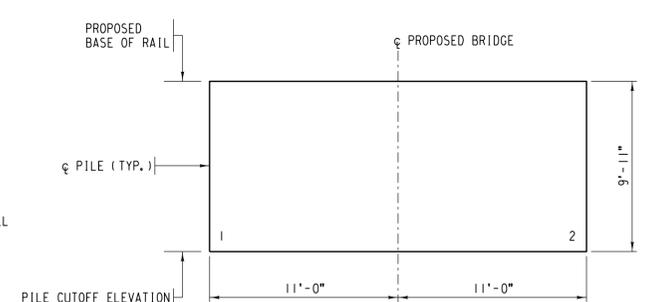
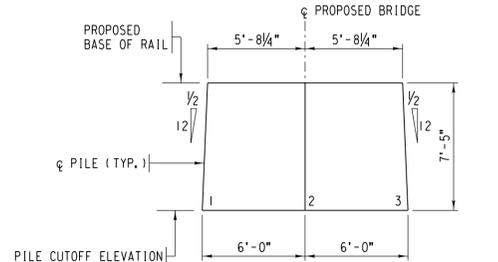


PLAN  
SCALE: 1/8" = 1'-0"



PILE DRIVING DIAGRAM  
SCALE: NO SCALE  
BENT #2 AND #3



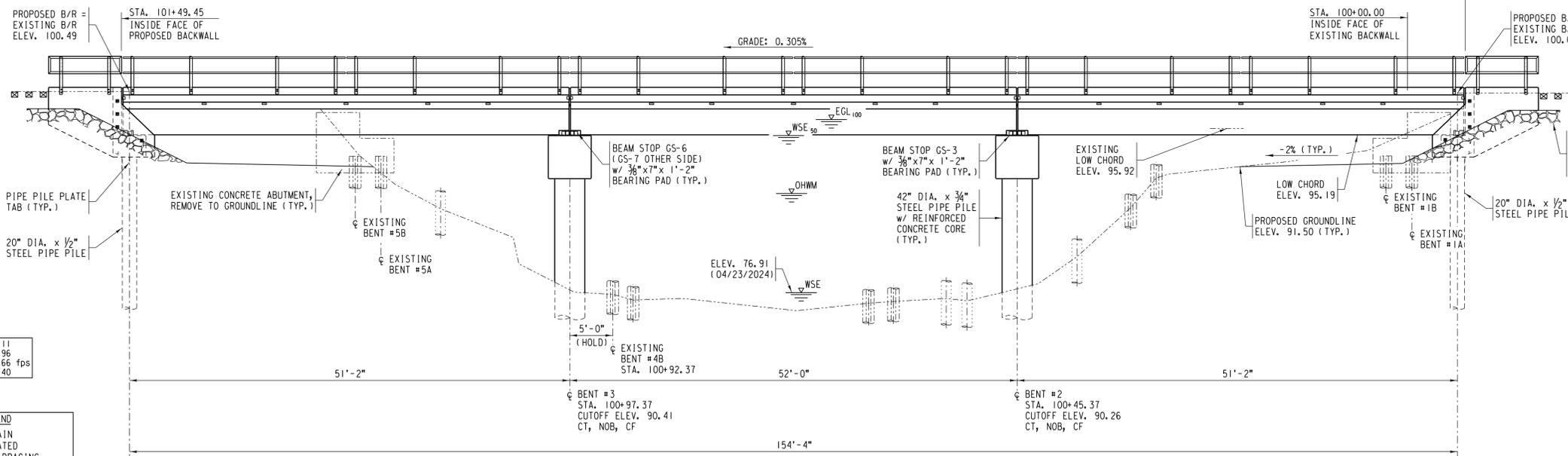
PILE DRIVING DIAGRAM  
SCALE: NO SCALE  
BENT #1 AND #4

- NOTES:
- VISIT [www.up.com/CBUD](http://www.up.com/CBUD) TO CREATE A DIG TICKET FOR FIBER OPTIC UTILITY LOCATES. THIS DIG TICKET MUST BE ISSUED NO LESS THAN 2 BUSINESS DAYS BEFORE EXCAVATION CAN BEGIN. REPORT EMERGENCY FIBER OPTIC ISSUES TO 1-800-336-9193.
  - LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY MCI, 1-800-624-9675, AND KANSAS 811, 1-800-344-7233 AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

LETTER SERIES  
SHEET NO. CUT ON SHEET NO. SHOWN ON

SECTION DESIGNATION

NO.	DATE	REVISIONS
COMPLETION STATUS:		
<b>FINAL</b>		03/03/2025
STATUS		DATE
APPROVED FOR UNION PACIFIC RAILROAD BY:		
<b>olsson</b>		2/28/2025
NICHOLAS A. SWOBODA, PE		DATE
DESIGN ENGINEER OF RECORD		
PROJECT ID:	WORK ORDER:	C NUMBER:
131772	73212	123704
LATITUDE: 39.76501°N		LONGITUDE: 96.47640°W



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

WSE<sub>100</sub> = 95.11  
ECL<sub>100</sub> = 96.96  
VEL<sub>100</sub> = 6.66 fps  
OHMM = 88.40

PILE LEGEND

P	=	PLAIN
CT	=	COATED
NOB	=	NO BRACING
SB	=	STANDARD BRACING
HB	=	HEAVY BRACING
S	=	SOCKETED
CF	=	CONCRETE FILL

DRAWING SCHEDULE

SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
S1	123704	GENERAL ARRANGEMENT	DESIGN
S2	123704	GENERAL NOTES AND BILL OF MATERIAL	DESIGN
S3	123704	PIPE PILE REINFORCED CORE DETAILS	DESIGN
S4	123704	BORING LOGS	DESIGN
T2	531100	GENERAL NOTES	STANDARD
A2	531100	STRUCTURE MARKER & NO TRESPASSING SIGN INSTALLATION DETAILS	STANDARD
2-3	533100	42" PCB SPANS MULTIPLE SPAN CONSTRUCTION PHASING	STANDARD
B2	533100	42" PCB SPANS MULTIPLE SPAN GENERAL ARRANGEMENT	STANDARD
B3-B4	533100	42" PCB SPANS END BENT CONSTRUCTION DETAILS	STANDARD
B8	533100	42" PCB SPANS INTERIOR BENT CONSTRUCTION DETAILS	STANDARD
B10-B11	533100	42" PCB SPANS MISCELLANEOUS CONSTRUCTION DETAILS	STANDARD
P1	531121	PILE INSTALLATION NOTES AND DETAILS	STANDARD
I-2	533120	DRIVEN PILE NOTES 20" TO 48" DIAMETER	STANDARD
I	533190	42" PCB SPANS END CAP PC42E1S OR PC42E2S STANDARD RIPRAP PLACEMENT DETAILS	STANDARD

POSTCONSTRUCTION COMPLIANCE

Constructor in charge of construction to provide to the office of the Senior Manager Structures Design as-built drawings confirming that the project was constructed in compliance with the plans and indicating any construction variances.

SIGNED \_\_\_\_\_ Date \_\_\_\_\_  
In Charge of Construction

NICHOLAS A. SWOBODA  
31053  
KANSAS PROFESSIONAL ENGINEER  
03/03/2025



UNION PACIFIC RAILROAD  
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 136.34, KANSAS SUB  
3 SPAN 42" PCB x 156' REPLACING 4 SPAN PCB-BD x 120'

SHEET TITLE: GENERAL ARRANGEMENT

**DESIGN NOTES**

1. In the event of a conflict between the design plans and the standards, the design plans shall control.

**RIGHT-OF-WAY**

- 1. 150' right of existing Main Track centerline.
- 250' left of existing Main Track centerline.

**LAYOUT**

- 1. Stationing: Sta. 100+00.00, West face of East backwall of existing Main Track Bridge No. 136.34.
- 2. Elevation Datum: Elev. 100.00, base of North rail of existing Main Track, Sta. 100+00.00. To convert to NAVD 1988 datum, add 1189.48' to elevations.

**Temporary Benchmarks:**

TBM 1: Elev. 98.41, established by chiseled "X" located in Northeast concrete abutment of existing Bridge No. 136.34, 9.06' right of existing Main Track centerline, Sta. 99+95.84.

TBM 2: Elev. 99.99, established by chiseled "X" located in Northwest concrete wingwall of existing Bridge No. 136.34, 9.25' right of existing Main Track centerline, Sta. 100+34.97.

4. Profile: No change in rail elevation.

5. Alignment: Tangent.

6. Information used to prepare this drawing in addition to reference drawings:

Location survey prepared by Olsson, dated 05/01/2024.

Geotechnical investigation prepared by Geotechnology, Inc., dated 06/19/2008.

Geotechnical recommendation prepared by Olsson, dated 01/13/2025.

**PILES**

1. Pipe piles shall be furnished, driven and tested per notes, Std. Dwg. No. 533120, Sheet 1. PDA testing shall be performed per Std. Dwg. No. 533120, Sheet 1.

2. The top pipe piles at all interior bents shall be furnished with coal tar epoxy coating per notes, Std. Dwg. No. 533120, Sheet 1. The upper 40' (min.) of pile length shall be coated.

3. All pipe piles shall be driven to the following allowable capacities:  
Bent #1 & #4: 130 ton  
Bent #2 & #3: 300 ton

\*Additional tonnage accommodates estimated resistance losses from future scour.

4. Design scour:  
Bent #1 and #4: No scour analysis  
Bent #2 and #3: Elev. 67.80

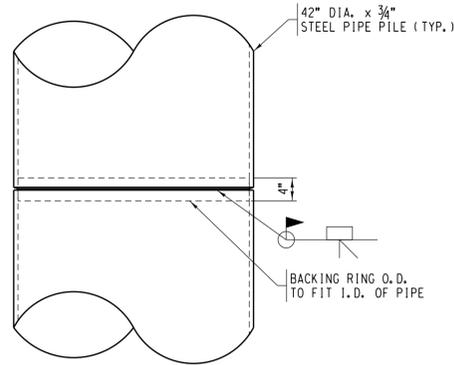
5. Estimated pile tip elevations are as follows:  
Bent #1 and #4: Elev. 13.00±  
Bent #2 and #3: Elev. 13.00±

6. If pile capacity is not achieved prior to reaching estimated pile tip elevations, notify UPRR for guidance on a potential restrrike program prior to driving additional piling.

**DESIGN**

1. This structure was designed for Cooper E80 Live Load plus impact with a 30" maximum total depth of ballast.

2. This drawing was prepared using 8" (min.) of ballast under timber ties.



**42" DIA. PIPE SPLICE DETAIL**  
SCALE: 3/4"=1'-0"

**NOTE:**  
INSTALL 42" DIA. PIPE PILE INSIDE FLANGE STEEL CUTTING SHOES (APF MODEL CS7714 OR APPROVED ALTERNATE) PER MANUFACTURER'S INSTRUCTIONS.

**BILL OF MATERIAL**

Ver 0

TOTAL	UNIT	DESCRIPTION	ITEM NO	ORDERED BY
6	EA	42" X 51'-10" PRESTRESSED CONCRETE BOX BEAM BG52-0, TYPE I W SLOPED CURB (PER STD. PLAN NO. 533130 SHT. 1-4 AND STD. PLAN NO. 531130 SHT. CC1-CC2)	510-0106	MBP
2	EA	PRECAST CONCRETE 1 PIECE END CAP ASSEMBLY PA42E1S, SINGLE, FOR 42" CONCRETE BOX BEAMS W/ 1" POLYURETHANE BEARING PADS - INCLUDING 1-END CAP PC42E1S AND 2-WINGWALLS PW42 (PER STD. PLAN NO. 533140, SHTS. E1 & E2)	510-0144	
2	EA	PRESTRESSED CONCRETE INTERIOR SUPERCAP PSC4211S, SINGLE TRACK, FOR 42" CONCRETE BOX BEAMS W/ 1" POLYURETHANE BEARING PADS (PER STD. PLAN NO. 533140, SHTS. E8 & E9 AND STD. PLAN NO. 533160, SHT. 1 AND STD. PLAN NO. 531160, SHT. 1)	510-0152	
6	EA	STEEL PIPE PILE 20" O.D. X 0.5" X DOUBLE RANDOM 40 FT LENGTH WITH 1 END BEVELED PER ASTM A252, GRADE 3 (PER STD. PLAN NO. 531120 SHT. P1)	510-7620	
6	EA	STEEL PIPE PILE 20" O.D. X 0.5" X 60 FT LENGTH WITH 1 END BEVELED PER ASTM A252, GRADE 3 (PER STD. PLAN NO. 531120 SHT. P1)	510-7624	
6	EA	20" PIPE PILE BACKING RING (PER STD. PLAN NO. 531120 SHT. P1)	510-7619	
6	EA	20" DIA. HARDENED STEEL PILE CONE POINT (PER STD. PLAN NO. 531120 SHT. P1)	510-7621	
4	EA	42" DIA. X 3/4" X 40'-0" STEEL PIPE PILE, ONE END BEVELED (ASTM A252, GR. 3), COAL TAR EPOXY COATED (PER DETAILS, SHT. NO. S3 AND NOTES, STD. PLAN NO. 533120 SHT. 1)	123704-01	
4	EA	42" DIA. X 3/4" X 60'-0" STEEL PIPE PILE, ONE END BEVELED (ASTM A252, GR. 3) (PER DETAILS, SHT. NO. S3 AND NOTES, STD. PLAN NO. 533120 SHT. 1)	123704-02	
4	EA	42" PIPE PILE BACKING RING (PER STD. PLAN NO. 533100, SHT. BB)	123704-03	
4	EA	42" PIPE PILE BACKING RING FOR CAP WELD (PER STD. PLAN NO. 533100, SHT. BB)	123704-04	
4	EA	42" PIPE PILE INSIDE FLANGE STEEL CUTTING SHOE, APF MODEL CS7714 OR APPROVED ALTERNATE.	123704-05	
4	LOT	CONCRETE FILL MATERIAL (PER SCHEDULE, SHEET NO. S3)	123704-06	
8	EA	END BENT BEAM STOP GS-3 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0596	
2	EA	BEAM STOP GS-6 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0000	
2	EA	BEAM STOP GS-7 (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0002	
12	EA	HANDRAIL ASSEMBLY C21 FOR 25'-10" CONCRETE INTERIOR SPAN (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0456	
4	EA	END HANDRAIL ASSEMBLY CEH-42 FOR CONCRETE SPANS W/O GRATING (PER DETAILS, STD. PLAN NO. 533180, SHT. 1 & NOTES, STD. PLAN NO. 531100, SHT. T3)	513-0002	
4	EA	DECK PLATE CDP1 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0590	
4	EA	DECK PLATE CDP2 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0591	
8	EA	DECK PLATE CDP3 (PER STD. PLAN NO. 531180, SHTS. 1-6)	510-0592	
4	EA	INTERIOR DECK PLATE HOLD DOWN PLATE PL31, GALVANIZED (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0005	
4	EA	END BENT DECK PLATE HOLD DOWN PLATE PL32, GALVANIZED (PER STD. PLAN NO. 531180 SHTS 1-6)	510-0006	
4	EA	PIPE PILE PLATE TAB PT-1 (PER STD. PLAN NO. 533180, SHT. 1)	510-0119	
4	EA	PIPE PILE PLATE TAB PT-2 (PER STD. PLAN NO. 533180, SHT. 1)	510-0120	
4	EA	PIPE PILE PLATE TAB PT-3 (PER STD. PLAN NO. 533180, SHT. 1)	510-0121	
4	EA	PL 3/8X24X 10' (A36, PLAIN)	510-7650	
12	EA	3/8" X 7" X 1'-2" ELASTOMERIC BEARING PAD (50 DUROMETER)	510-3637	
34	EA	1/2"X40" X 5'-6" PREMOLDED EXPANSION JOINT FILLER (PER ASTM D1751)	510-0122	
105	TN	RIPRAP, CLASS 1 (PER NOTES, STD. PLAN NO. 531190, SHT. R1 OR R2)	562-2764	
1	QT	ZRC COLD GALVANIZING COMPOUND OR APPROVED ALTERNATIVE	513-3960	
1	LOT	TARGUARD COAL TAR EPOXY (5 GAL. KIT) BY SHERWIN WILLIAMS OR APPROVED ALTERNATE		
1	LOT	PDA TESTING (PER NOTES, SHEET NO. S2 AND STD. DWG. 533120, SHEET NO. 1)		
128	TN	SEALANT BALLAST (PER STD. DWG. 0010E)	562-5428	
1	LOT	PL-400 CONSTRUCTION ADHESIVE FOR BEARING PADS (PER STD. DWG. 531100 SHT. A1)		

EST. WT. OF 20" DIA. STEEL PIPE PILING = 62,540 LB.  
EST. WT. OF 42" DIA. STEEL PIPE PILING = 132,295 LB.

BULK MATERIAL QUANTITIES ARE ESTIMATED.

