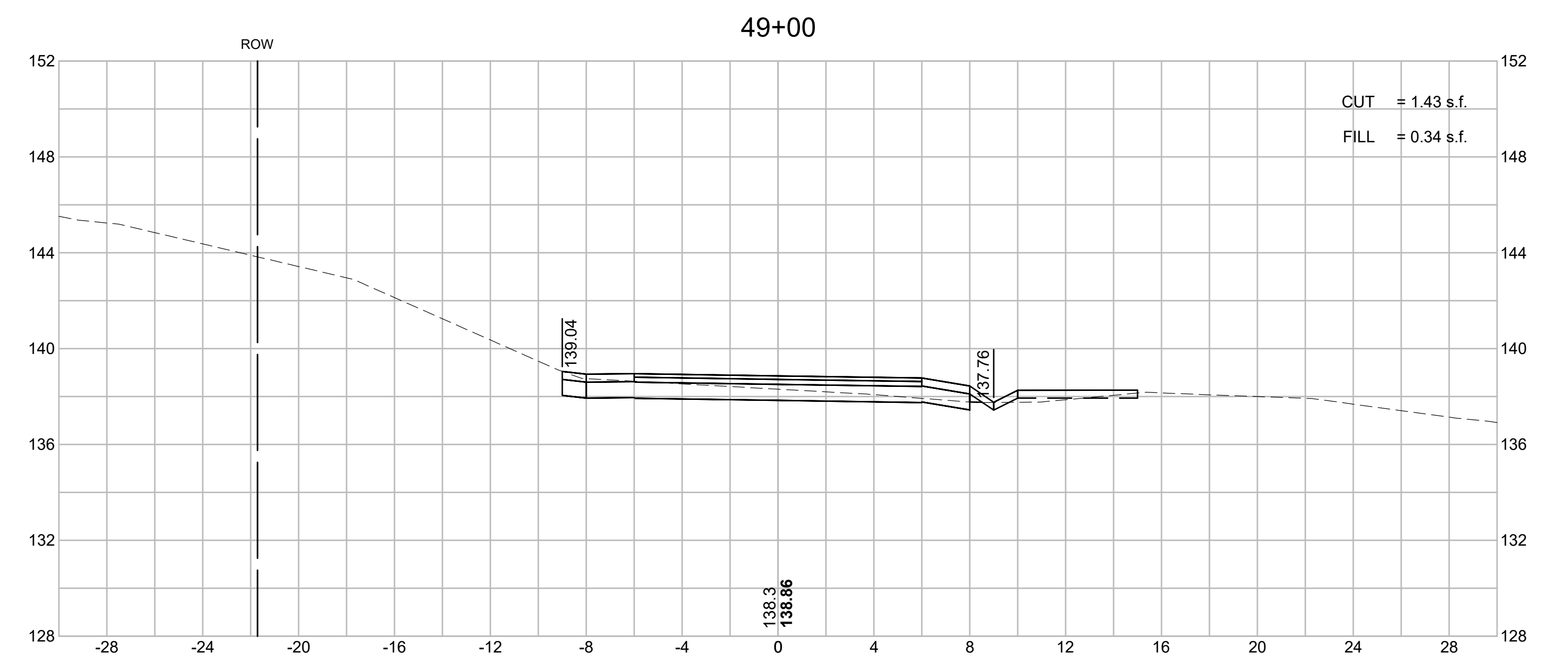
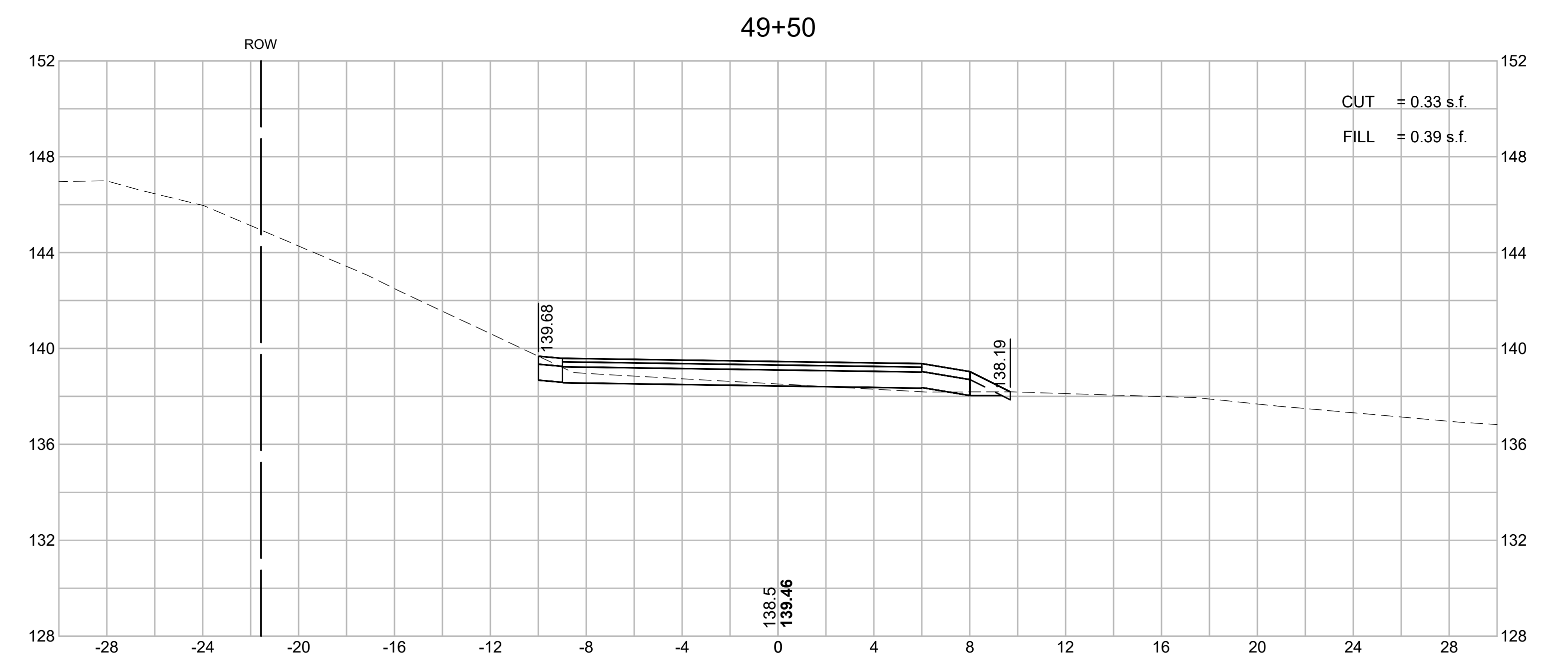
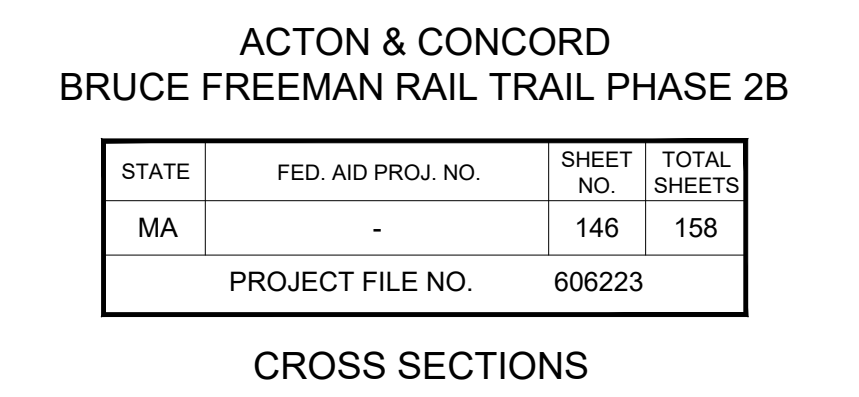
CROSS SECTIONS

ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

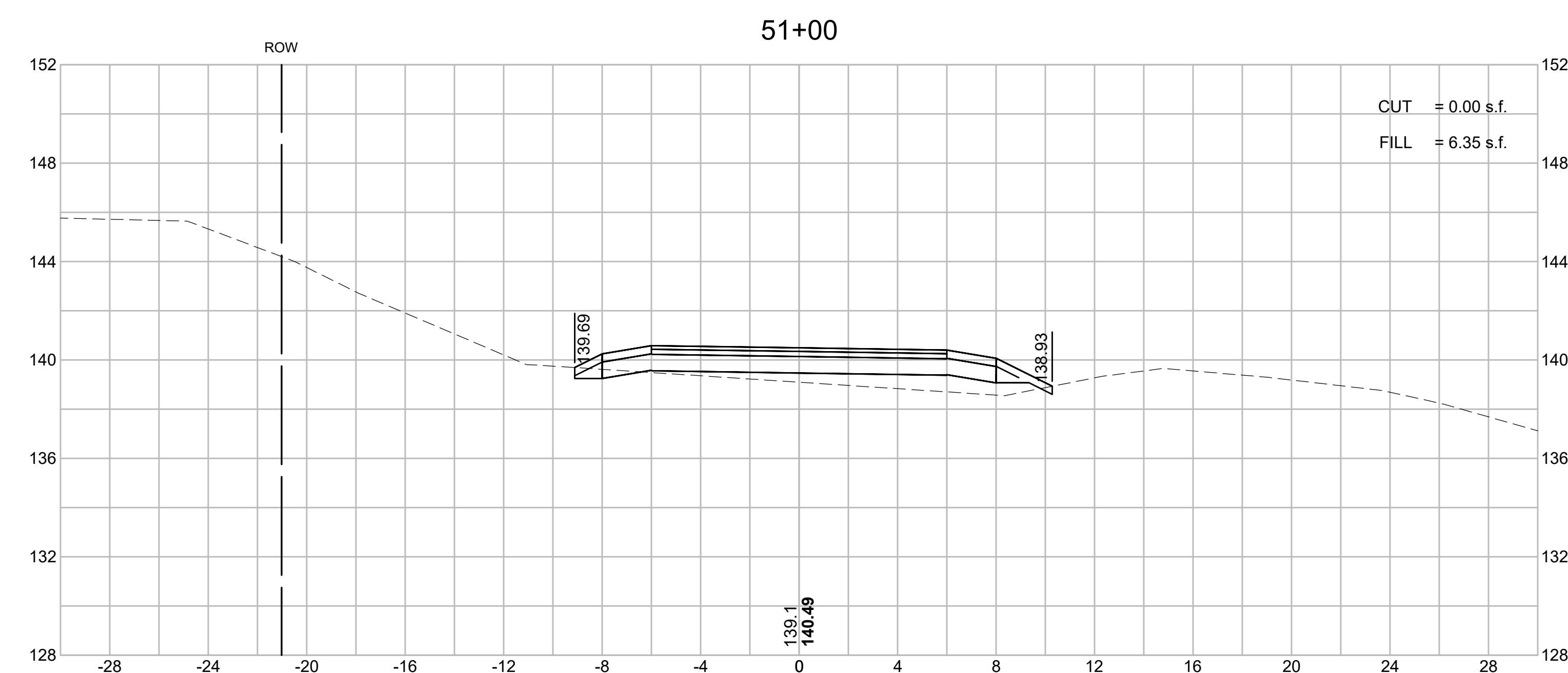
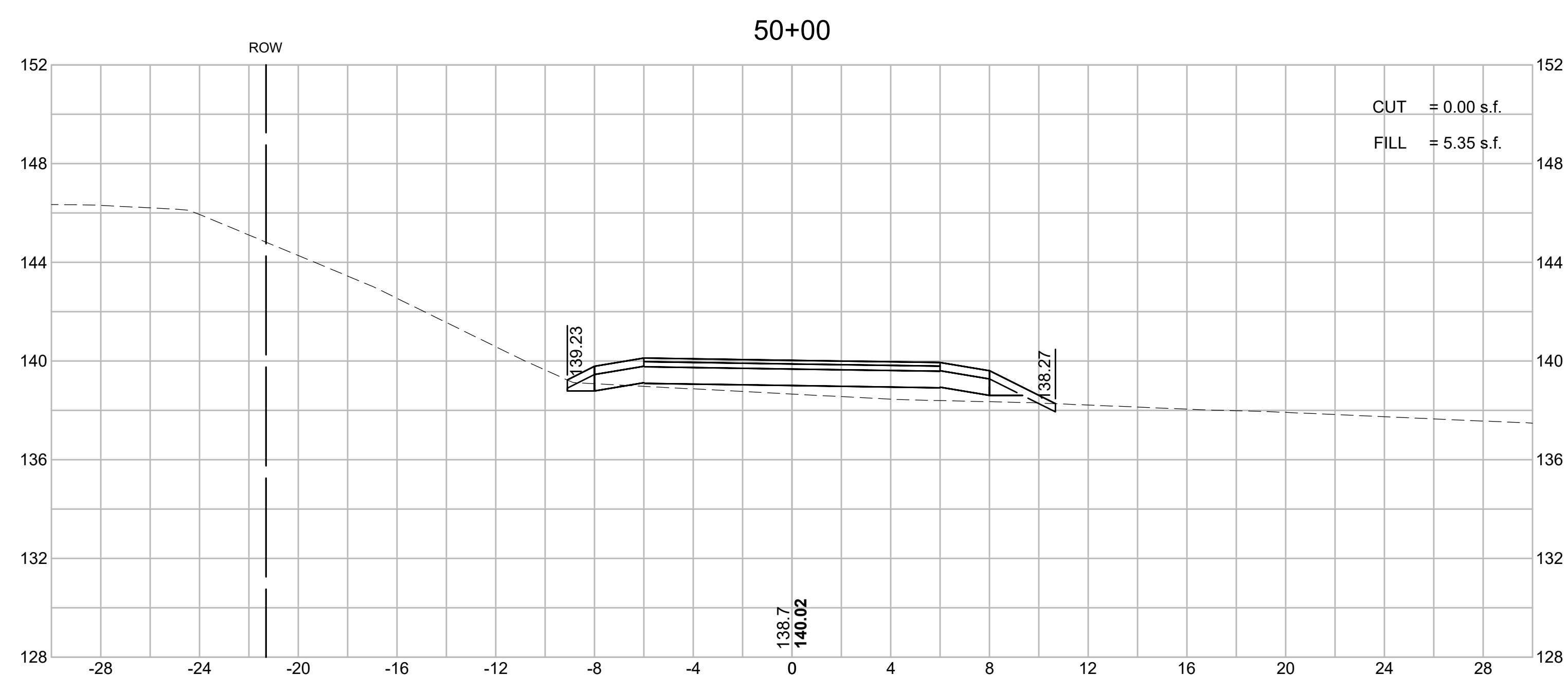
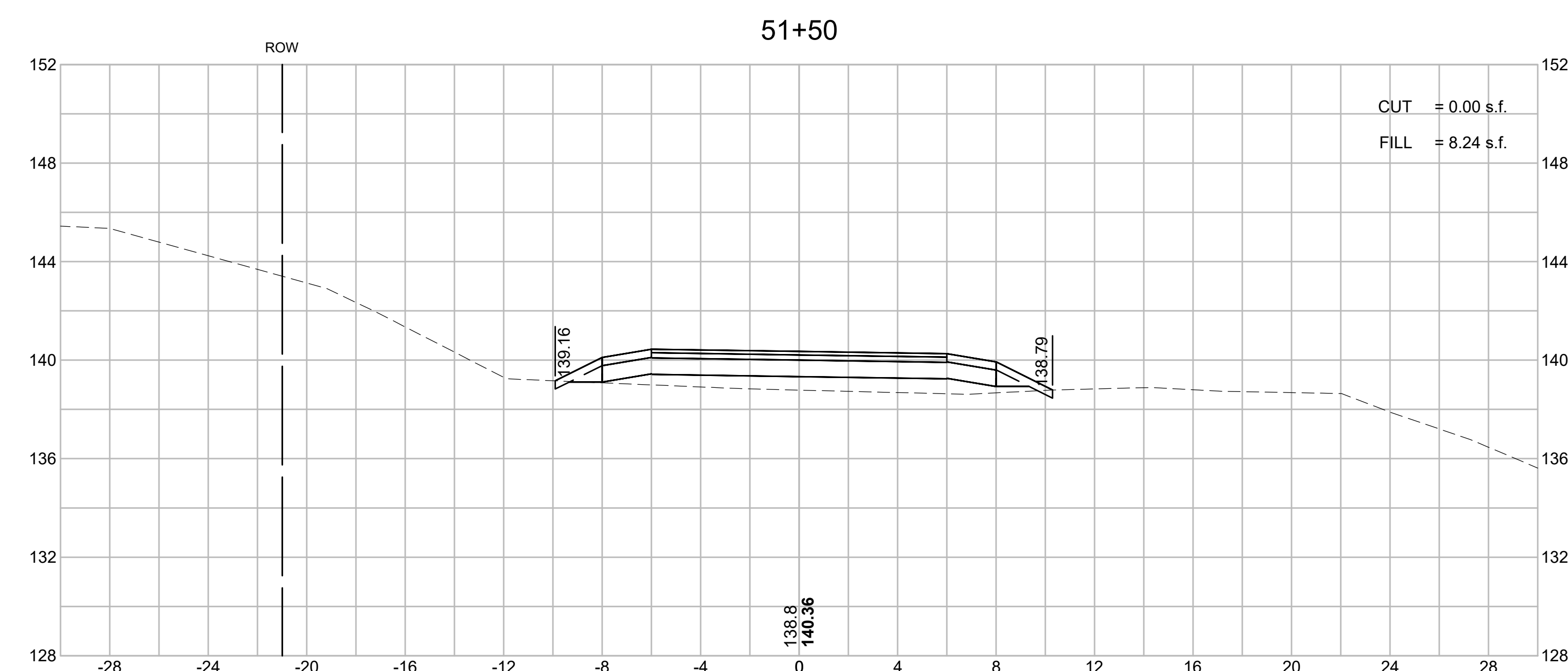
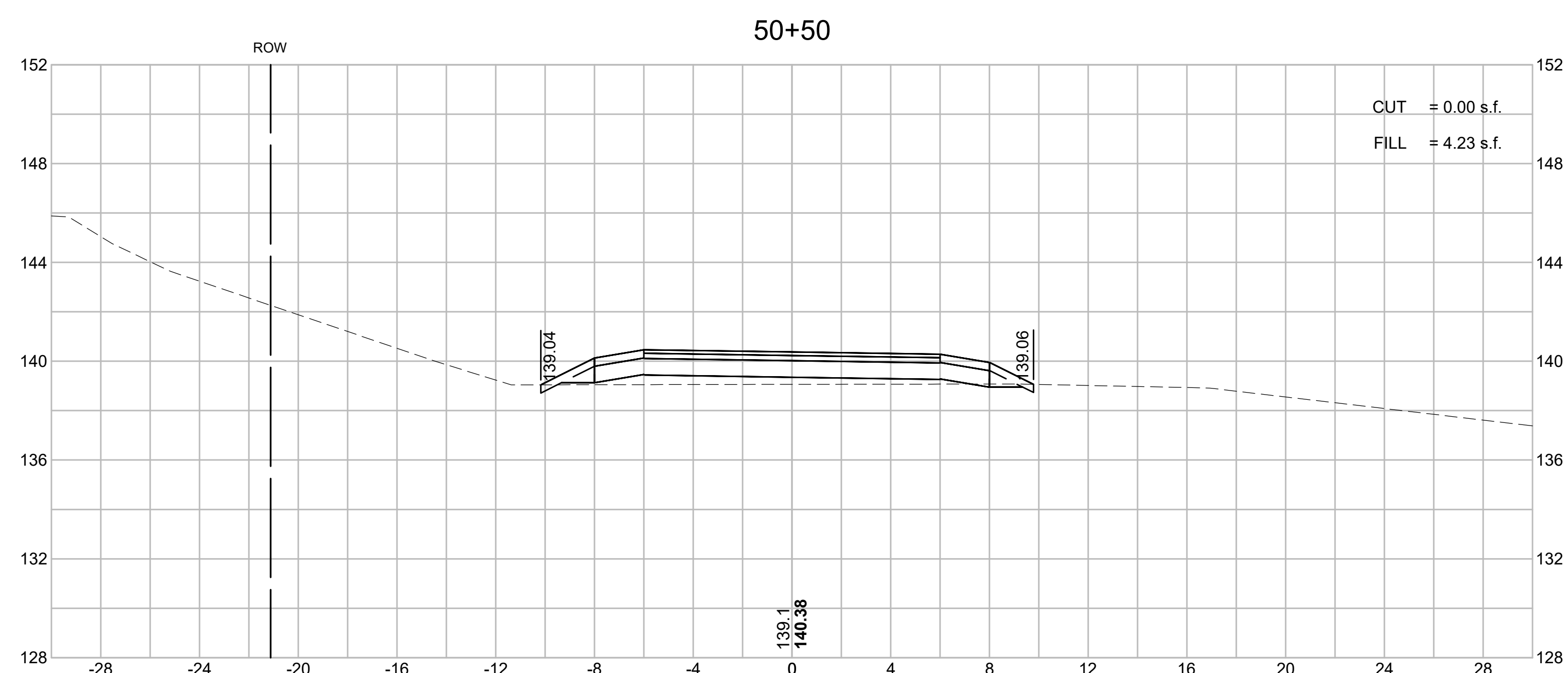
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	145	158
PROJECT FILE NO.		606223	

