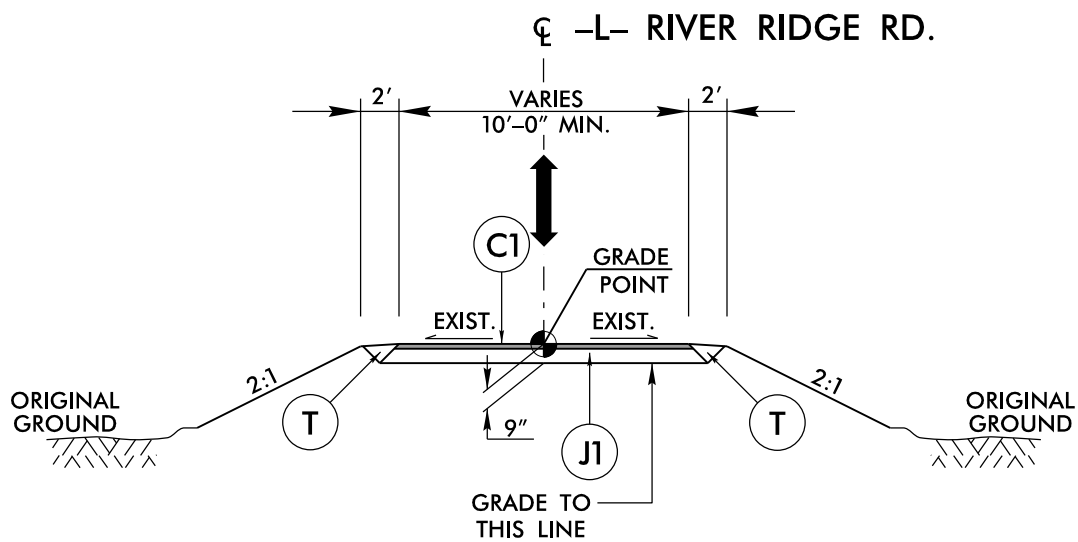
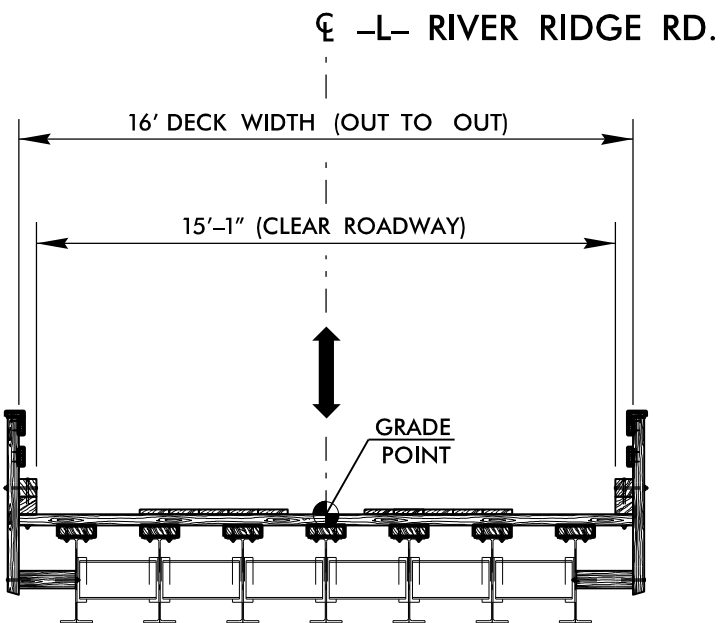




TYPICAL SECTION NO. 1
—L— STA. 10+15.00 TO STA. 10+23.00 (BEGIN BRIDGE)



TYPICAL SECTION NO. 2
—L— Sta. 10+23.00 TO Sta. 11+73.00
(SEE STRUCTURE PLANS FOR
STRUCTURE CONSTRUCTION DETAILS)

PAVEMENT SCHEDULE

C1	PROP. APPROX. 3" ASPHALT CONCRETE SURFACE COURSE, TYPE S9.5B, AT AN AVERAGE RATE OF 165 LBS. PER SQ. YD. IN EACH OF TWO LAYERS.
J1	PROP. 6" AGGREGATE BASE COURSE
T	EARTH MATERIAL

NOTE: PAVEMENT EDGE SLOPES ARE 1:1 UNLESS SHOWN OTHERWISE.

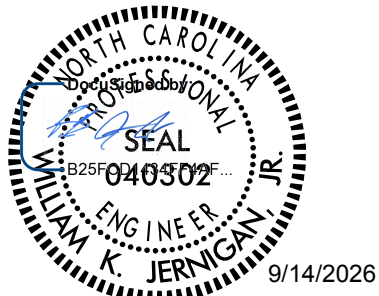
ROADWAY QUANTITIES

DESCRIPTION	QUANTITY	UNIT
ASPHALT TYPE S9.5B	3	TONS
AGGREGATE BASE COURSE	12	TONS
ASPHALT BINDER	1	TONS
PATCHING EXISTING PAVEMENT (FULL DEPTH)	50	TONS

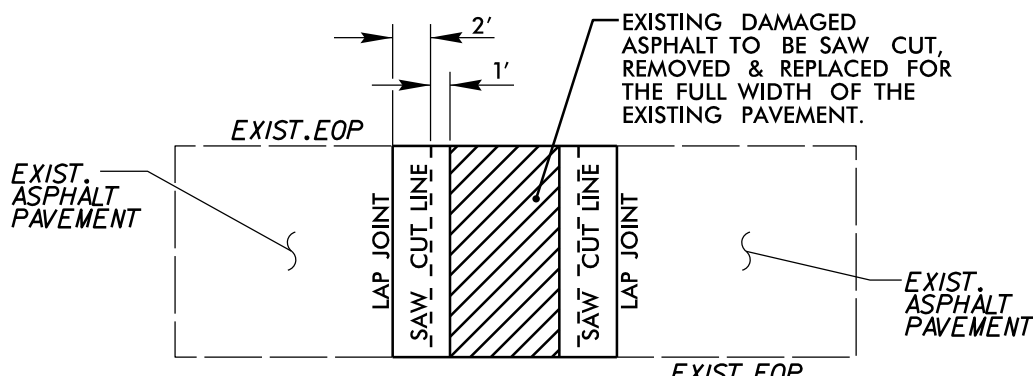
I hereby certify that that I have reviewed the existing hydraulic conveyance at this site which was a four (4) span existing bridge with the proposed conveyance provided by the proposed three (3) span bridge.

The proposed bridge low chord for the bridge shall be set no lower than the top of the existing bridge low chord as documented in the HEC-RAS model obtained from NCFMP which meets the FEMA Disaster Specific Guidance for the Replacement of Private Roads and Bridges issued on 14 February 2025, "to provide bridge/culvert design plans certified (sealed, signed, and dated) by a Professional Engineer licensed in the State of North Carolina demonstrating that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing".

This certification demonstrates that the newly designed and installed private bridge/culvert provides conveyance greater than or equal to the original destroyed crossing. This is based on the best available data provided from post storm evaluations. Portions of the existing structures may have been destroyed, removed, modified or shifted from their original location or elevation.



NOTE:
THIS REPAIR DETAIL TO BE USED IN
AREAS WHERE THE EXISTING RIVER RIDGE
ROAD IS DAMAGED BY CONSTRUCTION
VEHICLES.



ROADWAY DAMAGE REPAIR DETAIL

GRAPHIC SCALES



PLANS



PROFILE (HORIZONTAL)



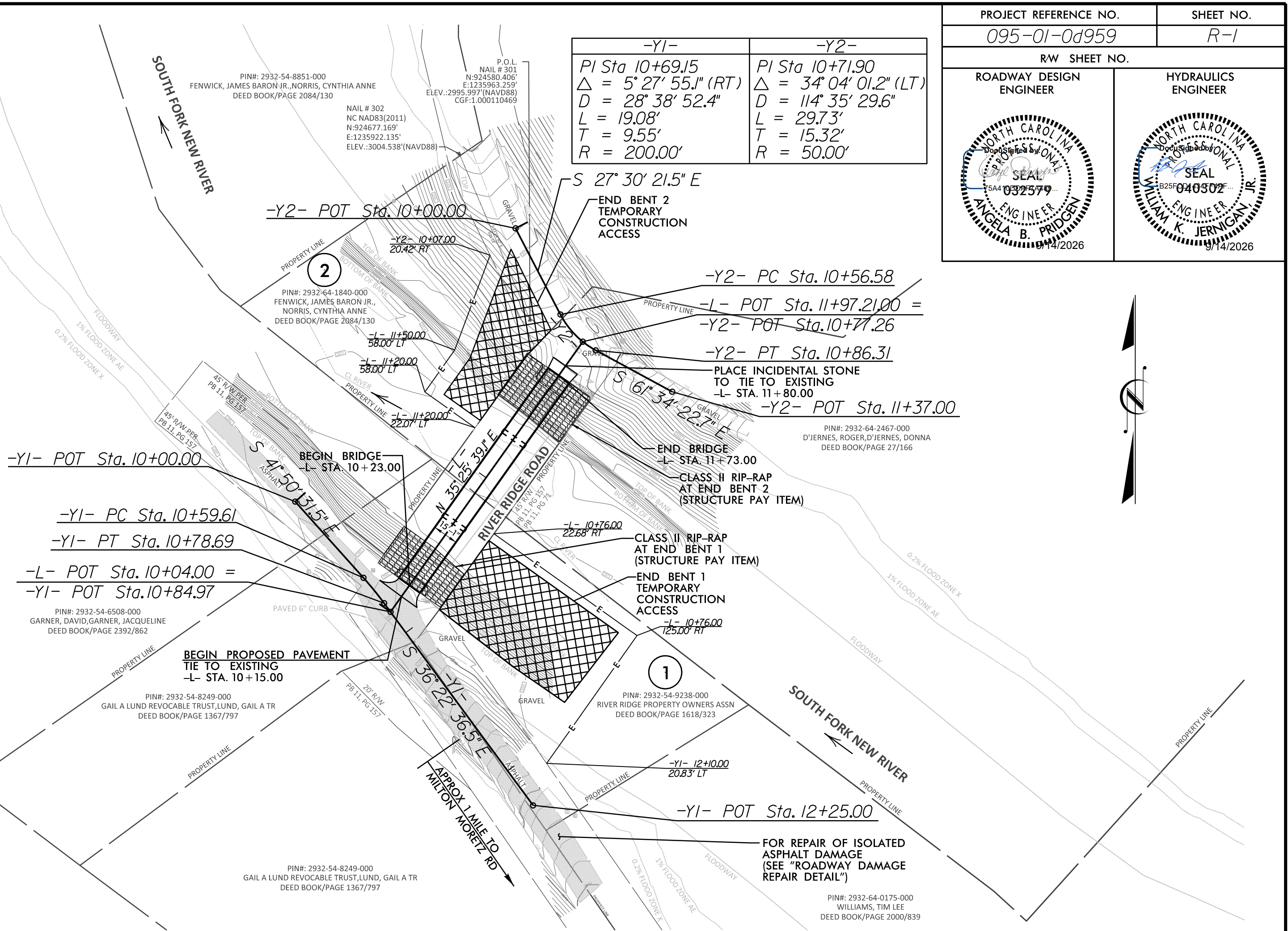
PROFILE (VERTICAL)



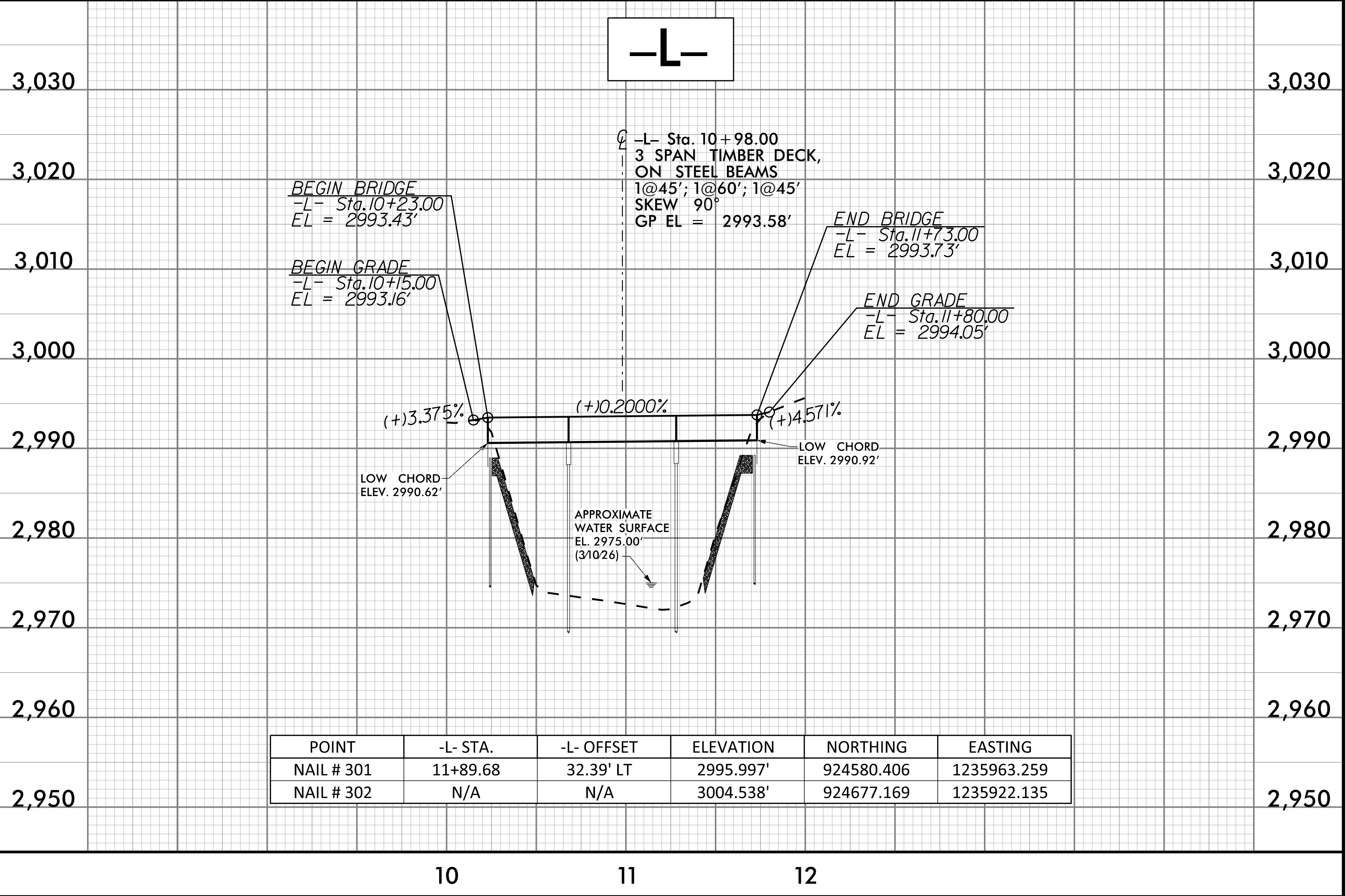
PREPARED BY

GFT

GFT Infrastructure, Inc.
One Glenwood Avenue, Suite 900
Raleigh, NC 27603
919-420-7660
NC Lic. No. F-0270



PROJECT REFERENCE NO.	SHEET NO.
095-01-0d959	R-1
RW SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

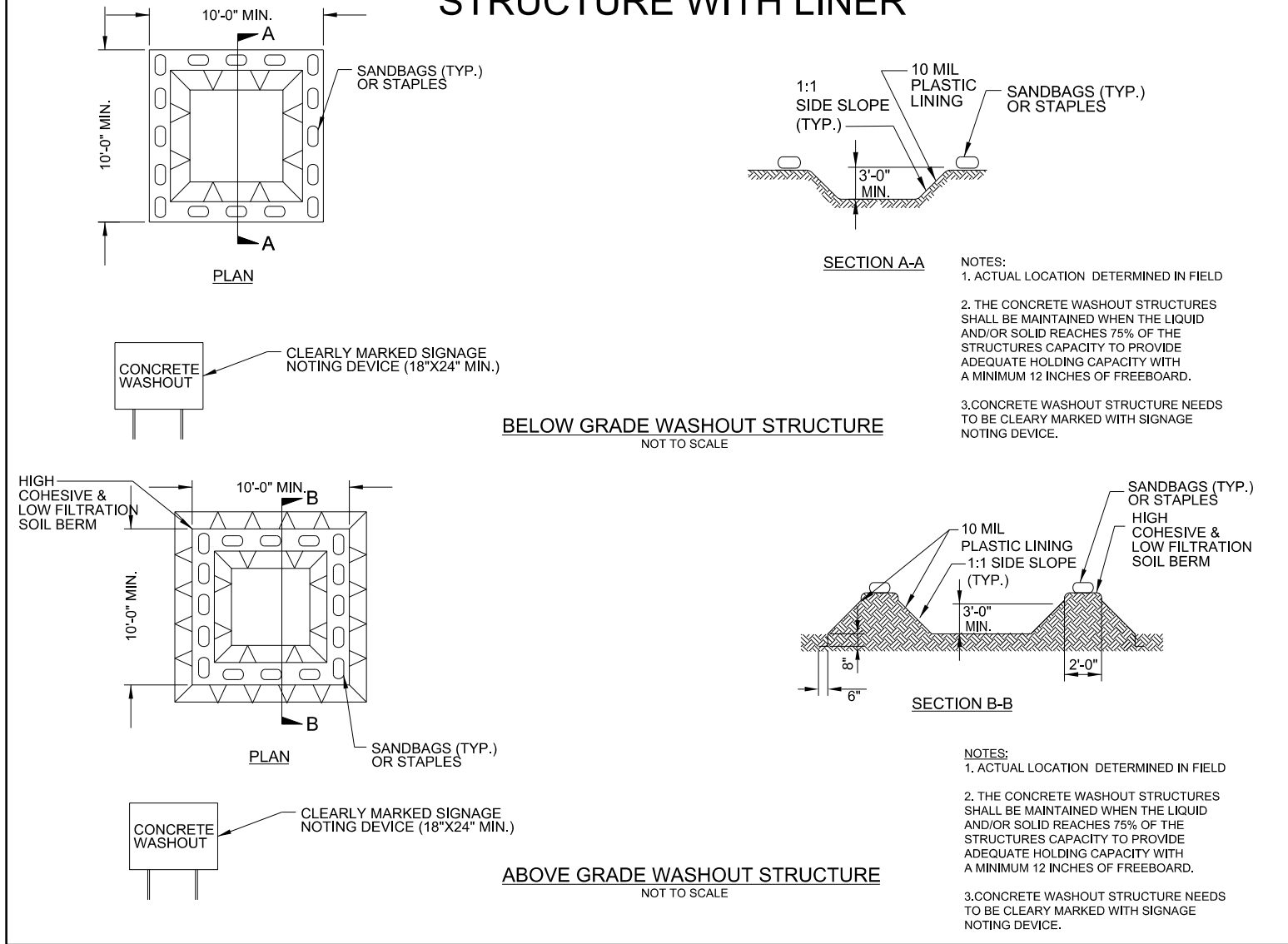


Erosion Control Quantities				
ITEM NUMBER	SECTION	TRNS-PORT ITEM DESCRIPTION	QUANTITY	UNIT
3656000000-E	876	GEOTEXTILE FOR DRAINAGE	360	SY
6000000000-E	1605	TEMPORARY SILT FENCE	170	LF
6006000000-E	1610	EROSION CONTROL STONE, CLASS A	75	TON
6012000000-E	1610	SEDIMENT CONTROL STONE	105	TON
6015000000-E	1615	TEMPORARY MULCHING	0.5	ACR
6018000000-E	1620	SEED FOR TEMPORARY SEEDING	100	LB
6021000000-E	1620	FERTILIZER FOR TEMPORARY SEEDING	0.5	TON
6024000000-E	1622	TEMPORARY SLOPE DRAINS	200	LF
6029000000-E	SP	SAFETY FENCE	260	LF
6036000000-E	1631	MATting FOR EROSION CONTROL	2000	SY
6037000000-E	1629	COIR FIBER MAT	100	SY
6042000000-E	1632	1/4" HARDWARE CLOTH	280	LF
6048000000-E	SP	FLOATING TURBIDITY CURTAIN	600	SY
6070000000-N	1639	SPECIAL STILLING BASINS	2	EA
6084000000-E	1660	SEEDING AND MULCHING	0.5	ACR
6087000000-E	1660	MOWING	0.5	ACR
6090000000-E	1661	SEED FOR REPAIR SEEDING	50	LB
6093000000-E	1661	FERTILIZER FOR REPAIR SEEDING	0.25	TON
6096000000-E	1662	SEED FOR SUPPLEMENTAL SEEDING	50	LB
6108000000-E	1665	FERTILIZER TOPDRESSING	0.25	TON
6114500000-N	1667	SPECIALIZED HAND MOWING	10	MHR
6117000000-N	1675	RESPONSE FOR EROSION CONTROL	25	EA
6117500000-N	SP	CONCRETE WASHOUT STRUCTURE	1	EA
6132000000-N	SP	GENERIC EROSION CONTROL ITEM - PREFABRICATED CONCRETE WASHOUT	3	EA

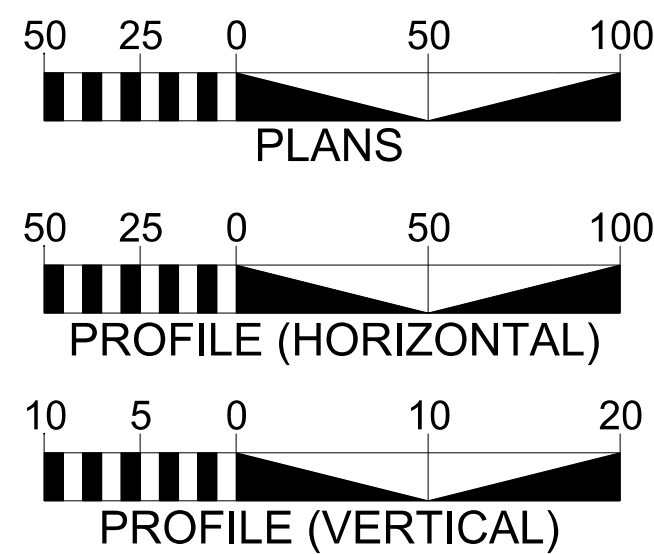
SOIL STABILIZATION TIMEFRAMES

SITE DESCRIPTION	STABILIZATION TIME	TIMEFRAME EXCEPTIONS
PERIMETER DIKES, SWALES, DITCHES AND SLOPES	7 DAYS	NONE
HIGH QUALITY WATER (HOW) ZONES	7 DAYS	NONE
SLOPES STEEPER THAN 3:1	7 DAYS	IF SLOPES ARE 10' OR LESS IN LENGTH AND ARE NOT STEEPER THAN 2:1, 14 DAYS ARE ALLOWED.
SLOPES 3:1 to 4:1	14 DAYS	7 DAYS FOR SLOPES GREATER THAN 50' IN LENGTH WITH SLOPES STEEPER THAN 4:1. 7 DAYS FOR PERIMETER DIKES, SWALES, DITCHES PERIMETER SLOPES, AND HOW ZONES
ALL OTHER AREAS WITH SLOPES FLATTER THAN 4:1	14 DAYS	7 DAYS FOR PERIMETER DIKES, SWALES, DITCHES PERIMETER SLOPES, AND HOW ZONES

ONSITE CONCRETE WASHOUT STRUCTURE WITH LINER



GRAPHIC SCALES



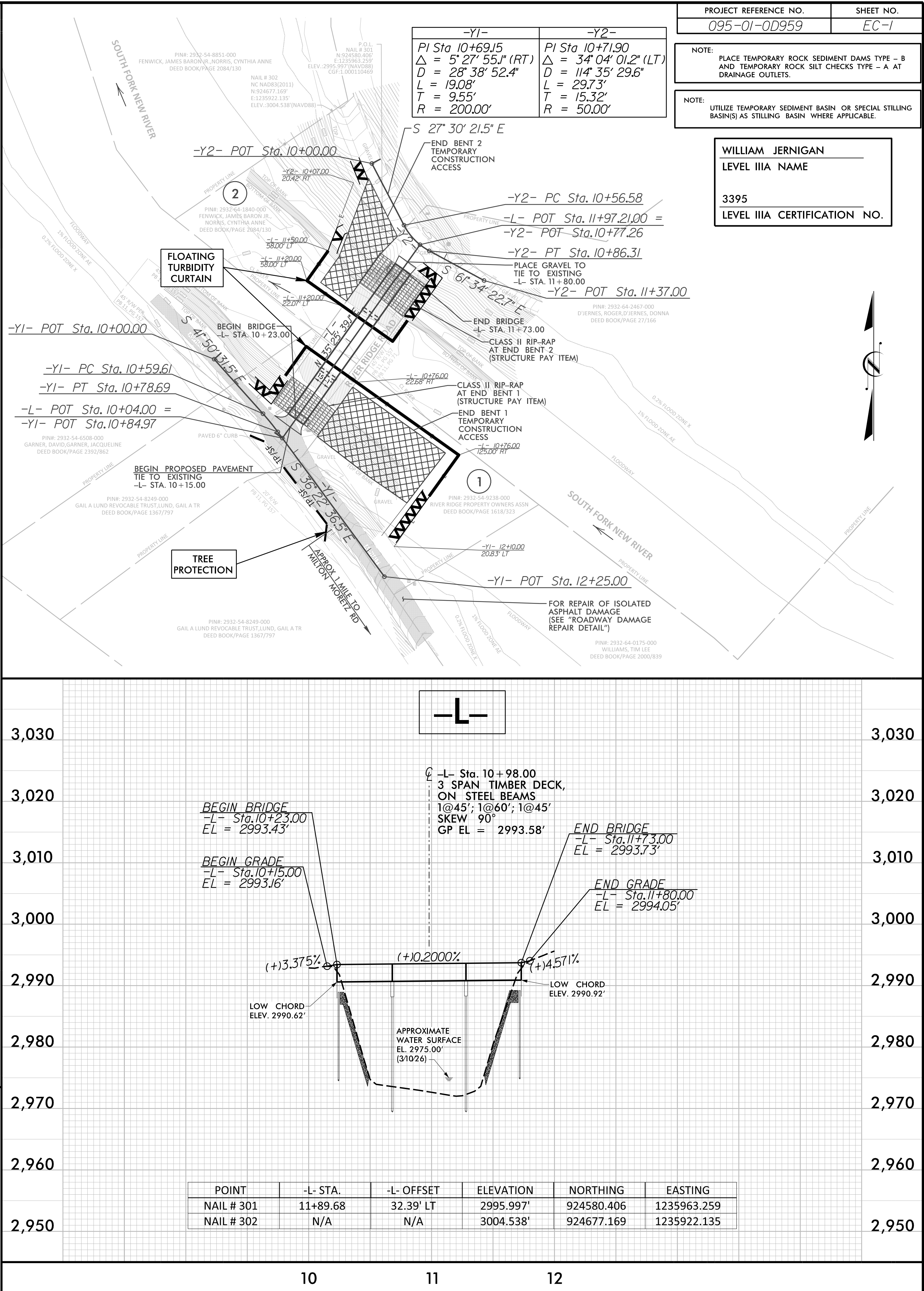
EROSION & SEDIMENT CONTROL LEGEND

Std. #	Description	Symbol
1605.01	Temporary Silt Fence	III III
1606.01	Special Sediment Control Fence	XXX
	Silt Fence/Tree Protection	---
1622.01	Temporary Berms and Slope Drains	--- ---
1630.02	Silt Basin Type B	XXX
1630.03	Temporary Silt Ditch	---
1630.04	Stilling Basin	XXX
1630.05	Temporary Diversion	TD
1630.06	Special Stilling Basin	XXX
1630.07	Skimmer Basin	XXX
1630.08	Tiered Skimmer Basin	XXX
1630.09	Earthen Dam with Skimmer	XXX
	Infiltration Basin	XXX
	Rock Inlet Sediment Trap:	
1632.01	Type A	A
1632.02	Type B	B
1632.03	Type C	C
1633.01	Temporary Rock Silt Check Type A	XXX
1633.02	Temporary Rock Silt Check Type B	---
1633.03	Temporary Rock Silt Check Type A with Excelsior Matting and Flocculant	XXX
1634.01	Temporary Rock Sediment Dam Type A	XXX
1634.02	Temporary Rock Sediment Dam Type B	XXX
1635.01	Rock Pipe Inlet Sediment Trap Type A	A
1635.02	Rock Pipe Inlet Sediment Trap Type B	B
1636.01	Excelsior Wattle Check	C
1636.01	Excelsior Wattle Check with Flocculant	C
1636.01	Coir Fiber Wattle Check	<
1636.01	Coir Fiber Wattle Check with Flocculant	<
1636.02	Silt Fence Excelsior Wattle Break	EW
	Silt Fence Coir Fiber Wattle Break	CFW
1636.03	Excelsior Wattle Barrier	EW-EW-EW
1636.03	Coir Fiber Wattle Barrier	CFW-CFW-CFW

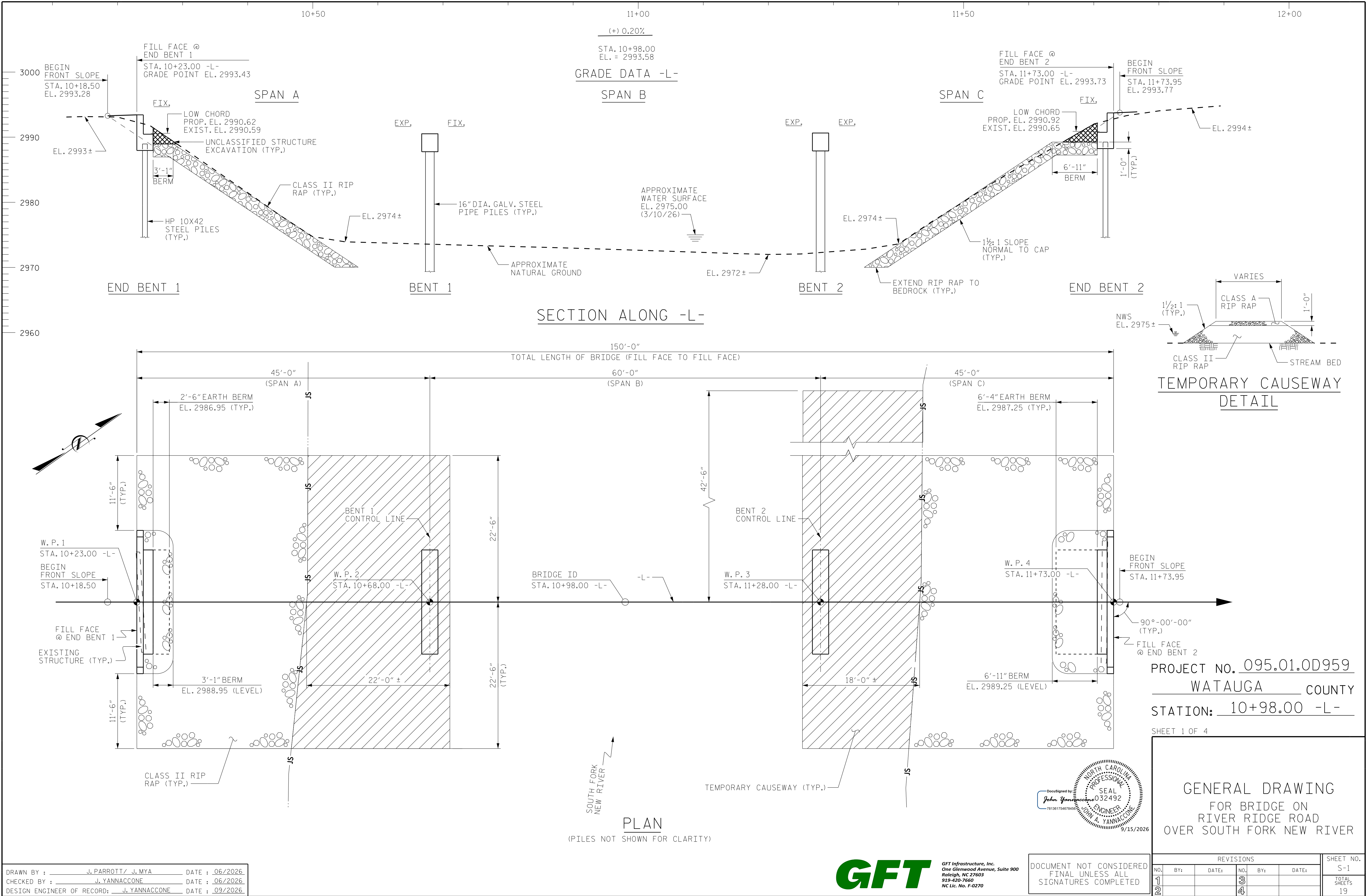
PREPARED BY

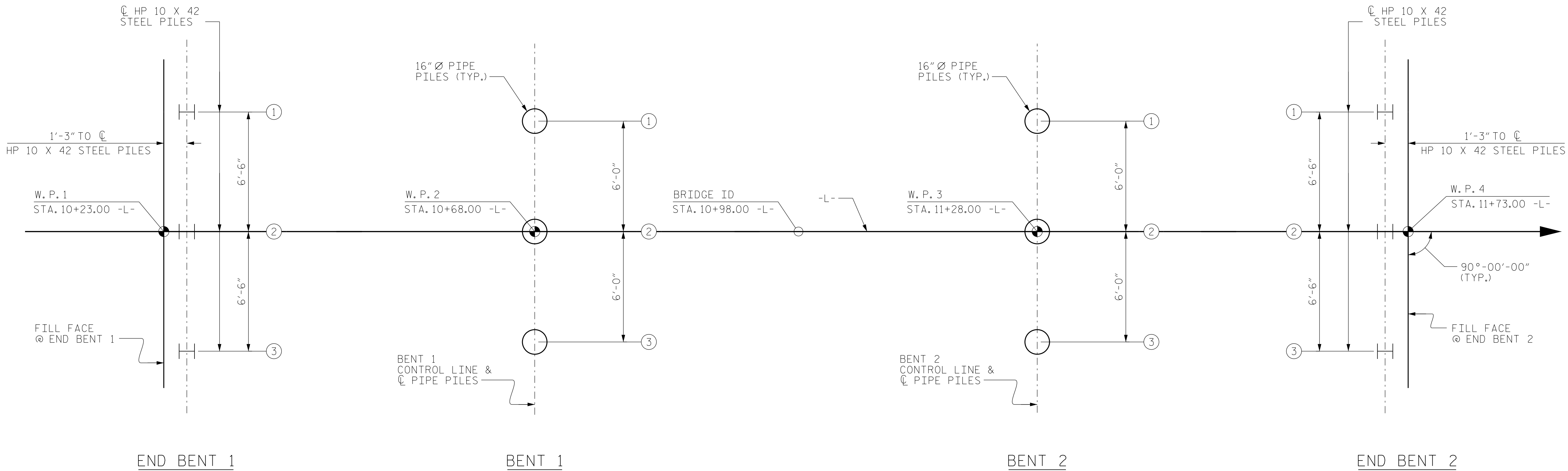
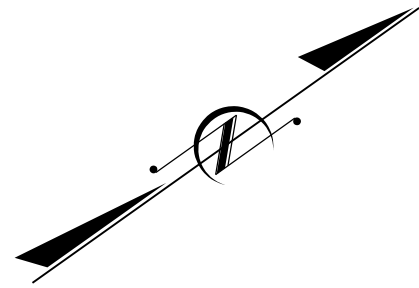


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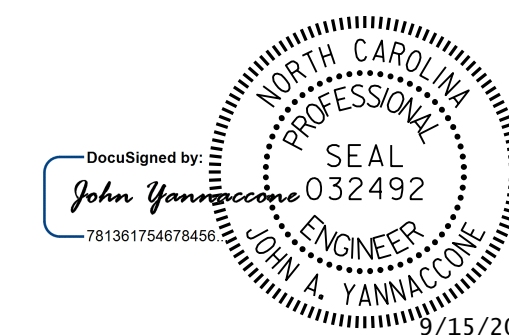


FOUNDATION LAYOUT

DIMENSIONS LOCATING END BENT PILES AND BENT PIPE PILES ARE SHOWN TO THE CENTERLINE OF PILES AND PIPE PILES.

