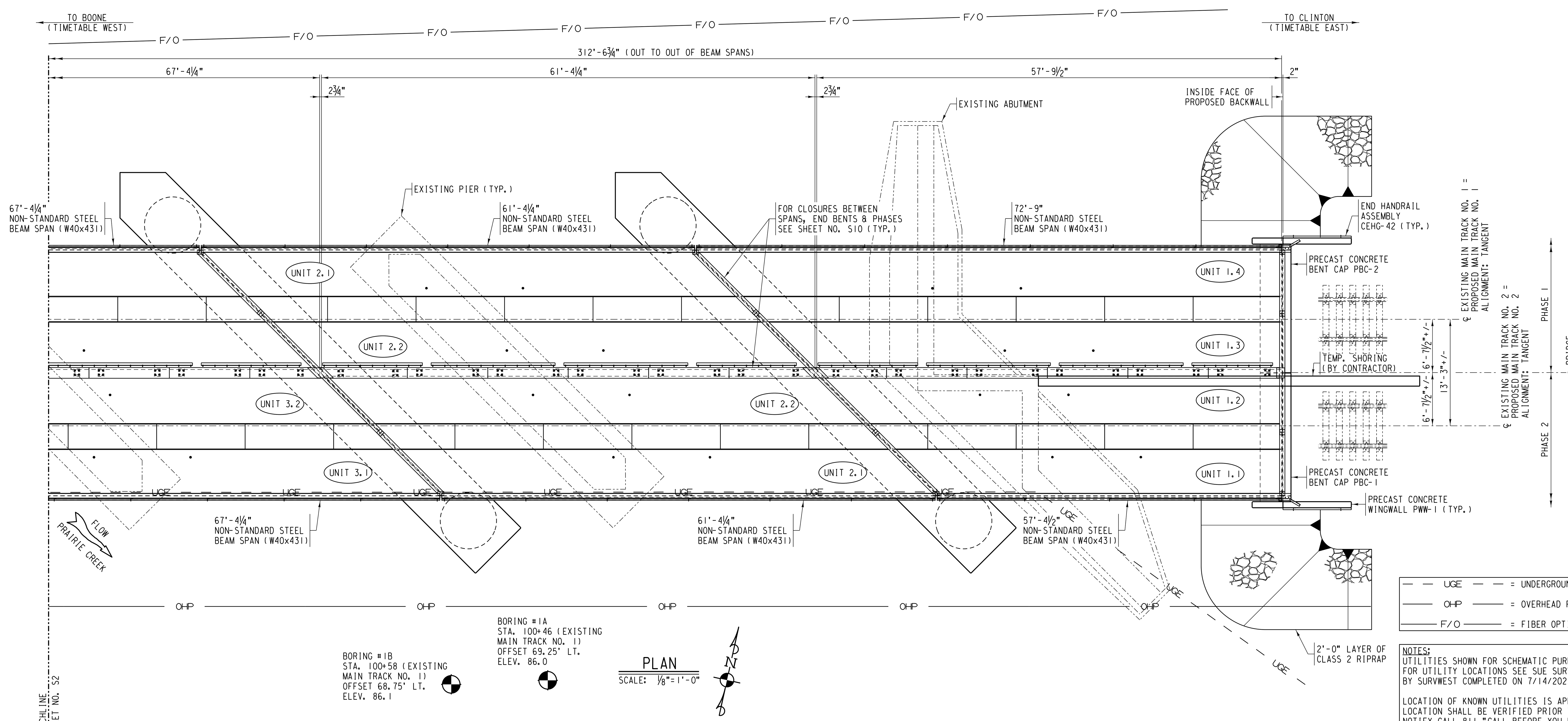
SHEET SIZE 22x34

DESIGN SHEET



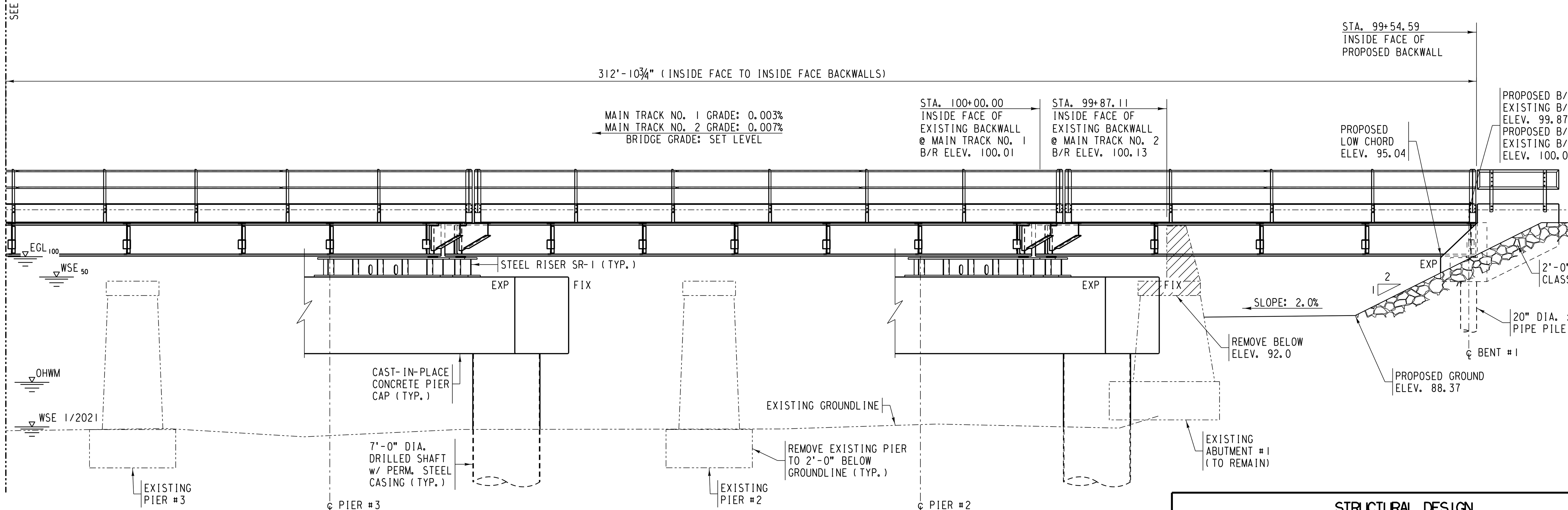
PLAN

SCALE: ⅛"=1'-0"

— — UGE — —	= UNDERGROUND ELECTRIC
—— OHP ——	= OVERHEAD POWER
—— F/O ——	= FIBER OPTICS

NOTES:
UTILITIES SHOWN FOR SCHEMATIC PURPOSES ONLY. FOR UTILITY LOCATIONS SEE SUE SURVEY PERFORMED BY SURVWEST COMPLETED ON 7/14/2023.

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.

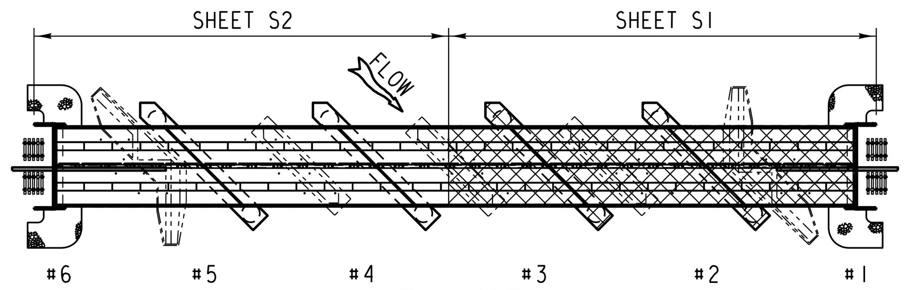


WSE_{50} =	93.24
EGL_{100} =	95.07
VEL_{100} =	12.57 fps
OHWM =	81.83

ELEVATION

SCALE: ⅛"=1'-0"

NOTE:
EXISTING GROUNDLINE IN RIVERBED BASED ON SURVEY PERFORMED BY OLSSON ASSOCIATES 01/20/2021. ACTUAL CONDITIONS MAY VARY.



KEY MAP

SCALE: NONE

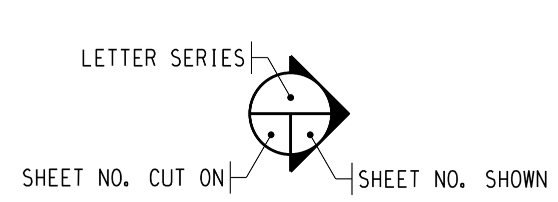
DRAWING SCHEDULE

SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
S1	122696	GENERAL ARRANGEMENT (1 OF 2)	DESIGN
S2	122696	GENERAL ARRANGEMENT (2 OF 2)	DESIGN
S3	122696	GENERAL NOTES AND BILL OF MATERIAL	DESIGN
S4	122696	FOUNDATION & TEMPORARY BALLAST RETAINER LAYOUT	DESIGN
S5	122696	SECTIONS AND DETAILS (1 OF 2)	DESIGN
S6	122696	SECTIONS AND DETAILS (2 OF 2)	DESIGN
S7	122696	DRILLED SHAFT DETAILS	DESIGN
S8	122696	PIER #2 THRU #5 DETAILS (1 OF 2)	DESIGN
S9	122696	PIER #2 THRU #5 DETAILS (2 OF 2)	DESIGN
S10	122696	SPAN CLOSURE AND WATERPROOFING DETAILS	DESIGN
S11	122696	BORING LOGS	DESIGN
F1	122696	BM SPAN - FRAMING AND DECK PLAN - UNIT 1.1 & 1.2	DESIGN
F2	122696	BM SPAN - FRAMING AND DECK PLAN - UNIT 1.3 & 1.4	DESIGN
F3	122696	BM SPAN - FRAMING AND DECK PLAN - UNIT 2.1 & 2.2	DESIGN
F4	122696	BM SPAN - FRAMING AND DECK PLAN - UNIT 3.1 & 3.2	DESIGN
F5	122696	BM SPAN - ASSEMBLY DETAILS (1 OF 3)	DESIGN
F6	122696	BM SPAN - ASSEMBLY DETAILS (2 OF 3)	DESIGN
F7	122696	BM SPAN - ASSEMBLY DETAILS (3 OF 3)	DESIGN
F8	122696	BM SPAN - PIECE MARK DETAILS (1 OF 2)	DESIGN
F9	122696	BM SPAN - PIECE MARK DETAILS (2 OF 2)	DESIGN
F10	122696	BM SPAN - HANDRAIL DETAILS	DESIGN
F11	122696	BM SPAN - LIFTING LUG DETAILS	DESIGN
F12	122696	BM SPAN - COVER PLATE AND CLOSURE PLATE DETAILS	DESIGN
F13	122696	BM SPAN - TEMPORARY BALLAST RETAINER DETAILS	DESIGN
F14	122696	BM SPAN - RISER DETAILS	DESIGN
F15	122696	BM SPAN - MATERIAL SCHEDULES	DESIGN
P1	122696	PRECAST CONCRETE BENT CAP PBC-1	DESIGN
P2	122696	PRECAST CONCRETE BENT CAP PBC-2	DESIGN
P3	122696	PRECAST CONCRETE WINGWALL PWW-1	DESIGN
M1	122696	MISCELLANEOUS STEEL DETAILS	DESIGN
T2-T3	531100	GENERAL NOTES AND PIECE FABRICATION NOTES	STANDARD
A2	531100	STRUCTURE MARKER & NO TRESPASSING SIGN INSTALLATION DETAILS	STANDARD
P1	531120	PIPE PILE FOUNDATIONS PILE INSTALLATION NOTES AND DETAILS	STANDARD
P5	531120	PIPE PILE FOUNDATIONS REINFORCING NOTES AND DETAILS	STANDARD
2	533120	DRIVEN PIPE PILE NOTES 20" TO 48" DIAMETER	STANDARD
D1	581001	DRILLED SHAFT CONSTRUCTION NOTES (SHEET 1 OF 2)	STANDARD
D2	581001	DRILLED SHAFT CONSTRUCTION NOTES (SHEET 2 OF 2)	STANDARD
D3	581001	DRILLED SHAFT INSPECTION NOTES	STANDARD
D4	581001	DRILLED SHAFT NON-DESTRUCTIVE TESTING NOTES	STANDARD
1	533190	STANDARD RIPRAP PLACEMENT DETAILS	STANDARD

ESTIMATED LIFTING WEIGHT

60'-0" EXISTING STEEL DPGOD SPAN w/ TRACK = 90,000 LB. (45.0 TON)
ONE STEEL BM SPAN UNIT 1.1 = 53,800 LB. (26.9 TON)
ONE STEEL BM SPAN UNIT 1.2 = 83,000 LB. (41.5 TON)
ASSEMBLED BM SPAN UNIT 1.1 & 1.2 w/ TRACK = 163,200 LB. (81.6 TON)
ONE STEEL BM SPAN UNIT 1.3 = 94,600 LB. (47.3 TON)
ONE STEEL BM SPAN UNIT 1.4 = 79,000 LB. (39.5 TON)
ASSEMBLED BM SPAN UNIT 1.3 & 1.4 w/ TRACK = 206,600 LB. (103.3 TON)
ONE STEEL BM SPAN UNIT 2.1 = 71,200 LB. (35.6 TON)
ONE STEEL BM SPAN UNIT 2.2 = 95,000 LB. (47.5 TON)
ASSEMBLED BM SPAN UNIT 2.1 & 2.2 w/ TRACK = 197,200 LB. (98.6 TON)
ONE STEEL BM SPAN UNIT 3.1 = 77,600 LB. (38.8 TON)
ONE STEEL BM SPAN UNIT 3.2 = 103,800 LB. (51.9 TON)
ASSEMBLED BM SPAN UNIT 3.1 & 3.2 w/ TRACK = 215,600 LB. (107.8 TON)
PRECAST CONCRETE END CAP PBC-1 OR PBC-2 = 33,000 LB. (16.5 TON)
PRECAST CONCRETE WINGWALL PWW-1 = 8,100 LB. (4.1 TON)

NOTES:
1. ASSEMBLED BM SPANS INCLUDE TEMPORARY BALLAST RETAINERS, COVER PLATES, CLOSURE PLATE ASSEMBLIES. CMU BLOCKING IS ALSO ASSUMED TO SUPPORT THE TRACK. VALUE SHOWN IS THE MAXIMUM OF PHASE 1 OR PHASE 2 SPAN.
2. THE CONTRACTOR SHALL SUBMIT THE ASSEMBLED SPAN LIFTING PLAN(S) IN CONJUNCTION WITH THE BM SPAN SHOP DRAWINGS FOR REVIEW AND APPROVAL.



SECTION DESIGNATION

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction   Date

STRUCTURAL DESIGN

LICENSED PROFESSIONAL ENGINEER — Nicholas J. Staroski — 23560 — IOWA

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: Nicholas J. Staroski   Date: 9-6-2023

Printed or Typed Name: Nicholas J. Staroski

License number: 23560

My license renewal date is December 31, 2023

Pages or sheets covered by this seal: S1-S11, F1-F15, P1-P3, M1 (Pages 1-30)

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL   DATE: 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD   DATE: 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N   LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S1 of S11

UNION PACIFIC RAILROAD

Office of Director Structures Design

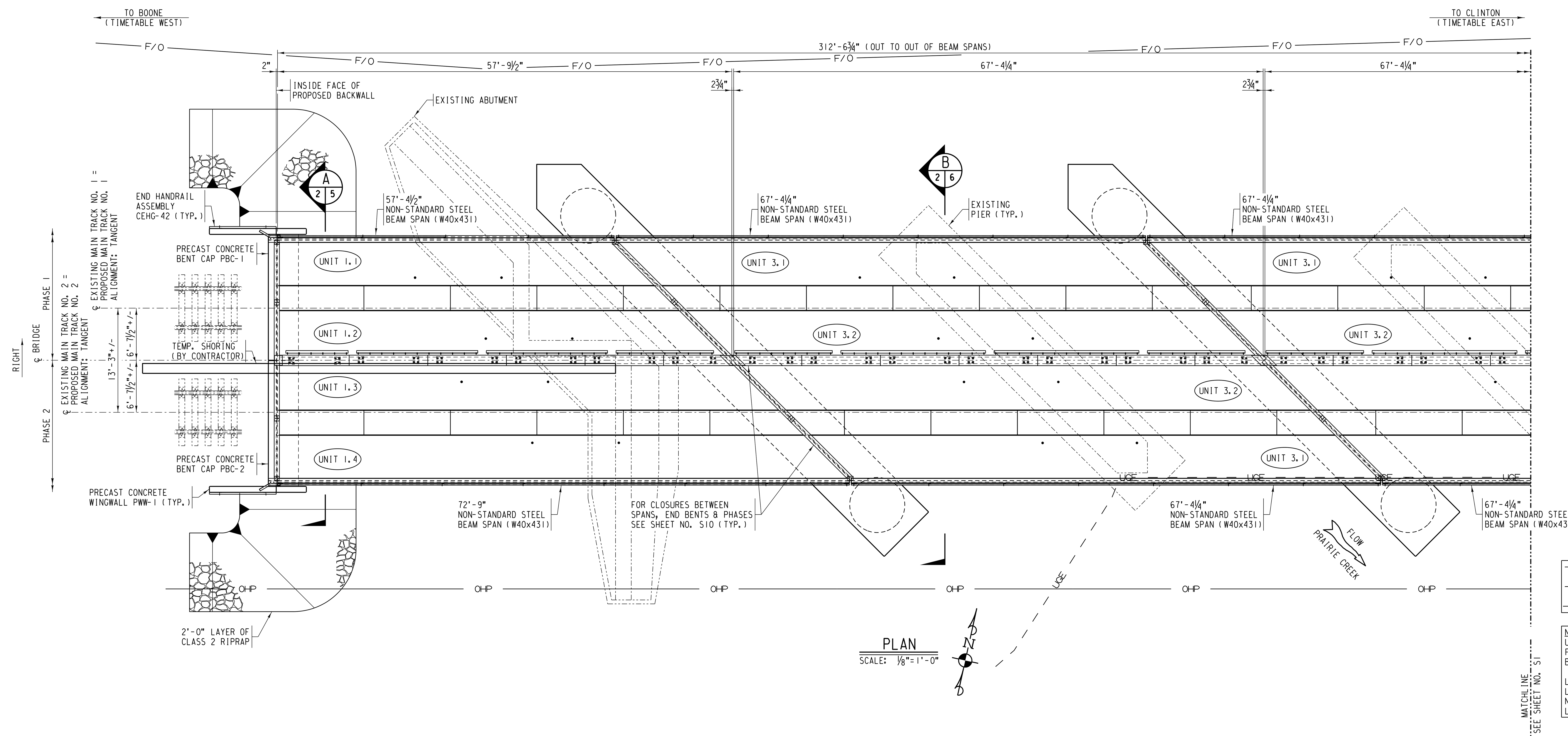
LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: GENERAL ARRANGEMENT (1 OF 2)

PLOTTED: 9/12/2023 9:43:00 AM

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw01/Documents/Projects_2023/KC01110123011/Bridge/Sheets/Br 81.79/clnt8179_bla

DESIGN SHEET



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—— OHP ——	= OVERHEAD POWER
—— F/O ——	= FIBER OPTICS

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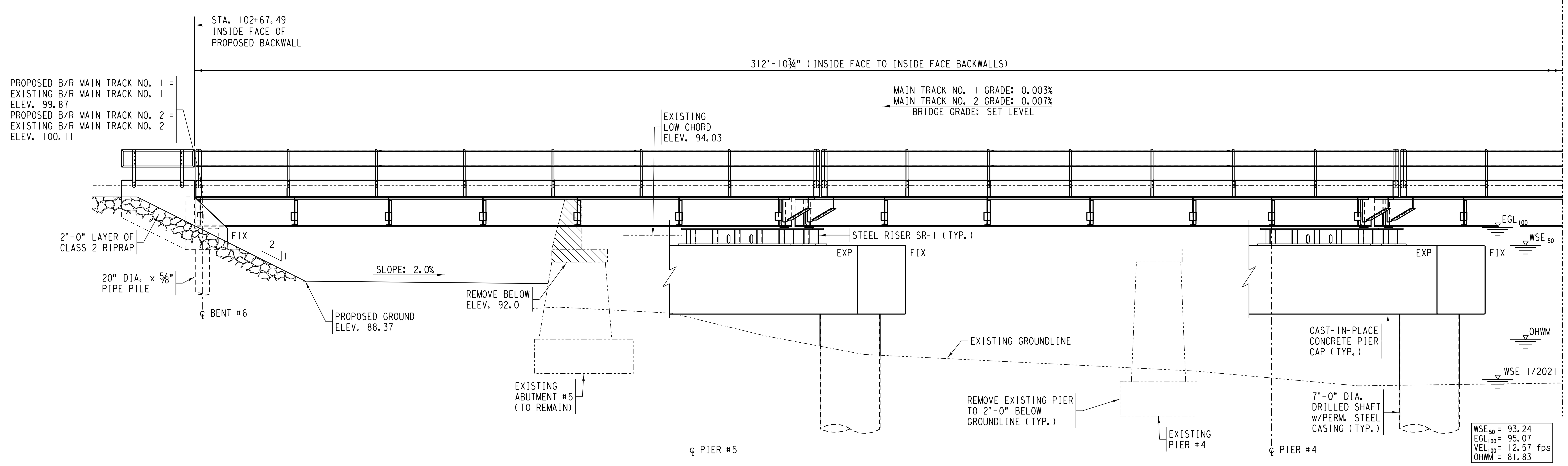
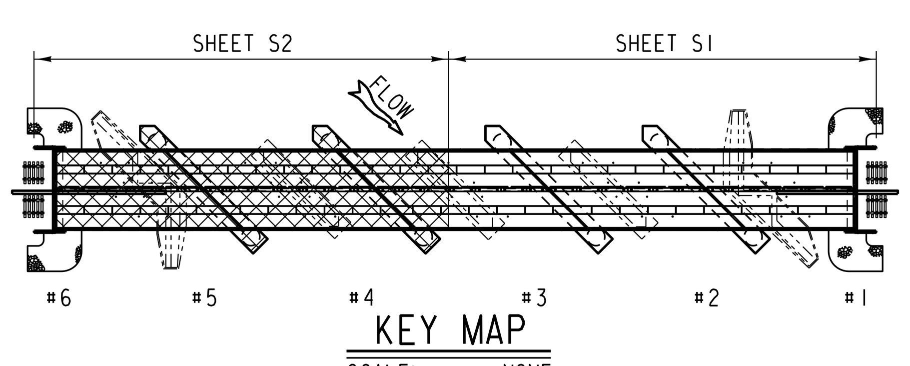




NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S2 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: GENERAL ARRANGEMENT (2 OF 2)

DESIGN SHEET

SHEET SIZE 22x34

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. 100' both sides of existing Main Track No. 1 centerline.

LAYOUT

1. Stationing: Sta. 100+00.00, West face of East backwall of existing Main Track No. 1, Bridge No. 81.79.
2. Elevation Datum: Elev. 100.00, base of South rail of existing Main Track No. 1, Sta. 100+00.00. To convert from local datum to NAVD88 add +638.17.
3. Temporary Benchmark: Elev. 99.52, established by top of Northeast concrete abutment, Bridge No. 81.79, 9.54' right of existing Main Track No. 1 track centerline, Sta. 99+88.27.
4. Profile: No Change in Rail Elevation.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawing.

   Location survey prepared by Olsson, Inc., dated 1/20/2021.

   Subsurface Exploration and Recommendations Form Revision 3 by Olsson, Inc., dated 7/12/2023.

   Replacement Structure Recommendation Form, UPRR's Br 81.79 Clinton Subdivision prepared by Olsson dated 8/14/2023.

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.
3. Design longitudinal load per 1996 edition of the AREA Manual.
4. Substructure has been designed for ice load with a minimum thickness of 1.4 feet with a crushing force 200 psi applied at midway between the ordinary high water mark and the 100-year water surface elevation. Stream flow skew to pier assumed to be 0 degrees. 15% of longitudinal ice load applied in pier transverse direction per AREMA Chap. 8 Art. 2.2.3n(5).
5. No net uplift occurs at beam span bearings due to design loads per AREMA and those described above.
6. End Bent Pile Design Load: 140 Ton (NOT FOR CONSTRUCTION)

PILE DRIVING

1. All pipe piles shall be driven to 204 ton capacity. Estimated pile tip elevation is 34.0.
2. Pile tip reinforcement shall be APF Inside Flange Cutting Shoe 0-14001 or approved alternative for all piles.
3. For additional pile driving notes and splice details, see Std. Plan No. 531120 Sht. P1.
4. Pile concrete fill and reinforcing shall be per notes on Std. Plan No. 533120 Sht. 2 and follow air content guidelines for Moderate Exposure.
5. Install reinforced concrete fill per details on Std. Plan No. 531120 SHT. P5. L = 30'-0". Reinforcing shall be per notes on Std. Plan No. 533120 Sht. 2.

DRILLED SHAFT NOTES

DRILLED SHAFT DESIGN NOTES

1. Drilled shaft service design loads (NOT TO BE USED FOR CONSTRUCTION):

   Pier #2 thru #5: 1,010 Ton
2. Drilled shafts shall derive their support from combined side friction and end bearing. Factor of Safety for side friction and end bearing is 2.5. Soil resistance above elevation 32.0 is neglected for permanent casing.
3. Drilled shaft vertical design load is controlled by Service Load Group I for geotechnical capacity. Drilled shaft lateral design is controlled by Factored Load Group VIII including ice loading.
4. For lateral design and stability of the drilled shafts, resistance above elevation 48.0 at Piers #2 & #3 and elevation 58.0 at Piers #4 & #5 is neglected for scour.
5. Permanent steel casing is provided for constructability and structural capacity for both load combinations with and without ice loading.

DRILLED SHAFT CONSTRUCTION NOTES

1. Minimum concrete compressive strength at 28 days shall be 4000 psi.
2. Exposure level for concrete air content: Moderate
3. Top of drilled shafts shall be at the elevations shown on the Drilled Shaft Details, Sheet No. S7.
4. Drilled shafts shall be advanced to the tip elevations (subject to change) shown on the Drilled Shaft Details, Sheet No. S7.
5. TIP and CSL testing must be performed at all shaft locations. CSL tubes shall be touching the bottom of shaft. No over excavation, blocking, and "rebar shoes" allowed. If both integrity test methods confirm an anomaly, contractor must repair shaft anomaly and cover costs associated with these repairs. If repair efforts are required due to a false test result, Contractor will be reimbursed for repair effort by UPRR.
6. For shafts bearing on limestone bedrock, the base of each shaft shall have a minimum of 50% of the base with less than ½" of sediment at the time of concrete placement. Ensure the maximum sediment or debris depth at the base of the shaft does not exceed 1 inch.
7. The drilled shaft inspector (DSI) shall provide video documentation of the shaft base material and cleanliness. A device capable of displacing the slurry or drilling fluids to facilitate inspection shall be utilized such as a MiniSID or similar device.
8. The drilled shaft inspector (DSI) shall be supplied by UPRR.
9. The Geotechnical Engineer of Record (EOR) will be conducting additional borings to further verify rock elevations and competency. The Contractor shall provide suitable access on the temporary work bridges to perform drilling operations. The Contractor shall coordinate timing and locations of additional borings with the Geotechnical EOR. The drilled shaft and/or rock sockets are subject to change based on additional borings, soils testing and geotechnical recommendations.

STRUCTURE MONITORING PLAN

1. The Contractor shall be responsible for development and implementation of a bridge monitoring program for approval by the Railroad. The plan shall detail the monitoring methods, frequency and duration of when the measurements are to be taken. A baseline for abutment/pier movements shall be established a minimum of 10 days prior to starting construction activities. Threshold values of movement shall be established for stopping construction activities and/or rail traffic.

BILL OF MATERIAL

Ver 0

TOTAL	PHASE 1	PHASE 2	UNIT	DESCRIPTION	ITEM NO	ORDERED BY
1	1	0	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 1.1 & 1.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 1)	122696-01	MBP
1	1	0	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 1.3 & 1.4 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 1)	122696-02	
1	1	0	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 2.1 & 2.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 1)	122696-03	
2	2	0	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 3.1 & 3.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 1)	122696-04	
1	0	1	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 1.1 & 1.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 2)	122696-05	
1	0	1	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 1.3 & 1.4 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 2)	122696-06	
1	0	1	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 2.1 & 2.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 2)	122696-07	
2	0	2	EA	(SBR) STRUCTURAL STEEL FOR BM SPAN (W40X431) UNIT 3.1 & 3.2 (PER SCHEDULE, SHT. F15 AND NOTES AND DETAILS, SHTS. F1 THRU F14) (PHASE 2)	122696-08	
2	1	1	EA	PRECAST CONCRETE END CAP PBC-1 (PER SCHEDULE & DETAILS, SHT. P1)	122696-09	
2	1	1	EA	PRECAST CONCRETE END CAP PBC-2 (PER SCHEDULE & DETAILS, SHT. P2)	122696-10	
4	2	2	EA	PRECAST CONCRETE WINGWALL PWW-1 (PER SCHEDULE & DETAILS, SHT. P3)	122696-11	
1	1	0	LOT	NON-STANDARD MISCELLANEOUS STEEL (PER SCHEDULE, SHEET M1)	122696-12	
24	24	0	EA	STEEL PIPE PILE 20" O.D. X 0.625" X DOUBLE RANDOM 40 FT LENGTH WITH 1 END BEVELED PER ASTM A252, GRADE 3 (PER STD. PLAN NO. 531120 SHT. P1)	122696-13	
12	12	0	EA	20" PIPE PILE BACKING RING (PER NOTES, STD. PLAN NO. 531120, SHT. P1 AND DETAIL, SHT. S4)	122696-14	
12	12	0	EA	20" PIPE PILE INSIDE FLANGE OPEN END HARDENED STEEL CUTTING SHOE (PER STD. PLAN NO. 531120, SHT. P1)	510-7493	
4	2	2	EA	END HANDRAIL ASSEMBLY CEHG-42 FOR CONCRETE SPANS W/ GRATING (PER DETAILS, STD. PLAN NO. 533180, SHT. 1 & NOTES, STD. PLAN NO. 531100, SHT. T3)	513-0003	
8	4	4	EA	PL 3/8X24X 10' (A36, PLAIN)	510-7650	
2	1	1	QT	ZRC COLD GALVANIZING COMPOUND OR APPROVED ALTERNATIVE	513-3960	
30	30	0	CU. YD.	4000 PSI CONCRETE FOR PIPE PILES, MODERATE EXPOSURE (PER NOTES, STD. PLAN NO. 533120, SHT. 2)		CONSTRUCTOR
12	12	0	EA	30' REBAR CAGE RB-30 FOR 20" STEEL PIPE PILE (PER STD. PLAN NO. 531100, SHT. T3 & STD. PLAN NO. 531120, SHT. P5)	512-0001	
1	1	0	LOT	CONTROLLED LOW-STRENGTH MATERIAL (CLSM) (PER NOTES, STD. PLAN NO. 531100, SHT. T2)		
424	424	0	LIN. FT.	7'-0" DIA. DRILLED SHAFT (PER NOTES, STD. PLAN NO. 581001 SHT D1-D4 AND SHT NO. S3 AND DETAILS, SHT. NO. S7)		
184	184	0	LIN. FT.	6'-6" DIA. DRILLED ROCK SOCKET (PER NOTES, STD. PLAN NO. 581001 SHT D1-D4 AND SHT NO. S3 AND DETAILS, SHT. NO. S7)		
464	464	0	LIN. FT.	PERMANENT STEEL CASING FOR 7'-0" DIA. DRILLED SHAFT		
1	1	0	LOT	TEMPORARY STEEL CASING, SLURRY MIX, AND MISCELLANEOUS MATERIAL AS REQUIRED FOR INSTALLATION OF DRILLED SHAFTS		
1	1	0	LOT	CROSS-HOLE SONIC LOG TESTING AND PIPES (PER NOTES, STD. PLAN NO. 581001 SHT D4 AND DETAILS, SHEET NO. S7)		
1	1	0	LOT	THERMAL INTEGRITY PROFILE TESTING (PER NOTES, STD. PLAN NO. 581001 SHT D4 AND DETAILS, SHEET NO. S7)		
611.2	611.2	0	CU. YD.	4,000 PSI CONCRETE FOR PIERS (PER NOTES, STD PLAN NO. 531100 SHT. T3 AND DETAILS AND SCHEDULES, SHT. NO. S8 & S9)		
4	4	0	LOT	REINFORCING STEEL FOR PIERS (PER NOTES, STD PLAN NO. 531100 SHT. T3 AND DETAILS AND SCHEDULES, SHT. NO. S8 & S9)		
1	1	1	LOT	6,000 PSI NON-SHRINK GROUT FOR ANCHOR RODS (PER NOTES, STD. PLAN NO. 531100 SHT. T2)		
1162	581	581	SQ. YD.	SPRAY-APPLIED WATERPROOFING (PER NOTES AND DETAILS, SHT. NO. S10)		
1	0	1	LOT	CARLISLE CCW-201 POLYURETHANE SEALANT OR APPROVED ALTERNATIVE		
1	1	1	LOT	EXCAVATION		
228	114	114	TN	SEALANT BALLAST (PER STD. DWG. 0010E)	562-5428	
257	128.5	128.5	TN	RIPRAP, CLASS 2 (PER NOTES, STD. PLAN NO. 531190, SHT. R1 OR R2)	562-3430	
1	1	1	LOT	BM SPAN ERECTION		
1	1	0	LOT	TEMPORARY WORK BRIDGES		
1	1	1	LOT	STRUCTURE MONITORING		
1	1	1	LOT	REMOVE STRUCTURE		
1	1	0	LOT	TEMPORARY SHORING		
1	1	1	LOT	EROSION CONTROL		

EST. WT. OF STEEL PILING = 124,280 LB.
EST. WT. OF NON-STANDARD MISC. STEEL (NOT INCL. BOLTS) = 1,710 LB.
BULK MATERIAL QUANTITIES ARE ESTIMATED

PROPOSED CONSTRUCTION SEQUENCE

PHASE 1

1. Install drilled shafts outside of existing bridge girder limits. Trim walkway and ties as required.
2. Construct cast-in-place concrete pier caps below existing girders.
3. Drive all piles for end bents and drive sheet piles for temporary shoring. Piles at each bent and sheet piling shall be driven within work windows.
4. Close traffic on existing Track No. 1 and route all traffic to Track No. 2.
5. Remove Phase 1 portion of existing rail, ties, existing superstructure and substructure for Track No. 1 as required.
6. Excavate as specified for construction of Phase 1 end bents.
7. Install Phase 1 steel risers and end bents.
8. Install wingwalls and backfill behind end bent caps.
9. Place Phase 1 superstructure.
10. Install cover plates.
11. Install ballast, ties, rail and OTM for proposed Track No. 1.
12. Traffic may now operate on Track No. 1 and Track No. 2.

PHASE 2

13. Close traffic on existing Track No. 2 and route all traffic to Track No. 1.
14. Remove Phase 2 portion of existing rail, ties, existing superstructure and substructure for Track No. 2 as required.
15. Excavate as specified for construction of Phase 2 end bents.
16. Remove the portion of the temporary shoring as needed to allow clearance for installation of Phase 2 concrete bent caps.
17. Install Phase 2 steel risers and end bents.
18. Install wingwalls and backfill behind end bent caps and remove (by torch cutting) the remaining temporary shoring to a minimum of 2'-0" below base of rail.
19. Place Phase 2 superstructure.
20. Install cover plates and closure plate assemblies.
21. Install ballast, ties, rail and OTM for Track No. 2.
22. Remove temporary ballast retainers.
23. Traffic may now operate on Track No. 1 and Track No. 2.
24. Install riprap.
25. Restore area to original or better condition.

NO.	DATE	REVISIONS
	/ /	
1	9/12/2023	UPDATED BOM ITEM DESCRIPTION

COMPLETION STATUS:
FINAL
STATUS
9/6/2023
DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
Nicholas J. Staroski
DESIGN ENGINEER OF RECORD
9/6/2023
DATE

PROJECT ID: 117429
WORK ORDER: 58028
C E NUMBER: 122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S3 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: GENERAL NOTES AND BILL OF MATERIAL

PLOTTED: 9/12/2023 9:43:02 AM

FILE NAME: pw://hq-pwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/cln08179_bia

DESIGN SHEET

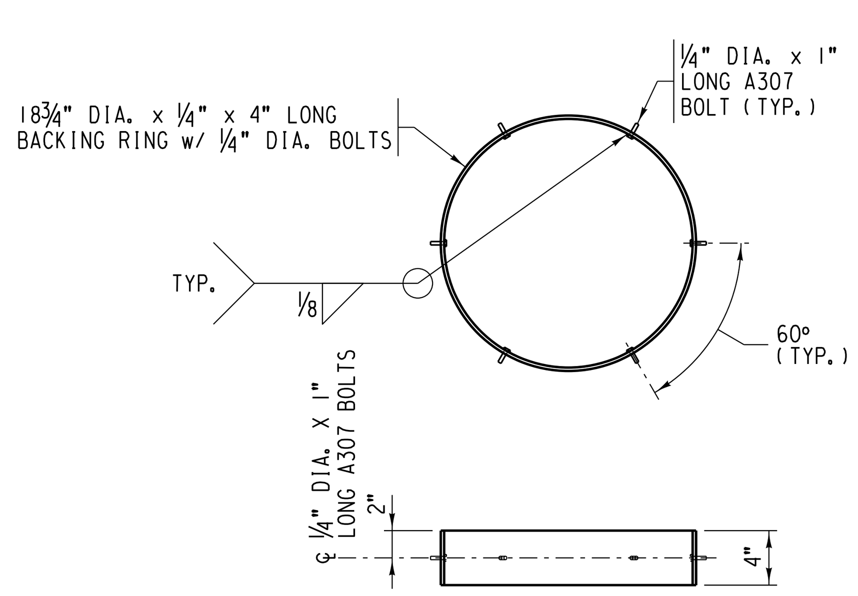
SHEET SIZE 22x34

PILE LEGEND:

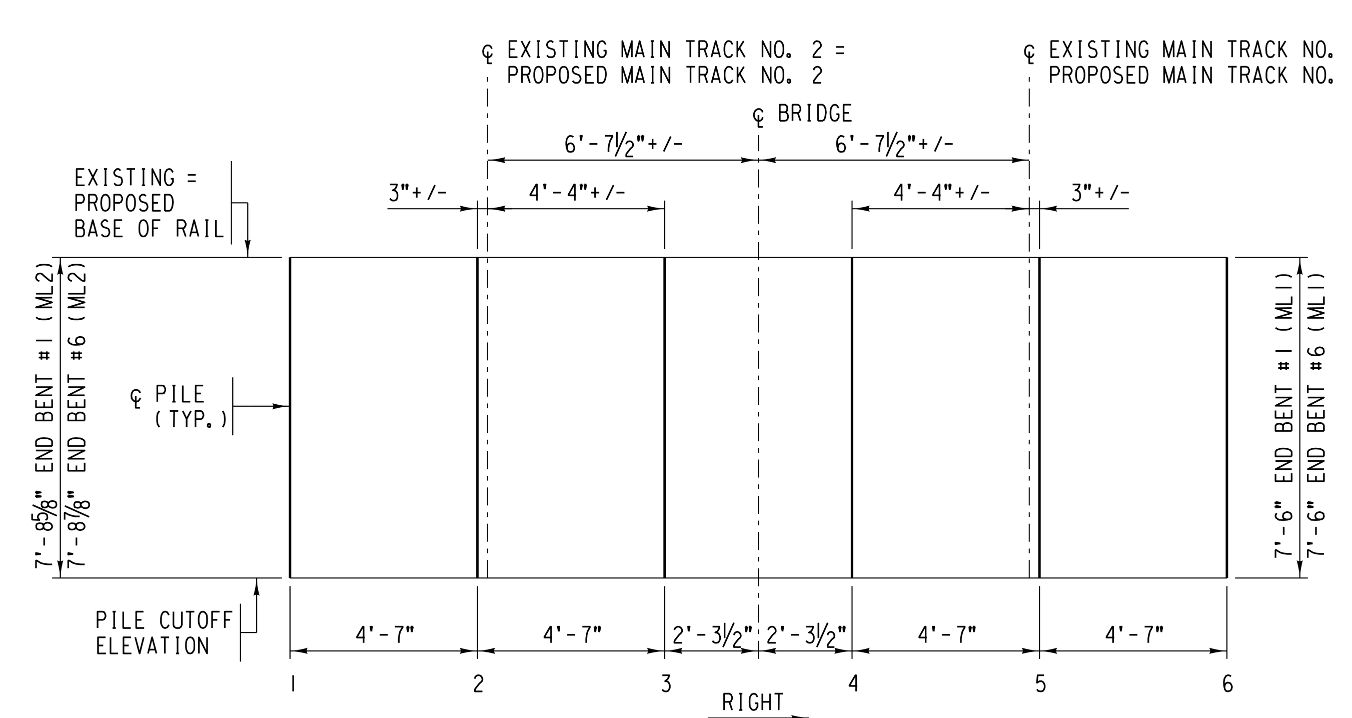
P = PLAIN
CT = COATED
NOB = NO BRACING
SB = STANDARD BRACING
HB = HEAVY BRACING
S = SOCKETED
CF = CONCRETE FILL

FOUNDATION LAYOUT
SCALE: 3/32 "=1'-0"

PHASE 1 TEMPORARY BALLAST RETAINER LOCATION DETAIL
SCALE: 3/32 "=1'-0"



20" PIPE PILE BACKING RING
SCALE: 1"=1'-0"



PILE DRIVING DIAGRAM
SCALE: NO SCALE
END BENT #1 & #6
ALL PILES PLUMB

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL
STATUS
9/6/2023
DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD
9/6/2023
DATE

PROJECT ID:	WORK ORDER:	C.E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S4 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION:
BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

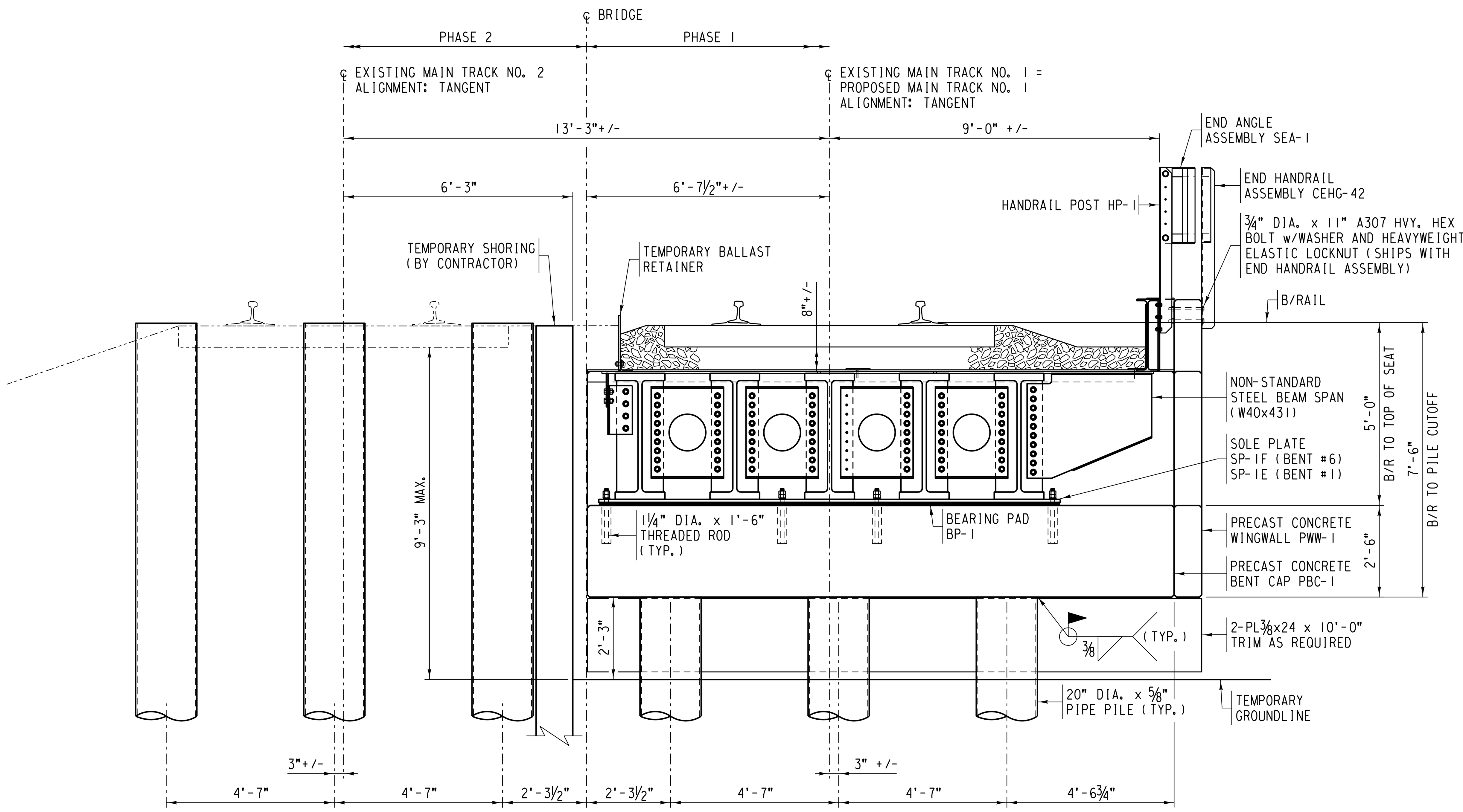
SHEET TITLE:
FOUNDATION & TEMPORARY BALLAST RETAINER LAYOUT

PLOTTED: 9/12/2023 9:43:02 AM

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC1011012301111/Bridge/Sheets/Br 81.79/dc08179_bla

SHEET SIZE 22x34

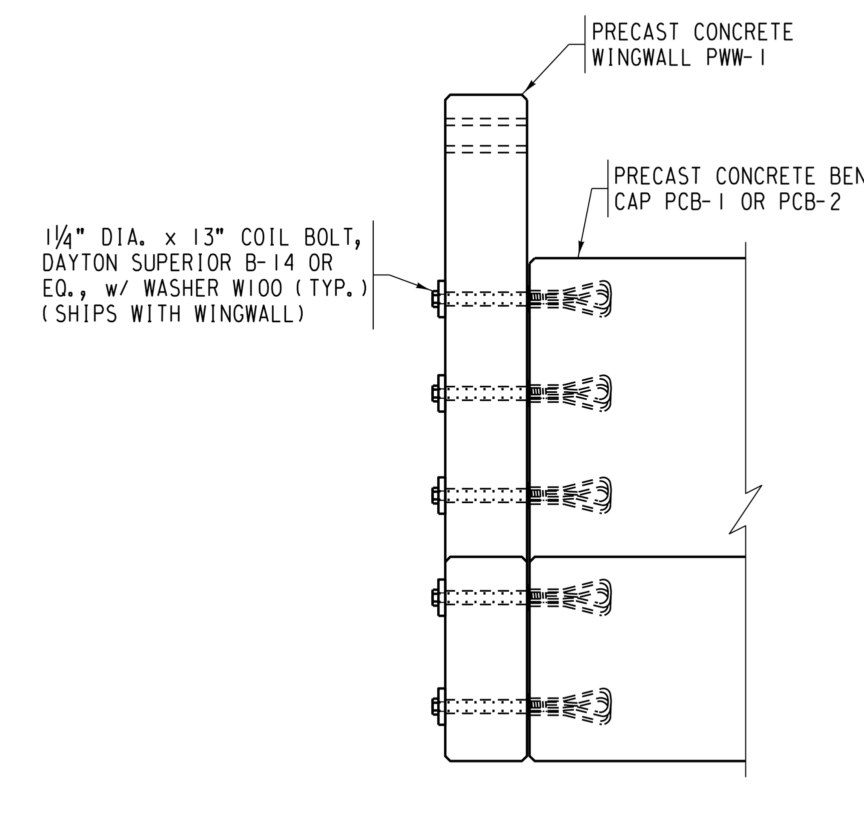
DESIGN SHEET



PHASE 1 - SECTION (A 2|5)

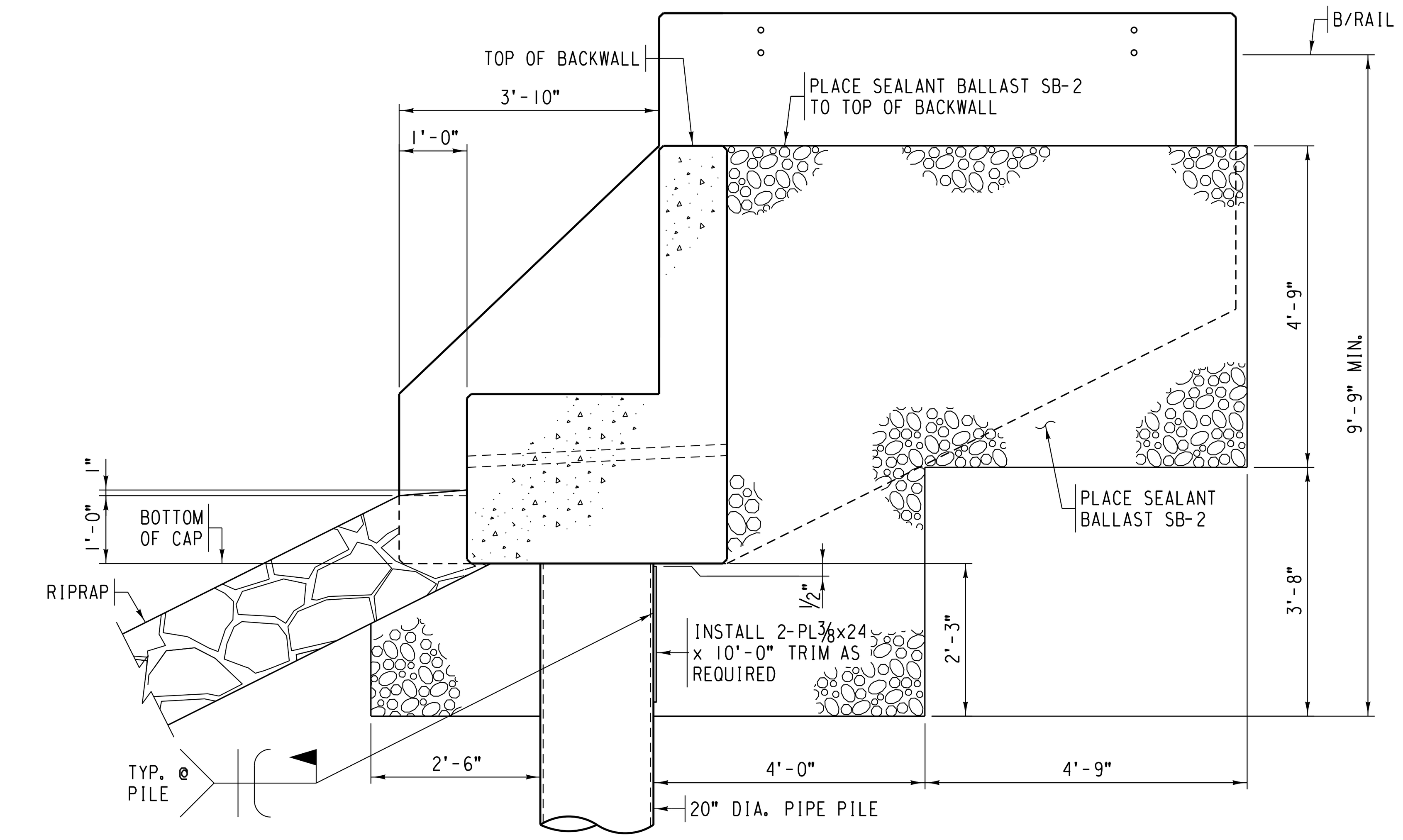
SCALE: ⅜"=1'-0"