CROSS SECTIONS





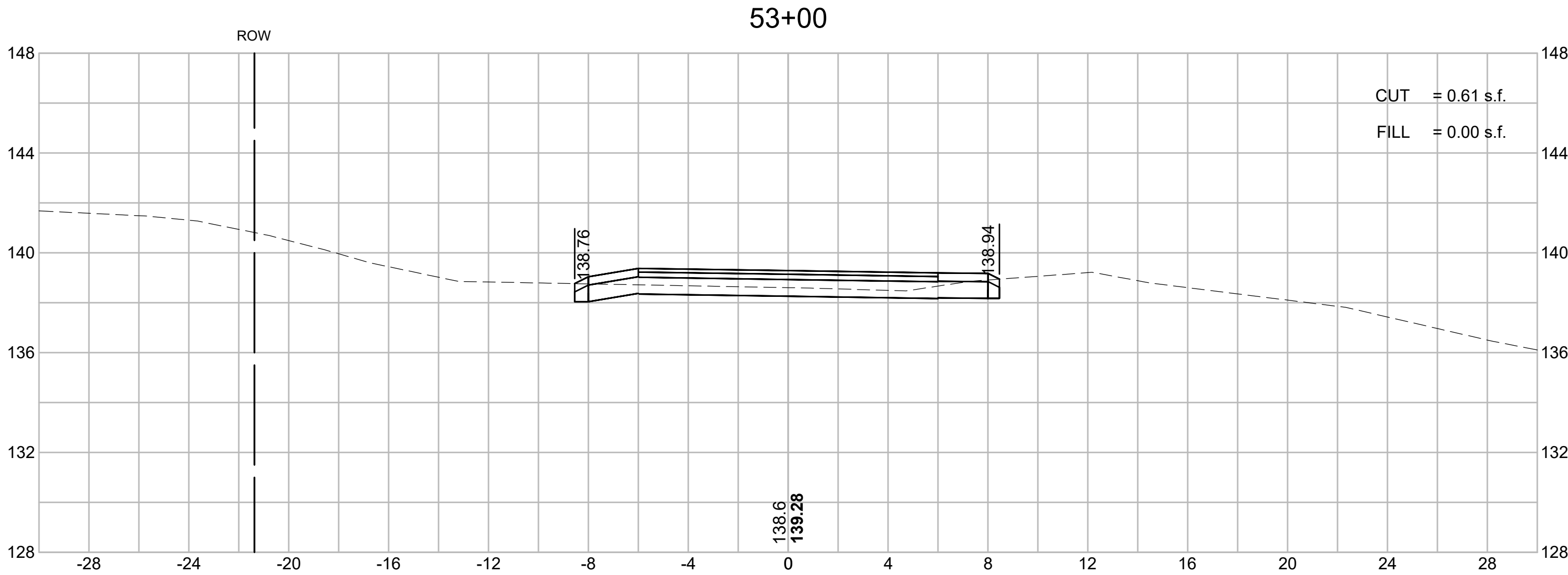
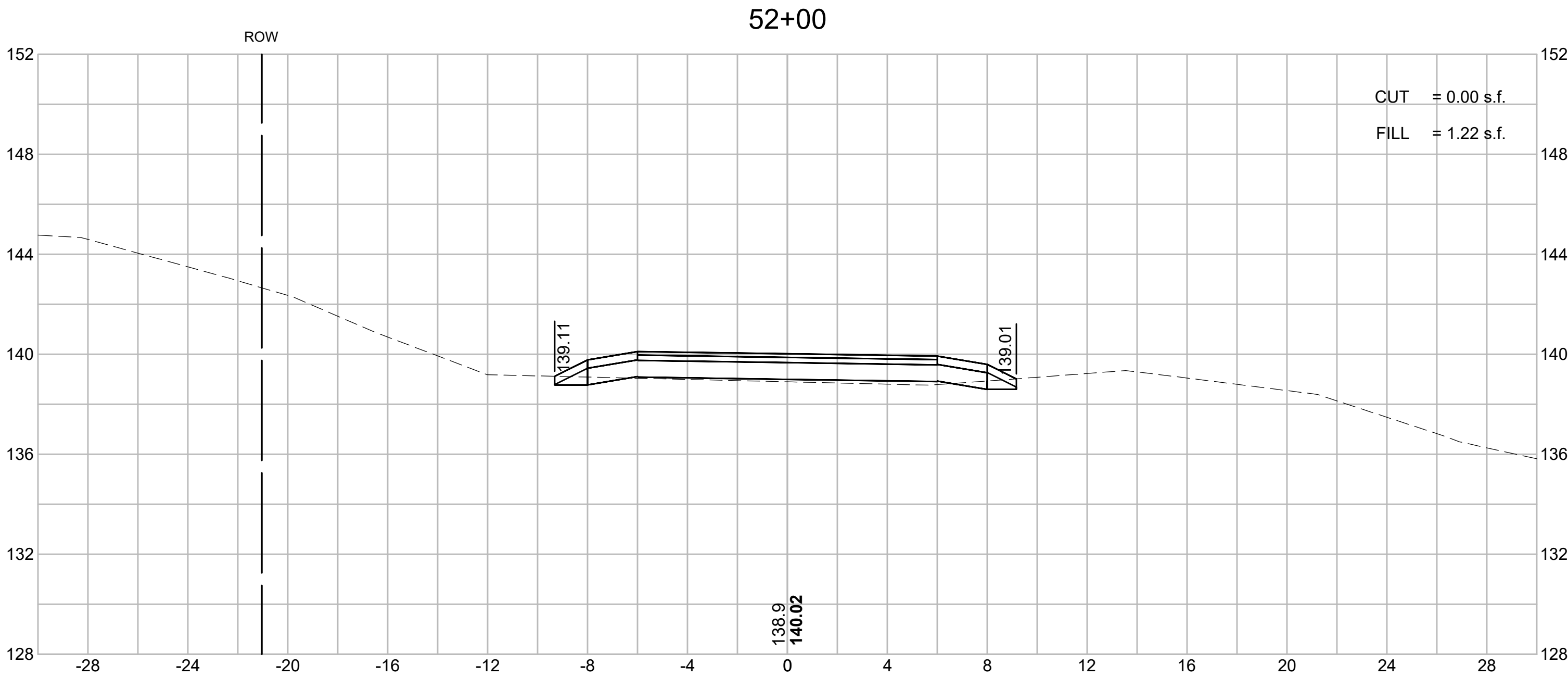
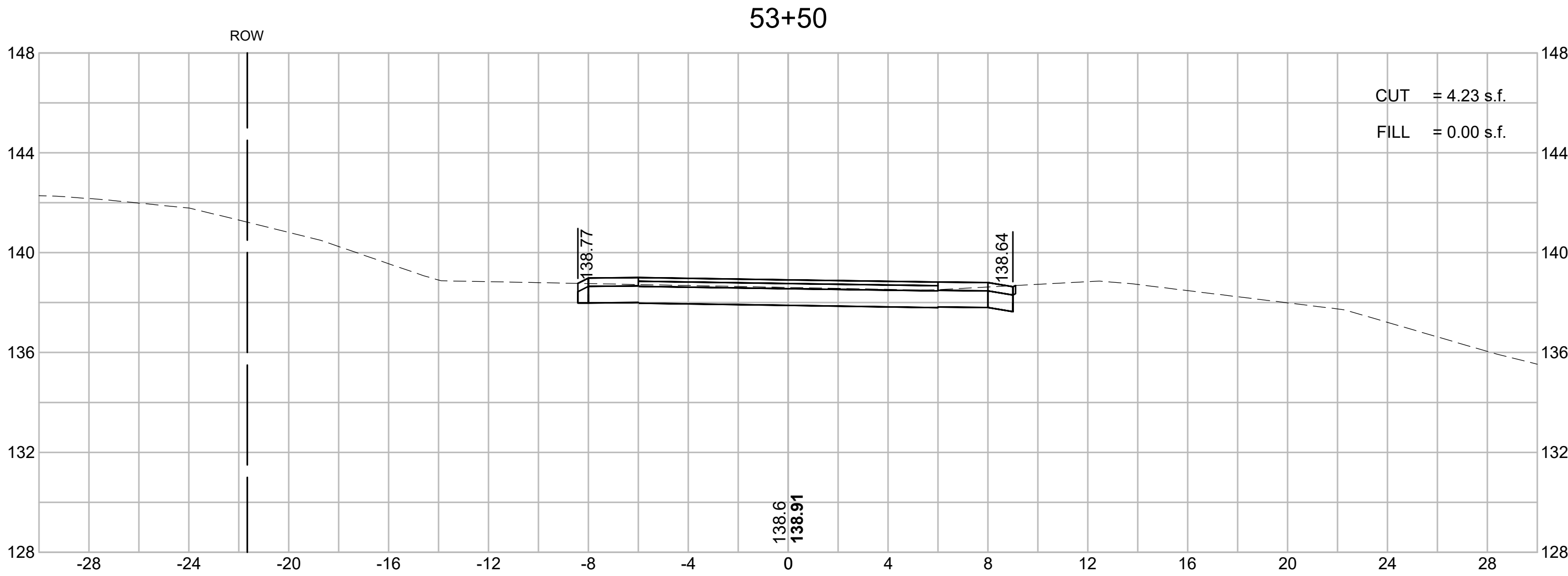
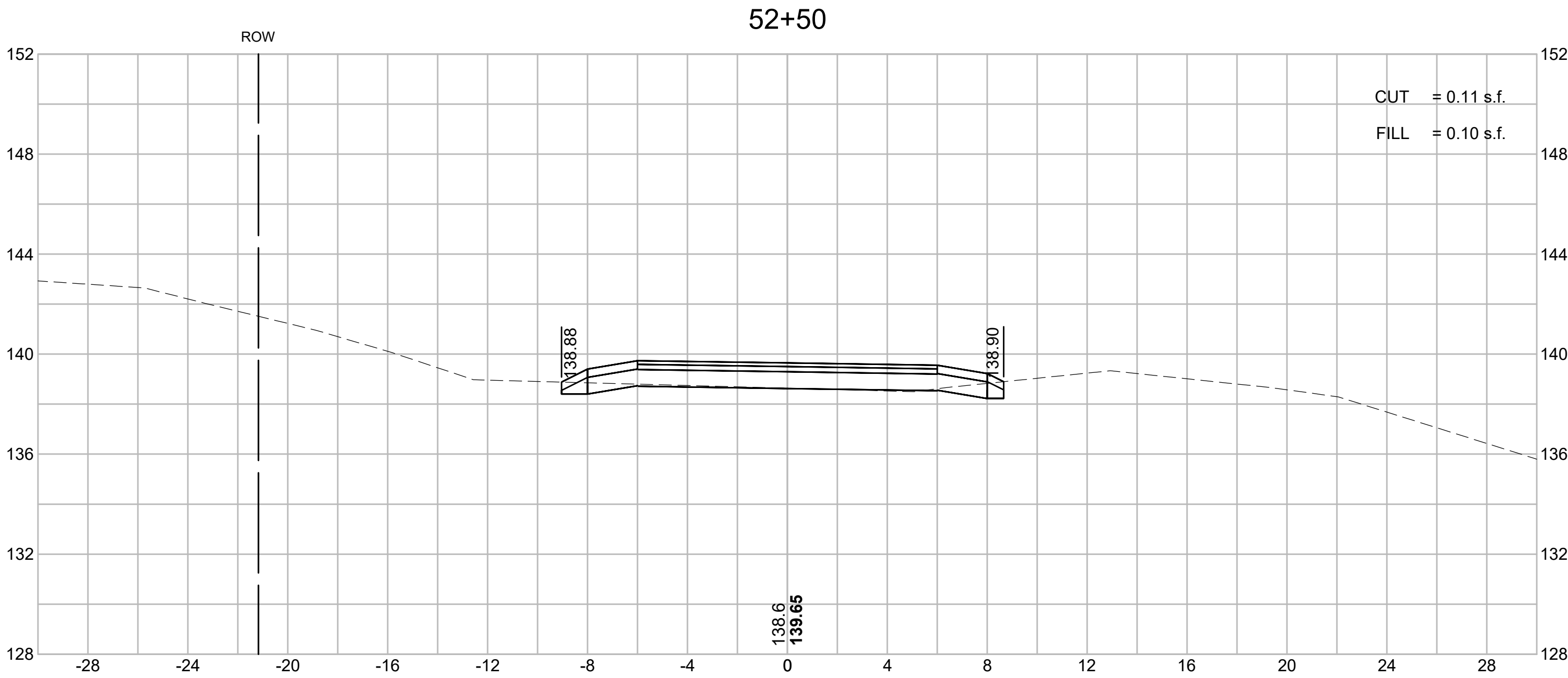
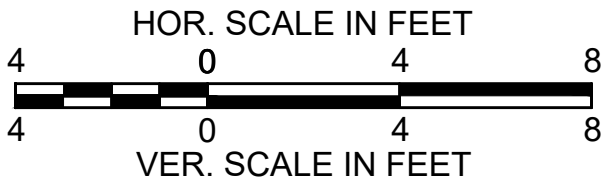
606223 HD_(XS).DWG Plotted on 4-Feb-2019 3:54 PM



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	148	158
PROJECT FILE NO.		606223	