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
STATION: 10+98.00 -L-

SHEET 2 OF 4



GENERAL DRAWING
FOR BRIDGE ON
RIVER RIDGE ROAD
OVER SOUTH FORK NEW RIVER

DRAWN BY : J. MYA DATE : 06/2026
CHECKED BY : J. YANNACCONE DATE : 06/2026
DESIGN ENGINEER OF RECORD: J. YANNACCONE DATE : 09/2026



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NO.	BY:	DATE:	NO.	BY:	DATE:	S-2
1			3			TOTAL SHEETS
2			4			19

(Blank entries indicate item is not applicable to structure)

$$*RDR = \frac{\text{Factored Resistance} + \text{Factored Drag Load} + \text{Factored Dead Load}}{\text{Dynamic Resistance Factor}} + \text{Nominal Drag Load Resistance} + \text{Nominal Resistance from Scourable Material}$$

PILE DESIGN INFORMATION
(Blank entries indicate item is not applicable to structure)

* Factored Dead Load is factored weight of pile above the ground line.

SHEET 3 OF 4

1. The Pile Foundation Tables are based on the bridge substructure design and foundation recommendations sealed by a North Carolina Professional Engineer (Mikel W. Shipman, #054501) on 09-03-2026.
2. Total Pile Driving Equipment Setup quantity (not shown in Pile Foundation Tables) equals the number of driven piles, i.e., the number of piles with a Required Driving Resistance.
3. The Engineer may adjust the quantity for DPT Testing, Pipe Pile Plates, Permanent Steel Casing, SPTs, TIPs, CSL Testing, SID Inspections and PITs when necessary.
4. For Piles, see Section 450 of the Standard Specifications.
5. Piles at End Bent No. 1 must be installed to a minimum tip elevation of 2978.0 ft in order to obtain sufficient lateral resistance.
6. Piles at Bent Nos. 1 and 2 must be installed to a minimum tip elevation of 2964.0 ft in order to obtain sufficient lateral resistance.
7. Piles at End Bent No. 2 must be installed to a minimum tip elevation of 2978.3 ft in order to obtain sufficient lateral resistance.
8. Fill holes for Pile Excavation at End Bent Nos. 1 and 2 with concrete or grout.
9. Fill holes for Pile Excavation at Bent Nos. 1 and 2 with concrete or grout.

	PILE AND DRILLED PIER FOUNDATION TABLES																										
DocuSigned by:  9/15/2026 781361756878456 SIGNATURE DATE	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="6" style="text-align: center;">REVISIONS</th> <th style="text-align: center;">SHEET NO. S-3</th> </tr> <tr> <th style="width: 10%;">NO.</th> <th style="width: 10%;">BY:</th> <th style="width: 10%;">DATE:</th> <th style="width: 10%;">NO.</th> <th style="width: 10%;">BY:</th> <th style="width: 10%;">DATE:</th> <th rowspan="3" style="text-align: center; vertical-align: middle;">TOTAL SHEETS 19</th> </tr> <tr> <td style="text-align: center;">1</td> <td></td> <td></td> <td style="text-align: center;">3</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">2</td> <td></td> <td></td> <td style="text-align: center;">4</td> <td></td> <td></td> </tr> </table>	REVISIONS						SHEET NO. S-3	NO.	BY:	DATE:	NO.	BY:	DATE:	TOTAL SHEETS 19	1			3			2			4		
REVISIONS						SHEET NO. S-3																					
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2			4																								
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PHOTOS OF EXISTING SITE CONDITIONS

NOTES:

ASSUMED LIVE LOAD = HS-20.

THIS BRIDGE HAS BEEN DESIGNED IN ACCORDANCE WITH THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS EXCEPT AS NOTED.

IMPACT ALLOWANCE = 15%

MULTIPLE PRESENCE FACTOR = 1.0

EXCEPT AS MAY OTHERWISE BE SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, ALL MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE 2024 "STANDARD SPECIFICATIONS FOR ROADS AND STRUCTURES" OF THE N.C. DEPARTMENT OF TRANSPORTATION, WHICH WILL BE REFERENCED IN THE PLANS AS THE STANDARD SPECIFICATIONS.

UNLESS OTHER REQUIRED ON THE PLANS, CLASS A CONCRETE SHALL
BE USED FOR ALL PORTIONS OF THE STRUCTURE.

UNLESS OTHERWISE NOTED ON THE PLANS, ALL EXPOSED CORNERS ON THE STRUCTURE SHALL BE CHAMFERED $\frac{3}{4}$ ".

THE BRIDGE SHALL BE ON THE GRADE OR VERTICAL CURVE SHOWN
ON THE PLANS.

ALL REINFORCING STEEL SHALL BE DEFORMED. DIMENSIONS RELATIVE TO PLACEMENT OF REINFORCING ARE TO CENTERS OF BARS UNLESS OTHERWISE INDICATED IN THE PLANS. DIMENSIONS ON BAR DETAILS ARE TO CENTERS OF BARS OR ARE OUT TO OUT AS INDICATED ON PLANS.

WIRE BAR SUPPORTS SHALL BE PROVIDED FOR REINFORCING STEEL WHERE INDICATED ON THE PLANS. WHEN BAR SUPPORT PIECES ARE PLACED IN CONTINUOUS LINES, THEY SHALL BE SO PLACED THAT THE ENDS OF THE SUPPORTING WIRES SHALL BE LAPPED TO LOCK LEGS ON ADJOINING PIECES.

WITH THE SOLE EXCEPTION OF EDGES AT SURFACES WHICH BEAR ON OTHER SURFACE, ALL SHARP EDGES AND ENDS OF SHAPES AND PLATES SHALL BE SLIGHTLY ROUNDED BY SUITABLE MEANS TO A RADIUS OF APPROXIMATELY $\frac{1}{16}$ " OR EQUIVALENT FLAT SURFACE AT A SUITABLE ANGLE PRIOR TO PAINTING, GALVANIZING OR METALLIZING.

FOR TIMBER MEMBERS, ALL TIMBER AND LUMBER SHALL BE TREATED No.1 SOUTHERN PINE AND CONFORM TO SECTION 1082 OF THE STANDARD SPECIFICATIONS.

THE MATERIAL SHOWN IN THE CROSS-HATCHED AREA SHALL BE
EXCAVATED FOR A DISTANCE OF 12 FT. EACH SIDE OF CENTERLINE
ROADWAY AS DIRECTED BY THE ENGINEER. THIS WORK WILL BE
PAID FOR AT THE CONTRACT LUMP SUM PRICE FOR UNCLASSIFIED
STRUCTURE EXCAVATION, SEE SECTION 412 OF THE STANDARD
SPECIFICATIONS.

BRIDGE COORDINATES	
LATITUDE	LONGITUDE
36°-15'-45.6"	81°-35'-30.8"

LRFR RATING SUMMARY		
	VEHICLE	RATING FACTOR
INVENTORY	HS-20	1.51
	EV2	1.78
	EV3	1.17
OPERATING	HS-20	1.96
	EV2	2.31
	EV3	1.51

TOTAL BILL OF MATERIAL																
	CONSTRUCTION, MAINTENANCE AND REMOVAL OF TEMPORARY ACCESS	UNCLASSIFIED STRUCTURE EXCAVATION AT STA. 10+98.00 -L-	PILE EXCAVATION IN SOIL	PILE EXCAVATION NOT IN SOIL	CLASS A CONCRETE	REINFORCING STEEL	HP 10X42 STEEL PILES		PP 16X0.50 GALVANIZED STEEL PILES		APPROX. 89,975 LBS STRUCTURAL STEEL	RIP RAP CLASS II (2'-0" THICK)	GEOTEXTILE FOR DRAINAGE	ELASTOMERIC BEARINGS	TIMBER BRIDGE DECK SYSTEM	TIMBER BRIDGE RAIL SYSTEM
	LUMP SUM	LUMP SUM	LIN. FT.	LIN. FT.	CU. YDS.	LBS.	NO.	LIN. FT.	NO.	LIN. FT.	LUMP SUM	TONS	SQ. YDS.	LUMP SUM	LUMP SUM	LIN. FT.
SUPERSTRUCTURE											LUMP SUM			LUMP SUM	LUMP SUM	296
END BENT 1		LUMP SUM	24.6	5.4	6.7	1,049	3	45				190	210			
BENT 1			6.0	18.0	3.6	937			3	90						
BENT 2			6.0	18.0	3.6	937			3	90						
END BENT 2		LUMP SUM	21.3	8.7	6.7	1,049	3	45				200	220			
TOTAL	LUMP SUM	LUMP SUM	57.9	50.1	20.6	3,972	6	90	6	180	LUMP SUM	390	430	LUMP SUM	LUMP SUM	296

PROJECT NO. 095.01.0D959

WATAUGA COUNTY

STATION: 10+98.00 -L-

SHEET 4 OF 4

GENERAL DRAWING
FOR BRIDGE ON
RIVER RIDGE ROAD
OVER SOUTH FORK NEW RIVER

DRAWN BY : J. PARROTT DATE : 06/2026
 CHECKED BY : J. YANNACCON DATE : 06/2026
 DESIGN ENGINEER OF RECORD: J. YANNACCON DATE : 09/2026

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NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		

SHEET NO.	S-4
TOTAL SHEETS	19

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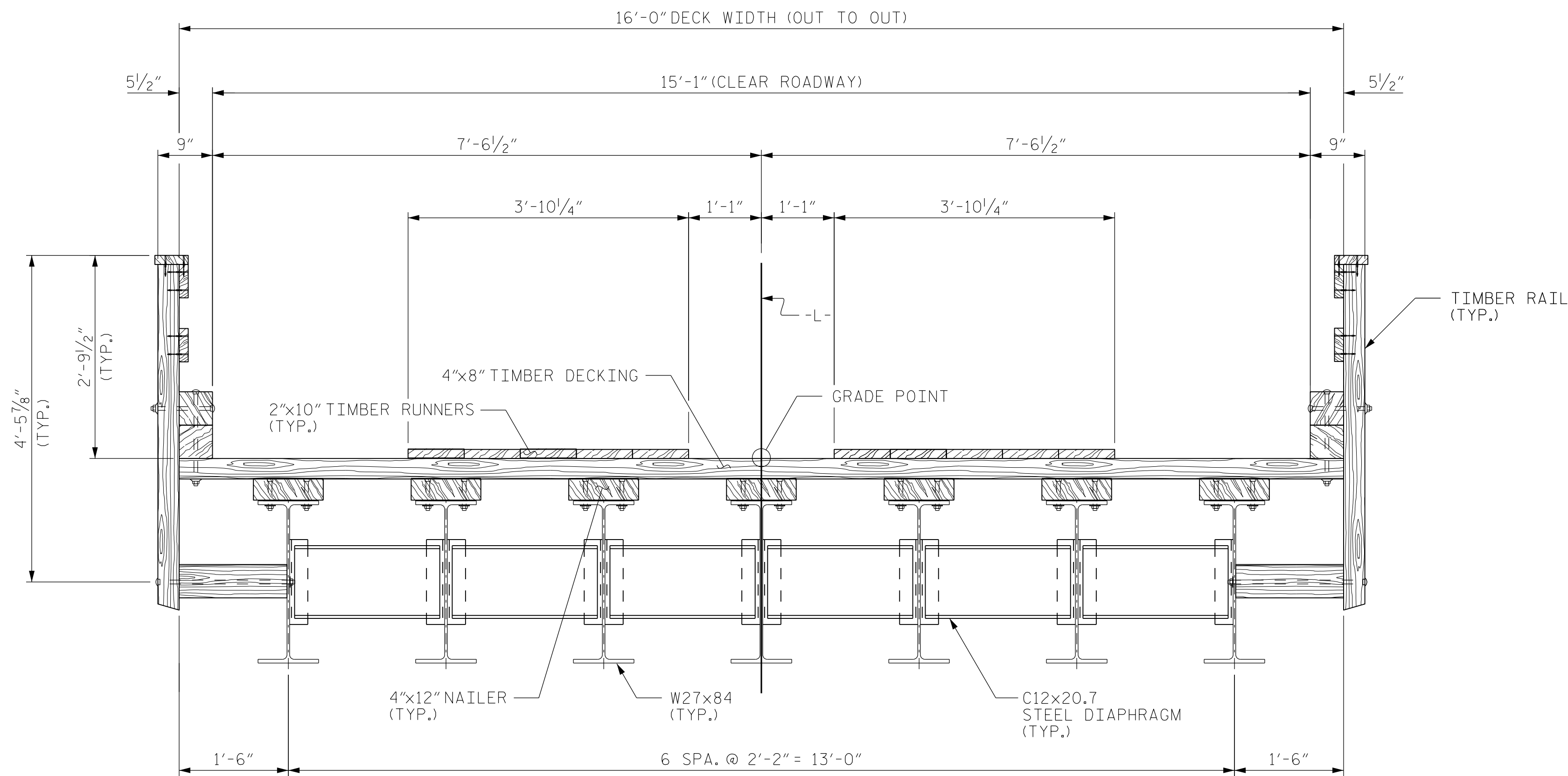
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Raleigh, NC 27603
919-420-7660
NC Lic. No. F-0270

DocuSigned by:
John Yannaccone
781361754678456

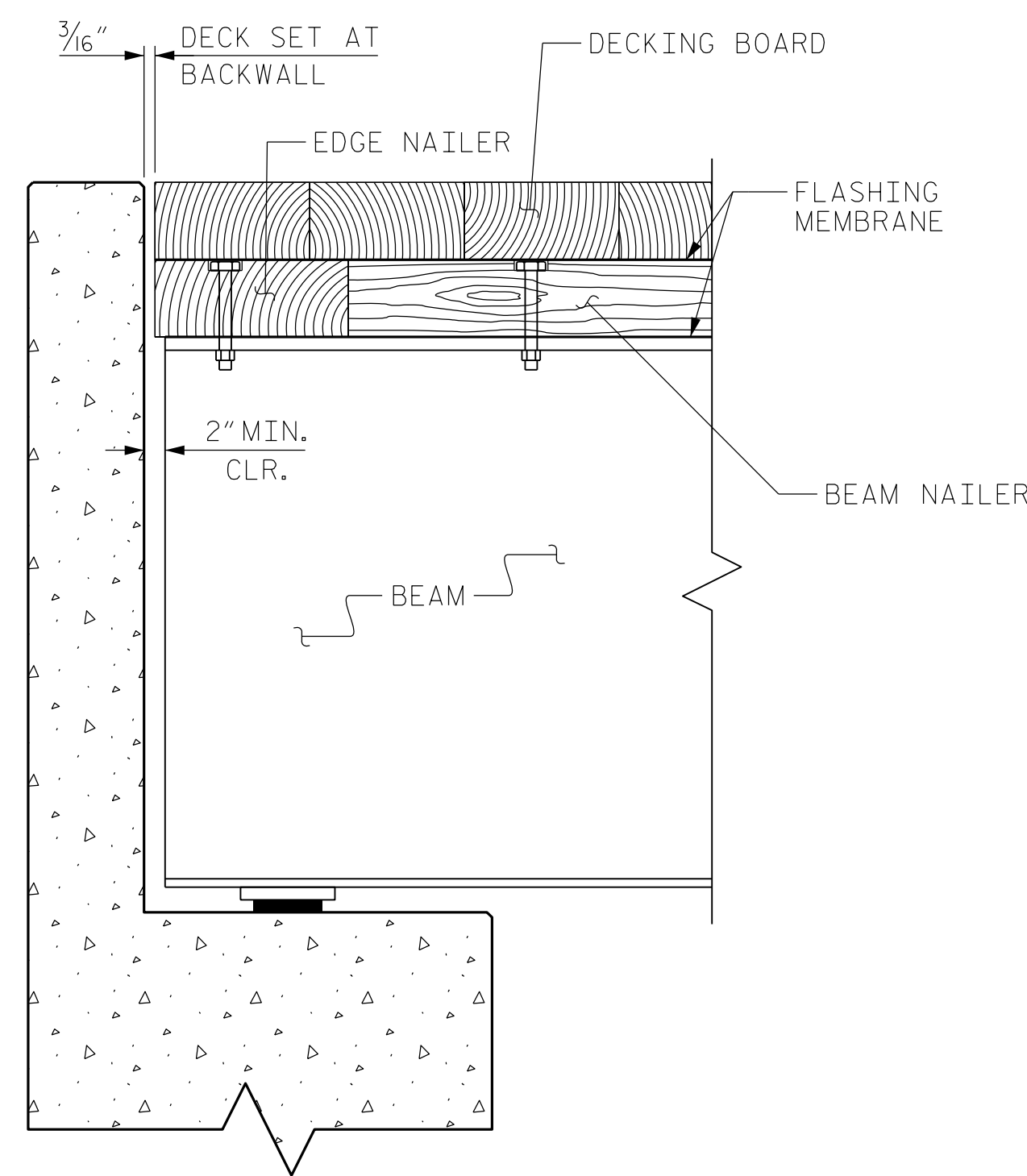
NORTH CAROLINA
PROFESSIONAL
SEAL
032492
ENGINEER
JOHN A. YANNAKONE

9/15/2026

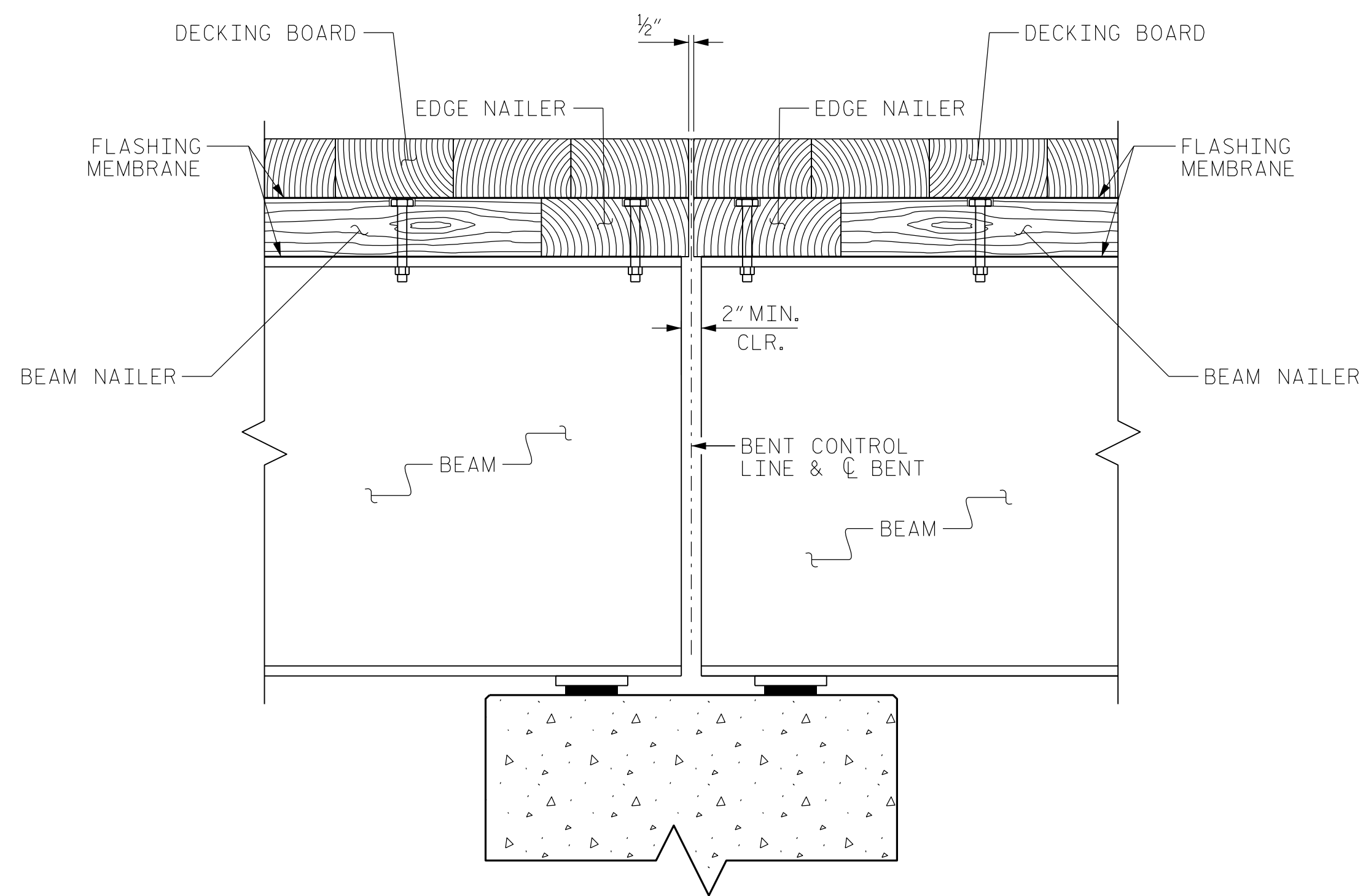
pw:/g/fnet-pw.bentley.com/gfnet-pw-01/Documents/Projects/67945/5-Working/Task 014 - SMU 2023 Timber Bridges (0BD)/Structures/CAD/5.0 River Ridge Road/401.009_BR-0D959_SMU_TS_S05.0D959 9/15/2026 12:00:48 PM Raleigh PDF Creator (Full)ptcfgr Timber.tbl



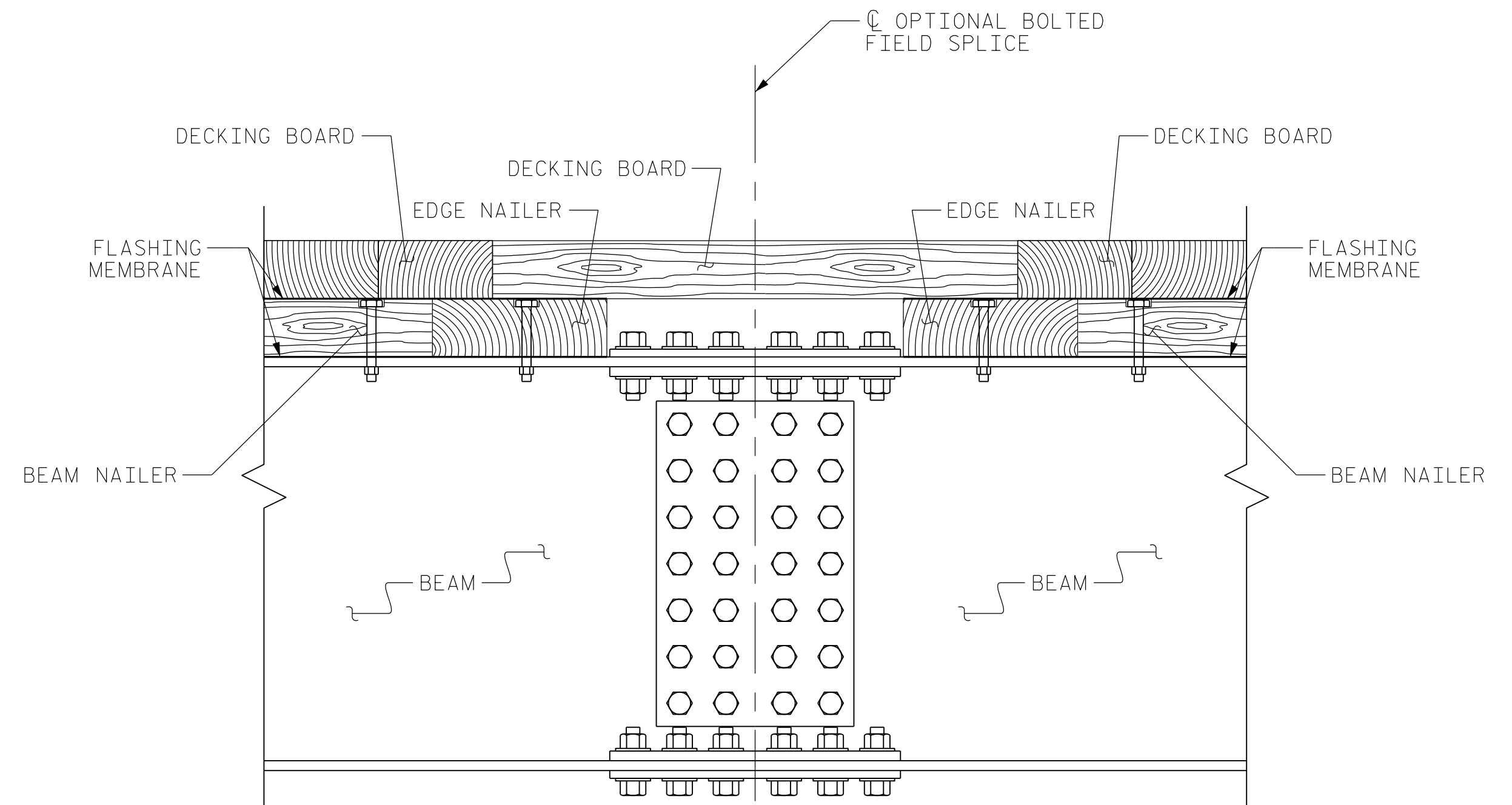
TYPICAL SECTION
(SIMPLE SPAN)



SECTION AT END BENT



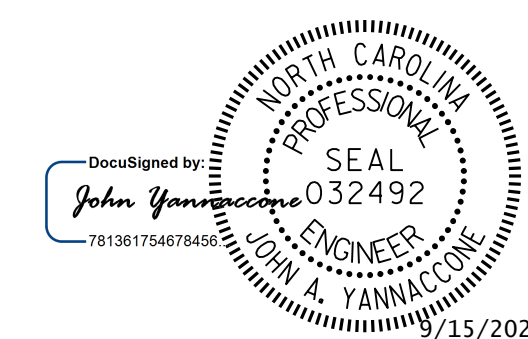
SECTION AT BENT



SECTION AT OPTIONAL
BOLTED FIELD SPLICE

NOTES:
FOR TIMBER DECK LAYOUT AND PLACEMENT OF MOISTURE CONTROL FLASHING MEMBRANE, SEE "TIMBER DECK LAYOUT" SHEET.