BENT #6 SHOWN, BENT #1 SIMILAR



WINGWALL TO BENT CAP DETAIL

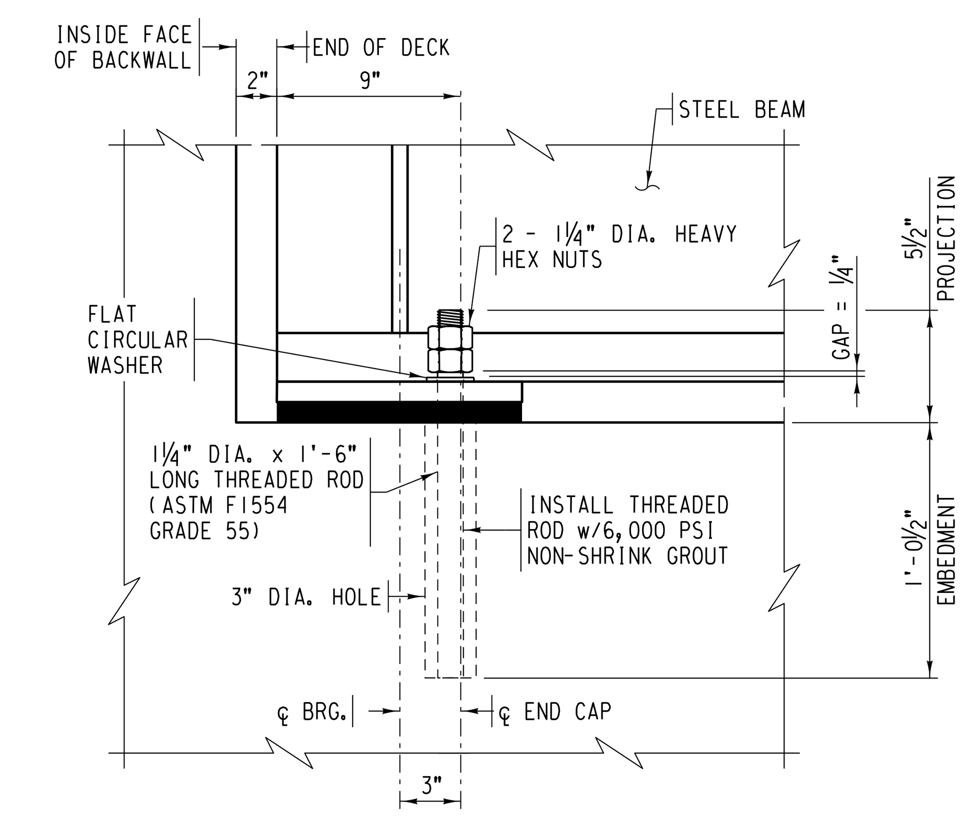
SCALE: ½"=1'-0"



END CAP EXCAVATION AND BACKFILL DETAIL

SCALE: ½"=1'-0"

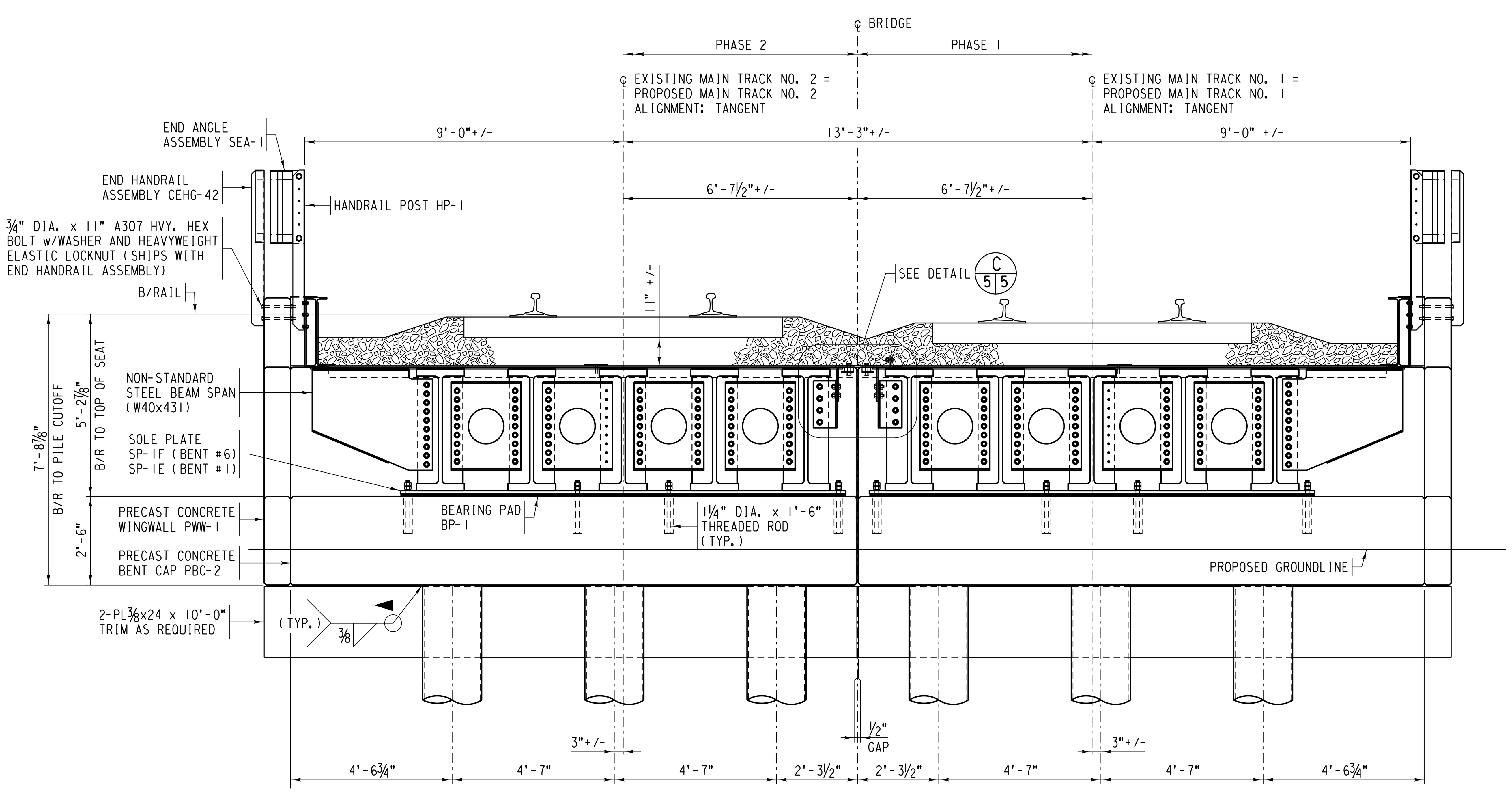
END CAP BACKFILL NOTES:
1. SEE UPRR STANDARD DRAWING 0010E FOR SEALANT BALLAST SB-2 MATERIAL GRADIATION REQUIREMENTS
2. SEALANT BALLAST SB-2 IS UPRR STORE ITEM NO. 562-5428.
3. CONTROLLED LOW STRENGTH MATERIAL (CLSM) MAY BE USED IN LIEU OF SEALANT BALLAST SB-2
4. ESTIMATED QUANTITY OF SEALANT BALLAST SB-2 REQUIRED:
 1 END BENT - 114 Ton
 2 END BENTS - 228 Ton



ANCHOR BOLT TIGHTENING DETAIL

SCALE: 1½"=1'-0"

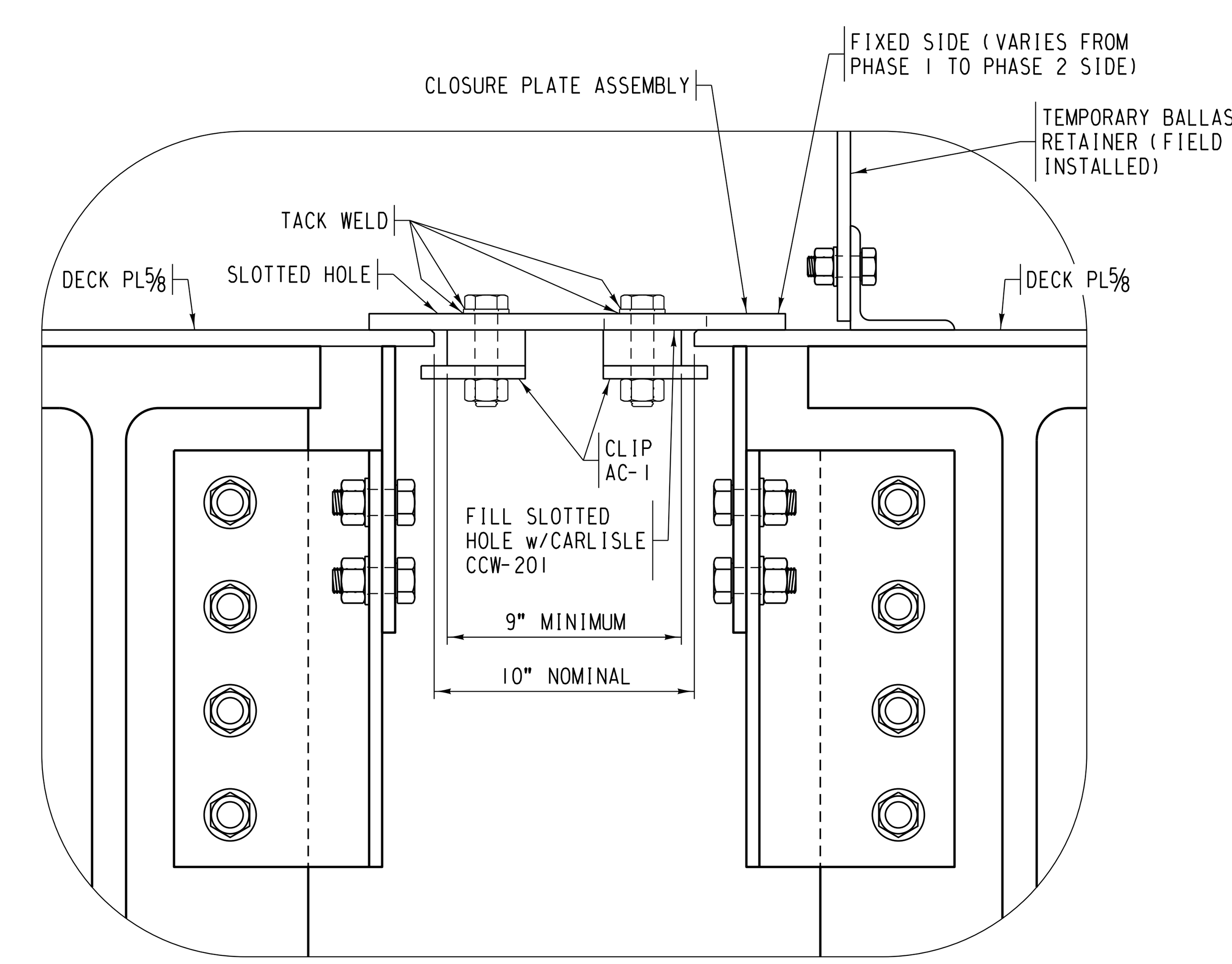
@ END BENTS ONLY



PHASE 2 - SECTION (A 2|5)

SCALE: ⅜"=1'-0"

BENT #6 SHOWN, BENT #1 SIMILAR



CLOSURE PLATE ASSEMBLY INSTALLATION DETAIL (C 5|5) (C 6|5)

SCALE: 2"=1'-0"

CLOSURE PLATE ASSEMBLY INSTALLATION INSTRUCTIONS
1. SLIDE CLIP AC-1 AND BOLT TOWARDS FIXED SIDE.
2. SLIDE FIXED SIDE OF PLATE OVER DECK PLATE.
3. SET CLOSURE PLATE ASSEMBLY INTO GAP.
4. SLIDE CLIP AC-1 TOWARDS DECK PLATE AND TIGHTEN BOLTS IN SLOTTED HOLES (4 PER PLATE).
5. TACK WELD BOLT HEADS TO WASHERS AND WASHERS TO CLOSURE PLATE.
6. FILL SLOTTED HOLES WITH CARLISLE CCW-201 POLYURETHANE SEALANT PER MANUFACTURERS INSTRUCTIONS.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:

FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS

DRAWN/CHK BY: TLO / ABB

UPRR ENGINEER: DEH

SHT NO.: S5 of S11

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB

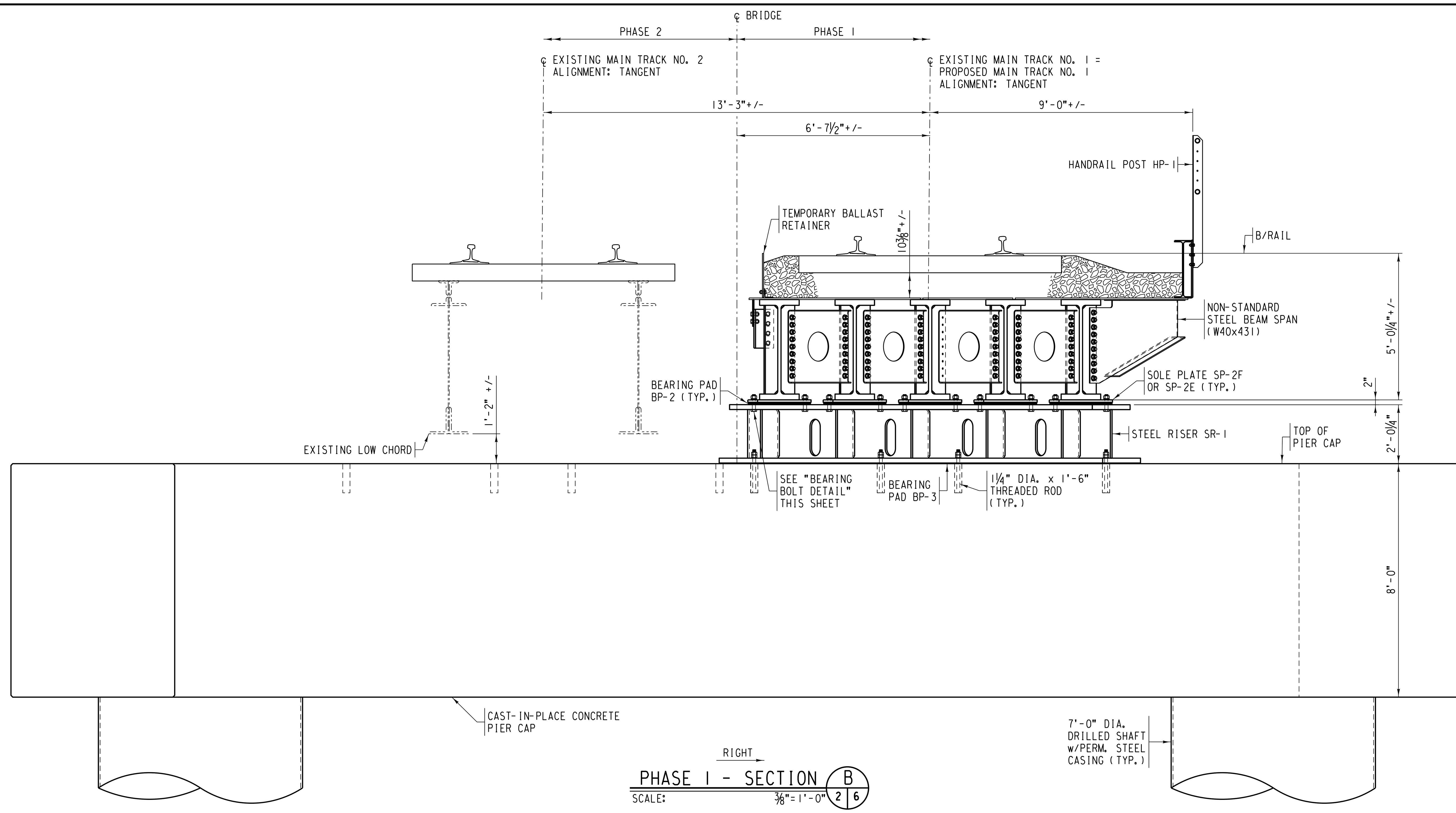
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: SECTIONS AND DETAILS (1 OF 2)

FILE NAME: pw://hqpwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/B 81.79/cldr0179_bia

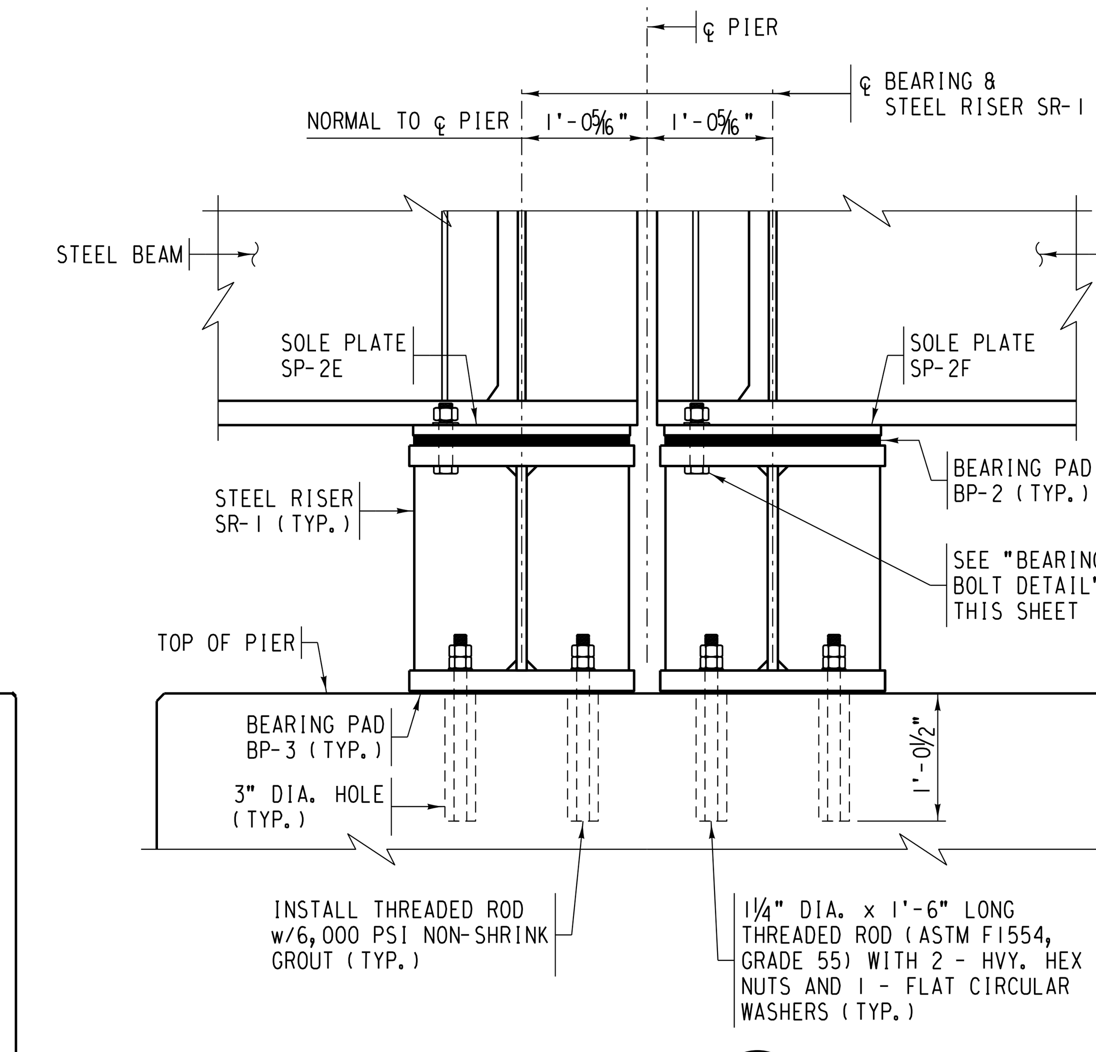
PLOTTED: 9/12/2023 9:43:03 AM

DESIGN SHEET



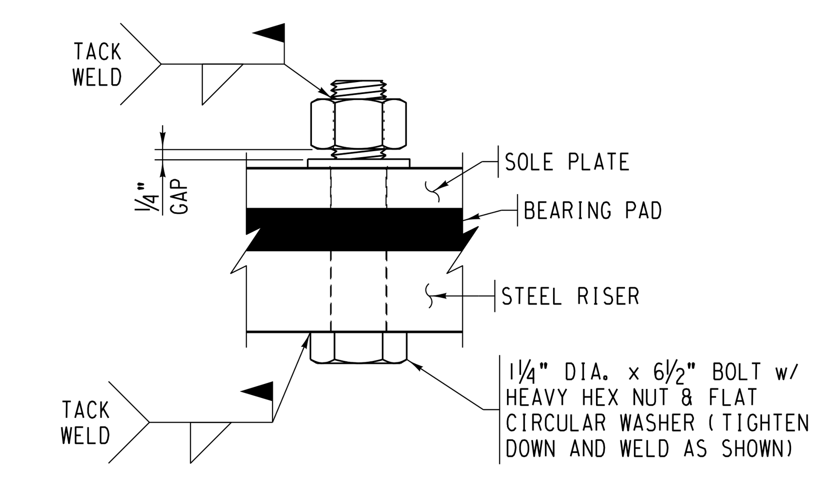
PHASE 1 - SECTION B 2 6

SCALE: ⅜"=1'-0"



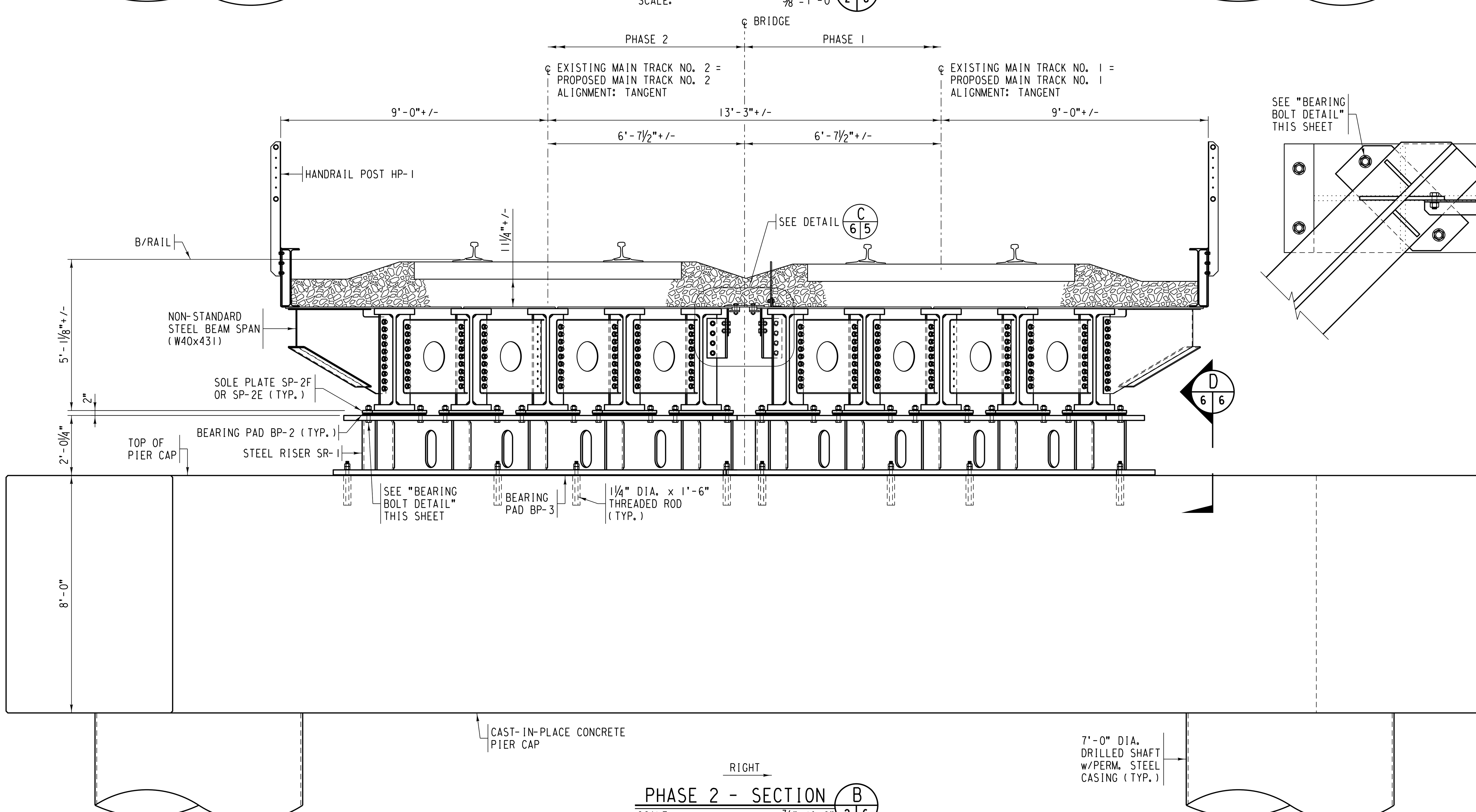
SECTION D 6 6

SCALE: ¾"=1'-0"



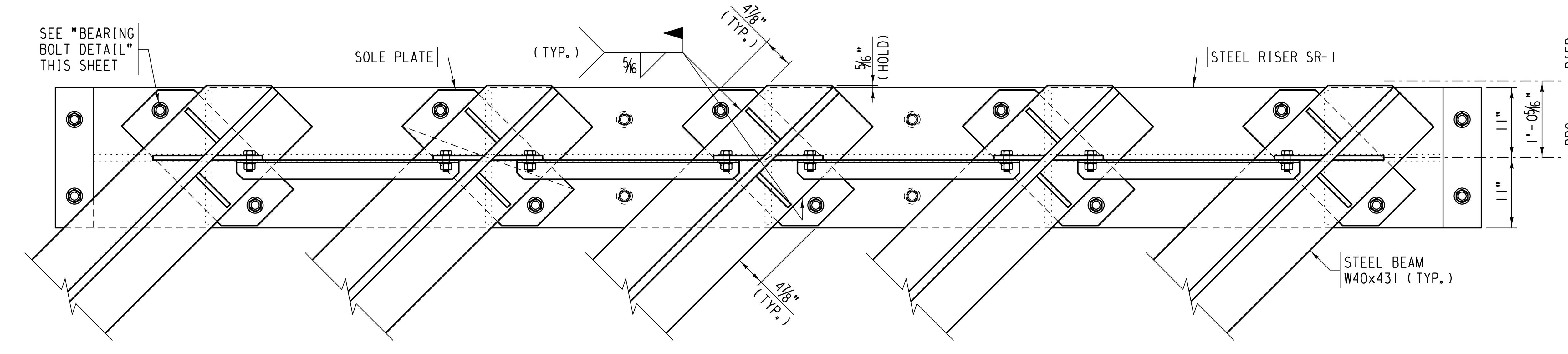
BEARING BOLT DETAIL

SCALE: 3"=1'-0"



PHASE 2 - SECTION B 2 6

SCALE: ⅜"=1'-0"



STEEL RISER & BEARING ASSEMBLY DETAIL

SCALE: ¾"=1'-0"

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL 9/6/2023
STATUS DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
Nicholas J. Sterck 9/6/2023
DESIGN ENGINEER OF RECORD DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S6 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

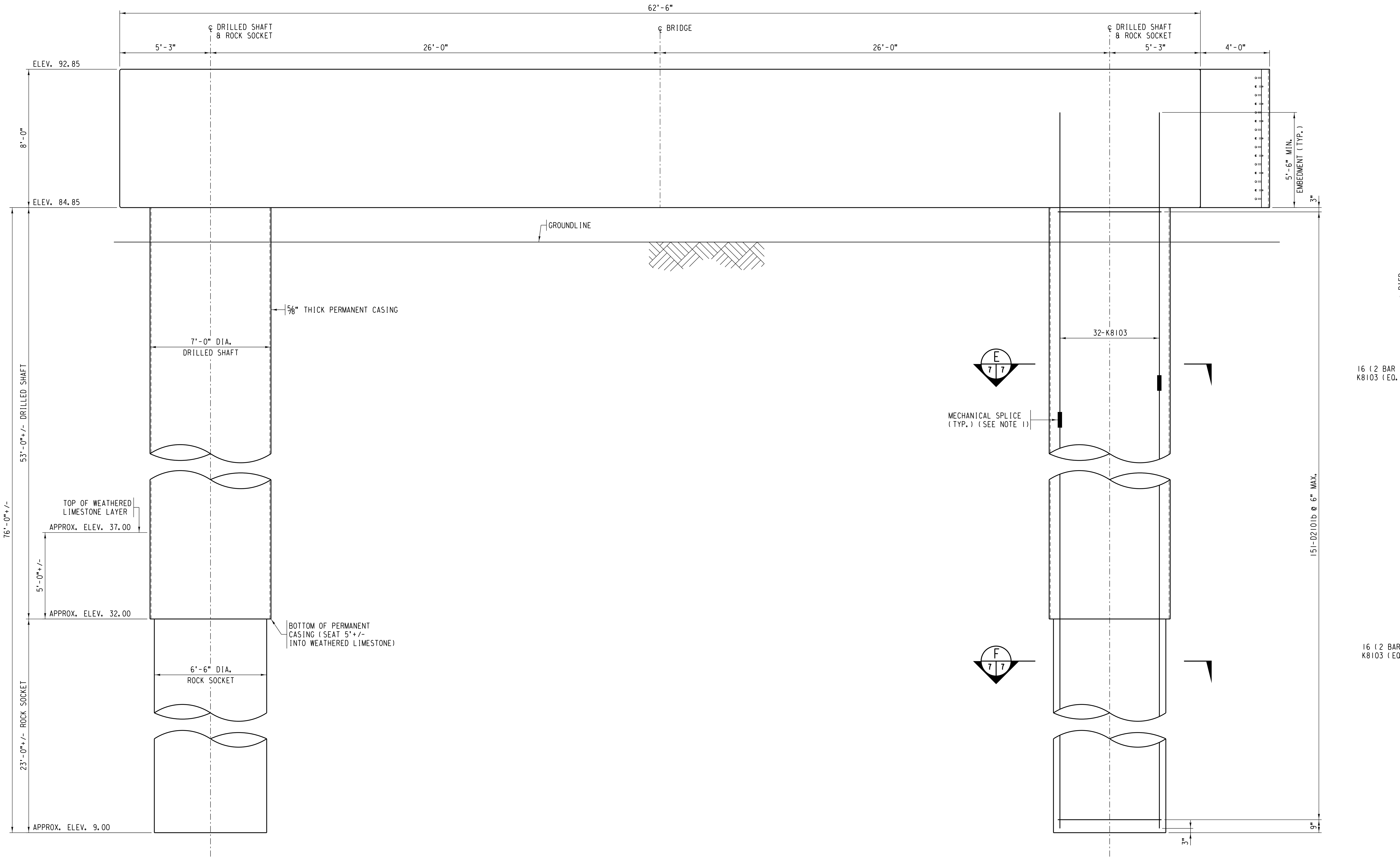
LOCATION & DESCRIPTION:
BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE:
SECTIONS AND DETAILS (2 OF 2)

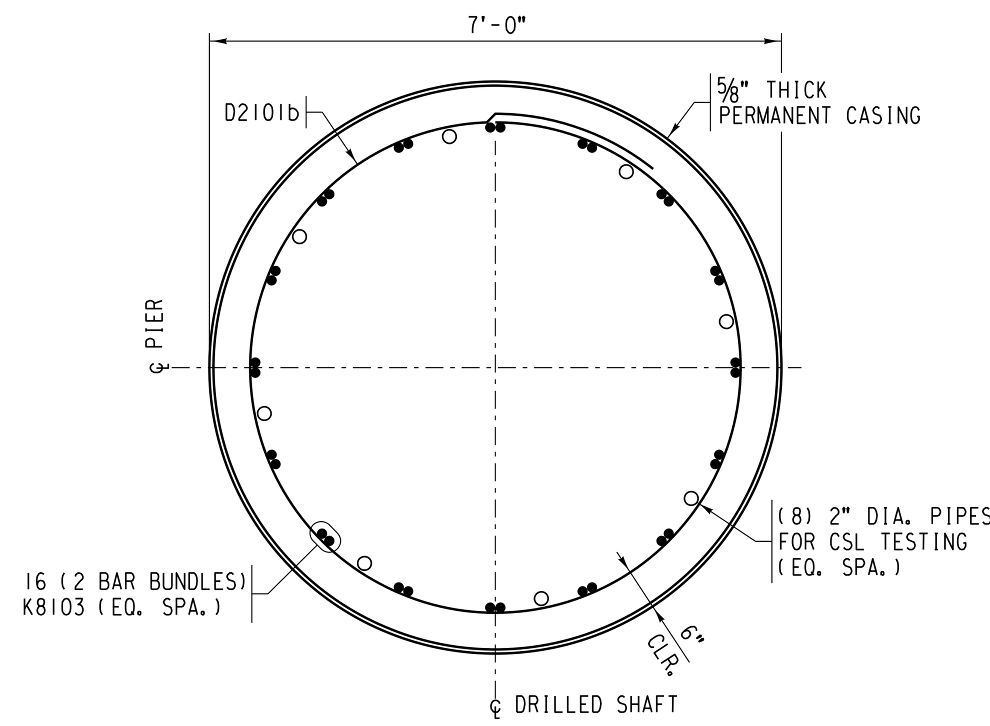
PLOTTED: 9/12/2023 9:43:03 AM

SHEET SIZE 22x34

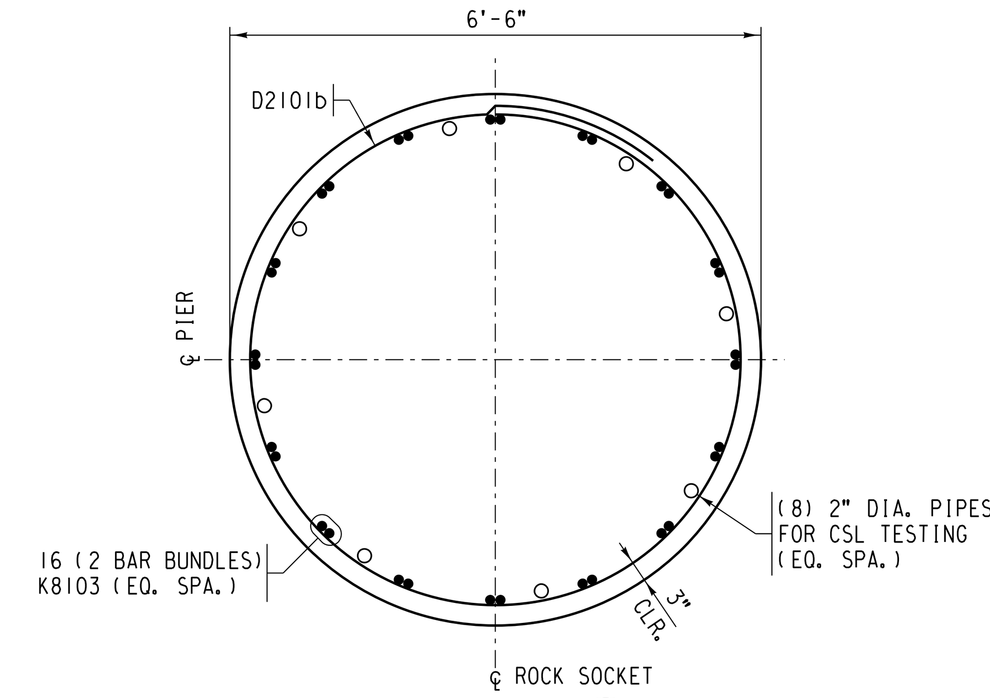
FILE NAME: pw://hqpwint01.ae.transyscorp.com/transyscorp-pw1/Documents/Projects_2023/KC1011101230111/Bridge/Sheets/Br 81.79/sdet8179_ba



ELEVATION
SCALE: 5/16"=1'-0"



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

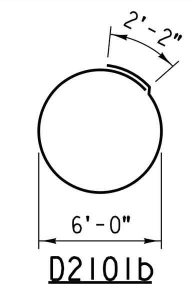


SECTION F 7 7
SCALE: 1/2"=1'-0"

REINFORCING SCHEDULE
(QUANTITY PER DRILLED SHAFT)

REQ'D	MARK	SIZE	LENGTH	SHAPE
151	D2101b	#5	21'-1"	○
32	✱K8103	#14	81'-3"	—

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



EST. WT. OF REINFORCING STEEL = 23,220 LB.
✱ INCLUDES 1 SET OF 32 MECHANICAL SPLICES

NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE AND LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR NUMBERS 2 THROUGH 18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES WITH THE FIRST DIGIT(S) INDICATING FEET AND THE LAST TWO DIGITS INDICATING INCHES.

NOTE:
1. MECHANICAL SPLICES SHALL CONFORM TO AREMA CH 8 ARTICLE 2.22.2. SPLICES ON ADJACENT BARS SHALL BE STAGGERED A MINIMUM OF 24". SPLICES ARE SUBSIDIARY TO THE COST FOR PAY ITEM '7'-0" DIA. DRILLED SHAFT'.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
9/6/2023 — DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S7 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION:
BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

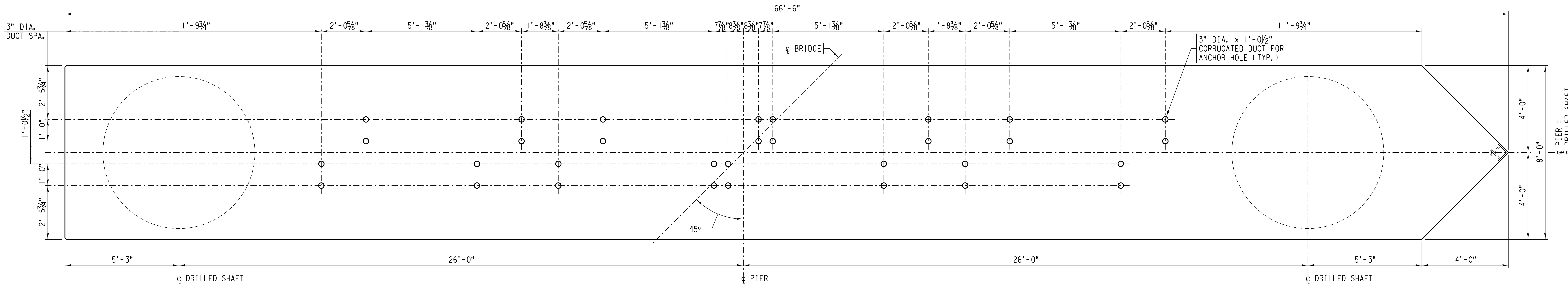
SHEET TITLE:
DRILLED SHAFT DETAILS

SHEET SIZE 22x34

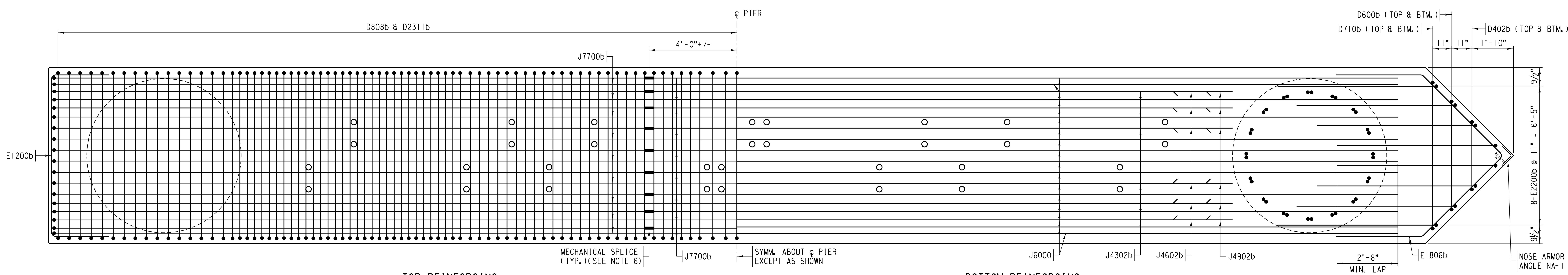
FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101110123011l/Bridge/Sheets/Br 81.79/dc08179_bis

PLOTTED: 9/12/2023 9:43:04 AM

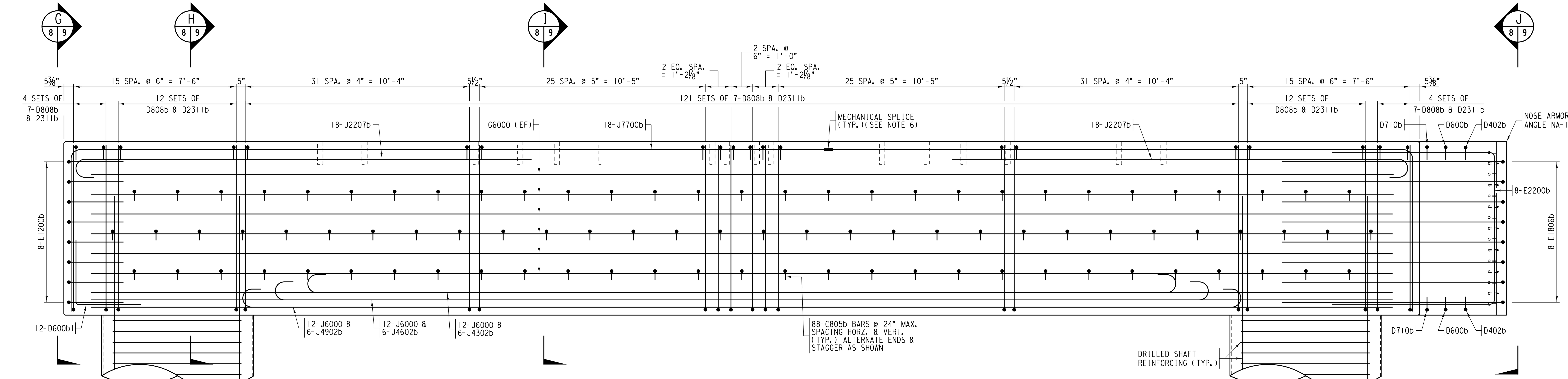
DESIGN SHEET



FRAMING PLAN
SCALE: 3/8" = 1'-0"



REINFORCING PLAN
SCALE: 3/8" = 1'-0"



ELEVATION
SCALE: 3/8" = 1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. PLAN NO. 531100, SHT. T3.
2. FOR MASS CONCRETE NOTES, SEE SHEET S9.
3. MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR DRILLED SHAFT REINFORCING AND ANCHOR BOLT HOLES.
4. EF = EACH FACE.
5. FOR NOSE ARMOR ANGLE DETAILS, SEE SHEET M1.
6. MECHANICAL SPLICES SHALL CONFORM TO AREMA CH. 8 ARTICLE 2.22.2. SPLICES ON ADJACENT BARS SHALL BE STAGGERED A MINIMUM OF 24". SPLICES ARE SUBSIDARY TO THE COST FOR PAY ITEM 'REINFORCING STEEL FOR PIERS'.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S8 of S11

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

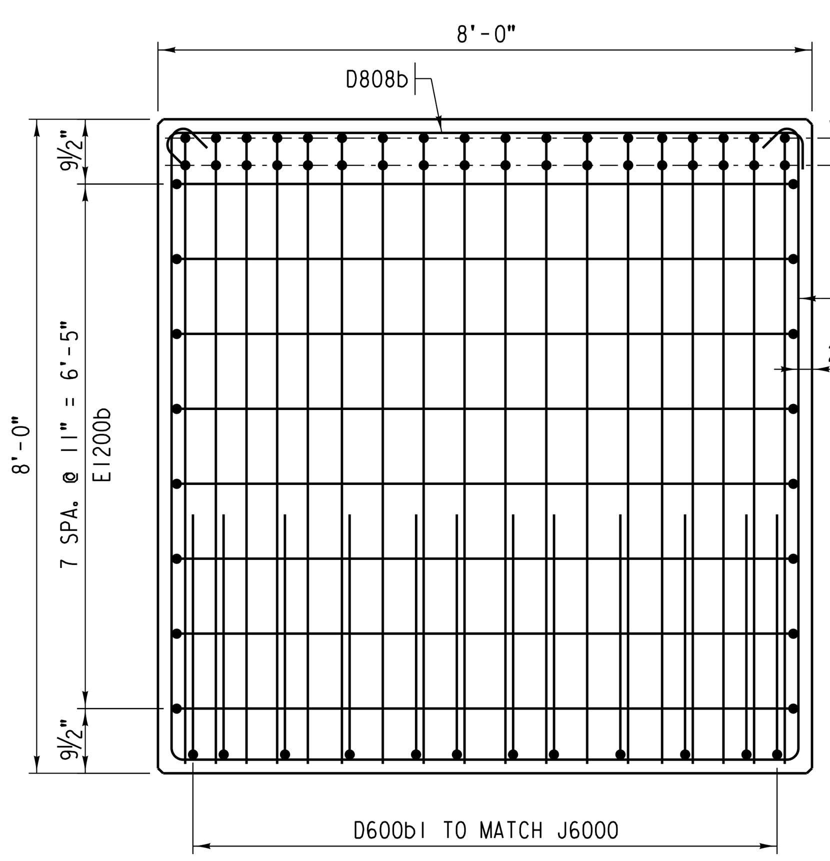
SHEET TITLE: PIER #2 THRU #5 DETAILS (1 OF 2)

FILE NAME: pw:\\hqpwint01.ae.transyscorp.com:transyscorp-pw1\Documents\Projects_2023\KC10110123011\Bridge\Sheets\8179dc8179_bis

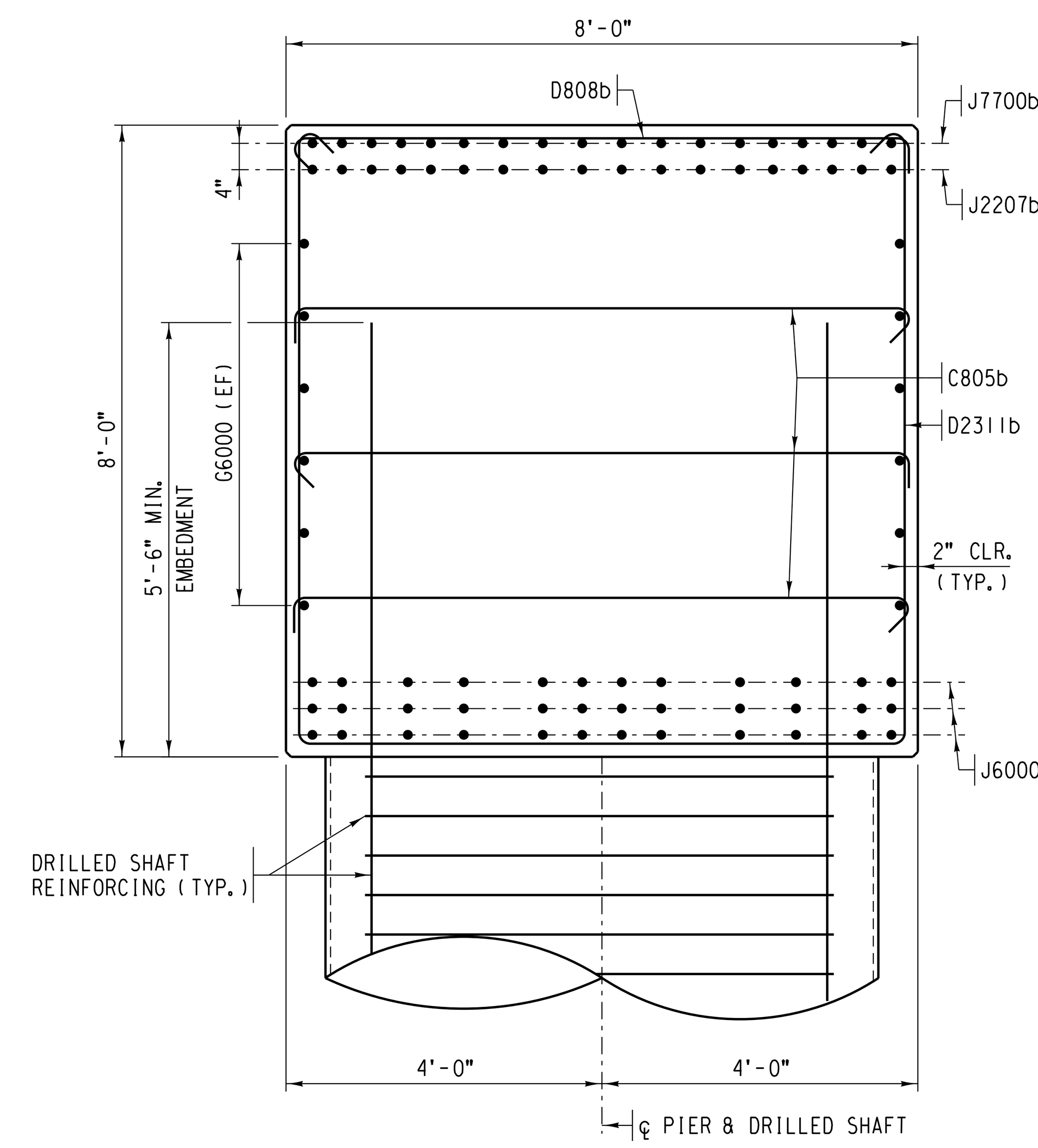
PLOTTED: 9/12/2023 9:43:04 AM

DESIGN SHEET

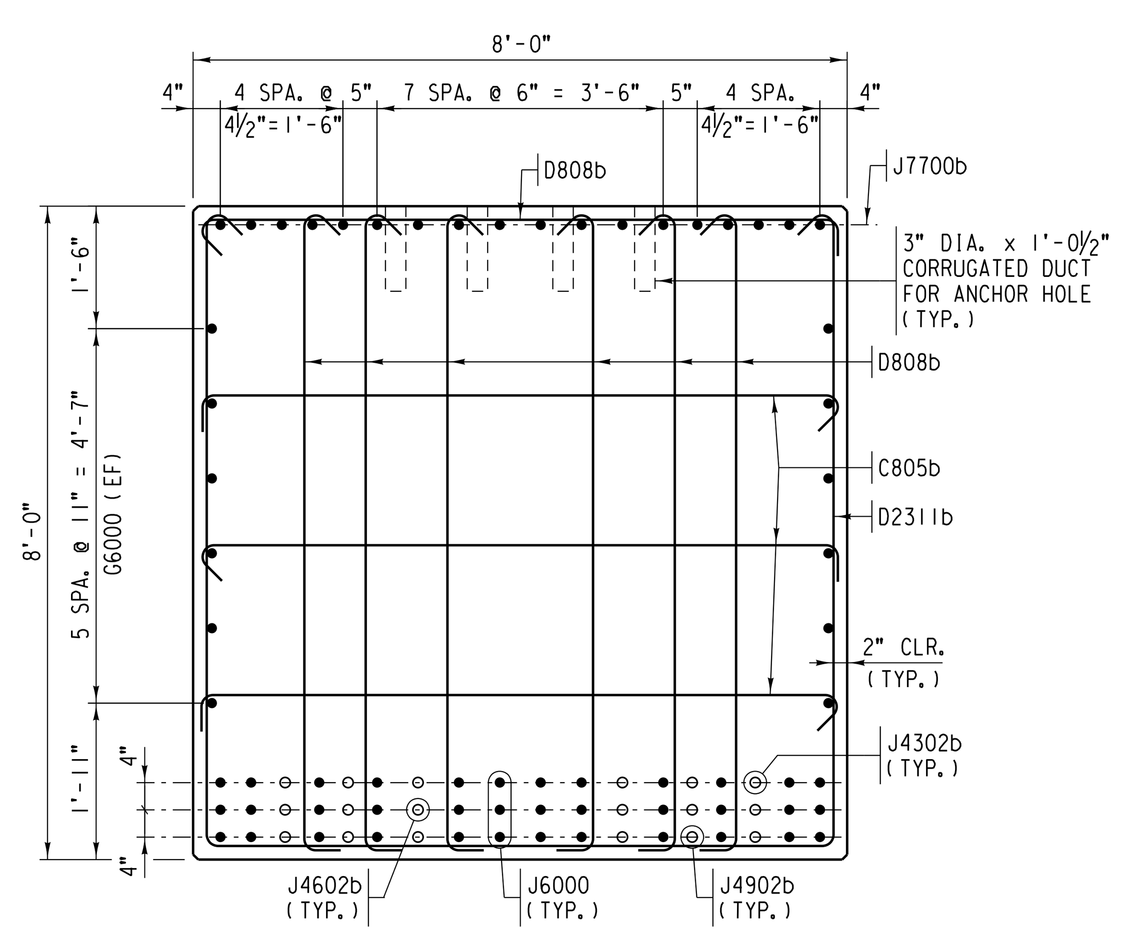
SHEET SIZE 22x34



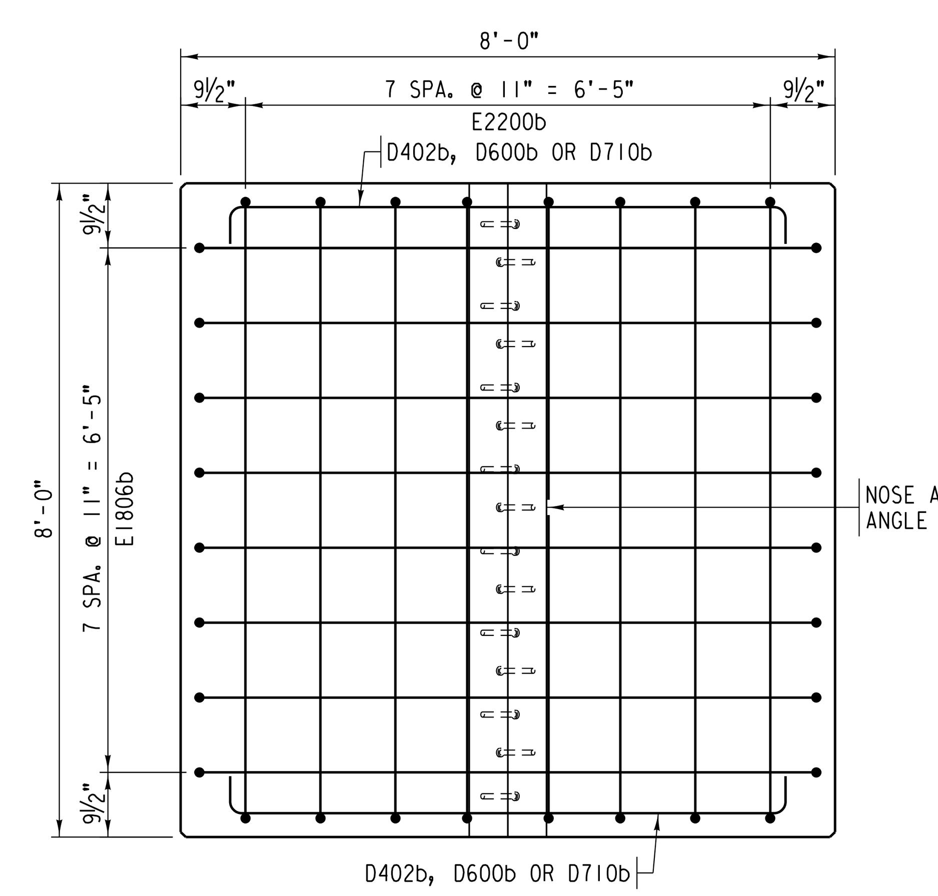
VIEW G
SCALE: ½" = 1'-0" 8 9



SECTION H
SCALE: ½" = 1'-0" 8 9



SECTION I
SCALE: ½" = 1'-0" 8 9



VIEW J
SCALE: ½" = 1'-0" 8 9

MATERIAL SCHEDULE
(QUANTITY PER PIER CAP)

REQ'D.	UNIT	DESCRIPTION
152.8	CU. YD.	4,000 PSI CONCRETE (MODERATE EXPOSURE) (PER NOTES STD. PLAN NO. 531100 SHT. T3 & SHT. S9)
1	LOT	REINFORCING STEEL (PER STD. PLAN NO 531100 SHT. T3 AND SCHEDULE, THIS SHEET)
1	EA.	NOSE ARMOR ANGLE NA-1, GALVANIZED (PER NOTES, STD. PLAN NO. 531100, SHT. T3 AND DETAILS, SHT. M1)

CAST-IN-PLACE MASS CONCRETE NOTES

1. Mass concrete is defined as placements with a least dimension greater than or equal to 5 feet and designated on the contract plans as mass concrete. Concrete for caps at Pier #2 thru #5 are designated as mass concrete. For monolithic mass placements, the Contractor shall develop and submit to the Engineer for approval a Thermal Control Plan to ensure the following during the heat dissipation period:

   a. Fresh concrete temperature shall not be less than 50°F and shall not exceed 90°F as measured at the point of discharge from the truck.
   b. Maximum difference in temperature between the concrete near the surface and the core of a mass concrete section shall not exceed the limits specified below.