NO.	DATE	REVISIONS
COMPLETION STATUS:		
<b>FINAL</b>		03/03/2025
STATUS		DATE
APPROVED FOR UNION PACIFIC RAILROAD BY:		
NICHOLAS A. SWOBODA, PE		2/28/2025
DESIGN ENGINEER OF RECORD		DATE
PROJECT ID:	WORK ORDER:	C E NUMBER:
131772	73212	123704
LATITUDE: 39.76501°N		LONGITUDE: 96.47640°W



	DSNCHK BY: NAS/KAS	<b>UNION PACIFIC RAILROAD</b> Office of Director Structures Design
	DRAWNCHK BY: EJS/NAS	
	UPRR ENGINEER: ADS	
SHT NO.: S2 of S4	WORK ORDER: 73212	LOCATION & DESCRIPTION: BRIDGE 136.34, KANSAS SUB 3 SPAN 42" PCB x 156' REPLACING 4 SPAN PCB-BD x 120'
SHEET TITLE: GENERAL NOTES AND BILL OF MATERIAL		

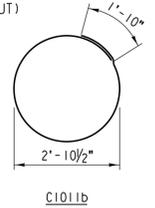
CONCRETE FILL MATERIAL SCHEDULE  
(QUANTITY PER PILE)

REQ'D.	UNIT	DESCRIPTION
24.9	CU. YD.	4000 PSI CONCRETE (PER NOTES, STD. DWG. 533120, SHT. T2)
1	LOT	REINFORCING STEEL (PER NOTES, STD. DWG. 533120, SHT. NO. T2 AND SCHEDULE, SHEET NO. S3)
1	LOT	E-Z LOK WHEELS (PER NOTES, STD. DWG. 533120, SHT. NO. 2) OR APPROVED ALTERNATE

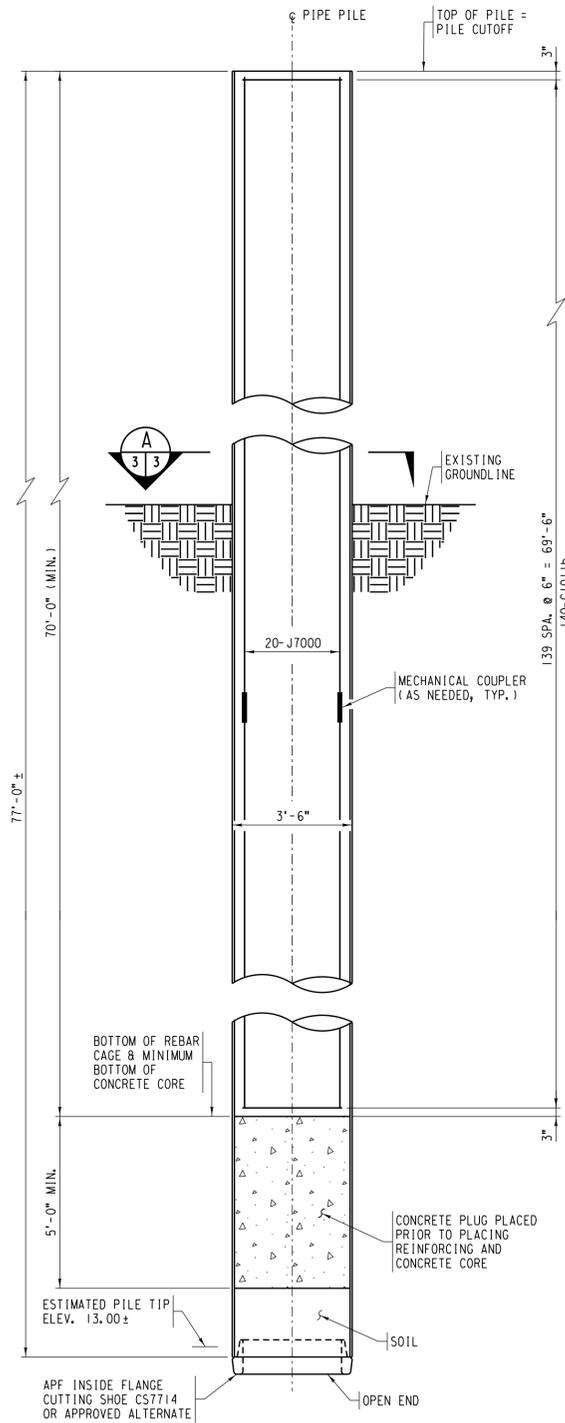
REINFORCING SCHEDULE  
(QUANTITY PER PILE)

TOTAL	MARK	SIZE	LENGTH	SHAPE
140	C1011b	#4	10'-11"	○
20	J7000	#11	*70'-0"	—

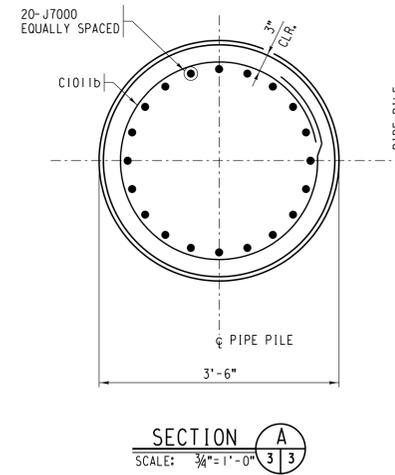
BENDING DIAGRAM  
(DIMENSIONS ARE OUT TO OUT)



NOTES:  
 BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.  
 EST. WT. OF REINFORCING STEEL = 8,460 LB.  
 \* TOTAL LENGTH INCLUDES MECHANICAL SPLICES



CONCRETE FILLED PIPE PILE  
 REINFORCING ELEVATION  
 SCALE: BENT #2 AND #3 3/8"=1'-0"



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

NOTES:  
 1. LAP SPLICES MAY BE USED IN LIEU OF MECHANICAL COUPLERS. LAP SPLICES AT ADJACENT BARS SHALL BE STAGGERED 8'-0" MINIMUM. LAP SPLICES SHALL NOT BE LESS THAN 8'-9" IN LENGTH.  
 2. FOR PIPE PILE NOTES, SEE SHEET NO. S2 AND STD. DWG. 533120 SHT. 1-2.

NO.	DATE	REVISIONS

COMPLETION STATUS:  
**FINAL** STATUS DATE: 03/03/2025

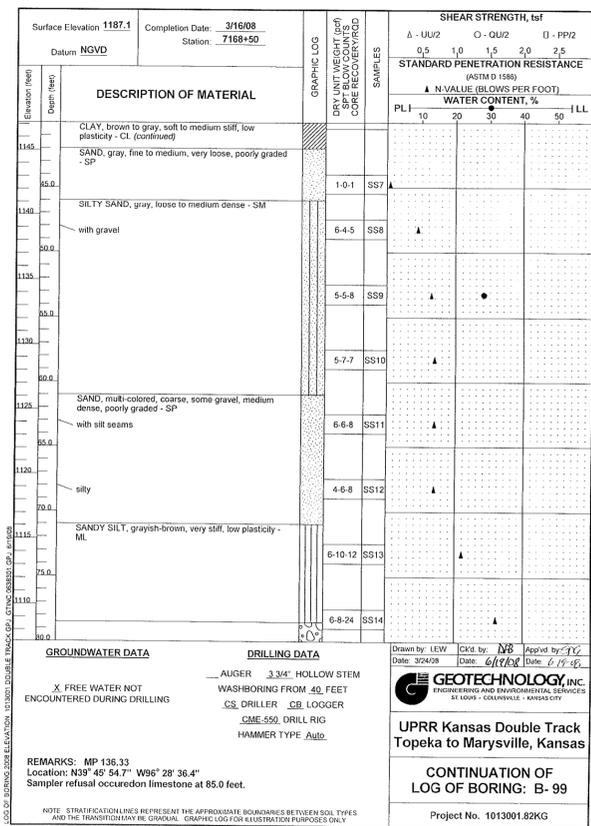
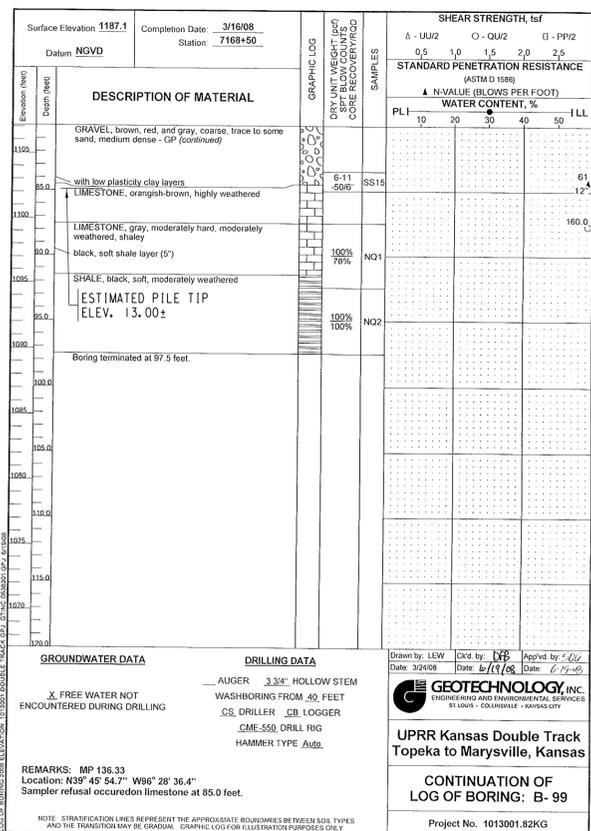
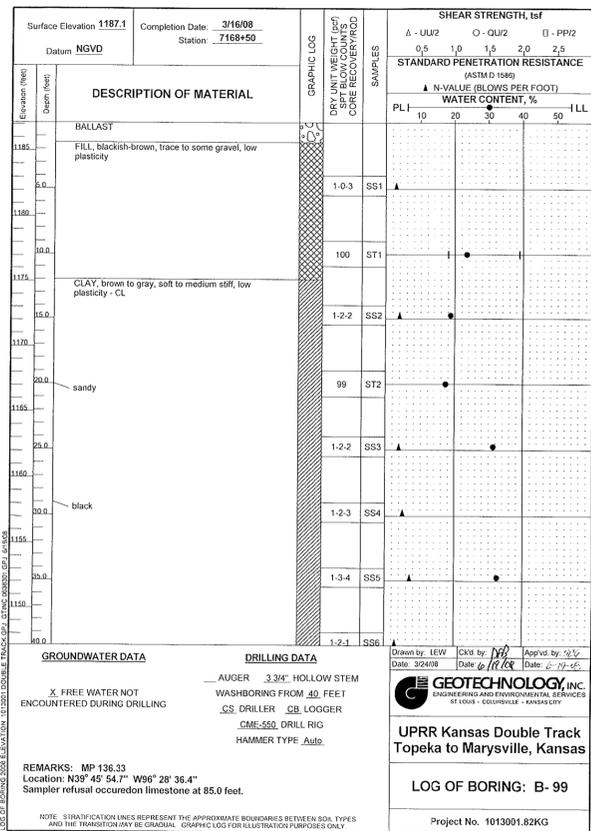
APPROVED FOR UNION PACIFIC RAILROAD BY:  
**NICHOLAS A. SWOBODA, PE** DESIGN ENGINEER OF RECORD DATE: 2/28/2025

PROJECT ID: 131772	WORK ORDER: 73212	C/E NUMBER: 123704
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LATITUDE: 39.76501°N LONGITUDE: 96.47640°W

**NICHOLAS A. SWOBODA**  
 LICENSED PROFESSIONAL ENGINEER  
 KANSAS  
 31053  
*Nicholas Swoboda*  
 03/03/2025

	DESIGNER BY: NAS/KAS	<p><b>UNION PACIFIC RAILROAD</b>                  Office of Director Structures Design</p> LOCATION & DESCRIPTION: BRIDGE 136.34, KANSAS SUB 3 SPAN 42" PCB x 156' REPLACING 4 SPAN PCB-BD x 120'
	DRAWN BY: EJS/NAS	
	UPRR ENGINEER: ADS	
SHT NO.: S3 of S4	SHEET TITLE: PIPE PILE REINFORCED CORE DETAILS	DATE: 03/03/2025



NOTES:  
 1. SUBSURFACE INFORMATION IS PROVIDED FOR INFORMATION ONLY FROM GEOTECHNOLOGY, INC. REPORT TITLED "SUBSURFACE EXPLORATION, PROPOSED DOUBLE TRACK, SEGMENTS 2 AND 5, UNION PACIFIC RAILROAD, MARYSVILLE TO TOPEKA, KANSAS", DATED 06/19/2008. A COMPLETE COPY OF THE REPORT MAY BE OBTAINED FROM THE OFFICE OF DIRECTOR STRUCTURES DESIGN UPON REQUEST.  
 2. BORING B-99: STA. 101+25.00  
 15.00' LEFT OF MAIN TRACK CENTERLINE  
 ELEV. 98.00

NO.	DATE	REVISIONS
COMPLETION STATUS:		
<b>FINAL</b>		03/03/2025
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APPROVED FOR UNION PACIFIC RAILROAD BY:		
NICHOLAS A. SWOBODA, PE		2/28/2025
DESIGN ENGINEER OF RECORD		DATE
PROJECT ID:	WORK ORDER:	C E NUMBER:
131772	73212	123704
LATITUDE: 39.76501°N LONGITUDE: 96.47640°W		



DESIGNED BY:	NAS/KAS
DRAWN/CHK BY:	EJS/NAS
UPRR ENGINEER:	ADS
SHT NO.:	S4 of S4
<b>UNION PACIFIC RAILROAD</b>	
Office of Director Structures Design	
LOCATION & DESCRIPTION:	BRIDGE 136.34, KANSAS SUB
	3 SPAN 42" PCB x 156' REPLACING 4 SPAN PCB-BD x 120'
SHEET TITLE:	BORING LOGS

STANDARD SHEET

**GENERAL NOTES**

GENERAL

- All work requirements shown on the design and not otherwise detailed shall be accomplished as specified in Union Pacific Railroad (UPRR) Specifications and the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. In the event of conflicts between specifications, the more restrictive shall apply.
- Construction means and methods shall comply with the All Permits Issued (API) package.
- Field verify all dimensions, stations and elevations prior to start of construction.
- Beams shall be supported by blocking within 1'-6" of ends during storage and transport. Store beams in level position. Beams shall be stacked no more than 3 high.
- Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.
- Location of known utilities is approximate. Location shall be verified prior to construction. Notify Call 811 "Call Before you Dig" number at least 48 hours prior to construction.

PILE DRIVING

- All piles shall be driven to capacity shown in design plan set.
- If any numbered pile cannot be driven to these capacities, the UPRR Office of Structures Design shall be notified.
- Estimated capacity of driven piles shall be calculated using the Modified ENR formula, with Factor of Safety of 5. Direct questions to the UPRR Office of Structures Design. Pile driving records and estimated capacities shall be submitted to the UPRR Office of Structures Design.
- Vibratory hammers shall not be permitted to drive any portion of any bearing piles.
- Splice pile per standard drawing Plan No. 531110, Sheet No. H1 for H-Piles or Plan No. 531120, Sheet No. 1 for pipe piles. Pile splices shall be located a minimum of 10' below the proposed or existing ground surface, whichever is lower.
- Mark every pile with a dimension indicating the pile depth from cutoff to point of pile. The dimension shall be rounded to the nearest foot. The mark shall be welded on the outside face, low mile post side on the pile flange, approximately 1'-0" below the bottom of the cap, and in numbers of approximately 3" in height. If a pile is not exposed, no mark is required.
- After pile driving is complete, provide pile driving logs to:  
  
UPRR Senior Manager Structures Design  
1400 Douglas St., Stop 0910  
Omaha, NE 68179

FIELD WELDING

- Welding shall be accomplished with the SMAW or FCAW Process.
- Welding shall be in compliance with the requirements specified in AWS D1.5, except 5/16" fillet welds may be made with a single pass.
- Welding electrodes shall be E7018 for SMAW. For other acceptable electrodes, refer to AWS D1.5.
- Welding electrodes shall be E71T-8 for FCAW. For other acceptable electrodes, refer to AWS D1.5.
- Union Pacific Railroad Employees engaged in welding on structures shall have valid certification through Course ES20, Advanced Welding.
- Contract welders shall possess valid AWS qualifications. Welders shall submit a Procedure Qualification Report (PQR) and Weld Procedure Specification (WPS) for each weld type to be performed. Welders shall be able to present documentation verifying that they have performed the specific weld(s) within the prior six months upon request.

GRADING

- Provide and place all fill and subballast material per UPRR Grading Specifications. Perform grading as required to drain and match existing embankments and upstream and downstream channel flowline.
- Perform grading as required for construction of the new structure and replace areas removed and disturbed in the course of construction to a condition equal to or better than existing.