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
STATION: 10+98.00 -L-



TYPICAL SECTION

DRAWN BY : J. HARRIS DATE : 06/2026
CHECKED BY : J. YANNACCONE DATE : 06/2026
DESIGN ENGINEER OF RECORD: J. YANNACCONE DATE : 09/2026

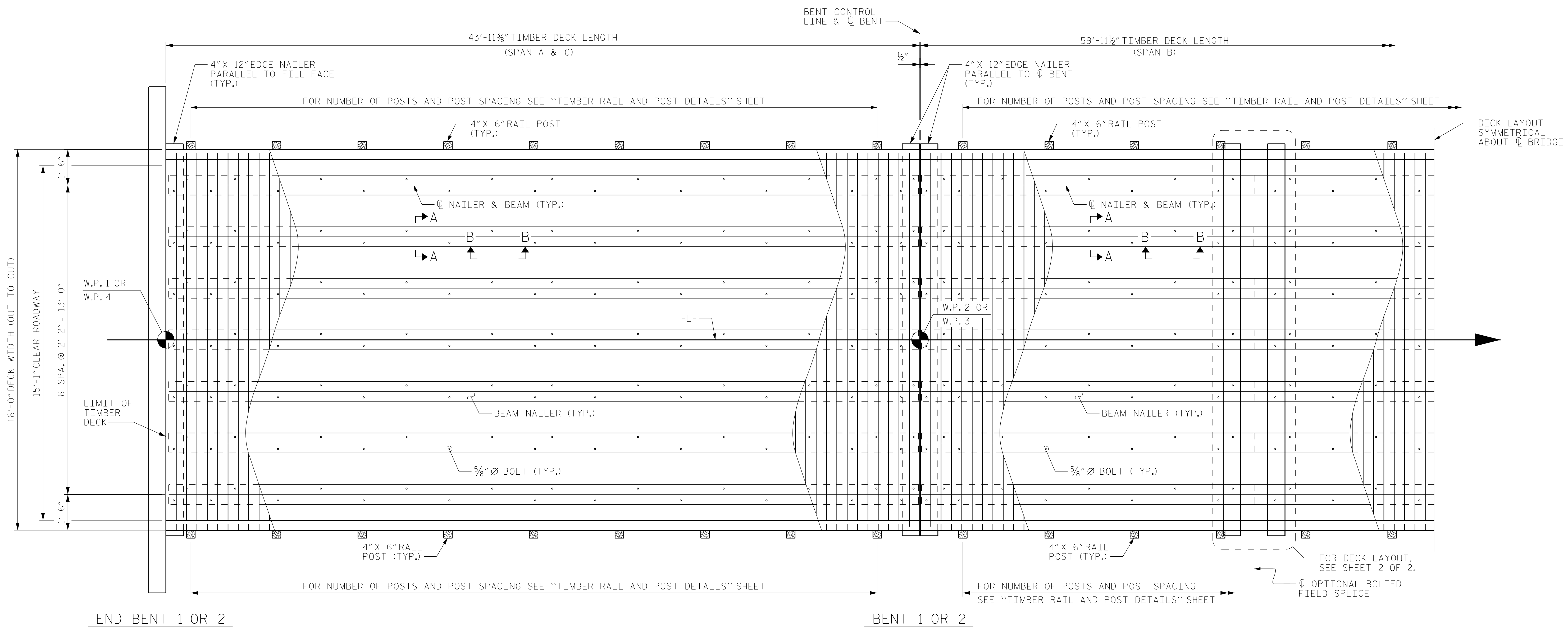
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NO.	BY:	DATE:	NO.	BY:	DATE:	S-5
1			3			TOTAL SHEETS
2			4			19

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DECK LAYOUT

(DIAPHRAGMS NOT SHOWN FOR CLARITY)

BILL OF MATERIAL									
BRIDGE DECK SYSTEM									
SPAN A OR C					SPAN B				
ITEM		SIZE		QUANTITY	ITEM		SIZE		QUANTITY
EDGE NAILERS		4" X 12"		32 LF	EDGE NAILERS		4" X 12"		64 LF
BEAM NAILERS		4" X 12"		295 LF	BEAM NAILERS		4" X 12"		386 LF
DECK BOARDS		4" X 8"		1,168 LF	DECK BOARDS		4" X 8"		1,601 LF
RUNNING BOARDS		2" X 10"		440 LF	RUNNING BOARDS		2" X 10"		570 LF
FLASHING MEMBRANE		25 MILS		562 SF	FLASHING MEMBRANE		25 MILS		741 SF
BRIDGE DECK SYSTEM		703 SF			BRIDGE DECK SYSTEM		911 SF		
HARDWARE					HARDWARE				
ITEM	NO.	SIZE	LENGTH	WEIGHT (LBS)	ITEM	NO.	SIZE	LENGTH	WEIGHT (LBS)
LOCK WASHERS	147	5/8" Ø	-	4	LOCK WASHERS	203	5/8" Ø	-	5
STD. WASHERS	294	5/8" Ø	-	24	STD. WASHERS	406	5/8" Ø	-	33
HEAVY HEX BOLTS	147	5/8" Ø	6"	89	HEAVY HEX BOLTS	203	5/8" Ø	6"	122
HEAVY HEX NUTS	147	5/8" Ø	-	18	HEAVY HEX NUTS	203	5/8" Ø	-	25
HARDWARE (BOLTS AND WASHERS)			135 LBS.		HARDWARE (BOLTS AND WASHERS)			185 LBS.	
FLAT HEAD STRUCTURAL SCREWS		0.275" Ø	6"	65	FLAT HEAD STRUCTURAL SCREWS		0.275" Ø	6"	90
HARDWARE (FLAT HEAD STRUCTURAL SCREWS)			65 LBS.		HARDWARE (FLAT HEAD STRUCTURAL SCREWS)			90 LBS.	

NOTE: TIMBER BOARD LENGTHS SHOWN ARE THE NET BOARD LENGTHS (AFTER CUTS) INCORPORATED IN THE STRUCTURE.



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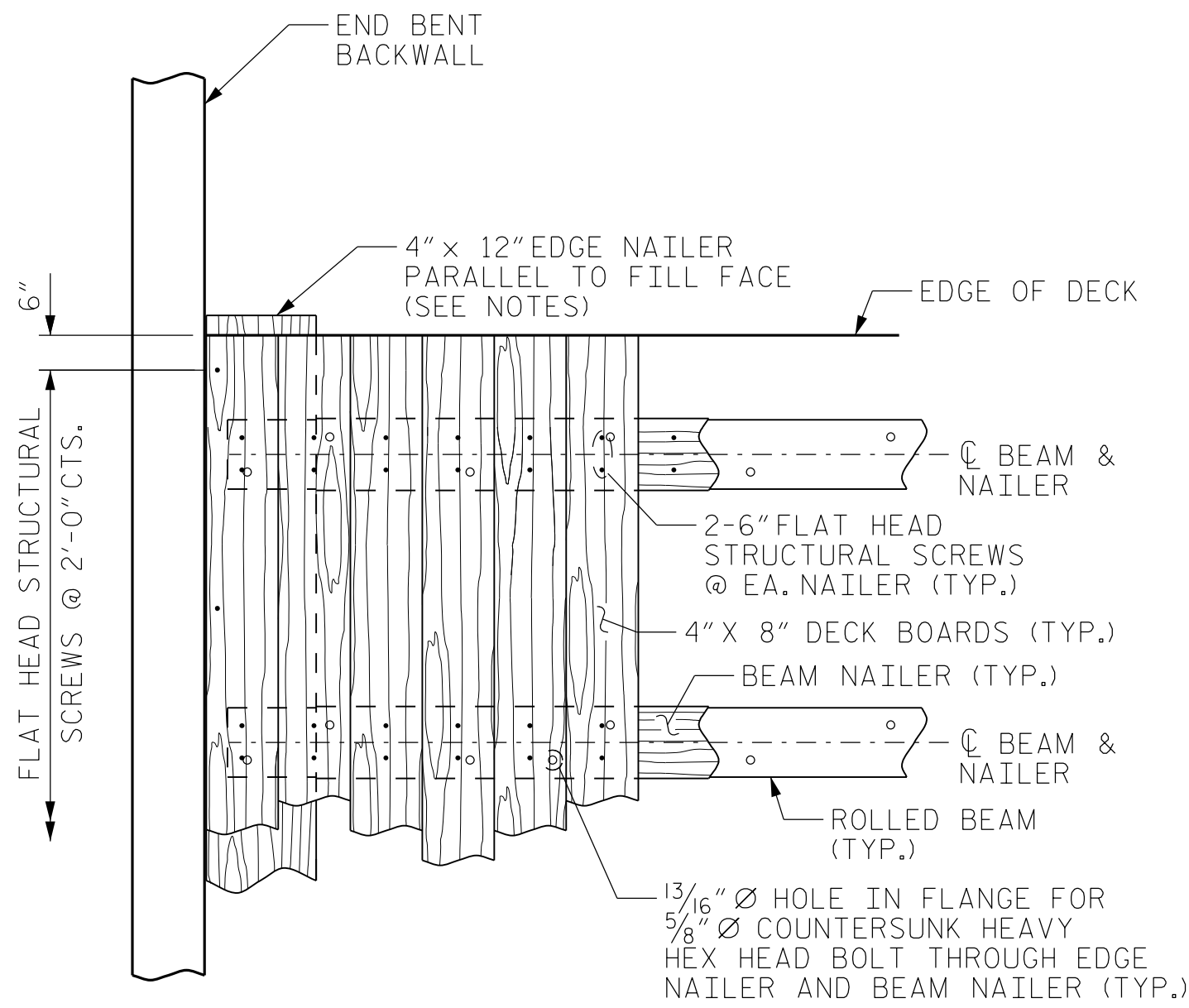
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WATAUGA COUNTY
STATION: 10+98.00 -L-

SHEET 1 OF 2

TIMBER DECK LAYOUT

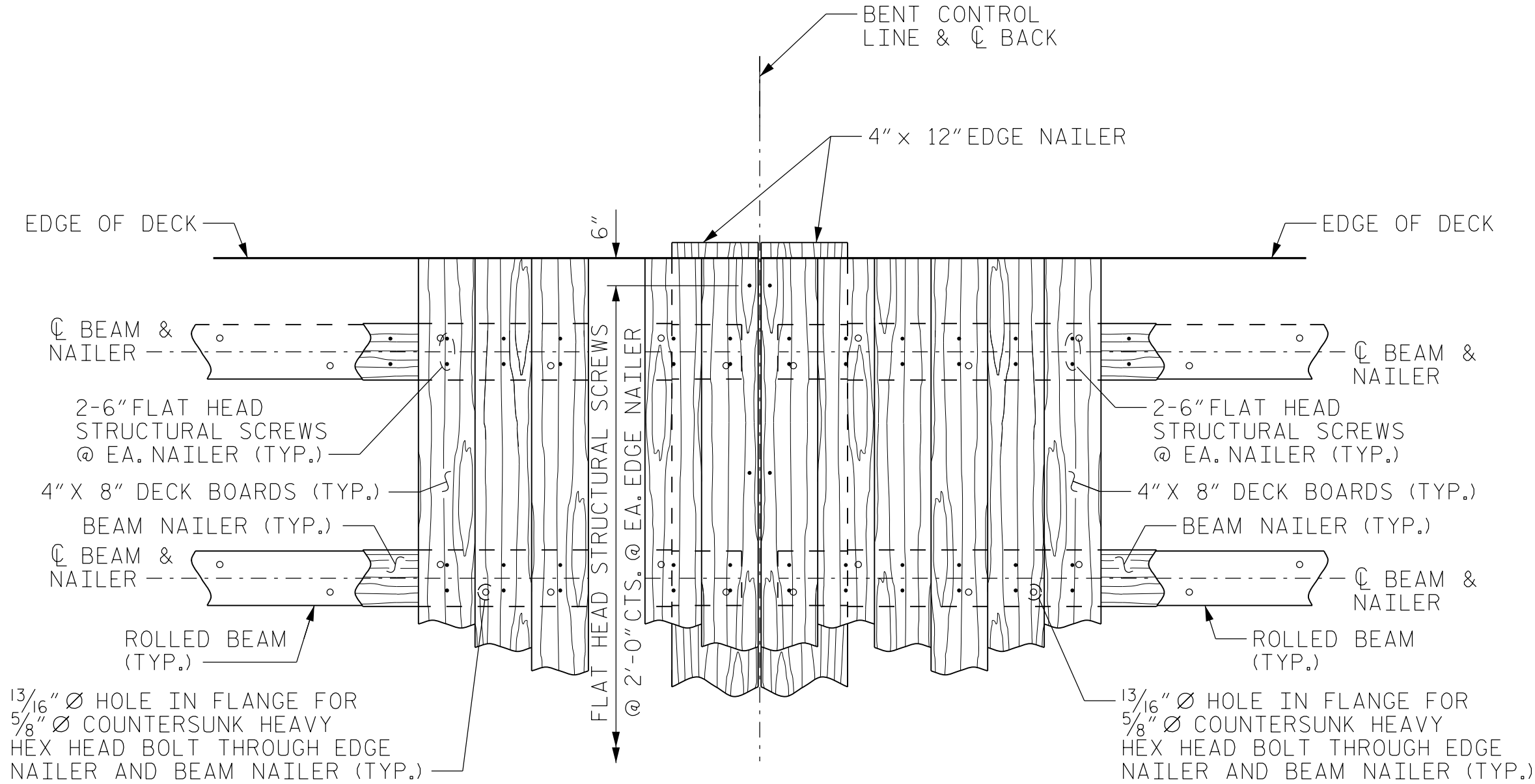
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NO.	BY:	DATE:	NO.	BY:	DATE:	
1			3			S-6
2			4			TOTAL SHEETS 19



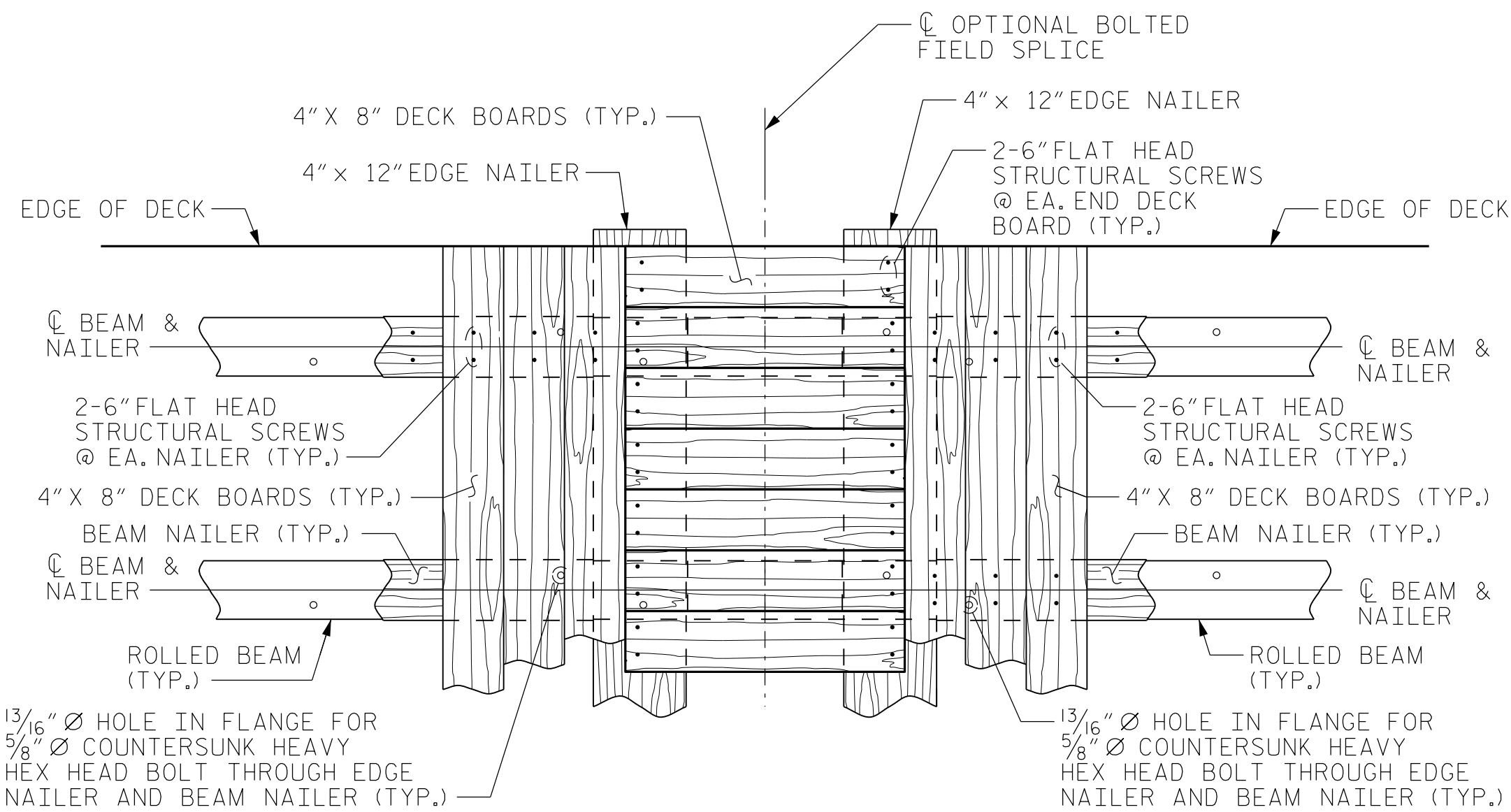
TYPICAL DECK
DETAIL AT END BENT

NOTES:
DECK BOARDS CUT ALONG THE SKEW SHALL BE ATTACHED TO THE EDGE NAILER WITH FLATHEAD STRUCTURAL SCREWS PLACED AS SHOWN IN SECTION C-C.

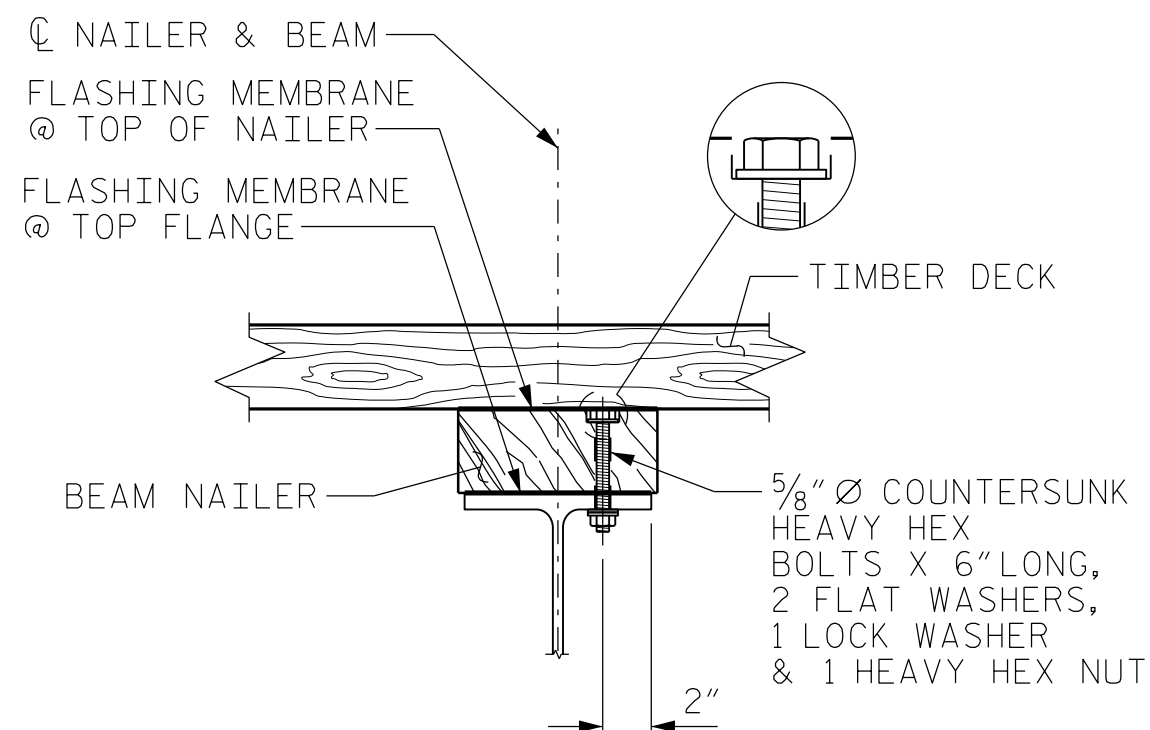
PRE-DRILL HOLES AS NEEDED TO ELIMINATE SPLITTING.



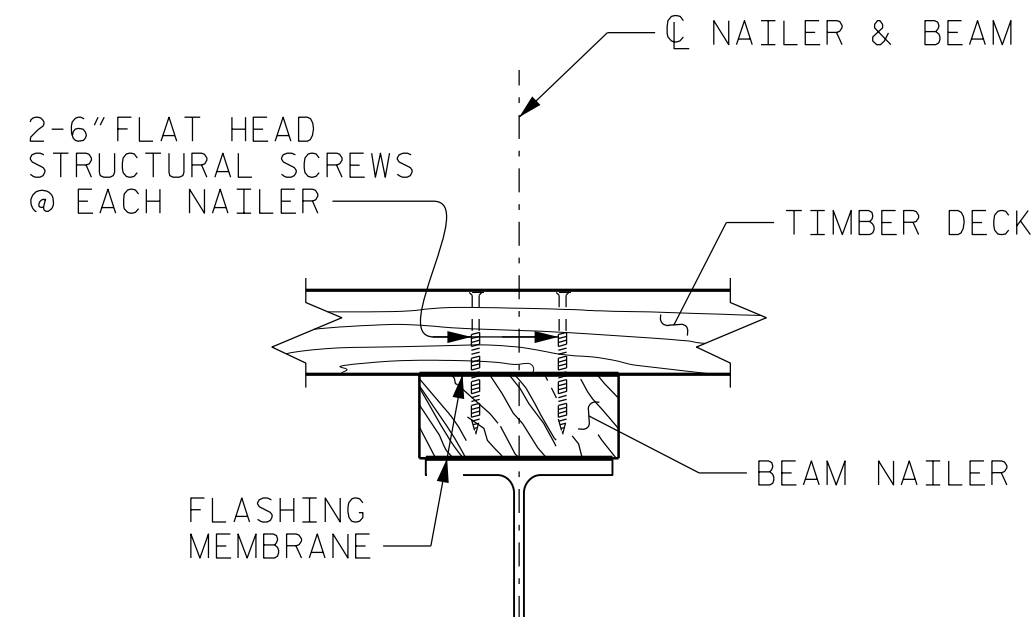
TYPICAL DECK
DETAIL AT BENT



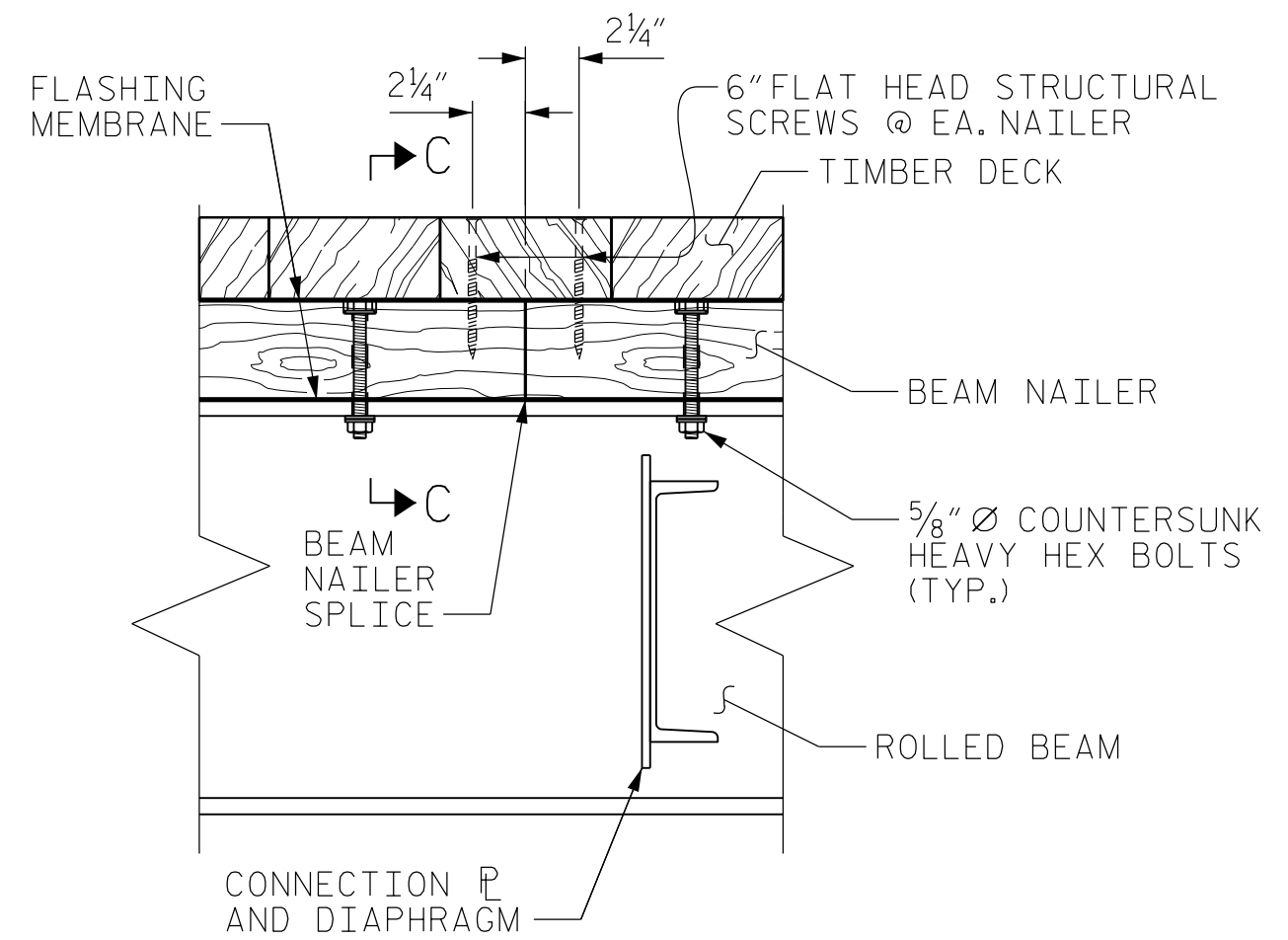
DECK DETAIL AT
OPTIONAL BOLTED FIELD SPLICE



SECTION A-A



SECTION C-C



SECTION B-B

NOTES:

SEE BEAM DETAILS FOR SPACING OF HEAVY HEX BOLTS IN TOP FLANGE OF ROLLED BEAM.

THE BRIDGE SKEW SHOWN IN THE DECK LAYOUT IS FOR ILLUSTRATION ONLY. FOR ACTUAL BRIDGE SKEW, SEE THE "GENERAL DRAWING" SHEET.

TRIM THE EDGE NAILER FLUSH WITH THE EDGE OF DECK.

DECK BOARD WIDTHS MAY BE CUT DOWN TO 6" (MIN.) TO FIT WITHIN LIMITS OF TIMBER DECK. ALL DECK BOARDS ATTACHED TO THE EDGE NAILER SHALL BE FULL WIDTH. CUT BOARDS WILL NOT BE PERMITTED TO BE PLACED ADJACENT TO ONE ANOTHER.

FOR TIMBER BRIDGE DECK SYSTEM INCLUDING LUMBER, HARDWARE FOR BOLT CONNECTIONS, HARDWARE FOR SCREW CONNECTIONS, AND FLASHING MEMBRANE, SEE TIMBER BRIDGE DECK ON STEEL BEAMS SPECIAL PROVISION.

PRIOR TO PLACING TIMBER NAILER MEMBERS, PLACE A SELF-ADHERING HIGH-DENSITY POLYETHYLENE RUBBERIZED ASPHALT ADHESIVE FLASHING MEMBRANE TO THE TOP SIDE OF THE STEEL BEAMS.

* REFERENCE DESIGN VALUES FOR VISUALLY GRADED SOUTHERN PINE (NO. 1 DENSE) DIMENSION LUMBER:

F_{bo} (FLEXURE) = 1,350 PSI
F_{vo} (SHEAR) = 175 PSI
E_o (MODULUS OF ELASTICITY) = 1,800,000 PSI

* SOURCE: NATIONAL DESIGN SPECIFICATION (NDS) FOR WOOD CONSTRUCTION (2018 SUPPLEMENT).

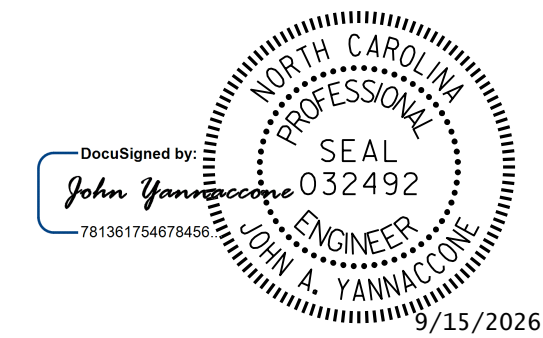
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SHEET 2 OF 2

TIMBER DECK LAYOUT DETAILS



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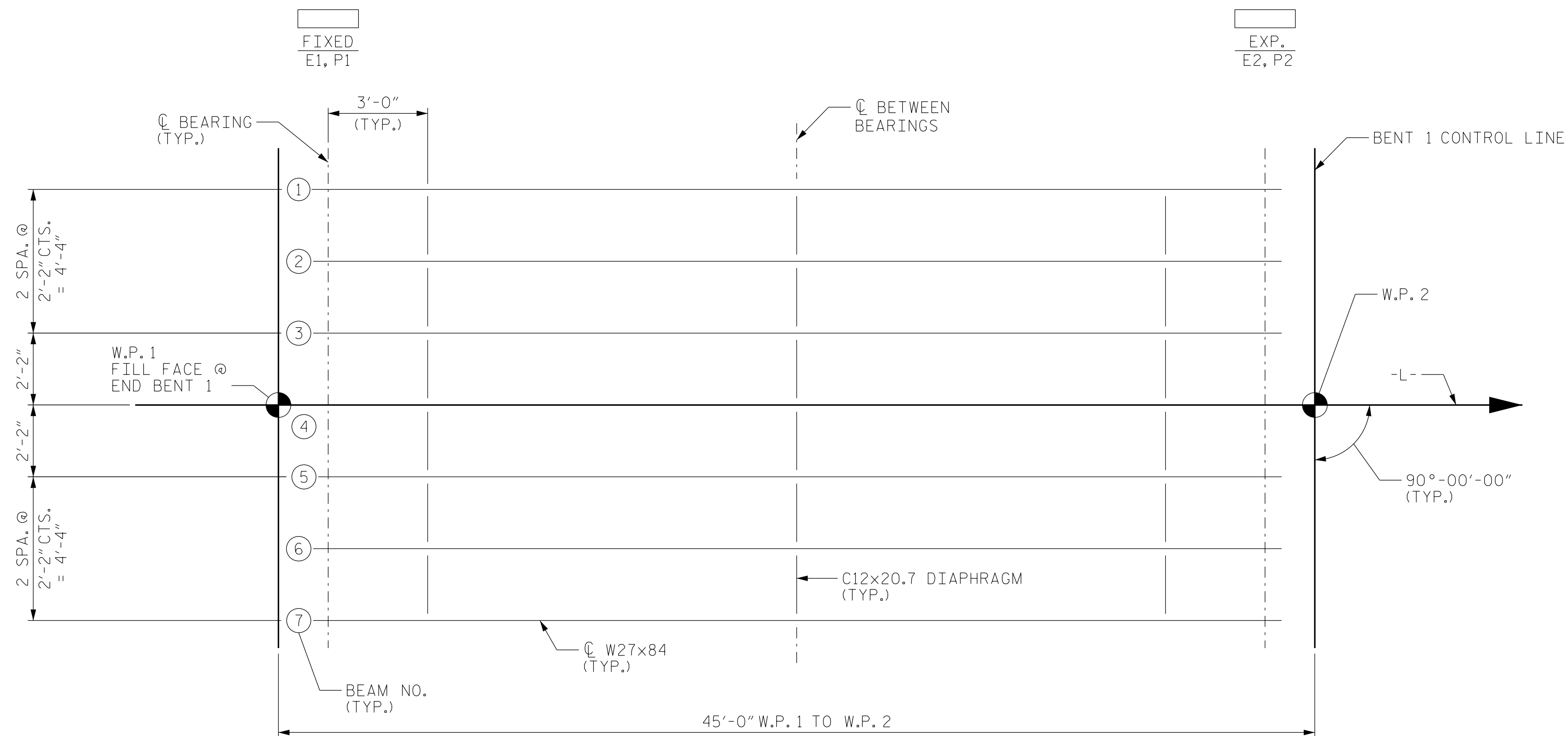
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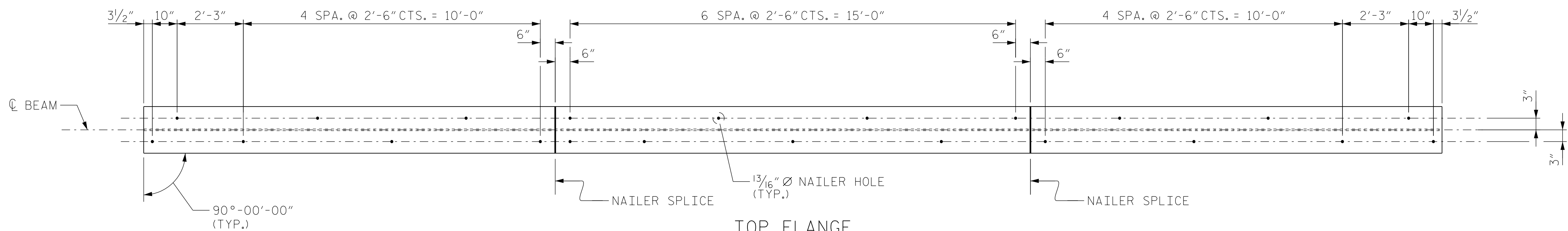
DRAWN BY : J. HARRIS/J. MYA DATE : 06/2026
CHECKED BY : J. YANNACCONE DATE : 06/2026
DESIGN ENGINEER OF RECORD: J. YANNACCONE DATE : 09/2026

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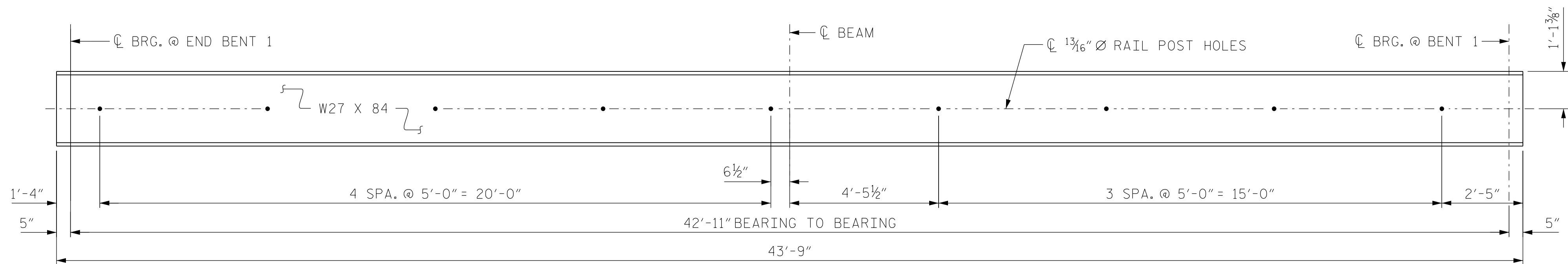
FOR STRUCTURAL STEEL DETAILS AND NOTES, SEE SHEET 3 OF 3.