      1. Less than 24 hours after placement: 30°F
      2. 24 to 96 hours after placement: 40°F
      3. More than 96 hours after placement: 50°F

   c. Maximum temperature at the core of mass placements during construction shall not exceed 160°F.

2. This plan shall be based on the equations given in the Portland Cement Association's "Design and Control of Concrete Mixtures" 16th Edition.

3. All mass placement operations shall be terminated and the plan shall be revised as necessary and resubmitted for approval if any of the above limitations are exceeded.

4. The plan must include a combination of the following elements:

   a. Selection of concrete materials including aggregates, gradation, and cement types, to control heat of hydration;
   b. Use of ice or other concrete cooling materials;
   c. Controlling rate or time of concrete placement;
   d. Use of insulation or supplemental external heat to control heat loss;
   e. Use of supplementary cementing materials; and/or
   f. Use of a cooling system to control the core temperature.

5. The Contractor shall furnish and install a minimum of 2 sets of temperature recording devices, maturity meters, or other approved equivalent devices for each mass concrete placement. These recording device types and locations shall be shown in the Thermal Control Plan. These devices shall be used to simultaneously measure the temperature of the concrete at the core and the surface. Maintain temperature control methods for 4 days unless otherwise approved. Maturity meters will not be used to predict strength of mass concrete.

6. The Contractor shall assume all risks connected with the placing of mass pour concrete and approval of the Contractor's plan will in no way relieve the Contractor of the responsibility for satisfactory results. Should any mass concrete placed under the Thermal Control Plan prove to be unsatisfactory, the Contractor shall be required to make the necessary repairs or replace the concrete at no additional cost and without any extension of contract time.

7. Any pours that exceed the maximum temperature or temperature differential as defined in the TCP will need to be inspected and repaired if necessary according to the following:

   The UPRR or representative will inspect the concrete for cracks after the temperature monitoring is discontinued, and the Contractor shall provide access to perform the inspection. A crack may require repair by the Contractor as determined by UPRR. The Contractor shall be responsible for the repair of all cracks. Protective coat or a concrete sealer shall be applied to a crack less than 0.007 in. (0.18 mm) in width. A crack that is 0.007 in. (0.18 mm) or greater shall be pressure injected with epoxy.

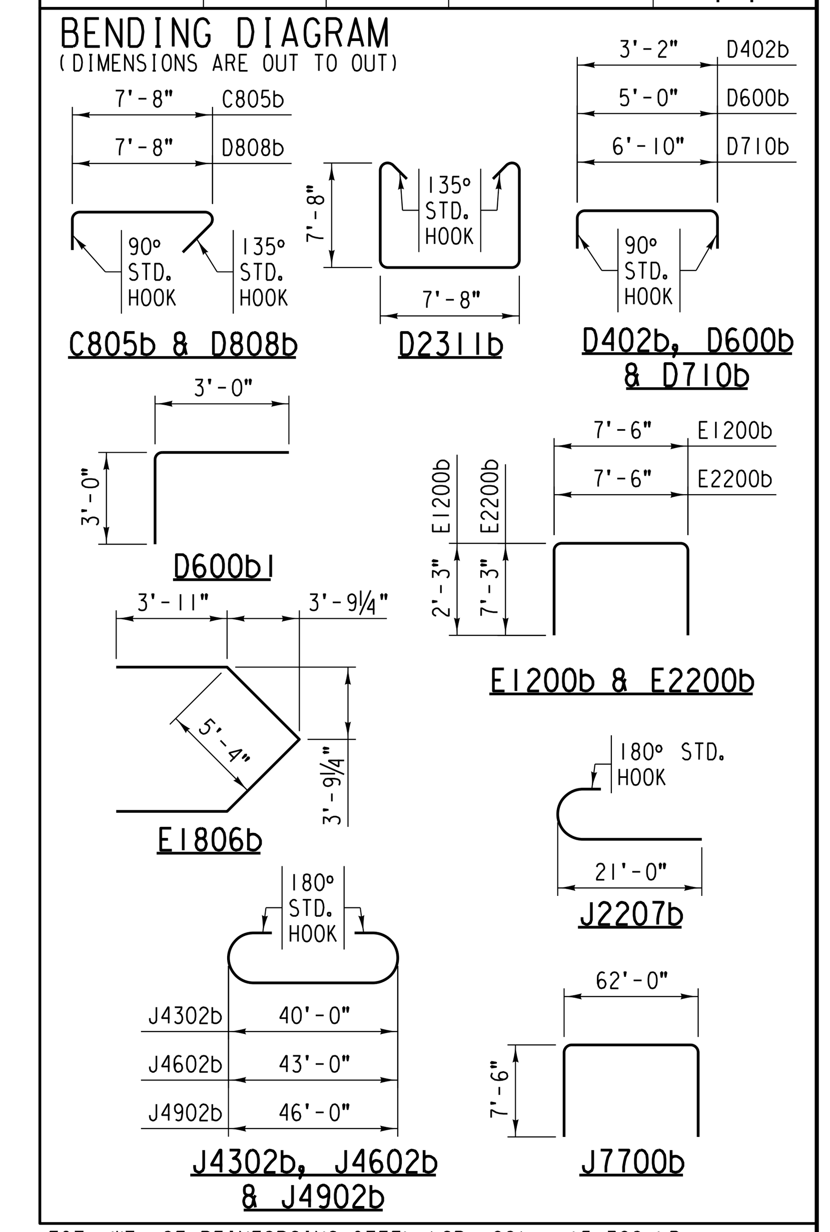
REINFORCING SCHEDULE (GRADE 60)
(QUANTITY PER PIER CAP)

REQ'D	MARK	SIZE	LENGTH	SHAPE
88	C805b	#4	8'-5"	
2	D402b	#5	4'-2"	
2	D600b	#5	6'-0"	
12	D600b1	#5	6'-0"	
2	D710b	#5	7'-10"	
927	D808b	#5	8'-8"	
153	D2311b	#5	23'-11"	
8	E1200b	#6	12'-0"	
8	E1806b	#6	18'-6"	
8	E2200b	#6	22'-0"	
12	G6000	#8	60'-0"	

REINFORCING SCHEDULE (GRADE 75)
(QUANTITY PER PIER CAP)

REQ'D	MARK	SIZE	LENGTH	SHAPE
36	J2207b	#11	22'-7"	
6	J4302b	#11	43'-2"	
6	J4602b	#11	46'-2"	
6	J4902b	#11	49'-2"	
36	J6000	#11	60'-0"	
18	✱J7700b	#11	77'-0"	

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



EST. WT. OF REINFORCING STEEL (GR. 60) = 15,360 LB.
EST. WT. OF REINFORCING STEEL (GR. 75) = 27,580 LB.
✱INCLUDES 1 SET OF 18 MECHANICAL SPLICES

NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE AND LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR NUMBERS 2 THROUGH 18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES WITH THE FIRST DIGIT(S) INDICATING FEET AND THE LAST TWO DIGITS INDICATING INCHES.

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. PLAN NO. 531100, SHT. T3.
2. MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR DRILLED SHAFT REINFORCING AND ANCHOR BOLT HOLES.
3. EF = EACH FACE.
4. FOR NOSE ARMOR ANGLE DETAILS, SEE SHEET M1.
5. REINFORCING SHOWN AS ASTM A615 GRADE 75 MAY BE SUBSTITUTED WITH ASTM A615 GRADE 80.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
9/6/2023 — DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
Nicholas J. Starosti — DESIGN ENGINEER OF RECORD
9/6/2023 — DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: S9 of S11

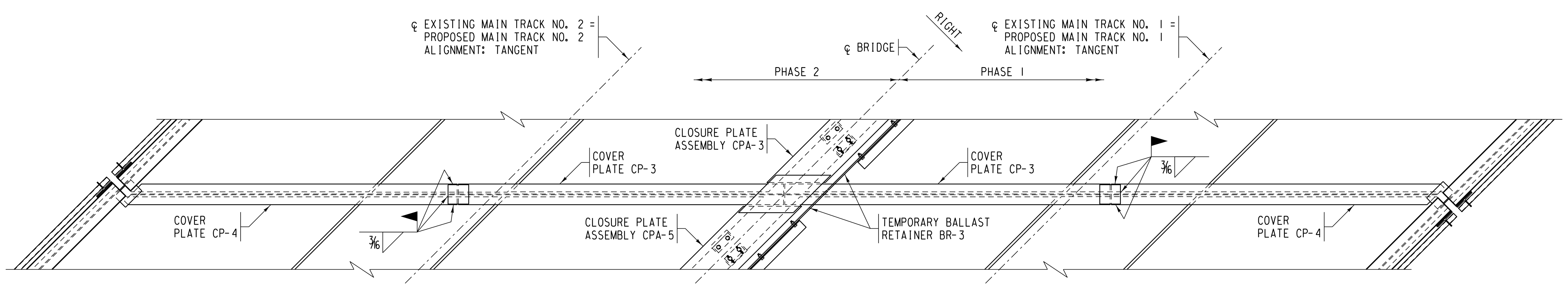
UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: PIER #2 THRU #5 DETAILS (2 OF 2)

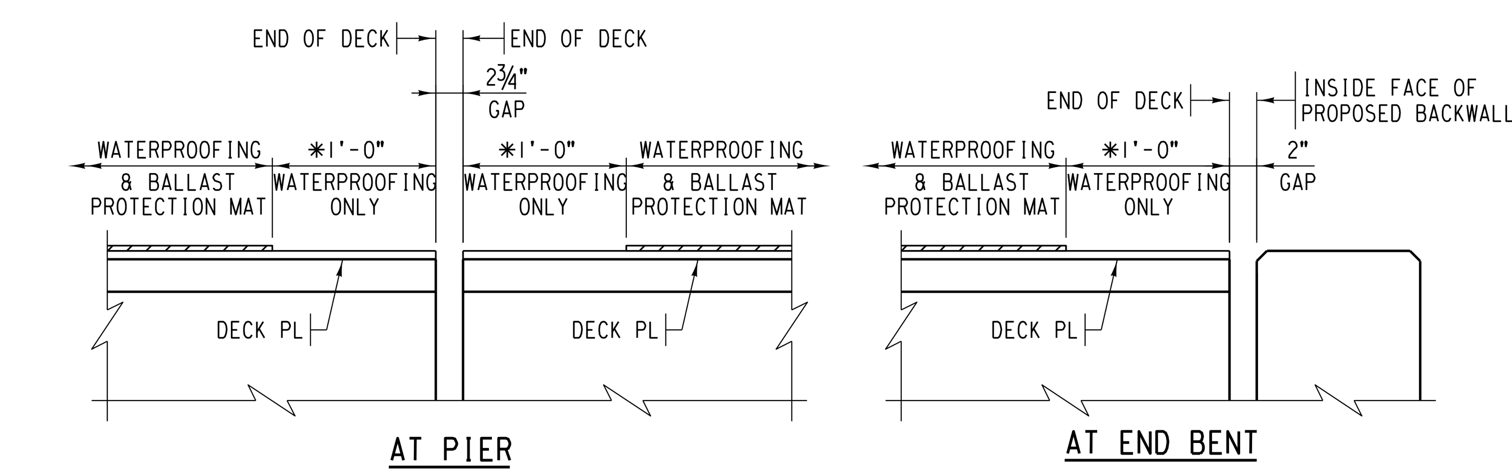
PLOTTED: 9/12/2023 9:43:05 AM

CLOSURE PLATE ASSEMBLY LOCATION PLAN
SCALE: 3/32"=1'-0"



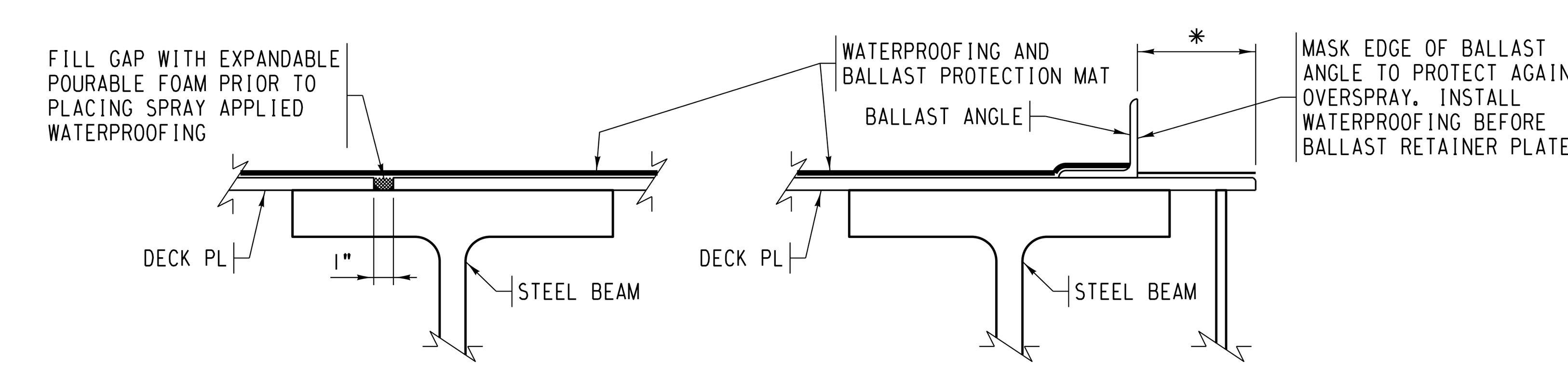
PIER COVER PLATE INSTALLATION DETAIL
SCALE: 3/8"=1'-0"
(PIER #4 SHOWN, ALL OTHER PIERS SIMILAR)

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

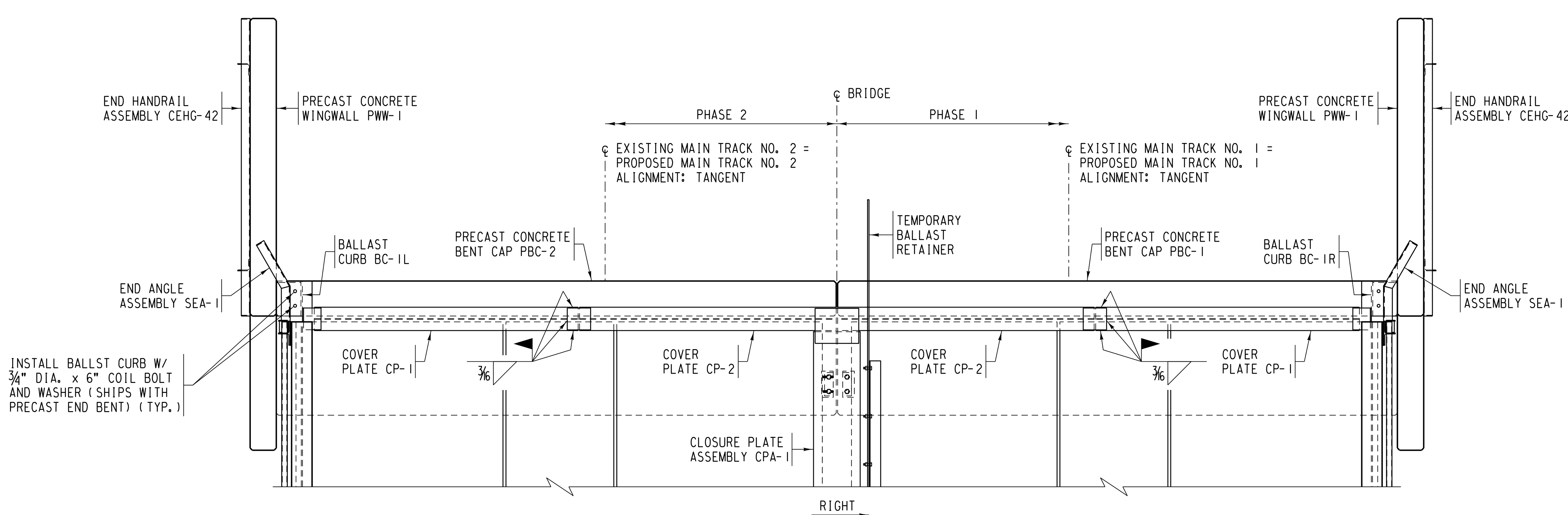


WATERPROOFING AT DECK JOINTS DETAIL
SCALE: 1"=1'-0"

NOTE:
✱ NO BALLAST PROTECTION MAT ON STEEL DECK OR STEEL CURB



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



END BENT COVER PLATE INSTALLATION DETAIL
SCALE: 3/8"=1'-0"
(BENT #6 SHOWN, BENT #1 SIMILAR)

WATERPROOFING NOTES

1. The beam span deck and ballast curbs shall be waterproofed with a cold applied spray-on waterproofing and protection layer in accordance with the 2023 AREMA Chapter 8 Part 29.
2. Waterproofing system shall be 80 MIL polyurea based, cold spray applied, seamless elastomeric waterproofing membrane as manufactured by Bridge Preservation LLC or approved alternate. Spray applied waterproofing systems shall have a 1/4" thick integrated ballast mat.
3. Contractor shall submit detailed application procedures, material specifications and shop drawings for the waterproofing system for approval.
4. Waterproofing installation shall be observed and approved by the manufacturer's representative.
5. All steel edges exposed to waterproofing shall have a 1/8"x1/8" minimum chamfer.
6. Prior to placing waterproofing, gaps 1/8" or greater between steel surfaces shall be filled. Gaps 1/8" to 1/4" shall be covered with bridge deck joint adhesive. Gaps greater than 1/4" shall be filled with pourable expandable foam.
7. Dry film thickness testing shall be in accordance with SSPC-PA2 and shall use non-destructive magnetic or ultrasonic testing methods and verified using the stroke per gallon method.
8. The adhesion of the elastomeric waterproofing membrane shall be tested in accordance with ASTM D4541. One test shall be conducted for every two thousand (2,000) square feet of application and at locations where deficient adhesion is suspected. Minimum adhesion strength shall be 300 psi for film membranes on steel. Additional layers of elastomeric waterproofing membrane shall be applied at damaged testing areas and the surrounding four (4) inches.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE: 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — DATE: 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS	**UNION PACIFIC RAILROAD** Office of Director Structures Design
DRAWN/CHK BY: TLO / ABB	LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB 5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)
UPRR ENGINEER: DEH	
SHT NO.: S10 of S11	SHEET TITLE: SPAN CLOSURE AND WATERPROOFING DETAILS

DESIGN SHEET

SHEET SIZE 22x34

BOREHOLE REPORT NO. B-1A/B — Sheet 1 of 5

PROJECT NAME	CLIENT
UPRR Clinton Subdivision Br. 81.79	Union Pacific Railroad
PROJECT NUMBER: 021-05232	LOCATION: Linn County, Iowa

Legend: Split Spoon; Rock Core

APPROX. SURFACE ELEV. (ft) 86.0

Elevation (ft)	Material Description	Depth (ft)	Sample Type Number	Classification (USCS)	Blows/6" N-Value	Unc. Str. (tsf)	Moisture (%)	Dry Density (pcf)	LL/PI (%)	Additional Data/ Remarks
86.0	***DEVELOPED ZONE*** (0.2')	0								
	ALLUVIUM									
85	*Silty sand (SM), medium dense, slightly moist, dark brown, few sand*		SS 1		3-6-8 N=14		4.4			
	Note: Boring B-1A was originally drilled on 8/18/21									
	Silty sand (SM), loose, slightly moist, dark brown, few sand (5.0')	5	SS 2		2-2-4 N=6		5.6			
80	*Poorly graded sand (SP), very loose, slightly moist, medium brown*		SS 3		2-1-1 N=2		5.4			
	Poorly graded sand (SP), very loose, wet, dark brown	10	SS 4		0-1-2 N=3		23.4			
75										
	Poorly graded sand (SP), loose, wet, medium brown	15	SS 5		2-3-5 N=8		14.0			P-200 = 3.2%
70										
	Poorly graded sand (SP), loose, wet, medium brown (20.0')	20	SS 6		3-2-4 N=6		16.4			

CONTINUED NEXT PAGE

WATER LEVEL OBSERVATIONS		OLSSON, INC.	STARTED: 8/18/21	FINISHED: 6/24/23
WD	9.0 ft	11627 VIRGINIA PLAZA, STE 103	DRILL CO.: OLSSON	DRILL RIG: CME 75
IAD	Not Encountered	LA VISTA, NEBRASKA 68128	DRILLER: J. YEAGER	LOGGED BY: C. HAACK
AD	Not Performed		METHOD: HOLLOW STEM AUGER	

BOREHOLE REPORT NO. B-1A/B — Sheet 2 of 5

PROJECT NAME	CLIENT
UPRR Clinton Subdivision Br. 81.79	Union Pacific Railroad
PROJECT NUMBER: 021-05232	LOCATION: Linn County, Iowa

Elevation (ft)	Material Description	Depth (ft)	Sample Type Number	Classification (USCS)	Blows/6" N-Value	Unc. Str. (tsf)	Moisture (%)	Dry Density (pcf)	LL/PI (%)	Additional Data/ Remarks
	ALLUVIUM	20								
65										
	Poorly graded sand (SP), medium dense, wet, medium brown	25	SS 7		6-8-12 N=20		12.9			P-200 = 4.0%
60										
	Poorly graded sand (SP), medium dense, wet, medium brown (30.0')	30	SS 8		4-7-10 N=17		14.9			
55										
	Lean clay with sand (CL), soft, wet, grayish brown, few sand	35	SS 9	CL	1-2-2 N=4		18.0		17/NP	
50										
	Lean clay with sand (CL), soft, wet, grayish brown, few sand (40.0')	40	SS 10		0-2-2 N=4		25.1			P-200 = 82.3%

CONTINUED NEXT PAGE

WATER LEVEL OBSERVATIONS		OLSSON, INC.	STARTED: 8/18/21	FINISHED: 6/24/23
WD	9.0 ft	11627 VIRGINIA PLAZA, STE 103	DRILL CO.: OLSSON	DRILL RIG: CME 75
IAD	Not Encountered	LA VISTA, NEBRASKA 68128	DRILLER: J. YEAGER	LOGGED BY: C. HAACK
AD	Not Performed		METHOD: HOLLOW STEM AUGER	

BOREHOLE REPORT NO. B-1A/B — Sheet 3 of 5

PROJECT NAME	CLIENT
UPRR Clinton Subdivision Br. 81.79	Union Pacific Railroad
PROJECT NUMBER: 021-05232	LOCATION: Linn County, Iowa

Elevation (ft)	Material Description	Depth (ft)	Sample Type Number	Classification (USCS)	Blows/6" N-Value	Unc. Str. (tsf)	Moisture (%)	Dry Density (pcf)	LL/PI (%)	Additional Data/ Remarks
	ALLUVIUM	40								
45	*Lean clay with sand (CL), soft, wet, grayish brown, few sand and gravel*	45	SS 11		2-2-2 N=4		23.2			
40	***Driller's Note: Thin layer of very dense sand or weathered sandstone encountered on top of the weathered limestone.*** (49.0')		SS 12		22-50/6"		16.7			
	WEATHERED LIMESTONE									
	Weathered limestone, hard, gray	50	RC 1							Recovery 78.0%; RQD 0.0%
35	***Note: Refusal encountered on very hard rock layer at 52 feet with hollow stem auger in original boring, B-1A. Boring was redrilled on 6/24/23 as B-1B to obtain rock core samples, began coring at a depth of 49.5 feet. Sand has been deposited on the river bank since boring B-1A was originally drilled.***									
	Weathered limestone, hard, gray	55	RC 2				6.2	136.8		2,431 PSI; Recovery 100.0%; RQD 65.0%
30	(59.0')						8.9	136.4		3,609 PSI
	LIMESTONE (60.0')	60								

CONTINUED NEXT PAGE

WATER LEVEL OBSERVATIONS		OLSSON, INC.	STARTED: 8/18/21	FINISHED: 6/24/23
WD	9.0 ft	11627 VIRGINIA PLAZA, STE 103	DRILL CO.: OLSSON	DRILL RIG: CME 75
IAD	Not Encountered	LA VISTA, NEBRASKA 68128	DRILLER: J. YEAGER	LOGGED BY: C. HAACK
AD	Not Performed		METHOD: HOLLOW STEM AUGER	

BOREHOLE REPORT NO. B-1A/B — Sheet 4 of 5

PROJECT NAME	CLIENT
UPRR Clinton Subdivision Br. 81.79	Union Pacific Railroad
PROJECT NUMBER: 021-05232	LOCATION: Linn County, Iowa

Elevation (ft)	Material Description	Depth (ft)	Sample Type Number	Classification (USCS)	Blows/6" N-Value	Unc. Str. (tsf)	Moisture (%)	Dry Density (pcf)	LL/PI (%)	Additional Data/ Remarks
	LIMESTONE	60								
25	*Limestone, gray, shale layers*		RC 3							Recovery 100.0%; RQD 90.0%
							4.7	143.8		7,337 PSI
20	*Limestone, gray*	65	RC 4							Recovery 100.0%; RQD 94.0%
							2.7	154.2		5,813 PSI
15	*Limestone, gray*	70	RC 5							Recovery 100.0%; RQD 88.0%; 3,835 PSI
							13.5	124.7		
10	*Limestone, gray*	75	RC 6				6.3	141.8		3,408 PSI; Recovery 98.0%; RQD 98.0%
	Limestone, gray (80.0')	80								

CONTINUED NEXT PAGE

WATER LEVEL OBSERVATIONS		OLSSON, INC.	STARTED: 8/18/21	FINISHED: 6/24/23
WD	9.0 ft	11627 VIRGINIA PLAZA, STE 103	DRILL CO.: OLSSON	DRILL RIG: CME 75
IAD	Not Encountered	LA VISTA, NEBRASKA 68128	DRILLER: J. YEAGER	LOGGED BY: C. HAACK
AD	Not Performed		METHOD: HOLLOW STEM AUGER	

BOREHOLE REPORT NO. B-1A/B — Sheet 5 of 5

PROJECT NAME	CLIENT
UPRR Clinton Subdivision Br. 81.79	Union Pacific Railroad
PROJECT NUMBER: 021-05232	LOCATION: Linn County, Iowa

Elevation (ft)	Material Description	Depth (ft)	Sample Type Number	Classification (USCS)	Blows/6" N-Value	Unc. Str. (tsf)	Moisture (%)	Dry Density (pcf)	LL/PI (%)	Additional Data/ Remarks
	LIMESTONE	80								
5			RC 7							Recovery 100.0%; RQD 94.0%; 5,564 PSI
							7.8	143.1		
0	*Limestone, gray*	85	RC 8				0.9	140.8		6,528 PSI; Recovery 100.0%; RQD 100.0%
-5	*Limestone, gray, shale layers*	90	RC 9				3.3	150.2		3,664 PSI; Recovery 100.0%; RQD 88.0%
-10	*Limestone, gray*	95	RC 10				1.1	171.1		5,978 PSI; Recovery 98.0%; RQD 86.0%
	(99.5')									

<<C>><<B>><<D>><<C>>

WATER LEVEL OBSERVATIONS		OLSSON, INC.	STARTED: 8/18/21	FINISHED: 6/24/23
WD	9.0 ft	11627 VIRGINIA PLAZA, STE 103	DRILL CO.: OLSSON	DRILL RIG: CME 75
IAD	Not Encountered	LA VISTA, NEBRASKA 68128	DRILLER: J. YEAGER	LOGGED BY: C. HAACK
AD	Not Performed		METHOD: HOLLOW STEM AUGER	

NOTES:

1. Subsurface information is provided for information only from Olsson Inc. Report Titled "Subsurface Exploration and Recommendations Form Revision 2" dated 7/12/23. A complete copy of the report may be obtained from the Office of Director Structures Design upon request.
2. Boring #1A:
   Sta. 100+86 (Existing Main Track No. 1)
   Offset 69.25' left (from ℄ of track)
   Elev. 86.0
3. Boring #1B:
   Sta. 100+98 (Existing Main Track No. 1)
   Offset 68.75' left (from ℄ of track)
   Elev. 86.1

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE: 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY: DESIGN ENGINEER OF RECORD — DATE: 9/6/2023

PROJECT ID: 117429	WORK ORDER: 58028	C E NUMBER: 122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

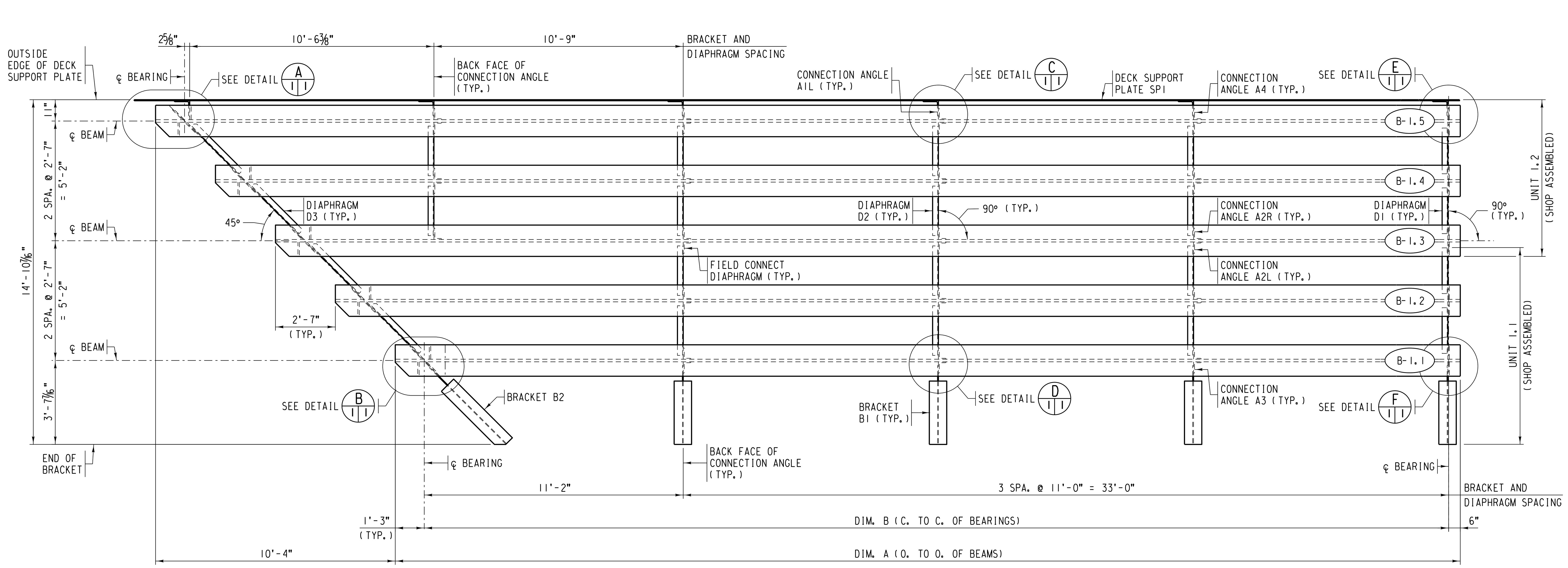
DSN/CHK BY: ABB / NJS	**UNION PACIFIC RAILROAD** Office of Director Structures Design	
DRAWN/CHK BY: TLO / ABB	LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB; 5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)	
UPRR ENGINEER: DEH		
SHT NO.: S11 of S11	SHEET TITLE: BORING LOGS	

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC10110123011\BridgeSheets\Br 81.79\dc08179_bla

PLOTTED: 9/12/2023 9:43:06 AM

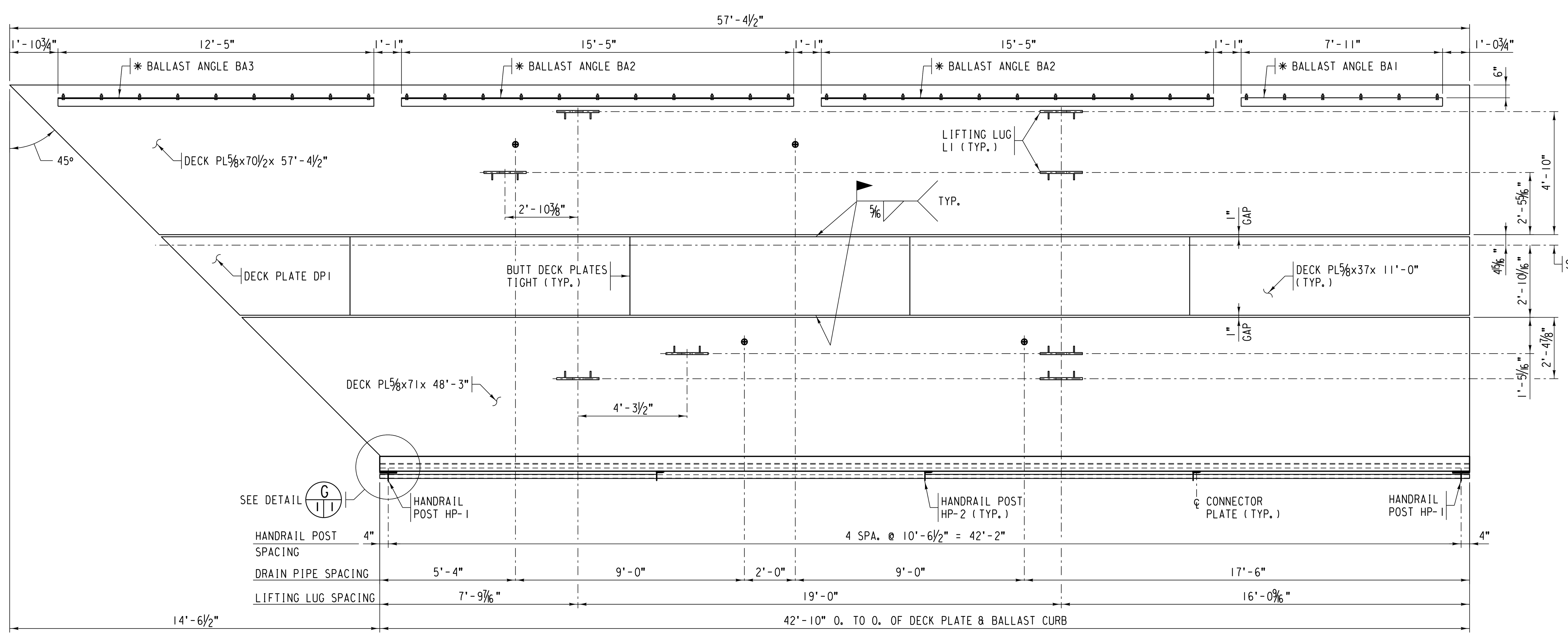
DESIGN SHEET

SHEET SIZE 22x34



FRAMING PLAN - UNIT 1.1 AND 1.2

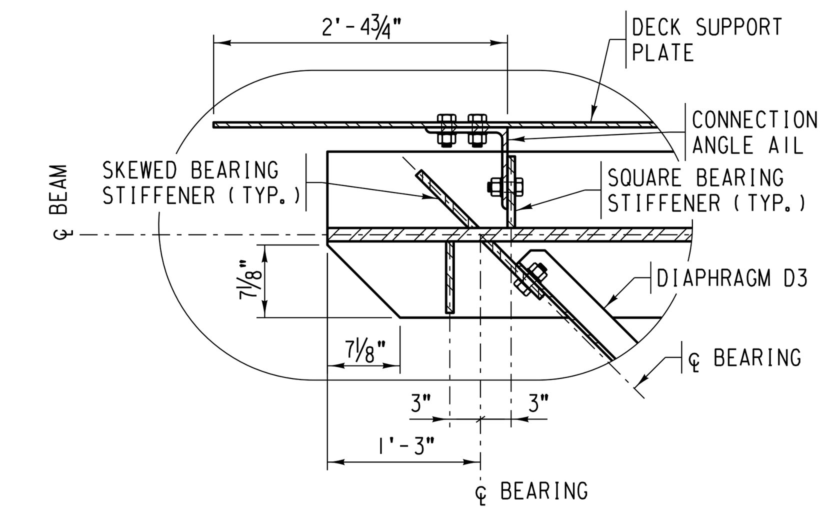
SCALE: 5/16" = 1'-0"



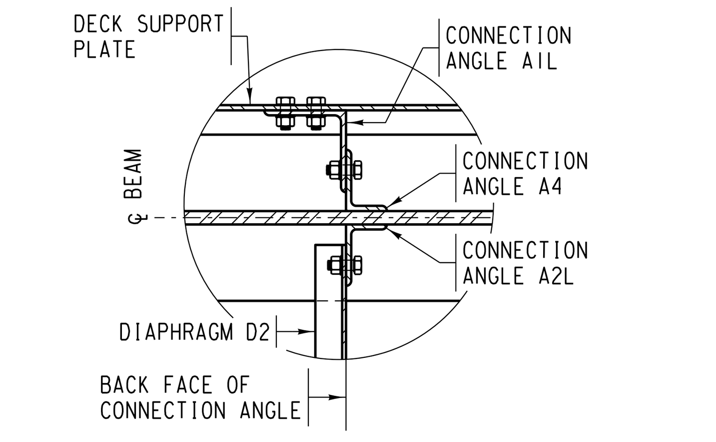
DECK PLAN - DECK PLATE, CURB AND HANDRAIL - UNIT 1.1 AND 1.2

SCALE: 5/16" = 1'-0"

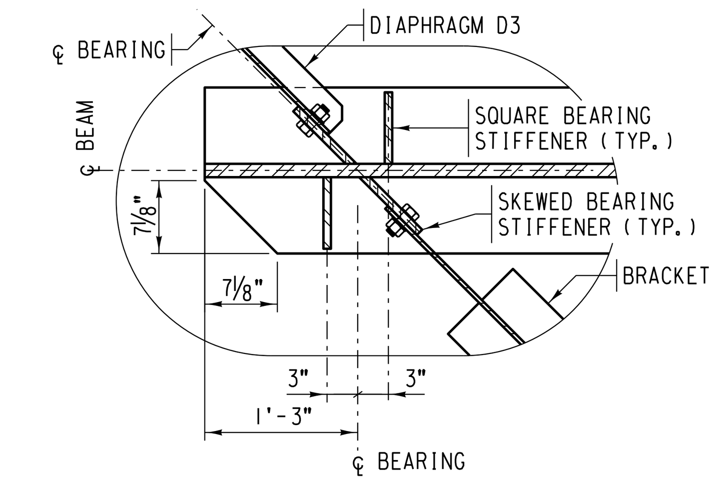
NOTE:
✱ ONLY ON PHASE 1 UNIT 1.2.



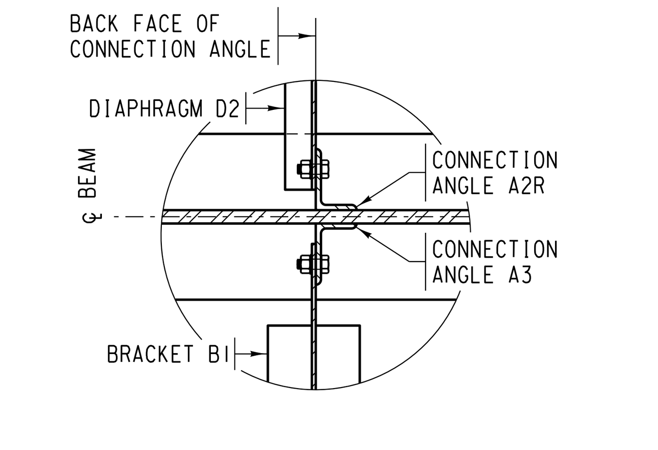
DETAIL A A A (1|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"



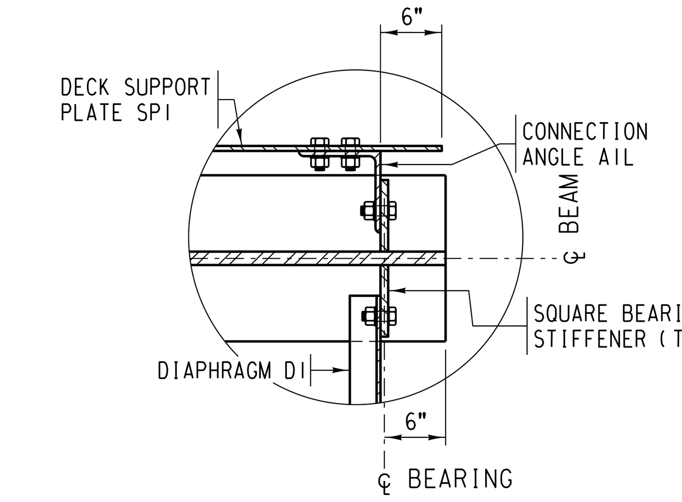
DETAIL C C C C (1|1, 2|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"



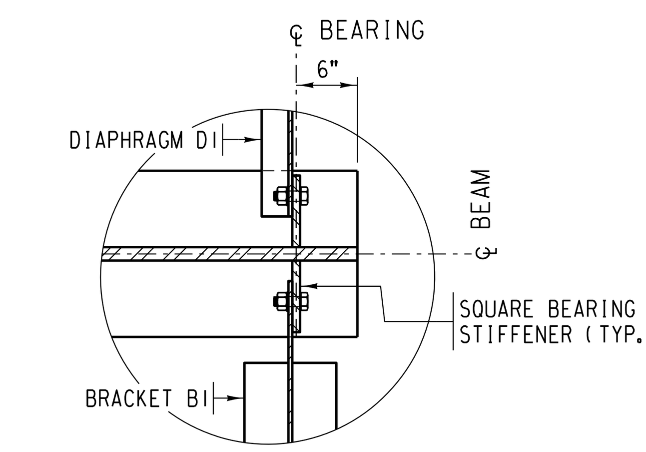
DETAIL B B B (1|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"



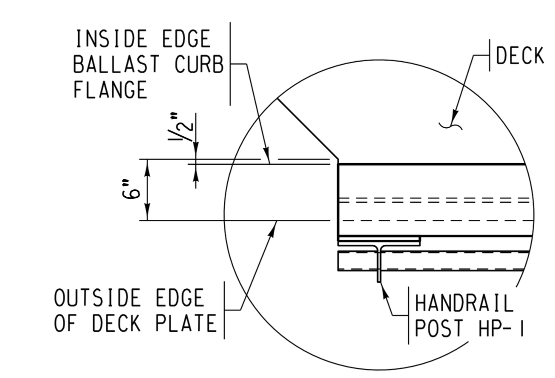
DETAIL D D D D (1|1, 2|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"



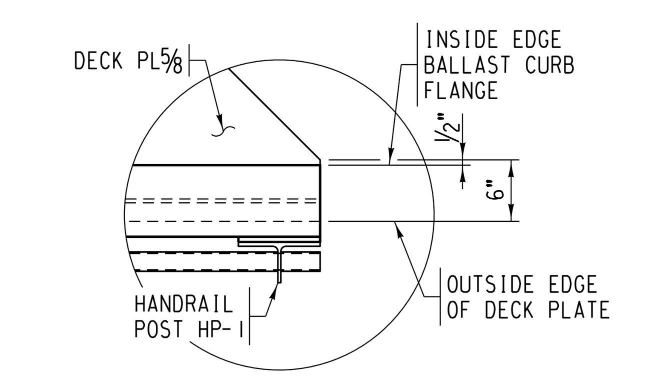
DETAIL E (1|1)
SCALE: 3/4" = 1'-0"



DETAIL F (1|1)
SCALE: 3/4" = 1'-0"



DETAIL G G G (1|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"



DETAIL L L L (2|1, 3|1, 4|1)
SCALE: 3/4" = 1'-0"

TABLE OF DIMENSIONS

BEAM	DIM. A	DIM. B
B-1.5	56'-3"	54'-6"
B-1.4	53'-8"	51'-11"
B-1.3	51'-1"	49'-4"
B-1.2	48'-6"	46'-9"
B-1.1	45'-11"	44'-2"

STRESS TABLE

SPAN LENGTH	BEAM SIZE	SHEAR: DEAD LOAD (k)	SHEAR: LIVE LOAD E80 (k)	SHEAR: IMPACT (k)	SHEAR: TOTAL (k)	WEB AREA, A_w: REQUIRED (in^2)	WEB AREA, A_w: PROVIDED, GROSS (in^2)	MOMENT: DEAD LOAD (k-ft)	MOMENT: LIVE LOAD E80 (k-ft)	MOMENT: IMPACT (k-ft)	MOMENT: TOTAL (k-ft)	NET SECTION MODULUS, S: REQUIRED (in^3)	NET SECTION MODULUS, S: PROVIDED (in^3)	LIVE LOAD + IMPACT DEFLECTION: ALLOWABLE L/640 (in)	MOMENT OF INERTIA, I: REQUIRED (in^4)	MOMENT OF INERTIA, I: PROVIDED, GROSS (in^4)
56'-3"	W40x431	48.4	73.7	35.7	157.8	9.0	49.0	639.6	877.4	424.7	1,941.7	847.3	1,515.7	1.022	22,633	42,188

NOTE: DATA SHOWN IS FOR EXTERIOR BEAM, WHICH IS THE LONGEST AND MOST HEAVILY LOADED BEAM. ALL BEAMS EFFECTIVE FOR LIVE LOAD.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — DATE 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F1 of F15

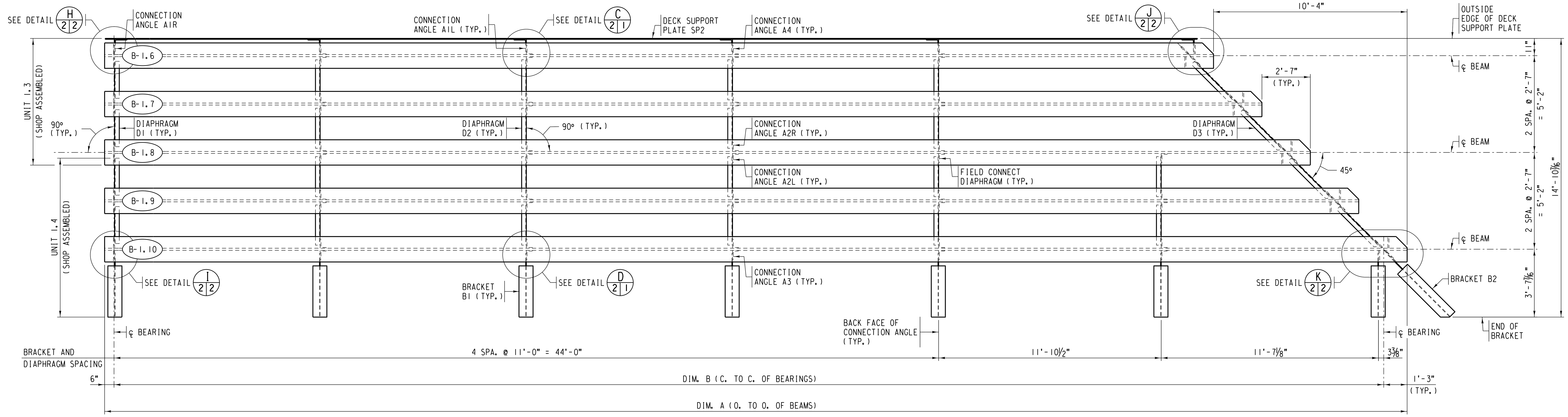
UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

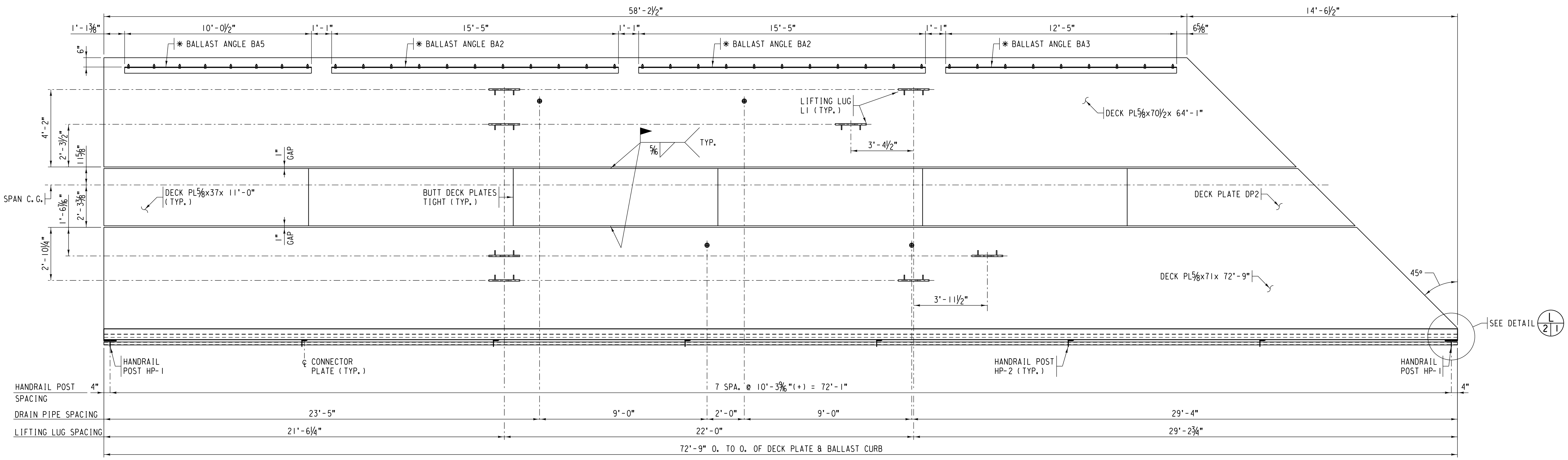
SHEET TITLE: BM SPAN - FRAMING AND DECK PLAN - UNIT 1.1 & 1.2

FILE NAME: pw://hqpwint01.ae-transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/dc8179_bia

PLOTTED: 9/12/2023 9:43:06 AM

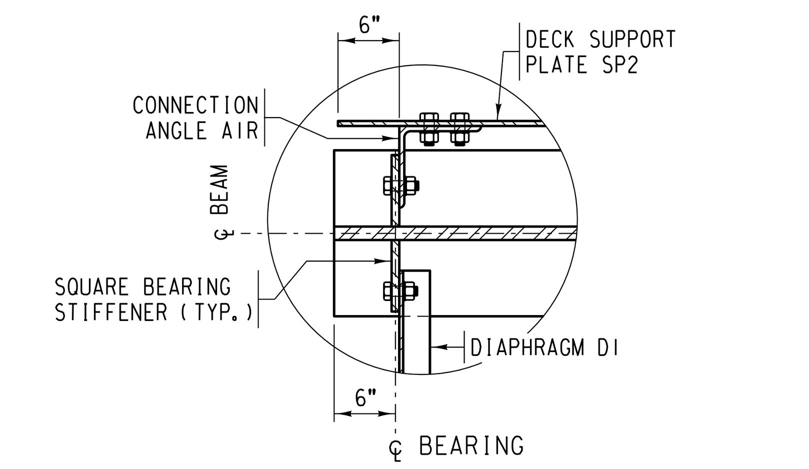


FRAMING PLAN - UNIT 1.3 AND 1.4
SCALE: 5/16" = 1'-0"

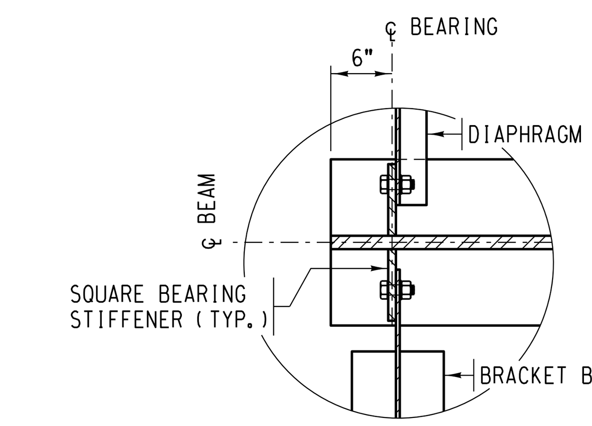


DECK PLAN - DECK PLATE, CURB AND HANDRAIL - UNIT 1.3 AND 1.4
SCALE: 5/16" = 1'-0"

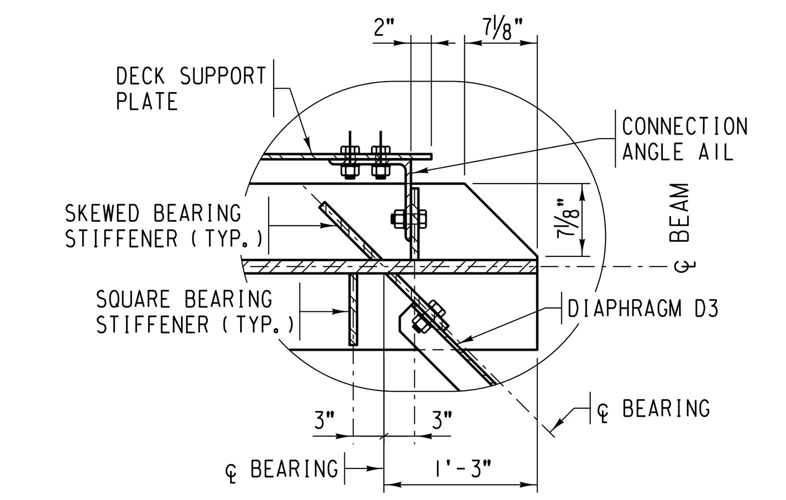
NOTE:
✱ ONLY ON PHASE 1 UNIT 1.3.