WELL-COMPACTED FILL

- Well-compacted fill shall be well-graded granular soil free of any organic material, stones larger than 3 inches, frozen lumps, debris or excessive moisture. All compaction shall be determined using ASTM D1556 for field test and ASTM D1557 for moisture and density. Fill shall be compacted to 95% of maximum dry density as defined in ASTM D1557 (Modified Proctor). Fill shall be placed in layers not to exceed 12 inches.

**CONSTRUCTOR NOTES (WHEN APPLICABLE)**

CONSTRUCTOR DEFINITION

Construction By	Term	Refers To
UPRR	Constructor	Manager Bridge Construction
Contractor	Constructor	Contractor

DIVISION OF RESPONSIBILITY

- A. RAILROAD (Unless Noted Otherwise by MBC)
- Remove ties, rail and OTM from existing bridge.
  - Provide and install ballast, ties, rail and OTM for proposed bridge.
  - Provide material as shown in the Bill of Material.
  - Provide and install Private Property/No Trespassing sign and bridge marker signs on right side at each end of bridge.
- B. CONSTRUCTOR
- Coordinate all construction activities with the Railroad.
  - Before ordering any material, Constructor shall make a detailed field inspection of the site verifying all pertinent dimensions and elevations. Any variations in dimensions or elevations from those shown on the drawings shall be reported immediately to the UPRR Project Manager.
  - Any modifications to this design shall be approved by the UPRR Office of Structures Design prior to construction.
  - Verify the location, relocation, abandonment, and/or temporary support of all utilities affected by the construction of the structure and embankment and coordinate these activities with the appropriate utility companies, agencies and/or authorities.
  - Apply for and obtain all construction permits necessary to perform the work.
  - Bill of Material and Schedules are provided for information only. Constructor shall be responsible for providing all material, not provided by the Railroad, required to complete the work.
  - Perform all work not performed by the Railroad.
  - Provide the Railroad with a detailed construction plan defining the activity, schedule and procedure for each aspect of the work. Construction shall not begin until the construction plan has been approved by the Railroad.
  - Provide all temporary structures (shoring, bracing and/or falsework) required to support and protect the existing embankments and structures affected by the work. Provide the Railroad with details, design and procedure for all temporary structures. All temporary structures shall be designed, signed and sealed by a professional engineer registered in the State that the structure is to be constructed. All temporary structures shall be approved by the UPRR Office of Structures Design prior to beginning construction.
  - Provide temporary guardrail system as directed by UPRR Project Manager. Guardrails on shoring shall include but not be limited to the following:

The top edge height of the top rail shall be 42" +/- 3" above the walking/working surface.

At least one midrail shall be provided, evenly spaced between walking/working surface and top rail.

Metal or timber posts or uprights shall be spaced at maximum intervals of 10'-0".

Entire guardrail system, including anchorages, shall be capable of withstanding without failure, a force of 200 lbs. applied in any outward or downward direction at any point.

Guardrail system shall be surfaced to prevent injuries from punctures and lacerations and prevent snagging of clothing. The ends of top rails and midrails shall not extend past the posts or uprights.

If conditions warrant, i.e. pedestrian traffic/weather, additional protection shall be provided such as screens or mesh to prevent slipping between the midrail and walking/working surface.

- Direct channel flow as required to perform work.
- Remove debris and ballst from channel as directed by the Railroad.
- Accomplish activities within the schedule specified in the approved construction plan.

**GROUT NOTES**

NON-SHRINK GROUT

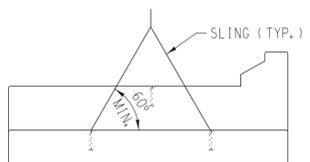
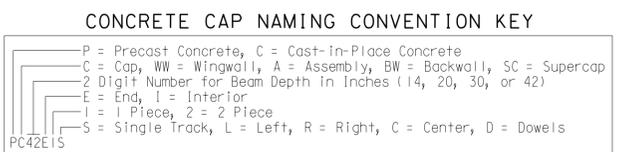
- Non-shrink grout shall conform to the requirements of ASTM C1107.
- Non-shrink grout shall meet the following strength requirements:  
  
1 day: 3,200 psi  
7 days: 6,000 psi

EPOXY GROUT

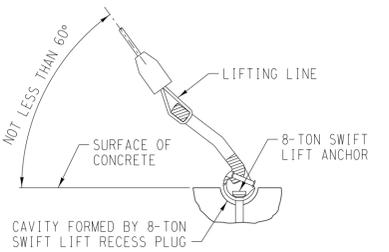
- Epoxy grout shall consist of a 3-component epoxy resin system.  
  
Two liquid epoxy components.  
One inert aggregate filler component.

**CONTROLLED LOW-STRENGTH MATERIAL (CLSM)**

- Controlled Low-Strength Material is a self-compacting, cementitious fill material with an unconfined compressive strength of 50 to 300 psi. The mixture shall consist of water, Portland cement, fly ash, and sound fine or coarse aggregate or both. The mix design shall allow adequate flowability without segregation of aggregates. Hardening time is of prime importance and CLSM should develop 50 psi in about one hour. The maximum layer thickness for CLSM shall be three feet. Additional layers shall not be placed until the CLSM has lost sufficient moisture to be walked on without indenting more than two inches.



**2 POINT PICK DETAIL**  
SCALE: NONE  
SINGLE PIECE END CAP AND LIFTING ANCHORS SHOWN, OTHER CAPS AND BACKWALLS AND LIFTING LOOPS SIMILAR



**TYPICAL LIFTING DETAIL**  
SCALE: NONE  
**NOTE:**  
8-TON SWIFT LIFT RECESS PLUGS, ANCHORS AND LIFTING EYES ARE AVAILABLE FROM DAYTON SUPERIOR CORP., 1125 BYERS ROAD, MIAMISBURG, OHIO 45342, TELEPHONE (937) 866-0711. THE MATERIALS FOR THIS LIFTING SYSTEM ARE NOT INCLUDED IN THE BILL OF MATERIAL BUT ARE TO BE ORDERED AS REQUIRED.

FILE NAME: \\uprr\corp\aut\uprr\commengood\br\fdgas (Concrete)\MO-Act\ve45311XX - Single Track - Deep Caps\531100 - Single Track Construction Drawings.dgn

INCHES 1 2 3 4 5 6 7 8 9 10 11 12

REVISIONS		
DATE	LTR.	DESCRIPTION
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05/21	A	FCAW E71T-7 TO E71T-8 ELECTRODE

DESIGN BY: UPRR	DRAWN BY: UPRR	CHECKED BY: HDR
APPROVED:		
xx-xx-2020		
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN		



**BRIDGE STANDARDS**  
CONCRETE BEAM BRIDGES

**GENERAL NOTES**

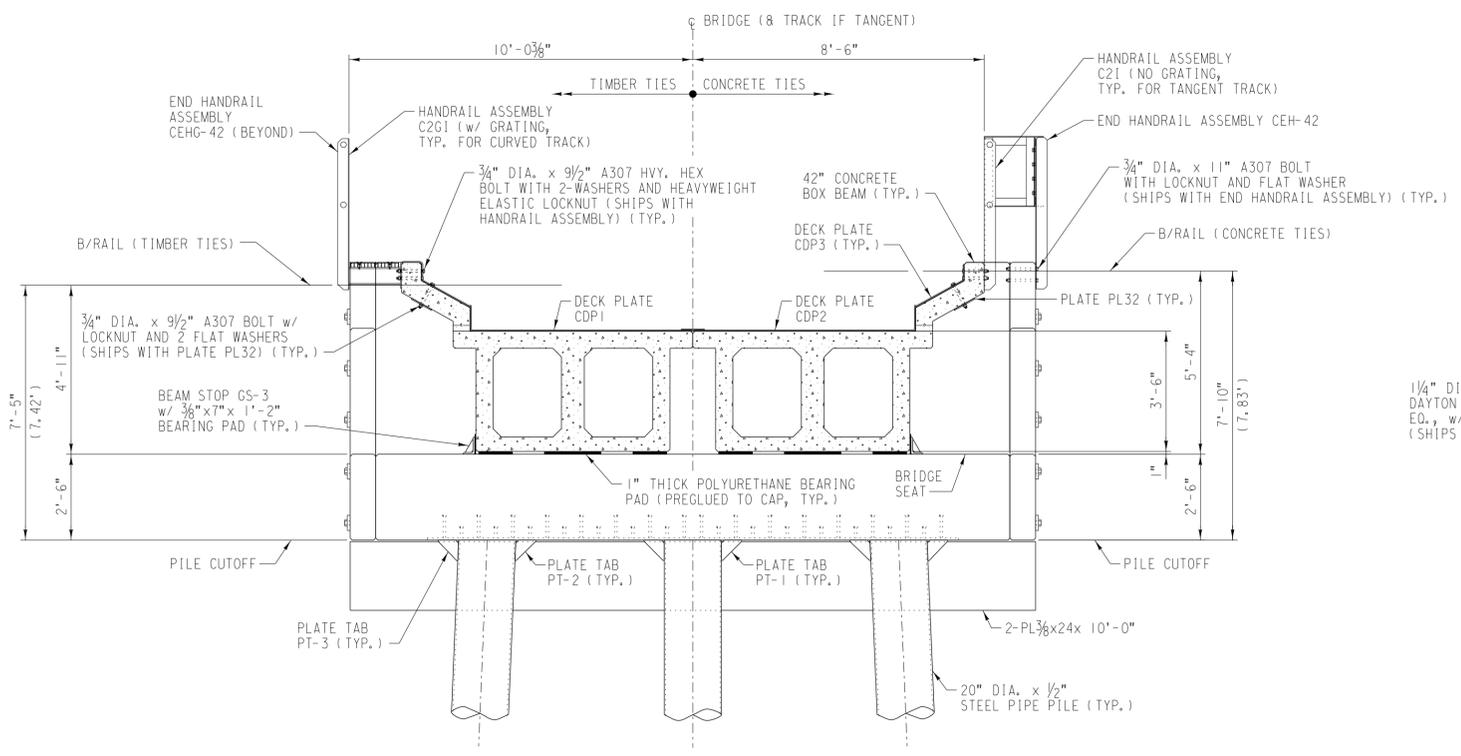
FILE OWNER: UPRR	DATE: APRIL, 2020
PLAN NO.: 531100	SHEET: T2



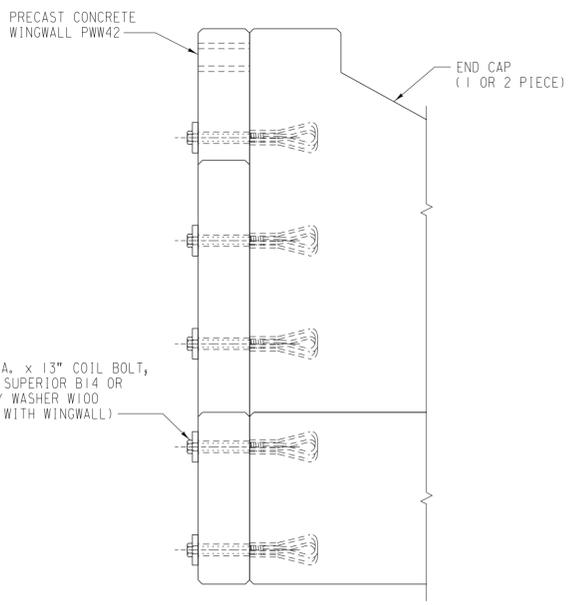




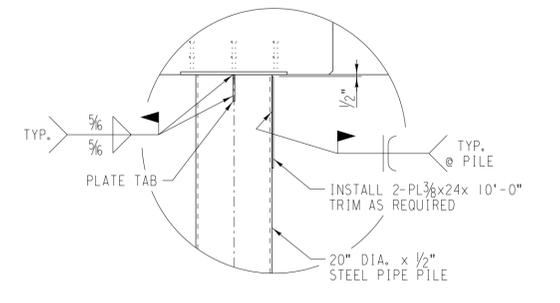




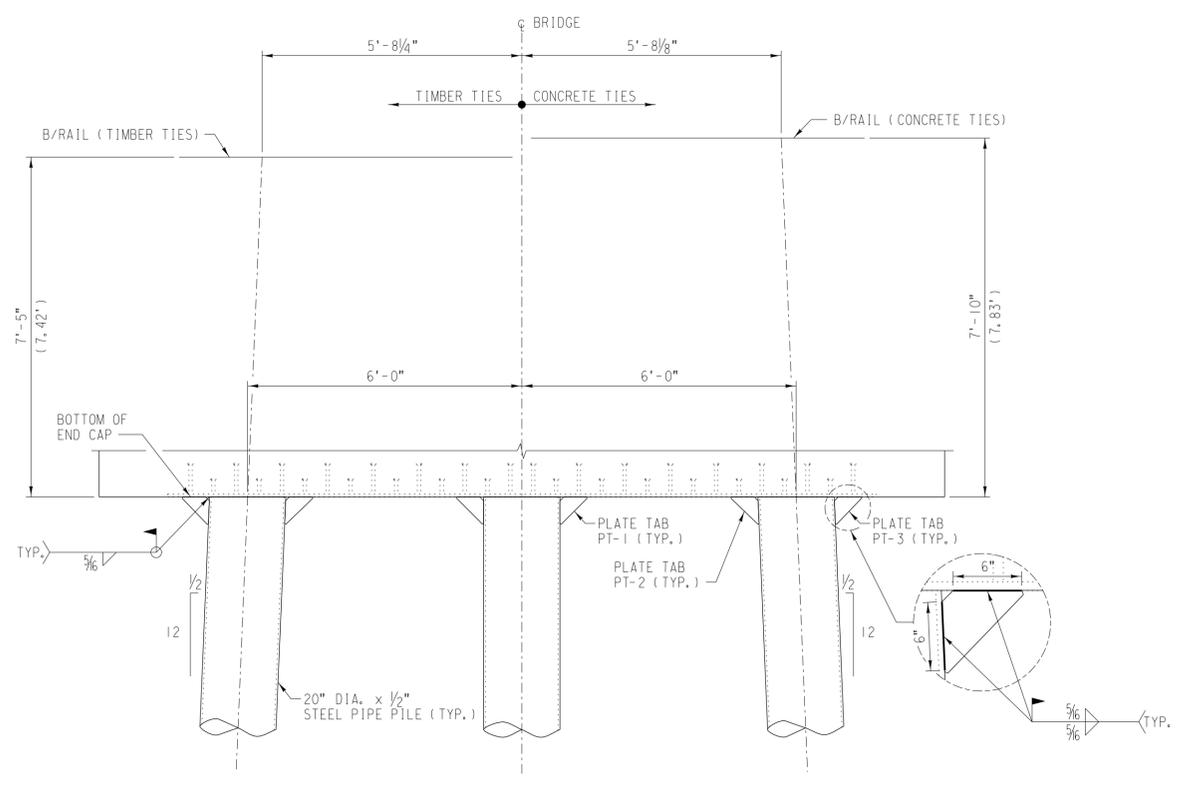
TYPICAL SECTION AT END BENT PA42E1S OR PA42E2S  
SCALE: 3/8" = 1'-0"



WINGWALL TO END CAP DETAIL  
SCALE: 3/4" = 1'-0"



PIPE PILING  
PLATE @ END BENT WELDING DETAIL  
SCALE: 1/2" = 1'-0"



ELEVATION  
END BENT PILE LAYOUT  
SCALE: 1/2" = 1'-0"

END BENT DESIGN NOTES:

- Standard design is valid for minimum pile penetration of 10' if geotechnical investigation demonstrates that piles can be firmly seated in hard rock or shale; otherwise minimum pile penetration of 25' required. If these values cannot be achieved, piles shall be socketed into rock per detail STD. DWG. 531120 SHT. P1. For any other conditions, special design is required.
- For span lengths less than 39', use values shown for 39' spans.
- Estimated effective pile fixity was assumed to be 10'-0" from bottom of cap for design modeling.
- Design Loading:
  - Dead Load: End bent was design for load from a 52'-0" long 42" PCB span with 30" of ballast.
  - Live Load: Cooper E80; centrifugal force and effects of eccentricity and superelevation applied per provisions of AREMA Chapter 8. Maximum design equilibrium superelevation is 6".
  - Impact:  $\frac{225}{\sqrt{L}}$  % (where  $L = L - 16'$ )  $L =$  Out to out of superstructure span
  - Offset: End bent was designed to accommodate a maximum 6" live load offset from bridge centerline.
  - Longitudinal Force: 1996 AREA
  - Loads neglected in design include stream flow, buoyancy, seismic and ice pressure.