FRAMING PLAN
(SPAN A SHOWN, SPAN C SIMILAR, OPPOSITE HAND.)



TOP FLANGE



ELEVATION

(SHOWING RAIL POST HOLES FOR BEAMS 1 & 7)
(BEAMS 2-6 ARE SIMILAR BUT WITHOUT RAIL
POST HOLES)

BEAM DETAILS

(SPAN A SHOWN. SPAN C SIMILAR, OPPOSITE HAND.)

SUMMARY OF QUANTITIES	
STRUCTURAL STEEL (SPAN A)	28,620 LBS.
STRUCTURAL STEEL (SPAN C)	28,620 LBS.

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
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SHEET 1 OF 3

SUPERSTRUCTURE
BEAM DETAILS
SPAN A & C



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 DESIGN ENGINEER OF RECORD: J. YANNACONE DATE : 09/2026

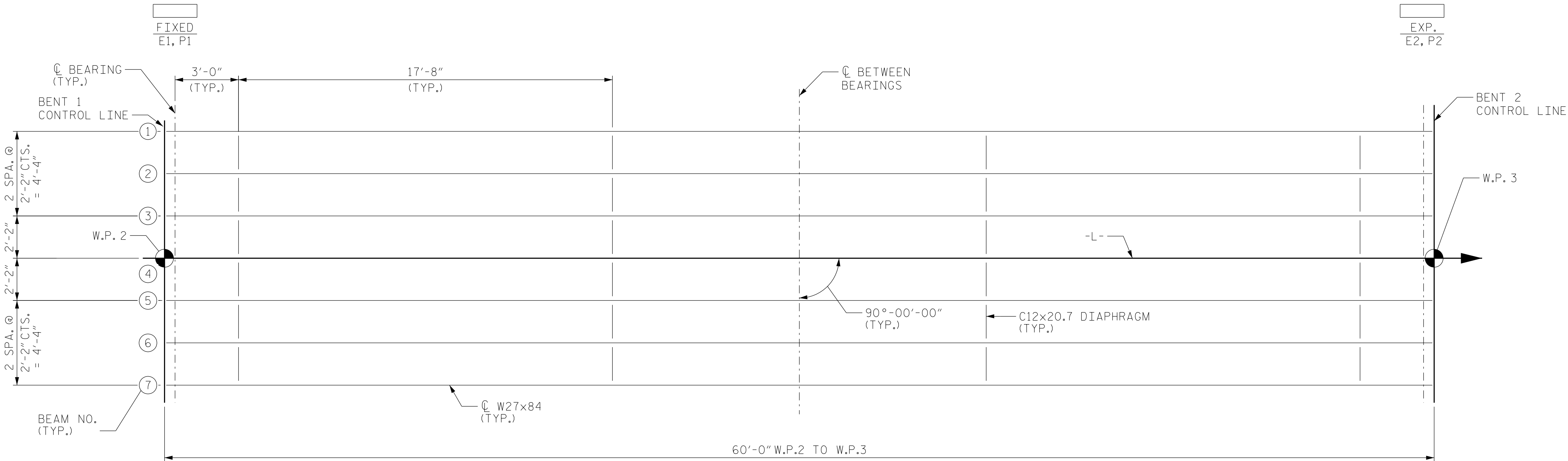


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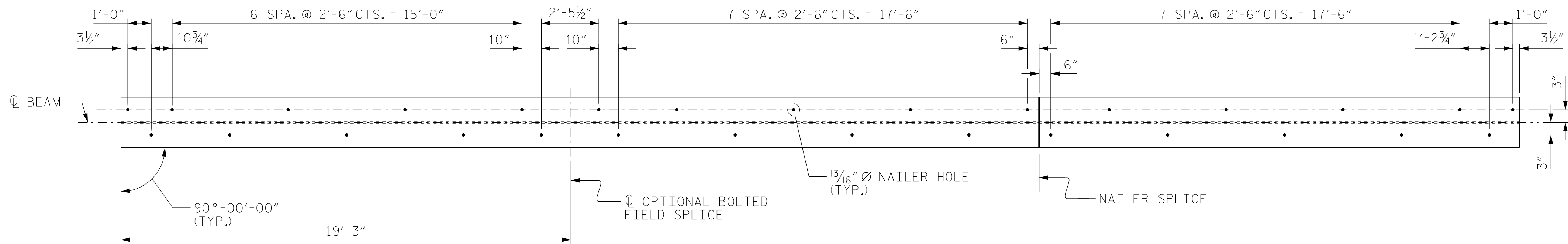
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2			4			

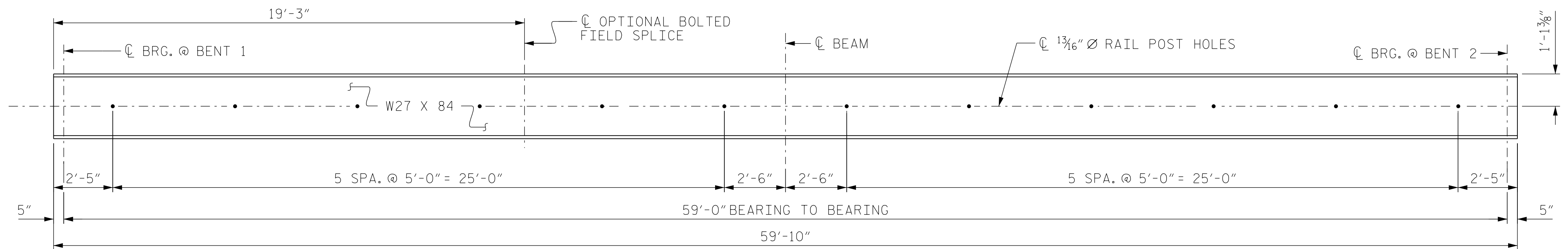
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FRAMING PLAN



TOP FLANGE



ELEVATION

(SHOWING RAIL POST HOLES FOR BEAMS 1 & 7)
(BEAMS 2-6 ARE SIMILAR BUT WITHOUT RAIL POST HOLES)

BEAM DETAILS

NOTES:
FOR STRUCTURAL STEEL DETAILS AND NOTES, SEE SHEET 3 OF 3.

SUMMARY OF QUANTITIES

STRUCTURAL STEEL (SPAN B)	32,735 LBS.
---------------------------	-------------

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WATAUGA COUNTY
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SHEET 2 OF 3

SUPERSTRUCTURE
BEAM DETAILS
SPAN B



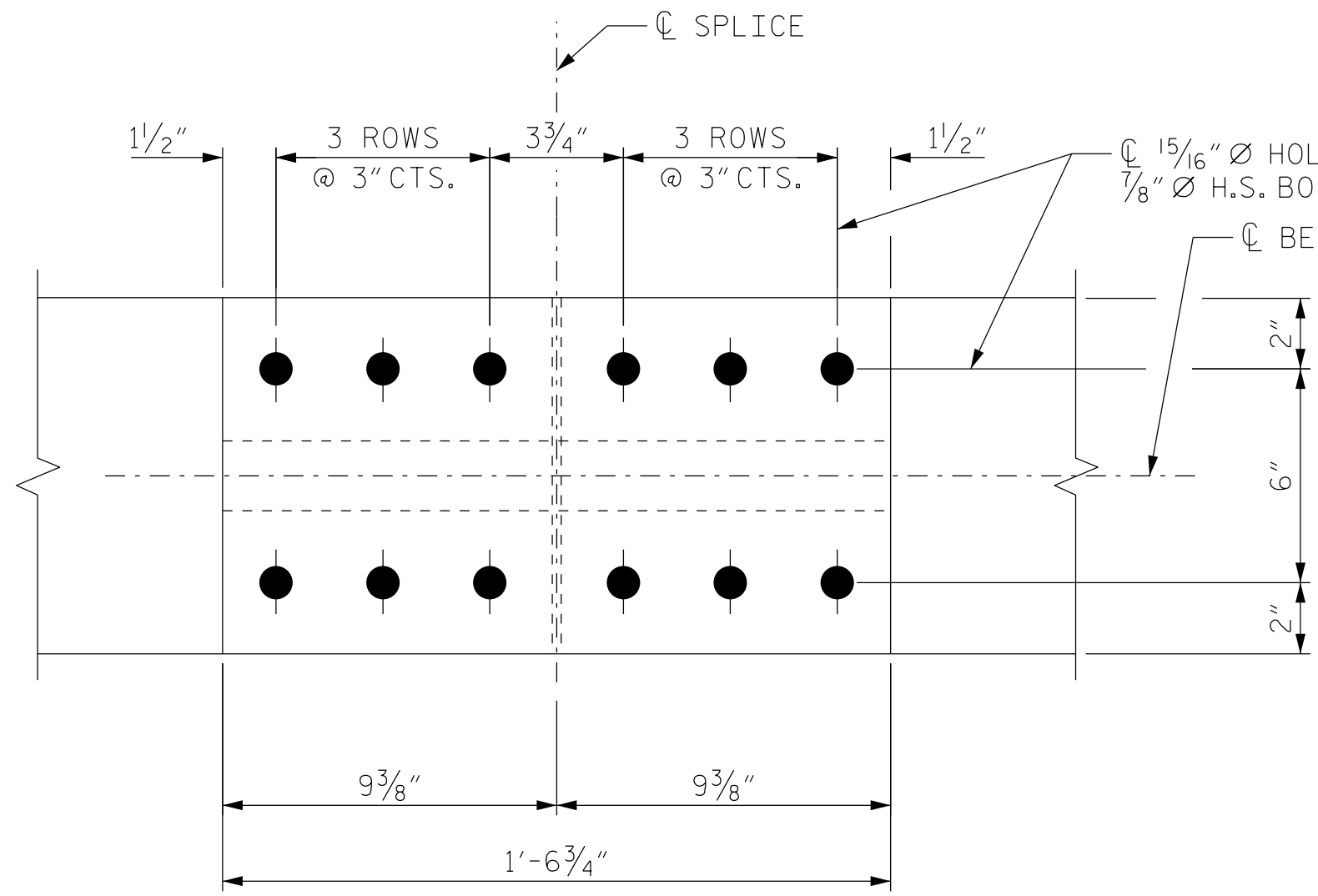
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CHECKED BY : J. YANNAKONE	DATE : 06/2026
DESIGN ENGINEER OF RECORD: J. YANNAKONE	DATE : 09/2026

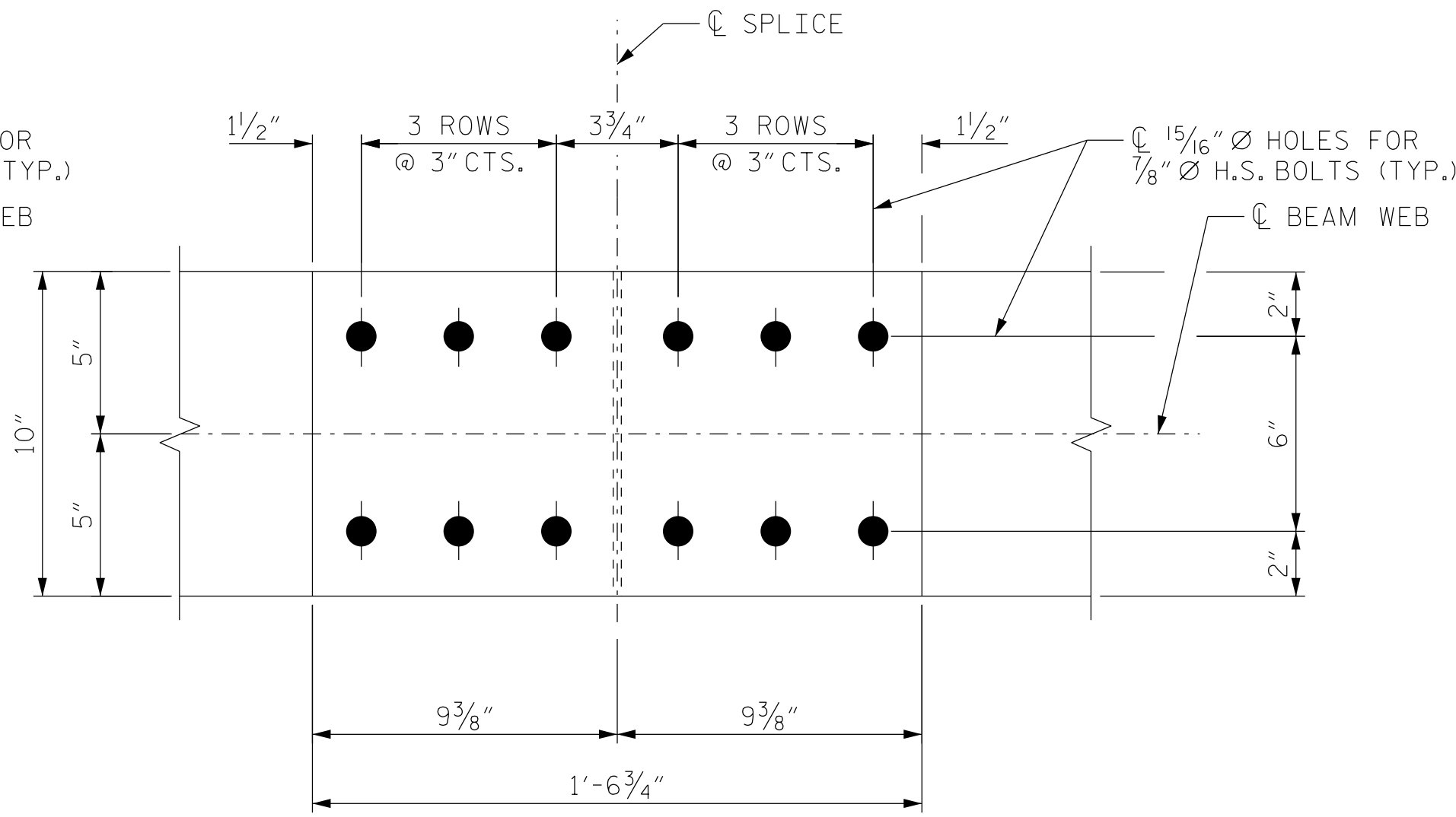


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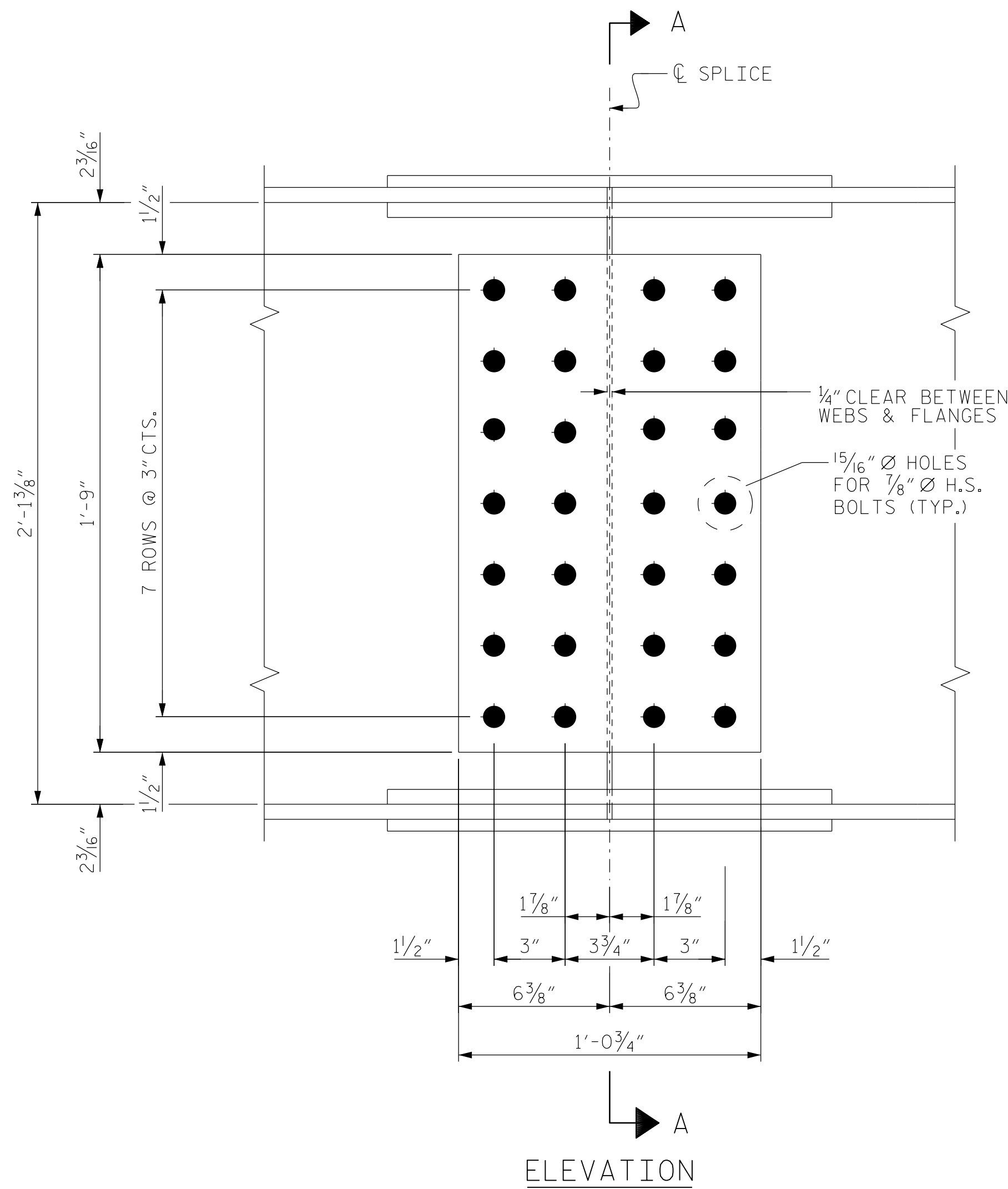
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2			4			TOTAL SHEETS 19



PLAN (TOP OF TOP FLANGE)

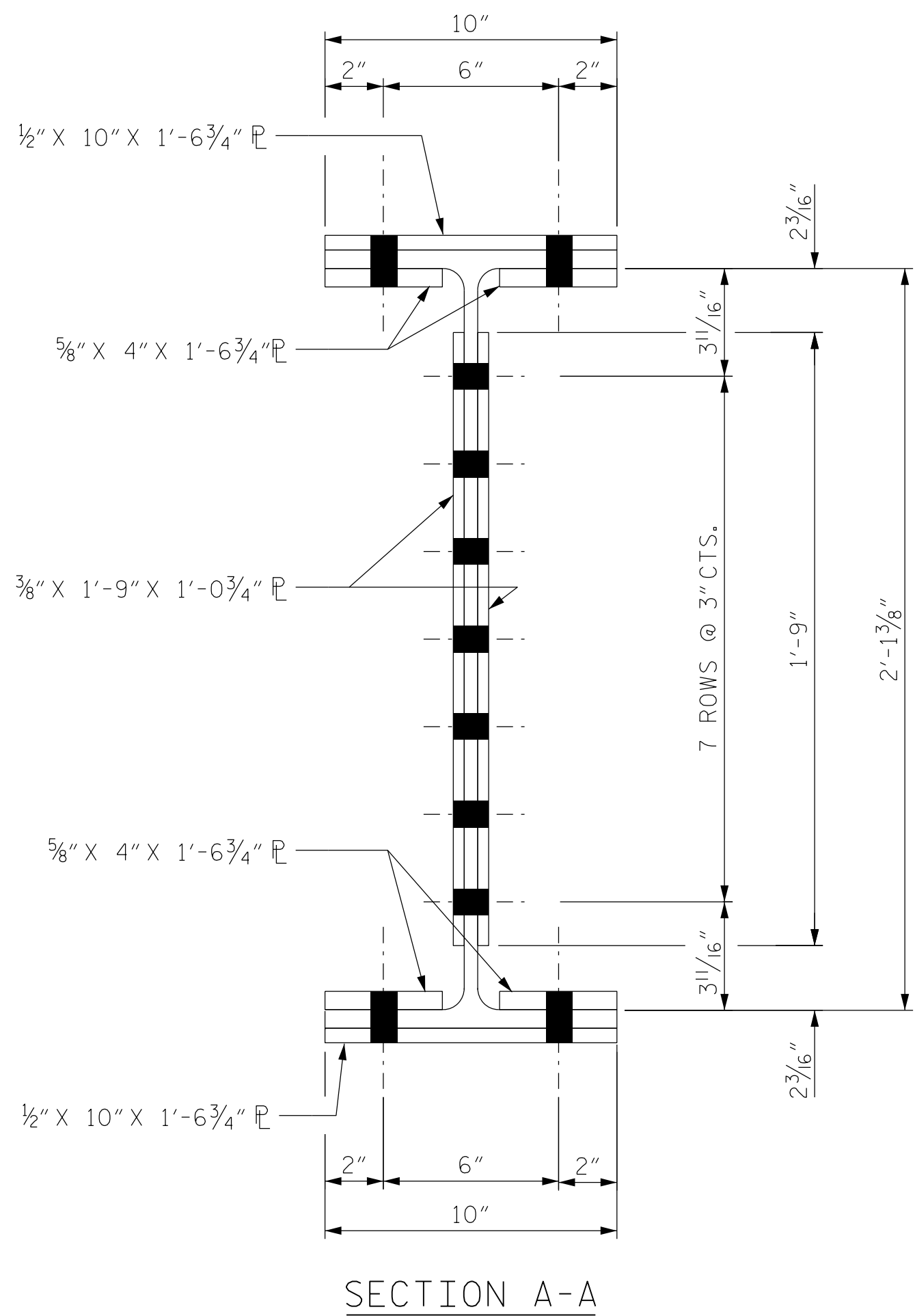


PLAN (TOP OF BOTTOM FLANGE)

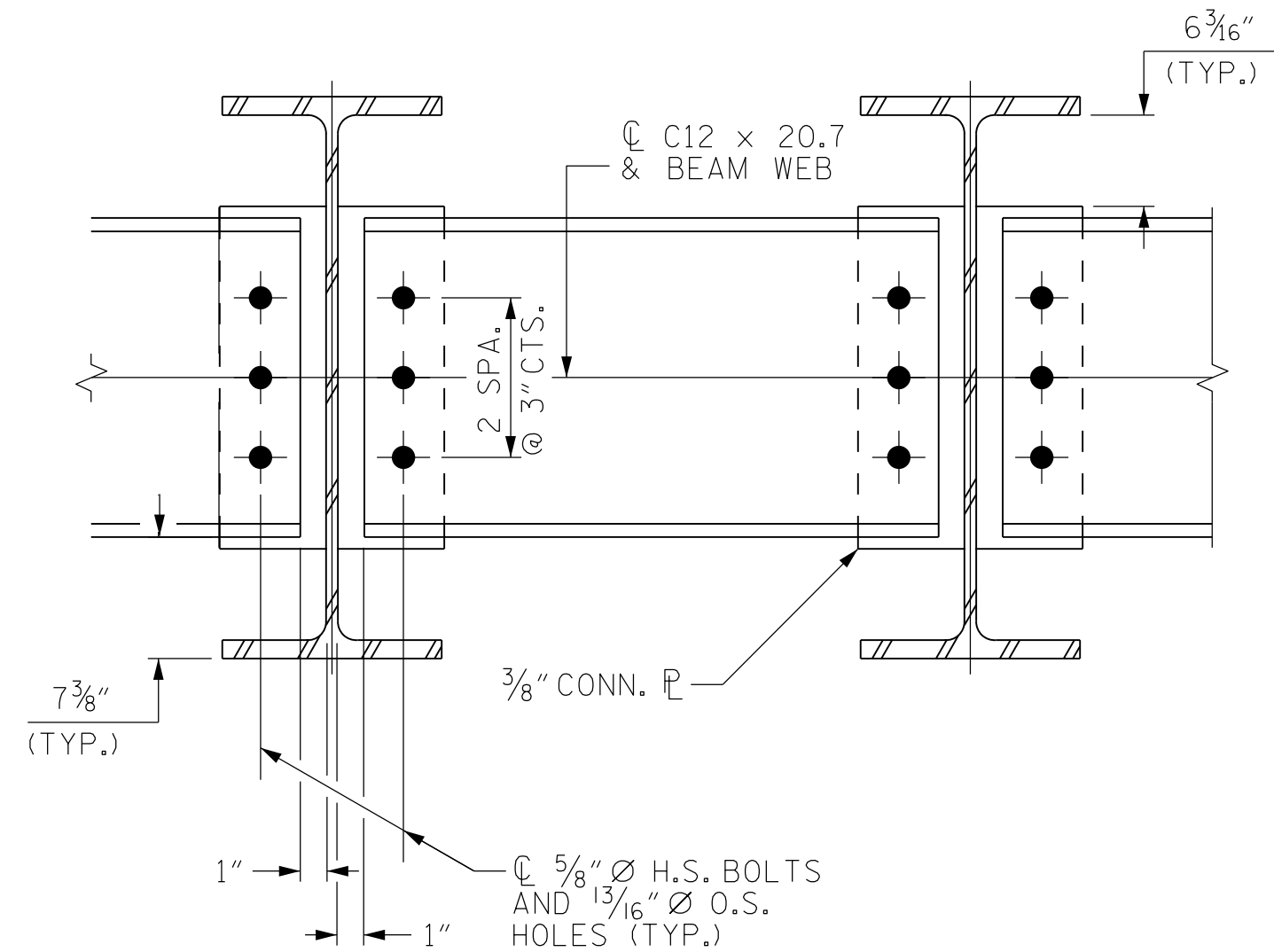


ELEVATION

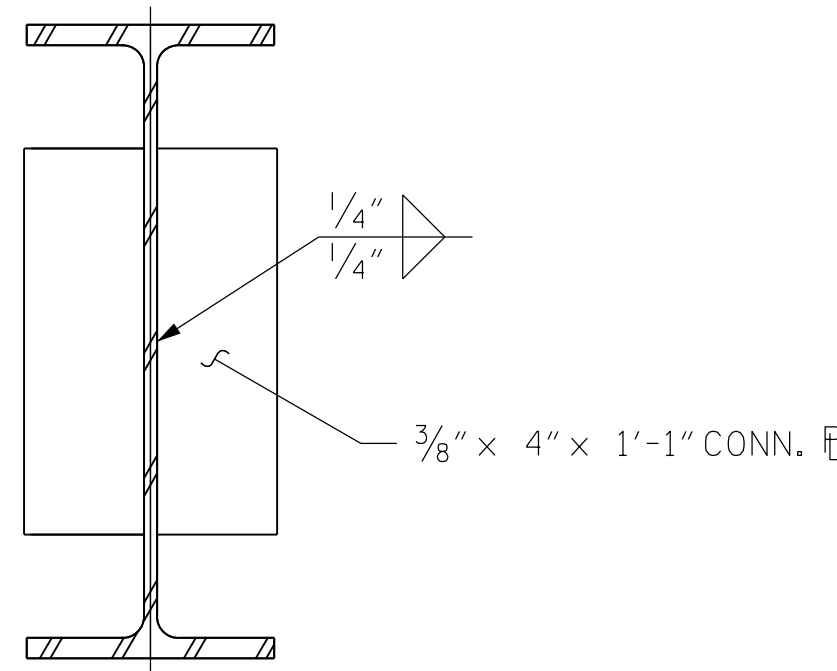
OPTIONAL BOLTED FIELD SPLICE DETAILS



SECTION A-A



DIAPHRAGM DETAIL



CONNECTOR PLATE DETAIL

NOTES:

BEAMS SHALL BE PLACED PARALLEL TO THE -L- LINE.

STRUCTURAL STEEL FOR ROLLED I-BEAMS, DIAPHRAGMS, AND CONNECTOR PLATES SHALL BE AASHTO M270 GRADE 50 AND PAINTED WITH SYSTEM 1 OR HOT DIPPED GALVANIZED IN ACCORDANCE WITH THE STRUCTURAL STEEL SHOP COATINGS PROGRAM AND SECTION 442-8 OF THE STANDARD SPECIFICATIONS.

COATING APPLICATION FOR ALL STRUCTURAL STEEL SHALL NOT BE PERFORMED UNTIL ALL SHOP FABRICATION INCLUDING CUTTING, DRILLING, AND WELDING HAS BEEN COMPLETED.

NO SALVAGED BEAMS SHALL BE USED, UNLESS OTHERWISE NOTED ON THE PLANS.

NO SHOP CAMBER REQUIRED, TURN NATURAL MILL CAMBER UP.

ALL STRUCTURAL STEEL FIELD CONNECTIONS SHALL BE 5/8" DIA. GALVANIZED HIGH STRENGTH BOLTS UNLESS OTHERWISE NOTED.