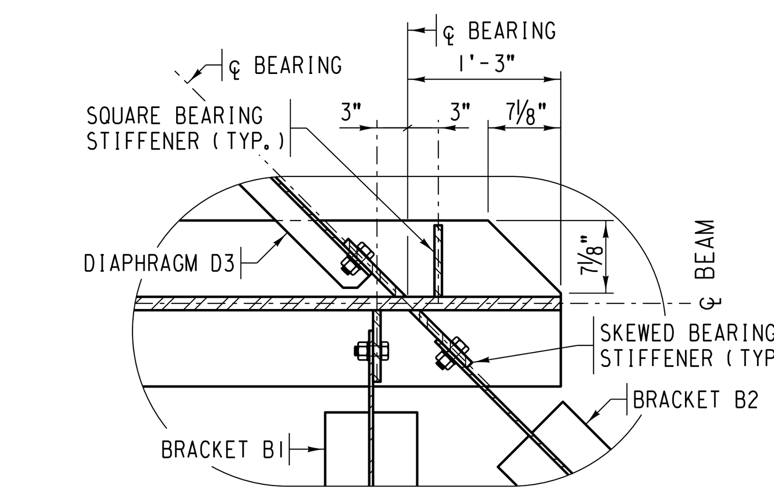
DETAIL H 2|2
SCALE: ¾" = 1'-0"



DETAIL I 2|2
SCALE: ¾" = 1'-0"



DETAIL J 2|2, J 3|2, J 4|2
SCALE: ¾" = 1'-0"



DETAIL K 2|2, K 3|2, K 4|2
SCALE: ¾" = 1'-0"

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL
STATUS — 9/6/2023 DATE

TRANSYSTEMS
APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

TABLE OF DIMENSIONS

BEAM	DIM. A	DIM. B
B-1.6	59'-2"	57'-5"
B-1.7	61'-9"	60'-0"
B-1.8	64'-4"	62'-7"
B-1.9	66'-11"	65'-2"
B-1.10	69'-6"	67'-9"

STRESS TABLE

SPAN LENGTH	BEAM SIZE	SHEAR						MOMENT						LIVE LOAD + IMPACT DEFLECTION		
		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	WEB AREA, A_W		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	NET SECTION MODULUS, S		ALLOWABLE L/640	MOMENT OF INERTIA, I	
						REQUIRED	PROVIDED, GROSS					REQUIRED	PROVIDED		REQUIRED	PROVIDED, GROSS
		(k)	(k)	(k)	(k)	(in^2)	(in^2)	(k-ft)	(k-ft)	(k-ft)	(k-ft)	(in^3)	(in^3)	(in)	(in^4)	(in^4)
69'-6"	W40x431	59.9	85.4	39.0	184.2	10.5	49.0	988.4	1,289.2	588.8	2,866.4	1,250.8	1,515.7	1.270	40,506	42,188

NOTE: DATA SHOWN IS FOR EXTERIOR BEAM, WHICH IS THE LONGEST AND MOST HEAVILY LOADED BEAM. ALL BEAMS EFFECTIVE FOR LIVE LOAD.

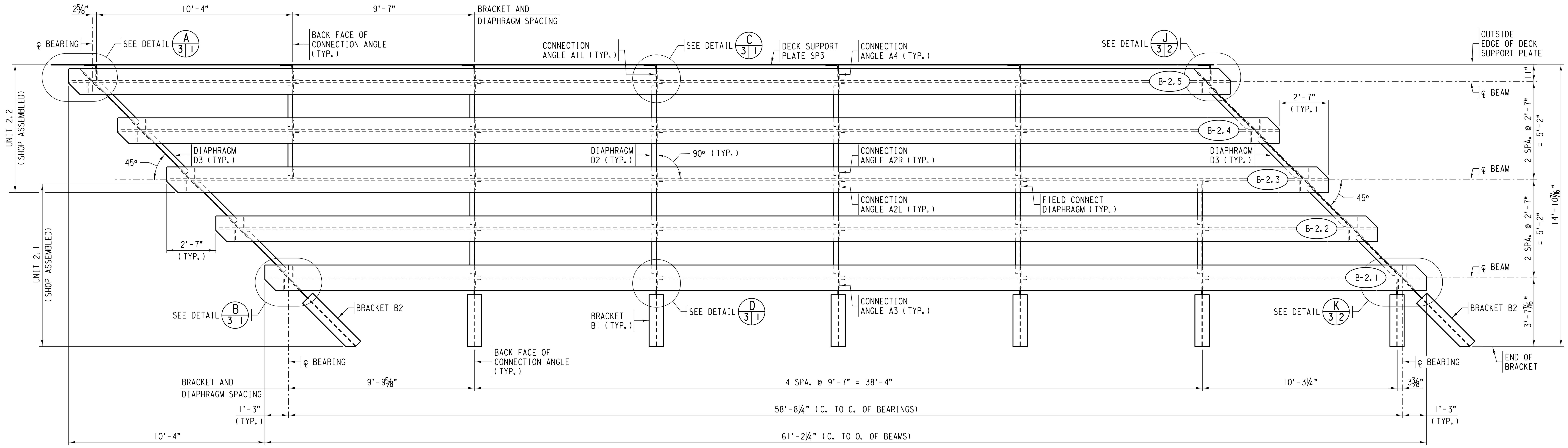
DSN/CHK BY:	DRAWN/CHK BY:	UPRR ENGINEER:	SHT NO.:
AS / NJS	TLO / ABB	DEH	F2 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

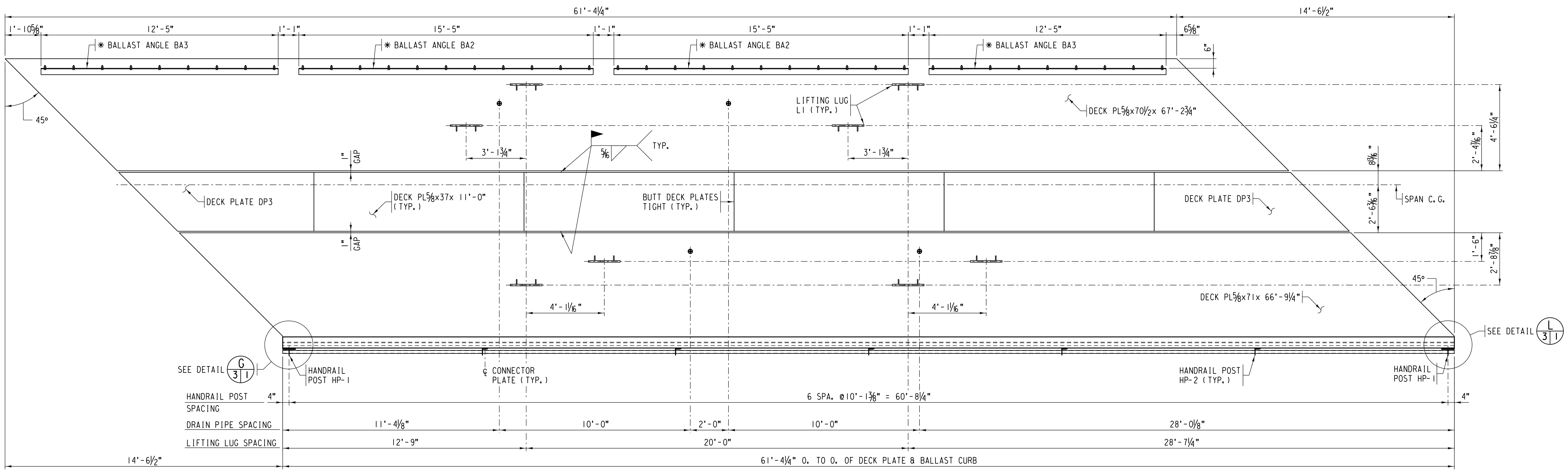
SHEET TITLE: BM SPAN - FRAMING AND DECK PLAN - UNIT 1.3 & 1.4

DESIGN SHEET



FRAMING PLAN - UNIT 2.1 AND 2.2

SCALE: 5/16" = 1'-0"



DECK PLAN - DECK PLATE, CURB AND HANDRAIL - UNIT 2.1 AND 2.2

SCALE: 5/16" = 1'-0"

NOTE:
* ONLY ON PHASE 1 UNIT 2.2.

STRESS TABLE

SPAN LENGTH	BEAM SIZE	SHEAR						MOMENT						LIVE LOAD + IMPACT DEFLECTION		
		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	WEB AREA, A_W		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	NET SECTION MODULUS, S		ALLOWABLE L/640	MOMENT OF INERTIA, I	
		(k)	(k)	(k)	(k)	REQUIRED (in^2)	PROVIDED, GROSS (in^2)	(k-ft)	(k-ft)	(k-ft)	(k-ft)	REQUIRED (in^3)	PROVIDED (in^3)	(in)	REQUIRED (in^4)	PROVIDED, GROSS (in^4)
61'-4¼"	W40x431	52.8	76.9	36.6	166.3	9.5	49.0	741.6	996.4	474.4	2,212.4	965.4	1,515.7	1.100	27,540	42,188

NOTE: ALL BEAMS EFFECTIVE FOR LIVE LOAD.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL (STATUS) 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY: Nicholas J. Sterosky

DESIGN ENGINEER OF RECORD 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC RAILROAD
Office of Director Structures Design

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F3 of F15

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: BM SPAN - FRAMING AND DECK PLAN - UNIT 2.1 & 2.2

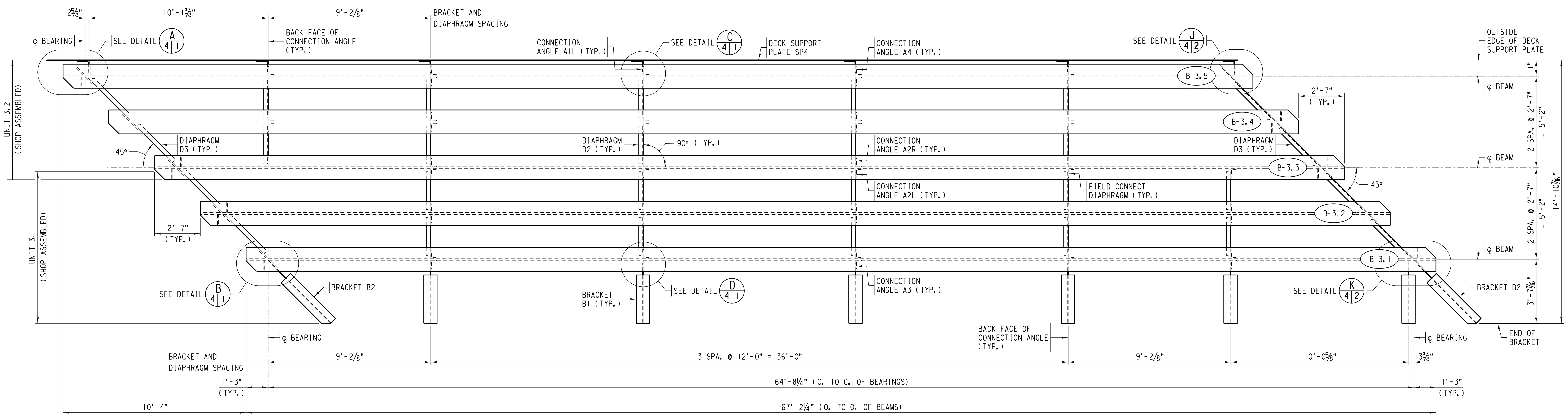
SHEET SIZE 22x34

FILE NAME: pw://hq-pwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC10110123011\Bridge\Sheets\Br 81.79\dcd8179_bia

PLOTTED: 9/12/2023 9:43:07 AM

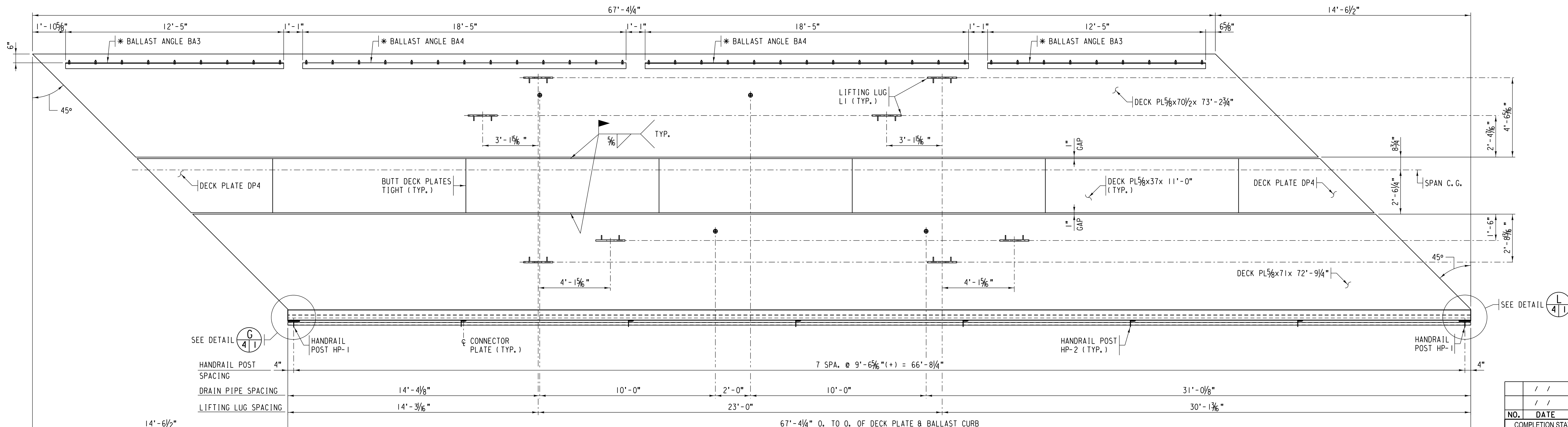
DESIGN SHEET

SHEET SIZE 22x34



FRAMING PLAN - UNIT 3.1 AND 3.2

SCALE: 5/16" = 1'-0"



DECK PLAN - DECK PLATE, CURB AND HANDRAIL - UNIT 3.1 AND 3.2

SCALE: 5/16" = 1'-0"

NOTE:
✻ ONLY ON PHASE 1 UNIT 3.2.

STRESS TABLE

SPAN LENGTH	BEAM SIZE	SHEAR						MOMENT						LIVE LOAD + IMPACT DEFLECTION		
		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	WEB AREA, A_W		DEAD LOAD	LIVE LOAD E80	IMPACT	TOTAL	NET SECTION MODULUS, S		ALLOWABLE L/640	MOMENT OF INERTIA, I	
		(k)	(k)	(k)	(k)	REQUIRED (in^2)	PROVIDED, GROSS (in^2)	(k-ft)	(k-ft)	(k-ft)	(k-ft)	REQUIRED (in^3)	PROVIDED (in^3)	(in)	REQUIRED (in^4)	PROVIDED, GROSS (in^4)
67'-4¼"	W40x431	58.0	82.3	38.2	178.5	10.1	49.0	901.0	1,186.0	549.8	2,636.9	1,150.6	1,515.7	1.213	35,713	42,188

NOTE: ALL BEAMS EFFECTIVE FOR LIVE LOAD.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS

DRAWN/CHK BY: TLO / ABB

UPRR ENGINEER: DEH

SHT NO.: F4 of F15

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB

5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

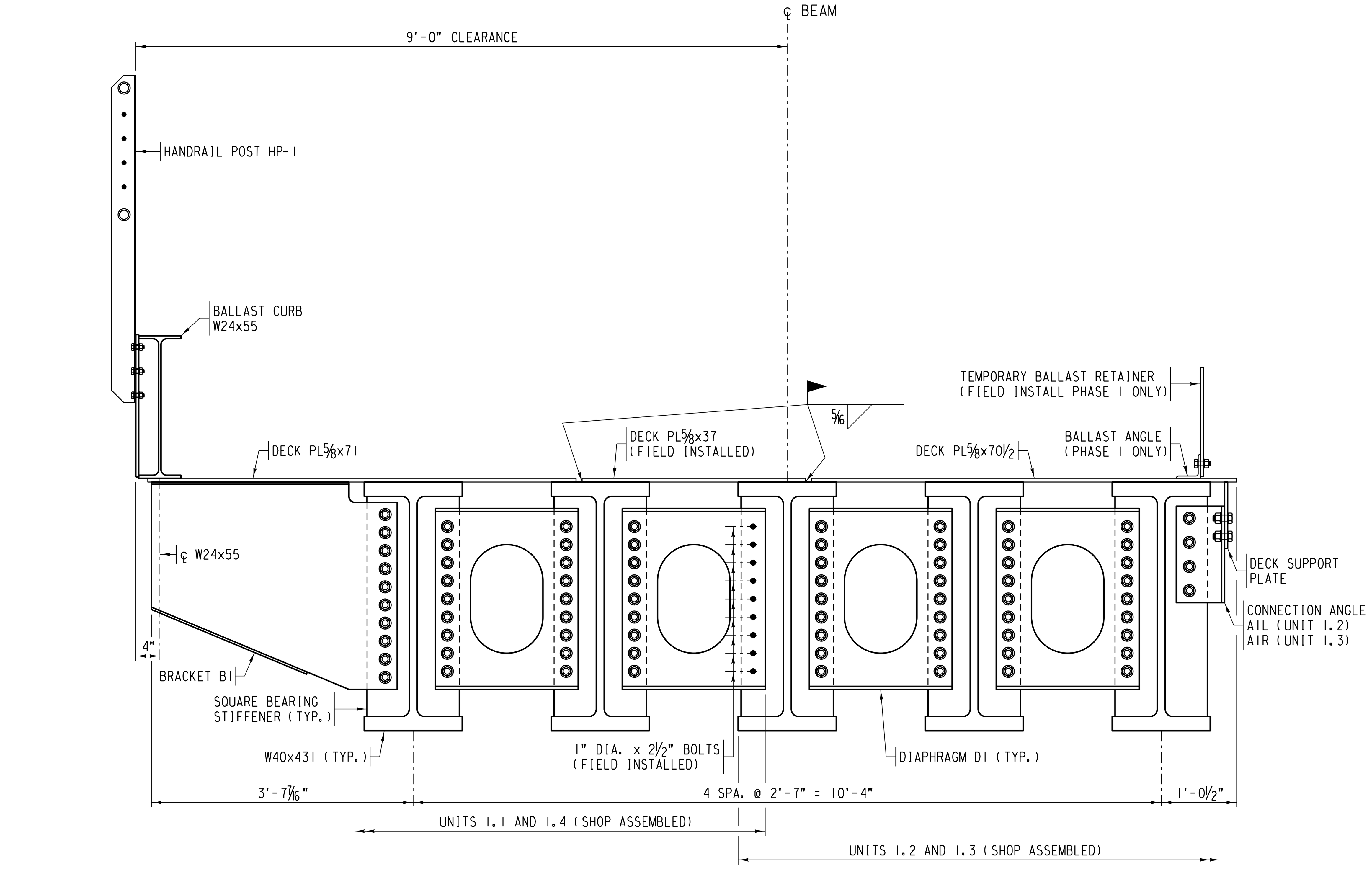
SHEET TITLE: BM SPAN - FRAMING AND DECK PLAN - UNIT 3.1 & 3.2

FILE NAME: pw://hq-pwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101101230111/Bridge/Sheets/B 81.79/clc8179_bs

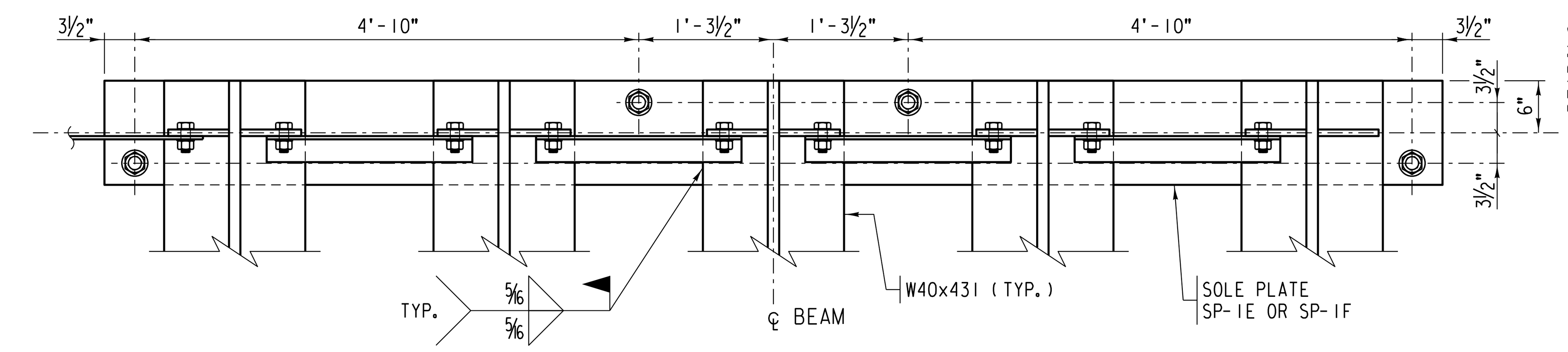
PLOTTED: 9/12/2023 9:43:07 AM

DESIGN SHEET

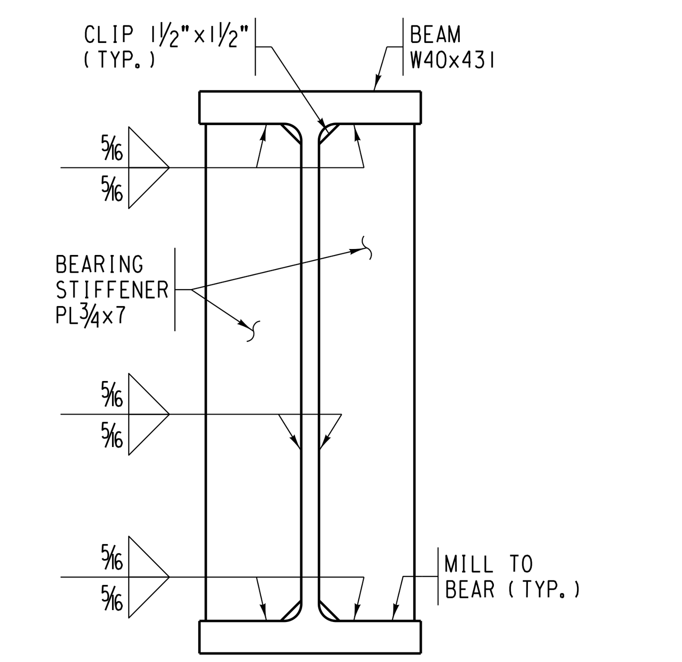
SHEET SIZE 22x34



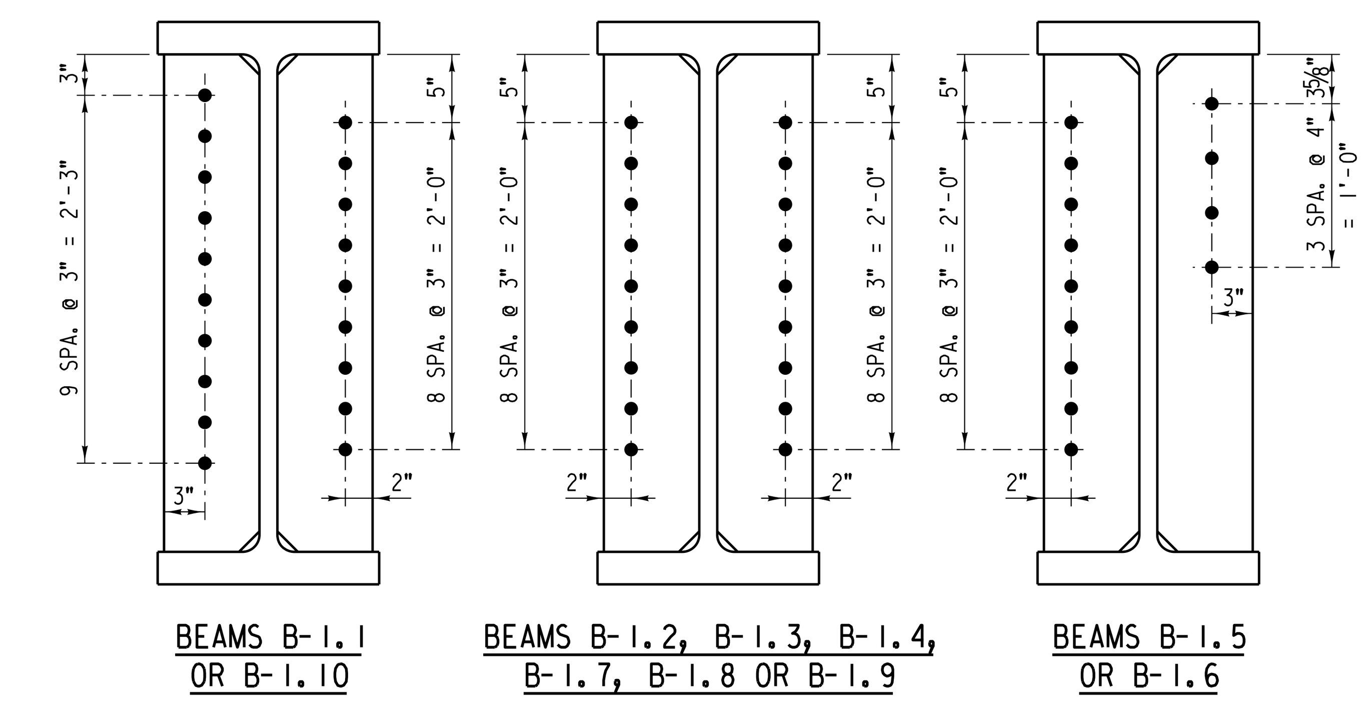
SECTION - ASSEMBLED SPAN AT END DIAPHRAGM (SQUARE END)
SCALE: 3/4"=1'-0"



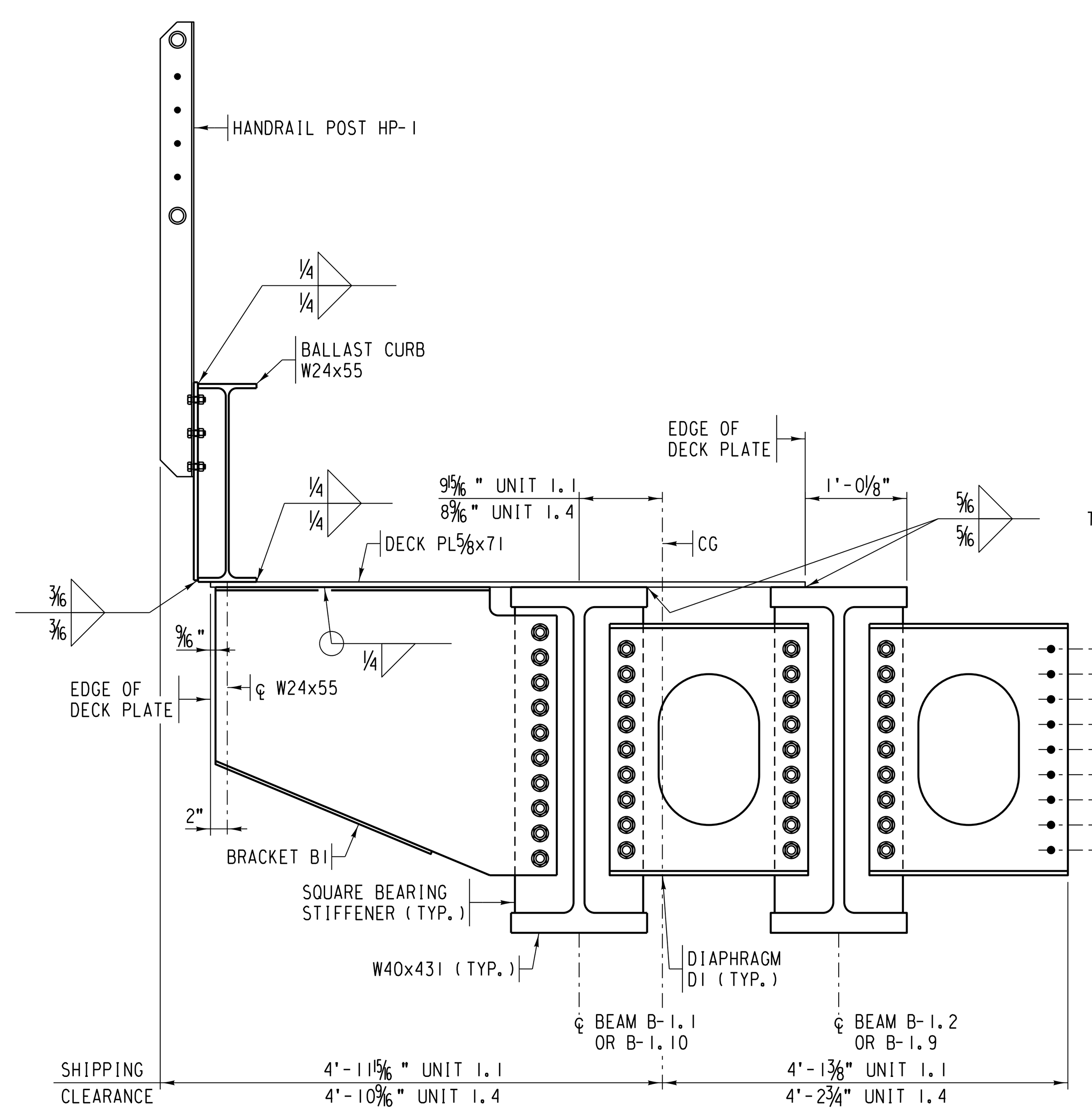
BEARING ASSEMBLY PLAN - END BENT (SQUARED END)
SCALE: 3/4"=1'-0"



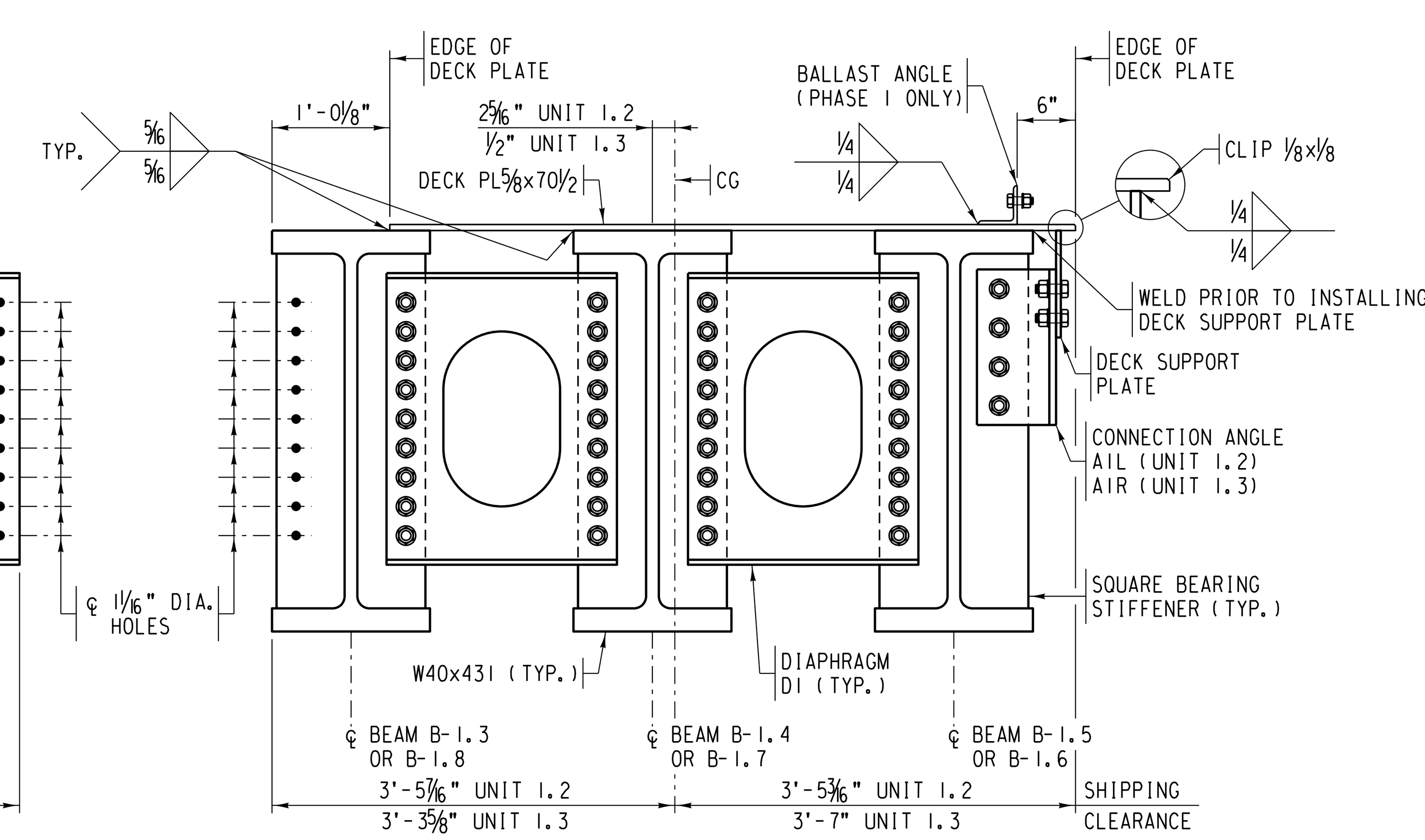
SQUARE BEARING STIFFENER WELD DETAIL
SCALE: 1"=1'-0"



SQUARE BEARING STIFFENER BOLTING DETAILS
SCALE: 1"=1'-0"



SECTION - UNIT 1.1 OR 1.4 (SQUARE END)
SCALE: 3/4"=1'-0"



SECTION - UNIT 1.2 OR 1.3 (SQUARE END)
SCALE: 3/4"=1'-0"

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL (STATUS) — 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — 9/6/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

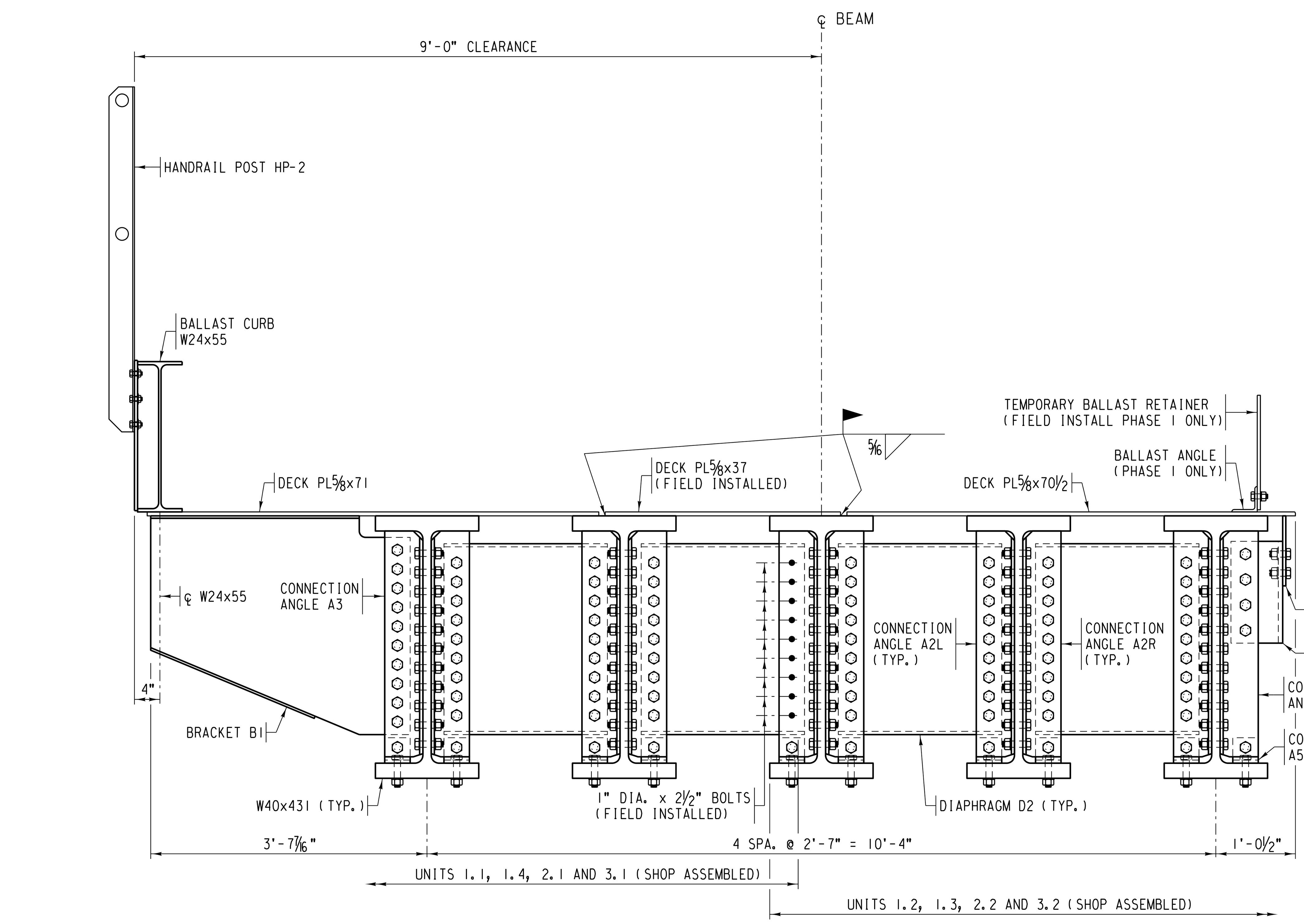
DSN/CHK BY: AS / NJS	**UNION PACIFIC RAILROAD** Office of Director Structures Design
DRAWN/CHK BY: TLO / ABB	LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
UPRR ENGINEER: DEH	5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)
SHT NO.: F5 of F15	SHEET TITLE: BM SPAN - ASSEMBLY DETAILS (1 OF 3)

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/dd8179_bia

PLOTTED: 9/12/2023 9:43:07 AM

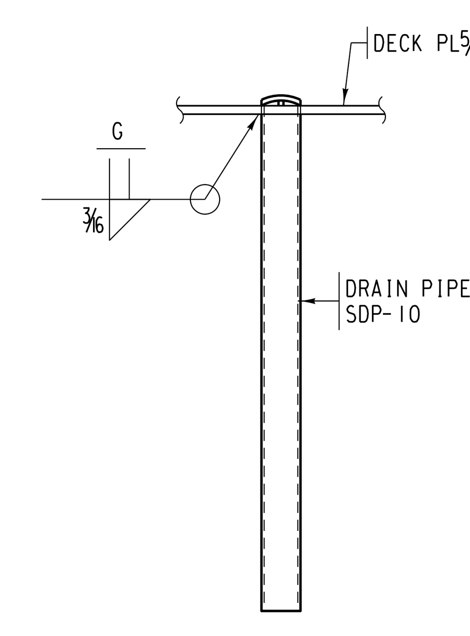
DESIGN SHEET

SHEET SIZE 22x34



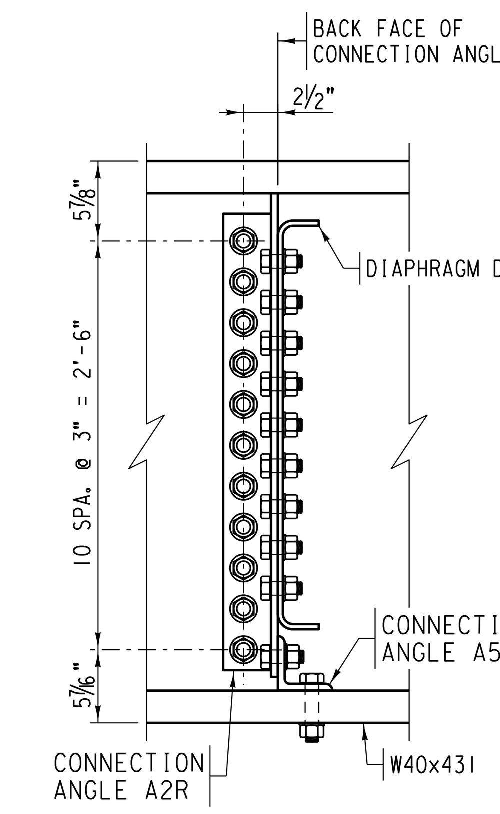
SECTION - ASSEMBLED SPAN AT INTERIOR DIAPHRAGM

SCALE: ¾"=1'-0"



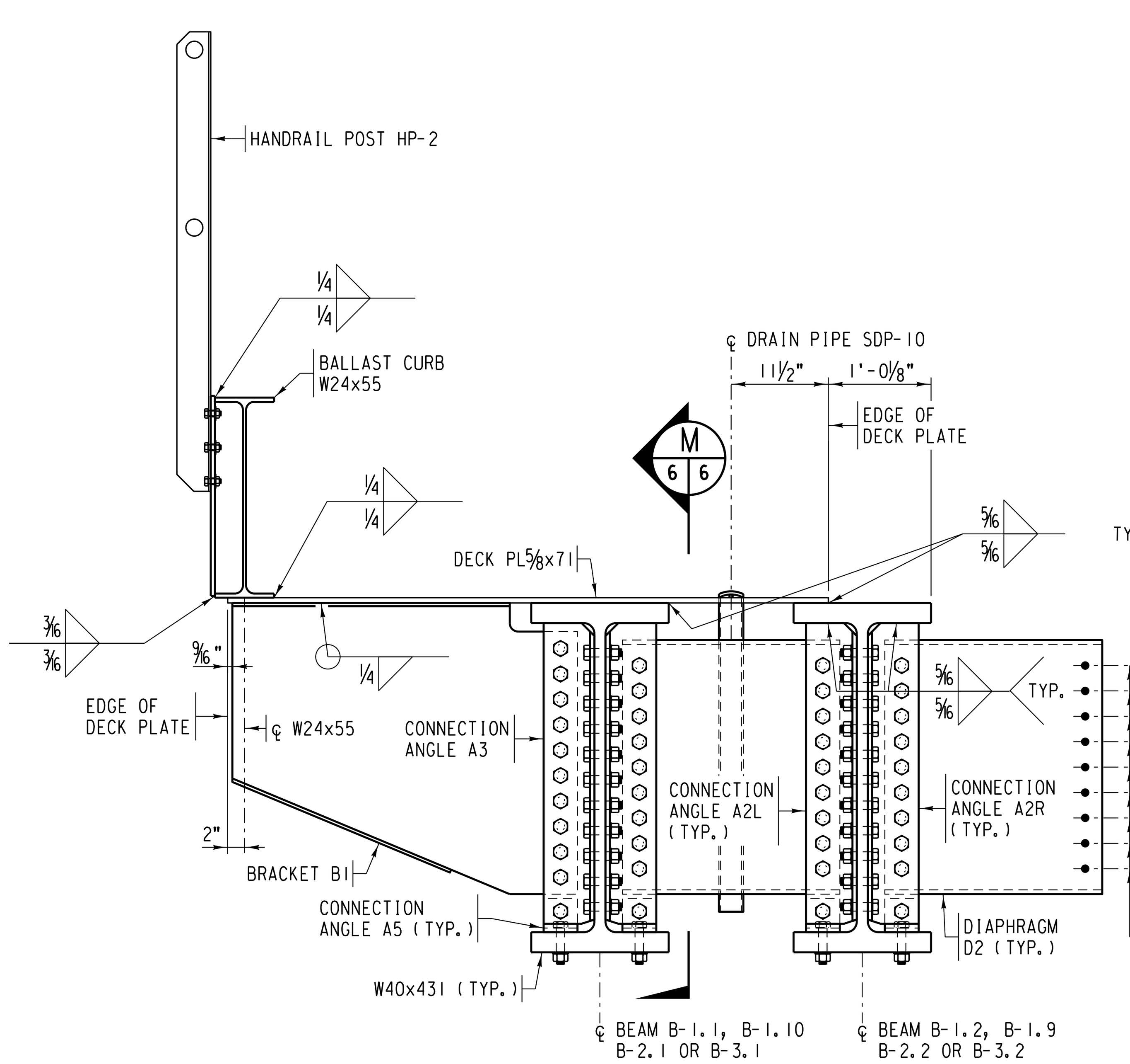
DRAIN PIPE DETAIL

SCALE: 1"=1'-0"



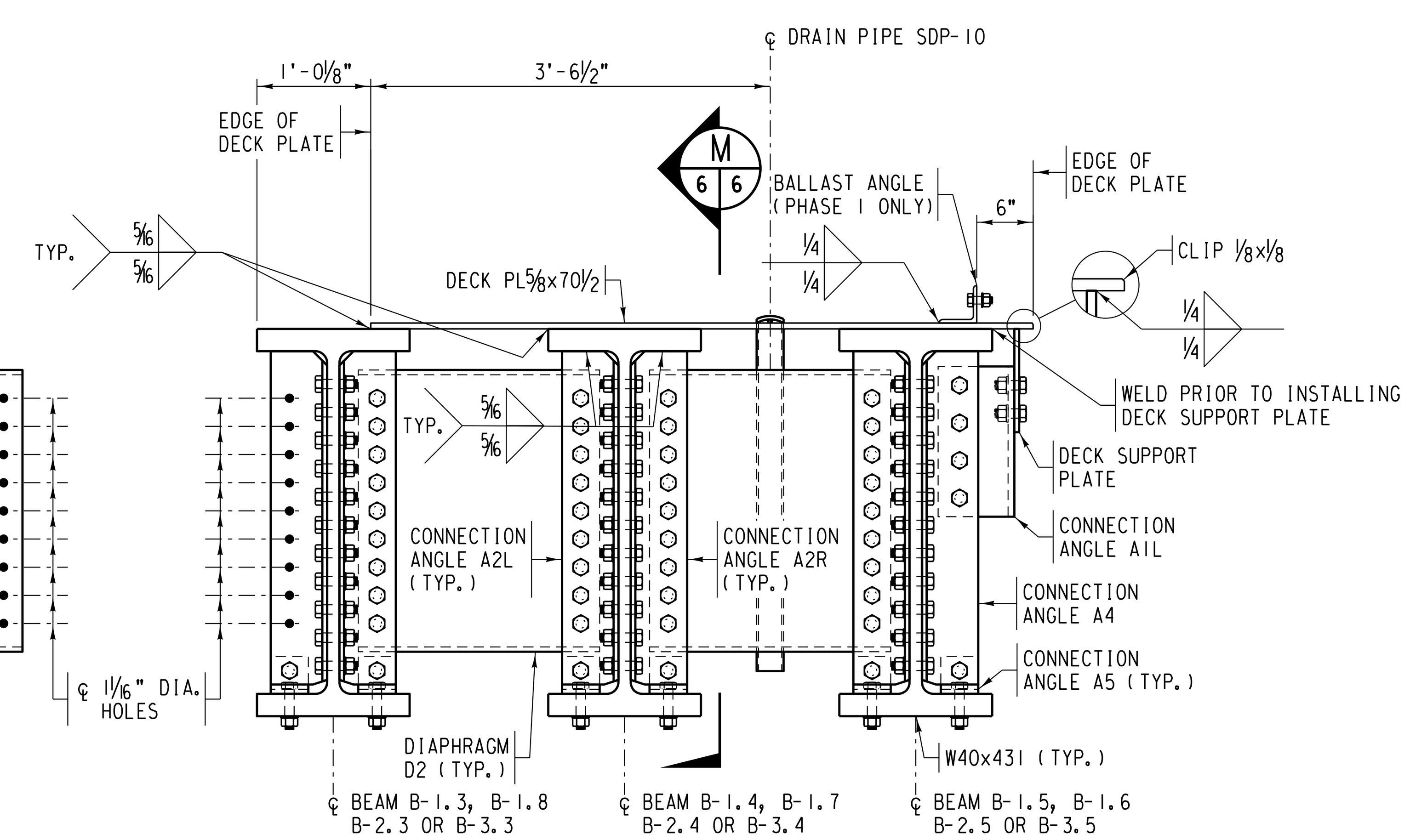
SECTION M/6

SCALE: 1"=1'-0"



SECTION - UNIT 1.1, 1.4, 2.1 OR 3.1

SCALE: ¾"=1'-0"



SECTION - UNIT 1.2, 1.3, 2.2 OR 3.2

SCALE: ¾"=1'-0"

STRUCTURAL STEEL NOTES

1. Materials, fabrication, shop assembly and erection shall be in accordance with Chapter 15: Steel Structures of the current AREMA Manual for Railway Engineering.