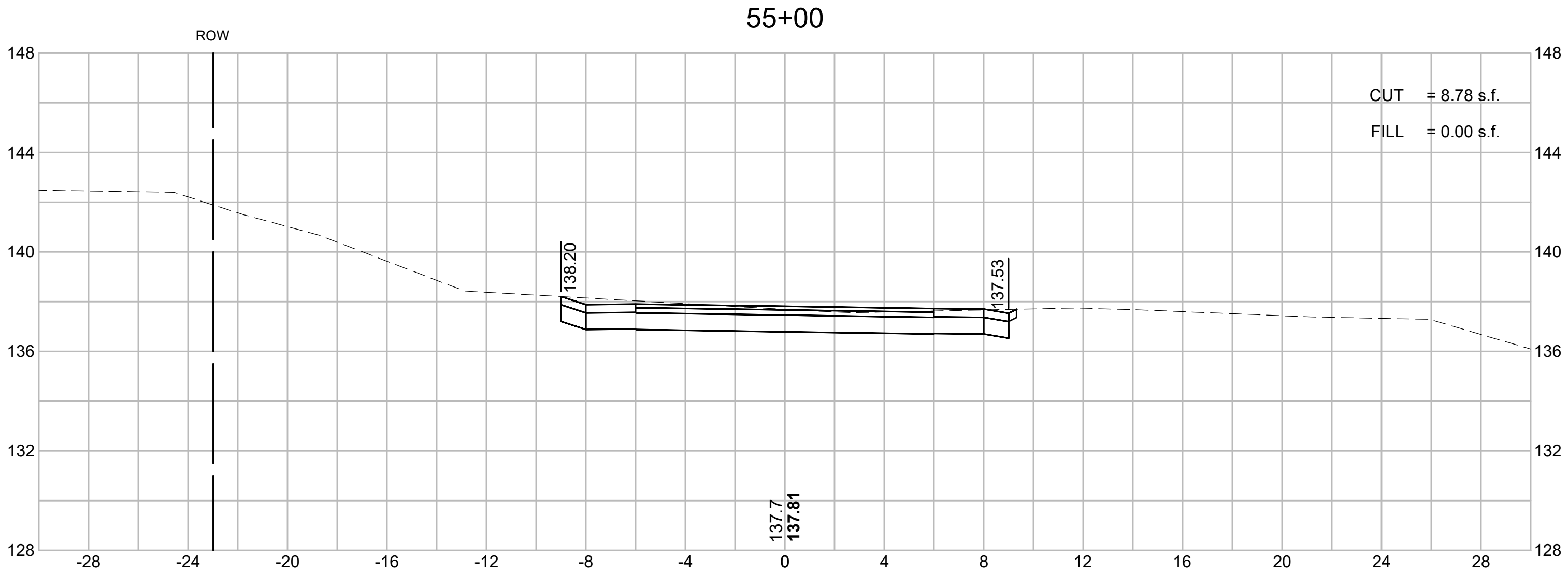
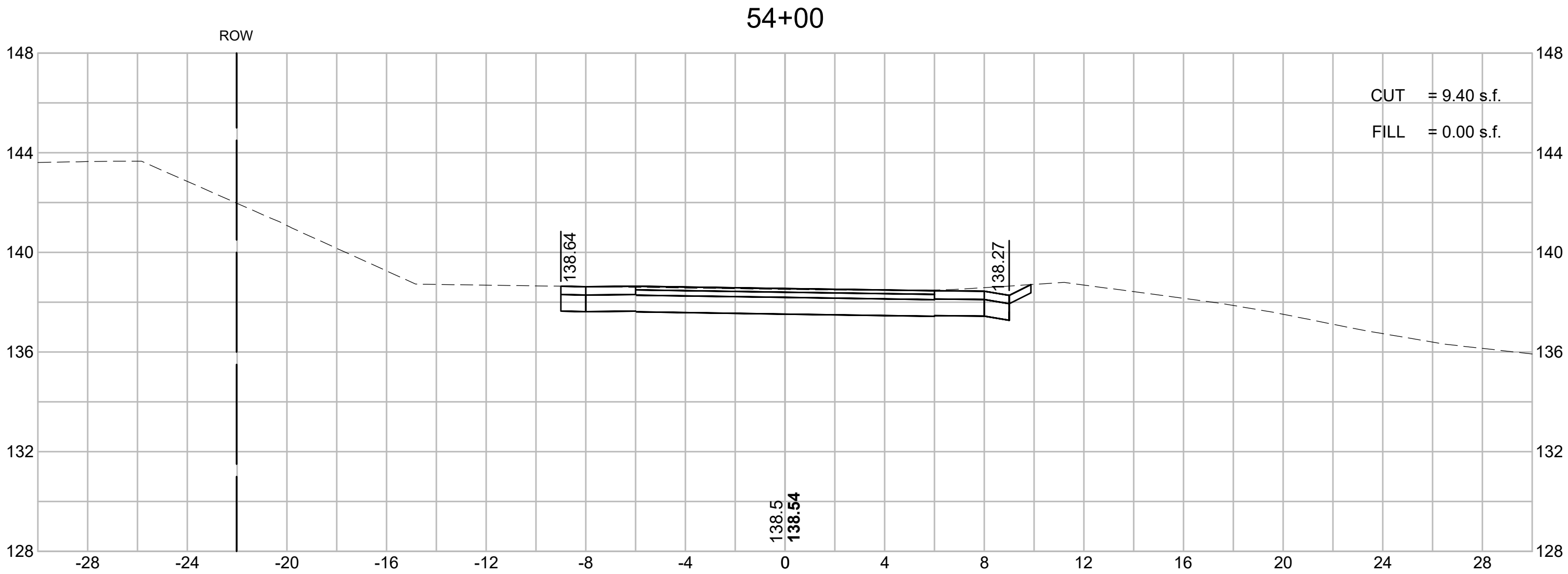
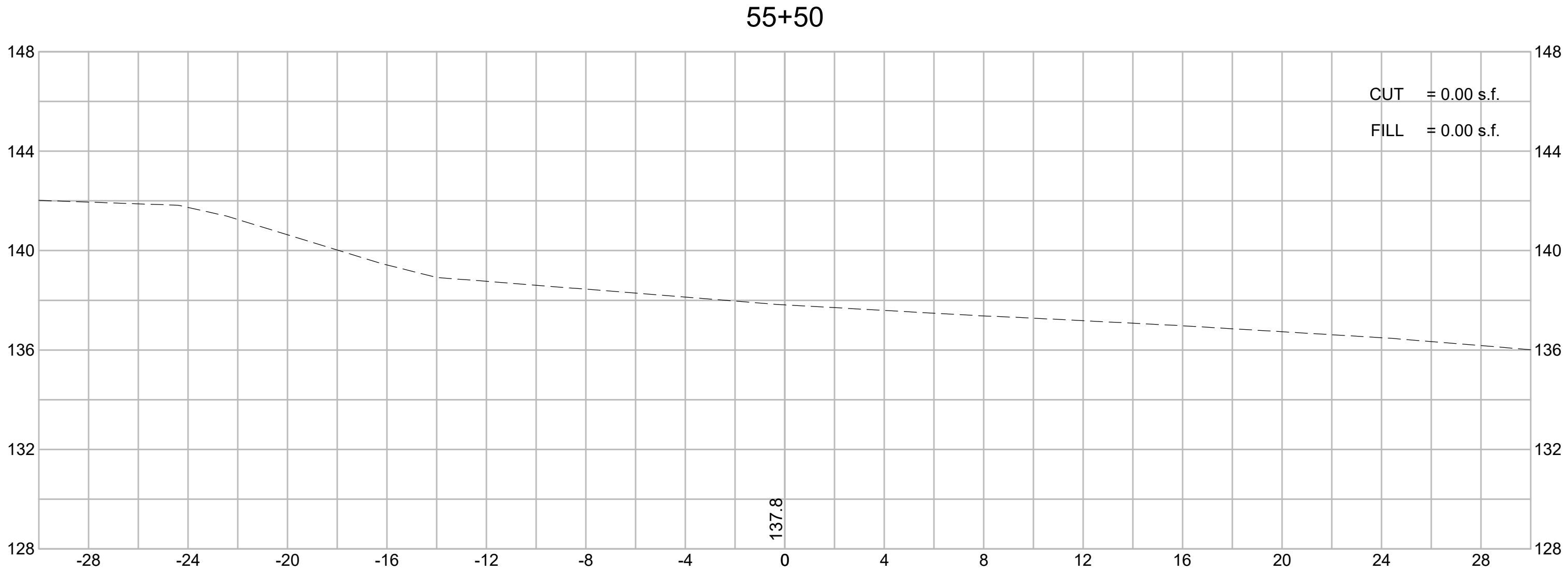
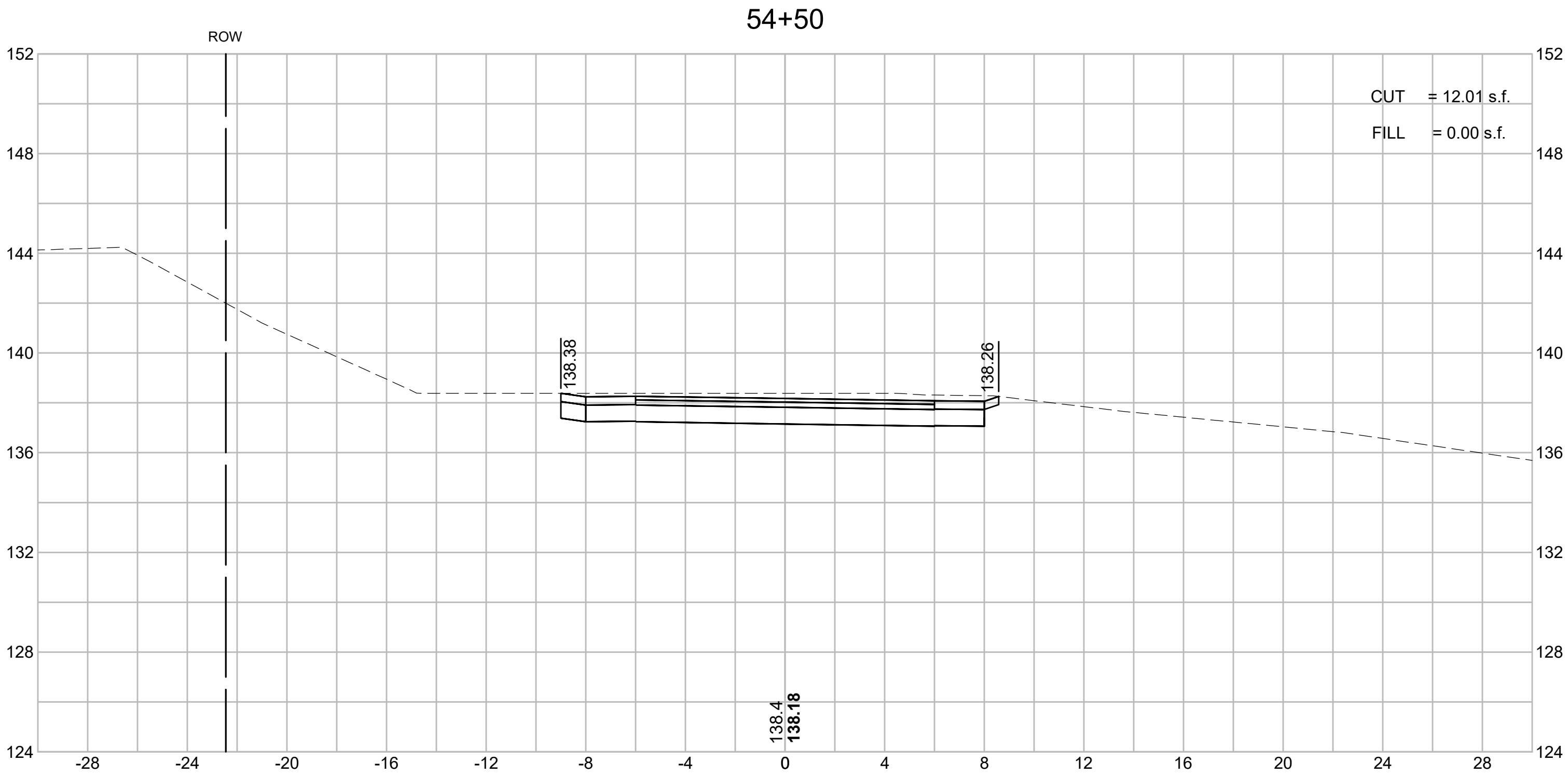
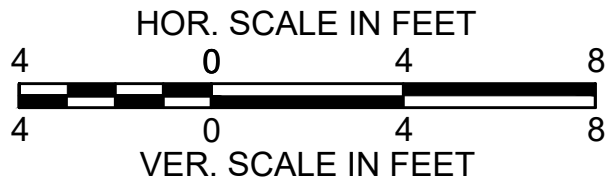
CROSS SECTIONS



ACTON & CONCORD
BRUCE FREEMAN RAIL TRAIL PHASE 2B

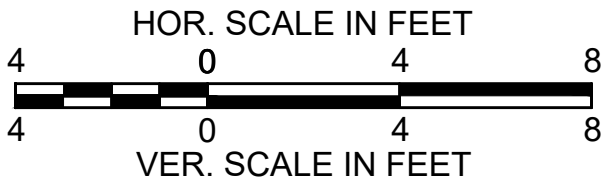
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	149	158
PROJECT FILE NO.		606223	

CROSS SECTIONS

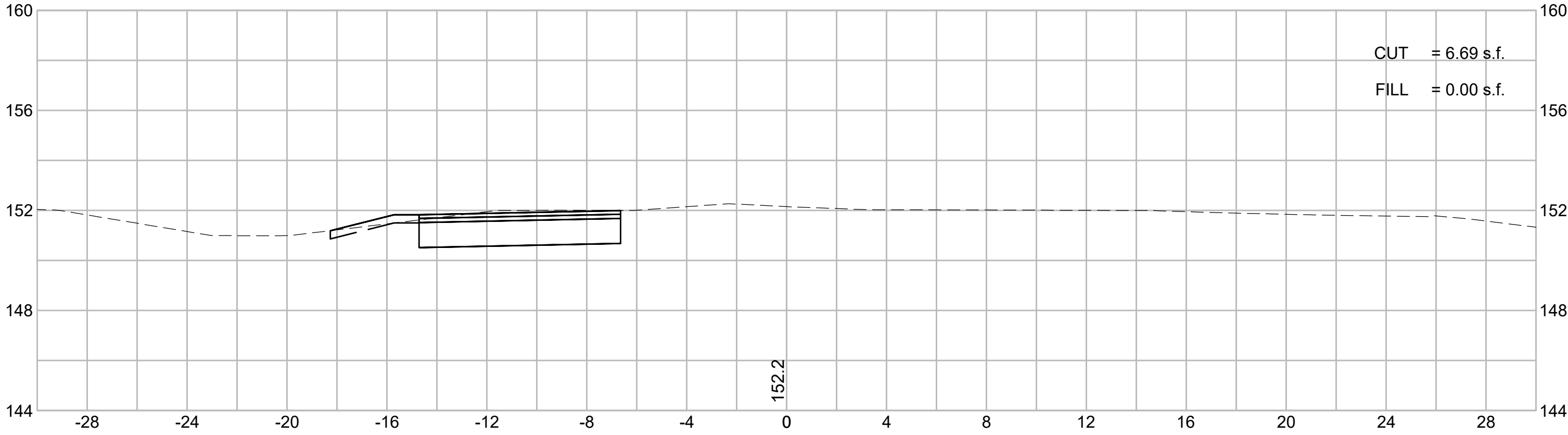


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	150	158
PROJECT FILE NO.		606223	