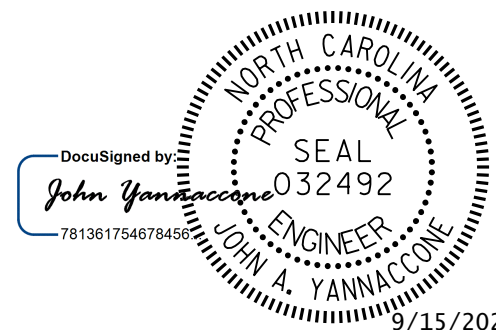
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SHEET 3 OF 3

SUPERSTRUCTURE
STRUCTURE STEEL
DETAILS



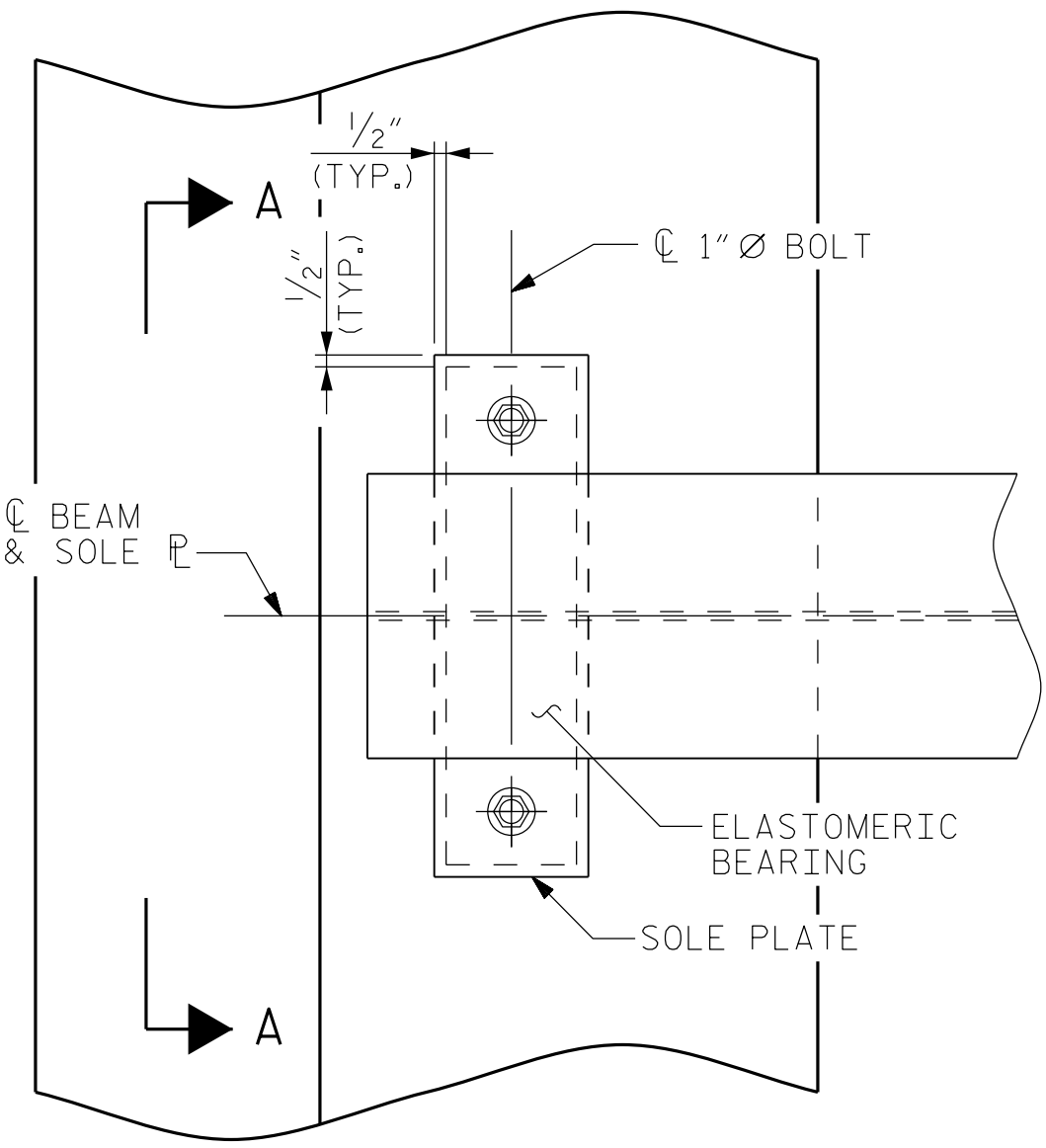
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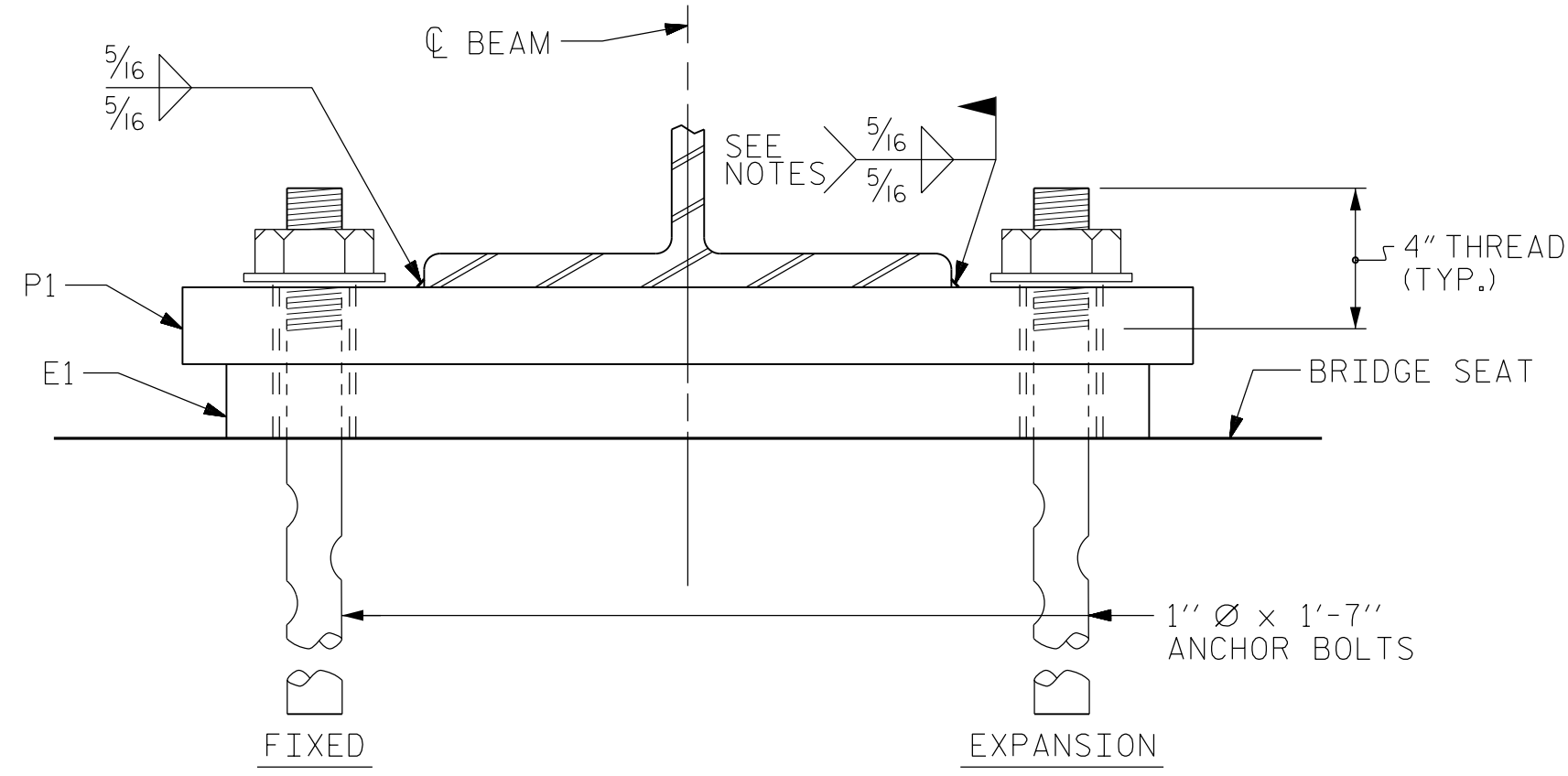
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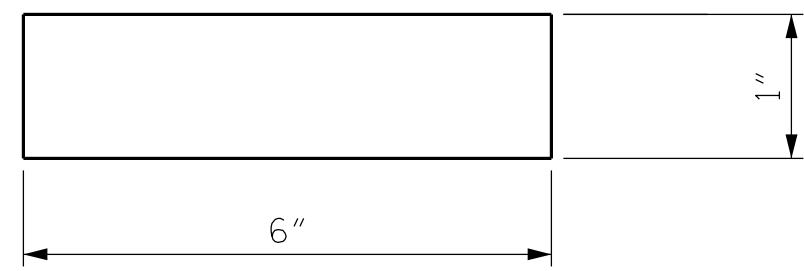
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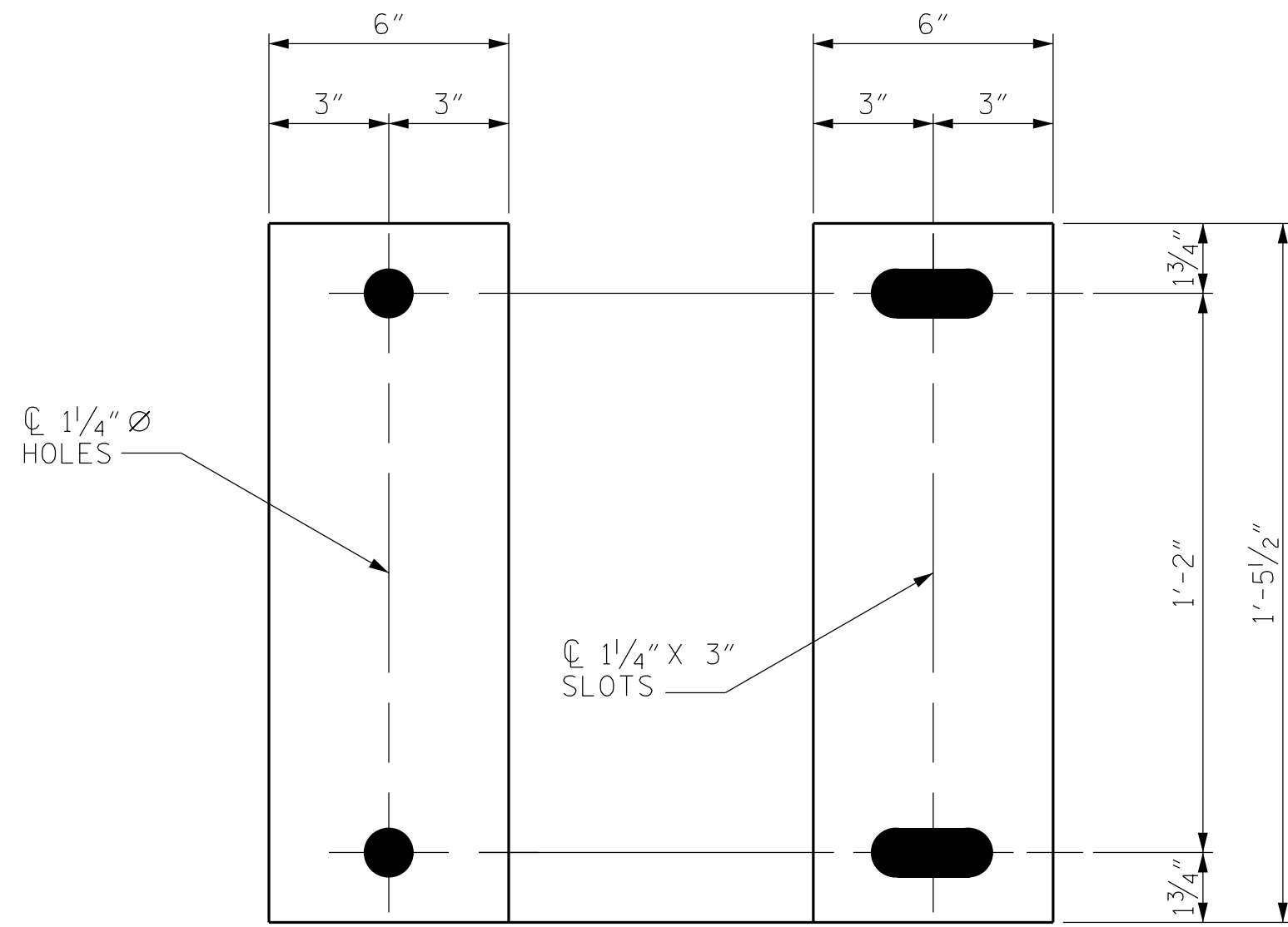
TYPICAL PLAN AT END BENT



SECTION A-A



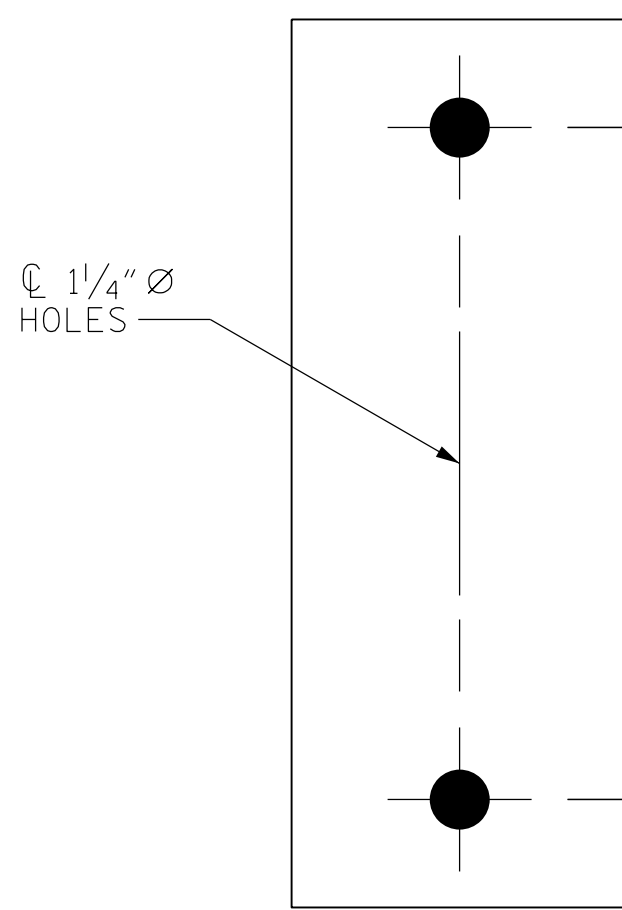
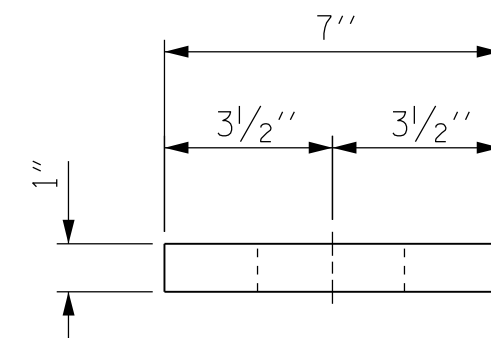
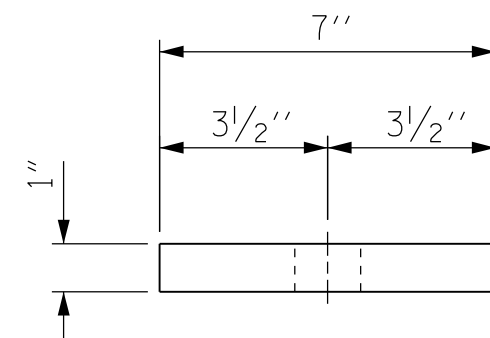
TYPICAL SECTION OF ELASTOMERIC BEARING



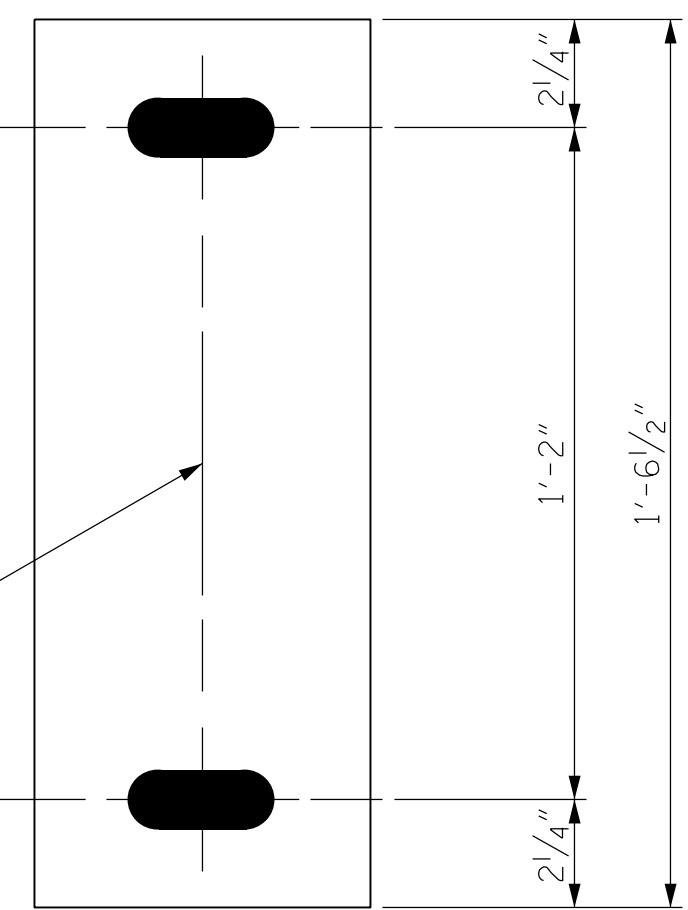
E1 (21 REQ'D)

E2 (21 REQ'D)

PLAN VIEW OF ELASTOMERIC BEARING



P1 (21 REQ'D)



P2 (21 REQ'D)

SOLE PLATE DETAILS

NOTES

AT ALL FIXED POINTS OF SUPPORT, NUTS FOR ANCHOR BOLTS ARE TO BE TIGHTENED FINGER TIGHT AND THEN BACKED OFF 1/2 TURN. THE THREAD OF THE NUT AND BOLT SHALL THEN BE BURRED WITH A SHARP POINTED TOOL.

FOR PAINTED STRUCTURAL STEEL (EXCLUDING AASHTO M270 GRADE 50W), SOLE PLATES, ANCHOR BOLTS NUTS AND WASHERS SHALL BE GALVANIZED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

ANCHOR BOLTS SHALL MEET THE REQUIREMENTS OF ASTM A449. NUTS SHALL MEET THE REQUIREMENTS OF AASHTO M291-DH OR AASHTO M292-2H. WASHERS SHALL MEET THE REQUIREMENTS OF AASHTO M293. SHOP DRAWINGS ARE NOT REQUIRED FOR ANCHOR BOLTS, NUTS AND WASHERS. SHOP INSPECTION IS REQUIRED.

THE CONTRACTOR MAY USE ADHESIVELY ANCHORED ANCHOR BOLTS IN LIEU OF CAST-IN-PLACE ANCHORS. THE MINIMUM EMBEDMENT FOR THE ANCHORS IS 9". FIELD TESTING OF ADHESIVE ANCHORS IS NOT REQUIRED AND THE DESIGN YIELD LOAD IS 47 KIPS. FOR ADHESIVELY ANCHORED ANCHOR BOLTS OR DOWELS. SEE STANDARD SPECIFICATIONS.

ADHESIVELY ANCHORED ANCHOR BOLTS SHALL BE THREADED FULL LENGTH.

AT THE CONTRACTOR'S OPTION, SOLE PLATES AT THE EXPANSION END MAY BE FIELD WELDED.

WHEN FIELD WELDING THE SOLE PLATE TO THE BEAM FLANGE, USE TEMPERATURE INDICATING WAX PENS, OR OTHER SUITABLE MEANS, TO ENSURE THAT THE TEMPERATURE OF THE SOLE PLATE DOES NOT EXCEED 300°F. TEMPERATURES ABOVE THIS MAY DAMAGE THE ELASTOMER.

ALL SURFACES OF BEARING PLATES SHALL BE SMOOTH AND STRAIGHT.

ELASTOMER BEARINGS SHALL HAVE A SHEAR MODULUS OF 0.160 KSI AND SHALL BE GRADE 50 DUROMETER. IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS AND AASHTO M251.

ALL BEARING PLATES SHALL BE AASHTO M270 GRADE 36.

PROJECT NO. 095.01.0D959

WATAUGA COUNTY

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ELASTOMERIC BEARING



DRAWN BY : J. HARRIS DATE : 06/2026
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DESIGN ENGINEER OF RECORD: J. YANNAACONE DATE : 09/2026



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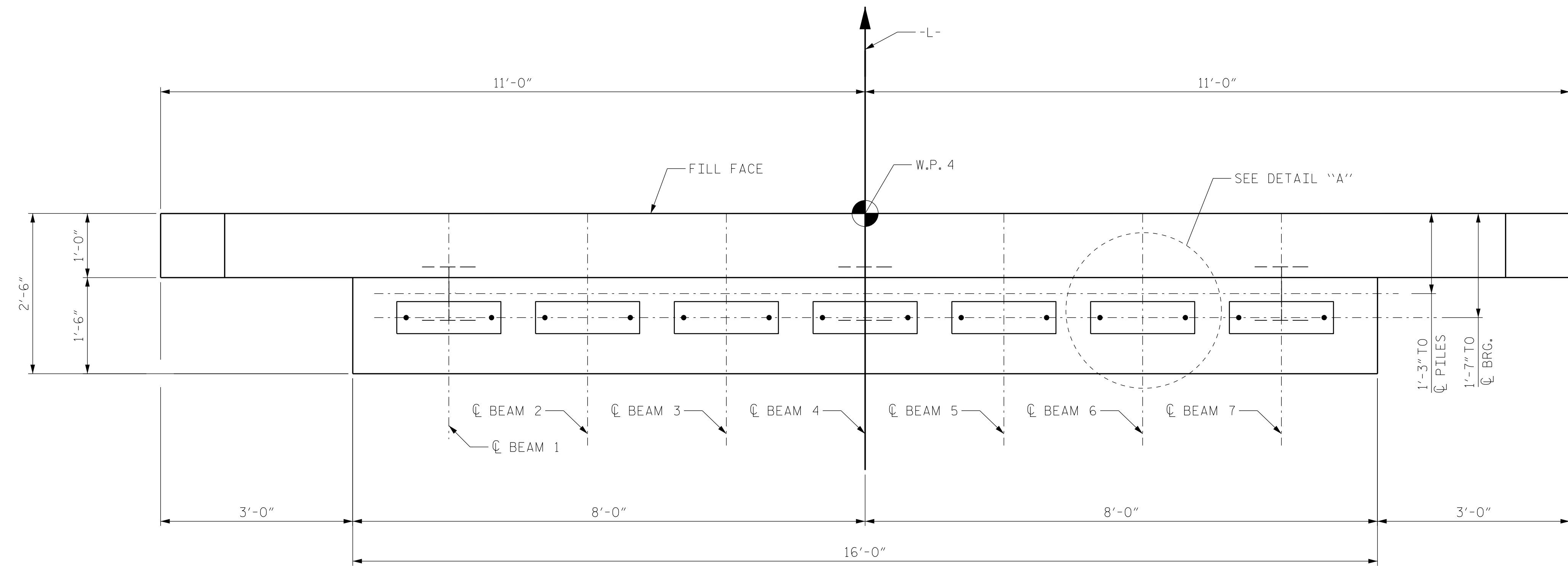
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PLAN

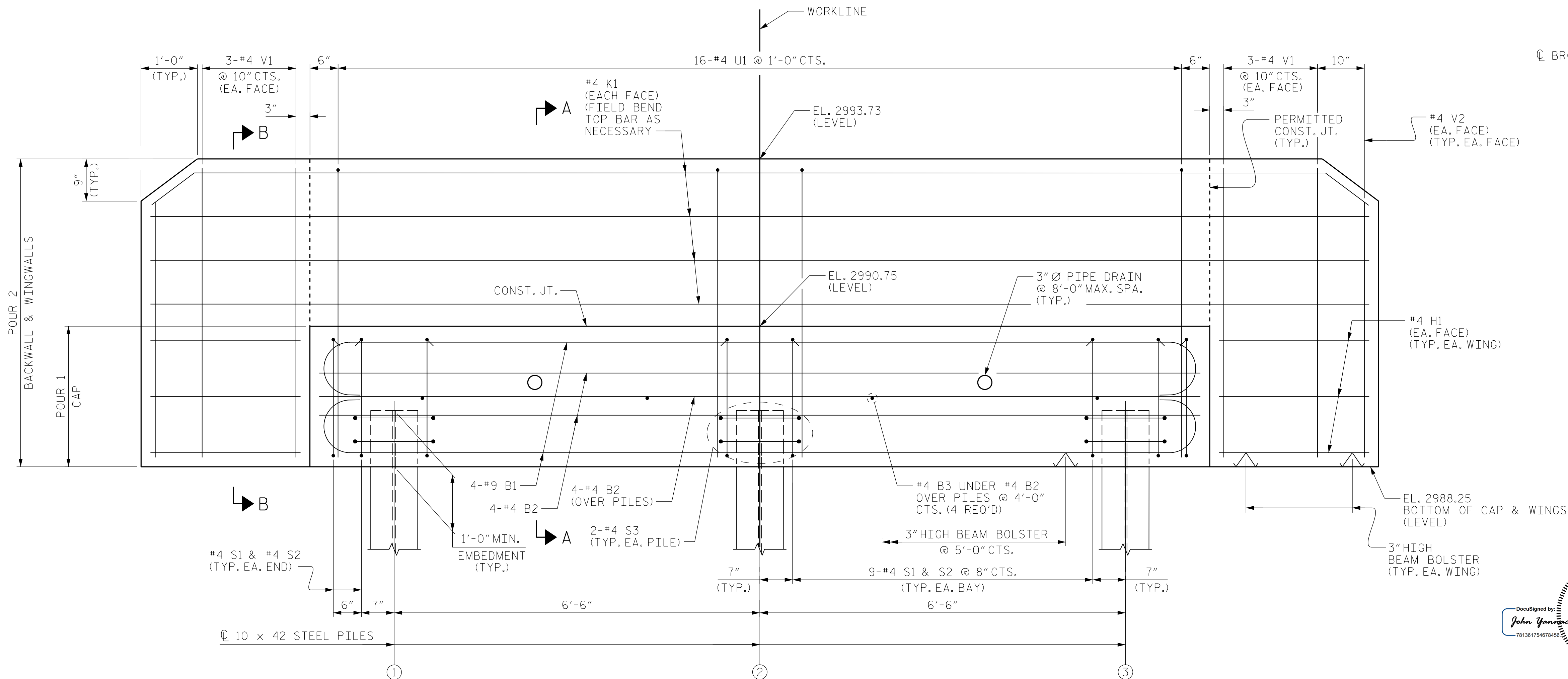
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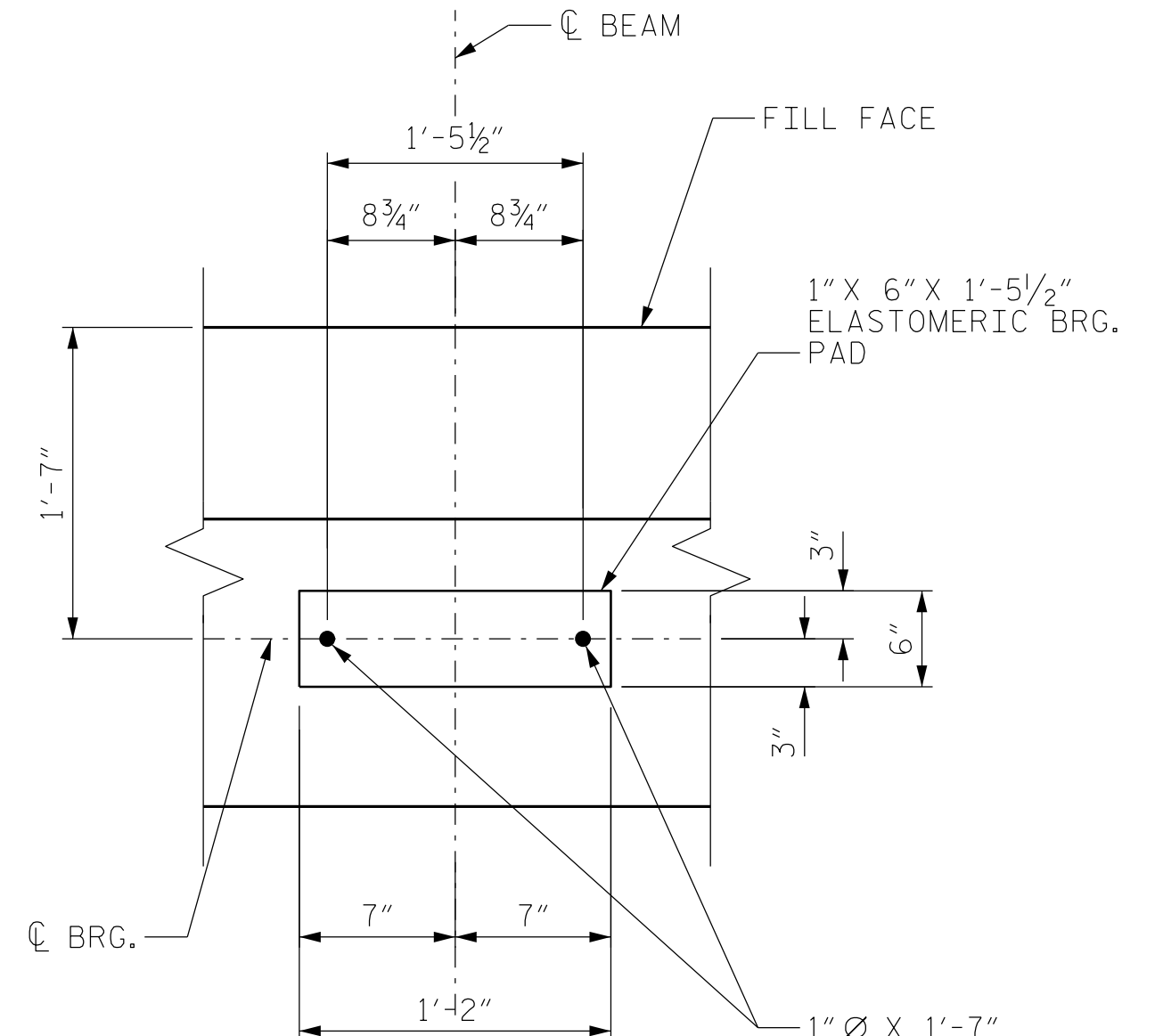
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PLAN



ELEVATION



DETAIL "A"
(TYP. EA. BEARING)

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WATAUGA COUNTY
STATION: 10+98.00 -L-