2. Fabrication of structural steel shall be performed by a Fabricator certified under AISC Quality Certification Program for Certified Bridge Fabricator - Simple (SBR).

3. Material shall conform to the following requirements:

Beams	ASTM A709 Gr. 50W T2
Deck Plate	ASTM A709 Gr. 50 T2
Drain Pipe	ASTM A53 Gr. B
Handrail	ASTM A847
All Remaining Steel	ASTM A709 Gr. 50W or A588
Bolts	ASTM A325 Type 3 (Class A Surface - 16.3 ksi)
M. Bolts	ASTM A307
Anchor Rods	ASTM F1554, Gr. 55
Bearing Pads	Cast Polyurethane (70 Durometer)

4. All structural steel shall be blast cleaned prior to shipment as follows, unless noted otherwise. All ASTM A709 steel, other surfaces visible from sides and all faying surfaces regardless of location: Minimum SSPC-SP6 Commercial Blast Cleaning. All remaining steel surfaces: SSPC-SP1, Solvent Cleaning. All steel members to be field assembled shall be clearly marked after blast cleaning has been completed.

5. Structural steel shall not be painted.

6. Structural steel shall be of the type and quality as designated on the drawings. Material supplied shall meet the longitudinal Charpy V-notch requirements for Zone 2 as specified in the AREMA Manual for Railway Engineering.

7. All shop and field bolted connections shall use high strength bolts (including nuts and washers) conforming to ASTM F3125, Grade A325 Type 3, unless otherwise noted. Nuts shall conform to ASTM A563. All bolts shall be 1" diameter unless noted otherwise. Diameter of bolt holes shall be 1/8" larger than nominal bolt diameter for bolts 1" or larger and 1/16" larger than nominal diameter for bolts less than 1", unless noted otherwise. All bolts shall have one hardened steel washer conforming to ASTM F436 per bolt under the element to be turned.

8. High strength steel bolts shall be installed in accordance with the "Turn of the Nut Method". The procedure for installation is as specified by the Research Council on Structural Connections. Alternative bolt installation methods are subject to approval by the UPRR Office of Engineering Design.

9. Horizontal bolts shall be installed so that the bolt heads are on the outside (exposed) surface of the member unless shown otherwise on the drawings. Vertical bolts shall be installed with heads on top of the connection unless shown otherwise. Threads shall be excluded from the shear plane in all connections.

10. Any machine bolts required for shipment shall be ASTM A307.

11. All welding shall be in accordance with the Bridge Welding Code, AWS D1.5. Welding to be allowed only as shown on the drawings and approved shop drawings.

12. All beam to deck plate shop welding shall be with the SAW process. All field welding shall be with the SMAW or FCAW process. Welding electrodes shall be E7018 for SMAW or E70T-1,5 for FCAW. All other welding shall be with the SAW or SMAW process.

13. When welding A709 Grade 50W steel, weld metal shall be equivalent to A709, Grade 50W steel in strength, corrosion resistance and weathered appearance.

14. The Fabricator shall submit copies of welders' certificates for all welding processes. Welders shall possess valid qualifications.

15. All edge preparation, removal of unacceptable weld or base metal, and backgouging shall be completed by machining. Rough removals may be completed by non-mechanical means.

16. The Fabricator shall submit detailed shop drawings prior to beginning fabrication. Fabrication shall not begin until shop drawings are approved.

17. The Fabricator shall shop assemble the steel framing prior to shipping. All bolts shall be placed in holes as work progresses to assure proper fit.

18. Reaming of holes during field erection is not allowed unless approved by the Railroad.

19. Shop assembled steel framing shall be made available for inspection by the Railroad at the Fabricator's plant before the steel is disassembled and shipped to the erection site at the Railroad's discretion. Fabricator shall keep structures Design Manager informed of anticipated span assembly schedule. Units and pieces shall be match-marked as required.

20. All steel components shall be inspected by the Fabricator before shipment.

21. All material certifications and quality control test results shall be submitted to Union Pacific Railroad at project completion.

22. All fabricator questions shall be addressed via email to Donovan Holder at deholder@up.com.

23. All correspondence shall be directed to Donovan Holder.

    Union Pacific Railroad
    1400 Douglas St., STOP 0910
    Omaha, NE 68179

24. Bearing pads shall be shipped flat.

25. Bearing pads shall meet requirements of Table 15-5-7 of the AREMA Manual for Railway Engineering.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL (STATUS) 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY: Nicholas J. Sterode

DESIGN ENGINEER OF RECORD — DATE 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY:	AS / NJS
DRAWN/CHK BY:	TLO / ABB
UPRR ENGINEER:	DEH
SHT NO.:	F6 of F15

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB

5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

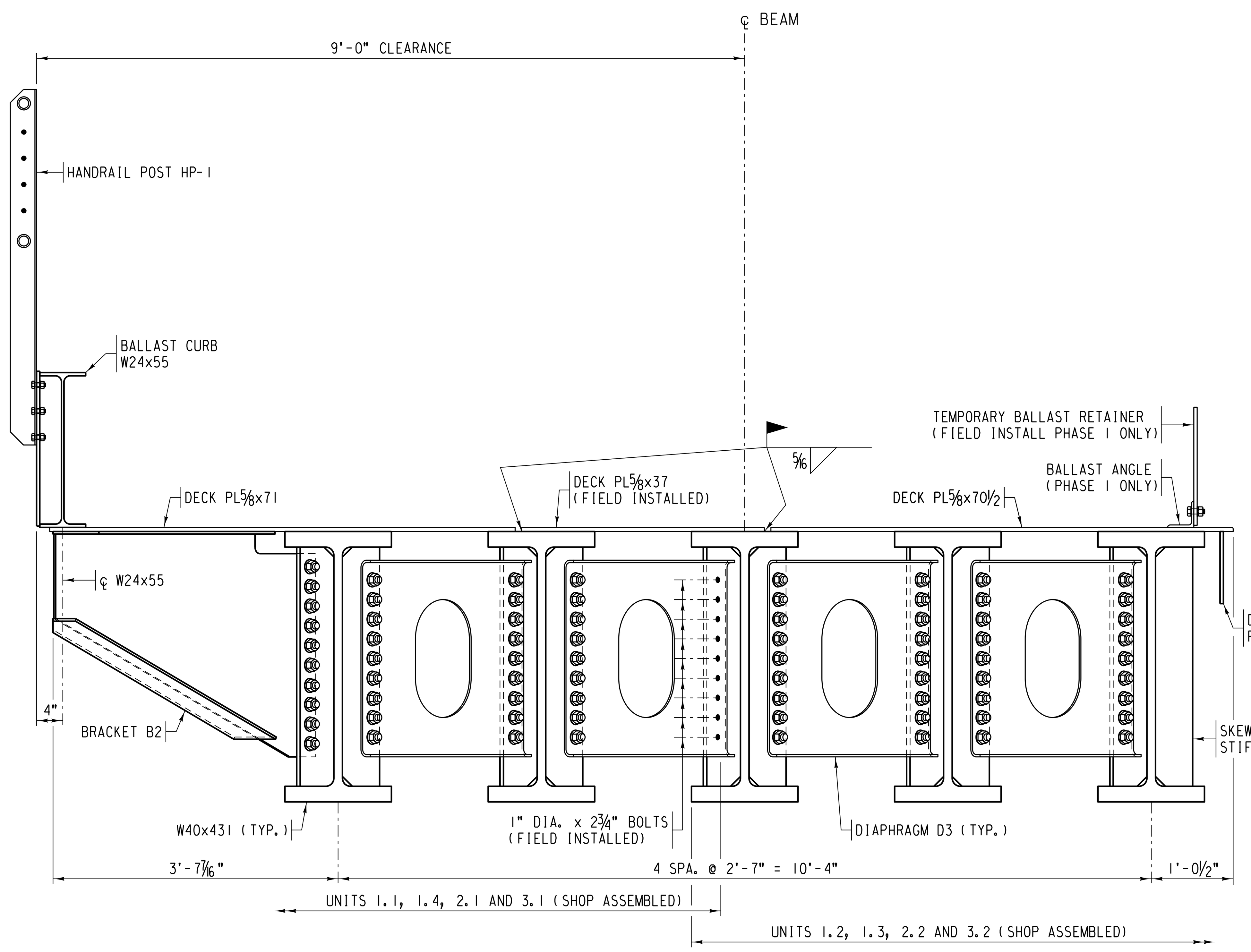
SHEET TITLE: BM SPAN - ASSEMBLY DETAILS (2 OF 3)

FILE NAME: pw://hqpwint01.ae-transyscorp.com/transyscorp-pw01/Documents/Projects_2023/KC101/1101230111/Bridge/Sheets/B 81.79/dc08179_bis

PLOTTED: 9/12/2023 9:43:08 AM

DESIGN SHEET

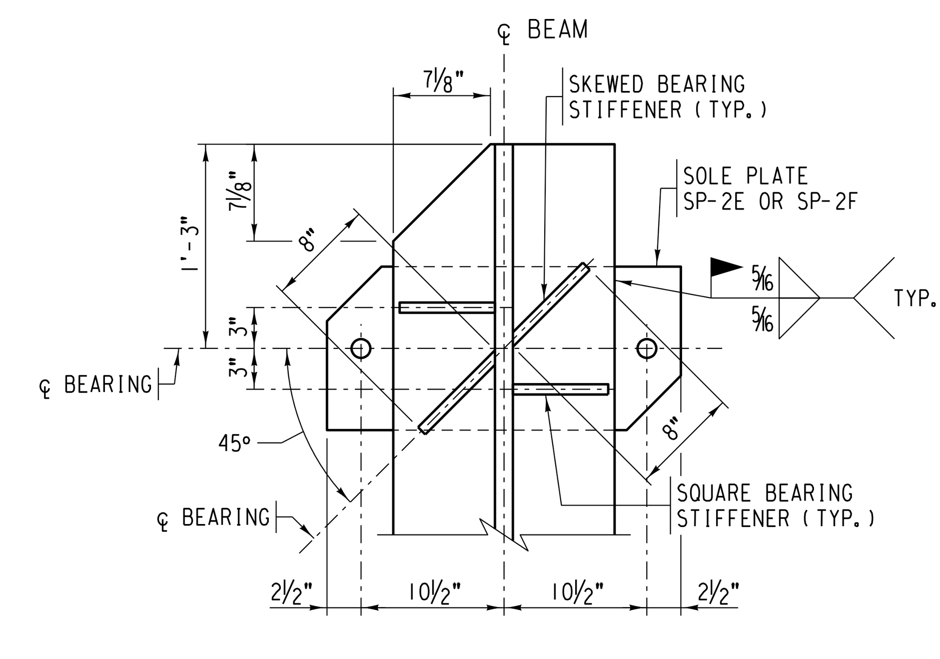
SHEET SIZE 22x34



SECTION - ASSEMBLED SPAN AT END DIAPHRAGM (SKEWED END)

SCALE: ¾"=1'-0"

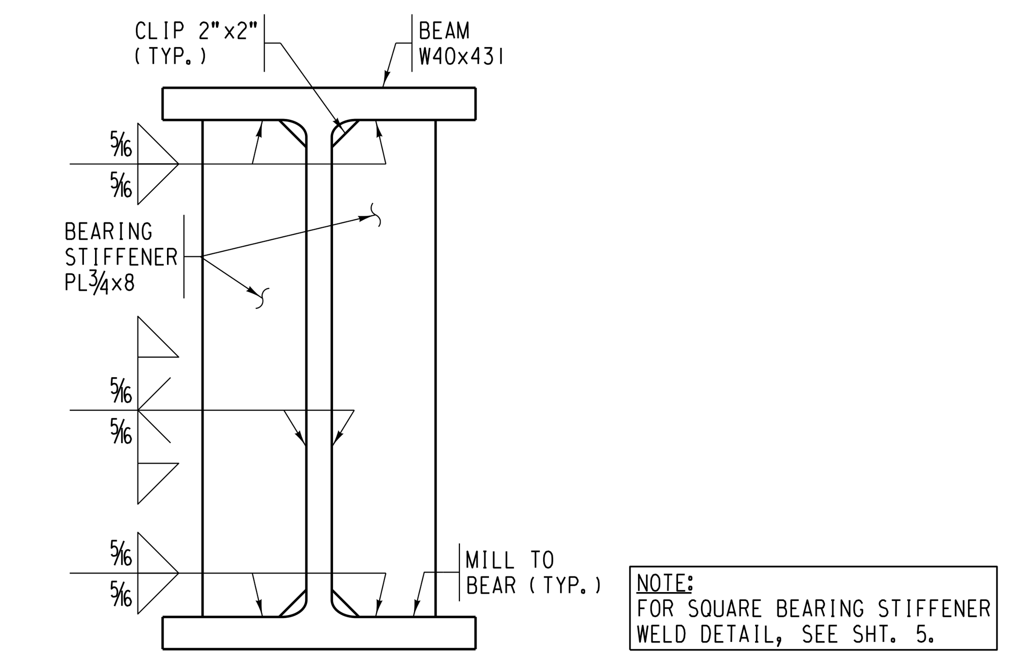
NOTE:
SQUARE BEARING STIFFENERS NOT SHOWN FOR CLARITY.



BEARING ASSEMBLY PLAN

SCALE: 1"=1'-0"

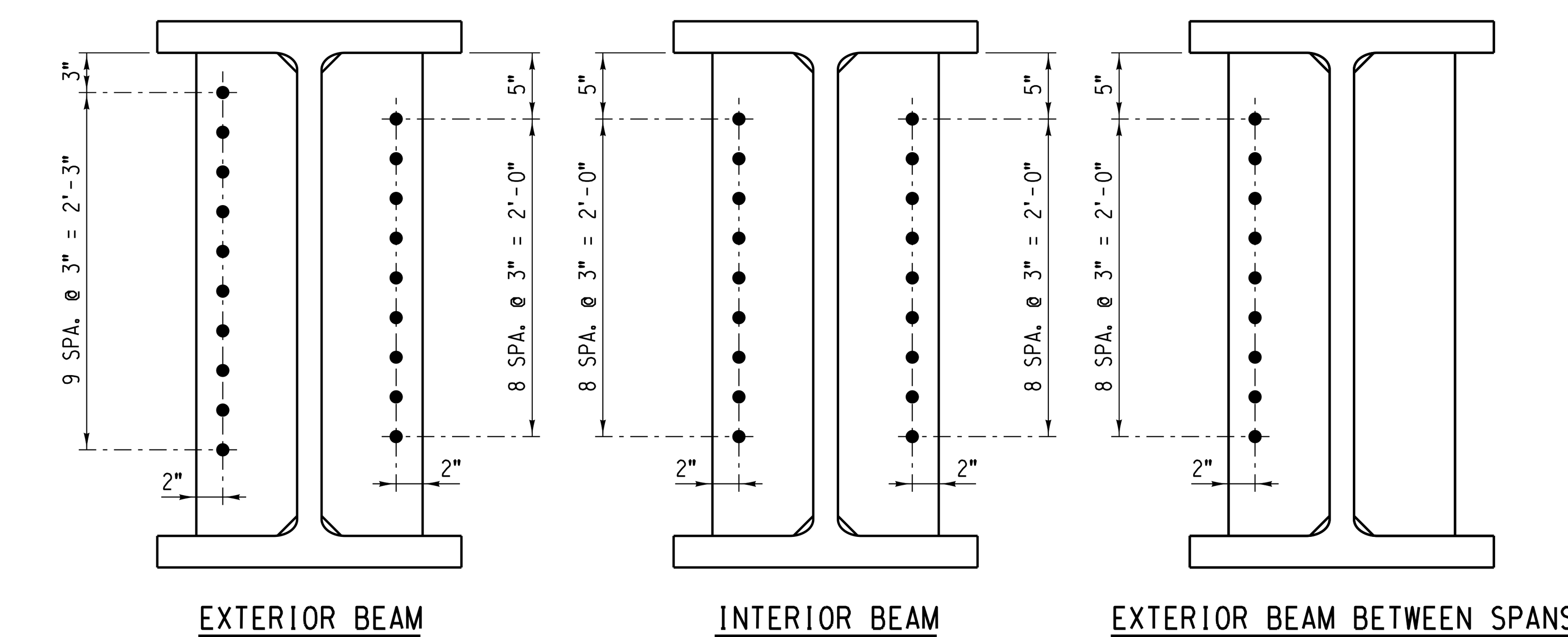
TYPICAL AT EACH BEAM AT SKEWED SUPPORTS



SKEWED BEARING STIFFENER WELD DETAIL

SCALE: 1"=1'-0"

DETAIL SHOWN NORMAL TO SKEWED BEARING STIFFENER

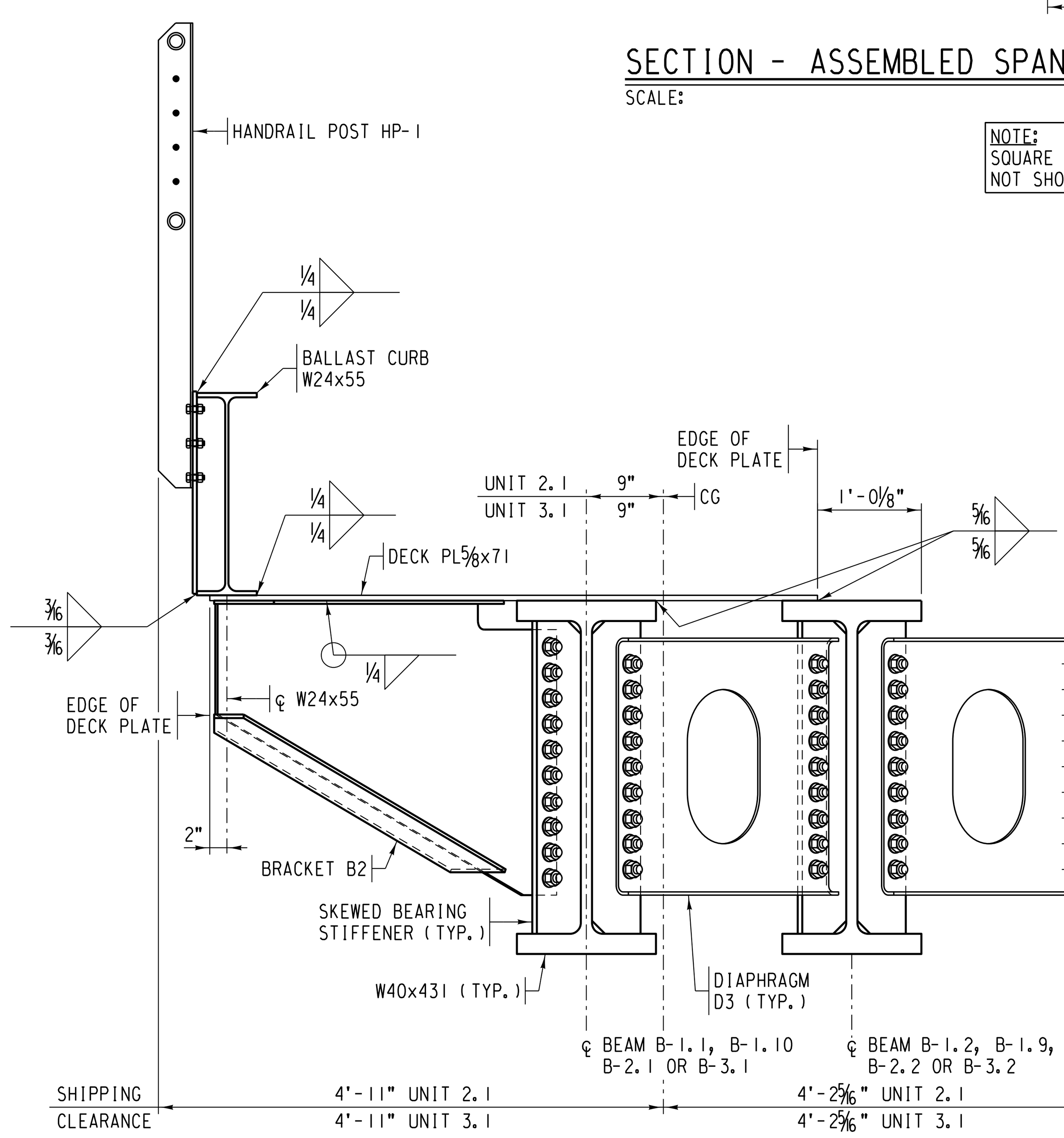


SKEWED BEARING STIFFENER BOLTING DETAILS

SCALE: 1"=1'-0"

DETAILS SHOWN NORMAL TO SKEWED BEARING STIFFENER

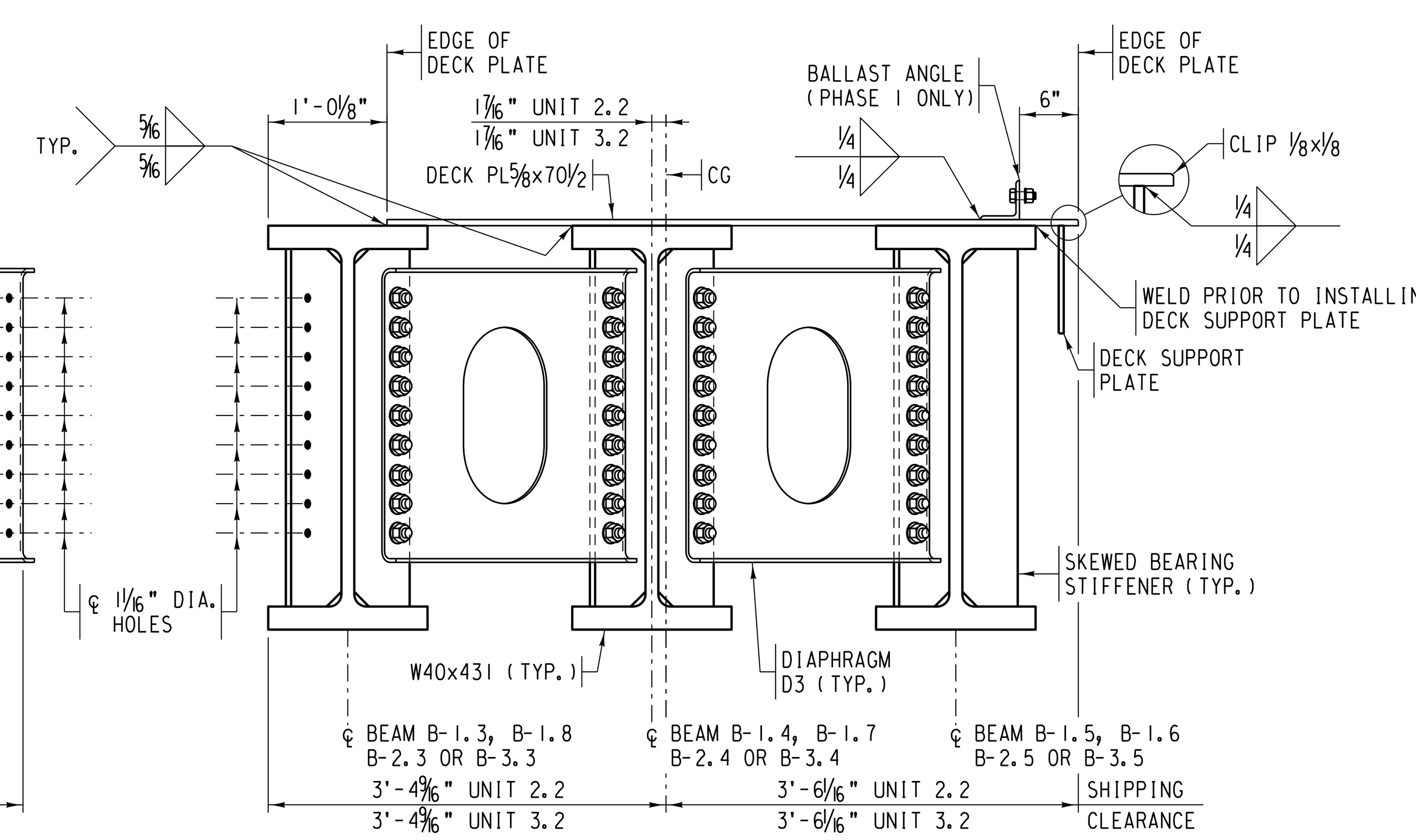
NOTE:
FOR SQUARE BEARING STIFFENER BOLTING DETAILS, SEE SHT. 5.



SECTION - UNIT 1.1, 1.4, 2.1 OR 3.1 (SKEWED END)

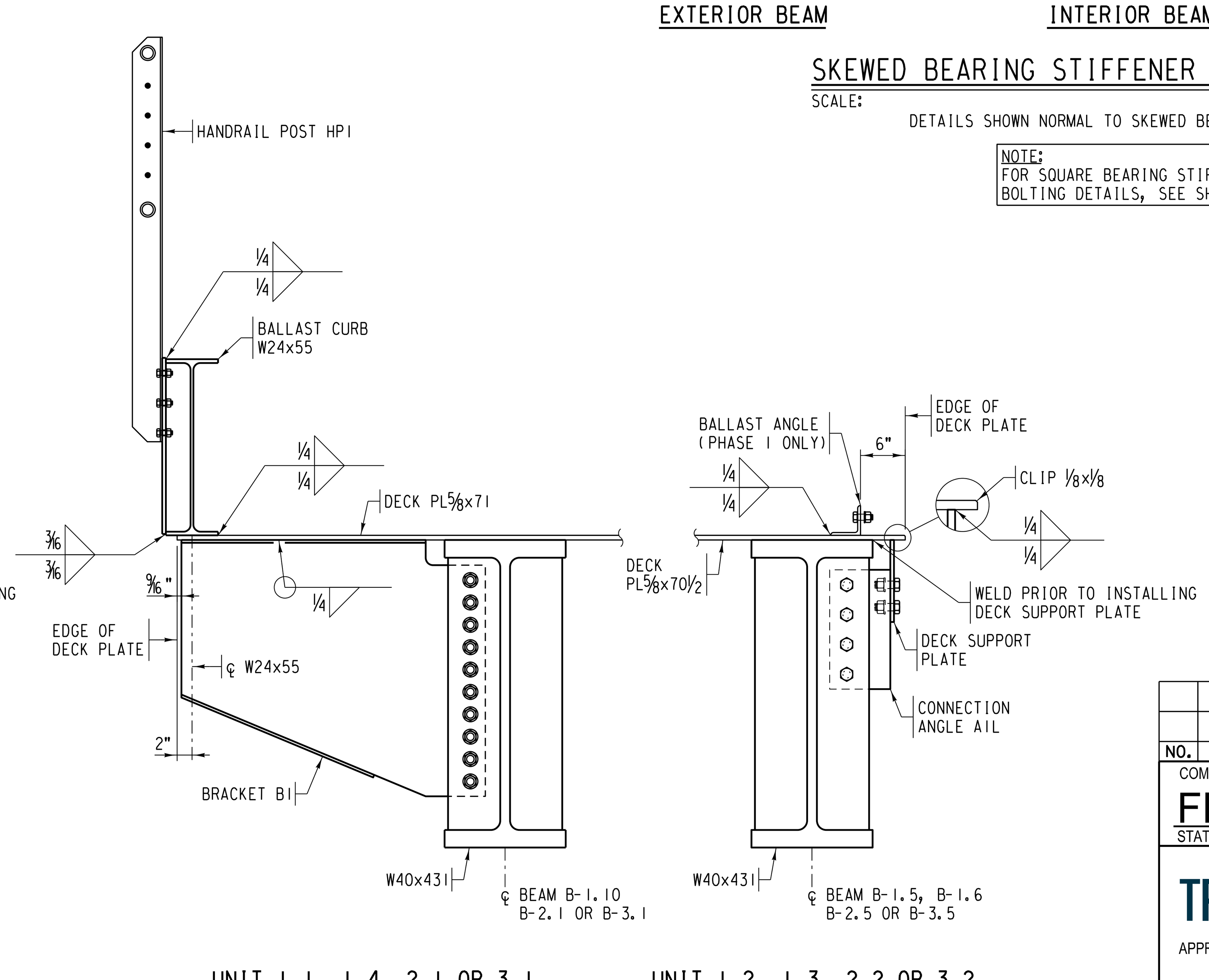
SCALE: ¾"=1'-0"

NOTE:
SQUARE BEARING STIFFENERS NOT SHOWN FOR CLARITY.



SECTION - UNIT 1.2, 1.3, 2.2 OR 3.2 (SKEWED END)

SCALE: ¾"=1'-0"



PARTIAL SECTION AT SQUARE BEARING STIFFENERS

SCALE: ¾"=1'-0"

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — DATE 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC

DSN/CHK BY:	AS / NJS
DRAWN/CHK BY:	TLO / ABB
UPRR ENGINEER:	DEH
SHT NO.:	F7 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

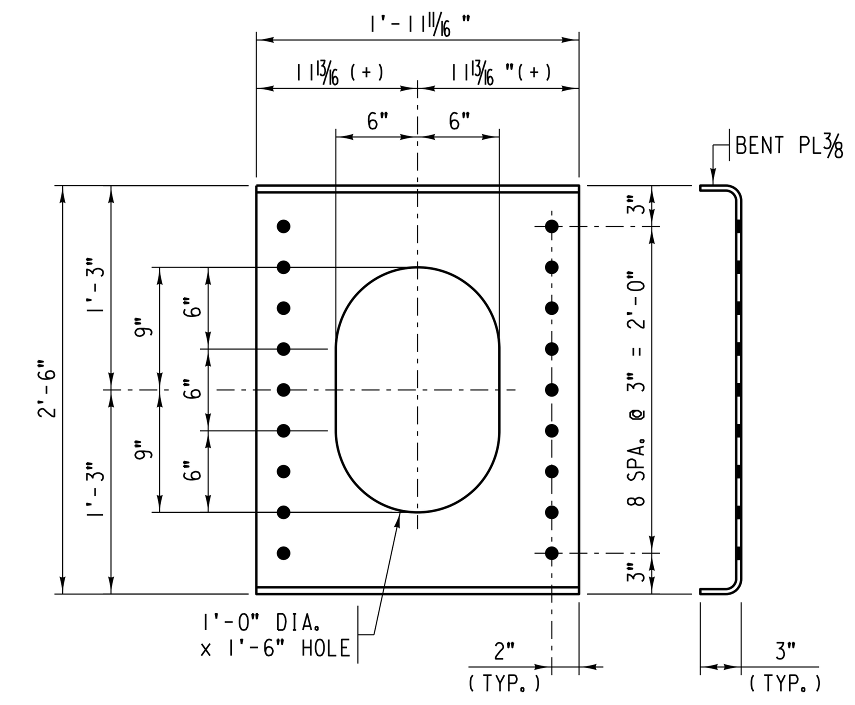
LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: BM SPAN - ASSEMBLY DETAILS (3 OF 3)

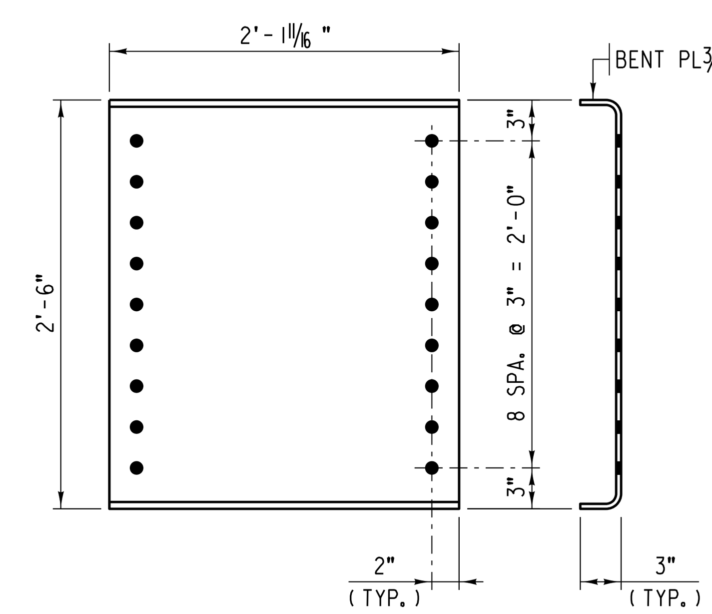
PLOTTED: 9/12/2023 9:43:08 AM

DESIGN SHEET

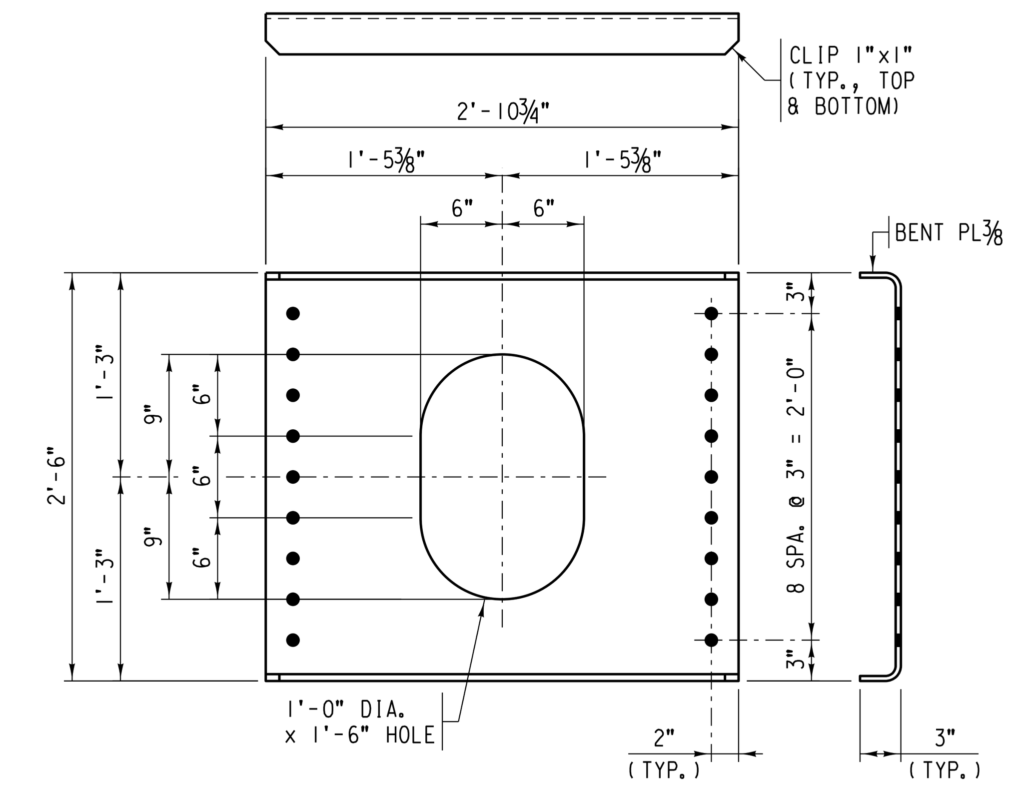
SHEET SIZE 22x34



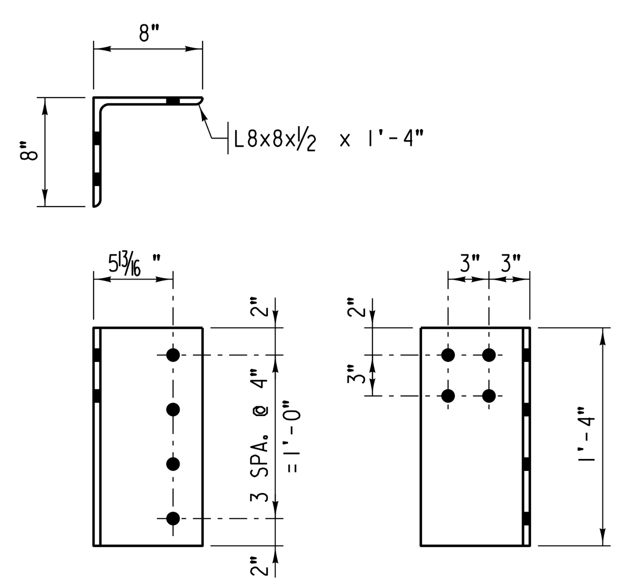
STEEL DIAPHRAGM D1
SCALE: 1"=1'-0"
EST. WT. = 71.0 LB. EA.



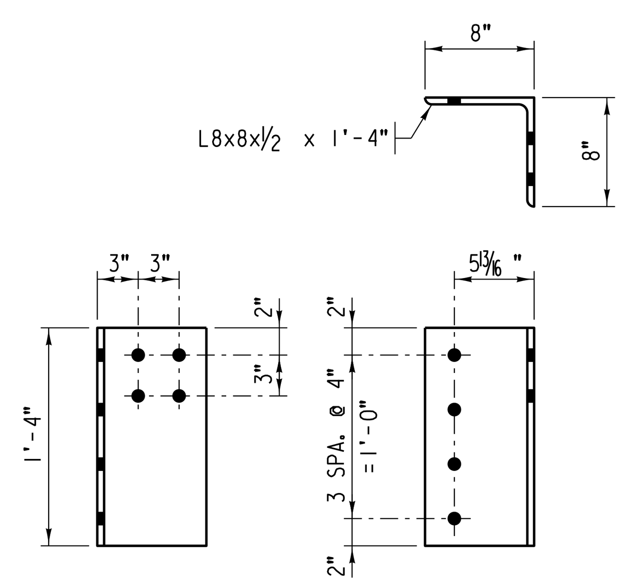
STEEL DIAPHRAGM D2
SCALE: 1"=1'-0"
EST. WT. = 98.3 LB. EA.



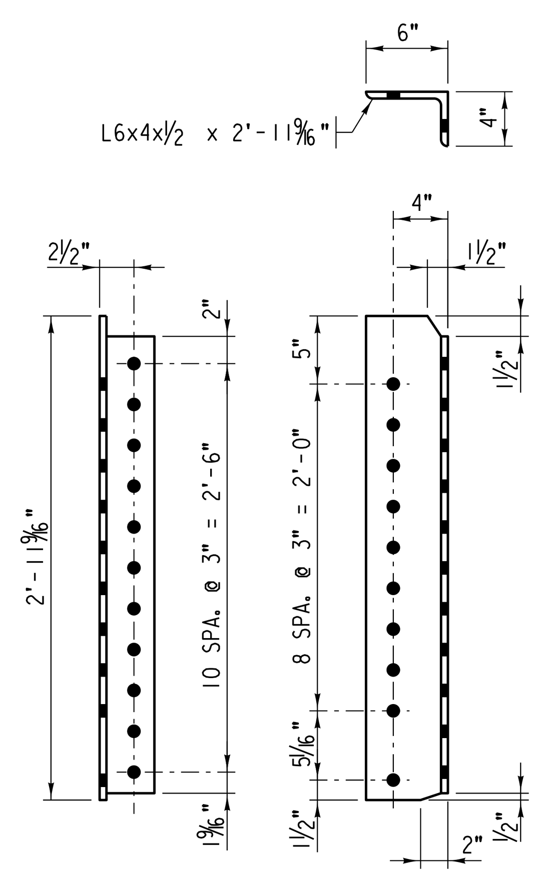
STEEL DIAPHRAGM D3
SCALE: 1"=1'-0"
EST. WT. = 113 LB. EA.



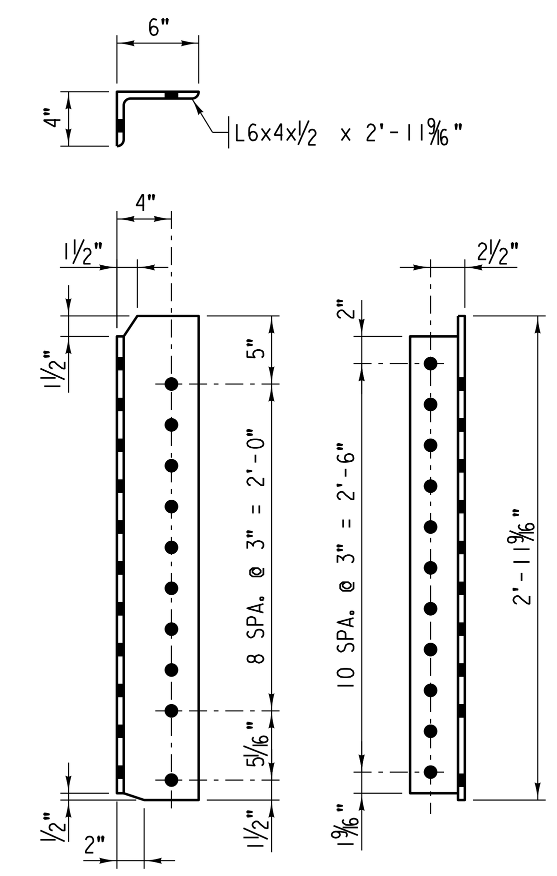
CONNECTION ANGLE A1L
SCALE: 1"=1'-0"
EST. WT. = 35.2 LB. EA.



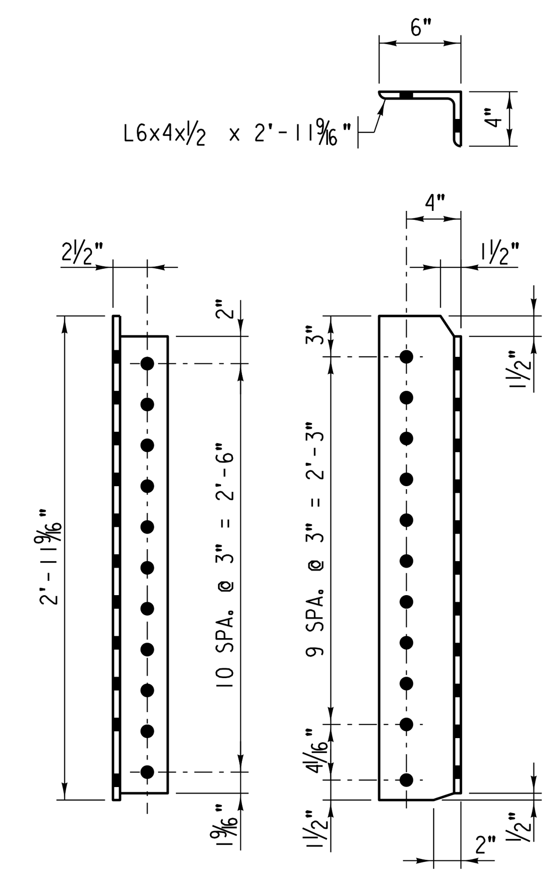
CONNECTION ANGLE A1R
SCALE: 1"=1'-0"
EST. WT. = 35.2 LB. EA.



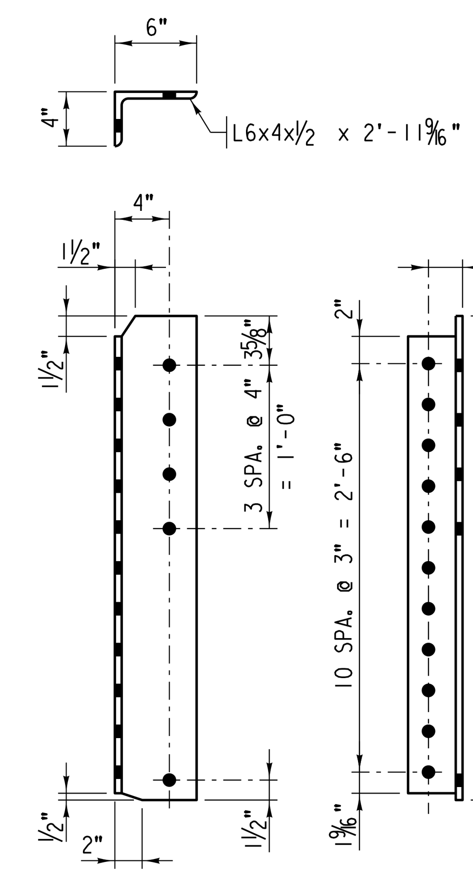
CONNECTION ANGLE A2L
SCALE: 1"=1'-0"
EST. WT. = 48.0 LB. EA.



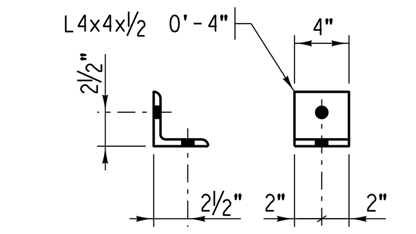
CONNECTION ANGLE A2R
SCALE: 1"=1'-0"
EST. WT. = 48.0 LB. EA.



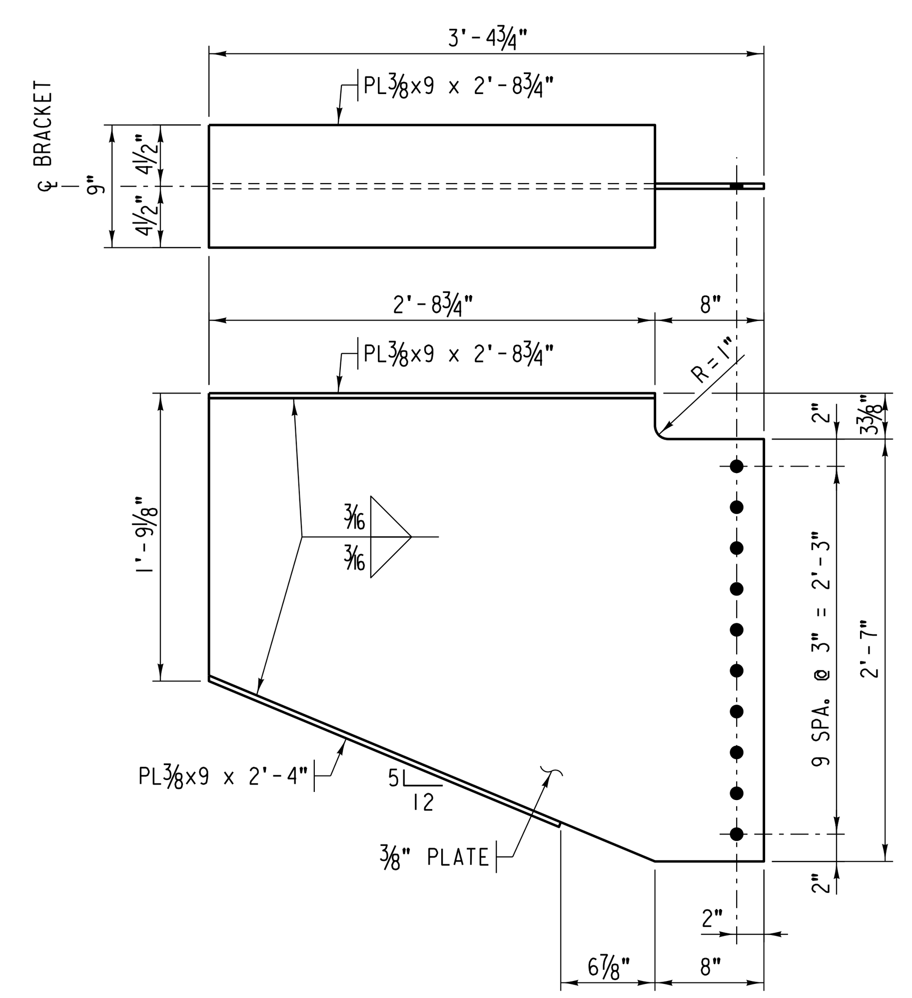
CONNECTION ANGLE A3
SCALE: 1"=1'-0"
EST. WT. = 48.0 LB. EA.



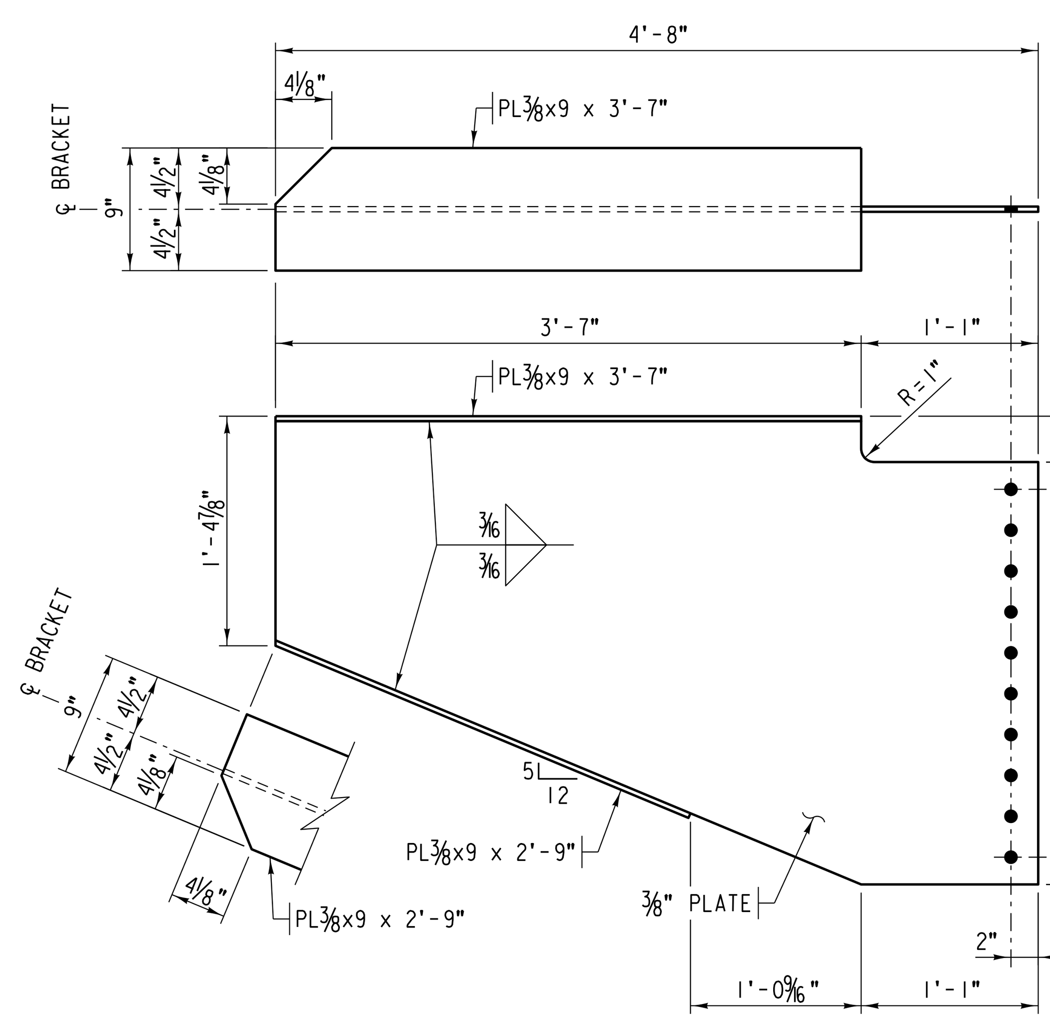
CONNECTION ANGLE A4
SCALE: 1"=1'-0"
EST. WT. = 48.0 LB. EA.



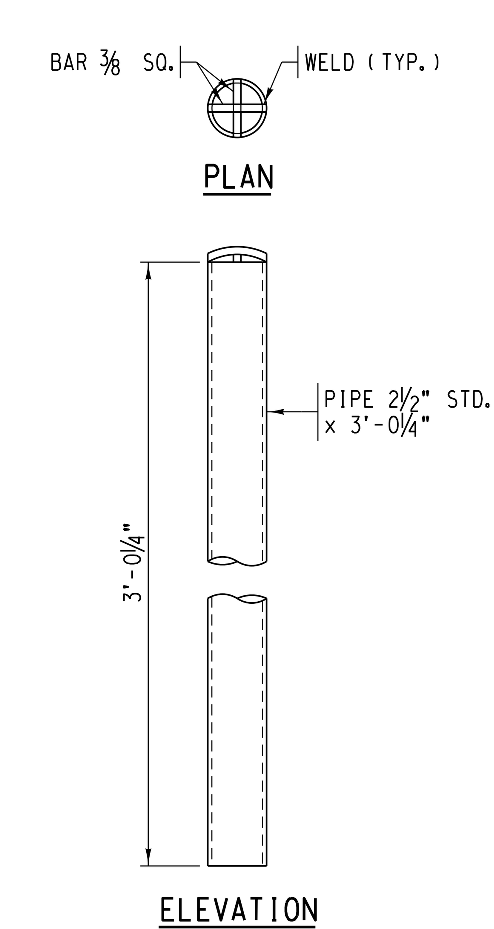
CONNECTION ANGLE A5
SCALE: 1"=1'-0"
EST. WT. = 4.3 LB. EA.



BRACKET B1
SCALE: 1"=1'-0"
EST. WT. = 180 LB. EA.