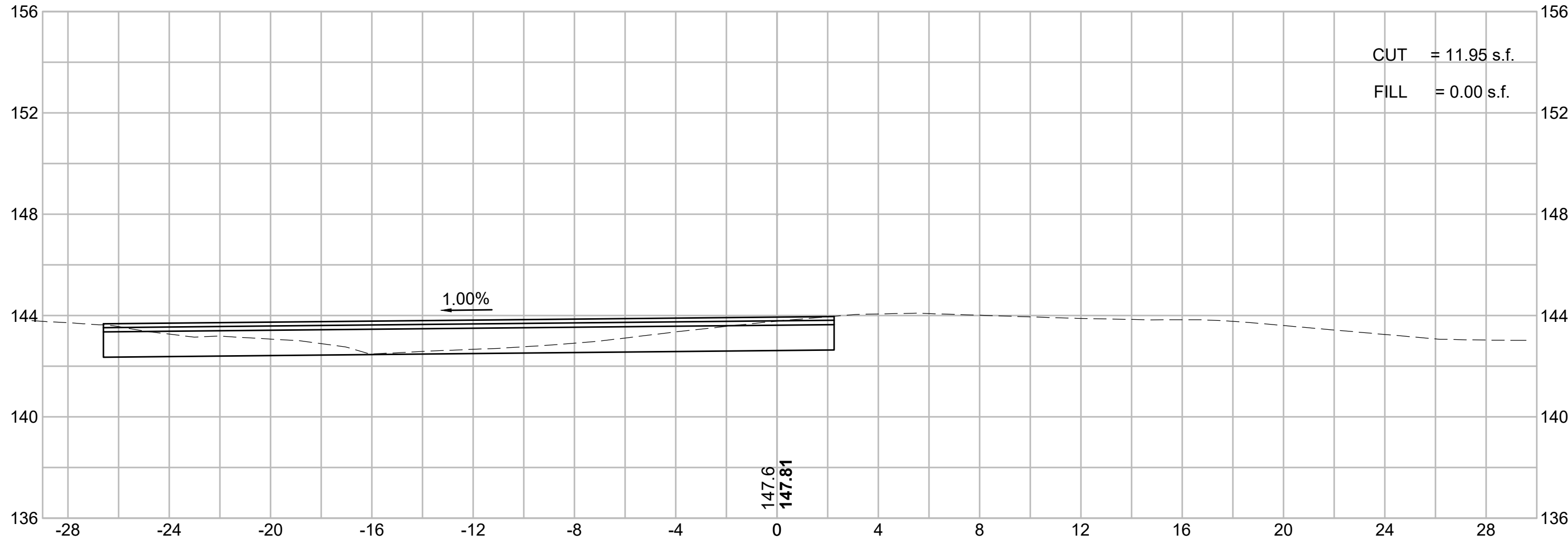
CROSS SECTIONS - MEDIAN
CROSSOVERS



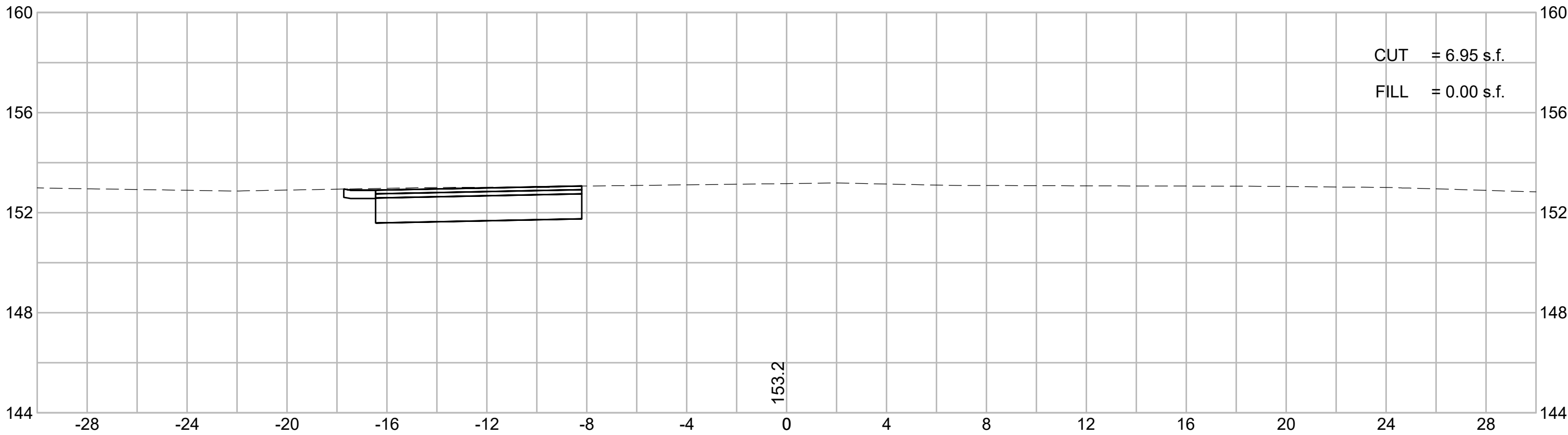
203+00
ROUTE 2 EB CROSSOVER



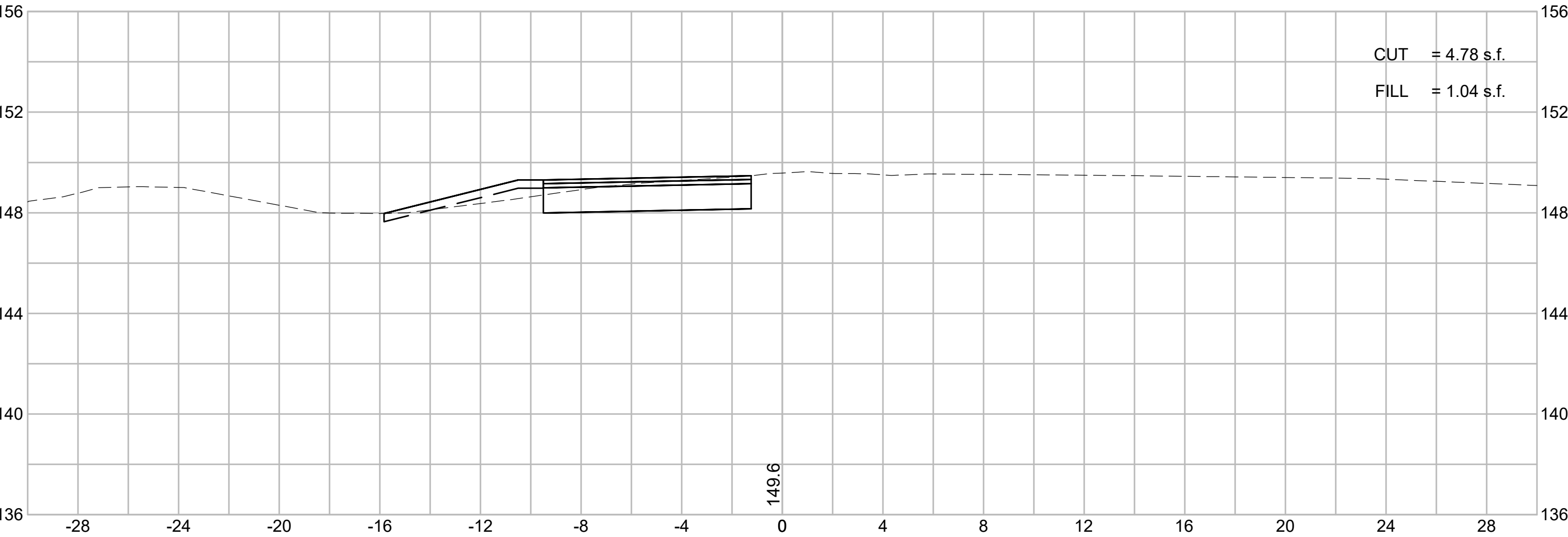
204+50
ROUTE 2 EB CROSSOVER



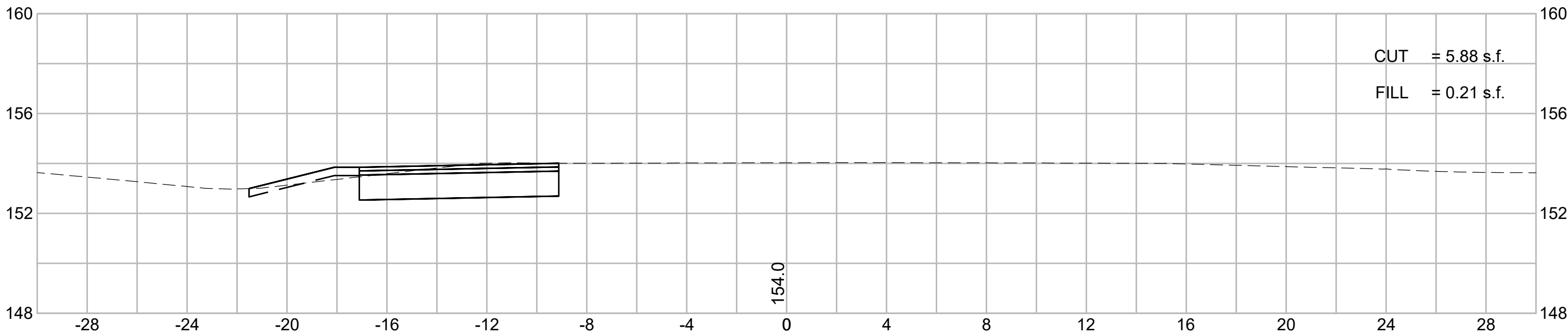
202+50
ROUTE 2 EB CROSSOVER



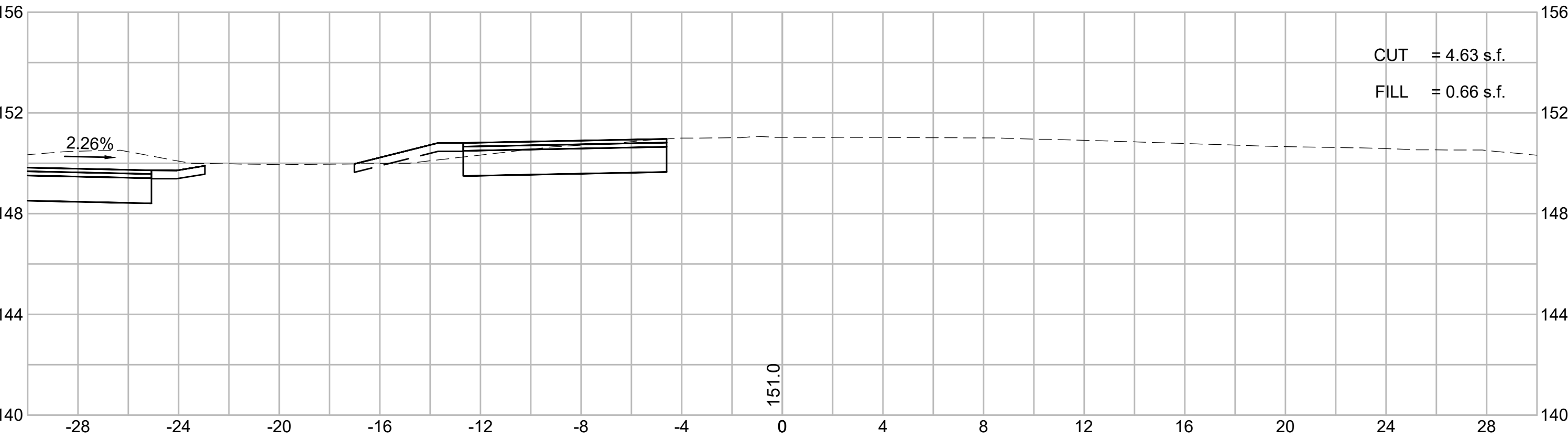
204+00
ROUTE 2 EB CROSSOVER



202+00
ROUTE 2 EB CROSSOVER

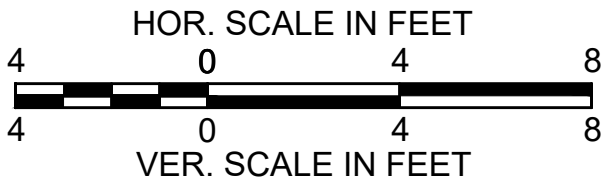


203+50
ROUTE 2 EB CROSSOVER

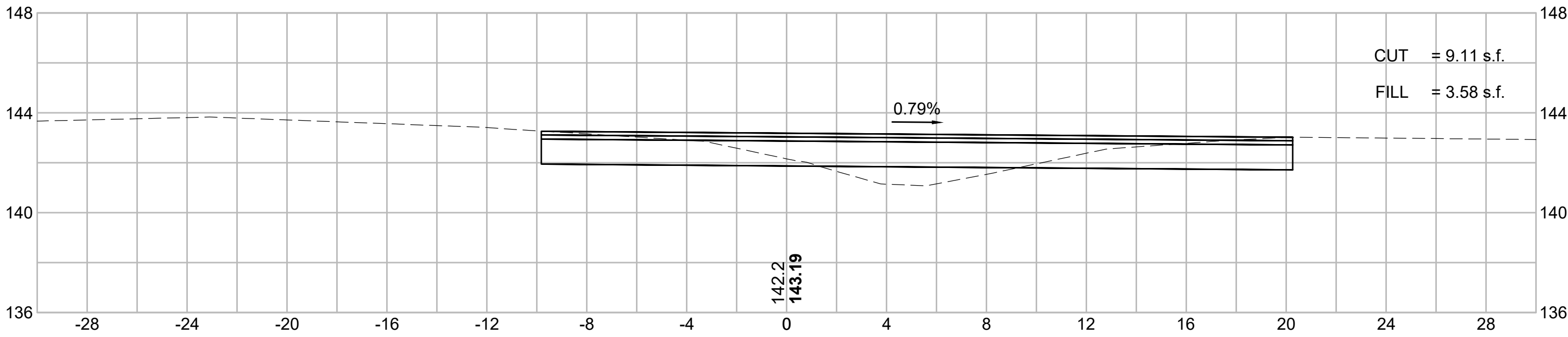


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	151	158
PROJECT FILE NO.		606223	