SHEET 2 OF 3

SUBSTRUCTURE
END BENT 2



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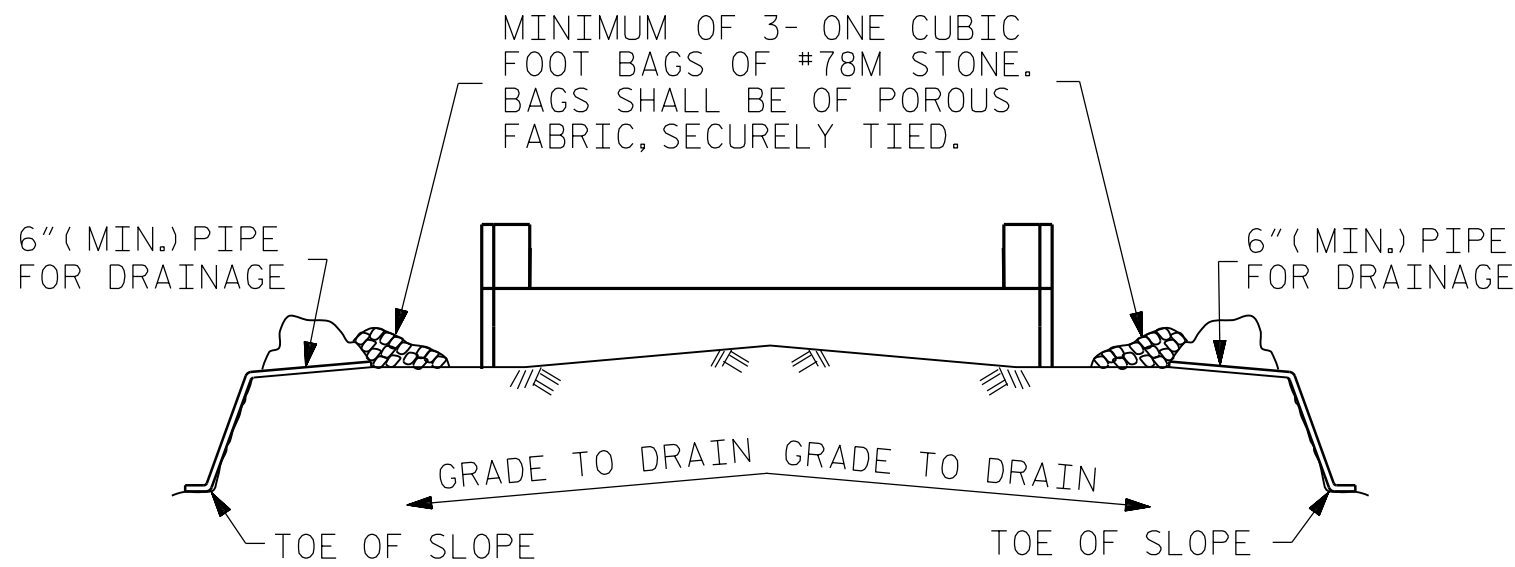


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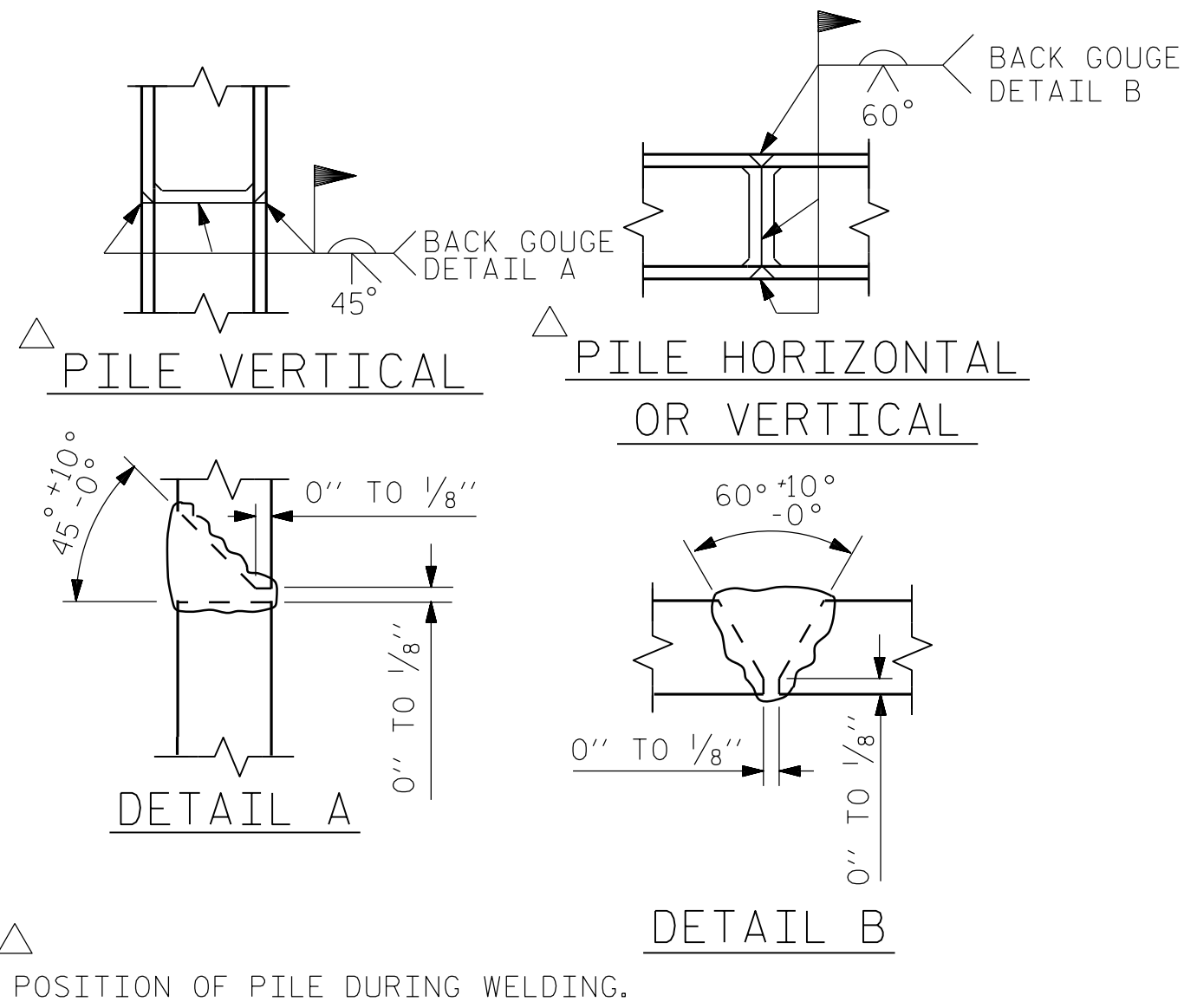


BAGGED STONE AND PIPE SHALL BE PLACED IMMEDIATELY AFTER COMPLETION OF END BENT EXCAVATION. PIPE MAY BE EITHER CONCRETE, CORRUGATED STEEL, CORRUGATED ALUMINUM ALLOY, OR CORRUGATED PLASTIC. PERFORATED PIPE WILL NOT BE ALLOWED.

BAGGED STONE SHALL REMAIN IN PLACE UNTIL THE ENGINEER DIRECTS THAT IT BE REMOVED. THE CONTRACTOR SHALL REMOVE AND DISPOSE OF SILT ACCUMULATIONS AT BAGGED STONE WHEN SO DIRECTED BY THE ENGINEER. BAGS SHALL BE REMOVED AND REPLACED WHENEVER THE ENGINEER DETERMINES THAT THEY HAVE DETEIORATED AND LOST THEIR EFFECTIVENESS.

NO SEPARATE PAYMENT WILL BE MADE FOR THIS WORK AND THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE BID FOR THE SEVERAL PAY ITEMS.

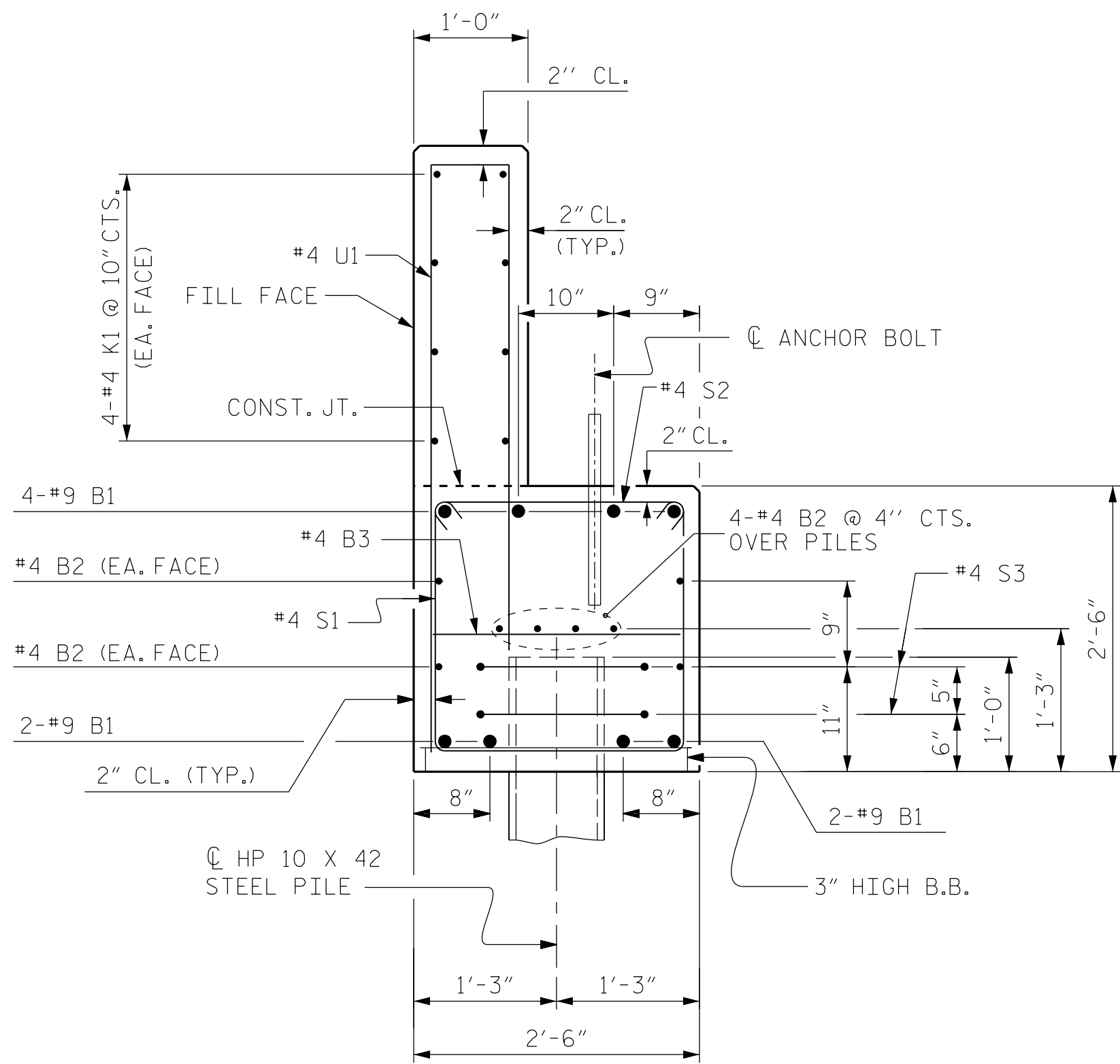
TEMPORARY DRAINAGE AT END BENT



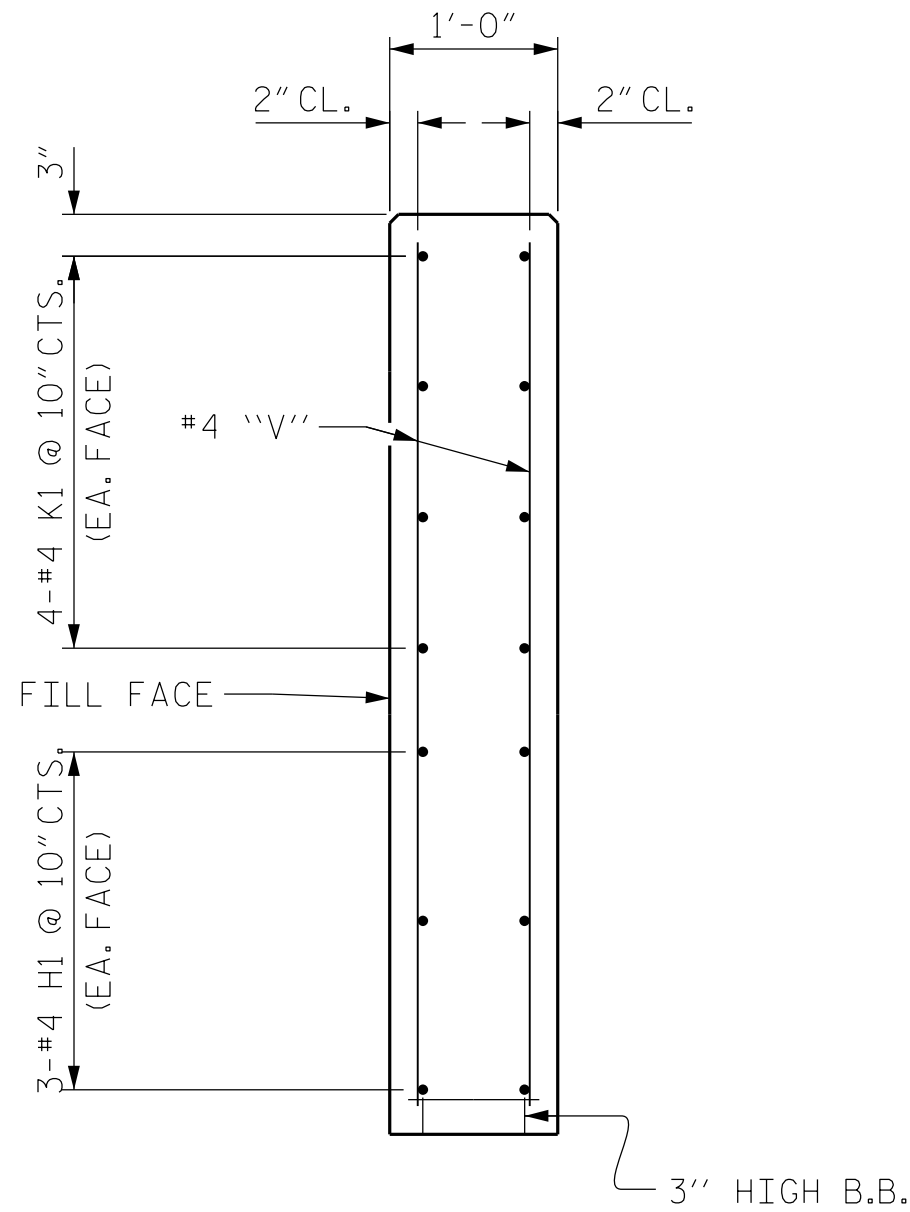
PILE SPLICE DETAILS

BAR TYPES					BILL OF MATERIAL				
					FOR ONE END BENT				
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT				
B1	8	#9		18'-0"	490				
B2	8	#4	STR	15'-8"	84				
B3	4	#4	STR	2'-2"	6				
H1	12	#4	STR	2'-9"	22				
K1	8	#4	STR	21'-8"	116				
S1	22	#4	3	7'-2"	105				
S2	22	#4	2	2'-11"	43				
S3	6	#4	4	6'-0"	24				
U1	16	#4	5	10'-0"	107				
V1	12	#4	STR	5'-0"	40				
V2	4	#4	STR	4'-6"	12				
REINFORCING STEEL (FOR ONE END BENT)					1,049 LBS.				
CLASS A CONCRETE BREAKDOWN (FOR ONE END BENT)									
POUR #1 CAP					3.7				
POUR #2 BACKWALL & WINGS					3.0				
TOTAL CLASS A CONCRETE					6.7				

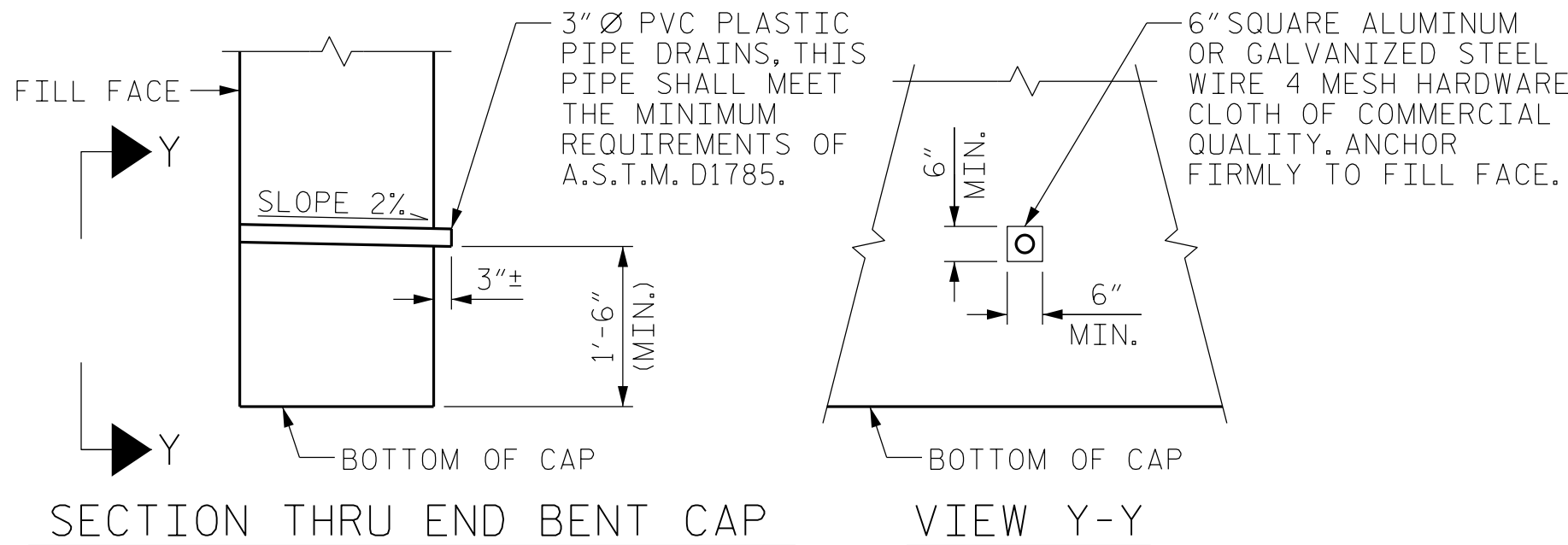
ALL BAR DIMENSIONS ARE OUT TO OUT.



SECTION A-A



SECTION B-B



NOTE:
NO SEPARATE PAYMENT WILL BE MADE FOR FURNISHING AND INSTALLING THE PVC PLASTIC PIPE DRAINS, HARDWARE CLOTH AND FASTENERS. THE ENTIRE COST OF THIS WORK SHALL BE INCLUDED IN THE UNIT CONTRACT PRICE FOR THE SEVERAL PAY ITEMS.

PIPE DRAIN DETAILS

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
STATION: 10+98.00 -L-

SHEET 3 OF 3

SUBSTRUCTURE
END BENT 1 & 2
DETAILS

DRAWN BY : J. MYA DATE : 06/2026
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DESIGN ENGINEER OF RECORD: J. YANNACCONE DATE : 09/2026

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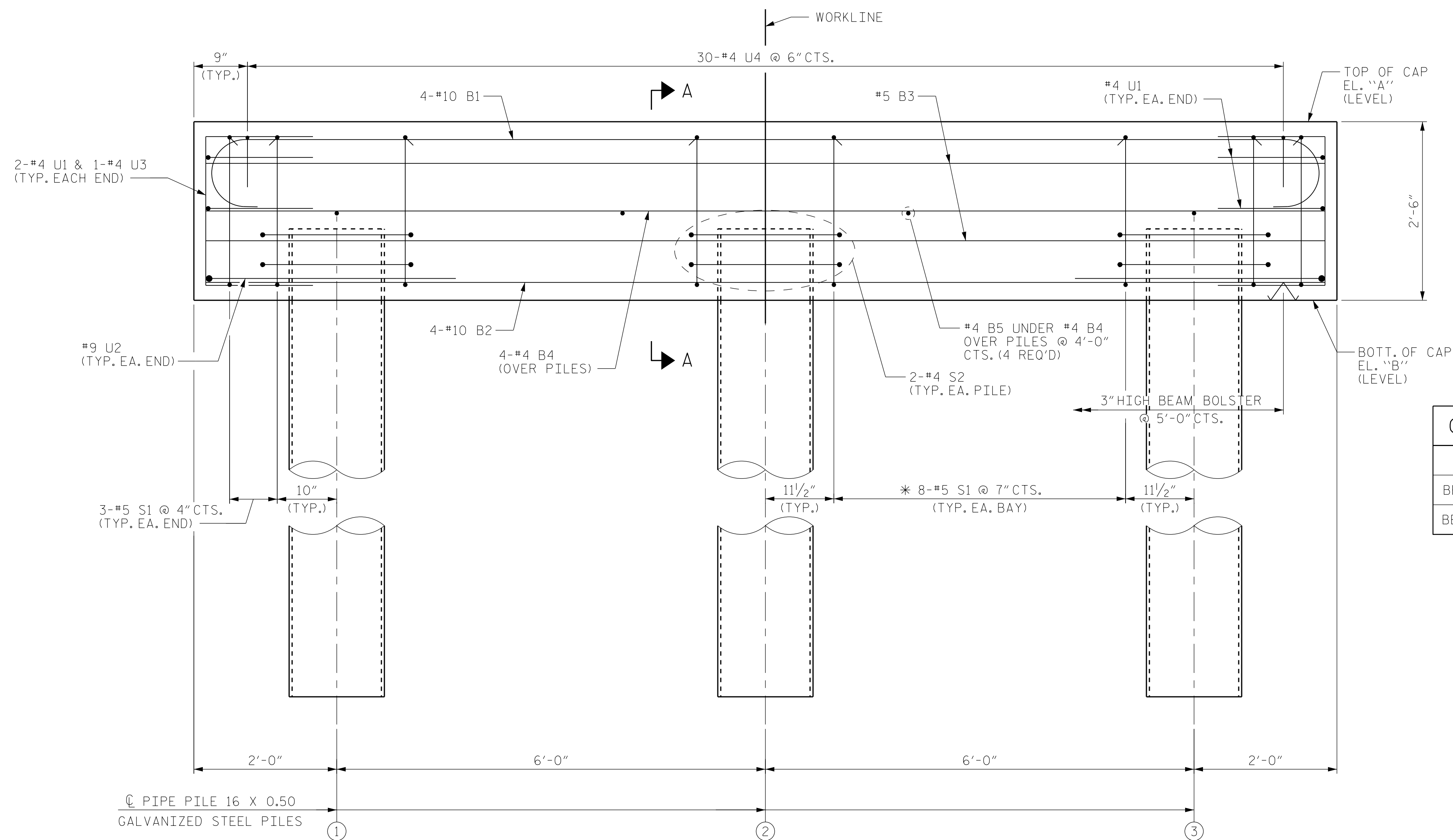
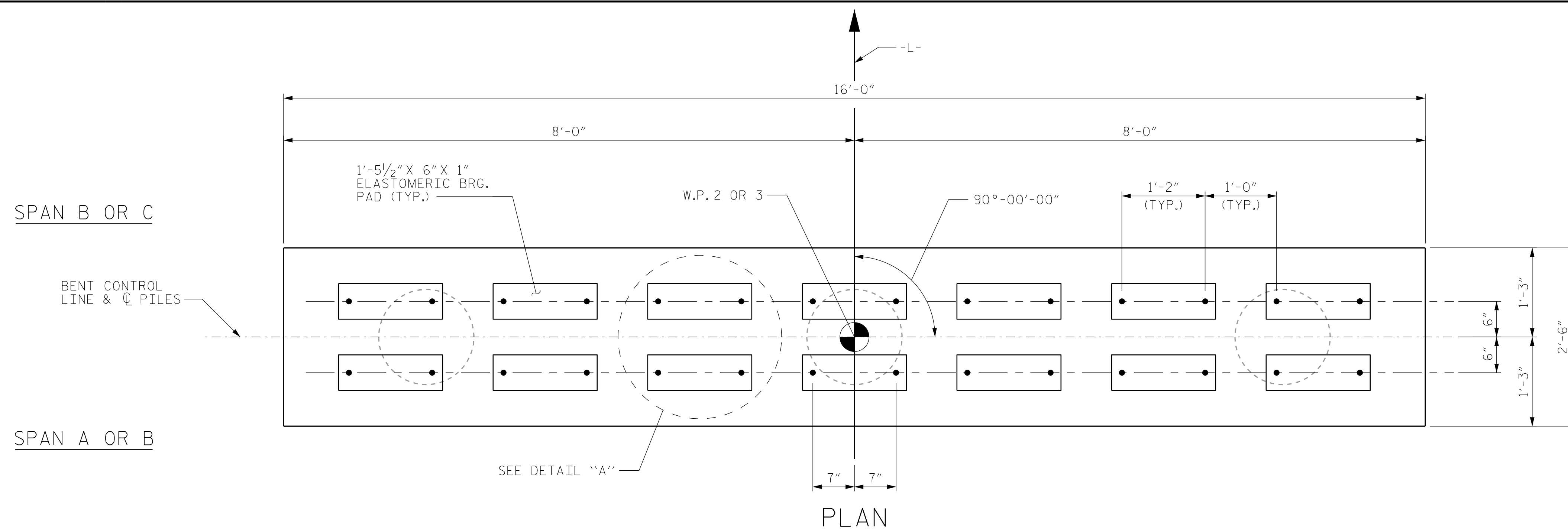
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ELEVATION

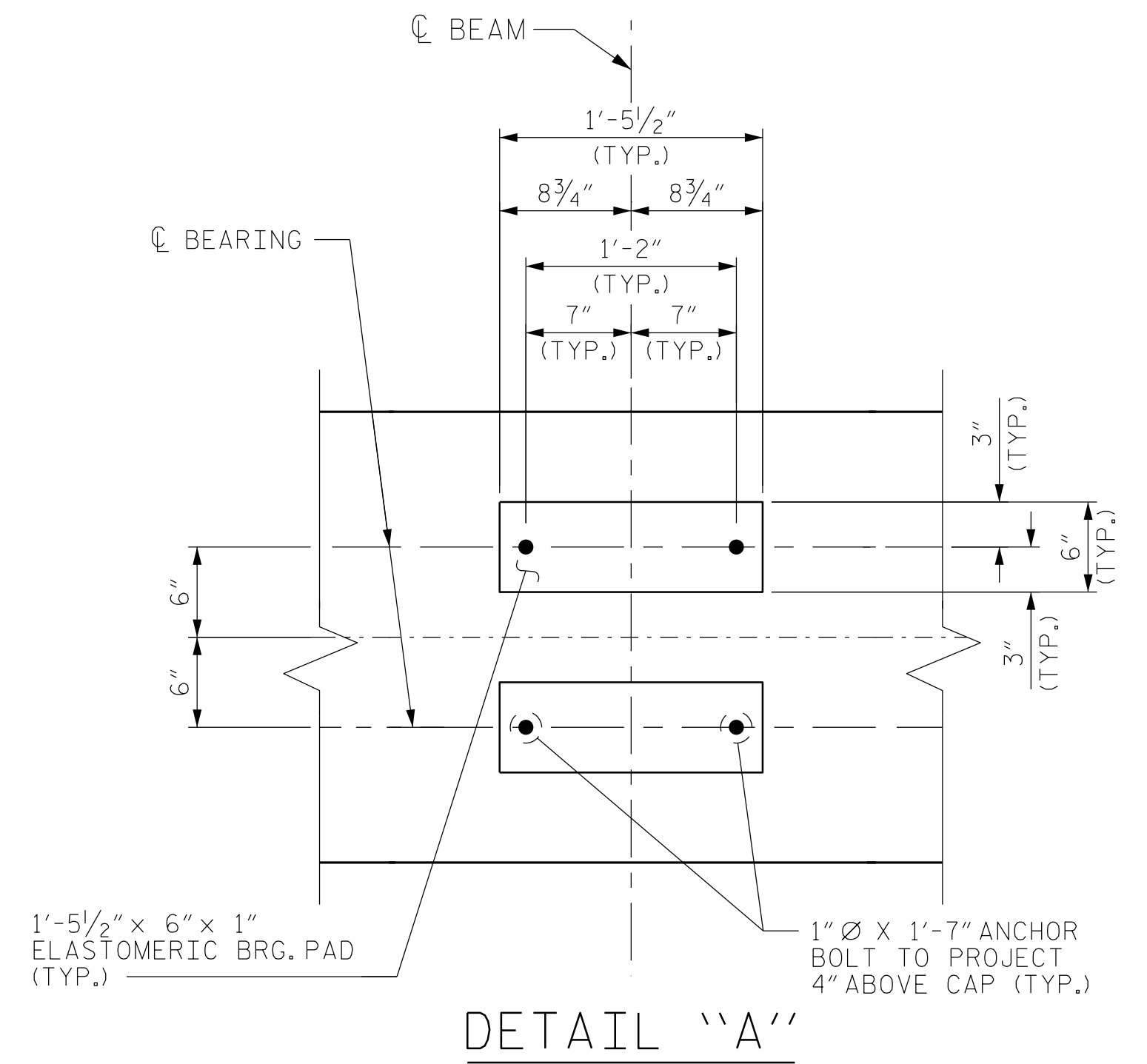
NOTES:

STIRRUPS IN CAP MAY BE SHIFTED AS NECESSARY TO
CLEAR ANCHOR BOLTS.

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* INVERT ALTERNATE STIRRUPS.
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FOR ADDITIONAL REINFORCING STEEL IN PP 16 x 0.50
GALVANIZED STEEL PILES, SEE SHEET 2 OF 3.

GALVANIZE THE FULL LENGTH OF EACH INTERIOR BENT PILE IN ACCORDANCE WITH SECTION 1076 OF THE STANDARD SPECIFICATIONS.