BRACKET B2
SCALE: 1"=1'-0"
EST. WT. = 230 LB. EA.



DRAIN PIPE SDP-10
SCALE: 1½"=1'-0"
EST. WT. = 21.0 LB. EA.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — 9/6/2023 (STATUS / DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F8 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

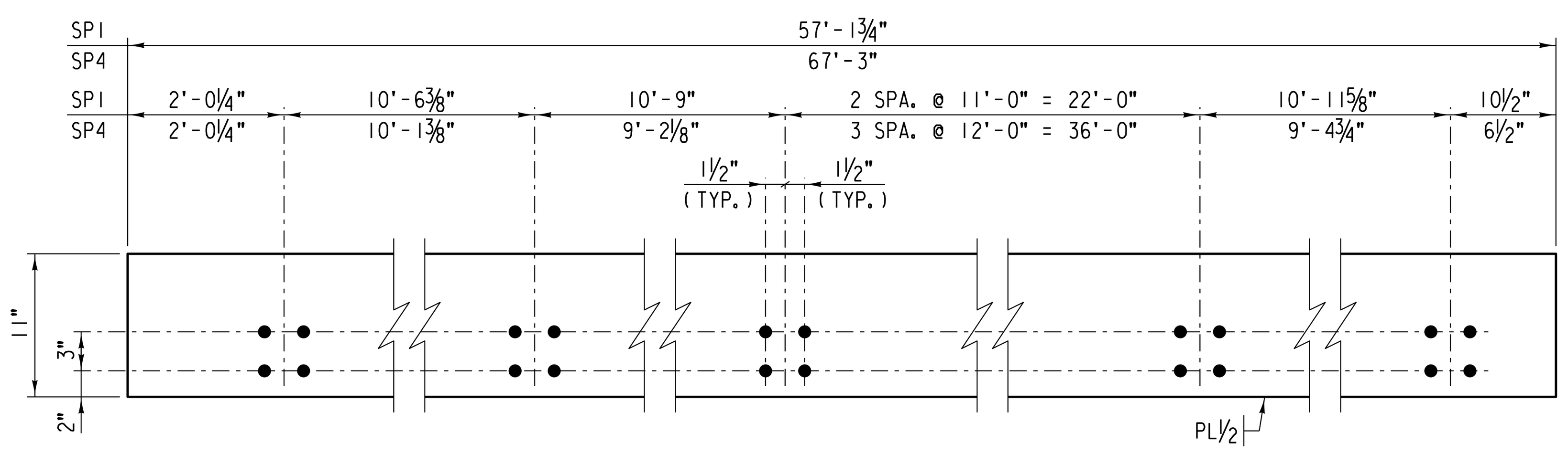
SHEET TITLE: BM SPAN - PIECE MARK DETAILS (1 OF 2)

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/dc08179_bia

PLOTTED: 9/12/2023 9:43:08 AM

DESIGN SHEET

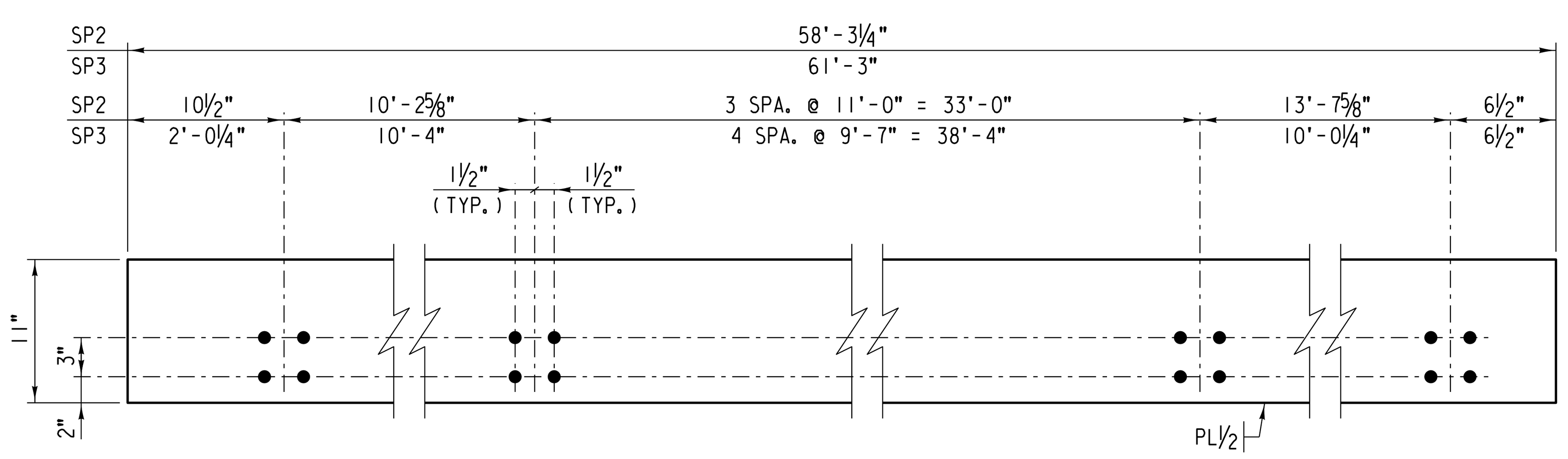
SHEET SIZE 22x34



DECK SUPPORT PLATE SP1 & SP4

SCALE: 1"=1'-0"

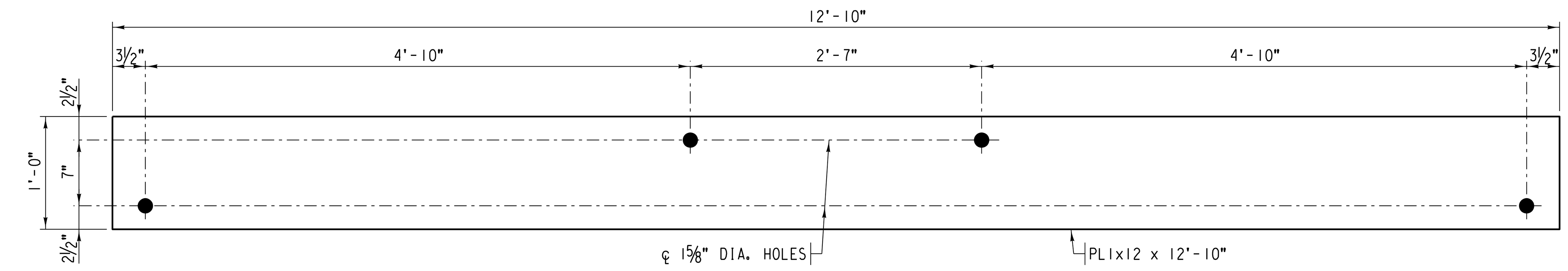
EST. WT. = 1,070 LB. EA. (SP1)
EST. WT. = 1,259 LB. EA. (SP4)



DECK SUPPORT PLATE SP2 & SP3

SCALE: 1"=1'-0"

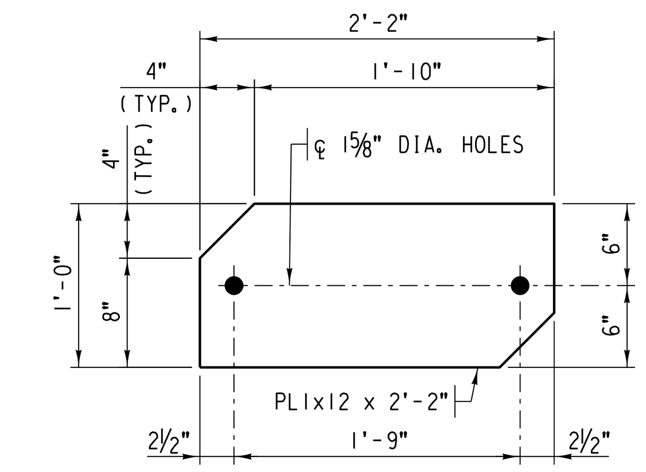
EST. WT. = 1,091 LB. EA. (SP2)
EST. WT. = 1,146 LB. EA. (SP3)



SOLE PLATE SP-1F

SCALE: 1"=1'-0"

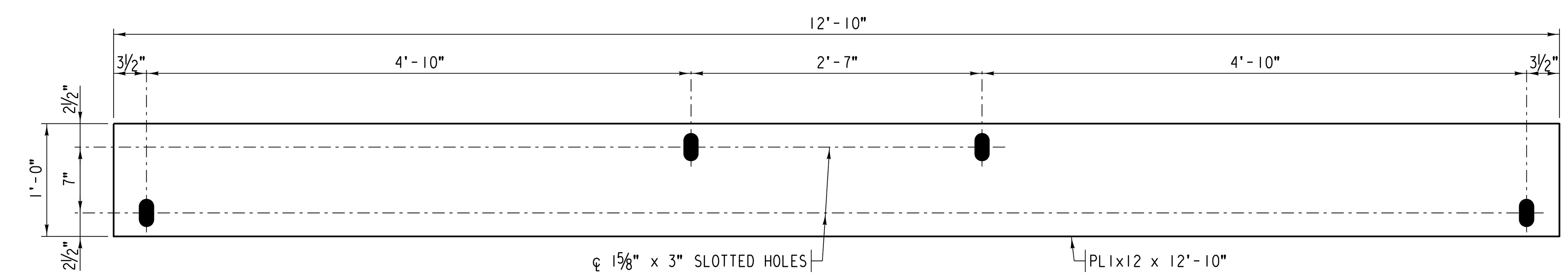
EST. WT. = 524 LB. EA.



SOLE PLATE SP-2F

SCALE: 1"=1'-0"

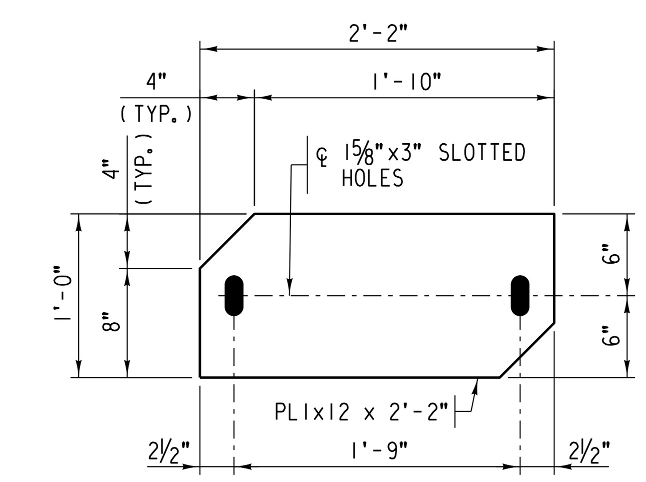
EST. WT. = 88.5 LB. EA.



SOLE PLATE SP-1E

SCALE: 1"=1'-0"

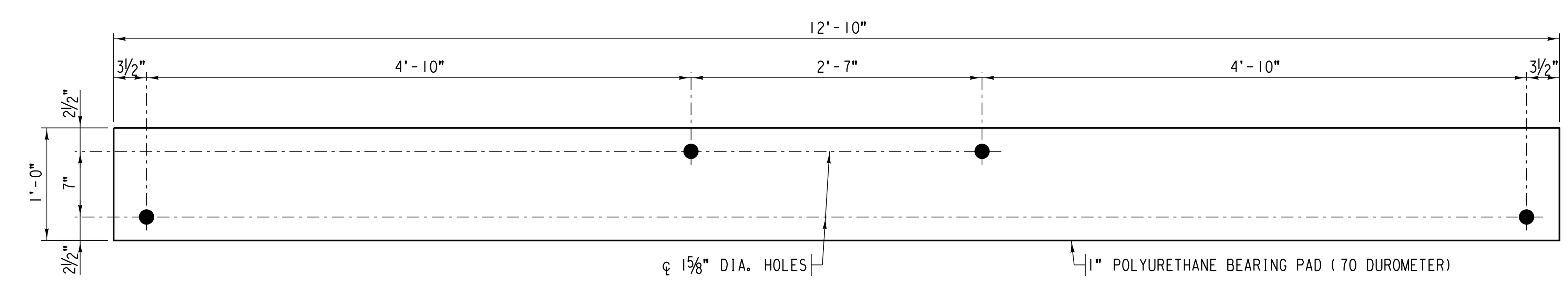
EST. WT. = 524 LB. EA.



SOLE PLATE SP-2E

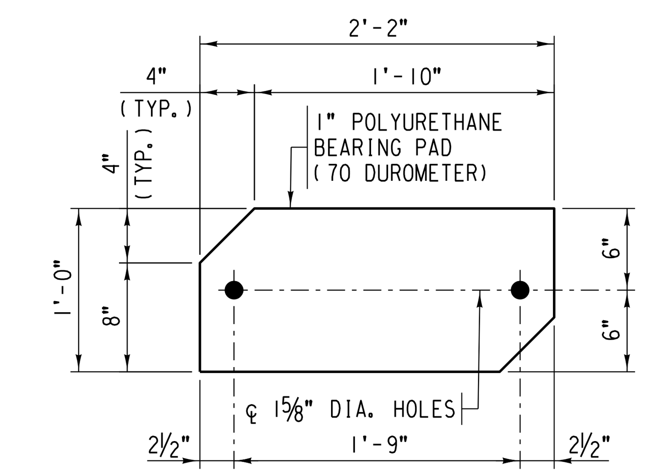
SCALE: 1"=1'-0"

EST. WT. = 88.5 LB. EA.



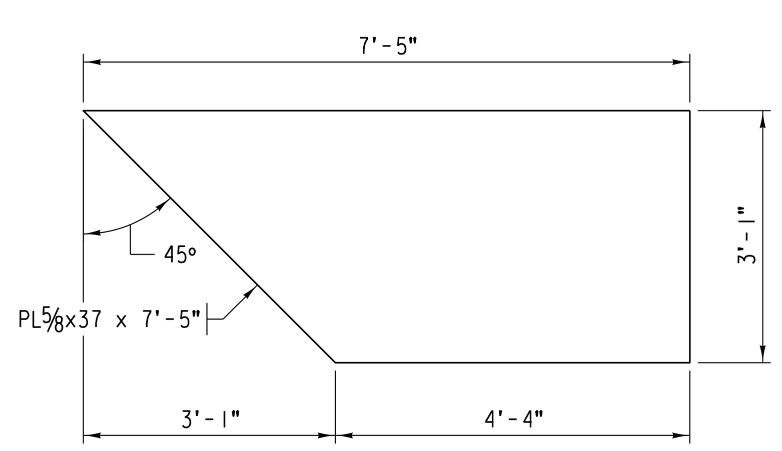
BEARING PAD BP-1

SCALE: 1"=1'-0"



BEARING PAD BP-2

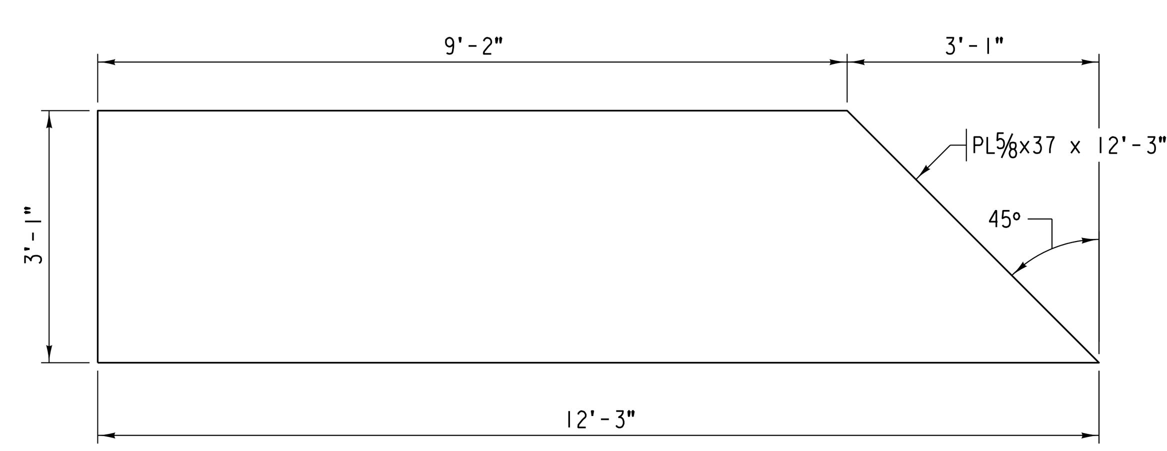
SCALE: 1"=1'-0"



DECK PLATE DP1

SCALE: ½"=1'-0"

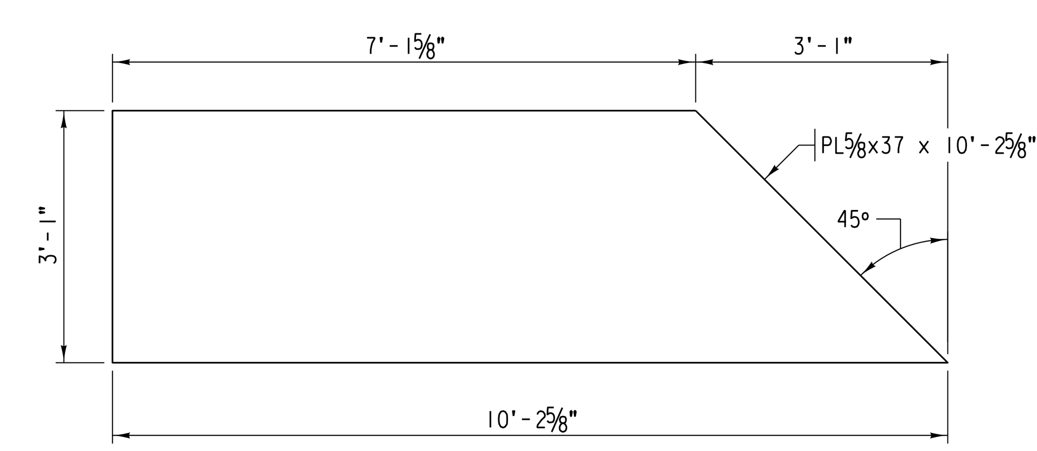
EST. WT. = 462 LB. EA.



DECK PLATE DP2

SCALE: ½"=1'-0"

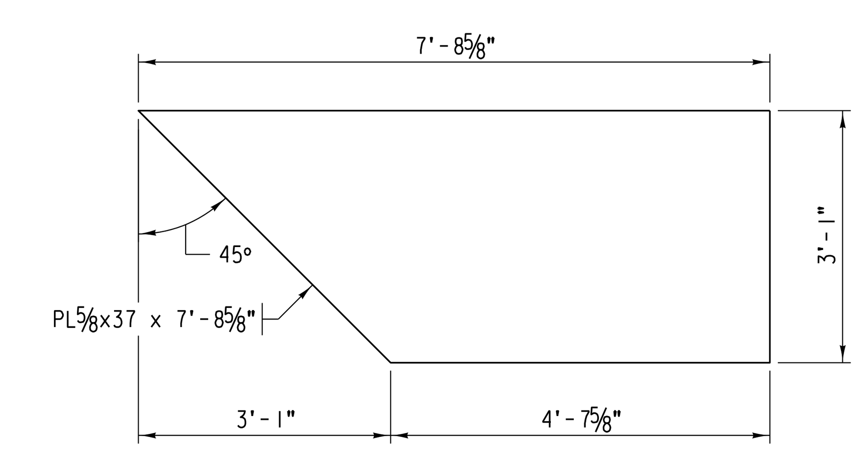
EST. WT. = 843 LB. EA.



DECK PLATE DP3

SCALE: ½"=1'-0"

EST. WT. = 683 LB. EA.



DECK PLATE DP4

SCALE: ½"=1'-0"

EST. WT. = 486 LB. EA.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:

FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS

DRAWN/CHK BY: TLO / ABB

UPRR ENGINEER: DEH

SHT NO.: F9 of F15

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB

5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

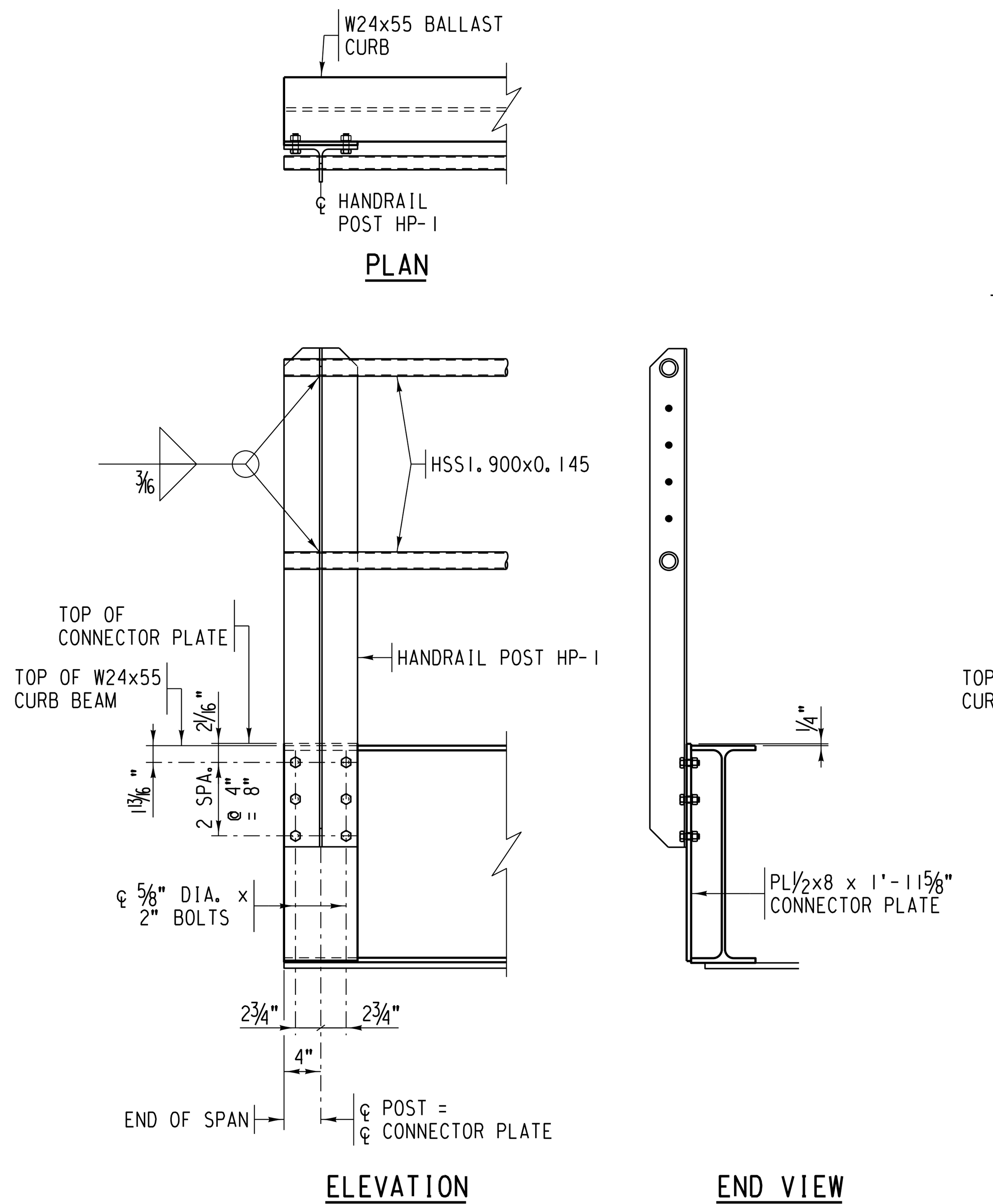
SHEET TITLE: BM SPAN - PIECE MARK DETAILS (2 OF 2)

FILE NAME: pw://hqpwint01.ae-transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC1011101230111/Bridge/Sheets/B 81.79/dc8179_bis

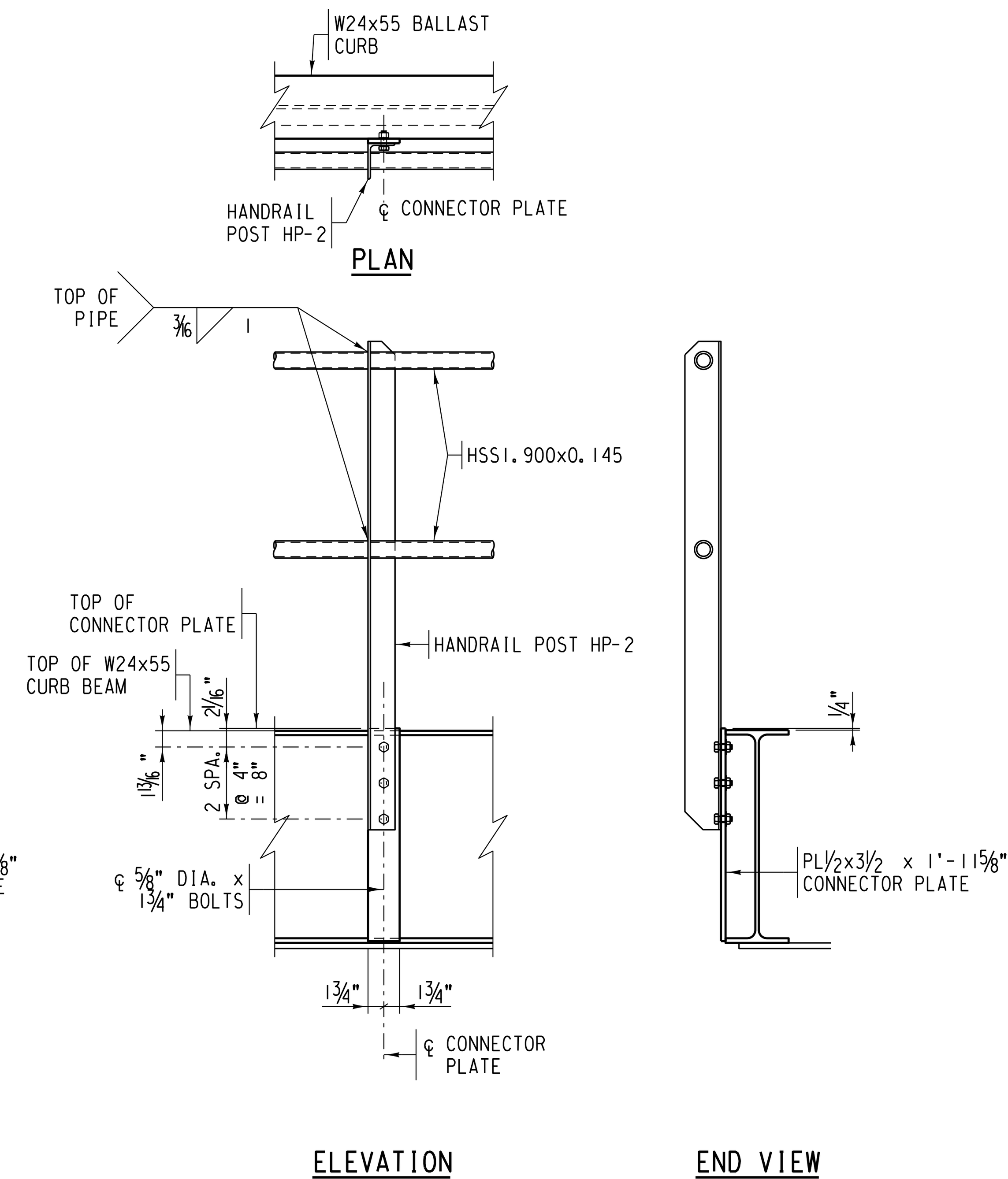
PLOTTED: 9/12/2023 9:43:09 AM

DESIGN SHEET

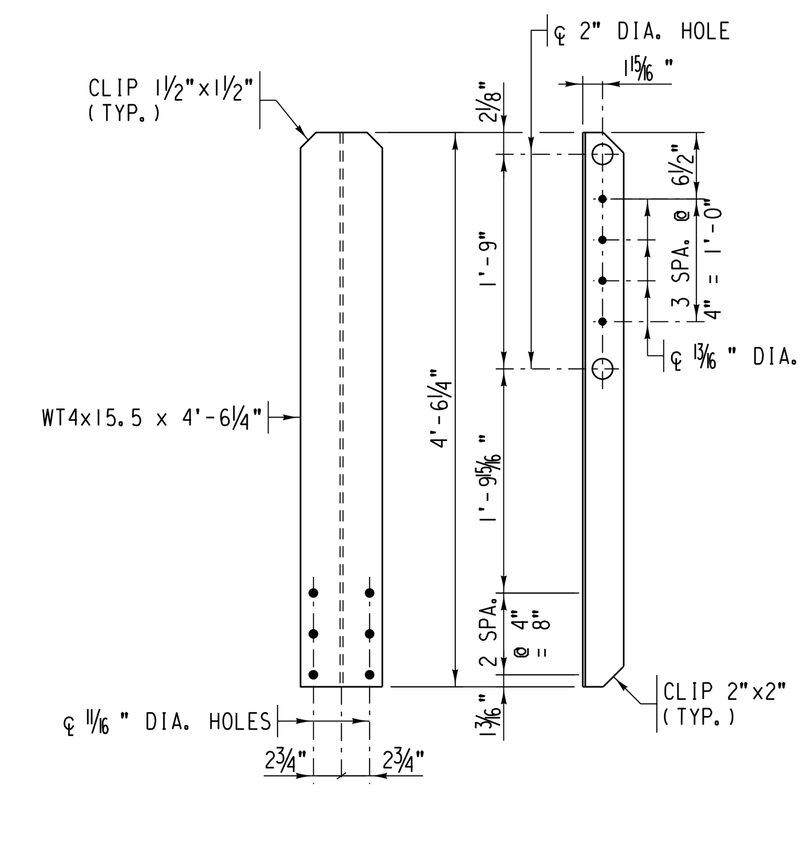
SHEET SIZE 22x34



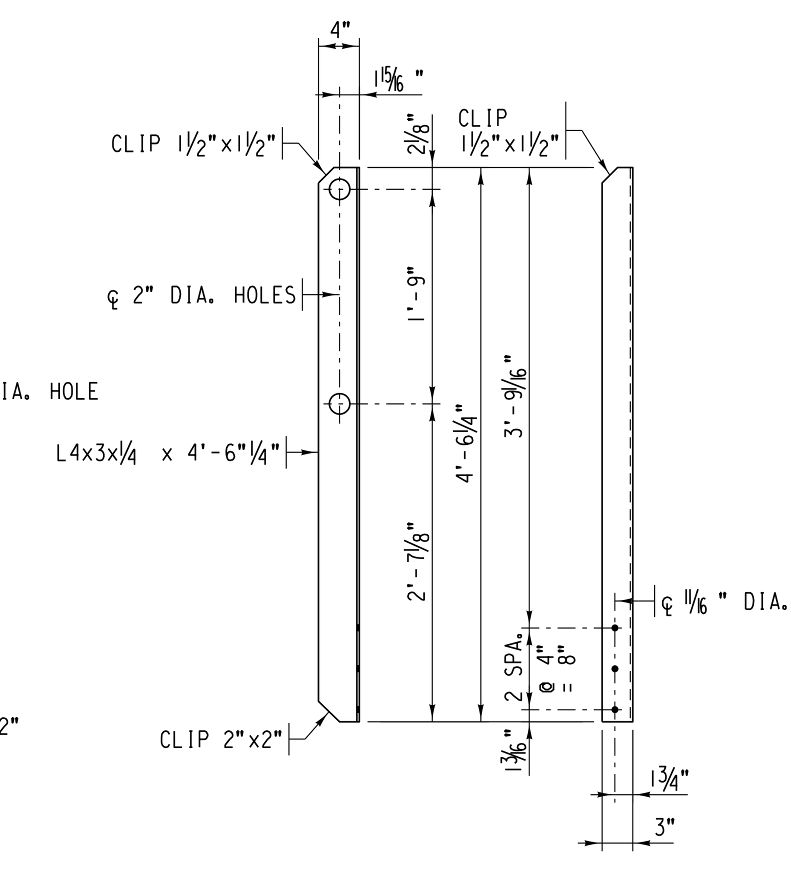
END HANDRAIL POST
SCALE: 3/4"=1'-0"



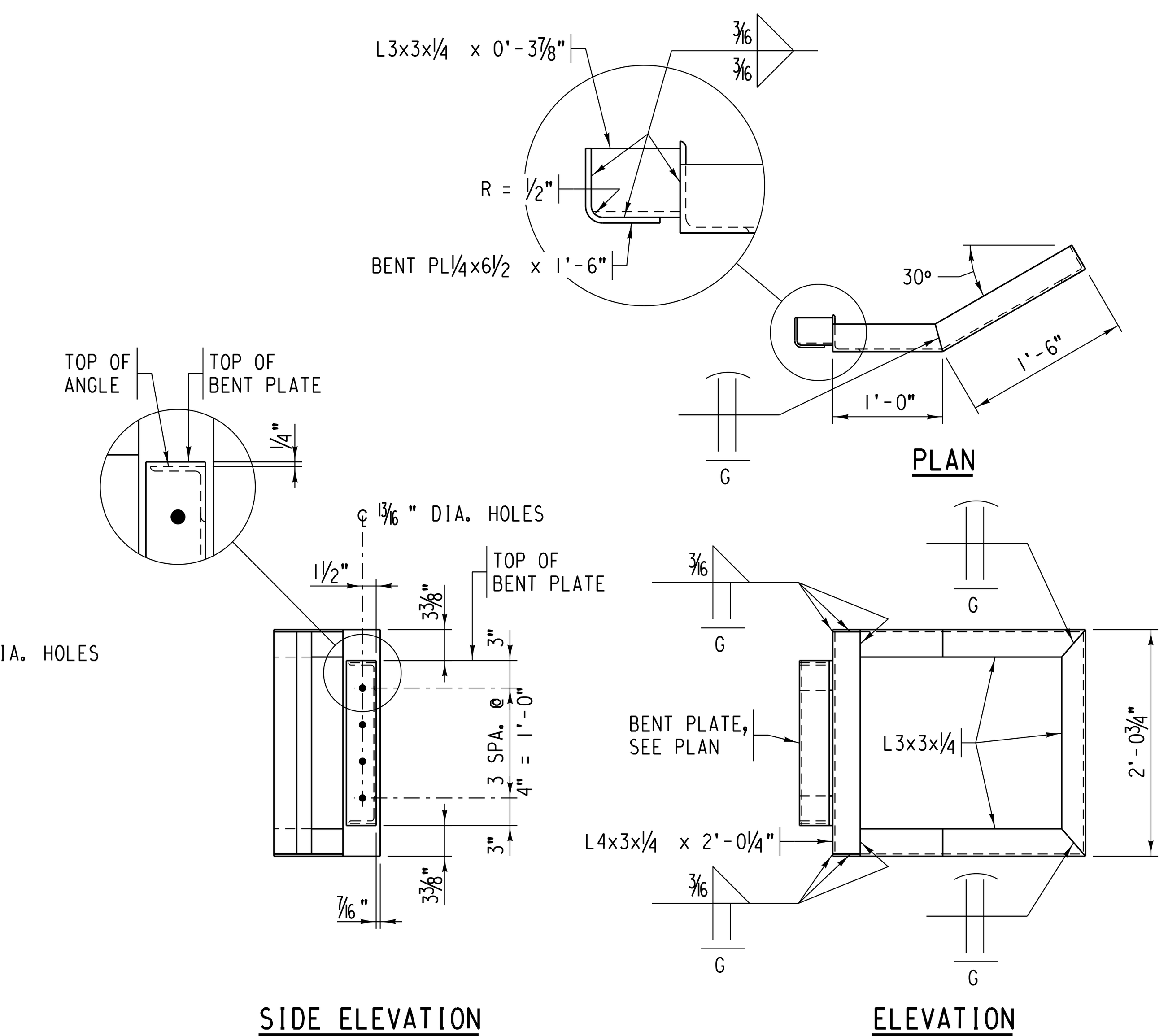
INTERIOR HANDRAIL POST
SCALE: 3/4"=1'-0"



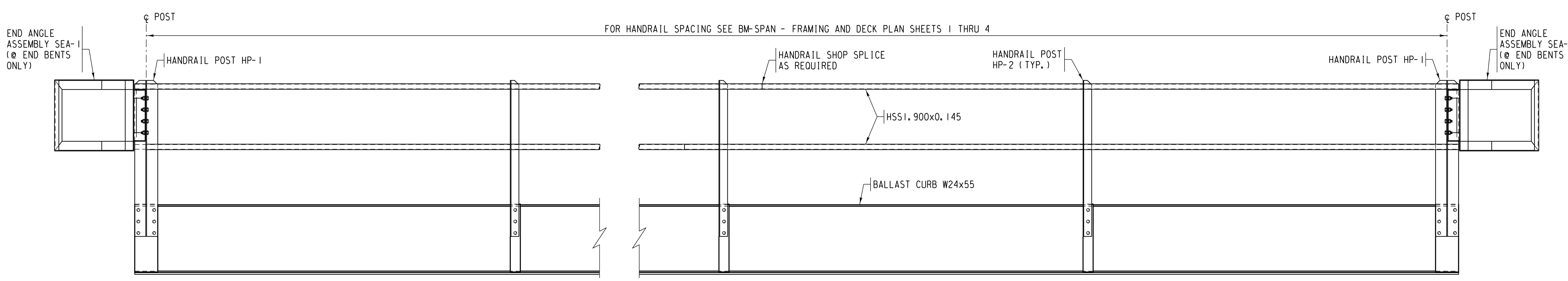
HANDRAIL POST HP-1
SCALE: 3/4"=1'-0"
EST. WT. = 70.1 LB. EA.



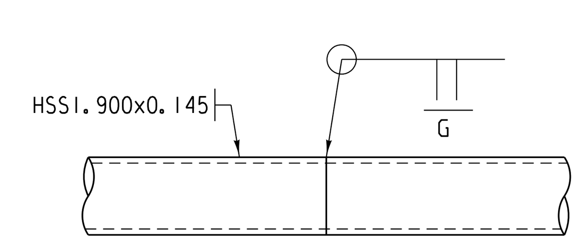
HANDRAIL POST HP-2
SCALE: 3/4"=1'-0"
EST. WT. = 26.2 LB. EA.



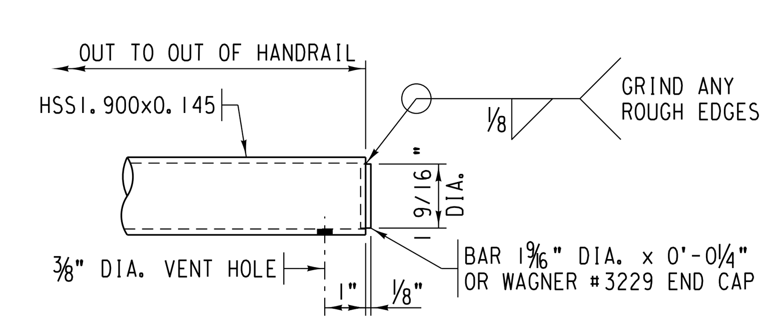
END ANGLE ASSEMBLY SEA-1
SCALE: 3/4"=1'-0"
EST. WT. = 56.0 LB. EA.



HANDRAIL ASSEMBLY DETAIL
SCALE: 1/2"=1'-0"



HANDRAIL SPLICE
SCALE: 3"=1'-0"



END CLOSURE DETAIL
SCALE: 3"=1'-0"

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY: DESIGN ENGINEER OF RECORD — 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F10 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

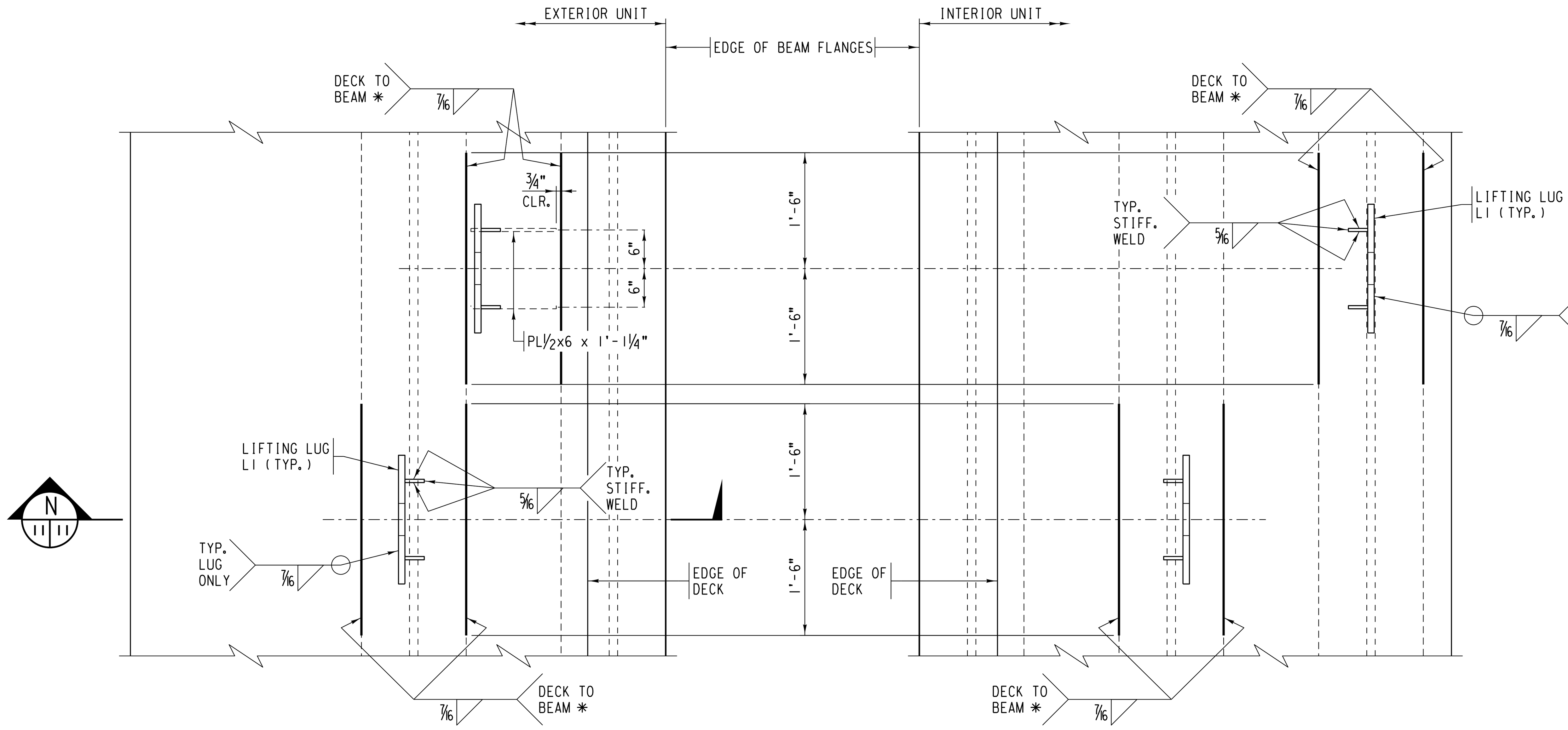
SHEET TITLE: BM SPAN - HANDRAIL DETAILS

PLOTTED: 9/12/2023 9:43:09 AM

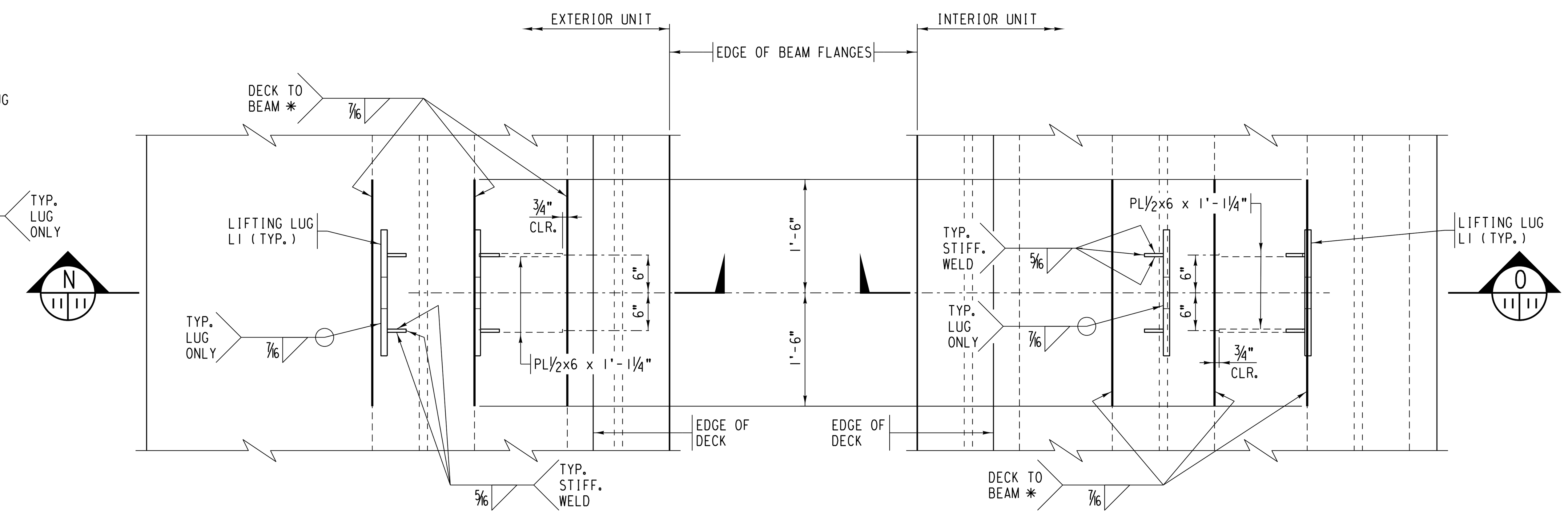
FILE NAME: pw://hq-pwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/10123011/Bridge/Sheets/Br 81.79/cln08179_bia

DESIGN SHEET

SHEET SIZE 22x34



CONFIGURATION 1



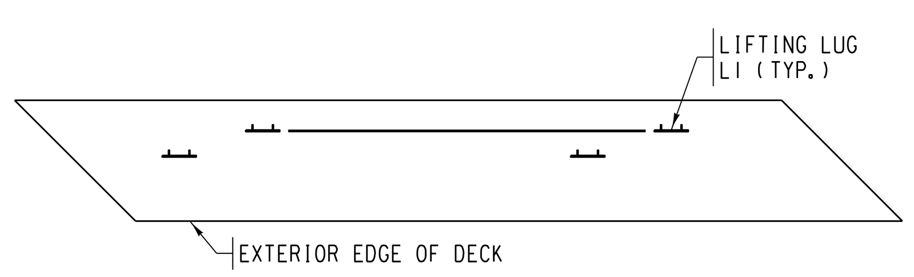
CONFIGURATION 2

LIFTING LUG LAYOUT

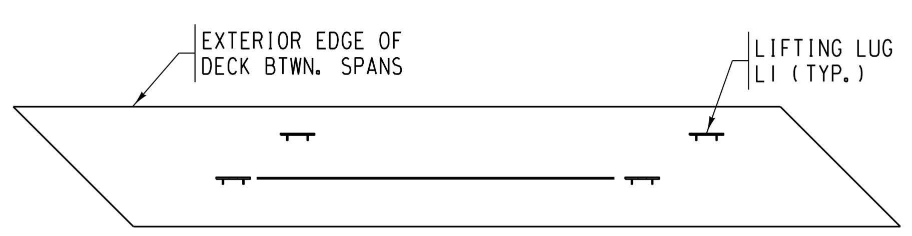
SCALE: ¾"=1'-0"

NOTES:
✱LOCALIZED DECK TO BEAM WELD IS IN LIEU OF NORMAL 5⁄16" FILLET WELD.

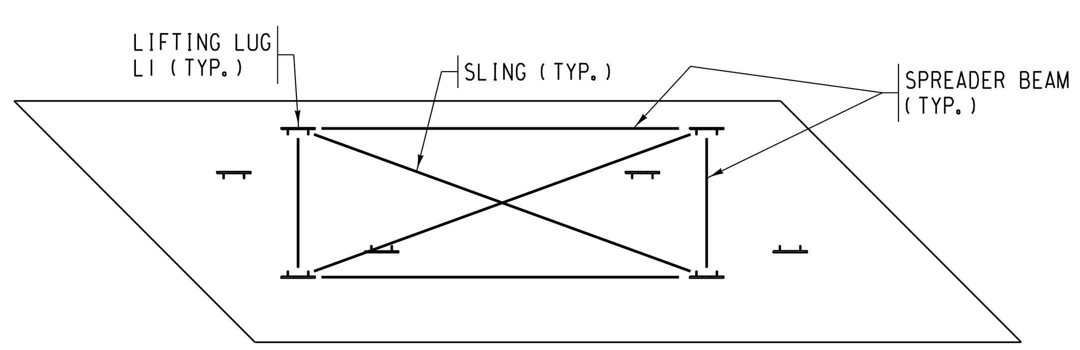
LIFTING LUG CONFIGURATIONS SHOWN ARE REPRESENTATIVE OF LAYOUTS FROM THE DECK PLANS OF SHEETS F1 THRU F4. CONCEPTS SHOWN SHALL BE APPLIED TO LIFTING LUG CONFIGURATIONS NOT EXPLICITLY DETAILED HERE.



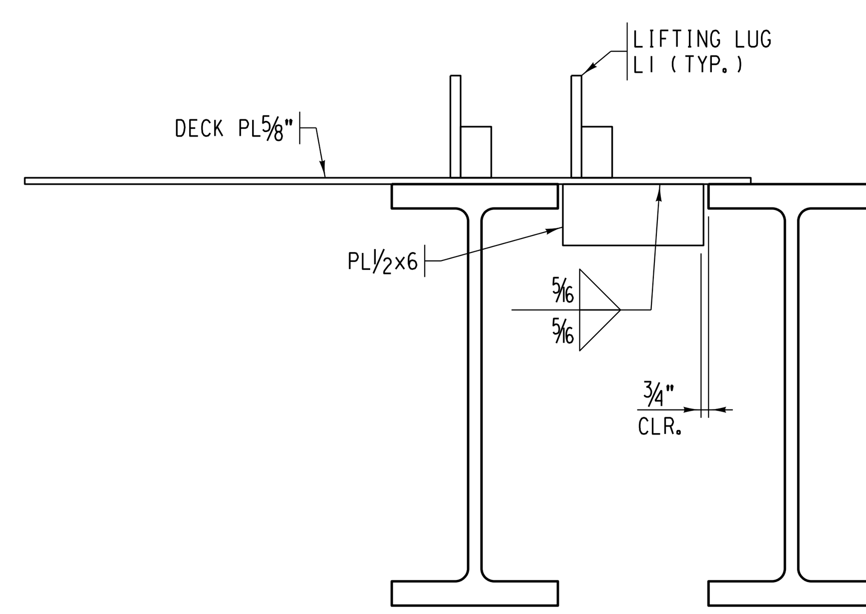
PLAN - EXTERIOR UNIT (2 - POINT PICKUP)



PLAN - INTERIOR UNIT (2 - POINT PICKUP)



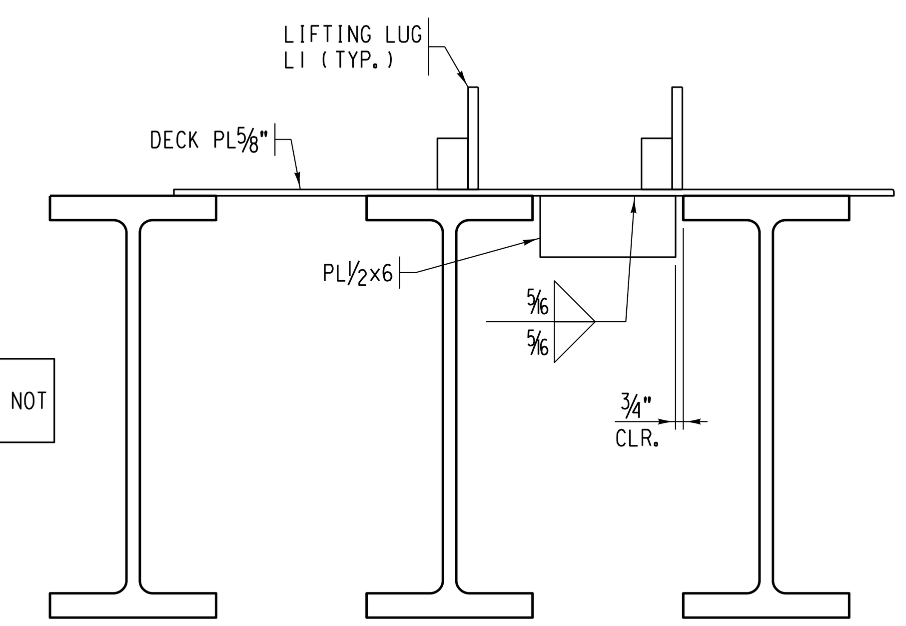
PLAN - ASSEMBLED SPAN (4 - POINT PICKUP)



NOTE:
DIAPHRAGMS AND CURB NOT SHOWN FOR CLARITY.