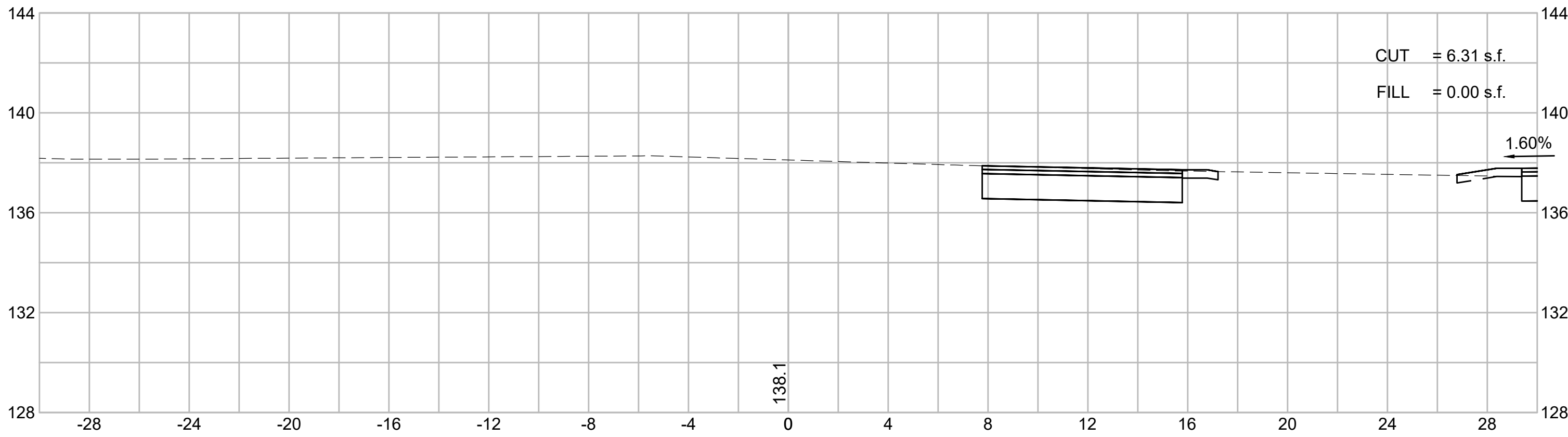
CROSS SECTIONS - MEDIAN
CROSSOVERS



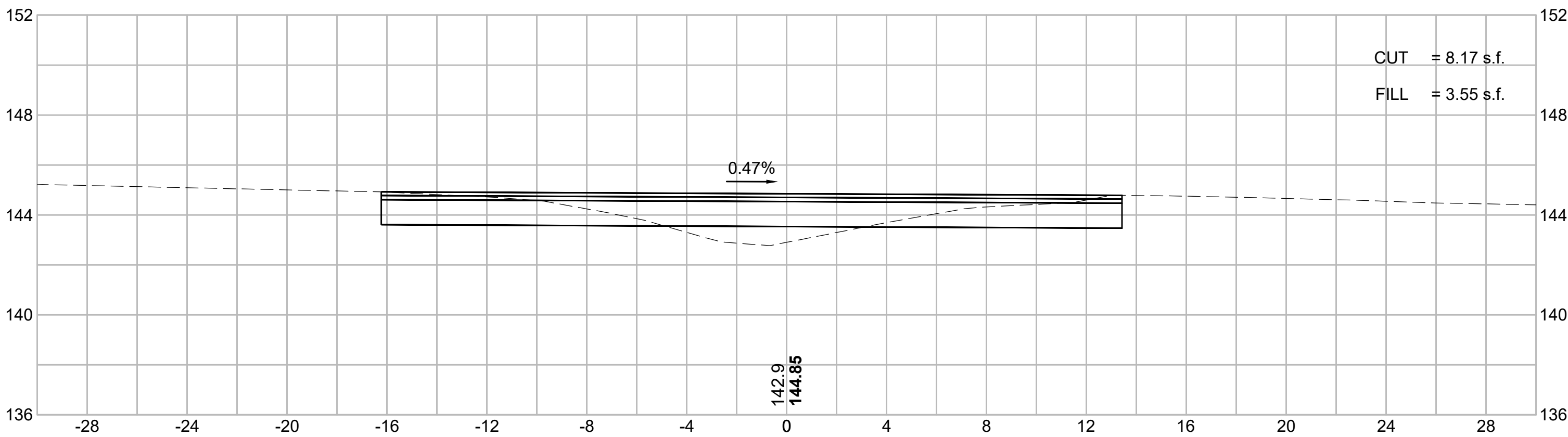
206+00
ROUTE 2 EB CROSSOVER



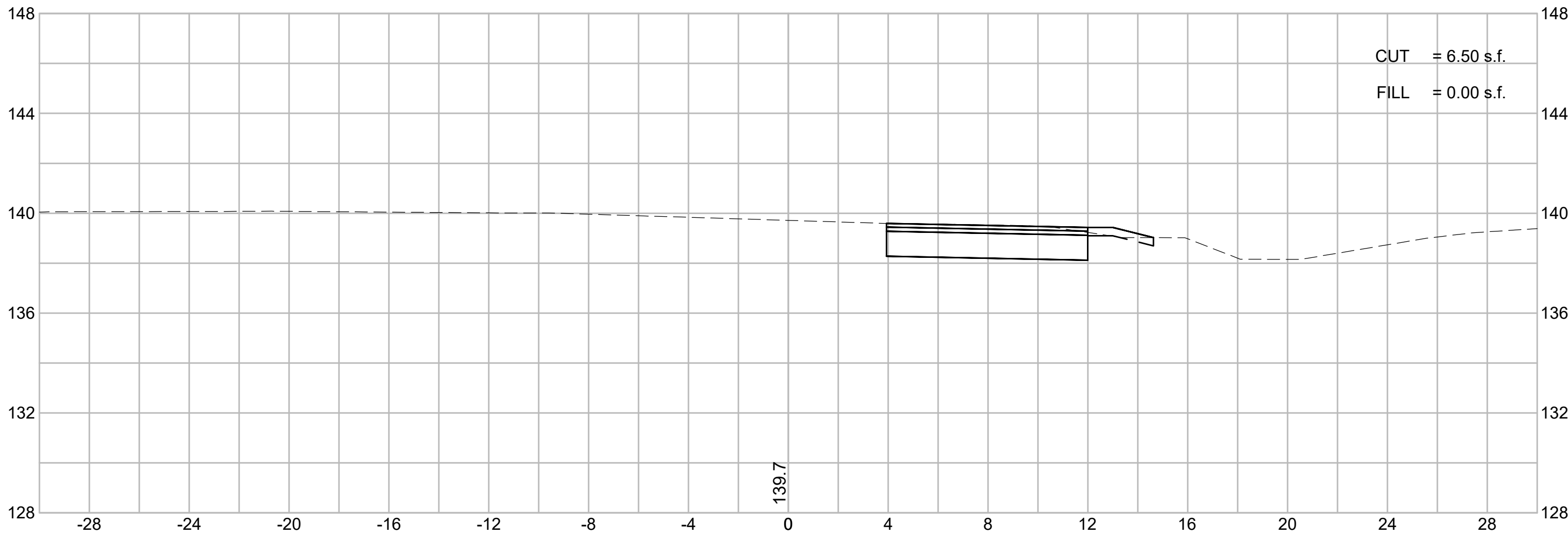
207+50
ROUTE 2 EB CROSSOVER



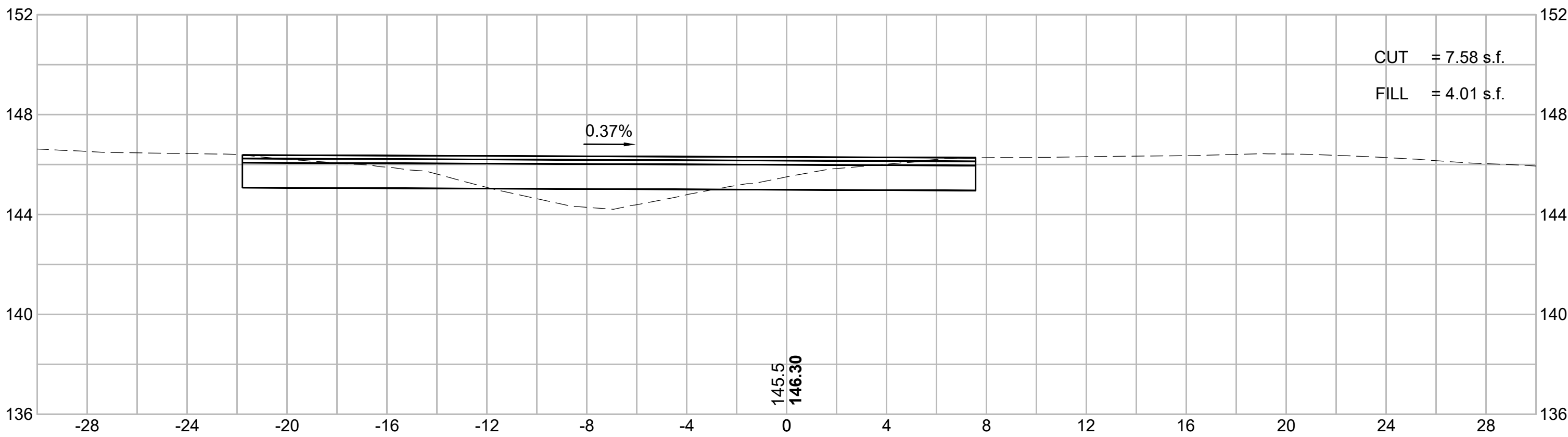
205+50
ROUTE 2 EB CROSSOVER



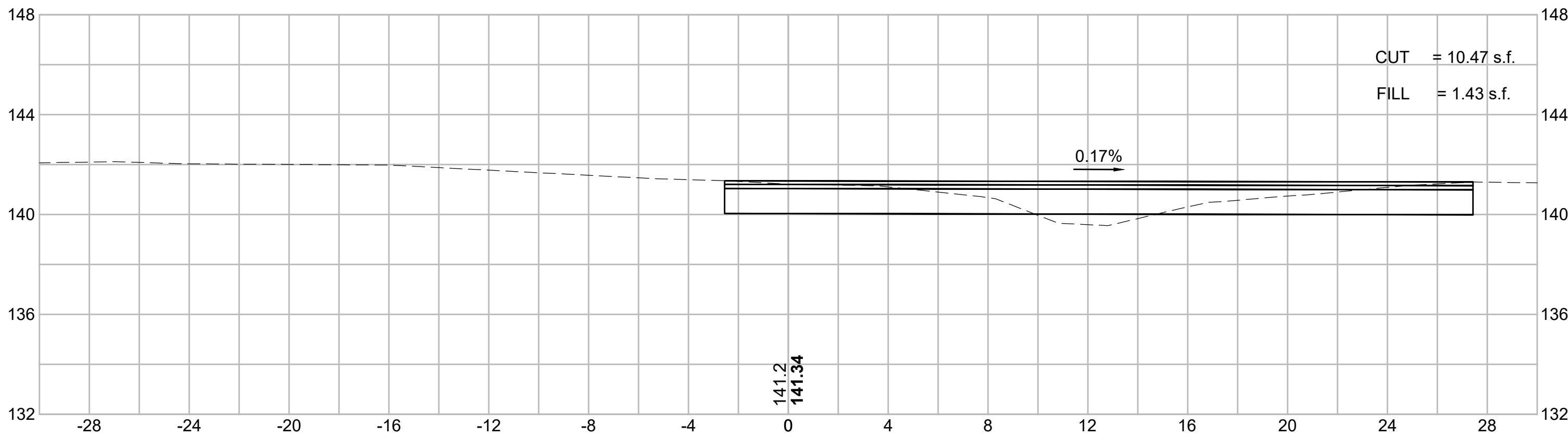
207+00
ROUTE 2 EB CROSSOVER



205+00
ROUTE 2 EB CROSSOVER

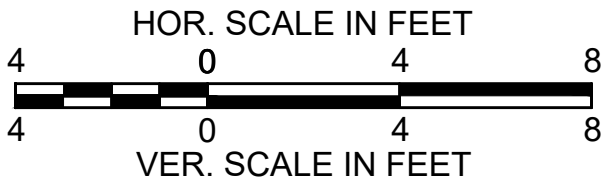


206+50
ROUTE 2 EB CROSSOVER

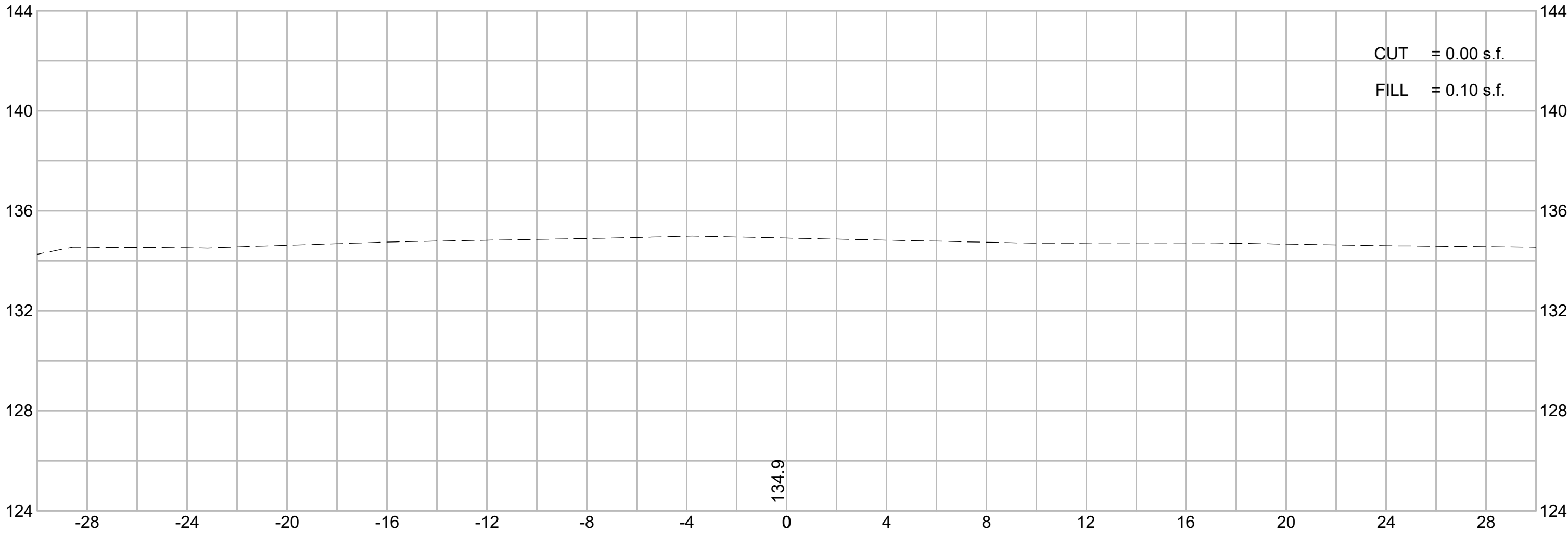


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	152	158
PROJECT FILE NO.		606223	

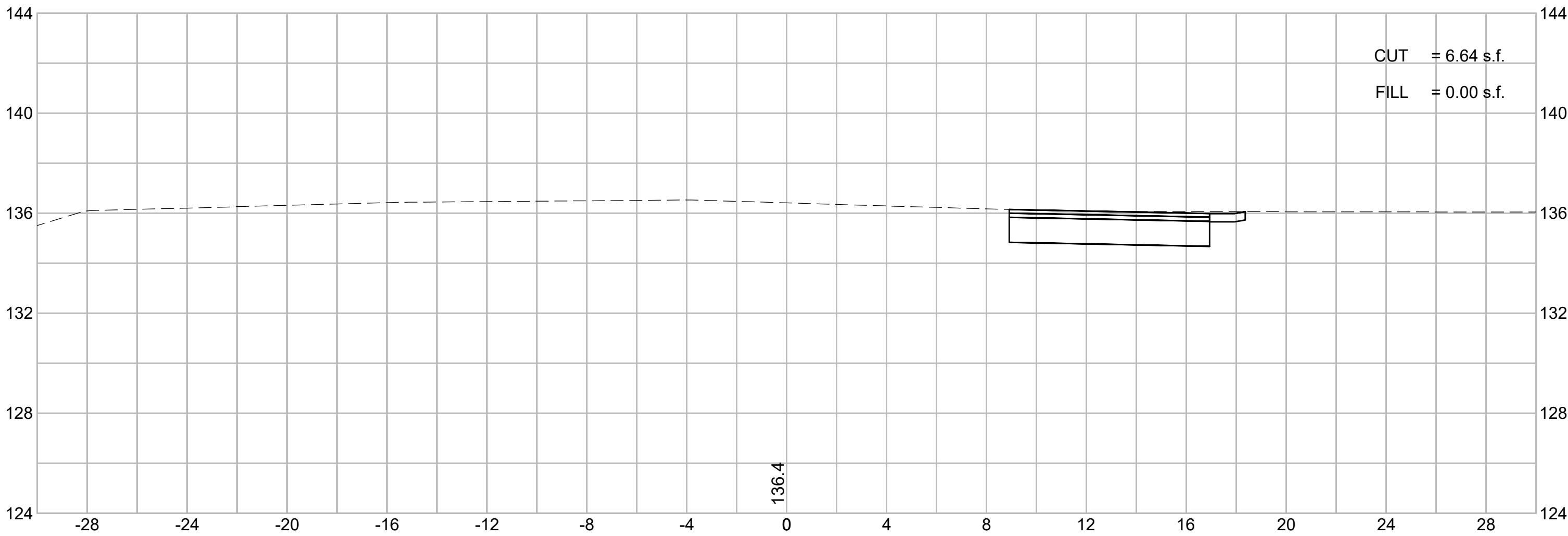
CROSS SECTIONS - MEDIAN
CROSSOVERS



208+50
ROUTE 2 EB CROSSOVER

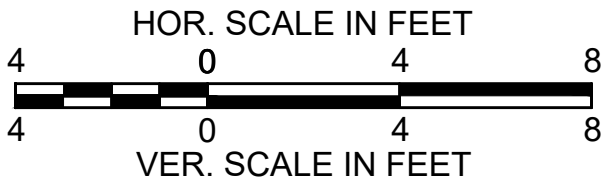


208+00
ROUTE 2 EB CROSSOVER

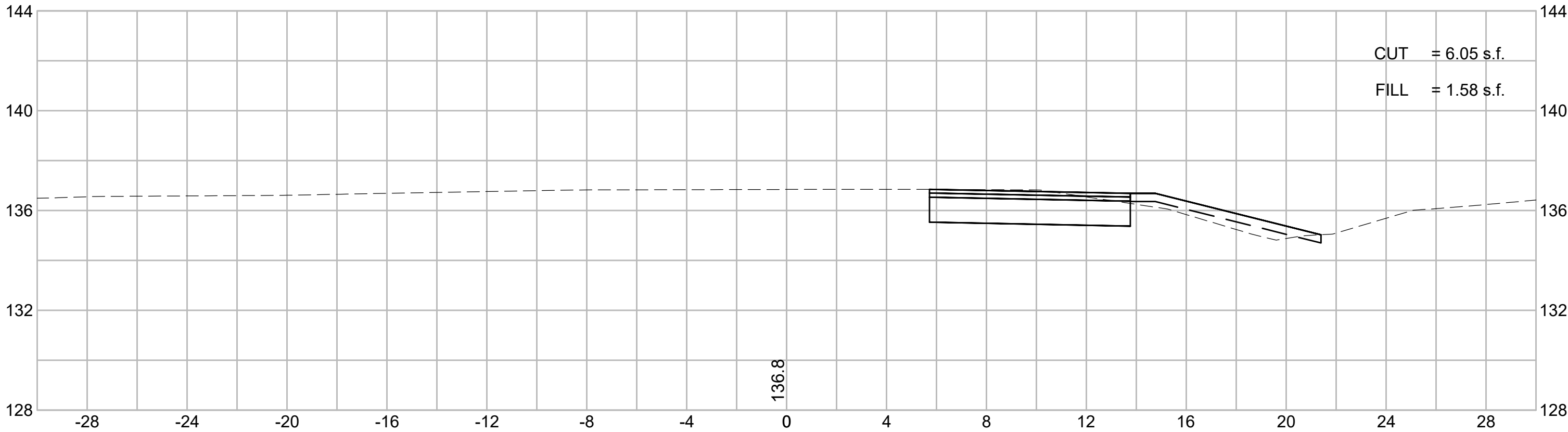


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	153	158
PROJECT FILE NO.		606223	