CAP ELEVATIONS		
	EL. "A"	EL. "B"
BENT 1	2990.54	2988.04
BENT 2	2990.66	2988.16

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
 STATION: 10+98.00 -L-

SHEET 1 OF 3

SUBSTRUCTURE
BENT 1 AND 2

DRAWN BY :	J. MYA	DATE :	06/2026
CHECKED BY :	J. YANNACCONE	DATE :	06/2026
DESIGN ENGINEER OF RECORD:	J. YANNACCONE	DATE :	09/2026

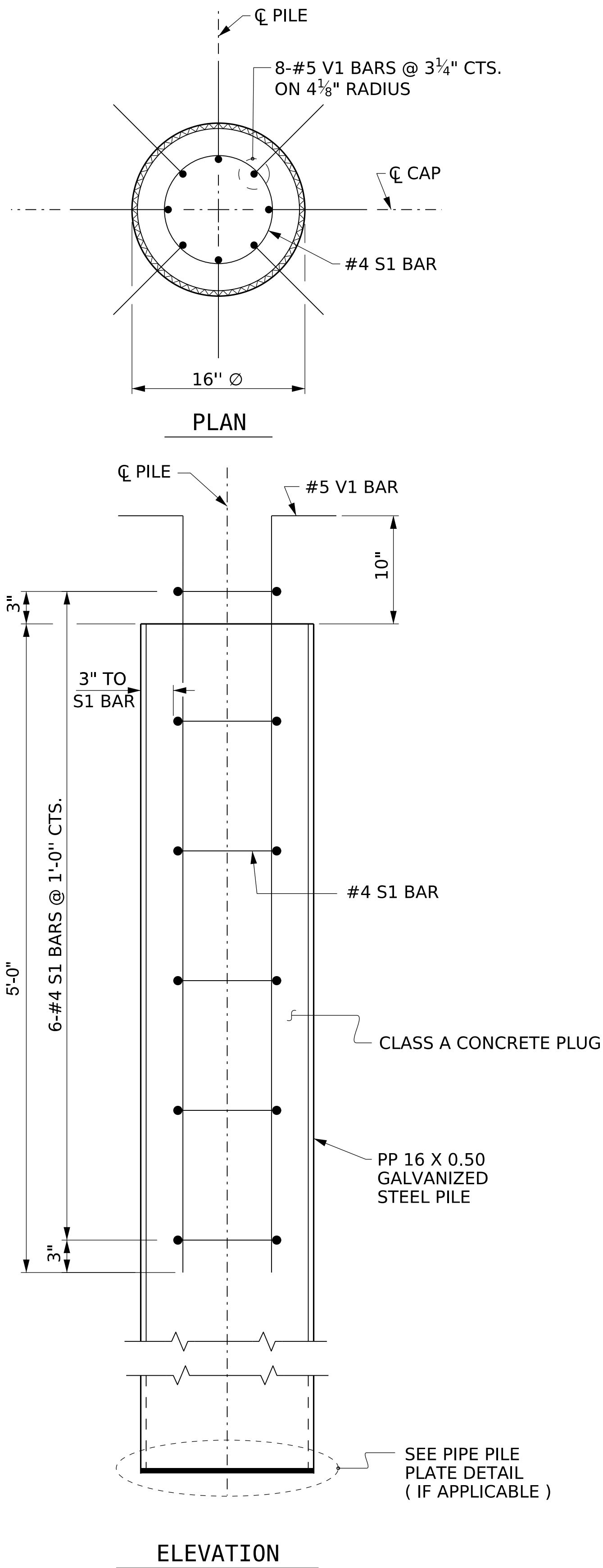


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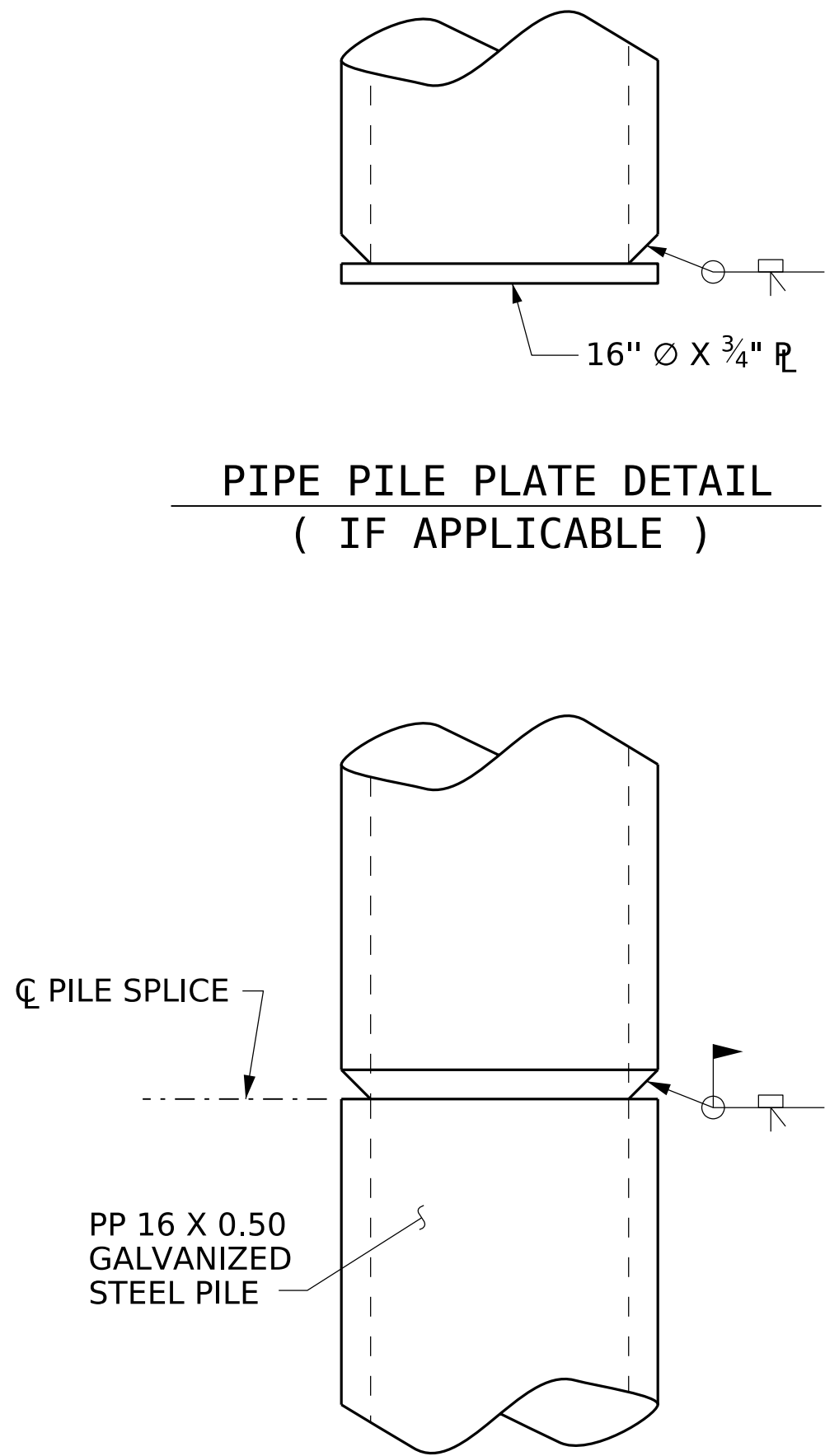
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SIGNATURES COMPLETED

ED	REVISIONS						SHEET NO.
	NO.	BY:	DATE:	NO.	BY:	DATE:	S-16
	1			3			TOTAL SHEETS
	2			4			19

p:\xgfn\pw.bentley.com\gfn\pw-01\Documents\Projects\67945\5-Working\Task 014 - SMU 2023 Timber Bridges (08D)\Structures\CAD\5.0 River Ridge Road\401.033.BR-0D959.SMU.B02.S17.0D959
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PP 16 X 0.50 GALVANIZED STEEL PILE
(OPEN OR CLOSED END)



PIPE PILE SPLICE DETAIL

NOTES

PIPE PILES SHALL BE IN ACCORDANCE WITH SECTION 1084 OF THE STANDARD SPECIFICATIONS.

GALVANIZE STEEL PIPE PILES IN ACCORDANCE WITH SECTION 1076 OF THE STANDARD SPECIFICATIONS UNLESS METALLIZING IS REQUIRED. GALVANIZING OR METALLIZING PIPE PILE PLATES IS NOT REQUIRED.

PIPE PILE PLATES, IF REQUIRED, SHALL BE IN ACCORDANCE WITH SECTION 450 OF THE STANDARD SPECIFICATIONS.

REMOVE AND REPLACE OR REPAIR TO THE SATISFACTION OF THE ENGINEER PILES THAT ARE DAMAGED, DEFORMED OR COLLAPSED DURING INSTALLATION OR DRIVING.

PILE SPLICES SHALL BE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS AND AWS D1.1.

FOR CLOSED END PIPE PILES, REMOVE ALL SOIL AND WATER FROM INSIDE THE PILES JUST PRIOR TO PLACING REINFORCING STEEL AND CONCRETE FOR THE CONCRETE PLUG.

FOR OPEN END PIPE PILES, REMOVE ENOUGH SOIL AND WATER FROM INSIDE THE PILES TO CONSTRUCT THE CONCRETE PLUG WITHOUT FOULING THE CONCRETE.

PLACE CLASS A CONCRETE FOR THE FULL HEIGHT OF THE STEEL PIPE PILE.

PLACE CONCRETE SUCH THAT THE REINFORCING STEEL OR CONCRETE DOES NOT MOVE AND THE CLEARANCE FROM THE REINFORCING STEEL TO THE INSIDE OF THE PILE IS MAINTAINED AFTER CONCRETE PLACEMENT. DO NOT PLACE CONCRETE IN THE BENT CAP UNTIL THE CONCRETE PLUG HAS ATTAINED A MINIMUM COMPRESSIVE STRENGTH OF 1500 PSI.

THE REINFORCING STEEL, CLASS A CONCRETE, AND GALVANIZING ARE CONSIDERED INCIDENTAL TO THE CONTRACT UNIT PRICE BID PER LINEAR FOOT FOR PP 16 X 0.50 GALVANIZED STEEL PILES.

TURN HORIZONTAL LEG OF V1 BARS TO MAINTAIN 2" CLEAR COVER ALONG VERTICAL FACE OF BENT CAP.

BILL OF MATERIAL FOR ONE PP 16 X 0.50 GALVANIZED STEEL PILE

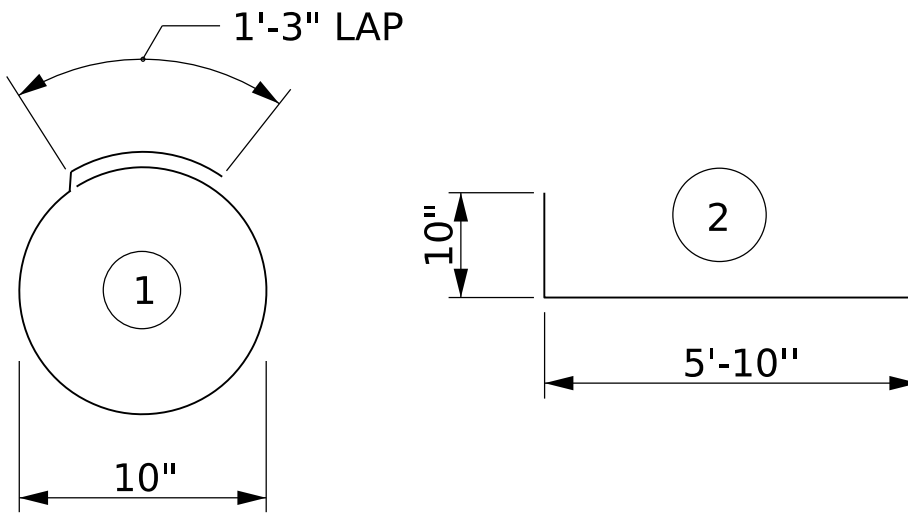
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
S1	6	#4	1	3'-11"	16
V1	8	#5	2	6'-8"	56

REINFORCING STEEL = 72 lbs

CLASS A CONCRETE

FULL HEIGHT PLUG 1.1 CY

BAR TYPES



ALL BAR DIMENSIONS ARE OUT TO OUT.

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
STATION: 10+98.00 -L-

SHEET 2 OF 3

SUBSTRUCTURE
16" STEEL PIPE PILE



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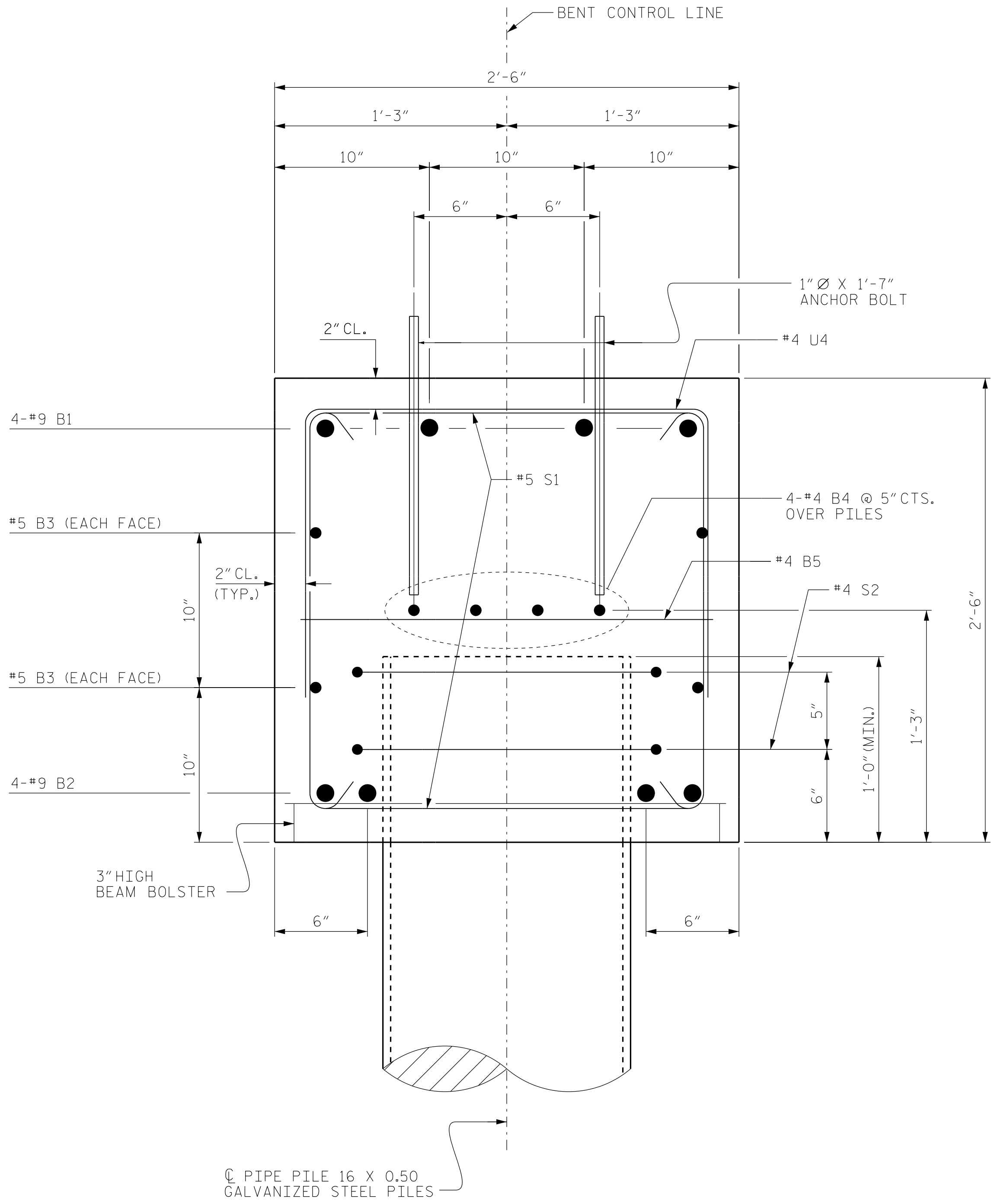
DRAWN BY : J. MYA DATE : 06/2026
CHECKED BY : J. YANNACCONE DATE : 06/2026
DESIGN ENGINEER OF RECORD: J. YANNACCONE DATE : 09/2026

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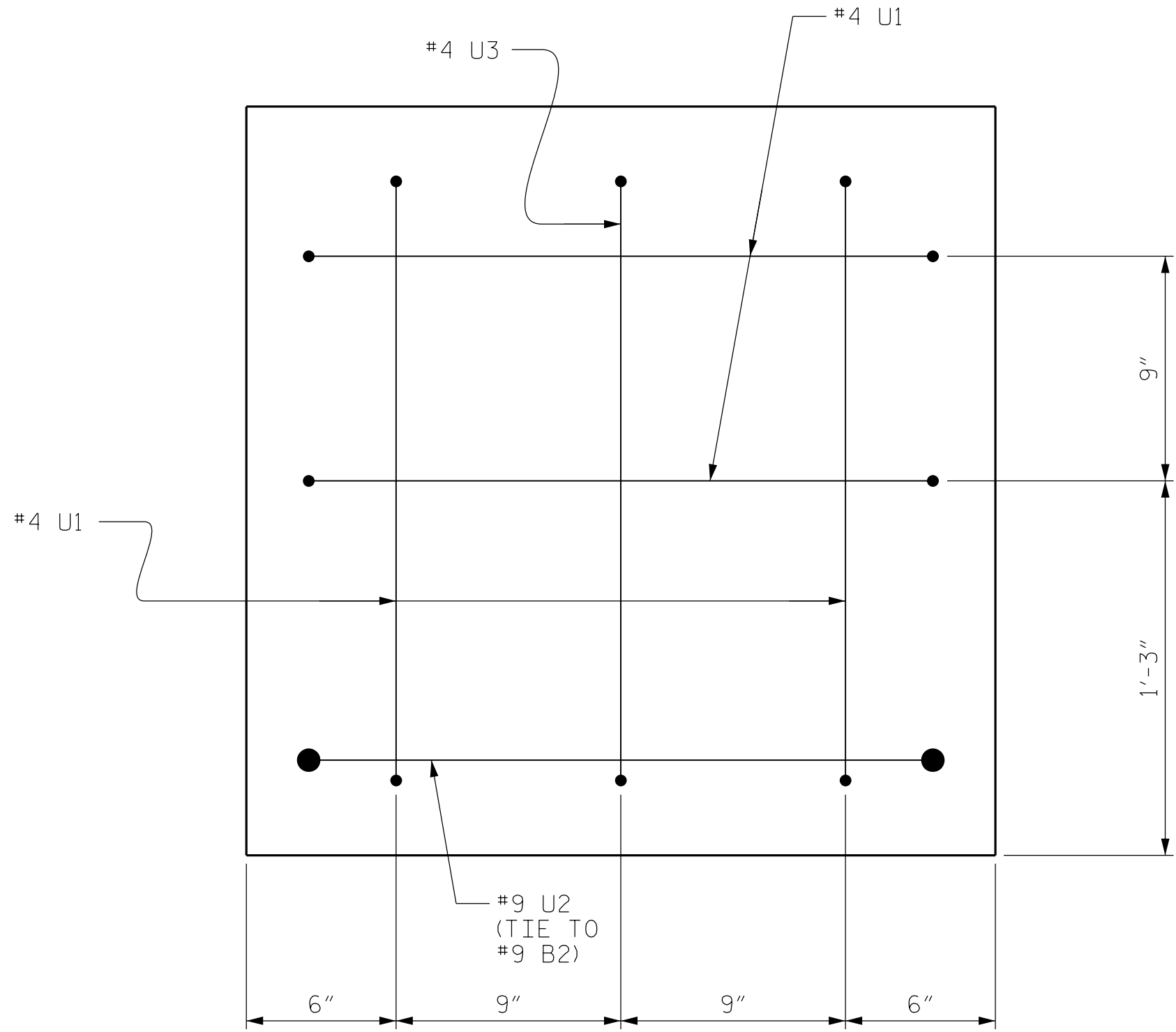
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REVISIONS						SHEET NO.
NO.	BY:	DATE:	NO.	BY:	DATE:	S-17
1			3			TOTAL SHEETS
2			4			19

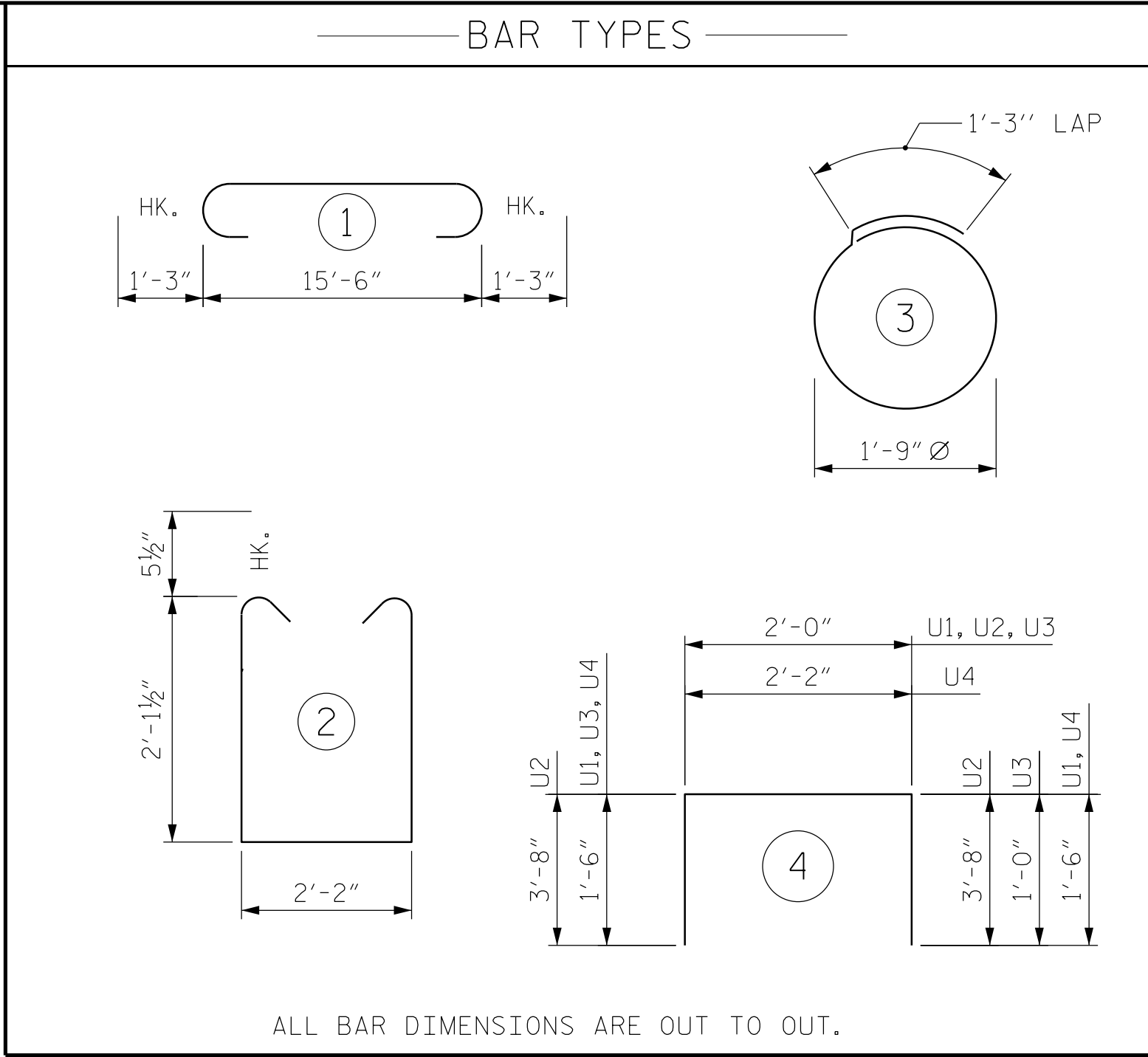
p:\xgfn\pw.bentley.com\gfn\pw-01\Documents\Projects\67945\5-Working\Task 014 - SMU 2023 Timber Bridges (OBD)\S\Structures\CAD\5.0 River Ridge Road\401.035_BR-0D959_SMU_B03_S18_0D959
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SECTION A-A



END OF CAP VIEW

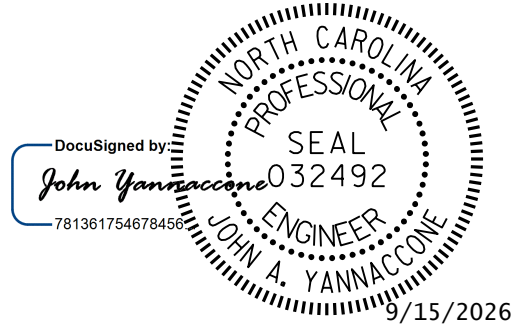


BILL OF MATERIAL FOR ONE BENT					
BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
B1	4	#9	1	18'-0"	245
B2	4	#9	STR	15'-8"	213
B3	4	#5	STR	15'-8"	65
B4	4	#4	STR	15'-8"	42
B5	4	#4	STR	2'-2"	6
S1	22	#5	2	7'-4"	168
S2	6	#4	3	6'-9"	27
U1	8	#4	4	5'-0"	27
U2	2	#4	4	6'-8"	9
U3	2	#9	4	4'-6"	31
U4	30	#4	4	5'-2"	104
REINFORCING STEEL (FOR ONE BENT) 937 LBS					
CLASS A CONCRETE BREAKDOWN (FOR ONE BENT)					
TOTAL CLASS A CONCRETE 3.6 C.Y.					

▲ CONCRETE DISPLACED BY THE PP 16 x 0.50 GALVANIZED STEEL PILES HAS BEEN DEDUCTED FROM THE CONCRETE QUANTITY.

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
STATION: 10+98.00 -L-
SHEET 3 OF 3

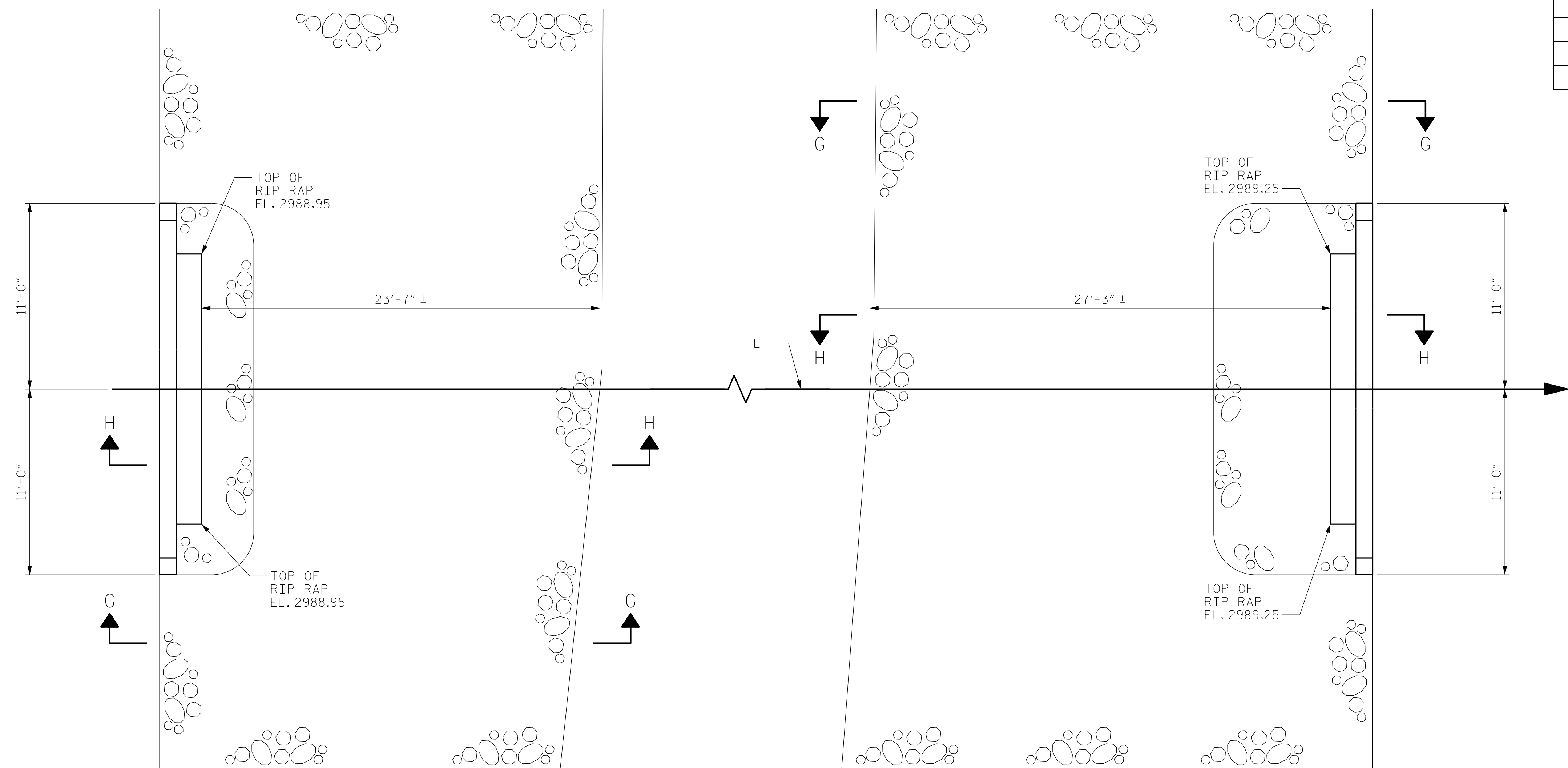
SUBSTRUCTURE BENT DETAILS					
REVISIONS					
NO.	BY:	DATE:	NO.	BY:	DATE:
1			3		
2			4		
SHEET NO. S-18					TOTAL SHEETS 19



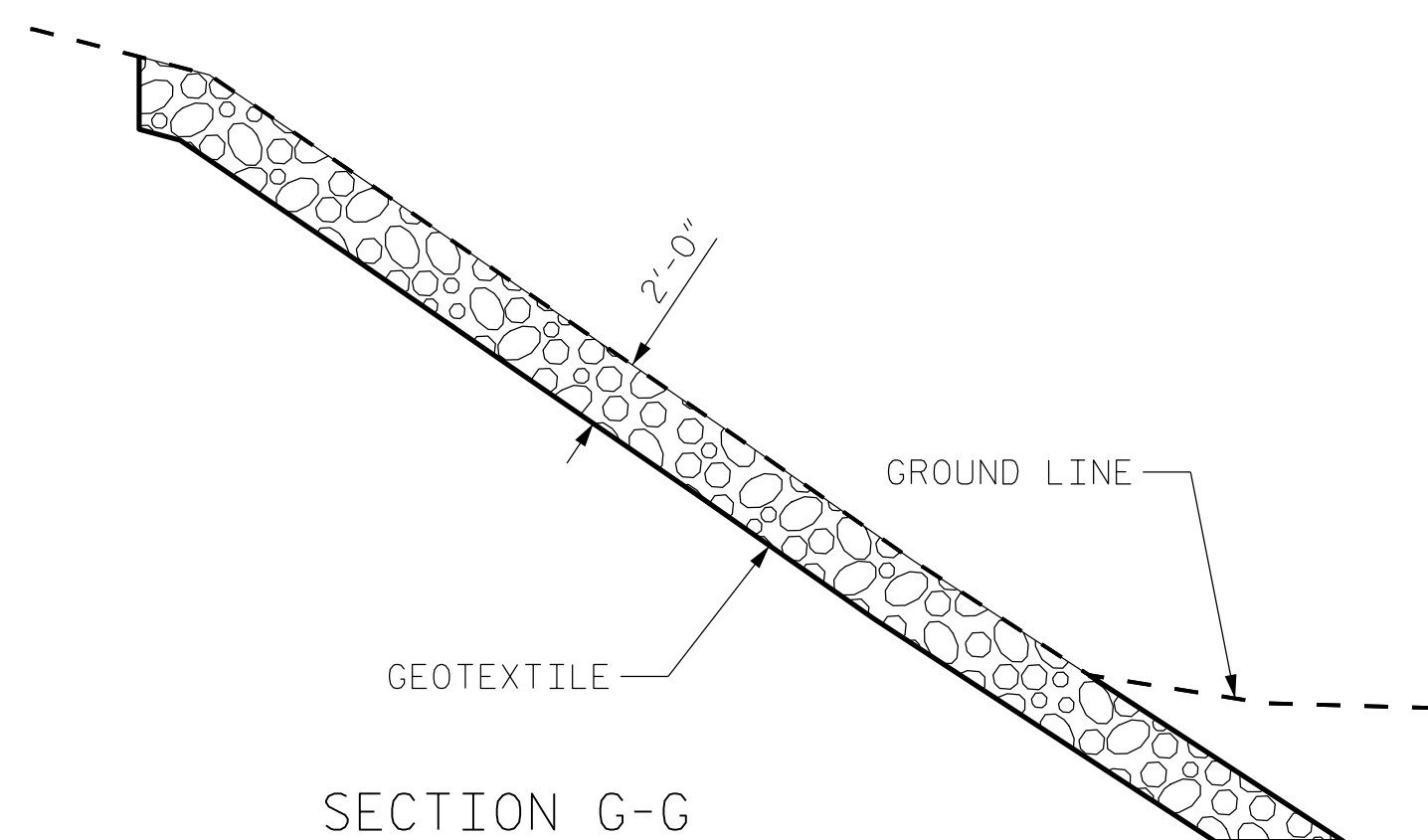
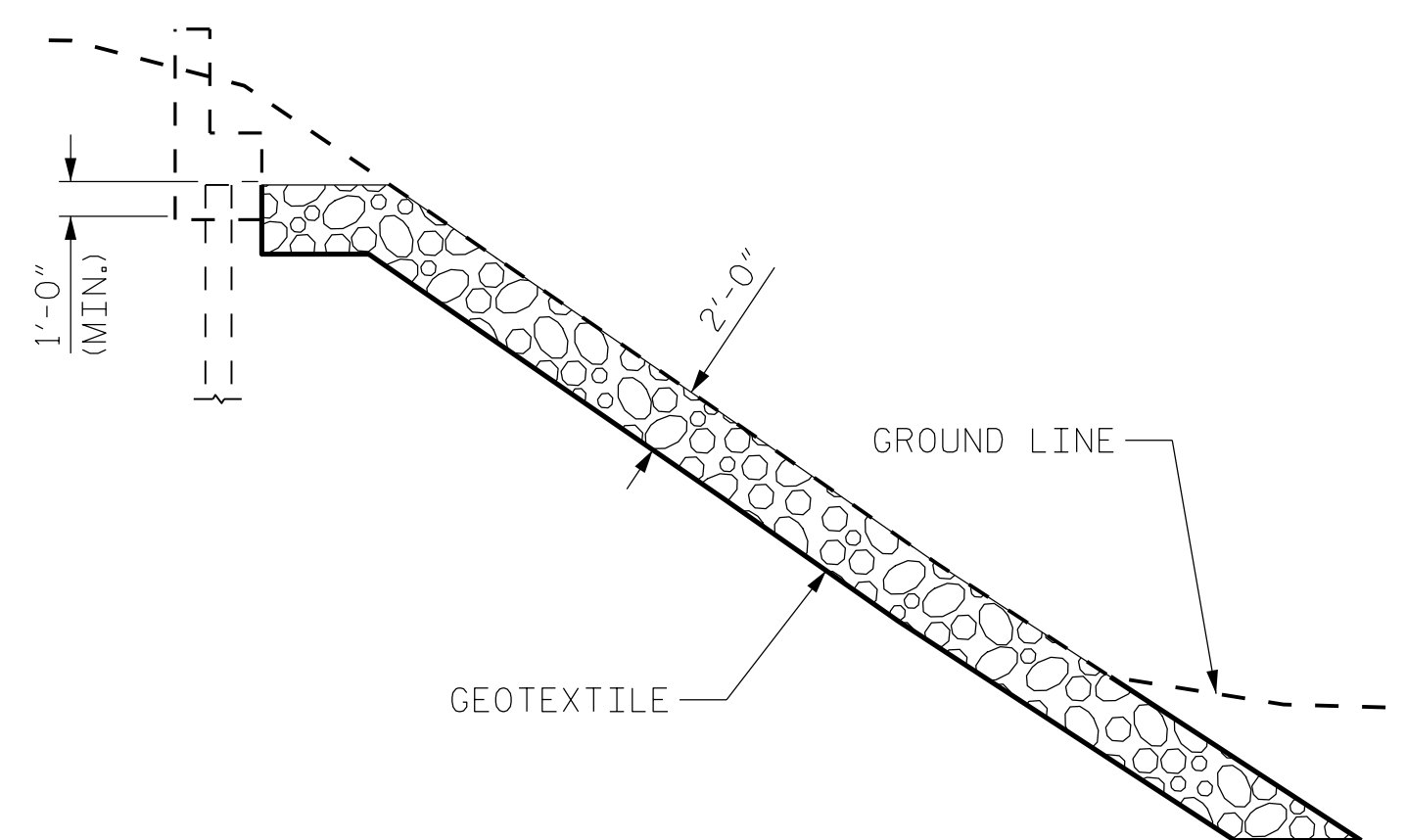
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DESIGN ENGINEER OF RECORD: J. YANNACCONI DATE : 09/2026