MAXIMUM PILE LOAD (FOR END BENTS - TONS)

EQUILIBRIUM SUPERELEVATION	SPAN L		
	52'	45'	39'
0"	130	117	104
≤ 2"	135	121	108
≤ 3"	138	124	110
≤ 4"	141	127	113
≤ 6"	146	131	117

- NOTES:
- FOR PIPE PILE SOCKET DETAIL, INSTALLATION NOTES AND DETAILS, SEE STD. DWG. 531120 SHT. P1.
  - FOR SUPERELEVATED TRACK, B/RAIL REFERS TO LOW RAIL.
  - TIMBER TIES:  
B/RAIL TO BOTTOM OF END CAP IS BASED ON 1" TIE PLATE, 7" TIE, AND 8" BALLAST DEPTH UNDER TIE.
  - CONCRETE TIES:  
B/RAIL TO BOTTOM OF END CAP IS BASED ON 1/4" RAIL PAD, 8 3/4" TIE, AND 12" BALLAST DEPTH UNDER TIE.
  - FOR B/RAIL TO BOTTOM OF END CAP DIMENSION OUTSIDE DEFINED RANGE, ADJUST PILE LATERAL LOCATION DIMENSIONS AT B/RAIL.
  - CONCRETE TIES SHOULD BE ACCOMMODATED IF SPECIFIED IN CURRENT UPRR CONCRETE TIE MAP OR IF THE EXISTING LINE IS CURRENTLY USING CONCRETE TIES.



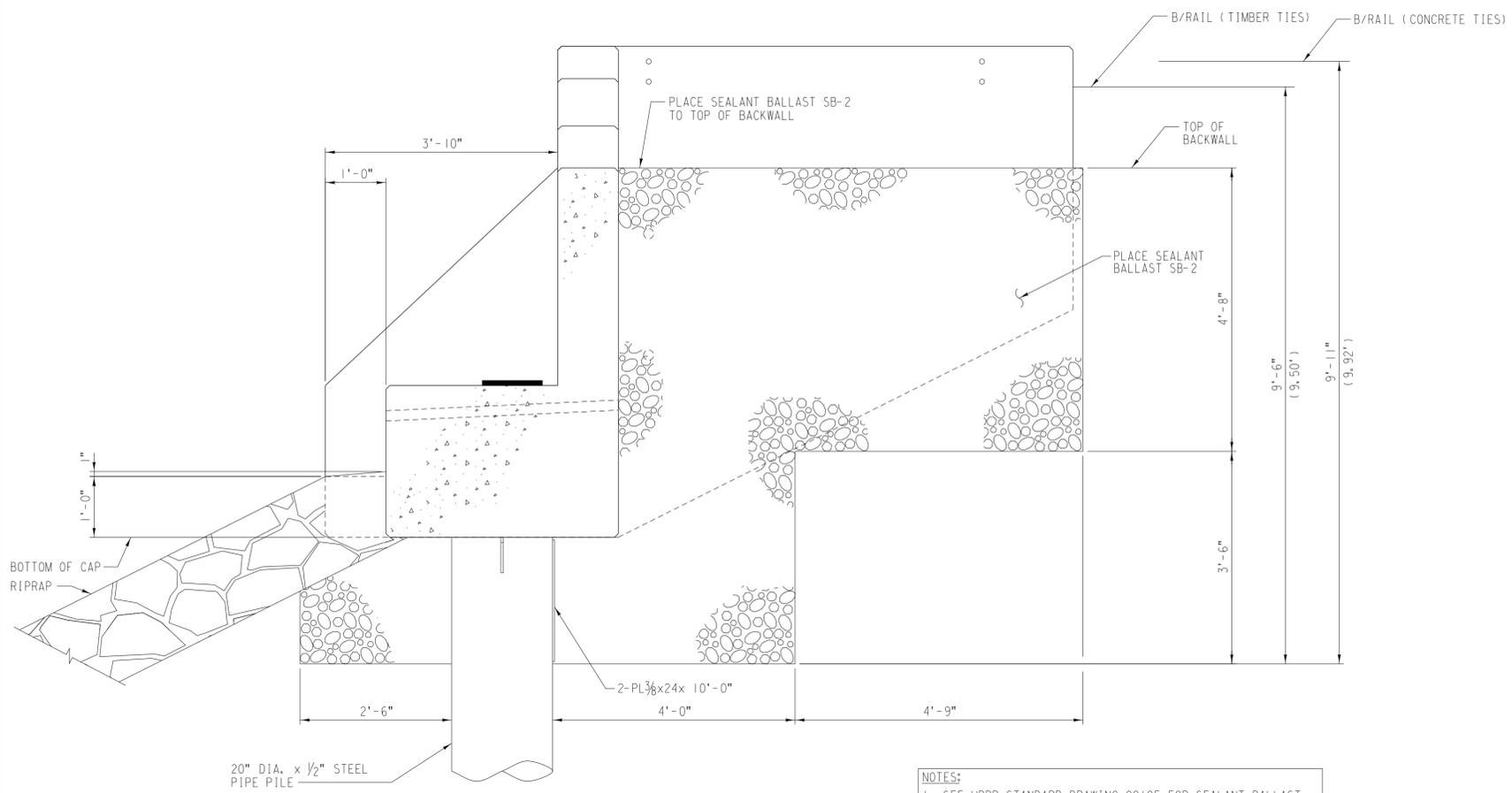
BRIDGE STANDARDS

CONCRETE BEAM BRIDGES  
42" PCB SPANS  
END BENT PC42E1S OR PC42E2S  
CONSTRUCTION DETAILS (1 OF 2)

REVISIONS			DESIGN BY: DEH	DRAWN BY: KJK	CHECKED BY: JRB
DATE	LTR.	DESCRIPTION	APPROVED:		
03/23	A	CHANGED BEARING PAD HEIGHT			
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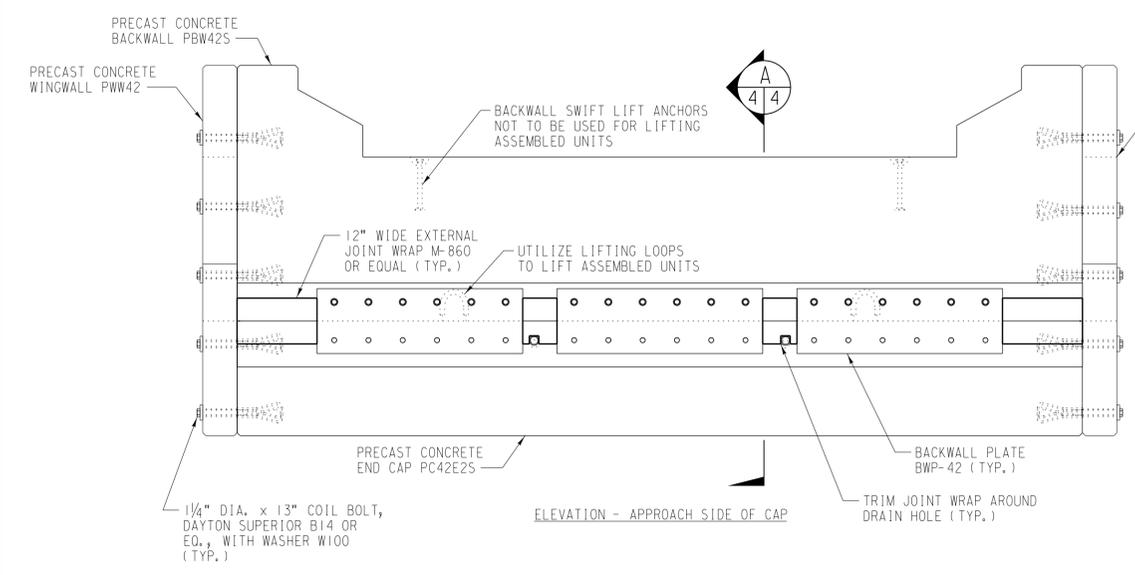
03/18/2021  
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

FILE OWNER: UPRR DATE: 05/13/2020  
PLAN NO.: 533100 SHEET: B3

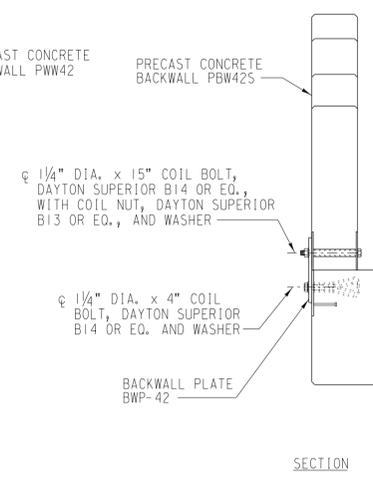


**END CAP EXCAVATION AND BACKFILL DETAIL**  
SCALE: 3/4" = 1'-0"

- NOTES:**
- SEE UPRR STANDARD DRAWING 0010E FOR SEALANT BALLAST SB-2 MATERIAL GRADATION REQUIREMENTS.
  - SEALANT BALLAST SB-2 IS UPRR STORE ITEM NO. 562-5428.
  - CONTROLLED LOW STRENGTH MATERIAL (CLSM) MAYBE USED IN LIEU OF SEALANT BALLAST SB-2.
  - ESTIMATED QUANTITY OF SEALANT BALLAST SB-2 REQUIRED:  
1 END BENT - 64 TON  
2 END BENTS - 128 TON

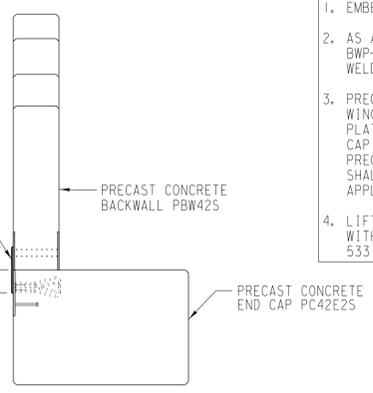


**PRECAST END CAP ASSEMBLY PA42E2S DETAIL**  
SCALE: 1/2" = 1'-0"



SECTION

FIELD APPLY 12" WIDE EXTERNAL JOINT WRAP M-860 OR EQUAL CENTERED OVER JOINT BETWEEN CAP AND BACKWALL PER MANUFACTURER'S INSTRUCTIONS



**SECTION A**  
SCALE: 1/2" = 1'-0"

- PRECAST END CAP ASSEMBLY NOTES:**
- EMBED PLATE 3/4"x28"x 15'-6" NOT SHOWN FOR CLARITY.
  - AS AN ALTERNATE CONNECTION OF THE BACKWALL PLATE BWP-42 TO EMBED PLATE EP-42, USE 5/8" ALL AROUND FILLET WELD.
  - PRECAST END CAP ASSEMBLY TO BE SHOP ASSEMBLED, INCLUDING WINGWALLS, TO ENSURE PROPER ALIGNMENT OF THE BACKWALL PLATE BWP-42 WITH THE EMBED PLATES IN THE PRECAST BACKWALL AND PRECAST END CAP SHALL BE SHIPPED ASSEMBLED. WINGWALLS SHALL BE SHIPPED LOOSE. SHOP ASSEMBLY WILL NOT INCLUDE APPLICATION OF THE 12" EXTERNAL JOINT WRAP.
  - LIFT PRECAST END CAP AND BACKWALL (WITHOUT WINGWALLS) WITH LIFTING LOOPS IN END CAP ONLY, SEE STD. DWG. 533140 SHT. E3.

**EST. WT. OF PRECAST CONCRETE**  
END CAP ASSEMBLY (w/o WINGWALLS) = 40,000 LB. (20.0 TON)

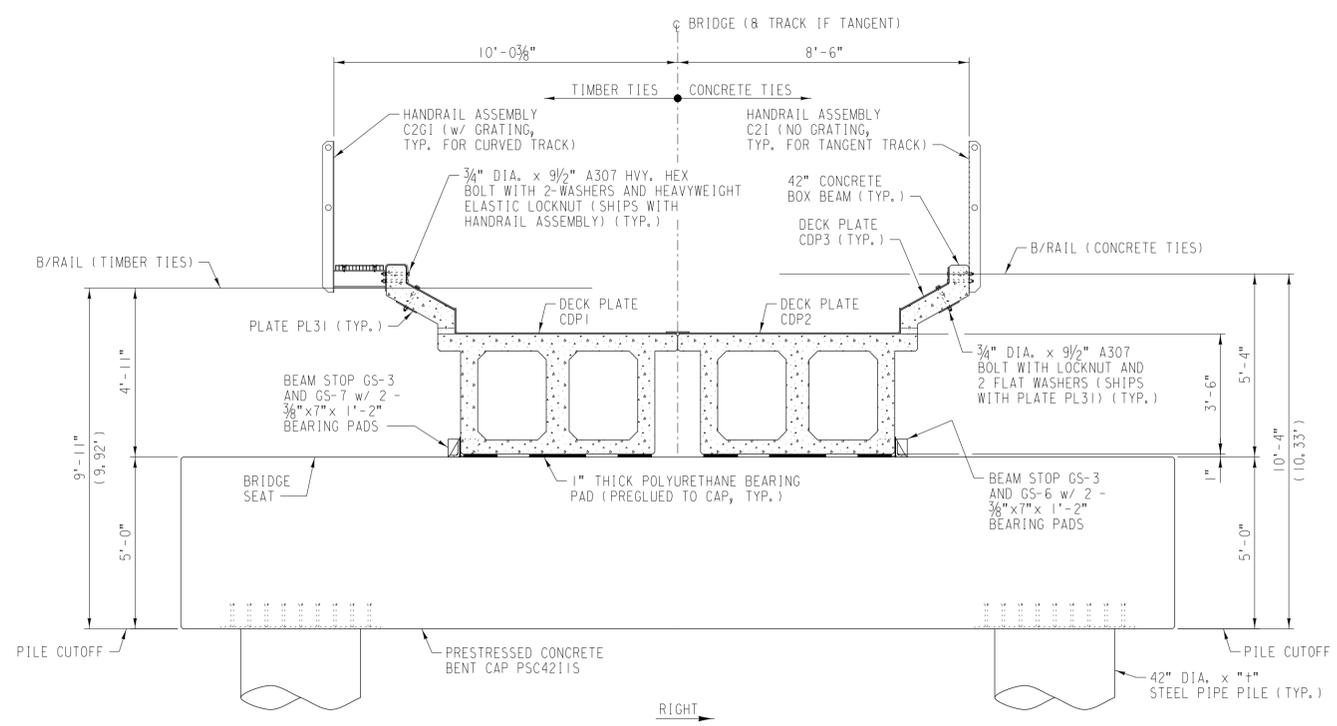


**BRIDGE STANDARDS**  
CONCRETE BEAM BRIDGES  
**42" PCB SPANS**  
END BENT PC42E1S OR PC42E2S  
CONSTRUCTION DETAILS (2 OF 2)

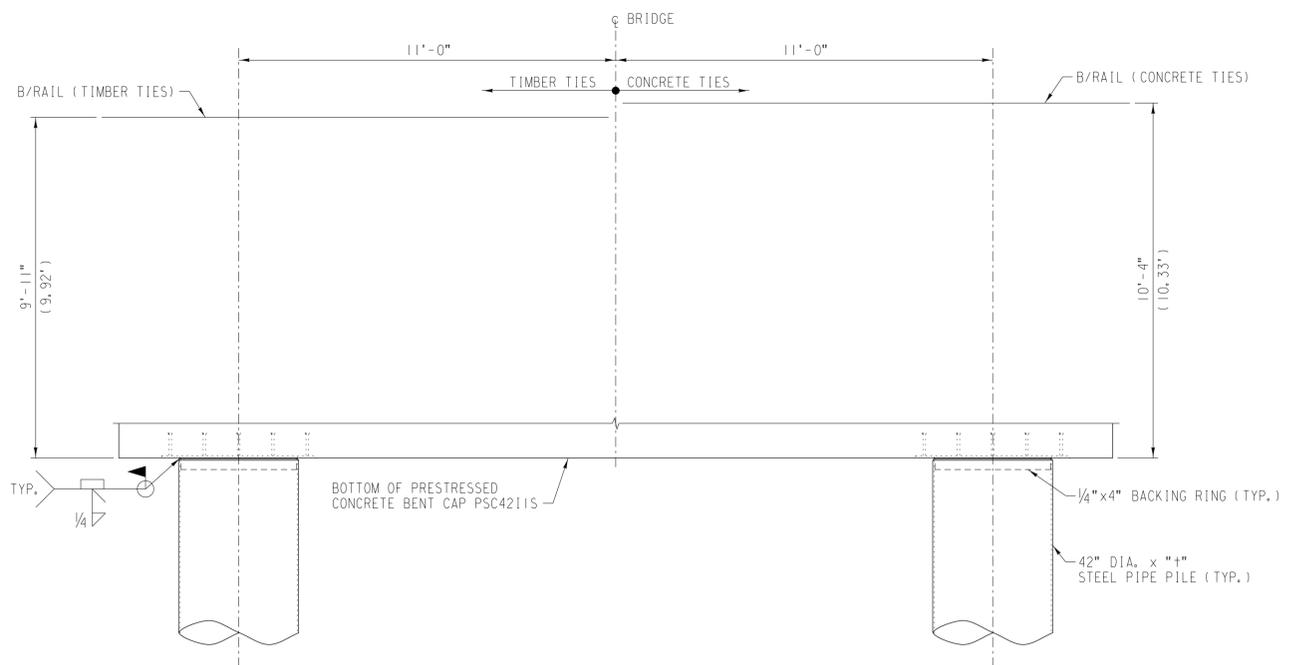
REVISIONS			DESIGN BY: DEH	DRAWN BY: KJK	CHECKED BY: JRB
DATE	LTR.	DESCRIPTION	APPROVED:		
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03/18/2021  
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