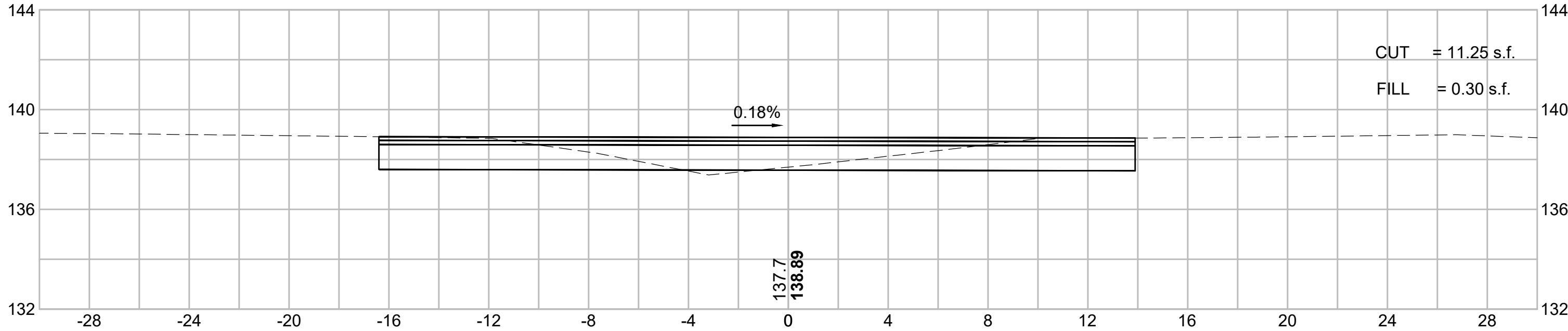
CROSS SECTIONS - MEDIAN
CROSSOVERS



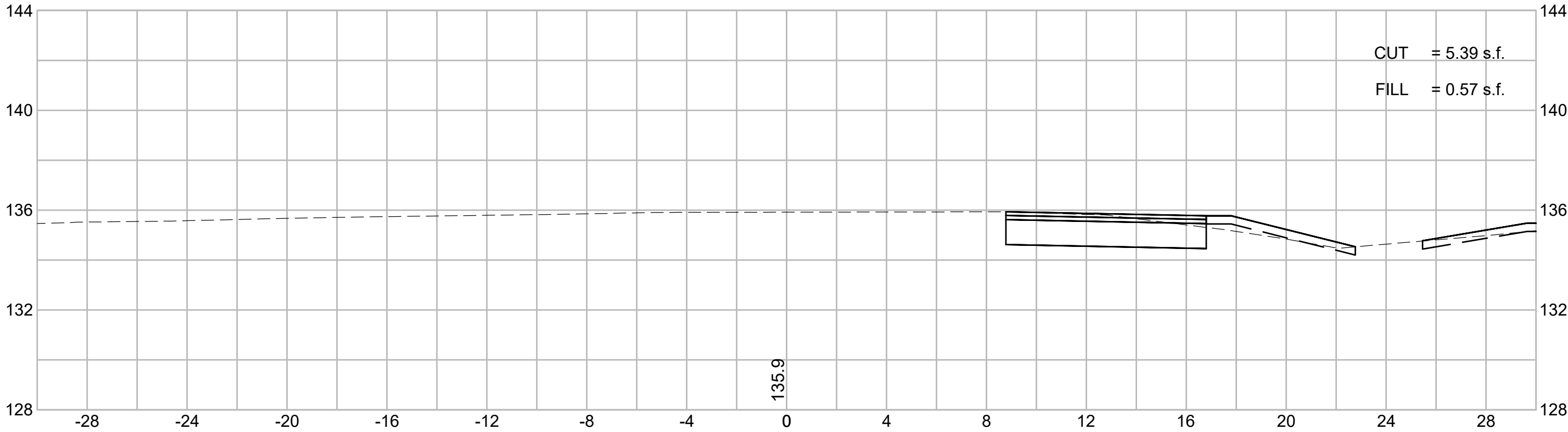
216+50
ROUTE 2 EB CROSSOVER



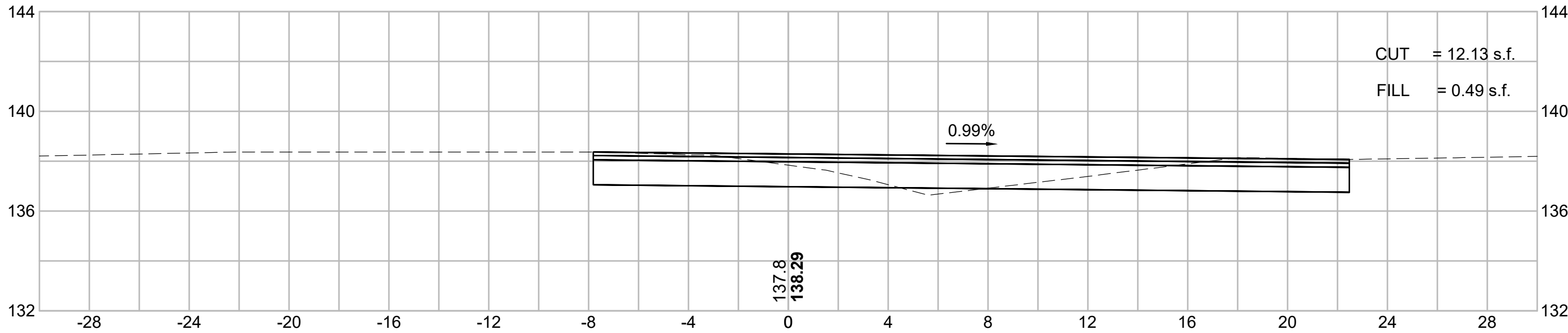
218+00
ROUTE 2 EB CROSSOVER



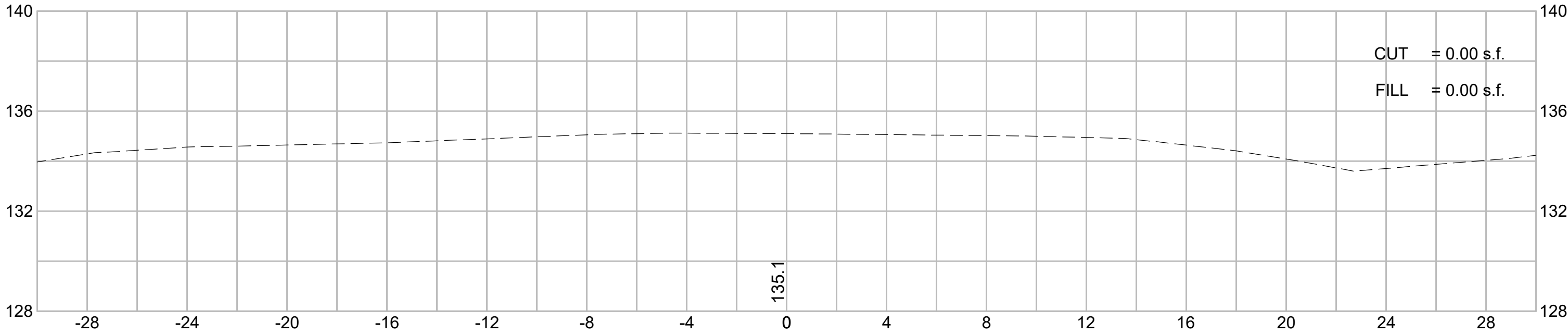
216+00
ROUTE 2 EB CROSSOVER



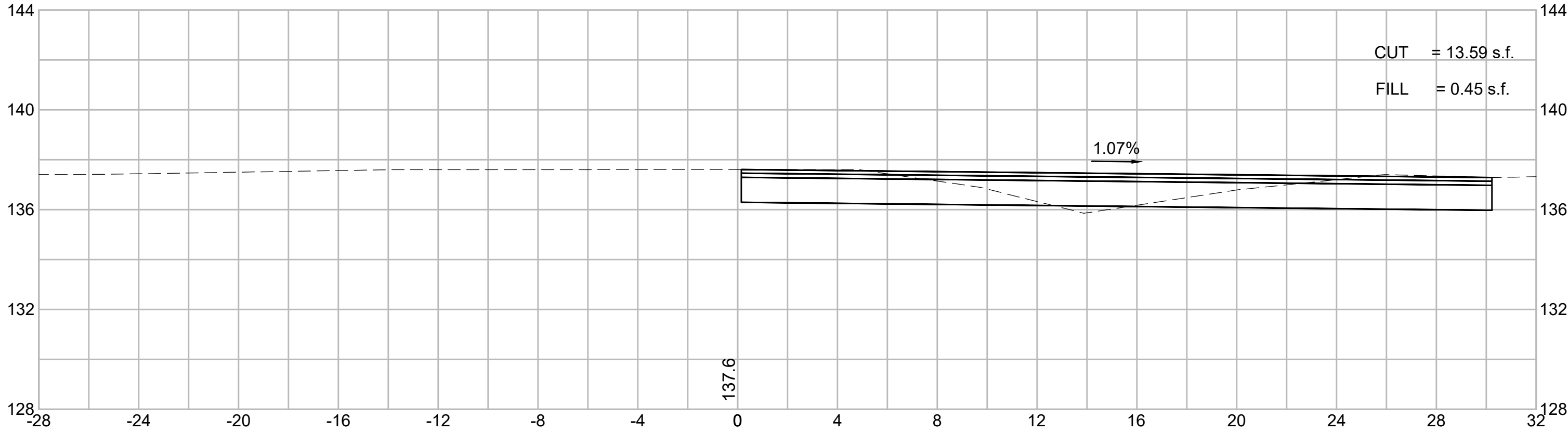
217+50
ROUTE 2 EB CROSSOVER



215+50
ROUTE 2 EB CROSSOVER

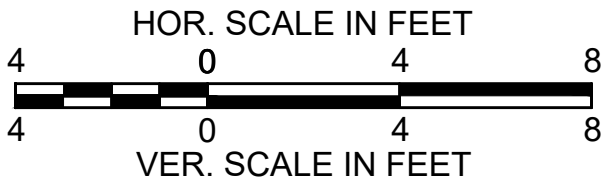


217+00
ROUTE 2 EB CROSSOVER

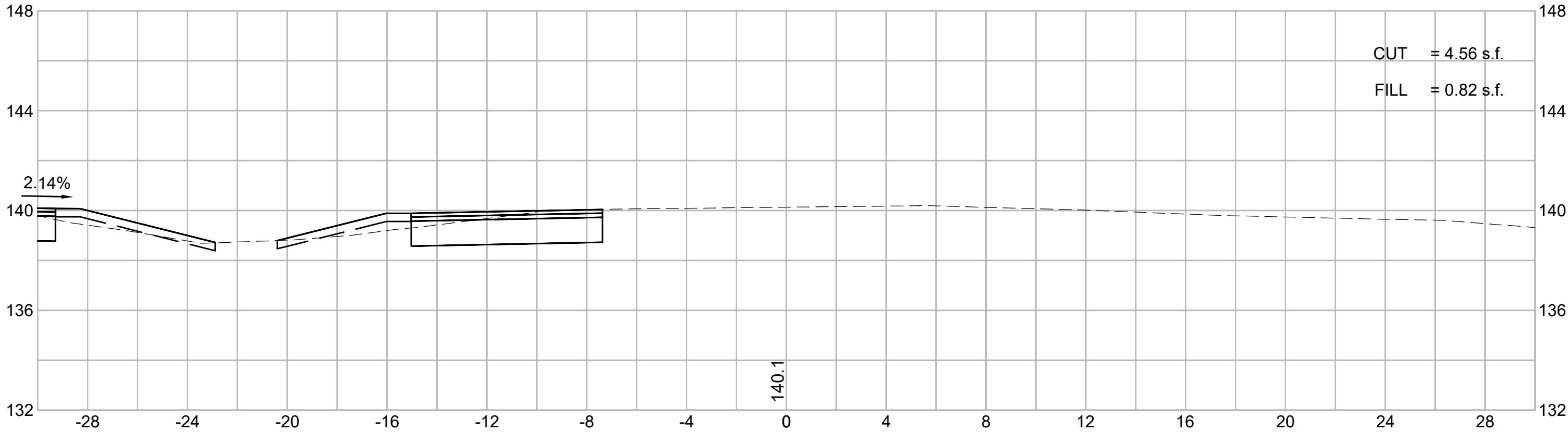


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	154	158
PROJECT FILE NO.		606223	

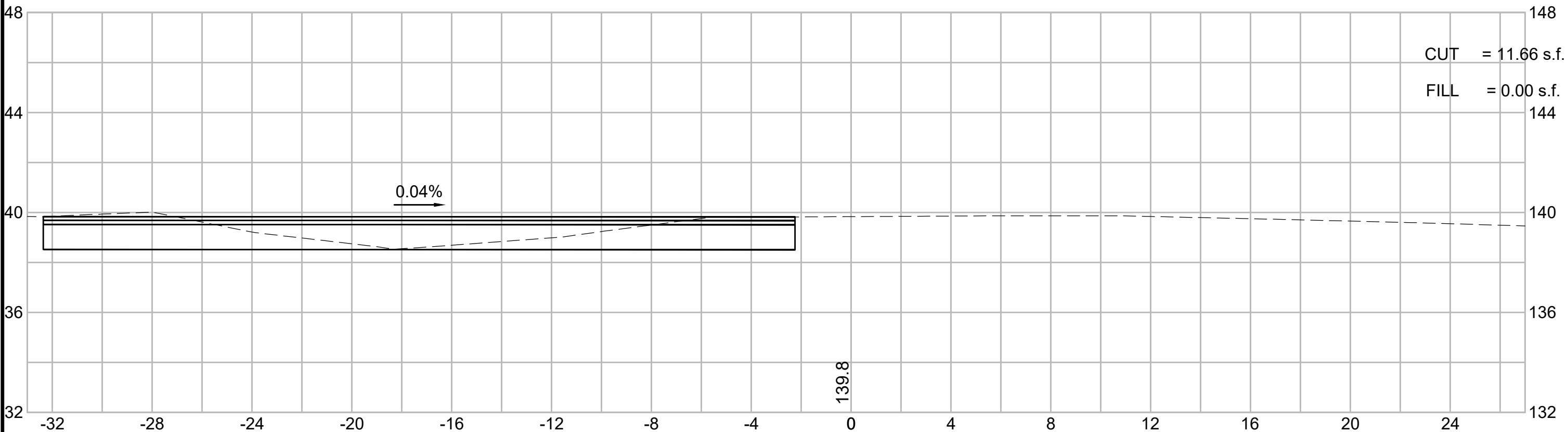
CROSS SECTIONS - MEDIAN
CROSSOVERS



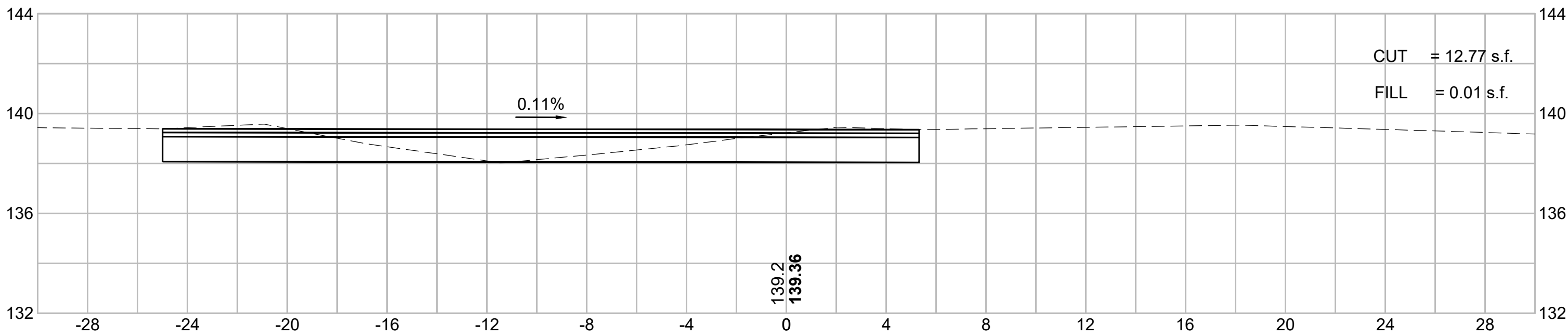
219+50
ROUTE 2 EB CROSSOVER



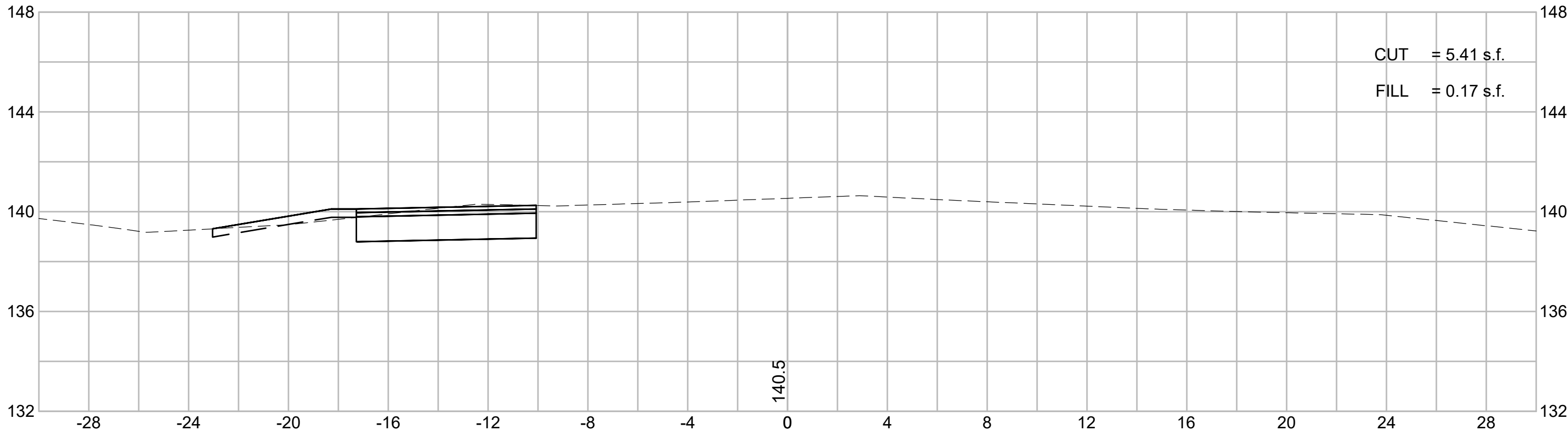
219+00
ROUTE 2 EB CROSSOVER



218+50
ROUTE 2 EB CROSSOVER

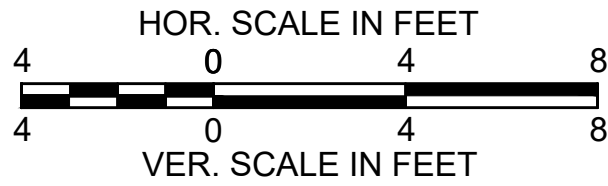


220+00
ROUTE 2 EB CROSSOVER

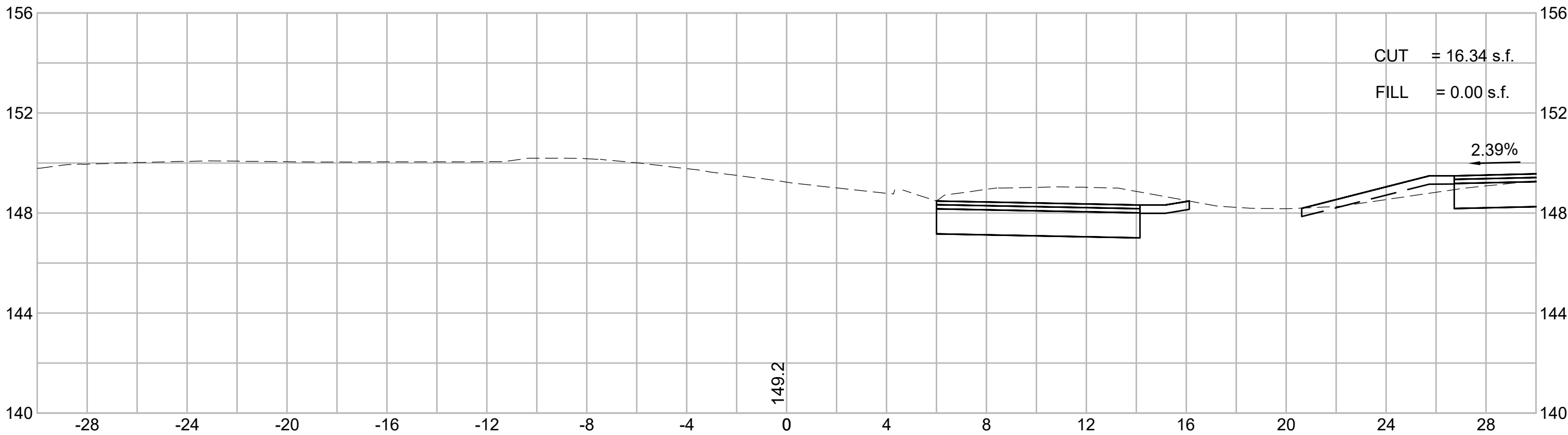


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	155	158
PROJECT FILE NO.		606223	