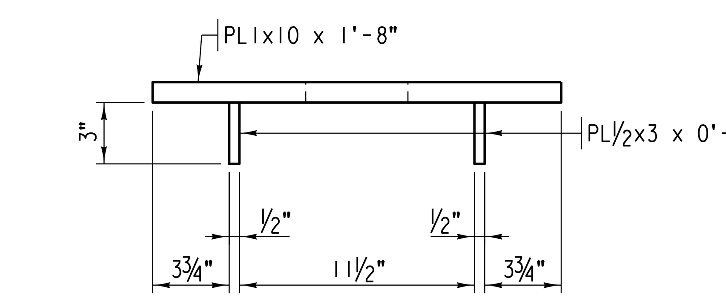
SECTION N

SCALE: ¾"=1'-0"

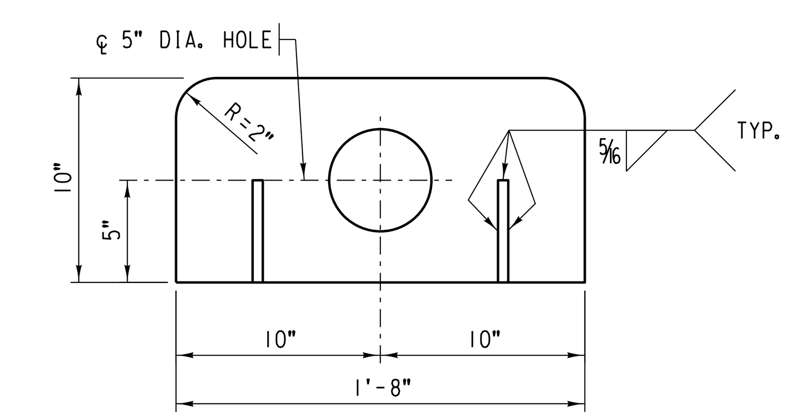


SECTION O

SCALE: ¾"=1'-0"



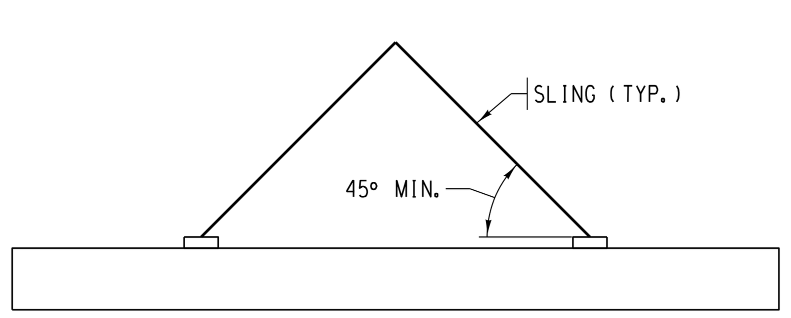
PLAN



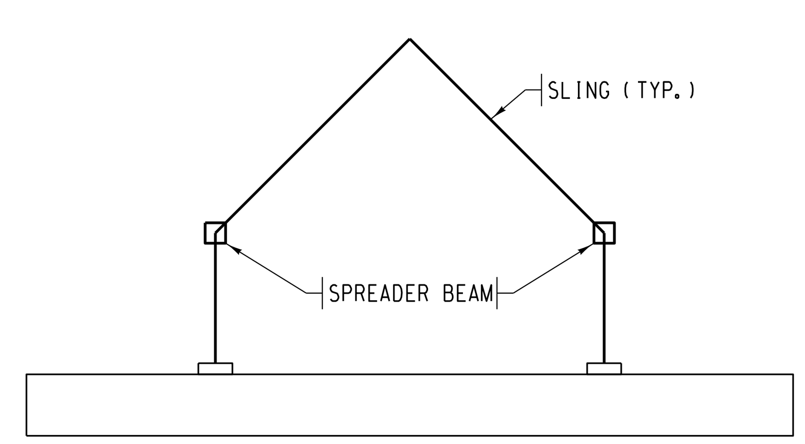
ELEVATION

LIFTING LUG - L1

SCALE: 1½"=1'-0"



2 - POINT PICK ELEVATION



4 - POINT PICK ELEVATION

LIFTING DIAGRAMS

NO SCALE

NOTES:
LIFTING LINES MUST BE VERTICAL FOR 4-POINT PICK OF FULL SPAN.

CONFIGURATIONS FOR UNITS 2 & 3 SHOWN, UNIT 1 SIMILAR.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL (STATUS) — 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:

DESIGN ENGINEER OF RECORD — 9/6/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

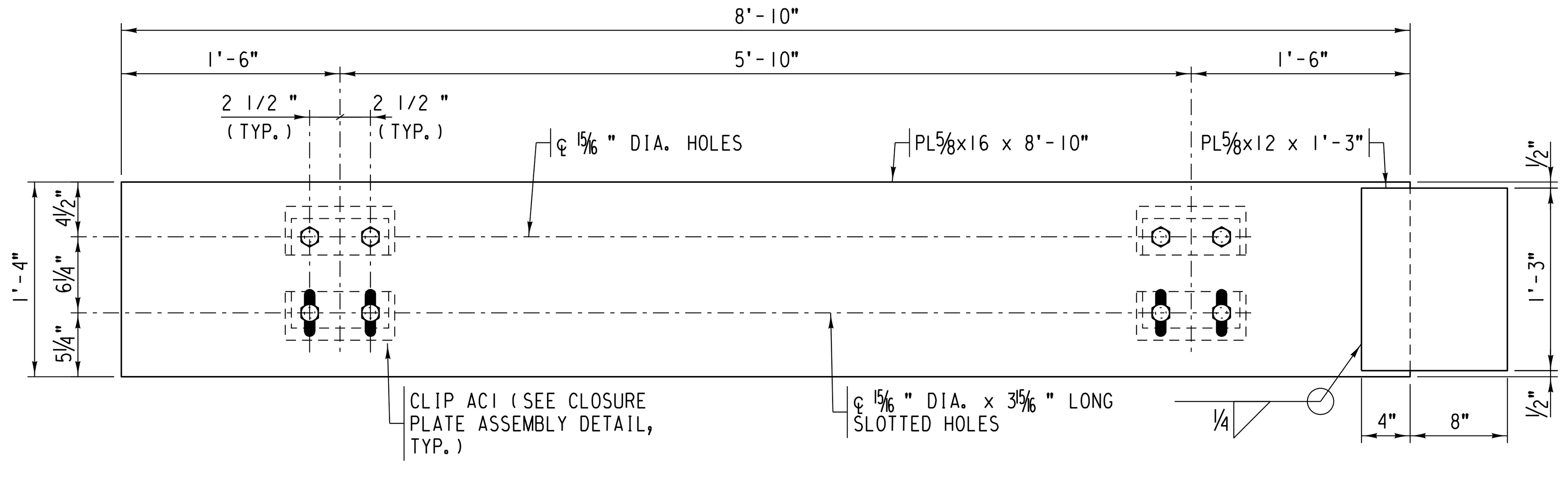
LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC

DSN/CHK BY: AS / NJS	**UNION PACIFIC RAILROAD** Office of Director Structures Design
DRAWN/CHK BY: TLO / ABB	LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB — 5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)
UPRR ENGINEER: DEH	
SHT NO.: F11 of F15	SHEET TITLE: BM SPAN - LIFTING LUG DETAILS

FILE NAME: pw://hq-pwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/cln08179_bia

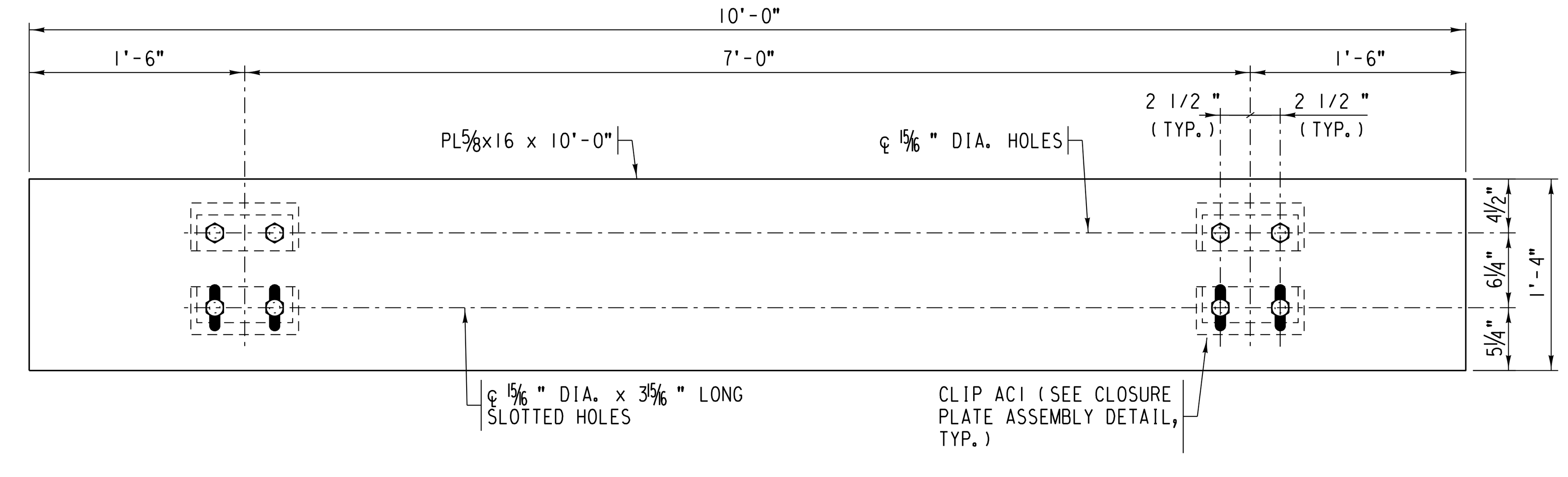
PLOTTED: 9/12/2023 9:43:09 AM



CLOSURE PLATE ASSEMBLY CPA-1

SCALE: 1"=1'-0"

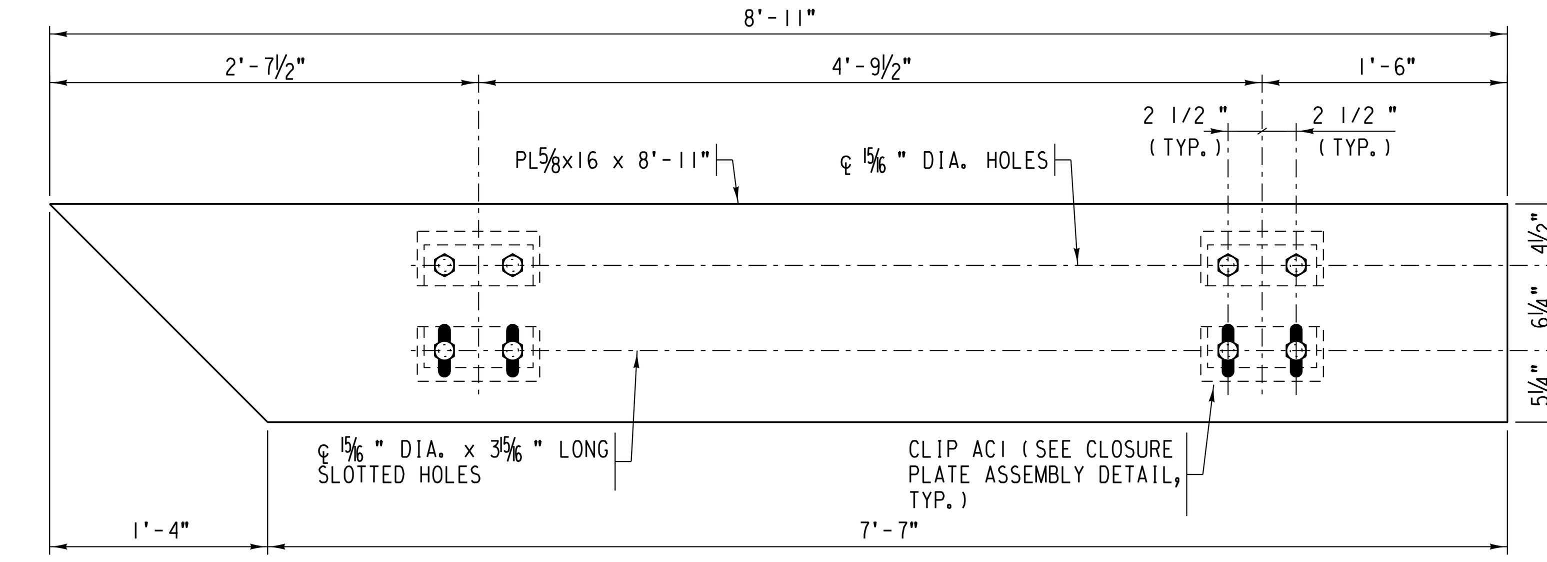
EST. WT. = 391 LB. EA.
GALVANIZE AFTER FABRICATION



CLOSURE PLATE ASSEMBLY CPA-2

SCALE: 1"=1'-0"

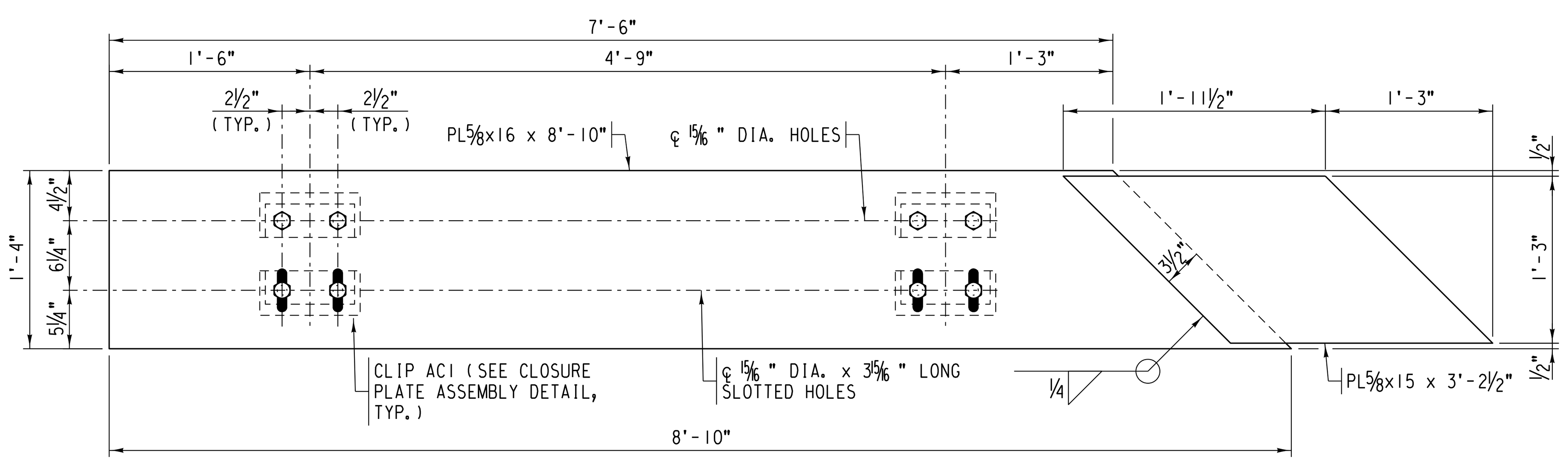
EST. WT. = 398 LB. EA.
GALVANIZE AFTER FABRICATION



CLOSURE PLATE ASSEMBLY CPA-5

SCALE: 1"=1'-0"

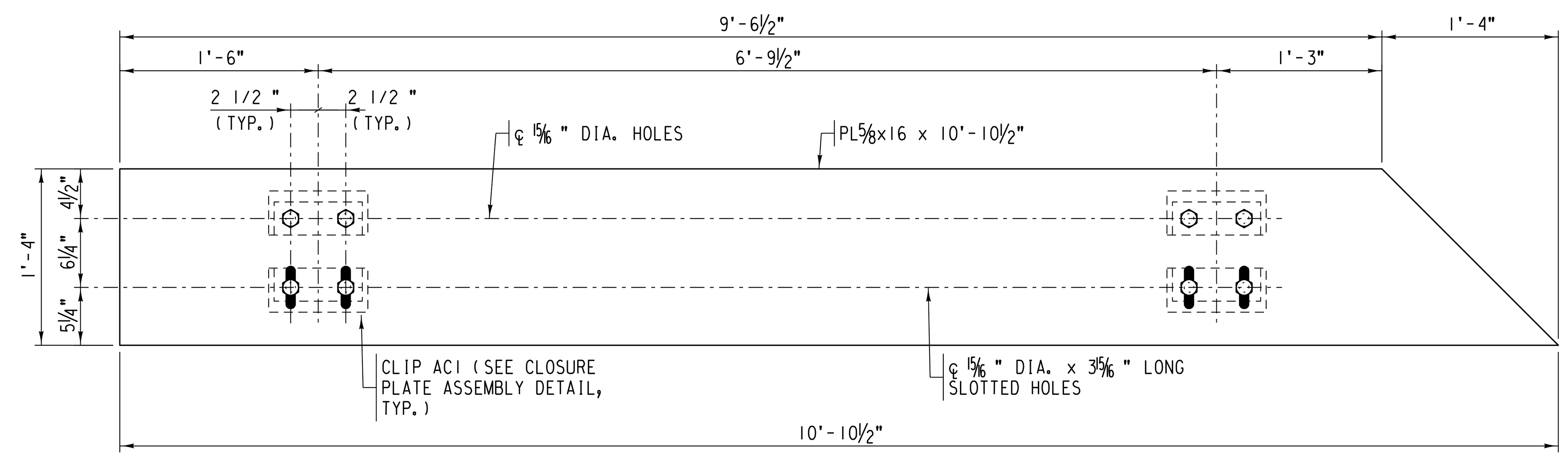
EST. WT. = 339 LB. EA.
GALVANIZE AFTER FABRICATION



CLOSURE PLATE ASSEMBLY CPA-3

SCALE: 1"=1'-0"

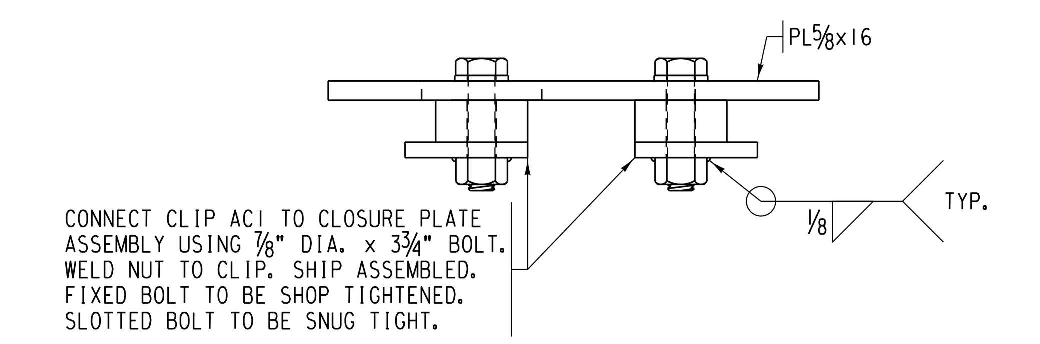
EST. WT. = 398 LB. EA.
GALVANIZE AFTER FABRICATION



CLOSURE PLATE ASSEMBLY CPA-4

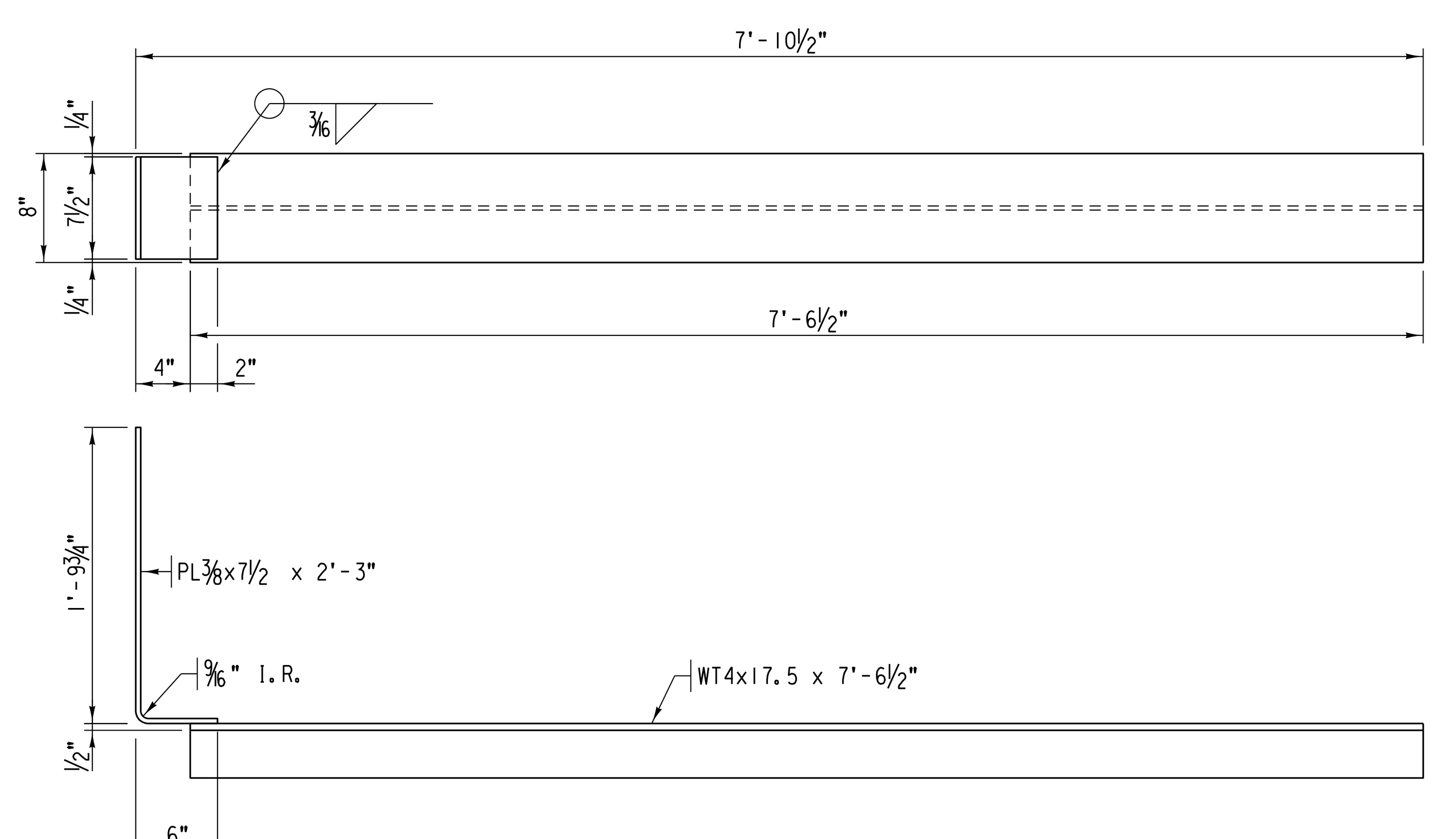
SCALE: 1"=1'-0"

EST. WT. = 405 LB. EA.
GALVANIZE AFTER FABRICATION



CLOSURE PLATE ASSEMBLY DETAIL

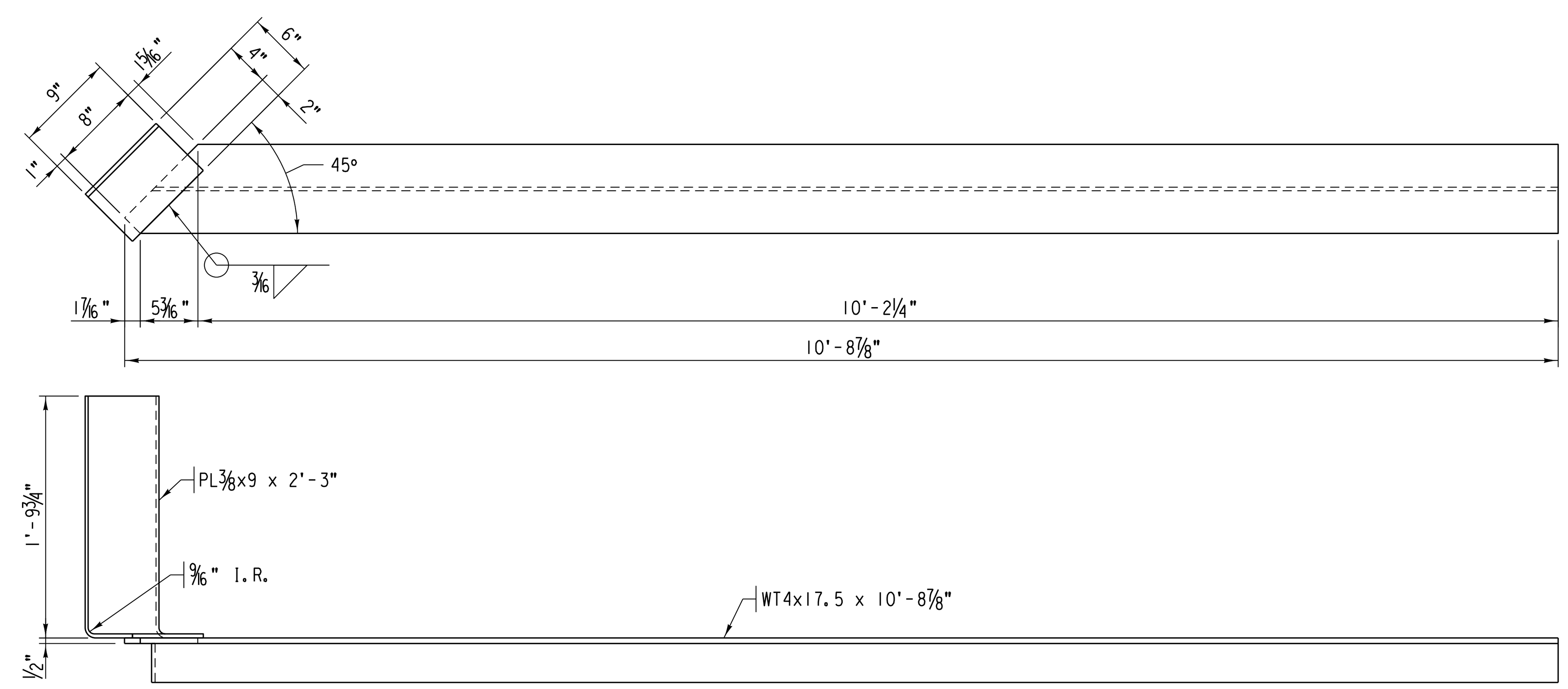
SCALE: 3"=1'-0"



COVER PLATE CP-1

SCALE: 1"=1'-0"

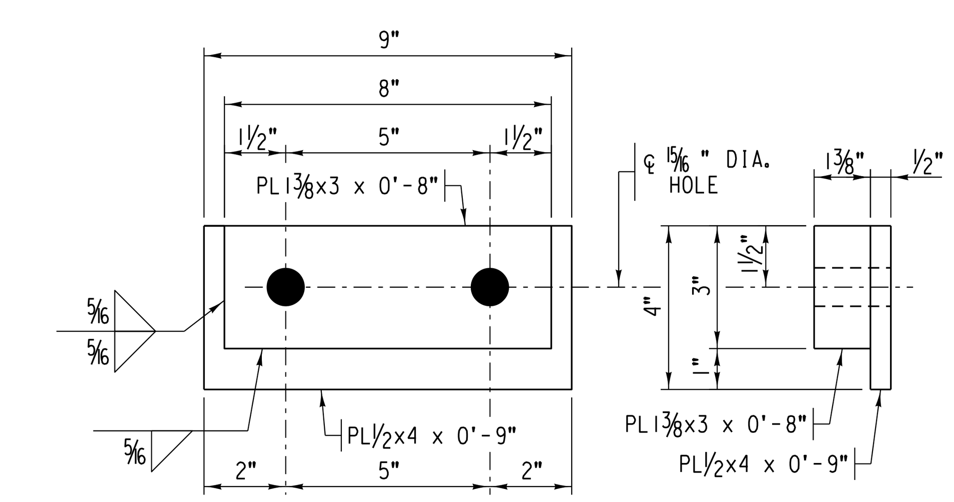
EST. WT. = 152 LB. EA.
GALVANIZE AFTER FABRICATION



COVER PLATE CP-4

SCALE: 1"=1'-0"

EST. WT. = 214 LB. EA.
GALVANIZE AFTER FABRICATION

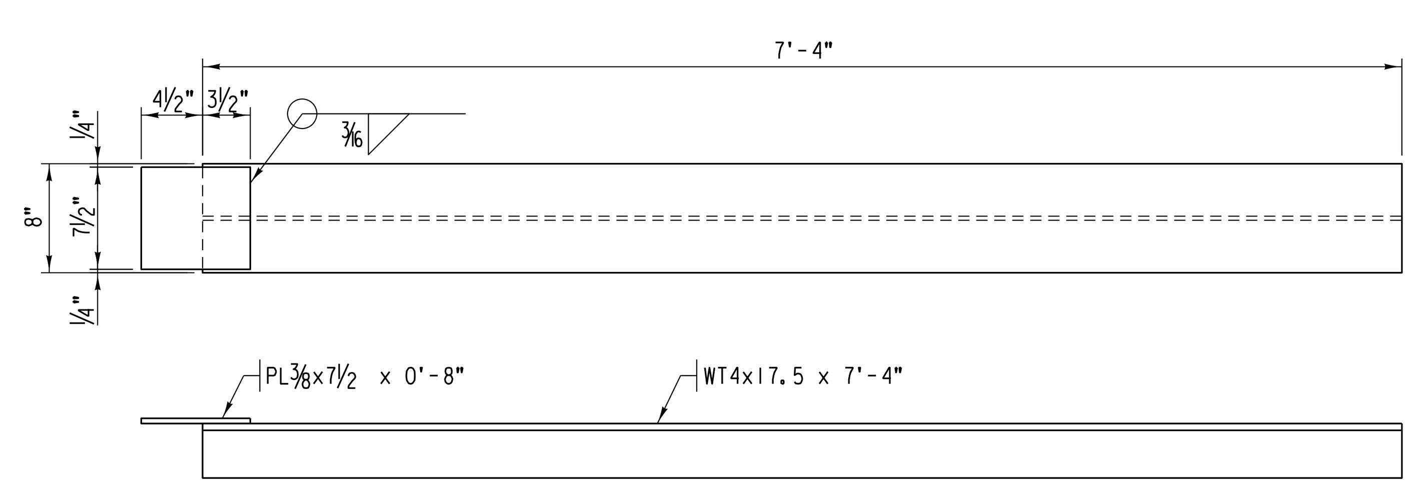


CLIP AC1

SCALE: 3"=1'-0"

EST. WT. = 14.5 LB. EA.
GALVANIZE AFTER FABRICATION

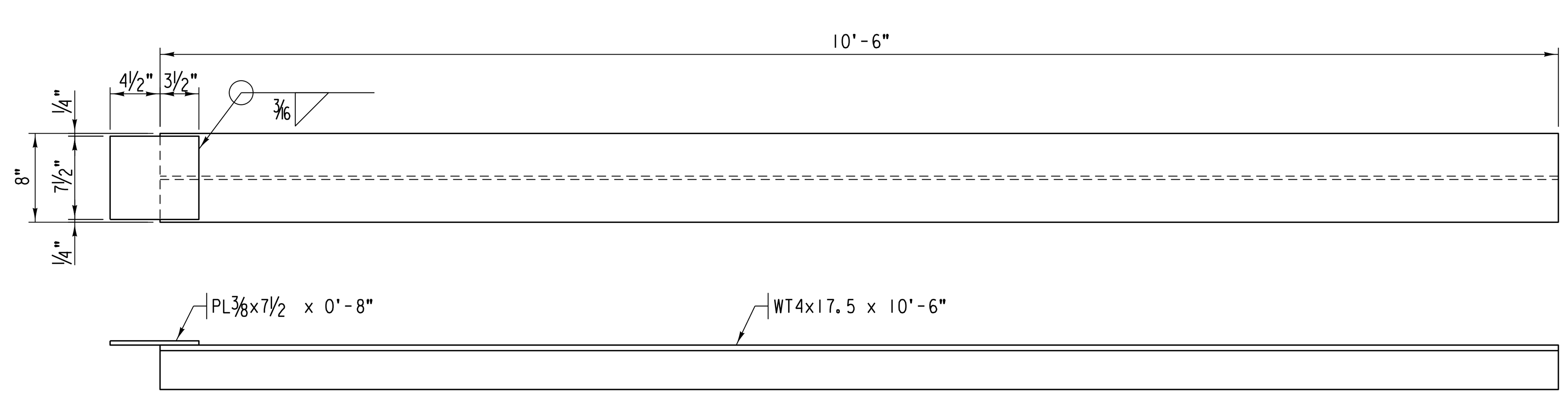
NOTE:
STEEL FOR COVER PLATES AND CLOSURE PLATE ASSEMBLIES SHALL BE PER ASTM A36, GALVANIZED. FOR ADDITIONAL MISCELLANEOUS STEEL NOTES, SEE STD. PLAN NO. 531100 SHT. T3.



COVER PLATE CP-2

SCALE: 1"=1'-0"

EST. WT. = 135 LB. EA.
GALVANIZE AFTER FABRICATION



COVER PLATE CP-3

SCALE: 1"=1'-0"

EST. WT. = 190 LB. EA.
GALVANIZE AFTER FABRICATION

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE: 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — DATE: 9/6/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

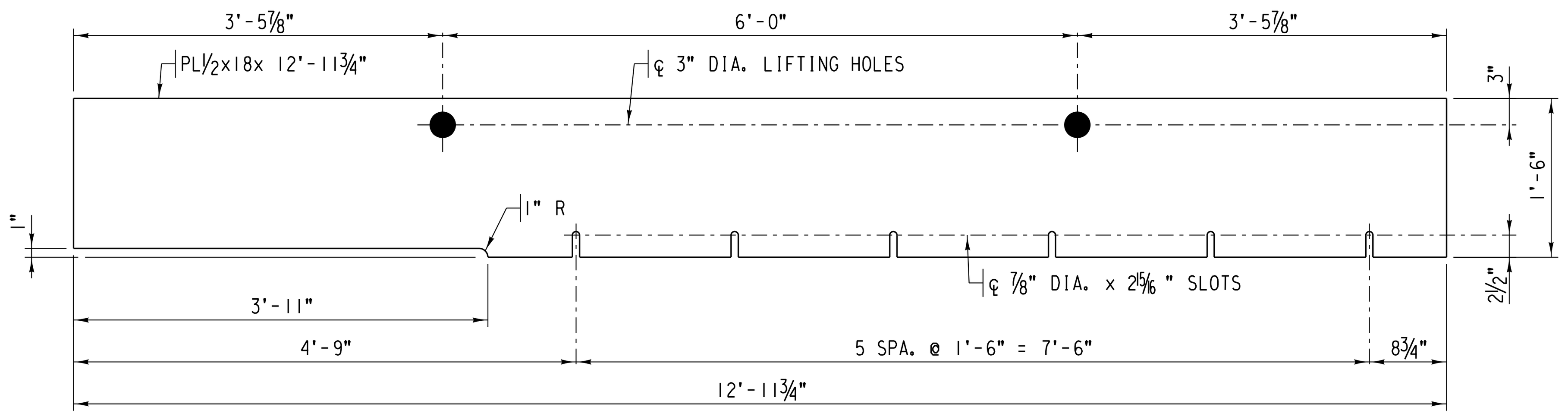
DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F12 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

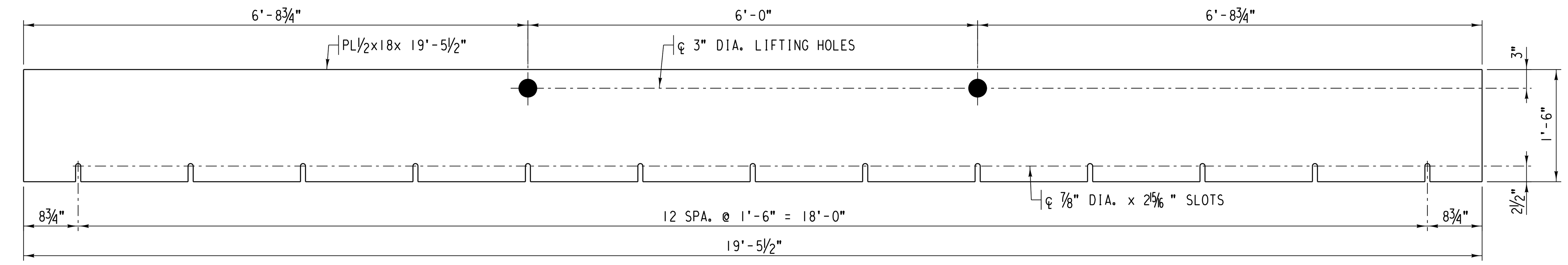
LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: BM SPAN - COVER PLATE AND CLOSURE DETAILS

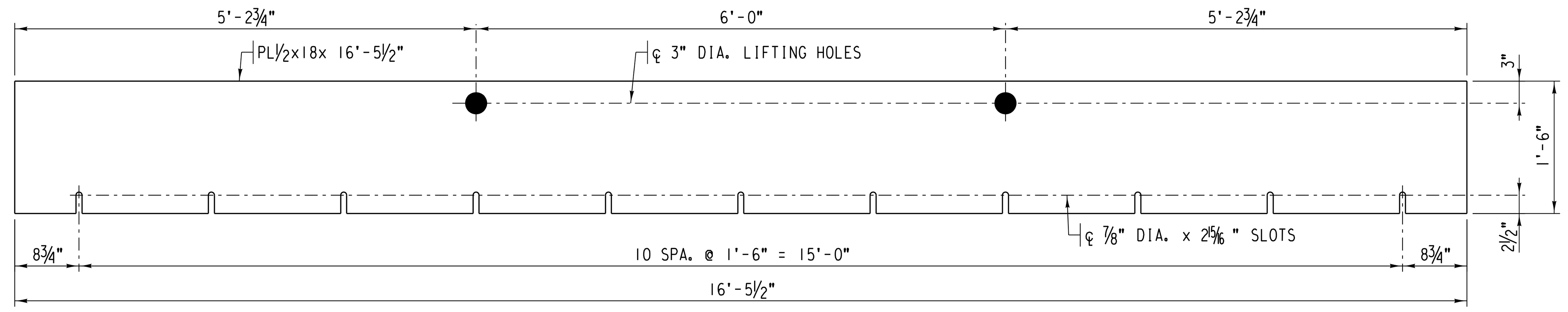
DESIGN SHEET



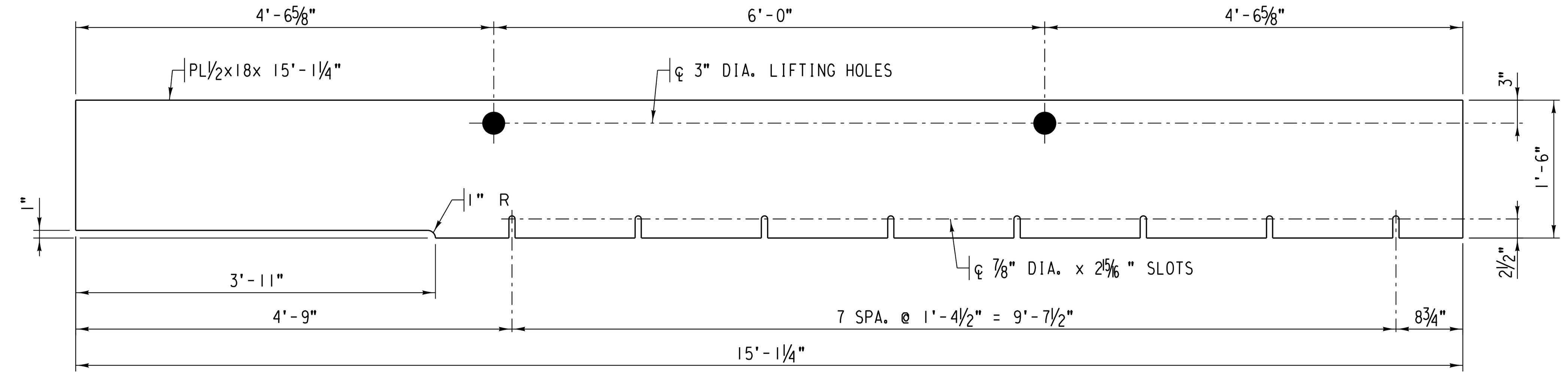
TEMPORARY BALLAST RETAINER BR-1
SCALE: ¾"=1'-0"
EST. WT. = 391 LB. EA.



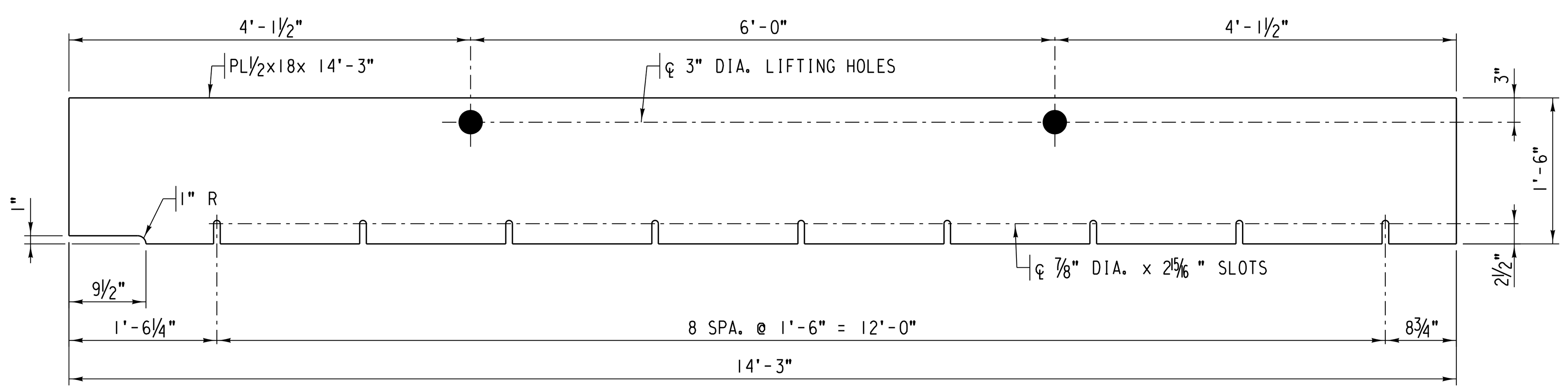
TEMPORARY BALLAST RETAINER BR-4
SCALE: ¾"=1'-0"
EST. WT. = 596 LB. EA.



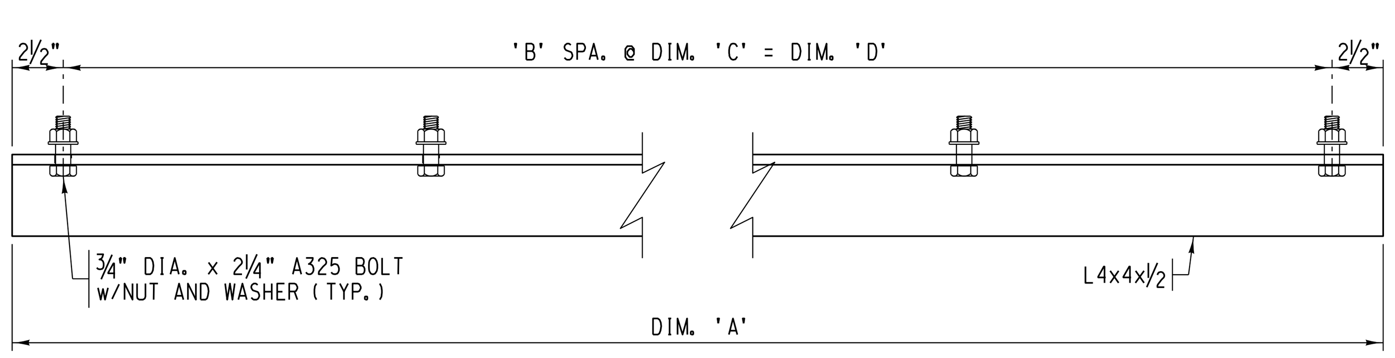
TEMPORARY BALLAST RETAINER BR-2
SCALE: ¾"=1'-0"
EST. WT. = 504 LB. EA.



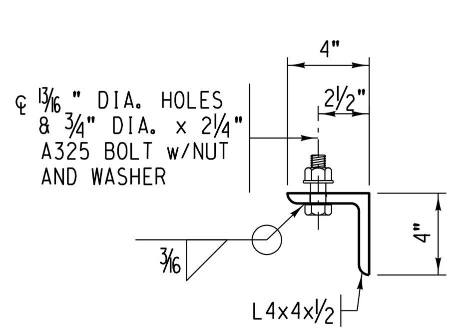
TEMPORARY BALLAST RETAINER BR-5
SCALE: ¾"=1'-0"
EST. WT. = 456 LB. EA.



TEMPORARY BALLAST RETAINER BR-3
SCALE: ¾"=1'-0"
EST. WT. = 435 LB. EA.



PLAN



SECTION

BALLAST ANGLE DETAILS
SCALE: 1½"=1'-0"

BALLAST ANGLE TABLE OF DIMENSIONS AND WEIGHT					
ANGLE	DIM. A	'B' SPA.	DIM. 'C'	DIM. 'D'	EST. WT. LB. EA.
BA-1	7'-11"	5	1'-6"	7'-6"	101
BA-2	15'-5"	10	1'-6"	15'-0"	197
BA-3	12'-5"	8	1'-6"	12'-0"	159
BA-4	18'-5"	12	1'-6"	18'-0"	236
BA-5	10'-0½"	7	1'-4½"	9'-7½"	129

NOTE:
STEEL FOR TEMPORARY BALLAST RETAINERS AND ANGLES SHALL BE PER ASTM A36, PLAIN. FOR ADDITIONAL MISCELLANEOUS STEEL NOTES, SEE STD. PLAN NO. 531100 SHT. T3.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID: 117429 | WORK ORDER: 58028 | C E NUMBER: 122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F13 of F15

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

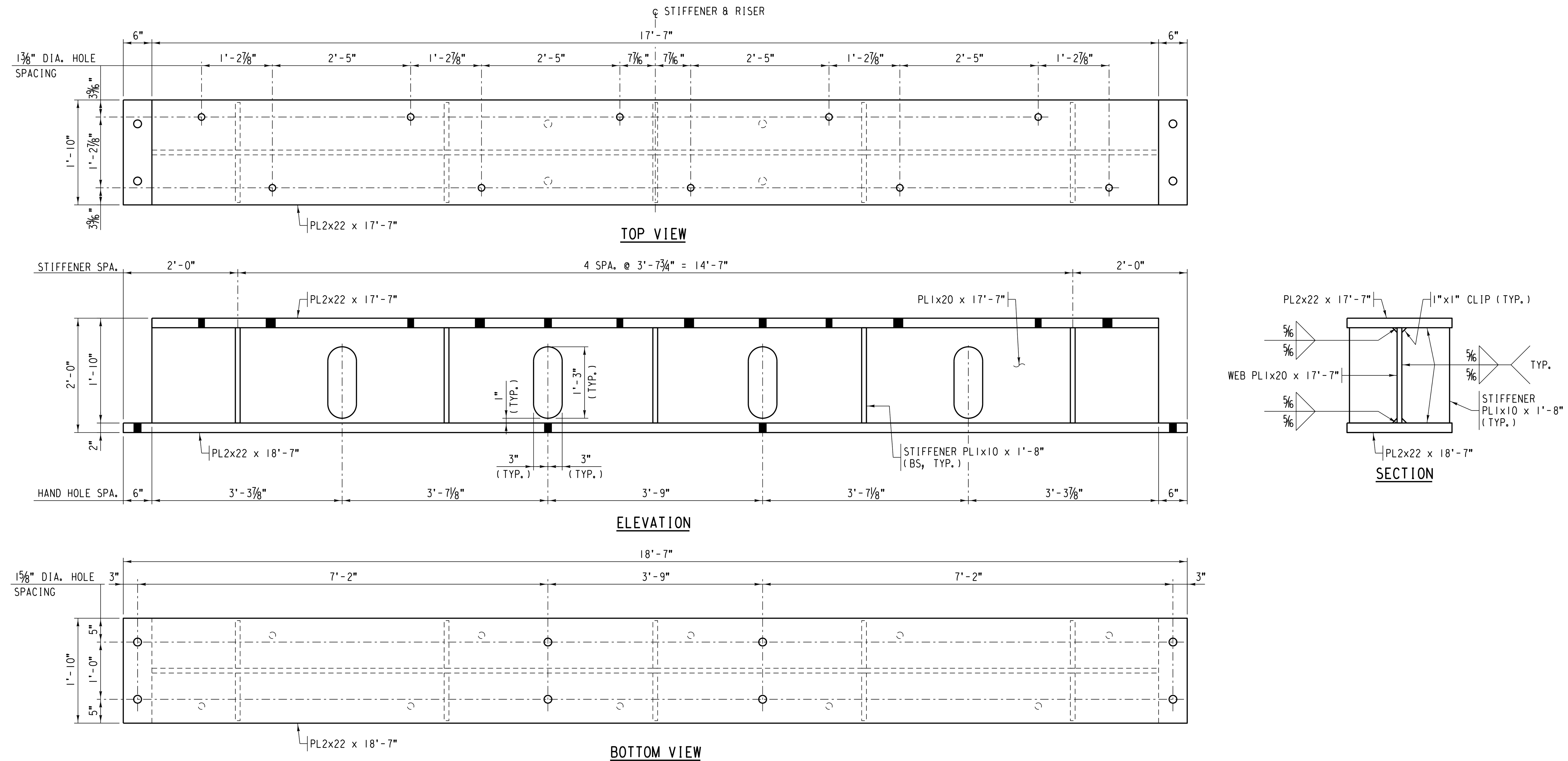
SHEET TITLE: BM SPAN - TEMPORARY BALLAST RETAINER DETAILS

SHEET SIZE 22x34

FILE NAME: pw://hqpwint01.a-e.transyscorp.com/transyscorp-pw1/Documents/Projects_2023/KC10110123011/Bridge/Sheets/Br 81.79/dc8179_bia

DESIGN SHEET

SHEET SIZE 22x34

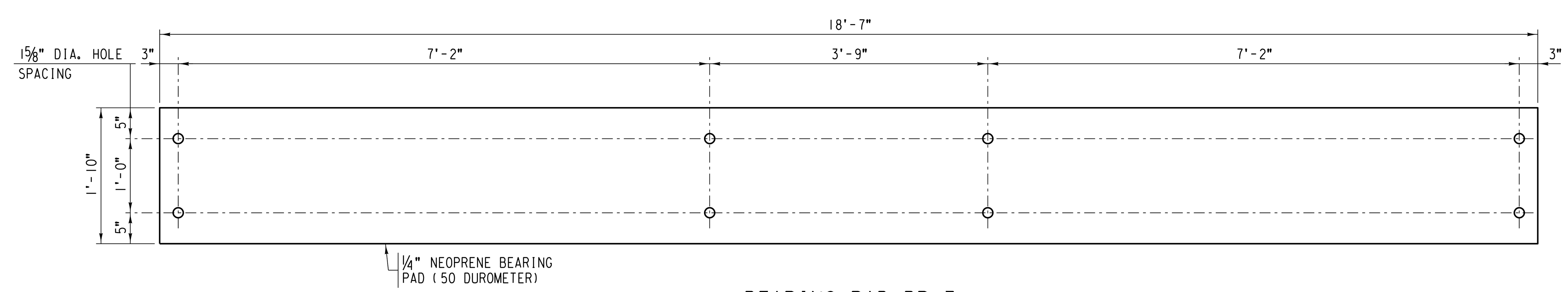


STEEL RISER SR-1

SCALE: ¾"=1'-0"

EST. WT. = 7,179 LB. EA.