FILE OWNER: UPRR DATE: 05/13/2020  
PLAN NO.: 533100 SHEET: B4



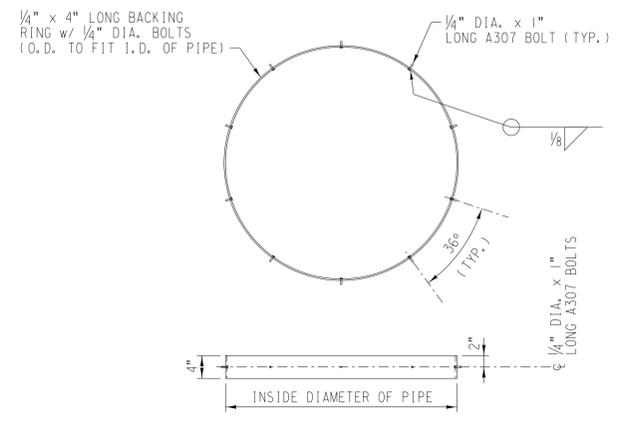
**TYPICAL SECTION AT PRESTRESSED INTERIOR BENT**  
SCALE: 3/8" = 1'-0"



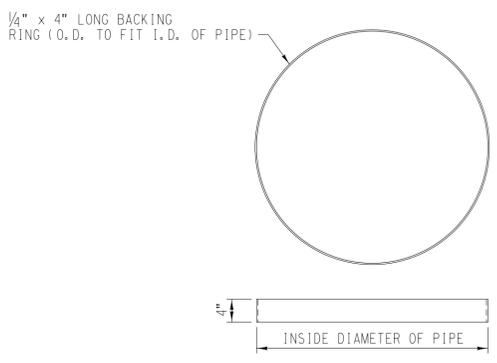
**PRESTRESSED CONCRETE INTERIOR BENT PILE LAYOUT**  
SCALE: 3/8" = 1'-0"

MAXIMUM PILE LOAD (FOR INTERIOR 2-PILE BENTS - TONS)						
EQUILIBRIUM SUPERELEVATION	H = 16'			H = 25'		
	SPAN L		SPAN L	SPAN L		SPAN L
0"	52'	45'	39'	52'	45'	39'
≤ 2"	284	254	228	285	255	228
≤ 3"	302	270	242	305	273	244
≤ 4"	311	278	249	315	282	252
≤ 6"	320	286	256	325	291	260
≤ 6"	338	302	270	345	309	276

H = DISTANCE B/RAIL TO GROUNDLINE



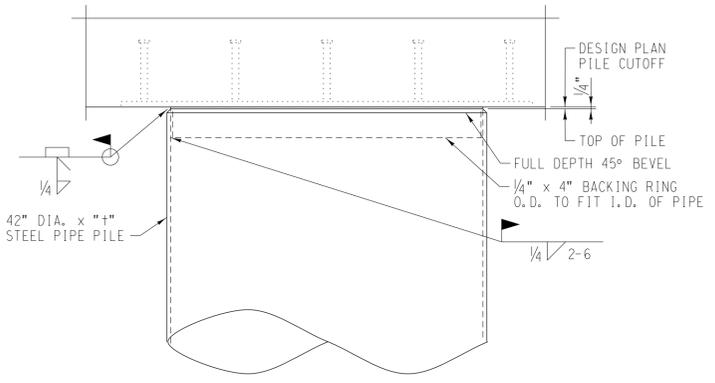
**42" PIPE PILE BACKING RING FOR SPLICE**  
SCALE: 3/4" = 1'-0"



**42" PIPE PILE BACKING RING FOR CAP WELD**  
SCALE: 3/4" = 1'-0"

**INTERIOR BENT DESIGN NOTES:**

- Selection of pile configuration and maximum heights based on equilibrium super-elevation (regardless of actual super-elevation installed). Refer to UPRR Track Standards Book, STD. DWG. 0020 latest revision.
- For span lengths less than 39', use values shown for 39' spans.
- Bent shall be driven per requirements of longer span length supported. For example, for a bent supporting 39' and 45' spans, drive per 45' span requirements.
- Estimated effective pile fixity was assumed to be 5D below existing groundline for design modeling, where D = pipe pile diameter.
- Scour was not included in bent heights. If scour is anticipated, the designer must consider it in the design.
- Design Loading:
  - Dead Load: Interior bent was designed for:
    - A combined load from two 52'-0" long 42" PCB spans with 30" of ballast.
    - A combined load from one 52'-0" long 42" PCB span with 30" of ballast and one open deck 8'-0" long steel jump span.
  - Live Load: Cooper E80; centrifugal force and effects of eccentricity and super-elevation applied per provisions of AREMA Chapter 8. Maximum design equilibrium super-elevation is 6".
  - Impact:  $\frac{225}{\sqrt{L}}$  % (where L = L - 16") L = 0' to out of superstructure span
  - Offset: Interior bent was designed to accommodate a maximum 6" beam offset on the cap and maximum 6" live load offset on beam.
  - Longitudinal Force: 1996 AREA
  - Loads neglected in design include stream flow, buoyancy, seismic and ice pressure.



**PIPE PILE CONNECTION DETAIL**  
SCALE: 1" = 1'-0"

- TO MINIMIZE THE HEAT GOING INTO THE PIPE, ABIDE BY THE FOLLOWING CRITERIA:
- ALL PASSES SHALL BE MADE AROUND FULL CIRCUMFERENCE BEFORE STARTING ANOTHER PASS.
  - ONLY 1 WELDER PER CONNECTION MAY BE WORKING AT A TIME.

- PILE SOCKET NOTES:**
- SEE DESIGN PLANS TO DETERMINE WHEN PILE SOCKETING IS REQUIRED.
  - PILING WITH TIP REINFORCEMENT SHALL BE PLACED INTO ROCK SOCKET AND DRIVEN TO ACHIEVE REQUIRED CAPACITY.
  - SEATED PILE SHALL BE ENCASED IN ROCK SOCKET WITH CONCRETE.
  - MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI AT 28 DAYS.
  - BORE 2" DIA. HOLE IN CENTER OF PILE SEAT TO A MINIMUM DEPTH OF 2 SOCKET DIAMETERS.

- NOTES:**
- FOR PIPE PILE NOTES, SEE STD. DWG. 533120.
  - FOR SUPERELEVATED TRACK, B/RAIL REFERS TO LOW RAIL.
  - TIMBER TIES: B/RAIL TO BOTTOM OF END CAP IS BASED ON 1" TIE PLATE, 7" TIE, AND 8" BALLAST DEPTH UNDER TIE.
  - CONCRETE TIES: B/RAIL TO BOTTOM OF END CAP IS BASED ON 1/4" RAIL PAD, 8 3/4" TIE, AND 12" BALLAST DEPTH UNDER TIE.
  - CONCRETE TIES SHOULD BE ACCOMMODATED IF SPECIFIED IN CURRENT UPRR CONCRETE TIE MAP OR IF THE EXISTING LINE IS CURRENTLY USING CONCRETE TIES.

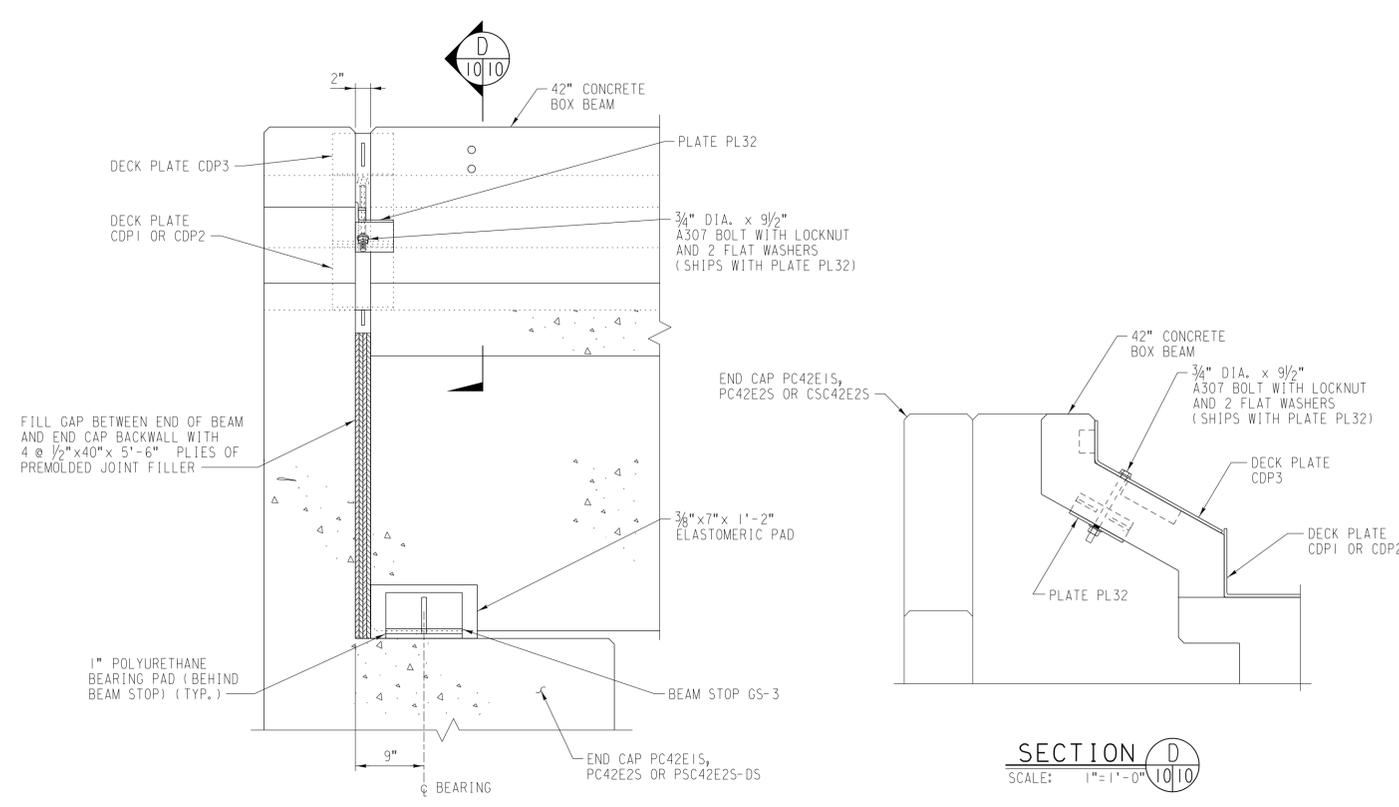
REVISIONS			DESIGN BY: DEH	DRAWN BY: ACB	CHECKED BY: JRB
DATE	LTR.	DESCRIPTION	APPROVED:		
03/23	A	UPDATED NOTES AND BEARING PADS			
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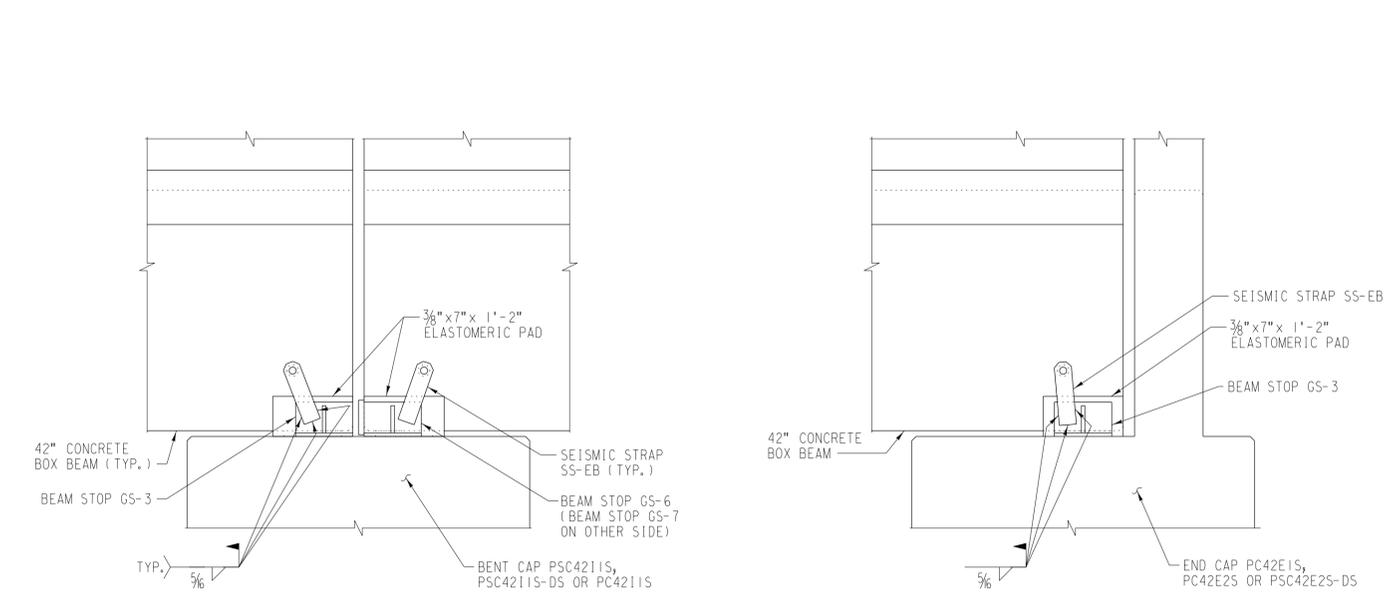
**BRIDGE STANDARDS**  
CONCRETE BEAM BRIDGES  
**42" PCB SPANS**  
**INTERIOR BENT PSC4211S**  
**CONSTRUCTION DETAILS**

FILE OWNER: UPRR	DATE: 05/13/2020
PLAN NO.: 533100	SHEET: B8

FILE NAME: Y:\Reel\1\reel\1\01005\010104\_891\Book\yn\_670\_07A\Eng\_Docs\04042\in\_Standards\_Summit\1\533100\_42\_inch\_PCB\_Rev1.dgn

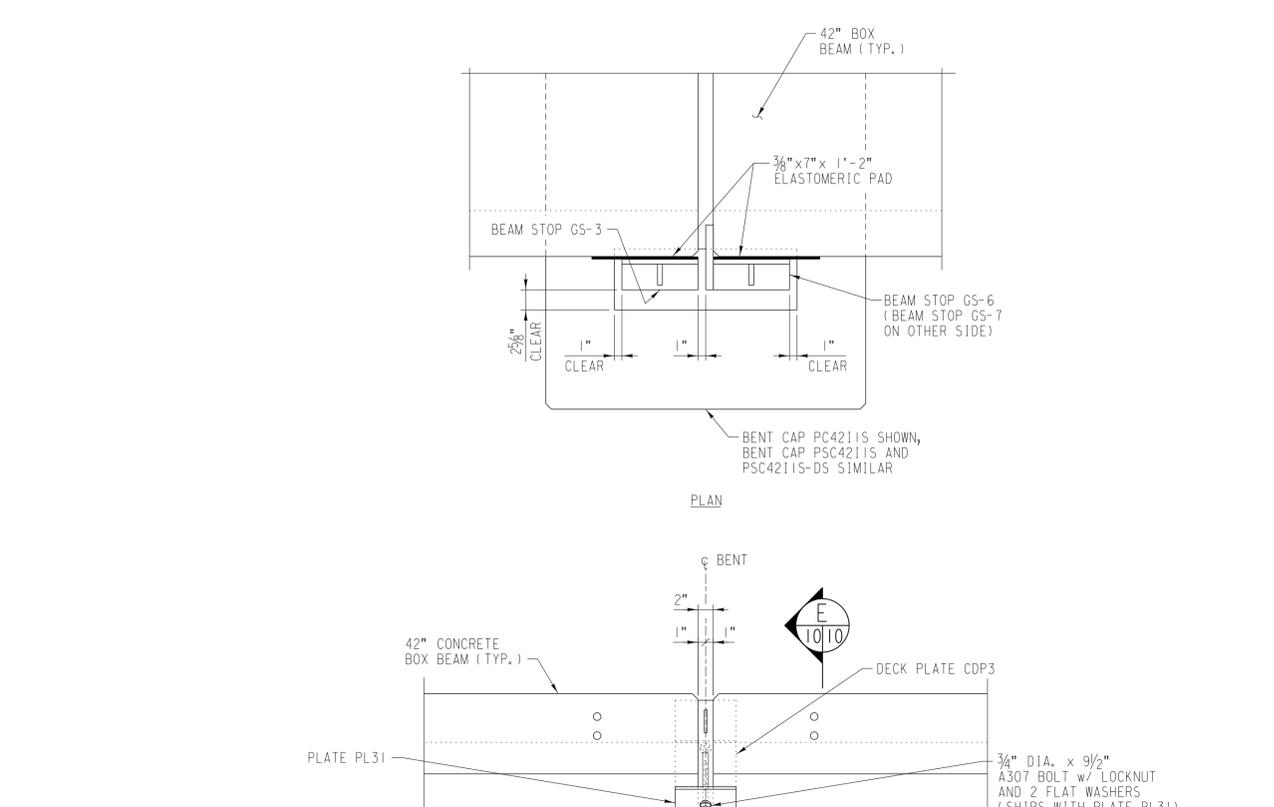


**END BENT CONSTRUCTION DETAILS**  
SCALE: 1"=1'-0"  
(HANDRAILS AND WINGWALLS NOT SHOWN FOR CLARITY)

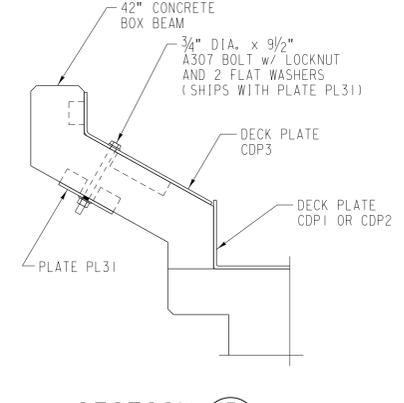


**SEISMIC STRAP DETAIL**  
SCALE: 3/4"=1'-0"

NOTE:  
SEISMIC STRAPS TO BE USED ONLY  
WHEN REQUIRED BY THE DESIGN DRAWINGS.