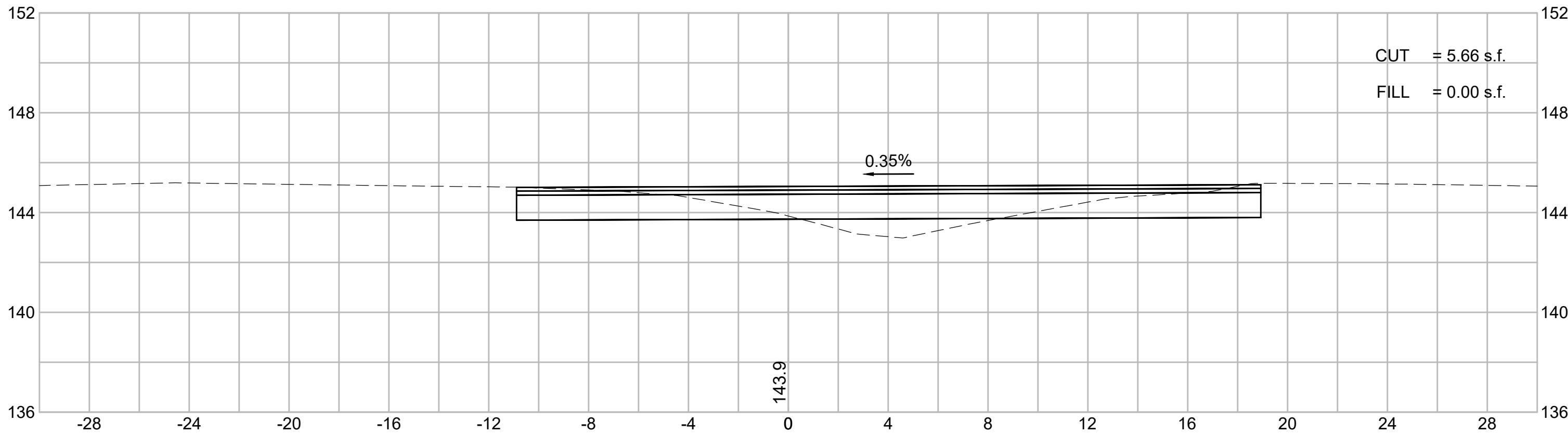
CROSS SECTIONS - MEDIAN
CROSSOVERS



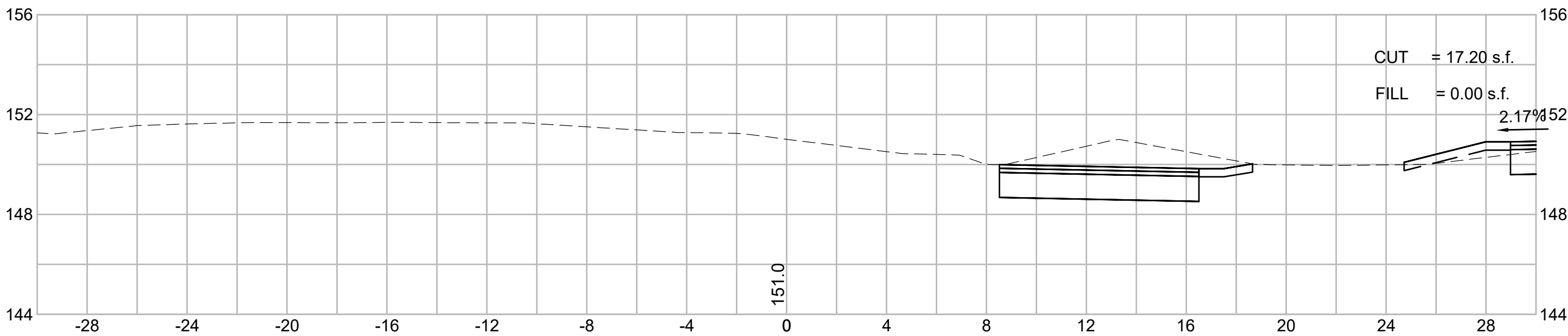
104+00
ROUTE 2 WB CROSSOVER



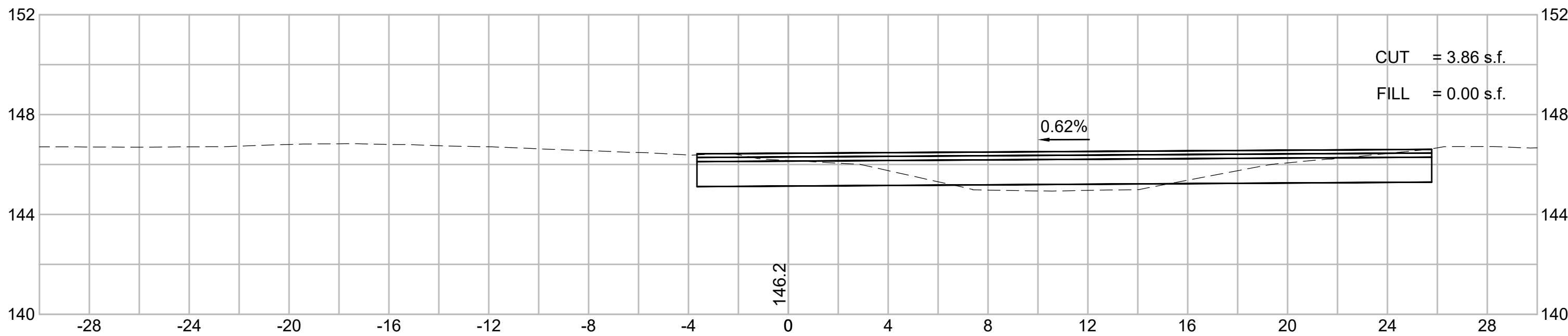
105+50
ROUTE 2 WB CROSSOVER



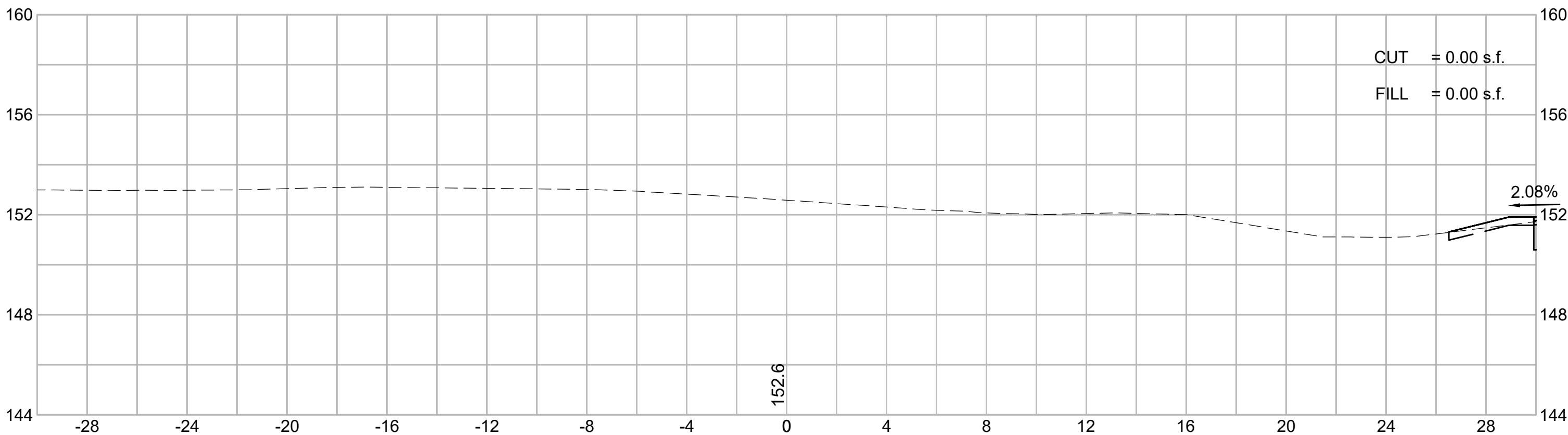
103+50
ROUTE 2 WB CROSSOVER



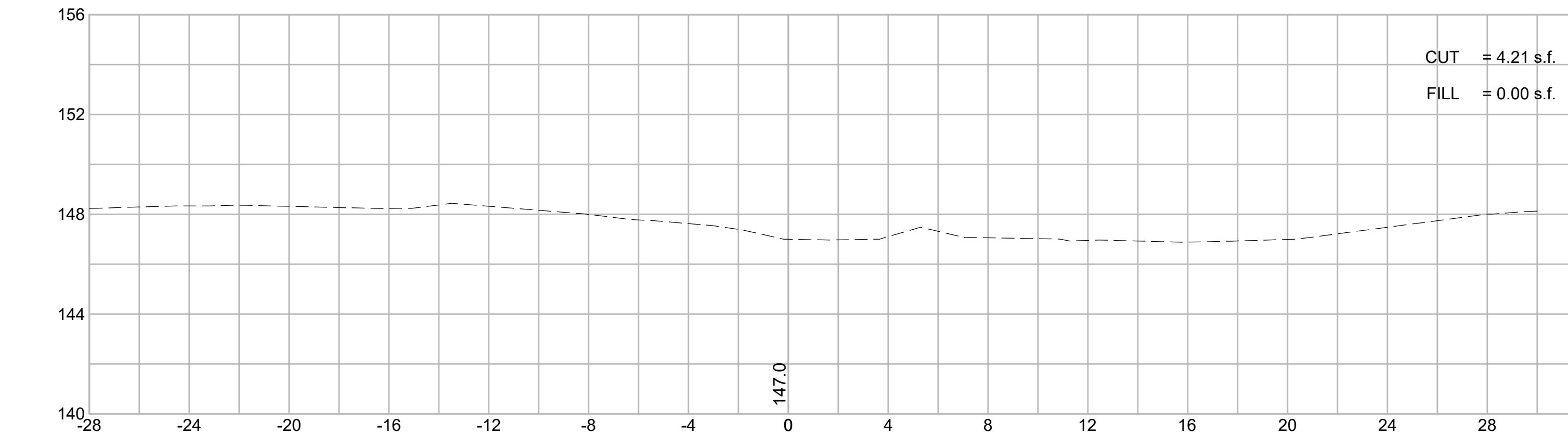
105+00
ROUTE 2 WB CROSSOVER



103+00
ROUTE 2 WB CROSSOVER

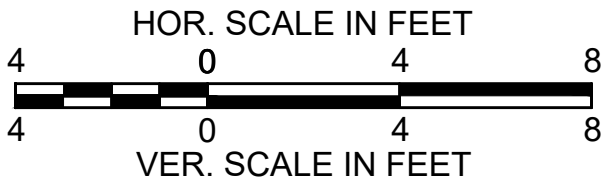


104+50
ROUTE 2 WB CROSSOVER

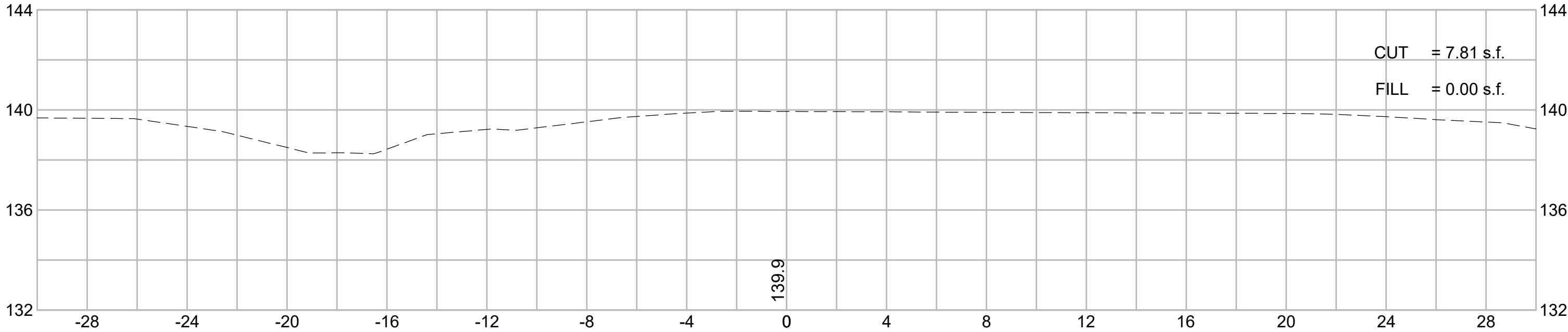


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	156	158
PROJECT FILE NO.		606223	

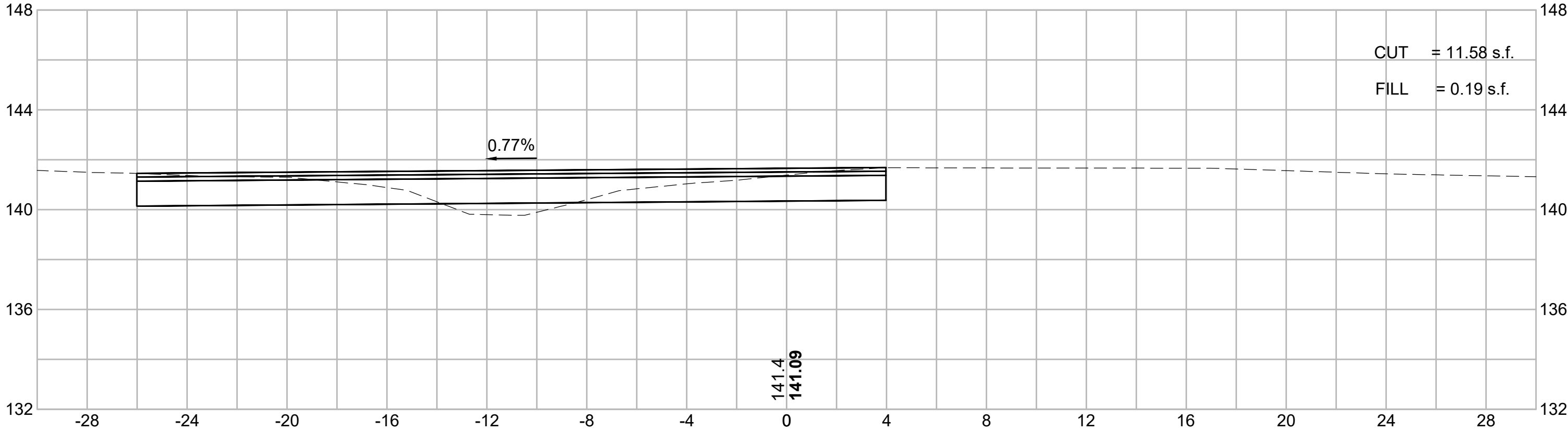
CROSS SECTIONS - MEDIAN
CROSSOVERS



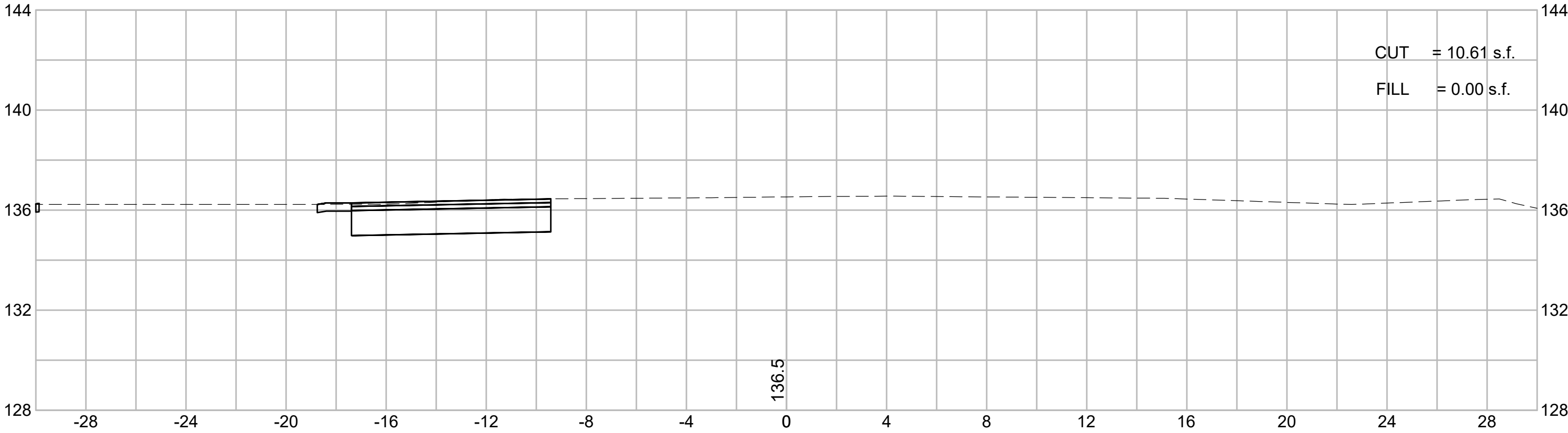
107+00
ROUTE 2 WB CROSSOVER



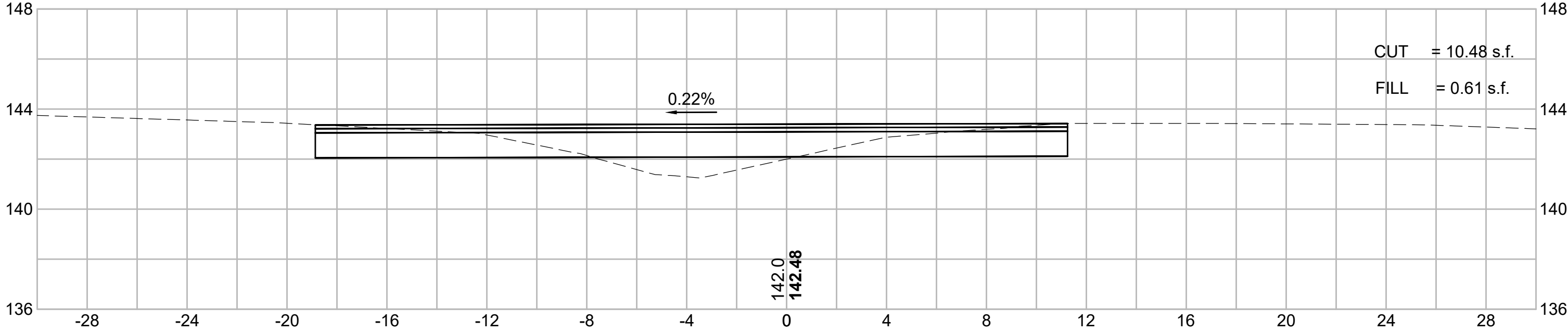
106+50
ROUTE 2 WB CROSSOVER



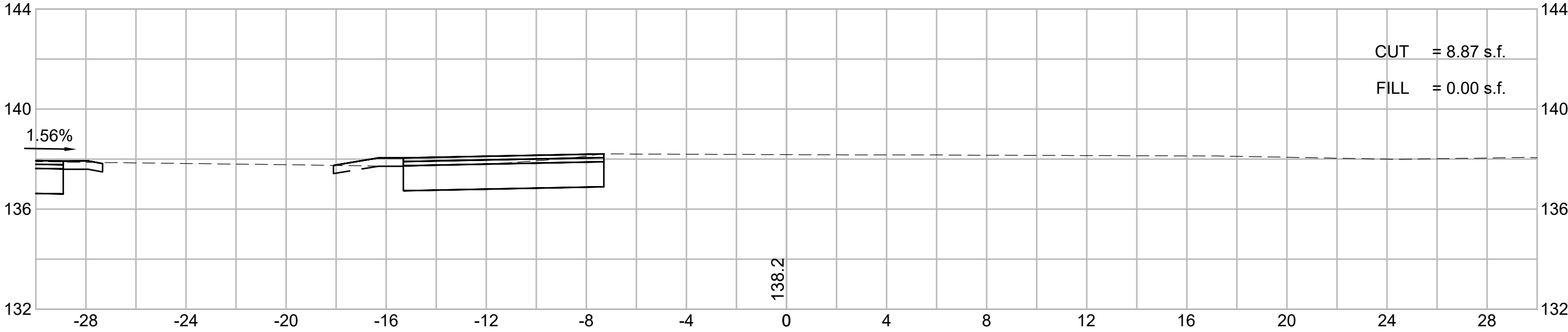
108+00
ROUTE 2 WB CROSSOVER



106+00
ROUTE 2 WB CROSSOVER

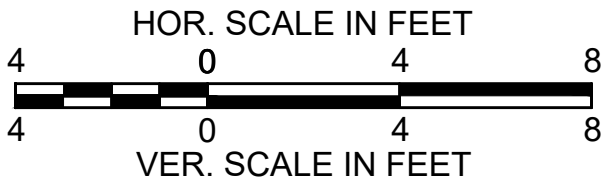


107+50
ROUTE 2 WB CROSSOVER

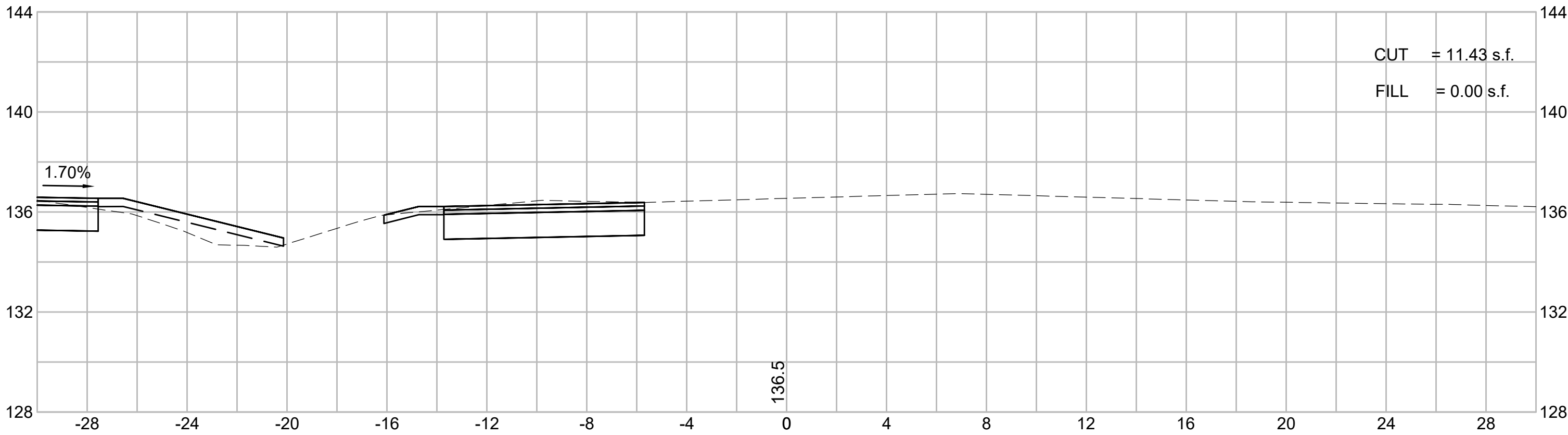


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	157	158
PROJECT FILE NO.		606223	