ESTIMATED QUANTITIES		
BRIDGE @ STA. 10+98.00 -L-	RIP RAP CLASS II (2'-0" THICK)	GEOTEXTILE FOR DRAINAGE
	TONS	SQUARE YARDS
END BENT 1	190	210
END BENT 2	200	220
TOTAL	390	430



PLAN OF RIP RAP

PROJECT NO. 095.01.0D959
WATAUGA COUNTY
 STATION: 10+98.00 -L-

RIP RAP DETAILS

DRAWN BY : J. MYA DATE : 06/2026
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NO.	BY:	DATE:	NO.	BY:	DATE:	S-19
1			3			TOTAL SHEETS
2			4			19

BRIDGE MAINTENANCE RECOMMENDATIONS

095-01-0D959 WATAUGA COUNTY (RIVER RIDGE ROAD BRIDGE)

A. BRIDGE APPROACH

- CHECK SIGNS ON BOTH ENDS OF BRIDGE
 - WARNING AND INFORMATION SIGNS.
 - BRIDGE END MARKERS.
- CLEAR WEEDS, BRUSH AND OVERHANGING LIMBS
 - ENSURE CLEAR VISIBILITY OF BRIDGE AND SIGNS.
 - CLEAN AREA AROUND BRIDGE.
 - REMOVE ALL DEBRIS FROM SITE.
- EROSION OF BRIDGE APPROACH
 - FILL ANY ERODED AREAS AT GUTTER LINE ON SHOULDER.
 - AT GUTTER LINE, BUILD (IF NEEDED) A PAVED CHANNEL TO CARRY WATER TO SIDE DITCH AT NON-EROSIVE VELOCITY.
 - CHECK SHOULDERS FOR SIGNS OF EROSION AND FILL AND TAMP EROSION CHANNELS.

B. APPROACH ROAD TRAFFIC LANES

- FILL ALL RUTS AND HOLES.
- CHECK TRANSITION FROM ROAD TO BRIDGE AND ENSURE A SMOOTH TRANSITION.
- BUILD A SHORT BITUMINOUS RAMP TO PROVIDE A SMOOTH TRANSITION, IF NEEDED.

C. SIDE DITCHES AND STREAM CHANNEL

- CLEAR SIDE DITCHES OF ALL BRUSH, WEEDS AND DEBRIS.
- CLEAR DEBRIS AND OBSTRUCTIONS FROM STREAM CHANNEL THROUGH FULL WIDTH OF R.O.W.
- ELIMINATE ALL BRUSH GROWING UNDER THE BRIDGE.

D. BRIDGE SUPERSTRUCTURE (DECK, RAILS, BEAMS AND BEARINGS)

- DECK MAINTENACE
 - DECK MAINTENANCE SHOULD BE PERFORMED ON AN ANNUAL BASIS.
 - CLEAN ALL DIRT, GRAVEL, TRASH AND DEBRIS FROM DECK.
 - CLEAR ALL GUTTERS AND DRAINAGE OUTLETS.
 - REMOVE ANY OBSTRUCTIONS CAUSING PONDING OF WATER.
 - DIRECT DECK DRAINS (IF PRESENT) AWAY FROM ALL STRUCTURAL COMPONENTS.
 - CHECK TRANSVERSE PLANKING FOR BREAKS, ROTTING OR ANY WEAKNESS. REPLACE INDIVIDUAL PLANKS, IF NEEDED. REPLACE DAMAGED PLANKS AND RE-NAIL OLD PLANKS, IF REQUIRED. PULL ANY PROTRUDING NAILS AND REPLACE.

2. EXPANSION JOINTS

- DECK EXPANSION JOINTS SHOULD BE CLEANED AND ANY DIRT, GRAVEL, DEBRIS OR OTHER OBSTRUCTIONS REMOVED FROM THE EXPANSION JOINT OPENING.

3. STRUCTURAL STEEL BEAMS

- CLEAR ANY DEBRIS FOUND ON FLANGES OR ON ANY BRACING OCCURRING ON THE STRUCTURE.
- CHECK LONGITUDINAL PLANKS BETWEEN GIRDER AND DECK FOR DAMAGE, EXCESSIVE WEAR, BREAKS, SHATTERING, LOOSENESS OR ROT. REPLACE DAMAGED PLANKS AND RE-NAIL OLD PLANKS, IF REQUIRED. PULL ANY PROTRUDING NAILS AND REPLACE.

4. HANDRAILS AND CURBS

- REPAIR ANY BENT, BROKEN OR MISSING PARTS OF THE BRIDGE HANDRAIL OR CURBS.
- CHECK LONGITUDINAL PLANKS ALONG CURB FOR DAMAGE, EXCESSIVE WEAR, BREAKS, SHATTERING, LOOSENESS OR ROT. REPLACE DAMAGED PLANKS AND RE-NAIL OLD PLANKS, IF REQUIRED. PULL ANY PROTRUDING NAILS AND REPLACE.

5. BEARINGS

- BEARINGS ARE POINTS WHERE THE BRIDGE SUPERSTRUCTURE IS ATTACHED TO THE SUBSTRUCTURE (BENTS, END BENTS AND OTHER SUPPORTS).
- IDENTIFY THE FIXED AND EXPANSION BEARINGS. CLEAR ALL DIRT, BROKEN CONCRETE OR DEBRIS OF ANY KIND FROM AROUND THE BEARINGS.
- CLEAR ANY OBSTRUCTION THAT WOULD PREVENT THE EXPANSION BEARING FROM BEING ABLE TO FUNCTION PROPERLY.
- BEARING SHOULD BE INSPECTED AND CLEANED ON AN ANNUAL BASIS.

E. BRIDGE SUBSTRUCTURE (END BENTS AND BENTS)

1. END BENTS

- INSPECT FOR CRACKING OF END BENT CAP OR WING WALLS.
- ASSESS SIGNIFICANT MOVEMENT OF ANY PART OF THE END BENT.
- NOTE OUT-OF-PLUMB COMPONENTS AND REPORT ANY SERIOUS DETERIORATION OF THE END BENT.
- NOTE ANY EROSION OF THE STREAM THAT MAY UNDERMINE THE END BENT AND ELIMINATE THE CAUSE OF THE EROSION, IF POSSIBLE.
- FILL AND TAMP ANY RODENT HOLES ALONG THE BASE OF THE END BENT AND WING WALLS.

2. BENTS

- CORRECT ANY WATER DRAINAGE ON BENT CAP.
- REPAIR, WHERE POSSIBLE, ANY CRACKS OR DETERIORATION OF THE BENT CAP.
- CHECK FOR UNDERMINING OF PIER FOUNDATION, IF POSSIBLE, AND REPAIR.
- CHECK BENT FOR ANY SIGNS OF MOVEMENT OR ALTERED ALIGNMENT OF BENT CAPS IN RELATION TO SUPERSTRUCTURE.

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	0D959	1	12

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY WATAUGA

SITE DESCRIPTION PROPOSED BRIDGE ON SR 1522
(RIVER RIDGE RD) OVER SOUTH FORK NEW
RIVER

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2, 2A	LEGEND (SOIL & ROCK)
2B, 2C	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4-II	BORE LOGS, CORE LOGS, CORE PHOTOS
12	SITE PHOTO

PERSONNEL

B. WORLEY, PG

S. DAVIS (F&R)

J. MARTINEZ (F&R)

INVESTIGATED BY GFT INC.

DRAWN BY B. WORLEY, PG

CHECKED BY B. HARLACHER, EIT

SUBMITTED BY B. WORLEY, PG

DATE JUNE, 2026

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

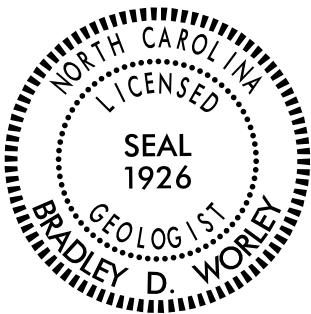
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO PERFORM INDEPENDENT SUBSURFACE INVESTIGATIONS AND MAKE INTERPRETATIONS AS NECESSARY TO CONFIRM CONDITIONS ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N. C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
- BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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PROJECT: 0D959

0D959

2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS
(PAGE 1 OF 2)

SOIL DESCRIPTION										GRADATION									
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.									
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS									
GENERAL CLASS. GRANULAR MATERIALS (≤ 35% PASSING #200) SILT-CLAY MATERIALS (> 35% PASSING #200) ORGANIC MATERIALS GROUP CLASS. A-1 A-1-b A-2 A-2-4 A-2-5 A-2-6 A-2-7 A-4 A-5 A-6 A-7 A-7-5 A-7-6 A-1-A-2 A-3 A-4, A-5 A-6, A-7 SYMBOL										THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.									
MINERALOGICAL COMPOSITION										COMPRESSIBILITY									
MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.										SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50									
PERCENTAGE OF MATERIAL										GROUND WATER									
ORGANIC MATERIAL GRANULAR SOILS SILT - CLAY SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE										WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP									
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS									
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE < 4 4 TO 10 N/A MEDIUM DENSE 10 TO 30 DENSE 30 TO 50 VERY DENSE > 50 GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT < 2 0.25 TO 0.5 SOFT 2 TO 4 0.5 TO 1.0 MEDIUM STIFF 4 TO 8 1 TO 2 STIFF 8 TO 15 2 TO 4 VERY STIFF 15 TO 30 > 4 HARD > 30										ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION 25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES SOIL SYMBOL SPT DPT DMT TEST BORING ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING INFERRED SOIL BOUNDARY CORE BORING INFERRED ROCK LINE MONITORING WELL ALLUVIAL SOIL BOUNDARY PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE									
TEXTURE OR GRAIN SIZE										RECOMMENDATION SYMBOLS									
U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.76 2.00 0.42 0.25 0.075 0.053 BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE, SD.) FINE SAND (F SD.) SILT (SL.) CLAY (CL.)										UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK									
GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005 IN. 12 3										ABBREVIATIONS									
SOIL MOISTURE - CORRELATION OF TERMS										AR - AUGER REFUSAL MED. - MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA - MICACEOUS WEA. - WEATHERED CL - CLAY MOD. - MODERATELY ̳ - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC ̳ _g - DRY UNIT WEIGHT CSE - COARSE ORG. - ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST DPT - DYNAMIC PENETRATION TEST SAP. - SAPROLITIC e - VOID RATIO SD. - SAND, SANDY F - FINE SL. - SILT, SILTY FOSS. - FOSSILIFEROUS SLI. - SLIGHTLY FRAC. - FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS. - FRAGMENTS w - MOISTURE CONTENT HI. - HIGHLY V - VERY									
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION LL LIQUID LIMIT - SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC RANGE (PI) - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE PL PLASTIC LIMIT OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE										EQUIPMENT USED ON SUBJECT PROJECT									
PLASTICITY										DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: ☐ CME-45C ☐ CLAY BITS ☒ AUTOMATIC ☐ MANUAL ☒ CME-750X ☐ 6" CONTINUOUS FLIGHT AUGER ☐ CME-550 ☐ 4" HOLLOW STEM AUGERS ☐ VANE SHEAR TEST ☐ HARD FACED FINGER BITS ☐ PORTABLE HOIST ☐ TUNG.-CARBIDE INSERTS ☐ CASING ☐ W/ ADVANCER ☐ TRICONE ☐ STEEL TEETH ☐ TRICONE ☐ TUNG.-CARB. ☒ CORE BIT ☐ CORE BIT CORE SIZE: ☐ -B ☐ -H ☒ -N Q3 HAND TOOLS: ☐ POST HOLE DIGGER ☐ HAND AUGER ☐ SOUNDING ROD ☐ VANE SHEAR TEST									
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH										COLOR									
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.																			

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2A

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

(PAGE 2 OF 2)

ROCK DESCRIPTION			TERMS AND DEFINITIONS	
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 60 BLOWS PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:			ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR CLAY THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.		
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.		
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.		
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.		
WEATHERING				
FRESH		ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.		
VERY SLIGHT (V SL.)		ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.		
SLIGHT (SL.)		ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.		
MODERATE (MOD.)		SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.		
MODERATELY SEVERE (MOD. SEV.)		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>		
SEVERE (SEV.)		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</u>		
VERY SEVERE (V SEV.)		ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>		
COMPLETE		ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.		
ROCK HARDNESS				
VERY HARD		CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.		
HARD		CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.		
MODERATELY HARD		CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.		
MEDIUM HARD		CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.		
SOFT		CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.		
VERY SOFT		CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.		
FRACTURE SPACING		BEDDING		
TERM	SPACING	TERM	THICKNESS	
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	4 FEET	
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	
CLOSE	0.16 TO 1 FOOT	VERY THINLY BEDDED	0.03 - 0.16 FEET	
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET	
		THINLY LAMINATED	< 0.008 FEET	
INDURATION				
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.				
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.			
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.			
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.			
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.			
			BENCH MARK: *See Note	
			ELEVATION:	FEET
			NOTES: Stations/Offsets, Northings/Eastings, and Elevations for boring collars provided by GFT, Inc. Roadway/Survey (Raleigh, NC) using GPS coordinates gathered in the field.	

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2B

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 1 OF 2)

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000)

From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that $GSI = 35$. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.

SURFACE CONDITIONS

VERY GOOD
Very rough, fresh unweathered surfaces

GOOD
Rough, slightly weathered, iron stained surfaces

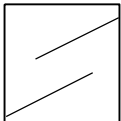
FAIR
Smooth, moderately weathered and altered surfaces

POOR
Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments

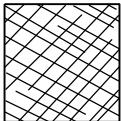
VERY POOR
Slickensided, highly weathered surfaces with soft clay coatings or fillings

STRUCTURE

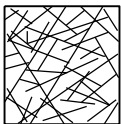
DECREASING SURFACE QUALITY →



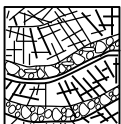
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities



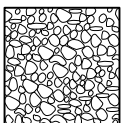
BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets



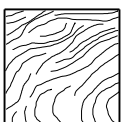
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets



BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity

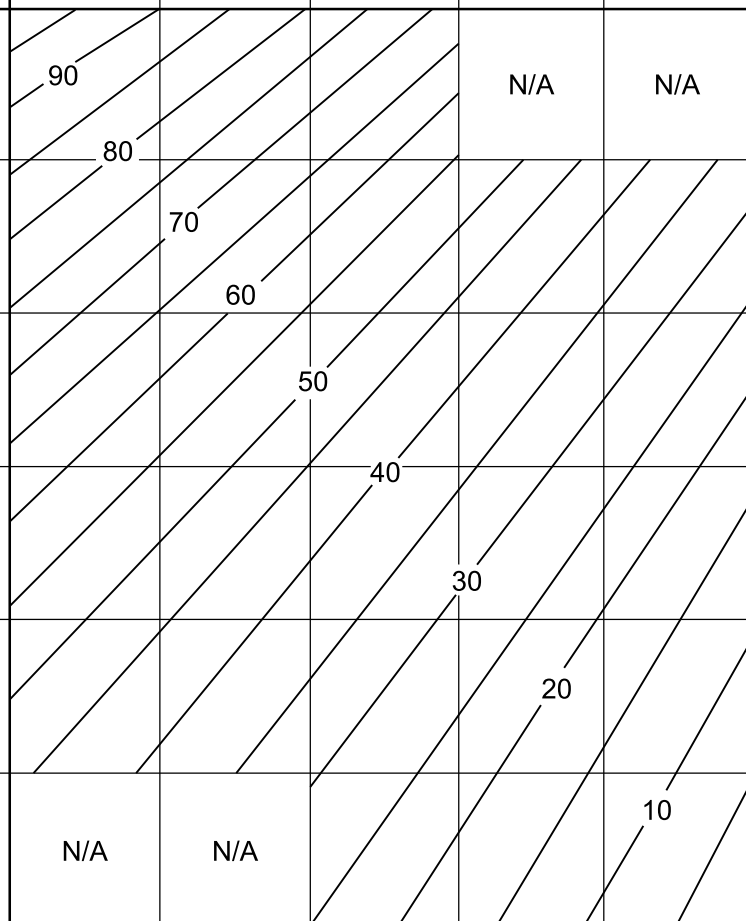


DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces



LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes

DECREASING INTERLOCKING OF ROCK PIECES



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2C

**NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT**

SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (PAGE 2 OF 2)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000)

From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.

COMPOSITION AND STRUCTURE

SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)

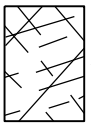
VERY GOOD - Very Rough, fresh unweathered surfaces

GOOD - Rough, slightly weathered surfaces

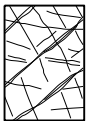
FAIR - Smooth, moderately weathered and altered surfaces

POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments

VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings



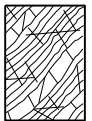
A. Thick bedded, very blocky sandstone
The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.



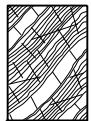
B. Sandstone with thin inter-layers of siltstone



C. Sandstone and siltstone in similar amounts



D. Siltstone or silty shale with sandstone layers



E. Weak siltstone or clayey shale with sandstone layers

C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to **F** and **H**.



F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure



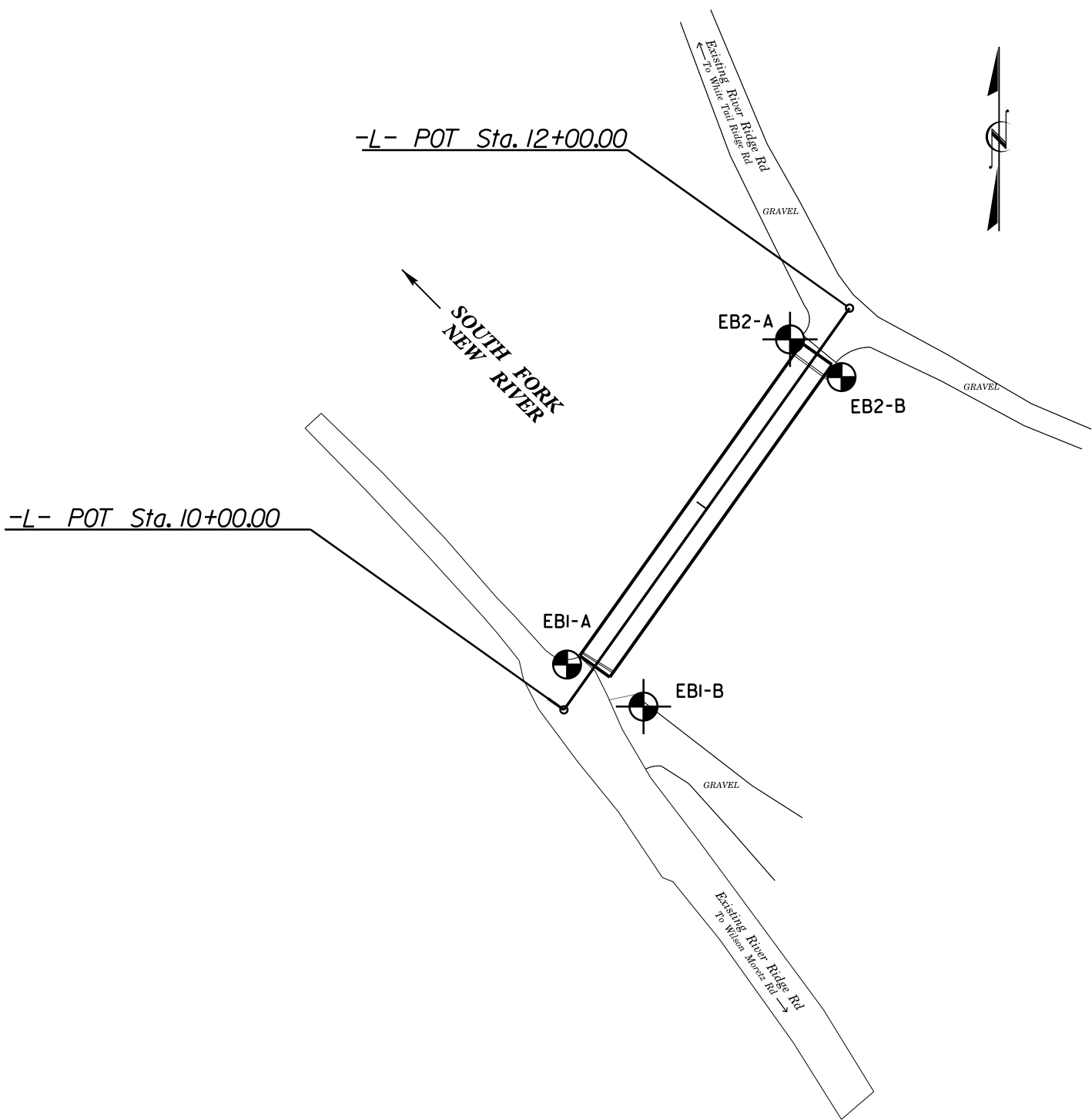
G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers



H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces.

→ Means deformation after tectonic disturbance

PROJECT REFERENCE NO.	SHEET NO.
OD959	3
SITE PLAN	
0 60 120 FEET	



Proposed Skew = 90 Degrees

NCDOT BORE SINGLE OD549 GEU BRDG GINT.GPJ NC DOT.GDT 6/5/26

WBS 083783			TIP 0D959			COUNTY WATAUGA			GEOLOGIST B. Worley, PG			
SITE DESCRIPTION Proposed Bridge on SR 1522 (River Ridge Rd) over South Fork New River									GROUND WTR (ft)			
BORING NO. EB1-A			STATION 10+16			OFFSET 10 ft LT			ALIGNMENT -L-			
COLLAR ELEV. 2,992.6 ft			TOTAL DEPTH 12.6 ft			NORTHING 924,425			EASTING 1,235,881			
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic			
DRILLER S. Davis			START DATE 04/28/26			COMP. DATE 04/28/26			SURFACE WATER DEPTH N/A			
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100		ELEV. (ft) DEPTH (ft)
2995												
2990	2,989.1	3.5	4	4	5						D	2,992.6 GROUND SURFACE 0.0
2985	2,984.1	8.5	3	6	5						D	2,985.1 7.5
2980	2,980.1	12.5										2,980.6 12.0
		60/0.1										2,980.0 12.6
												CRYSTALLINE ROCK (biotite gneiss - Ashe Metamorphic Suite)
												Boring Terminated with Standard Penetration Test Refusal at Elevation 2,980.0 ft in Crystalline Rock (biotite gneiss - Ashe Metamorphic Suite)

NCDOT BORE SINGLE OD549 GEU BRDG GINT.GPJ NC DOT.GDT 6/5/26

WBS 083783			TIP 0D959			COUNTY WATAUGA			GEOLOGIST B. Worley, PG					
SITE DESCRIPTION Proposed Bridge on SR 1522 (River Ridge Rd) over South Fork New River									GROUND WTR (ft)					
BORING NO. EB1-B			STATION 10+20			OFFSET 26 ft RT			ALIGNMENT -L-					
COLLAR ELEV. 2,993.2 ft			TOTAL DEPTH 41.0 ft			NORTHING 924,557			EASTING 1,235,971					
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic					
DRILLER S. Davis			START DATE 04/28/26			COMP. DATE 04/28/26			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
2995														
2990	2,989.7	3.5	2	2	3								2,993.2	GROUND SURFACE 0.0
2985	2,984.7	8.5	2	2	2								2,987.2	RESIDUAL 6.0
2980	2,979.7	13.5												
	2,978.7	14.5	6	94/0.3						100/0.8			2,979.2	14.0
2975			60/0.0							60/0.0			2,978.7	14.5
2970														
2965														
2960														
2955														
													2,952.2	41.0
														Boring Terminated at Elevation 2,952.2 ft in Crystalline Rock (biotite gneiss - Ashe Metamorphic Suite)

CORE LOG

NCDOT CORE SINGLE OD549_GEU_BRDG_GINT.GPJ NC_DOT.GDT 6/5/26

CORE PHOTOGRAPH

EB1-B

BOXES 1-3: 14.5' to 41.0'



BORE LOG

NC DOT BORE SINGLE OD549 GEU_BRDG_GINT.GPJ NC DOT.GDT 6/5/26

GEOTECHNICAL BORING REPORT

CORE LOG

WBS 083783				TIP 0D959		COUNTY WATAUGA		GEOLOGIST B. Worley, PG				
SITE DESCRIPTION Proposed Bridge on SR 1522 (River Ridge Rd) over South Fork New River										GROUND WTR (ft)		
BORING NO. EB2-A				STATION 11+76		OFFSET 12 ft LT		ALIGNMENT -L-		0 HR.	N/A	
COLLAR ELEV. 2,992.4 ft				TOTAL DEPTH 41.6 ft		NORTHING 924,408		EASTING 1,235,971		24 HR.	Dry	
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic			
DRILLER S. Davis				START DATE 04/29/26		COMP. DATE 04/30/26		SURFACE WATER DEPTH N/A				
CORE SIZE NQ3				TOTAL RUN 29.6 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	ROD (ft) %	SAMP. NO.	REC. (ft) %	ROD (ft) %	L O G	DESCRIPTION AND REMARKS ELEV. (ft) DEPTH (ft)	
2980.4											Begin Coring @ 12.0 ft	
2980.4	2,980.4	12.0	4.6	N=60/0.0 0:40/0.6 1:13/1.0 1:47/1.0 1:14/1.0 1:32/1.0	(4.3) 93%	(3.6) 78%		(28.0) 95%	(25.6) 86%		2,980.4 CRYSTALLINE ROCK Gray to dark gray and black, mod. hard to fresh, close to wide-fractured, biotite gneiss (Ashe Metamorphic Suite) GSI = 85-95	12.0
2975	2,975.8	16.6										
			5.0	1:29/1.0 1:22/1.0 1:29/1.0 1:07/1.0 1:32/1.0	(3.9) 78%	(3.0) 60%						
2970	2,970.8	21.6										
			5.0	1:23/1.0 1:07/1.0 1:25/1.0 1:51/1.0 2:14/1.0	(4.9) 98%	(4.2) 84%						
2965	2,965.8	26.6										
			5.0	1:17/1.0 1:32/1.0 1:29/1.0 1:29/1.0 2:03/1.0	(5.0) 100%	(4.9) 98%						
2960	2,960.8	31.6										
			5.0	1:40/1.0 2:04/1.0 1:48/1.0 1:39/1.0 1:42/1.0	(4.9) 98%	(4.9) 98%						
2955	2,955.8	36.6										
			5.0	1:28/1.0 1:31/1.0 1:29/1.0 1:24/1.0 1:55/1.0	(5.0) 100%	(5.0) 100%						
	2,950.8	41.6									2,951.3 Boring Terminated at Elevation 2,951.3 ft in Crystalline Rock (biotite gneiss - Ashe Metamorphic Suite)	41.6

CORE PHOTOGRAPH

EB2-A

BOXES 1-3: 12.0' to 41.6'



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 083783			TIP 0D959			COUNTY WATAUGA			GEOLOGIST B. Worley, PG				
SITE DESCRIPTION Proposed Bridge on SR 1522 (River Ridge Rd) over South Fork New River										GROUND WTR (ft)			
BORING NO. EB2-B			STATION 11+75			OFFSET 14 ft RT			ALIGNMENT -L-				
COLLAR ELEV. 2,994.0 ft			TOTAL DEPTH 12.0 ft			NORTHING 924,542			EASTING 1,235,992				
DRILL RIG/HAMMER EFF./DATE F&R7348 CME-750X 87% 12/20/2024						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic				
DRILLER S. Davis			START DATE 04/30/26			COMP. DATE 04/30/26			SURFACE WATER DEPTH N/A				
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
			0.5ft	0.5ft	0.5ft	0	25	50	75				
2995													
													2,994.0 GROUND SURFACE 0.0
2990	2,990.5	3.5	4	2	2								RESIDUAL Brown, loose, silty f. SAND (A-2-4) w/ trace mica
2985	2,985.5	8.5	2	5	5								
	2,982.0	12.0											
			60/0.0										2,982.0 12.0
													CRYSTALLINE ROCK (biotite gneiss - Ashe Metamorphic Suite) Boring Terminated with Standard Penetration Test Refusal at Elevation 2,982.0 ft on Crystalline Rock (biotite gneiss - Ashe Metamorphic Suite)

SITE PHOTOS – Proposed Bridge on SR 1522 (River Ridge Rd) over South Fork
New River



View From Proposed EB2 Looking Southwest Toward Proposed EB1



View From Proposed EB1 Looking North/Northeast Toward Proposed EB2