**INTERIOR BENT CONSTRUCTION DETAILS**  
SCALE: 1"=1'-0"  
(HANDRAILS NOT SHOWN FOR CLARITY)



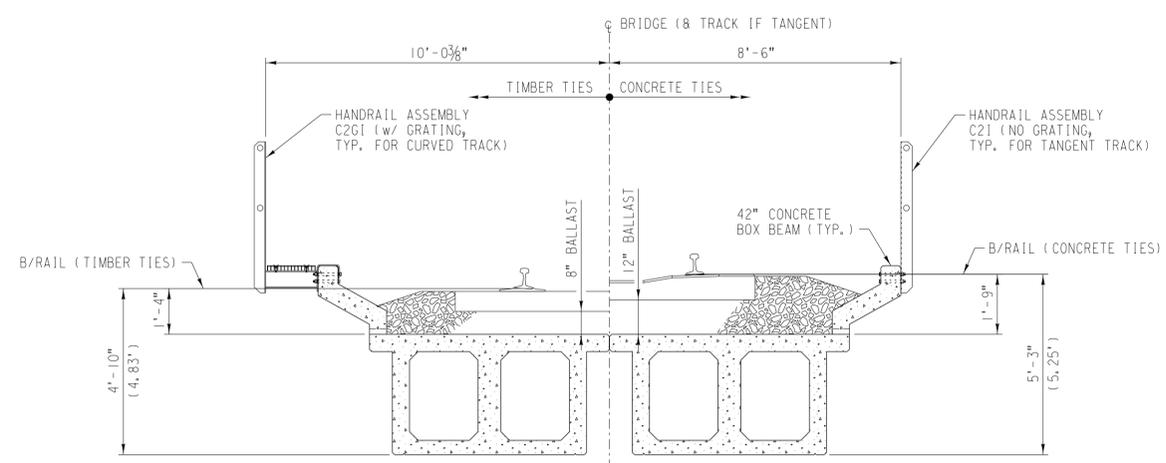
**SECTION E**  
SCALE: 1"=1'-0"

REVISIONS		
DATE	LTR.	DESCRIPTION
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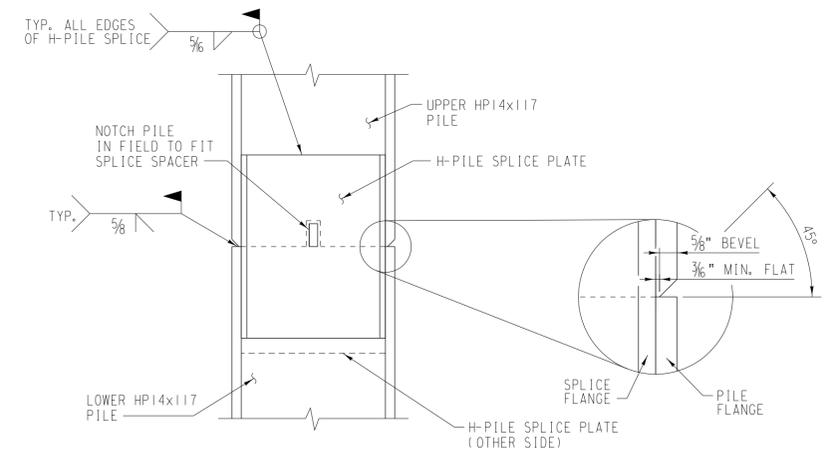
DESIGN BY: DEH  
DRAWN BY: ACB  
CHECKED BY: JRB  
APPROVED:  
*Alan Decker*  
03/18/2021  
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

**UNION PACIFIC**  
**BRIDGE STANDARDS**  
CONCRETE BEAM BRIDGES  
**42" PCB SPANS  
MISCELLANEOUS  
CONSTRUCTION DETAILS (1 OF 2)**  
FILE OWNER: UPRR  
DATE: 05/13/2020  
PLAN NO.: 533100  
SHEET: B10

FILE NAME: Y:\Rail\1\road\2\101005\210104\_891\_Brooklyn\_670\_07A\Eng\_Docs\040\42in\_Standards\_Submittal\533100\_42\_inch\_PCB\_Rev1.dgn

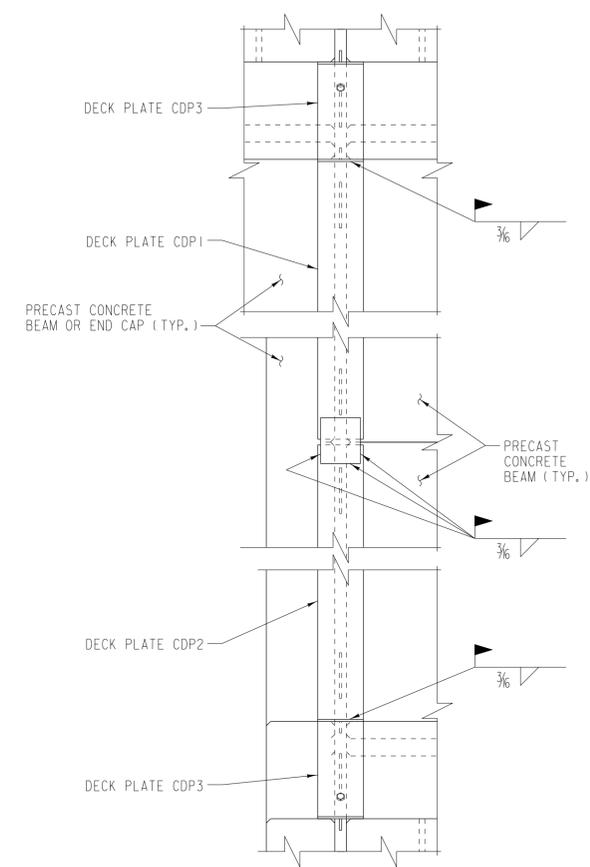


TYPICAL SECTION WITH TRACK  
SCALE: 3/8"=1'-0"



- INSTALLATION INSTRUCTIONS:**
- (NOTE: SPLICE IS SHOWN INSTALLED ON UPPER PILE SECTION FIRST. ALTERNATIVELY, SPLICE MAY BE INSTALLED ON BOTTOM SECTION FIRST.)
1. NOTCH THE END OF H-PILE SECTION TO RECEIVE SPLICE FIRST (NOTCH TO ACCOMMODATE THE SPLICE SPACER BAR).
  2. FIT SPLICE PLATES OVER NOTCHED END OF H-PILE AND FILLET WELD BOTH SPLICE PLATE ENDS TO PILE WEB AS SHOWN.
  3. ADD 5/8" BEVEL @ 45° ON EXTERIOR FLANGES OF TOP PILE.
  4. PLACE THE UPPER H-PILE SECTION INTO POSITION ONTO THE LOWER SECTION.
  5. COMPLETE WELD ALONG ALL SPLICE PLATE EDGES WITH SINGLE PASS 5/8" FILLET WELD. COMPLETE FOR BOTH H-PILE SPLICE PLATES.
  6. WELD FLANGE JOINT BETWEEN UPPER AND LOWER PILE SECTIONS WITH 2 PASS 5/8" BEVEL WELD.

PILE SPLICE DETAIL  
SCALE: 1/2"=1'-0"



DECK PLATES WELDING DETAIL  
SCALE: 3/4"=1'-0"

NOTE:  
AFTER FIELD WELDING, APPLY ZRC COLD GALVANIZING COMPOUND OR APPROVED ALTERNATE, FIELD APPLIED TO EACH OF THE WELDED INTERFACES.

REVISIONS		
DATE	LTR.	DESCRIPTION
03/23	A	DETAILS ADDED
/		
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DESIGN BY: DEH    DRAWN BY: ACB    CHECKED BY: JRB

APPROVED:

*Alan Becker*    03/18/2021

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

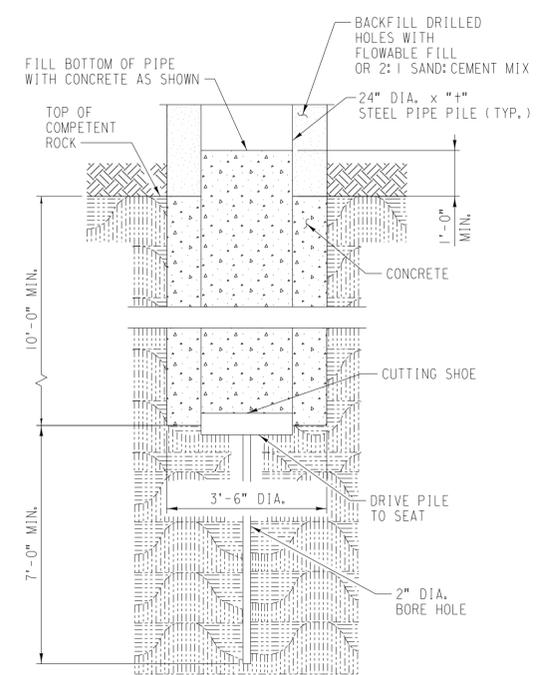


**BRIDGE STANDARDS**

CONCRETE BEAM BRIDGES

**42" PCB SPANS  
MISCELLANEOUS  
CONSTRUCTION DETAILS (2 OF 2)**

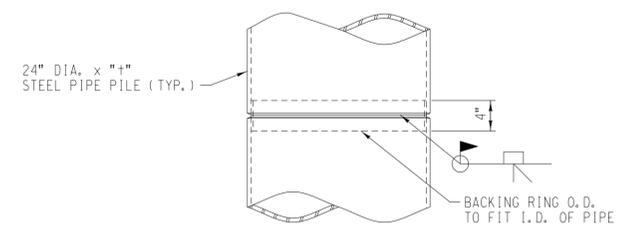
FILE OWNER: UPRR	DATE: 05/13/2020
PLAN NO.: 533100	SHEET: B11



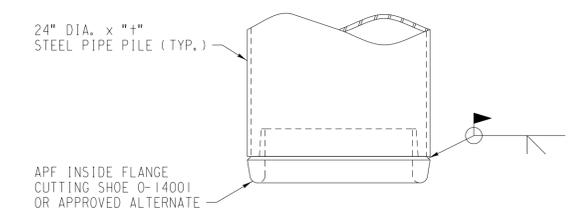
**PILE SOCKET DETAIL**  
SCALE: 1/2" = 1'-0"

EST. VOLUME OF CONCRETE = 3.7 CU. YD. PER 10' SOCKET DEPTH

- PILE SOCKET NOTES:**
- SEE PILE DRIVING NOTES TO DETERMINE WHEN PILE SOCKETTING IS REQUIRED.
  - PILING SHALL BE SEATED IN PREDRILLED HOLES IN THE ROCK AND ENCASED IN CONCRETE WITHIN THE BEDROCK (SEE DETAIL).
  - MINIMUM DEPTH OF PILE SOCKET SHALL BE 10'-0" INTO COMPETENT ROCK. GEOTECHNICAL RECOMMENDATIONS PER PROJECT SITE SHALL BE FOLLOWED IF AVAILABLE.
  - PILING WITH TIP REINFORCEMENT SHALL BE PLACED INTO ROCK SOCKET AND DRIVEN TO ACHIEVE REQUIRED CAPACITY.
  - SEATED PILE SHALL BE ENCASED IN ROCK SOCKET WITH CONCRETE.
  - MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI AT 28 DAYS.
  - BORE 2" DIA. HOLE IN CENTER OF PILE SEAT TO A MINIMUM DEPTH OF 7'-0".

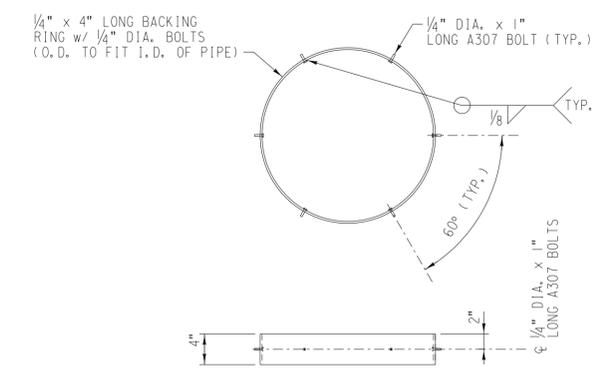


**SINGLE BEVEL SPLICE DETAIL**  
SCALE: 1" = 1'-0"

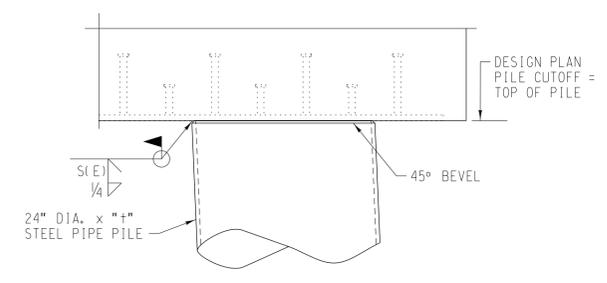


**CUTTING SHOE DETAIL**  
SCALE: 1" = 1'-0"

**NOTE:**  
CUTTING SHOE TO BE UTILIZED ONLY WHEN SHOWN ON THE DESIGN PLANS.



**24\"/>**



**GROOVE WELD SIZE**

Weld Size	S	E
"+" = 1/2"	S = 5/8"	E = 3/8"
"+" = 5/8"	S = 7/8"	E = 3/8"
"+" = 3/4"	S = 1/2"	E = 1/4"

**PIPE PILE CONNECTION DETAIL**  
SCALE: 1" = 1'-0"

- THE FOLLOWING CRITERIA SHALL BE FOLLOWED TO AVOID EXCESSIVE HEAT IN PIPE PILE:
- ALL PASSES SHALL BE MADE AROUND FULL CIRCUMFERENCE BEFORE STARTING ANOTHER PASS.
  - ONLY 1 WELDER PER CONNECTION MAY BE WORKING AT A TIME.
  - E = PJP GROOVE WELD SIZE COORESPONDING TO S  
S = PJP GROOVE WELD DEPTH OF GROOVE

**GENERAL NOTES:**

- Longitudinal bracing between bents required in select bays on bridges longer than 200 ft. and some bridges not composed entirely of concrete spans. See Sheets P6 and P7.
- For required driven pile capacities, see "Maximum Pile Load" tables.
- For Pipe Pile Notes, see STD. DWG. 533120.
- For End Bent pile size, geometry and cap connection details, see STD. DWG. 533100 SH. B3.