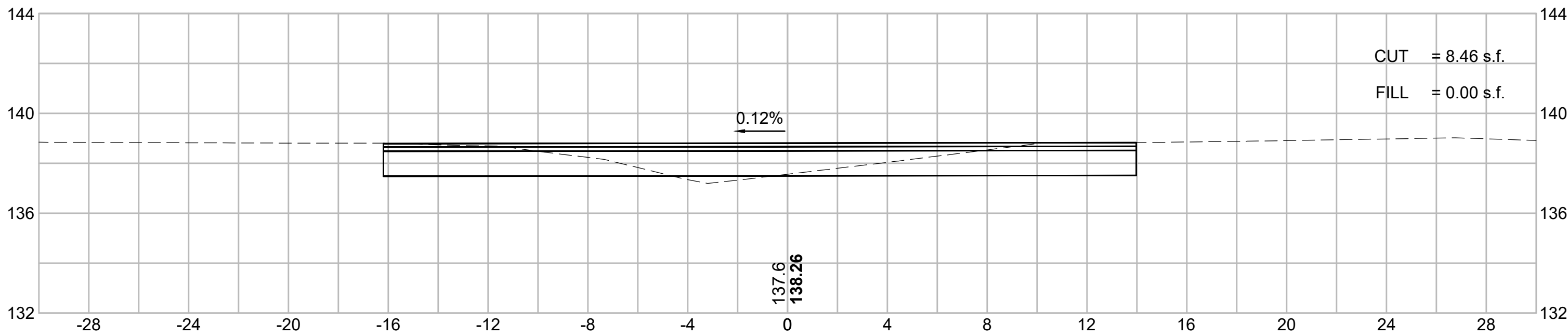
CROSS SECTIONS - MEDIAN
CROSSOVERS



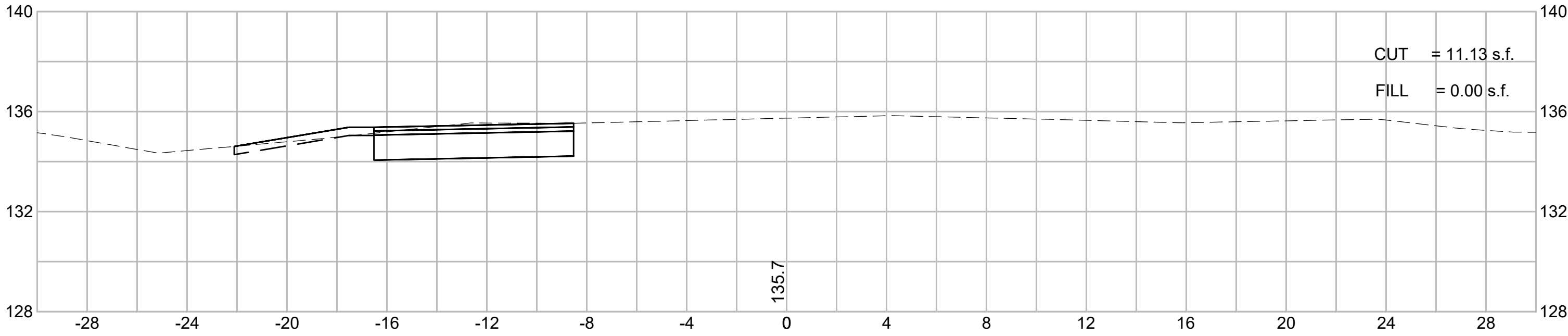
116+50
ROUTE 2 WB CROSSOVER



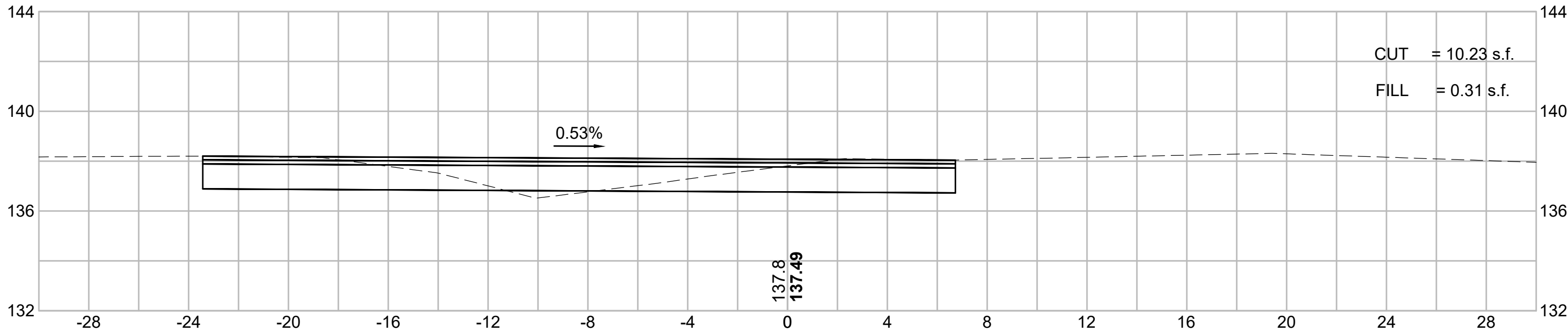
118+00
ROUTE 2 WB CROSSOVER



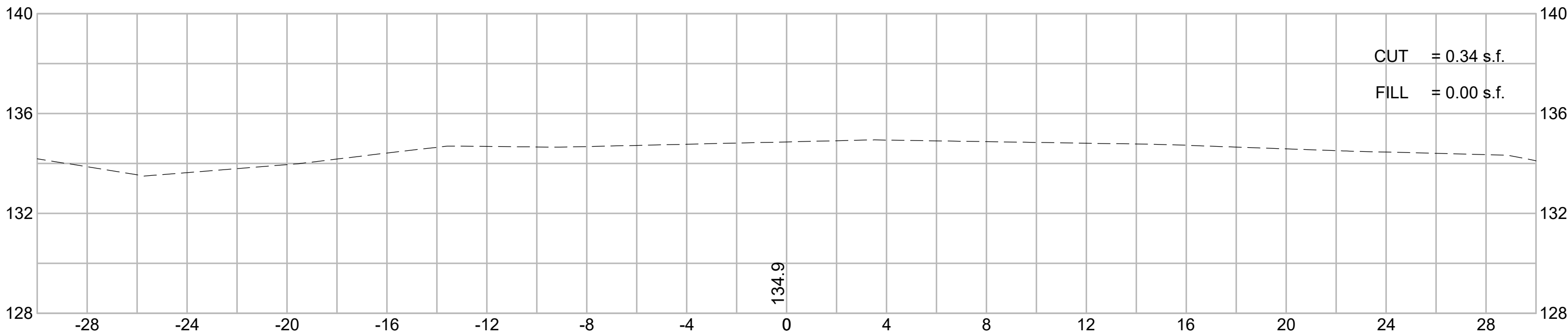
116+00
ROUTE 2 WB CROSSOVER



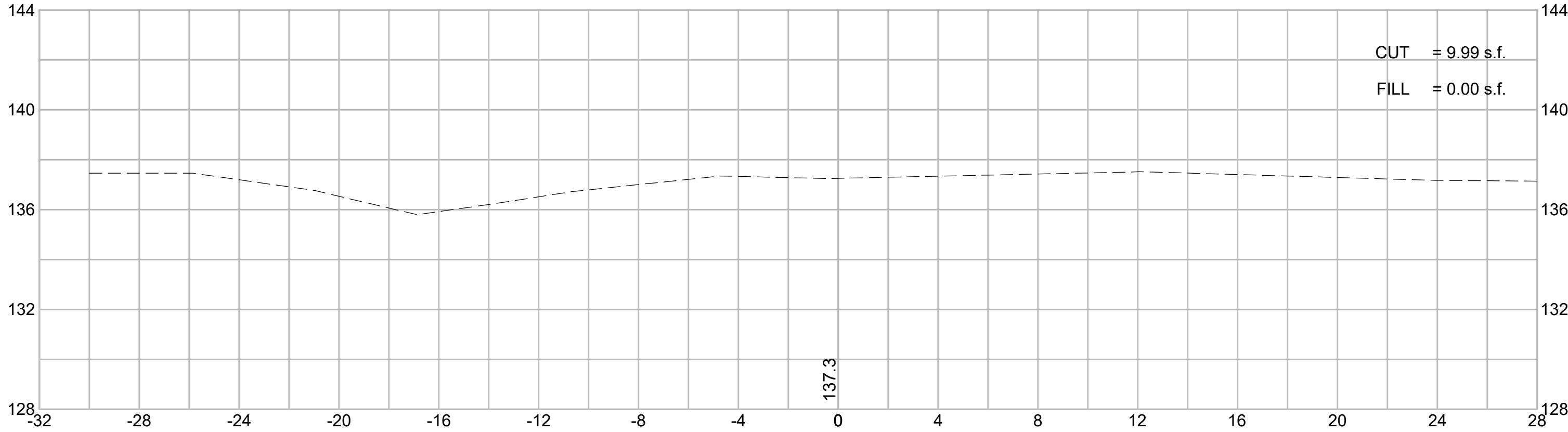
117+50
ROUTE 2 WB CROSSOVER



115+50
ROUTE 2 WB CROSSOVER

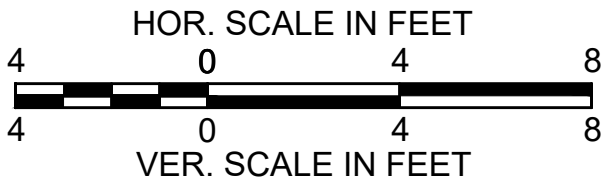


117+00
ROUTE 2 WB CROSSOVER

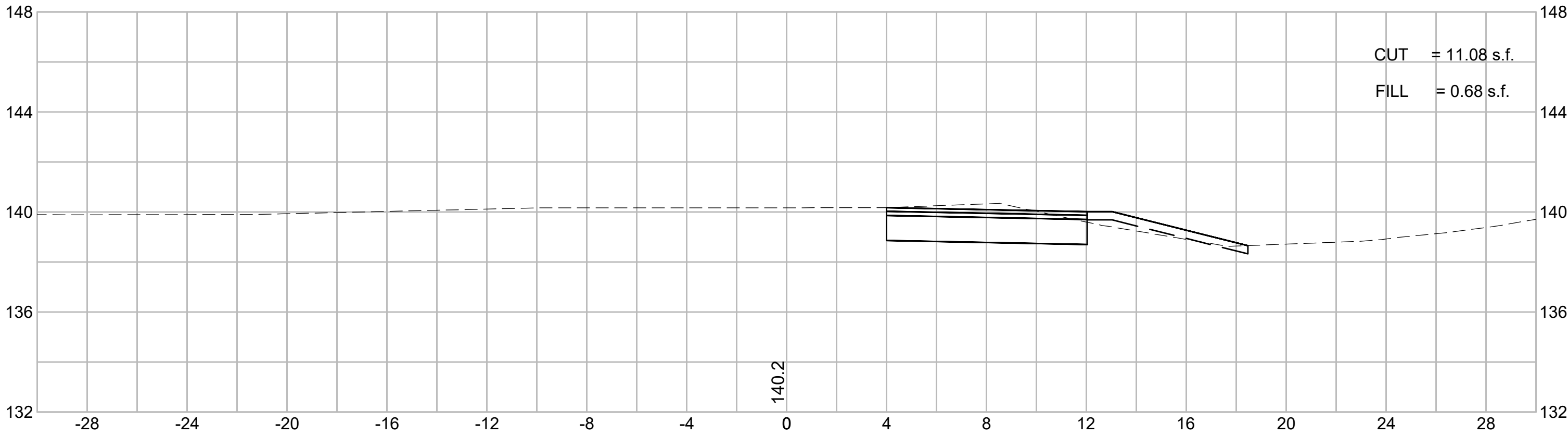


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	-	158	158
PROJECT FILE NO.		606223	

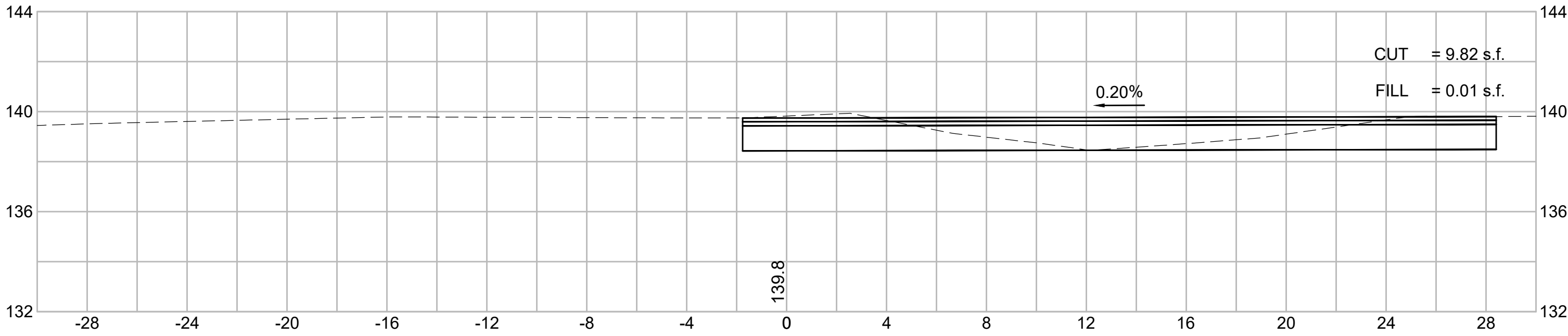
CROSS SECTIONS - MEDIAN
CROSSOVERS



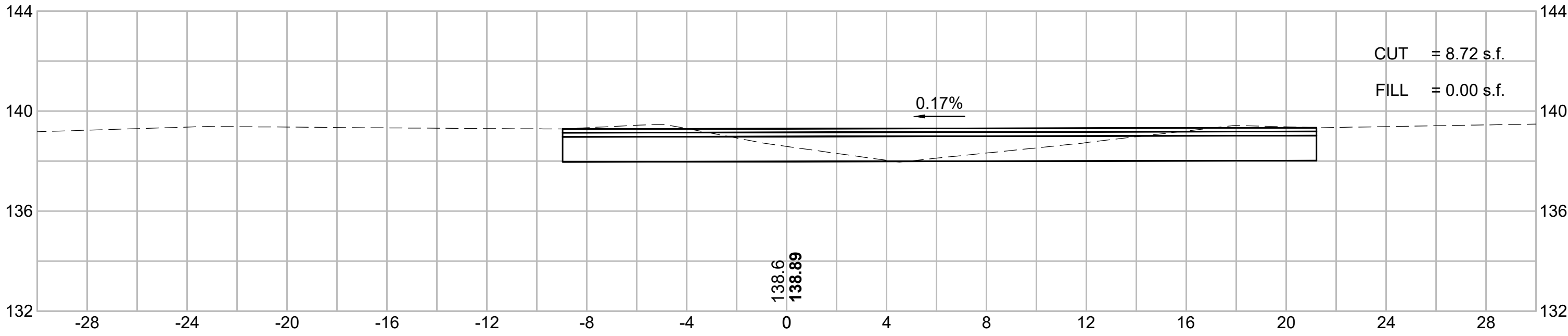
119+50
ROUTE 2 WB CROSSOVER



119+00
ROUTE 2 WB CROSSOVER



118+50
ROUTE 2 WB CROSSOVER



120+00
ROUTE 2 WB CROSSOVER