**BENT DESIGN NOTES:**

- Selection of pile configuration and maximum heights based on equilibrium super-elevation (regardless of actual super-elevation installed). Refer to UPRR Track Standards Book, STD. DWG. 0020 latest revision.
- Standard design is valid for minimum pile penetration of 10' if geotechnical investigation demonstrates that piles can be firmly seated in hard rock or shale; otherwise minimum pile penetration of 25' required. If these values cannot be achieved, piles shall be socketed into rock per detail on this sheet. For any other conditions, special design is required.
- For span lengths less than 39', use values shown for 39' spans.
- Bent shall be driven per requirements of longer span length supported. For example, for a bent supporting 39' and 45' spans, drive per 45' span requirements.
- Substructure design considers 8' of total scour from ground line.
- This standard applies only for complete bridges that follow the UP concrete bridge standards or for standard concrete bridge segments that provide one of the following:
  - New segments that include longitudinal bracing.
  - New segments adjacent to robust existing or proposed bents or piers that have strength to support longitudinal load and a load path to do so, as determined by the designer.
- Design Loading:
  - Dead Load: Interior bent was design for:
    - A combined load from two 52'-0" long 42" PCB spans with 30" of ballast.
    - A combined load from one 52'-0" long 42" PCB span with 30" of ballast and one open deck 8'-0" long steel jump span.
  - Live Load: Cooper E80, centrifugal force and effects of eccentricity and super-elevation applied per provisions of AREMA Chapter 8. Maximum design equilibrium super-elevation is 5".
  - Impact:  $\frac{225}{\sqrt{L}}$  % (where L = L - 16") L = Out to out of span
  - Offset: Interior bent was designed to accommodate a transverse eccentricity of 6" maximum from CL bridge for superstructure dead and live load.
  - Longitudinal Force: 1996 AREA
  - Stream Flow:  $V_{avg} = 12$  ft/sec, K = 0.7, water surface at top of pile cap/seat
  - Loads neglected in design include seismic and ice pressure.
- If specific design parameters conflict with notes 1 thru 7, further design analysis will be required.

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REVISIONS			DESIGN BY: HDR	DRAWN BY: HDR	CHECKED BY: AJB
DATE	LTR.	DESCRIPTION	APPROVED:		
/			 UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN		
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**BRIDGE STANDARDS**  
CONCRETE BEAM BRIDGES  
**42" PCB SPANS**  
**INTERIOR BENT PIPE PILE FOUNDATIONS**  
**PILE INSTALLATION NOTES AND DETAILS**

FILE OWNER: UPRR      DATE: FEBRUARY, 2023  
PLAN NO.: 533121      SHEET: P1

02-17-2023  
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

GENERAL NOTES

- 1. Pipe piles shall be designed in accordance with the AREMA Manual for Railway Engineering, Chapter 8, Part 2: Design and Part 4: Pile Foundations and Chapter 15, Part 1: Design.
2. Pipe pile construction shall be in accordance with the AREMA Manual for Railway Engineering, Chapter 8, Part 4: Pile Foundations.
3. If actual subsurface conditions differ substantially from those anticipated, the UPRR Office of Director Structures Design shall be notified immediately.
4. When driving pile near an existing track or bridge, the track and/or bridge shall be monitored for movement. If the track or bridge is observed to shift more than 1/4" cumulative vertically or laterally during or after pile driving, the UPRR Office of Director Structures Design shall be notified immediately.

STEEL

- 1. Materials:
Piles ASTM A252, Grade 3 (or as noted in the design plans), one end beveled
Pipe splices ASTM A572, Grade 50
Lateral Bracing ASTM A572, Grade 50
Longitudinal Bracing ASTM A53, Grade B (A500, Grade C if HSS used)
Pile Splice Bolts ASTM A307, Grade A
2. Spiral weld pipe is permitted when the following conditions are met:
a. The pipe is manufactured with a fully automated double submerged arc weld.
b. The spiral weld is 50% UT inspected.
c. The manufacturing facility has a written letter from the UPRR Director Structures Design stating your facility is approved to manufacture spiral weld pipe for driven pile applications.
3. Carbon Equivalency for Raw Plate
CE = C + 1/6(Mn+Si) + 1/5(Cr+Mo+V) + 1/15(Ni+Cu)
CE Limit = 0.43 Max

WELDING

- 1. Welding shall be accomplished with the SMAW or FCAW Process.
2. Welding shall be in compliance with the requirements specified in AWS D1.5, except 3/16" fillet welds may be made with a single pass.
3. Welding electrodes shall be E7018 for SMAW. For other acceptable electrodes, refer to AWS D1.5.
4. Welding electrodes shall be E71T-8 for FCAW. For other acceptable electrodes, refer to AWS D1.5.
5. Union Pacific Railroad Employees engaged in welding on structures shall have valid certification through Course ES20, Advanced Welding.
6. Contract welders shall possess valid AWS qualifications. Welders shall submit a Procedure Qualification Report (PQR) and Weld Procedure Specification (WPS) for each weld type to be performed. Welders shall be able to present documentation verifying that they have performed the specific weld(s) within the prior six months upon request.

SPLICES

- 1. See Plan No. 531120, Sheet PI for standard splice details for 20" pipe pile or Plan No. 533120, Sheet PI for 24" pipe pile.
2. Splices shall be made a sufficient distance above the ground or water (not less than three feet) so that the splice can be observed during driving.
3. The pile shall be driven so that the upper splice is at least 10 feet below the ground surface.
4. Visual inspection of splice welds shall be performed by the Constructor's welding inspector qualified in accordance with AWS QC-1. Employ quality control inspectors qualified in accordance with the Bridge Welding Code. Individuals assigned to production welding activities or processes and their supervisors are not acceptable for performing quality control testing. Ensure a qualified quality control welding inspector (CWI) is present any time splice welding is in progress.

TIP REINFORCEMENT

- 1. Pile tip reinforcement shall be used when specified in the design plans.
2. See Plan No. 531120, Sheet PI for standard pile tip details for 20" pipe pile or Plan No. 533120, Sheet PI for 24" pipe pile.

COAL TAR EPOXY COATING

- 1. Where specified, coal tar epoxy coating shall be applied to piles in accordance with the following guidelines:
Surface Preparation SSPC-SP6/NACE 3
Coating 2 Coats at 8 Mils each coat for a total 16 Mils DFT
Masking 3" Mask on each end
Material Specification Corps of Engineers Formula C-200a & SSPC Paint 16
2. After pile cutoff, coal tar epoxy coating shall be completely removed from the top 2 inches of the pile and at locations where pile bracing will be installed prior to welding piles to pile cap and/or installing pile bracing. A proper respirator shall be worn by those involved in coal tar epoxy removal.
3. After field welding, apply two coats of Targuard Coal Tar Epoxy (5 gal. kit) by Sherwin Williams or approved alternate, field applied to each of the welded interfaces. Apply per manufacturer's requirements.

POLYURETHANE COATING

- 1. Where specified, polyurethane coating shall be applied to piles in accordance with the following guidelines:
Surface Preparation SSPC-SP5/NACE 1
Coating 1 Coat at 25 Mils DFT
Masking 3" Mask on each end
Material Specification ChemLine 2261 or Approved Alternate
2. After pile cutoff, polyurethane coating shall be completely removed from the top 2 inches of the pile and at locations where pile bracing will be installed prior to welding piles to pile cap and/or installing pile bracing. A proper respirator shall be worn by those involved in polyurethane removal.
3. After field welding, apply two coats of Targuard Coal Tar Epoxy (5 gal. kit) by Sherwin Williams or approved alternate, field applied to each of the welded interfaces. Apply per manufacturer's requirements.

PILE DRIVING REQUIREMENTS

DRIVING TOLERANCES

- 1. Deviation shall not exceed 1/4 inch per foot from vertical or batter line.
2. The deviation from the plan location at the top of pile shall not exceed 7.5% of the pile diameter. Where piles are to be welded to a concrete pile cap embed plate, deviation shall be limited such that there is adequate room to perform the weld to the embed plate.
3. Piles not meeting tolerance requirements or out of line as to impair usefulness, or piles that are damaged in driving as to impair structural capacity, shall be pulled and redriven or an additional pile shall be driven to provide added support.

PRE-DRIVING CONTRACTOR REQUIREMENTS - WEAP

- 1. The maximum allowable pile stress during pile driving is 0.8 times the pile steel yield stress.
2. The Constructor shall submit a wave equation (WEAP) analysis to UPRR for approval at least 14 days prior to driving test piles. The WEAP analysis must utilize the actual pile driving hammer-helmet-suction-pile system that will be used for bridge construction. The analysis shall be sealed by an engineer licensed in the state of the bridge construction. The analysis must demonstrate that the proposed driving system can develop the required pile capacity at a driving resistance between 4 and 12 blows per inch within the allowable driving stress limits.
3. The following shall be submitted for review and approval by UPRR at least 14 days prior to driving test piles:
a. Method to be used to determine capacity and rationale for method choice
b. Consultant performing PDA testing and CAPWAP, if used
c. Consultant qualifications
d. Example Pile Capacity Report
e. Type of leads
f. Type of pile template
g. Type of splice
h. Method of cleaning out pile, when required
i. Method of placing rebar and concrete, when required
j. Plan for field verification of pile capacity.

ACTIVE DRIVING CONTRACTOR REQUIREMENTS - CAPACITY VERIFICATION

- 1. All piles shall be driven to capacity shown in the design plan set and to the minimum pile tip elevation, as required on the design plans.
2. Allowable capacity shall include one of the following factors of safety on the calculated ultimate capacity, based on the verification method selected and subsurface conditions. Verification method may be selected by the Constructor unless specifically prescribed in the design plans:

METHOD 1 - PDA + CAPWAP - FACTOR OF SAFETY = 2.0

Dynamic Testing on test piles using signal matching in accordance with ASTM D4945. Constructor to utilize a qualified PDA Consultant and perform PDA testing and CAPWAP analyses and provide PDA reports. An engineer who has achieved an Intermediate Level or better on the PDI/PDCA Dynamic Measurement and Analysis Proficiency Test shall be in charge of PDA operation and of result interpretation, either on site or by remote connection (SiteLink).

METHOD 2 - PDA (CASE METHOD) - FACTOR OF SAFETY = 2.25

Dynamic Testing on test piles using a Pile Driving Analyzer in accordance with ASTM D4945 without CAPWAP analysis. Constructor to utilize a qualified PDA Consultant and perform PDA testing and analyses and provide PDA reports. An engineer who has achieved an Intermediate Level or better on the PDI/PDCA Dynamic Measurement and Analysis Proficiency Test shall be in charge of PDA operation and of result interpretation, either on site or by remote connection (SiteLink).

METHOD 3 - WEAP ANALYSIS ONLY - FACTOR OF SAFETY = 2.75

Pile driving to refusal based on driving criteria from the approved pre-construction WEAP analysis. When driving to hard rock or similar end bearing refusal material, the Factor of Safety may be reduced to 2.0 or less at the discretion of UPRR. The WEAP analysis should demonstrate that driving to hard rock will not overstress piles at the selected Factor of Safety. Dynamic testing may be required to support the WEAP analysis.

- 3. PDA sensors shall be installed and dynamic testing shall be performed in accordance with PDI recommendations.
4. One production pile per each 100' of bridge length shall be designated as a test pile, with a minimum of two test piles per bridge. For spans longer than 100', one pile at each supporting bent or pier shall be designated as a test pile. The test pile shall be the first production pile of a bent or pier.
5. A separate test pile is required for each change in pile size or type along the bridge length; test piles are not acceptable for use in determining pile driving criteria for a pile of a different size or type, even when the test pile may be within 100'.
6. Test piles will provide verification of bearing depths, axial capacities and driving conditions using one of the methods in note 2 prior to driving the remaining piles in the vicinity of the test pile. The Constructor's Engineer shall evaluate the test pile data and revise the pile driving criteria as needed for the remaining piles in the vicinity of the test pile. Revised driving criteria shall be submitted to the Railroad for approval. For diesel hammers, air/stream hammers, and single acting hydraulic hammers, provide driving criteria that relates hammer stroke and blows per foot to the ultimate pile capacity. For double acting hydraulic hammers, provide driving criteria that relates transferred energy and blows per foot to the ultimate pile capacity.
7. If any numbered pile cannot be driven to the required allowable capacity, the UPRR Office of Director Structures Design shall be notified.

[When restrrike is specified in the design plans, note 8 shall apply.]
8. Piles may require setup time to achieve adequate capacity. See design plans for restrrike instructions and requirements.

PILE DRIVING REQUIREMENTS (CONTINUED)

POST DRIVING CONTRACTOR REQUIREMENTS - RESULTS REPORTING

- 1. Mark every pile with a dimension indicating the pile depth from cutoff to point of pile. Round dimension to the nearest foot. The mark shall be welded on the low milepost side of the pile, approximately 1'-0" below the bottom of the cap, and in numbers of approximately 3" in height. If a pile is not exposed, no mark is required.
2. A pile capacity report for each test pile shall be submitted to the Railroad within 48 hours of driving the pile. The report shall also include the PDA output report and/or full CAPWAP output report. The report shall be sealed by an engineer licensed in the state of the bridge construction. PDA reports shall be filled out by an independent 3rd party inspector. PDA testing and CAPWAP analysis shall be conducted by the same consultant.
3. The Railroad's Pile Driving Record form, which provides documentation of pile driving conditions for the full length of the pile, shall be completed for each test pile and submitted to the Railroad within 48 hours of pile driving.
4. The Constructor shall coordinate and pay for all pile capacity verification and pile testing.

SAFETY

- 1. After driving, pipe piles cut off lower than 4' above an adjacent walking surface shall be covered with a cap secured against displacement and capable of withstanding a concentrated live load of 250 pounds at the center of pile with a maximum deflection of 1/16 of the pile diameter.

VIBRATORY HAMMER

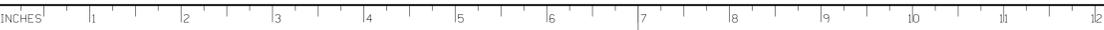
- 1. Vibratory hammers SHALL NOT be used without written approval from the UPRR Office of Director Structures Design.
2. Vibratory hammers may be used for initial set only. All piles shall be driven to capacity with an impact hammer and have capacity verified by one of the stated pile capacity verification methods.
3. Where a vibratory hammer will be used for initial set, the Geotechnical Engineer shall determine the maximum allowable depth for vibratory driving. This maximum depth shall be provided in the pre-construction wave equation analysis submitted for review by the Railroad.
4. Vibratory hammer usage may be allowed for piles that are driven to rock or similar end bearing refusal material, contingent on approval from the UPRR Office of Director Structures Design. Where a vibratory hammer is used, all piles shall be impact driven at their final tip elevation to verify the pile driving criteria have been met.
5. Due diligence must be provided to ensure the use of a vibratory hammer does not negatively impact the existing or proposed structure(s) through liquefaction or other subsurface subsidence issues. A boring log must be obtained prior to utilizing a vibratory hammer.
6. Monitoring of adjacent structures during vibrating will be required. The scope of monitoring will vary with size, location, and subsidence risk of adjacent structures. Monitoring guidance shall come from the UPRR Office of Director Structures Design.

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Table with 4 columns: DESIGN BY: HDR, DRAWN BY: HDR, CHECKED BY: AJB, APPROVED: (Signature). Includes date 10/26/2021 and project name UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN.

BRIDGE STANDARDS CONCRETE BEAM BRIDGES DRIVEN PIPE PILE NOTES 20" TO 48" DIAMETER. Includes file owner, date, plan no., and sheet info.

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**REINFORCED CONCRETE FILL**

CONCRETE

1. All concrete material, transportation, placement, workmanship and testing shall be in accordance with Chapter 8 of the current edition of the AREMA Manual for Railway Engineering.
2. Minimum compressive strength at 28 days shall be 4,000 psi (or as noted in the design plans).
3. Concrete shall be proportioned such that the water-cement ratio (by weight) does not exceed 0.45. Concrete must contain a minimum of 6/2 sacks of cement per cubic yard of concrete.
4. Cement replacement with Class F fly ash per ASTM C618 is permissible up to 25% replacement.
5. Cement shall be Type I, Type II or Type III Portland Cement in accordance with ASTM C150 specifications.
6. Aggregates shall be graded in accordance with ASTM C33. Coarse aggregate shall be size no. 67. Fine aggregate shall be sand or quarry screenings.
7. Air content shall be indicated on the design plans based on the following guidelines:
  - Severe Exposure - 5% to 7%  
Exposed to wet freeze-thaw, de-icers, or other aggressive agents.
  - Moderate Exposure - 4% to 7%  
Exposed to dry freeze-thaw and no de-icers or other aggressive agents.
  - Mild Exposure - 3% to 5%  
Not exposed to freezing, de-icers or other aggressive agents.
8. Admixtures shall be submitted to the Railroad for acceptance. Admixture dosages shall conform to manufacturer recommendations. Where multiple admixtures are used, all admixtures shall be obtained from the same company.
9. Prior to the addition of admixtures, concrete shall have a slump not greater than 4 inches. During placement, concrete shall have a slump of not less than 6 inches.
10. Where exposed to air, curing shall be accomplished by wet curing or membrane curing compound. Membrane curing compound shall conform to ASTM C309, Type 2.
11. Do not use calcium chloride or any admixture containing intentionally added chloride ions. Testing for chloride ions is not required.
12. It is recommended that trial mixes be performed prior to the delivery in order to adjust the desired air content, set time, and slump.
13. Apply MasterEmaco PI24 bonding agent, or approved alternate, to construction joints.

[Note 14 applies only when specifically stated in the Bill of Material.]  
 14. DCI-S, as manufactured by W.R. Grace, or approved alternate shall be added at a quantity of 5 gallons per cubic yard. Calcium nitrite solution shall contain 30% solids and shall provide 15.0 pounds per cubic yard chloride protection. Mix shall also include 7%, by weight of cement, force 10,000 microfibrils slurry by W.R. Grace or approved addendum shall be used. Adjust weight of concrete mix water for weight of DCI-S used.

REINFORCING STEEL

1. Reinforcing steel shall be deformed, new billet bars per ASTM A615 specifications and meet Grade 60 requirements.
2. Fabrication of reinforcing steel shall be per Chapter 7 of the CRSI Manual of Standard Practice. Dimensions of bending details are out to out of bar.
3. Reinforcing steel cage shall be prefabricated. Reinforcing steel is to be securely tied to prevent deformation or relative displacement of bars during handling and concrete placement. Tie wires shall be installed at every other bar intersection so that at least 50% of the intersections are tied. Tack welding of reinforcing is prohibited.
4. Splice bars in conformance with the drawings. Submit any alternative splice details to the Railroad for approval.
5. Place reinforcing steel cage immediately prior to the start of concrete placement. Provide E-Z Lok Wheel spacer rollers, or approved alternate, at 12" maximum spacing for plumb piles or 6' maximum spacing for battered piles to maintain the reinforcing cage at the proper location within the pipe pile. Spacers shall be placed in groups of three (min.) spaced equally around the circumference of the pile. If an alternate reinforcing spacer device is used, follow manufacturer's recommendations for spacing while not exceeding the 12' and 6' maximum spacings above. Cage shall be independently secured against displacement until such time as the concrete has set and can support the weight of the cage.
6. Bracing bars on reinforcing cage may be cut as cage is lowered into pile to allow for tremie pipe placement.

[Note 7 applies only when specifically stated in the Bill of Material.]  
 7. Reinforcing steel shall be epoxy coated per ASTM A775 specifications meeting Annex A1 for epoxy coating.

CONTROLLED LOW-STRENGTH MATERIAL (CLSM) FILL

1. Controlled Low-Strength Material is a self-compacting, cementitious fill material with an unconfined compressive strength of 50 to 300 psi. The mixture shall consist of water, Portland cement, fly ash, and sand fine or coarse aggregate or both. The mix design shall allow adequate flowability without segregation of aggregates. Hardening time is of prime importance and CLSM should develop 50 psi in about one hour.
2. Refer to design plans for CLSM placement detail.

**REINFORCED CONCRETE FILL (CONTINUED)**

INTERNAL CLEANING

1. The inside of pipe piles that are driven open-ended and will be filled with concrete shall be thoroughly cleaned to the bottom of proposed concrete depth to the satisfaction of the UPRR Manager of Bridge Construction. Cleaning shall remove all loose or flaking material inside the pipe. Approval of hole cleanliness shall be obtained from the UPRR Manager of Bridge Construction prior to installing cage and filling pipes with concrete.
2. Where piles are closed ended, UPRR Manager of Bridge Construction approval is not necessary unless the pile is damaged, allowing soil and water to intrude inside the pile.

CONCRETE AND CLSM FILL PLACEMENT

1. CLSM and concrete fill shall be placed in pipe piles by tremie.
2. If water is present inside the pipe pile, an attempt shall be made to dewater the pile to the satisfaction of the UPRR Manager of Bridge Construction prior to placement of CLSM or concrete.
3. Where water is not present inside the pile or dewatering is successful, concrete shall be placed in such a manner as to limit free-fall distance of concrete to 8 feet. Free-fall distances greater than 8 feet shall not be allowed unless otherwise approved by the Railroad. Concrete should be directed so that the fall is vertical down the center of the pile and the concrete does not hit the reinforcing steel.
4. If dewatering is not possible, the inside of the pipe pile shall be thoroughly flushed with clean water until the pipe walls are clearly visible to an underwater camera for video inspection. The Constructor shall submit a plan for cleaning, inspection and placement of CLSM and concrete to the Railroad for approval.
5. Tremie pipe shall be a minimum of 8" diameter for pipe piles greater than 24" diameter. For pipe piles 24" and less, a smaller diameter tremie pipe may be used as approved by the Railroad.
6. Tremie pipe shall be constructed in sections, having flanged couplings with watertight gaskets. The pipe top shall be fitted with a cone bottom hopper with a minimum capacity of 2 cubic yards. Tremie pipe shall be supported by cranes to allow raising or lowering of the pipe. For CLSM placement, the tremie shall be started with pipe full of CLSM and pipe end resting flat on the pile tip, soil or rock. For concrete placement, the tremie shall be started with pipe full of concrete and pipe end resting flat on CLSM. At all times during CLSM or concrete placement, the lower end of the tremie shall be kept 5 feet minimum below the surface of the CLSM or concrete fill. The tremie hopper shall be kept full continuously until the pipe pile is filled. Place concrete by tremie until fresh, clean concrete exits the top of the pile.
7. Where pile core reinforcing steel is continuous into cast-in-place concrete pile cap, the top 5 feet of pile concrete fill shall be consolidated via rodding or mechanical vibration.

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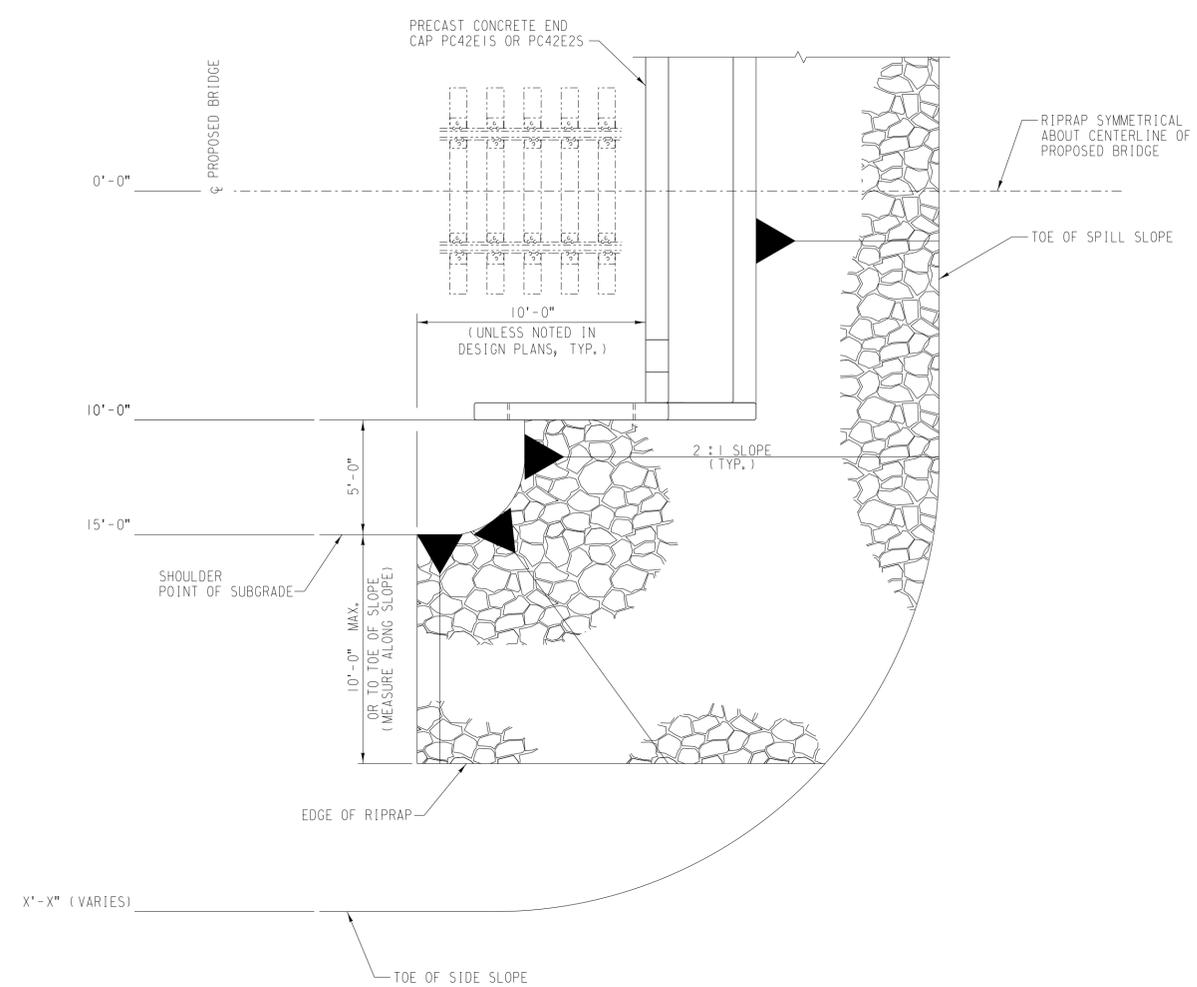
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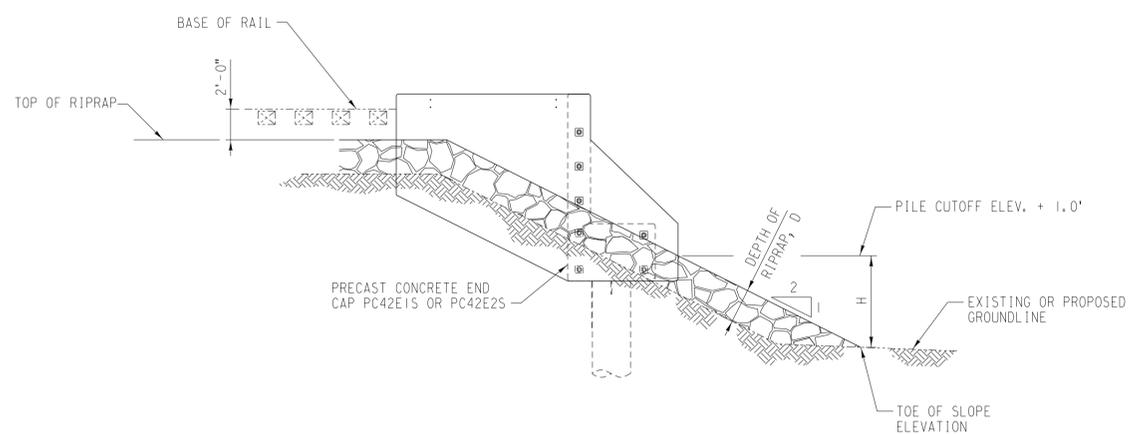
**BRIDGE STANDARDS**  
 CONCRETE BEAM BRIDGES  
**DRIVEN PIPE PILE NOTES**  
**20" TO 48" DIAMETER**

FILE OWNER: UPRR	DATE: AUGUST, 2021
PLAN NO.: 533120	SHEET: 2

# STANDARD SHEET



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



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

RIPRAP QUANTITIES (IN TONS FOR ONE EMBANKMENT)			
HEIGHT, H	CLASS 1	CLASS 2	CLASS 3
	2:1	2:1	2:1
0'-0"	32	42	63
1'-0"	42	56	84
2'-0"	52	69	104
3'-0"	62	83	124
4'-0"	72	96	144
5'-0"	82	110	164
6'-0"	92	123	184
7'-0"	102	136	204
8'-0"	112	150	224
9'-0"	123	163	245
10'-0"	133	177	265
11'-0"	143	190	285
12'-0"	153	203	305
13'-0"	163	217	325
14'-0"	173	230	345
15'-0"	183	244	365
16'-0"	193	257	385
17'-0"	203	271	406
18'-0"	213	284	426
19'-0"	223	297	446
20'-0"	233	311	466
21'-0"	243	324	486
22'-0"	253	338	506
23'-0"	263	351	526
24'-0"	273	364	546
25'-0"	284	378	567
26'-0"	294	391	587
27'-0"	304	405	607
28'-0"	314	418	627
29'-0"	324	432	647

**NOTES:**

- CLASS 3 AND CLASS 4 RIPRAP NOT TO BE USED WITHOUT APPROVAL FROM UPRR DESIGN MANAGER.
- CONCRETE BEAMS NOT SHOWN FOR CLARITY.

## RIPRAP NOTES

Class of riprap shall be specified by the engineer. Riprap shall be placed in such a manner as to avoid segregation of various sizes of rock, and distributed so that there will be no large accumulation of either the larger or smaller sizes of stone. Individual rocks shall be placed in tight contact with one another in such a way to produce the least amount of void spaces. Riprap shall be solid, unfractured rock or concrete, bulky in shape with sharp angular edges.

Individual rocks shall vary as shown:

RIPRAP CLASS	AVERAGE WEIGHT PER STONE (LBS.)	DIMENSION (INCHES)	ITEM NO.	UNIT OF MEASURE	LAYER THICKNESS, D	TYPICAL VELOCITIES
I	50 to 200	9 to 14	562-2764	Ton	1'-6"	0 - 12 fps
II	200 to 1,000	14 to 24	562-3430	Ton	2'-0"	12 - 14 fps
III	1,000 to 4,000	24 to 38	562-4096	Ton	3'-0"	> 14 fps

The entire mass of riprap shall well distributed within the limits specified. However, the following allowances shall be acceptable to produce the required riprap protection:

Riprap Class I - No allowances are permitted  
 Riprap Class II - 15% of Riprap Class I.  
 Riprap Class III - 15% of Riprap Class I and 15% of Riprap Class II.

### CLASS 1 RIPRAP

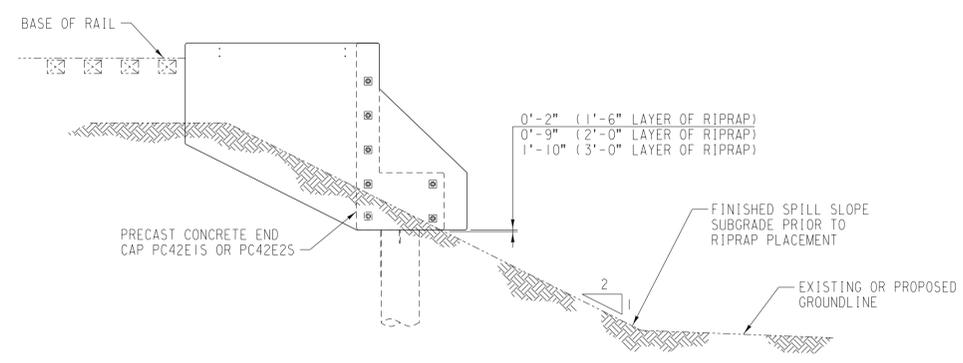
- Riprap shall be placed in such a manner as to avoid segregation of the various sizes of rock, individual rocks shall be placed in tight contact with one another in such a way to produce the least amount of void spaces.
- Riprap shall be solid, unfractured rock or concrete, bulky in shape with sharp angular edges. Weight of individual rocks shall vary from a minimum of 50 lb. to a maximum of 200 lb. for Class 1, UPRR Item No. 562-2764.

### CLASS 2 RIPRAP

- Riprap shall be placed in such a manner as to avoid segregation of the various sizes of rock, individual rocks shall be placed in tight contact with one another in such a way to produce the least amount of void spaces.
- Riprap shall be solid, unfractured rock or concrete, bulky in shape with sharp angular edges. Weight of individual rocks shall vary from a minimum of 200 lb. to a maximum of 1,000 lb. for Class 2, UPRR Item No. 562-3430.

### CLASS 3 RIPRAP

- Riprap shall be placed in such a manner as to avoid segregation of the various sizes of rock, individual rocks shall be placed in tight contact with one another in such a way to produce the least amount of void spaces.
- Riprap shall be solid, unfractured rock or concrete, bulky in shape with sharp angular edges. Weight of individual rocks shall vary from a minimum of 1,000 lb. to a maximum of 4,000 lb. for Class 3, UPRR Item No. 562-4096.



**SPILL SLOPE ELEVATION**  
SCALE: 1/4" = 1'-0"

REVISIONS			DESIGN BY: DEH	DRAWN BY: KJK	CHECKED BY: JRB
DATE	LTR.	DESCRIPTION	APPROVED:		
03/23	A	REVISED DIMENSIONS			
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/					
/					
/					
/					

*Alan Decker* 03/18/2021  
 UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN



**BRIDGE STANDARDS**  
 CONCRETE BEAM BRIDGES  
**42" PCB SPANS END CAP  
 PC42E1S OR PC42E2S STANDARD  
 RIPRAP PLACEMENT DETAILS**

FILE OWNER: UPRR	DATE: 05/13/2020
PLAN NO.: 533190	SHEET: 1

FILE NAME: Y:\Rail\1\road\2\101005\210104\_89\_Brooklyn\_670\_07A\Eng\_Docs\040\_42.in\_Standards\_Summit\1\533100\_42.inch\_PCB\_Rev1.dgn