GALVANIZE AFTER FABRICATION



BEARING PAD BP-3

SCALE: ¾"=1'-0"

NOTE:
STEEL FOR RISERS SHALL BE PER ASTM A709 GRADE 50, GALVANIZED. FOR ADDITIONAL STEEL FABRICATION NOTES, SEE SHEET F6.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 9/6/2023 DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
Nicholas J. Sterzik — DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC

DSN/CHK BY: AS / NJS

DRAWN/CHK BY: TLO / ABB

UPRR ENGINEER: DEH

SHT NO.: F14 of F15

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB

5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: BM SPAN - RISER DETAILS

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/de08179_bia

PLOTTED: 9/12/2023 9:43:10 AM

DESIGN SHEET

SHEET SIZE 22x34

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 1.1 & 1.2 - PHASE 1 (SPAN 5)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 1.1 & 1.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F1 & F5 THRU F11)
1	EA.	TEMPORARY BALLAST RETAINER BR-1 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
2	EA.	TEMPORARY BALLAST RETAINER BR-2 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	TEMPORARY BALLAST RETAINER BR-3 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	COVER PLATE CP-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	SOLE PLATE SP-1F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
1	EA.	BEARING PAD BP-1 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
12	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 151,000 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 1.1 & 1.2 - PHASE 2 (SPAN 1)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 1.1 & 1.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F1 & F5 THRU F11)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
4	EA.	CLOSURE PLATE ASSEMBLY CPA-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	COVER PLATE CP-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	SOLE PLATE SP-1E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
1	EA.	BEARING PAD BP-1 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
15	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 152,000 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 1.3 & 1.4 - PHASE 1 (SPAN 1)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 1.3 & 1.4 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F2 & F5 THRU F11)
2	EA.	TEMPORARY BALLAST RETAINER BR-2 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	TEMPORARY BALLAST RETAINER BR-3 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	TEMPORARY BALLAST RETAINER BR-5 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	COVER PLATE CP-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	SOLE PLATE SP-1E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
1	EA.	BEARING PAD BP-1 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
12	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 189,400 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 1.3 & 1.4 - PHASE 2 (SPAN 5)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 1.3 & 1.4 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F2 & F5 THRU F11)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
4	EA.	CLOSURE PLATE ASSEMBLY CPA-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	COVER PLATE CP-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	SOLE PLATE SP-1F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
1	EA.	BEARING PAD BP-1 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
1	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
12	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 189,600 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 2.1 & 2.2 - PHASE 1 (SPAN 2)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 2.1 & 2.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F3 & F5 THRU F11)
2	EA.	TEMPORARY BALLAST RETAINER BR-2 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
2	EA.	TEMPORARY BALLAST RETAINER BR-3 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
20	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
16	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 188,400 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 2.1 & 2.2 - PHASE 2 (SPAN 2)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 2.1 & 2.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F3 & F5 THRU F11)
4	EA.	CLOSURE PLATE ASSEMBLY CPA-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
2	EA.	CLOSURE PLATE ASSEMBLY CPA-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
20	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
16	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 189,000 LB.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 3.1 & 3.2 - PHASE 1 (SPAN 3 OR 4)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 3.1 & 3.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F4 & F5 THRU F11)
2	EA.	TEMPORARY BALLAST RETAINER BR-3 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
2	EA.	TEMPORARY BALLAST RETAINER BR-4 (PER NOTES, SHT. F6 AND DETAILS, SHT. F13)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
20	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
16	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 204,400 LB. EA.

STRUCTURAL STEEL MATERIAL SCHEDULE
UNIT 3.1 & 3.2 - PHASE 2 (SPAN 3 OR 4)

REQ'D.	UNIT	DESCRIPTION
1	EA.	(SBR) STRUCTURAL STEEL AND FASTENERS FOR ONE UNIT 3.1 & 3.2 BM SPAN, COMPLETE (PER NOTES, SHT. F6 AND DETAILS, SHT. F4 & F5 THRU F11)
5	EA.	CLOSURE PLATE ASSEMBLY CPA-2, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT. F12)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	CLOSURE PLATE ASSEMBLY CPA-5, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-3, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
1	EA.	COVER PLATE CP-4, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F12)
5	EA.	SOLE PLATE SP-2F (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
5	EA.	SOLE PLATE SP-2E (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	STEEL RISER SR-1, GALVANIZED (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
10	EA.	BEARING PAD BP-2 (PER NOTES, SHT. F6 AND DETAILS, SHT F9)
2	EA.	BEARING PAD BP-3 (PER NOTES, SHT. F6 AND DETAILS, SHT F14)
20	EA.	1¼" DIA. x 6½" F3125 GRADE A325 HEAVY HEX BOLT, TYPE 3 WITH HEAVY HEX NUT (ASTM A563, LUBRICATED) AND FLAT CIRCULAR WASHER (ASTM F436)
16	EA.	1¼" DIA. X 1'-6" LONG THREADED ROD (ASTM F1554, GRADE 55) WITH 2 HEAVY HEX NUTS AND 1 - FLAT CIRCULAR WASHERS (GALVANIZED)

EST. WT. OF STRUCTURAL STEEL (NOT INCL. BOLTS) = 205,000 LB. EA.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL (STATUS) — 9/6/2023 (DATE)

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY: Nicholas J. Stenzel — DESIGN ENGINEER OF RECORD — 9/6/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

UNION PACIFIC RAILROAD
Office of Director Structures Design

DSN/CHK BY: AS / NJS
DRAWN/CHK BY: TLO / ABB
UPRR ENGINEER: DEH
SHT NO.: F15 of F15

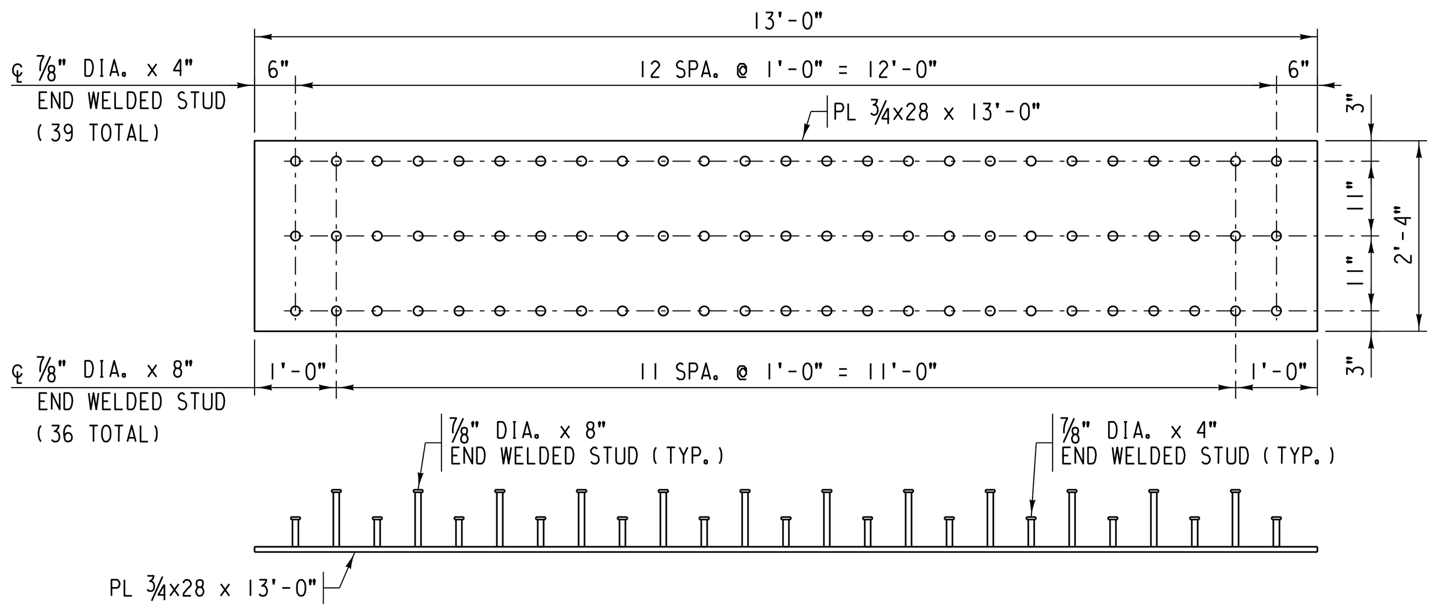
LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: BM SPAN - MATERIAL SCHEDULES

PLOTTED: 9/12/2023 9:43:10 AM

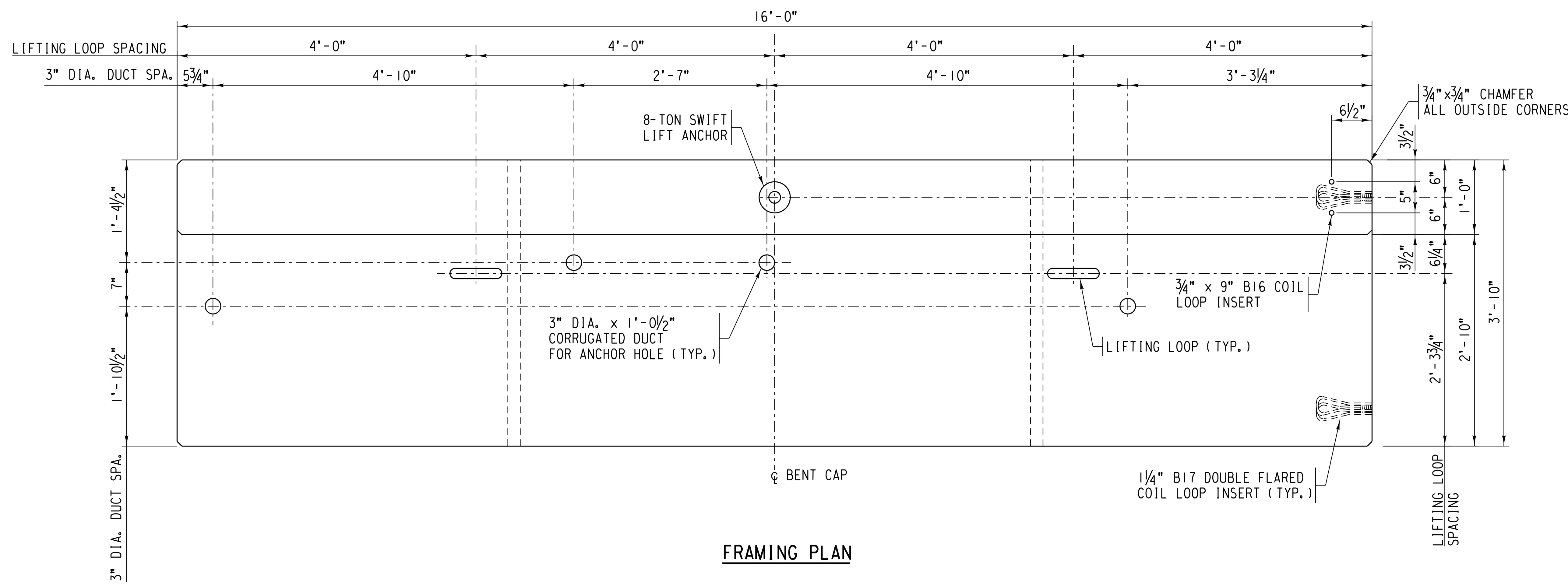
FILE NAME: pw://hqpwint01.ae.transyscorp.com/transyscorp-pw1/Documents/Projects_2023/KC101\1012301111\Bridge\Sheets\B' 81.79\cb08179_bla

DESIGN SHEET

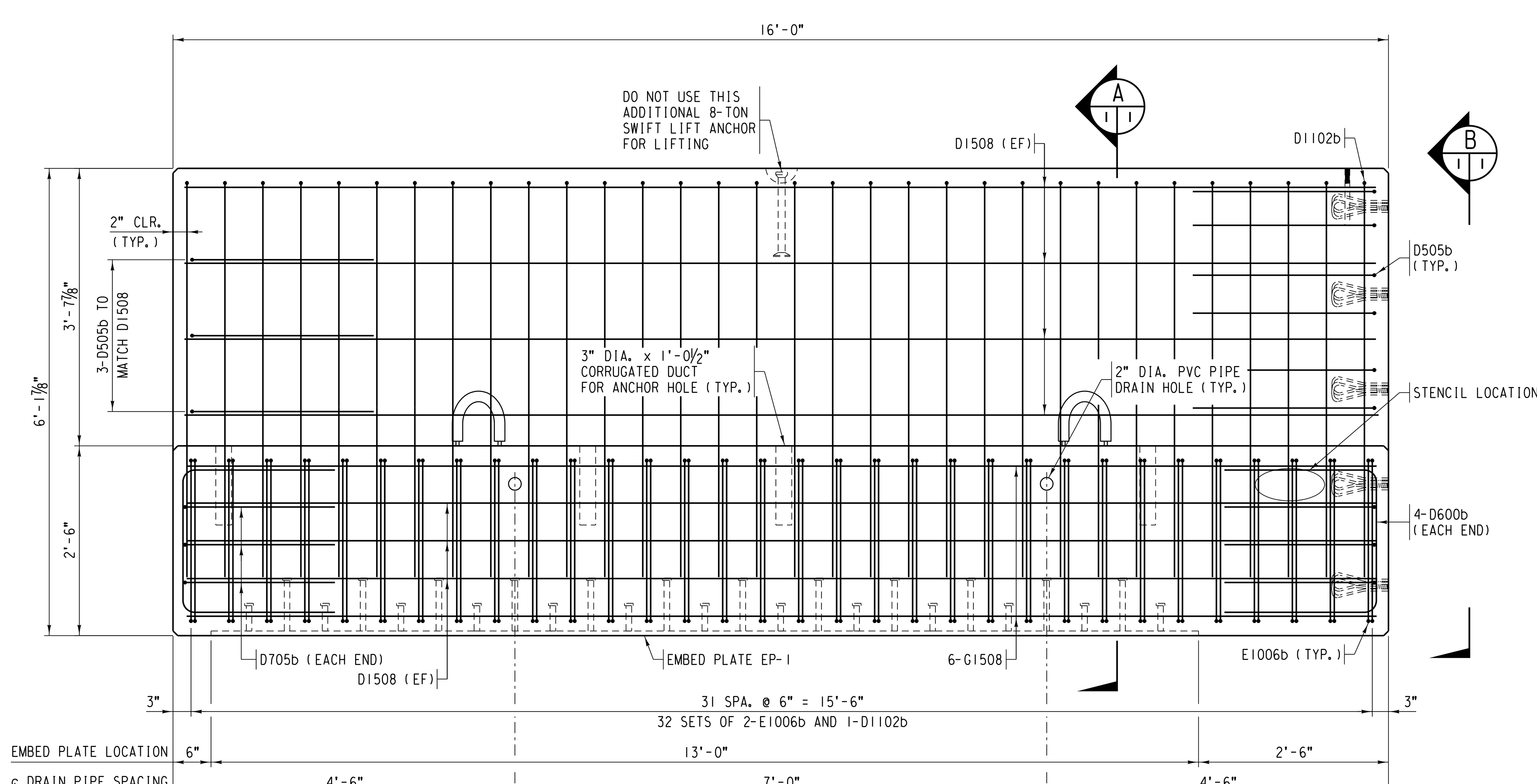


EMBED PLATE EP-1

SCALE: 1/2" = 1'-0"
EST. WT. = 1,005 LB. EA.



FRAMING PLAN



REINFORCING ELEVATION

PRECAST CONCRETE BENT CAP PBC-1

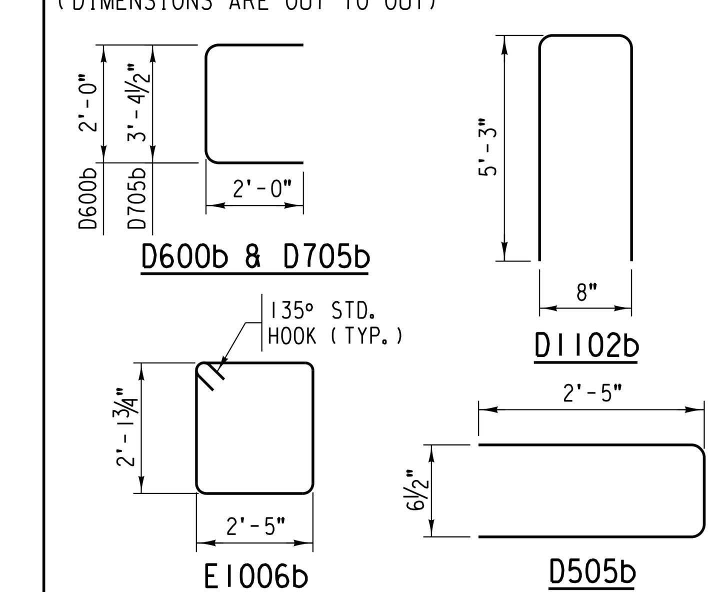
SCALE: 3/4"=1'-0"
SHIP WITH 2 - 3/4" DIA. x 6" COIL BOLTS AND 2 - WASHERS

MATERIAL SCHEDULE (QUANTITY PER BENT CAP PBC-1)		
REQ'D.	UNIT	DESCRIPTION
7.9	CU. YD.	4,000 PSI CONCRETE (PER STD, PLAN NO. 531100 SHT. T3)
1	LOT	REINFORCING STEEL (PER STD. PLAN NO 531100 SHT. T3 AND SCHEDULE, SHT. P1)
1	EA.	EMBED PLATE EP-1 (PER NOTES, STD. PLAN NO 531100 SHT. T3 AND DETAIL, SHT. P1)
7	EA.	1 1/4" DIA. B-17 DOUBLE FLARED COIL LOOP INSERT, DAYTON SUPERIOR, ELECTRO-GALVANIZED
1	EA.	8-TON SWIFT LIFT ANCHOR (PER NOTES, STD. PLAN NO. 531100 SHT. T3)
2	EA.	4" SQUARE ALUMINUM #4 MESH HARDWARE CLOTH
2	EA.	3/4" x 9" B-16 STRAIGHT COIL LOOP INSERT, DAYTON SUPERIOR ELECTRO-GALVANIZED
8	LIN. FT.	2" DIA. PVC PIPE, SCHEDULE 40
2	EA.	LIFTING LOOP (PER DETAIL, SHT. P2)
4	EA.	3" DIA. x 1'-0 1/2" CORRUGATED DUCT MANUFACTURED BY DYWIDAG OR APPROVED ALTERNATIVE
2	EA.	3/4" x 6" COIL BOLT AND WASHER, DAYTON SUPERIOR B-14
1	EA.	3/8"x4"x2'-4" NEOPRENE BEARING PAD (60 DUROMETER)
5	EA.	ELASTOMERIC WASHER EW1 (PER DETAIL, PLAN NO. 531160, SHT. 1)

REINFORCING SCHEDULE (QUANTITY BENT CAP PBC-1)				
TOTAL	MARK	SIZE	LENGTH	SHAPE
9	D505b	#5	5'-5"	⊐
8	D600b	#5	6'-0"	[
6	D705b	#5	7'-5"	[
32	D1102b	#5	11'-2"	∩
14	D1508	#5	15'-8"	—
64	E1006b	#6	10'-6"	□
12	G1508	#8	15'-8"	—

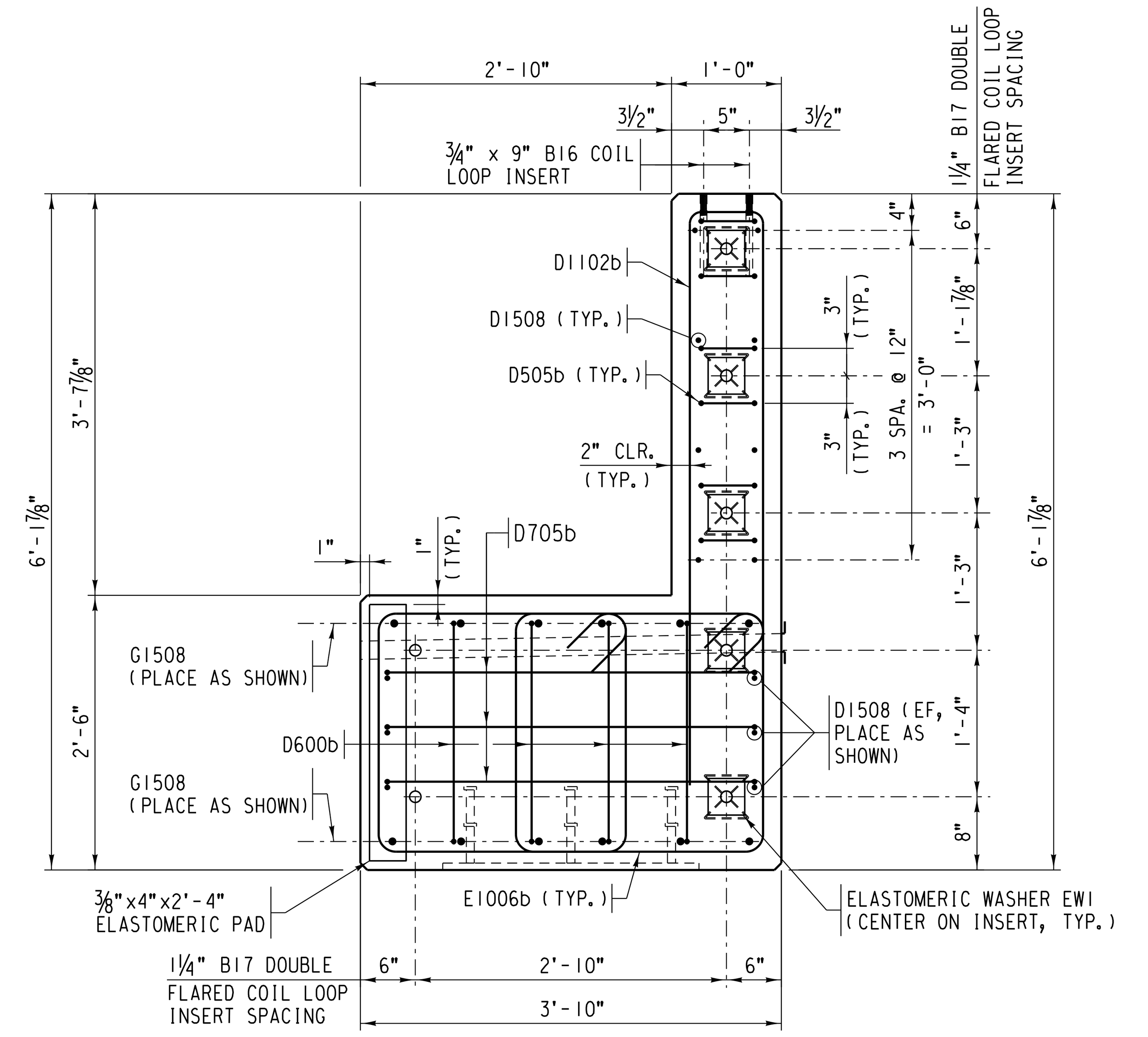
BENDING DIAGRAM

(DIMENSIONS ARE OUT TO OUT)



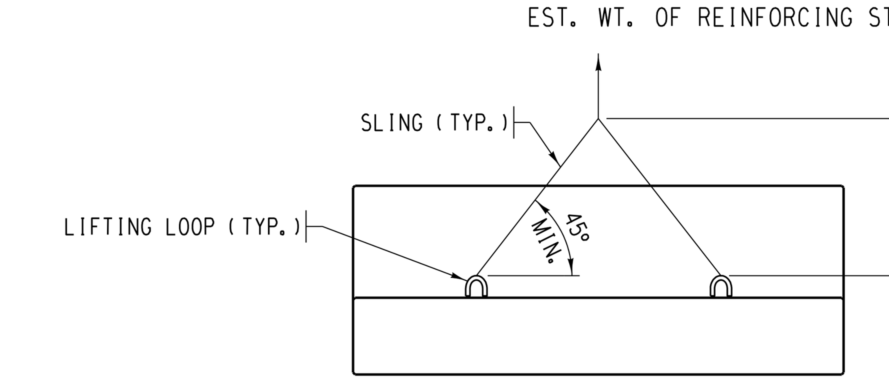
NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.

EST. WT. OF REINFORCING STEEL = 2,270 LB.



SECTION B

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

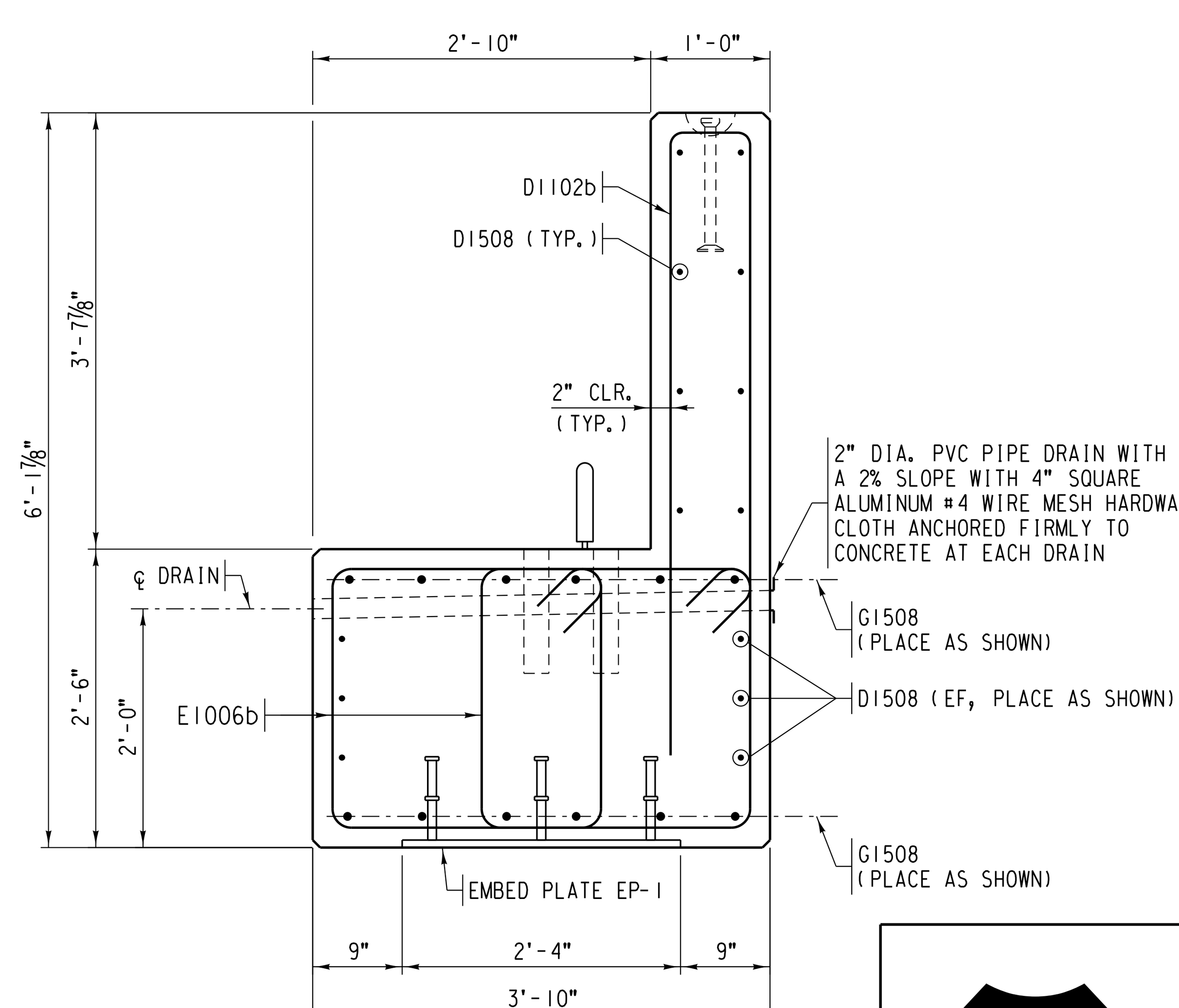


ELEVATION

2-POINT PICK-UP

SCALE: NONE

PIN OR HOOK FOR ENGAGING LIFTING LOOPS SHALL HAVE A MINIMUM DIAMETER OF 1"



SECTION A

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

NOTES:

1. FOR PRECAST CONCRETE AND REINFORCING STEEL NOTES, SEE STD. PLAN NO. 531100 SHT. T3
2. END CAP PBC-1 AND WINGWALL PWW-1 SHALL BE FIT UP AT THE FABRICATION PLANT PRIOR TO SHIPMENT TO ENSURE ACCURACY OF CONNECTIONS.
3. MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR CAST HOLES AND EMBEDDED ITEMS.
4. EF = EACH FACE
5. GLUE ELASTOMERIC PADS AND WASHERS TO CAP WITH PL-400 ADHESIVE OR APPROVED EQUAL.

EST. WT. OF PRECAST CONCRETE

BENT CAP PBC-1 = 33,000 LBS. EA. (16.5 TON)

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — DATE 9/6/2023

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — DATE 9/6/2023

PROJECT ID: 117429 | WORK ORDER: 58028 | C E NUMBER: 122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: CIS / NJS
UPRR ENGINEER: DEH
SHT NO.: P1 of P3

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: PRECAST CONCRETE BENT CAP PBC-1

SHEET SIZE 22x34

FILE NAME:

PLOTTED: 9/12/2023 9:43:10 AM

DESIGN SHEET

SHEET SIZE 22x34

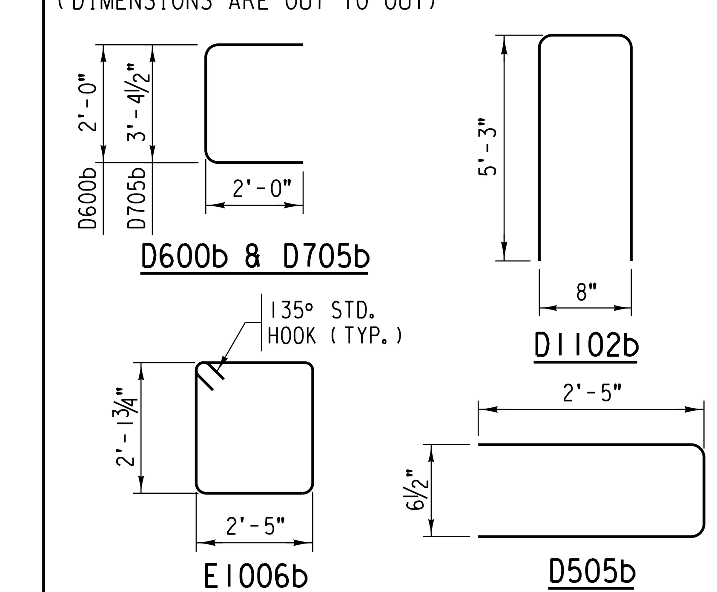
MATERIAL SCHEDULE
(QUANTITY PER BENT CAP PBC-2)

REQ'D.	UNIT	DESCRIPTION
7.9	CU. YD.	4,000 PSI CONCRETE (PER STD. PLAN NO. 531100 SHT. T3)
1	LOT	REINFORCING STEEL (PER STD. PLAN NO 531100 SHT. T3 AND SCHEDULE, SHT. P2)
1	EA.	EMBED PLATE EP-1 (PER NOTES, STD. PLAN NO 531100 SHT. T3 AND DETAIL, SHT. P1)
7	EA.	1¼" DIA. B-17 DOUBLE FLARED COIL LOOP INSERT, DAYTON SUPERIOR, ELECTRO-GALVANIZED
1	EA.	8-TON SWIFT LIFT ANCHOR (PER NOTES, STD. PLAN NO. 531100 SHT. T3)
2	EA.	4" SQUARE ALUMINUM #4 MESH HARDWARE CLOTH
2	EA.	¾" x 9" B-16 STRAIGHT COIL LOOP INSERT, DAYTON SUPERIOR ELECTRO-GALVANIZED
8	LIN. FT.	2" DIA. PVC PIPE, SCHEDULE 40
2	EA.	LIFTING LOOP (PER DETAIL, SHT. P2)
4	EA.	3" DIA. x 1'-0½" CORRUGATED DUCT MANUFACTURED BY DYWIDAG OR APPROVED ALTERNATIVE
2	EA.	¾" x 6" COIL BOLT AND WASHER, DAYTON SUPERIOR B-14
1	EA.	⅜"x4"x2'-4" NEOPRENE BEARING PAD (60 DUROMETER)
5	EA.	ELASTOMERIC WASHER EW1 (PER DETAIL, PLAN NO. 531160, SHT. 1)

REINFORCING SCHEDULE
(QUANTITY BENT CAP PBC-2)

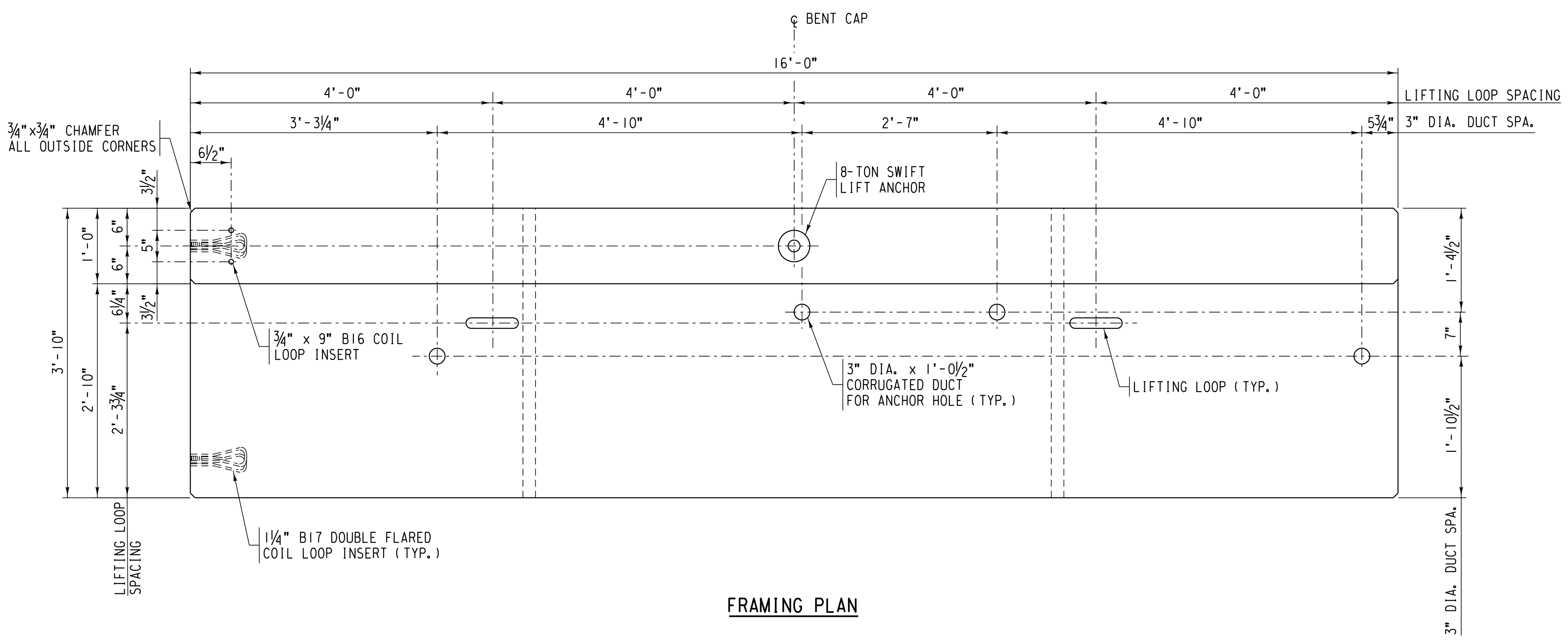
TOTAL	MARK	SIZE	LENGTH	SHAPE
9	D505b	#5	5'-5"	
8	D600b	#5	6'-0"	
6	D705b	#5	7'-5"	
32	D1102b	#5	11'-2"	
14	D1508	#5	15'-8"	
64	E1006b	#6	10'-6"	
12	G1508	#8	15'-8"	

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)

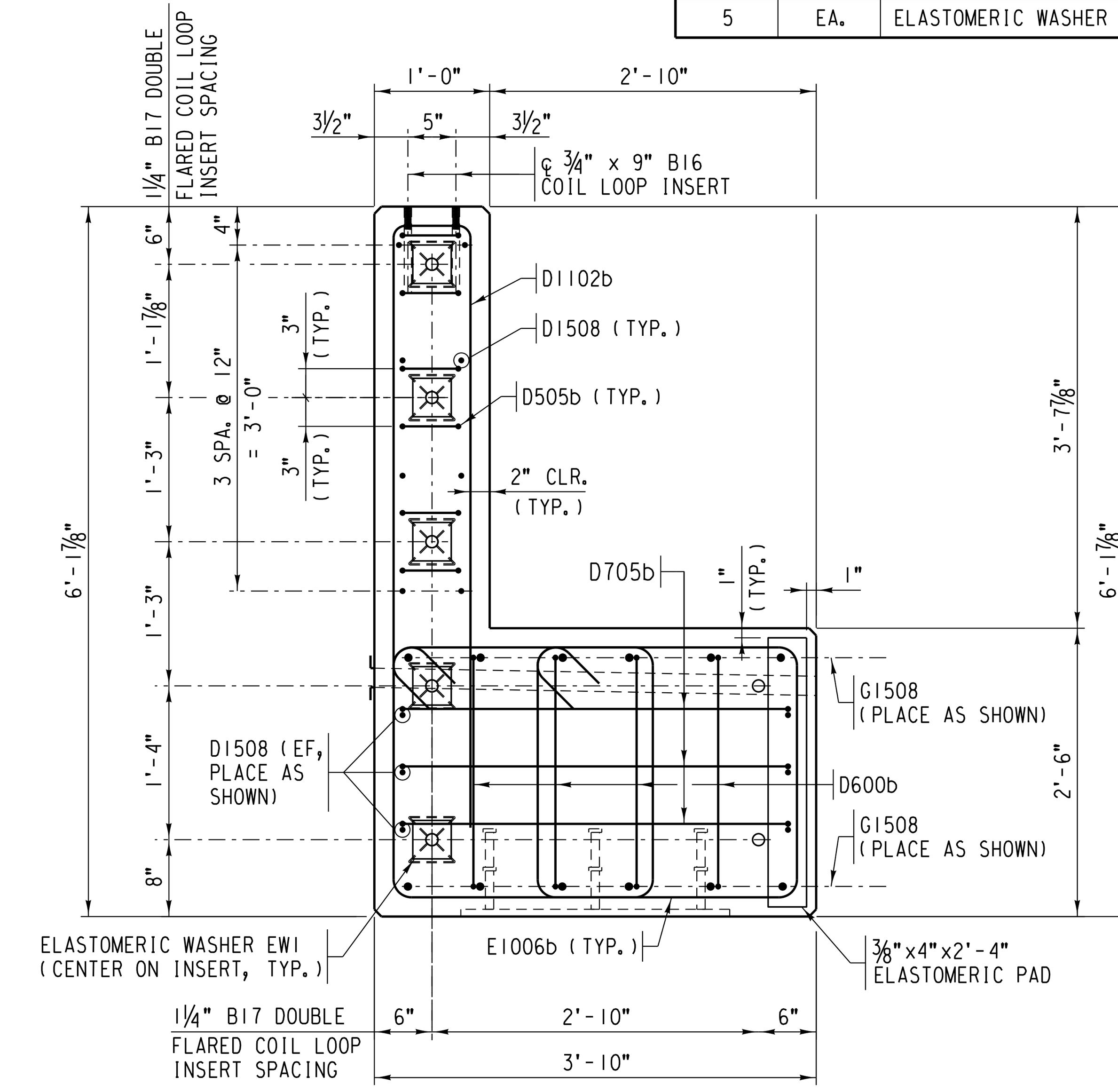


NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.

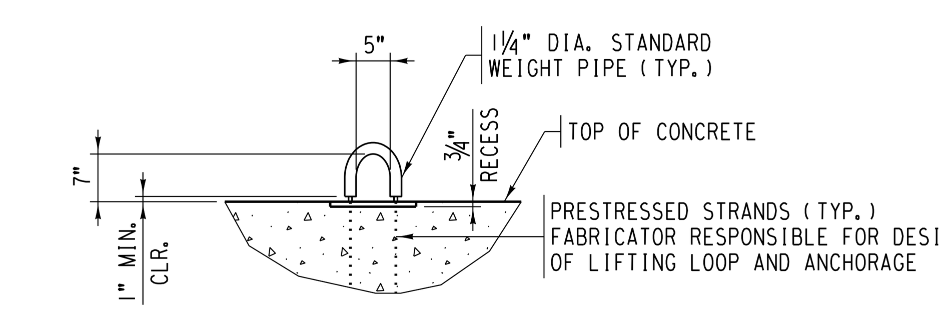
EST. WT. OF REINFORCING STEEL = 2,270 LB.



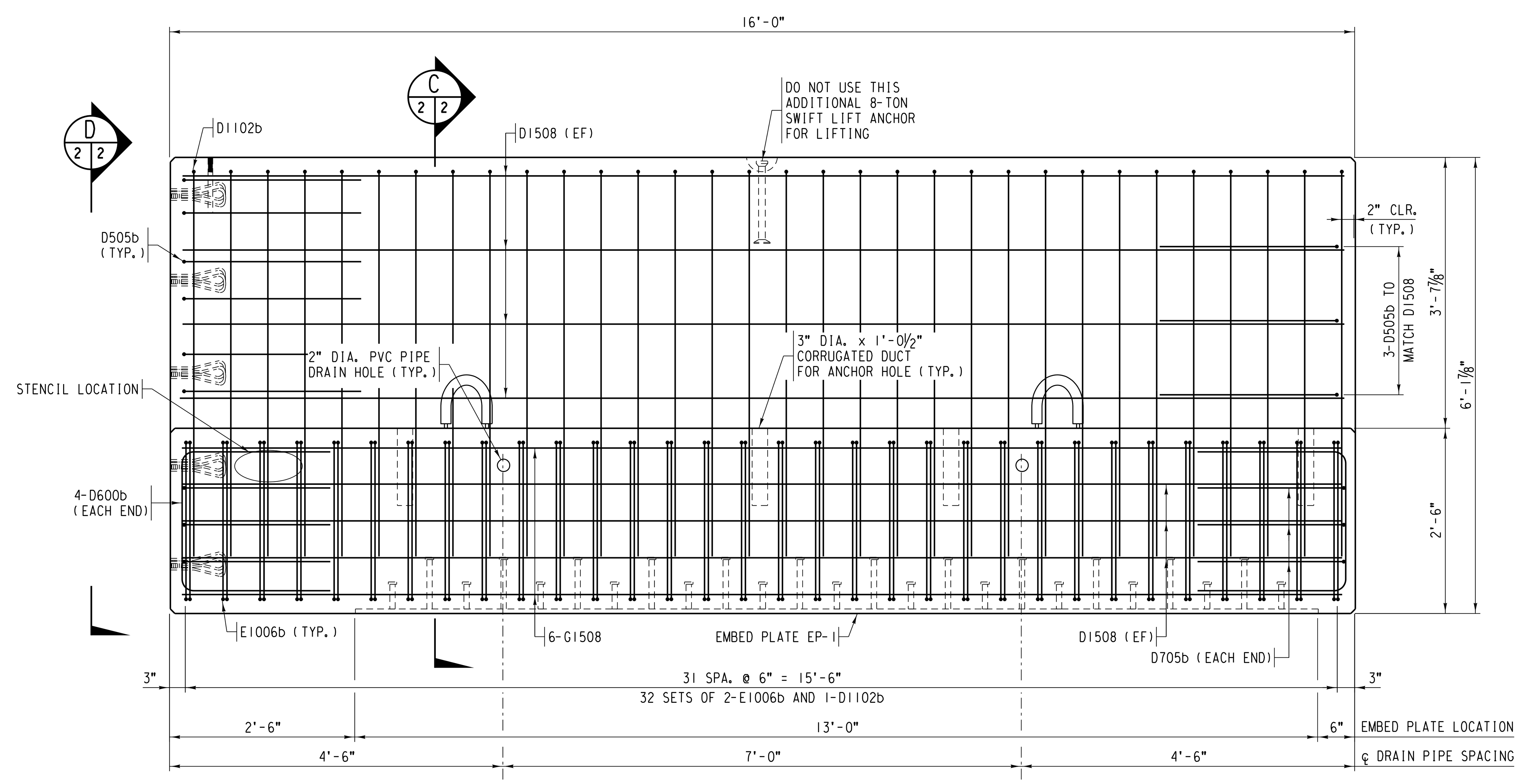
FRAMING PLAN



SECTION D
SCALE: ¾"=1'-0" (2/2)

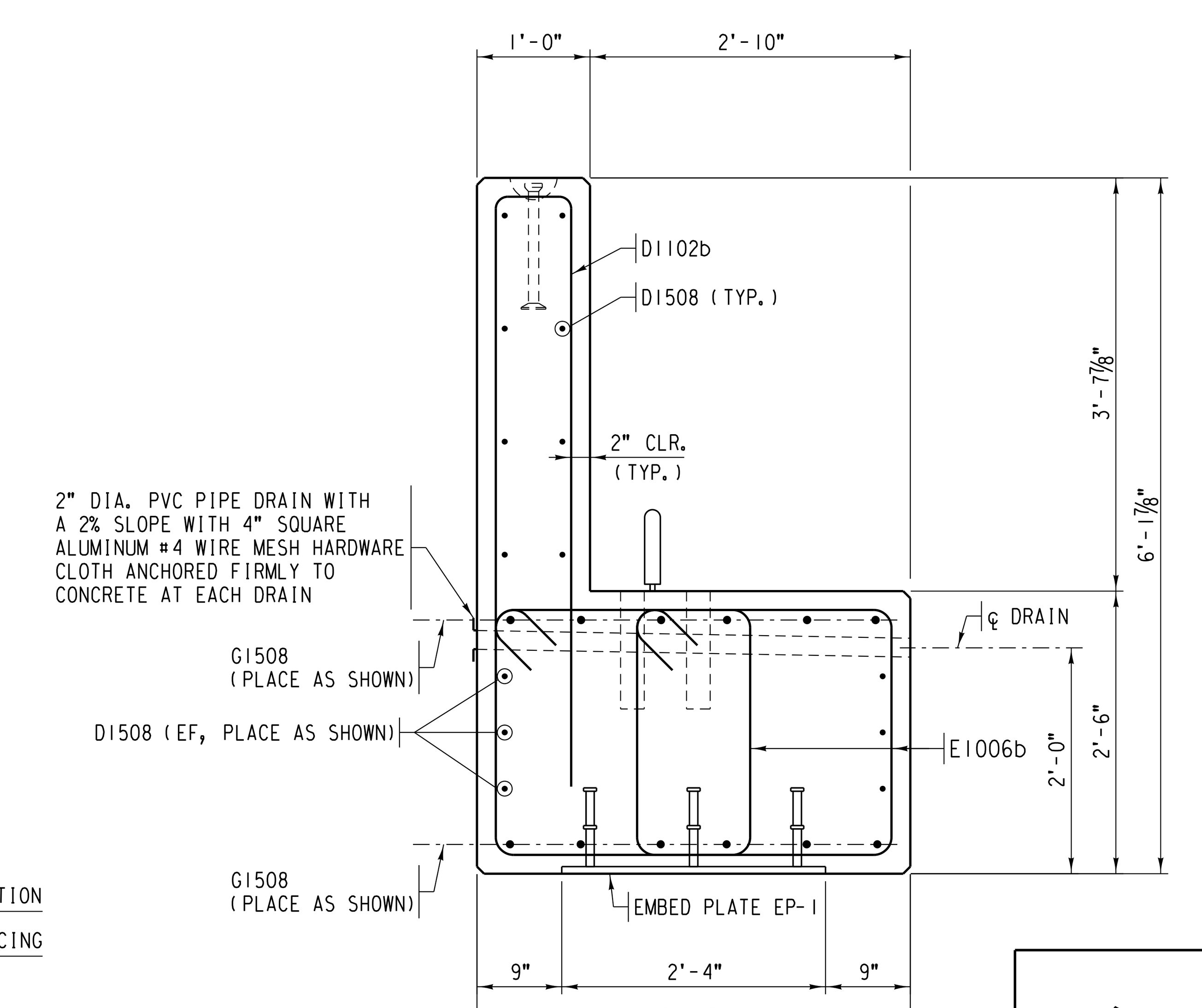


LIFTING LOOP DETAIL
SCALE: NO SCALE



REINFORCING ELEVATION

PRECAST CONCRETE BENT CAP PBC-2
SCALE: ¾"=1'-0"
SHIP WITH 2 - ¾" DIA. x 6" COIL BOLTS AND 2 - WASHERS



SECTION C
SCALE: ¾"=1'-0" (2/2)

NOTES:

1. FOR PRECAST CONCRETE AND REINFORCING STEEL NOTES, SEE STD. PLAN NO. 531100 SHT. T3
2. END CAP PBC-2 AND WINGWALL PWW-1 SHALL BE FIT UP AT THE FABRICATION PLANT PRIOR TO SHIPMENT TO ENSURE ACCURACY OF CONNECTIONS.
3. MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR CAST HOLES AND EMBEDDED ITEMS.
4. EF = EACH FACE
5. GLUE ELASTOMERIC PADS AND WASHERS TO CAP WITH PL-400 ADHESIVE OR APPROVED EQUAL.

EST. WT. OF PRECAST CONCRETE
BENT CAP PBC-2 = 32,000 LBS. (16.5 TON)

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — 9/6/2023
STATUS / DATE

TRANSYSTEMS
APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY:	ABB / NJS
DRAWN/CHK BY:	CIS / NJS
UPRR ENGINEER:	DEH
SHT NO.:	P2 of P3

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: PRECAST CONCRETE BENT CAP PBC-2

FILE NAME: pw://hqpwint01.ae.transyscorp.com:transyscorp-pw10/Documents/Projects_2023/KC101110123011\Bridge\Sheets\Br 81.79\dc08179_bis

PLOTTED: 9/12/2023 9:43:10 AM

DESIGN SHEET

SHEET SIZE 22x34

MATERIAL SCHEDULE
(QUANTITY PER WINGWALL PWW-1)

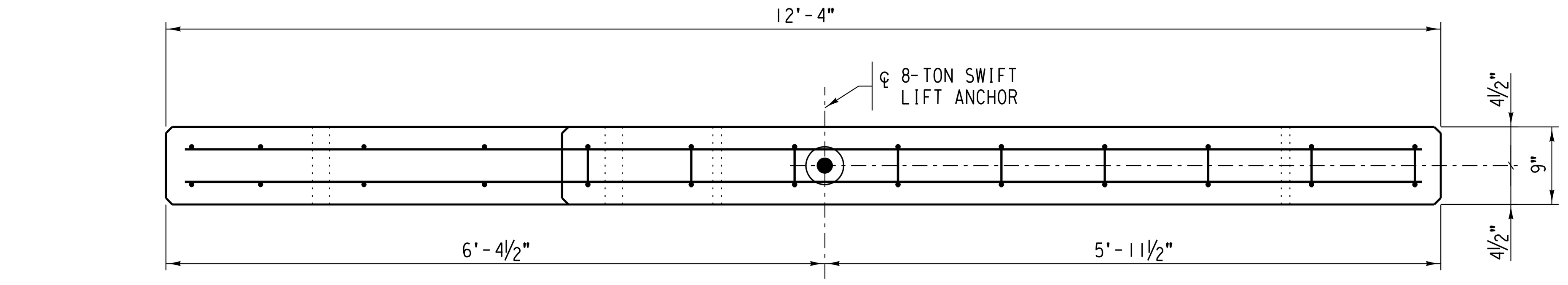
REQ'D.	UNIT	DESCRIPTION
2.0	CU. YD.	4,000 PSI CONCRETE (PER STD, PLAN NO. 531100 SHT. T3)
1	LOT	REINFORCING STEEL (PER STD. PLAN NO 531100 SHT. T3 AND SCHEDULE, SHT. P3)
1	EA.	8-TON SWIFT LIFT ANCHOR (PER NOTES, STD. PLAN NO. 531100 SHT. T3 AND DETAIL, SHT. T2)
2	LIN. FT.	2" DIA. PVC PIPE, SCHEDULE 40
7	EA.	STEEL WASHER W100, GALVANIZED (PER DETAIL, STD. PLAN NO. 531180 SHT. 1)
7	EA.	1¼" DIA. x 13" COIL BOLT, DAYTON-SUPERIOR B-14

REINFORCING SCHEDULE
(QUANTITY PER PWW-1)

TOTAL	MARK	SIZE	LENGTH	SHAPE
8	D802	#5	8'-2"	
2	D808b	#5	8'-8"	
2	D1210b	#5	12'-10"	
1	D1509b	#5	15'-9"	

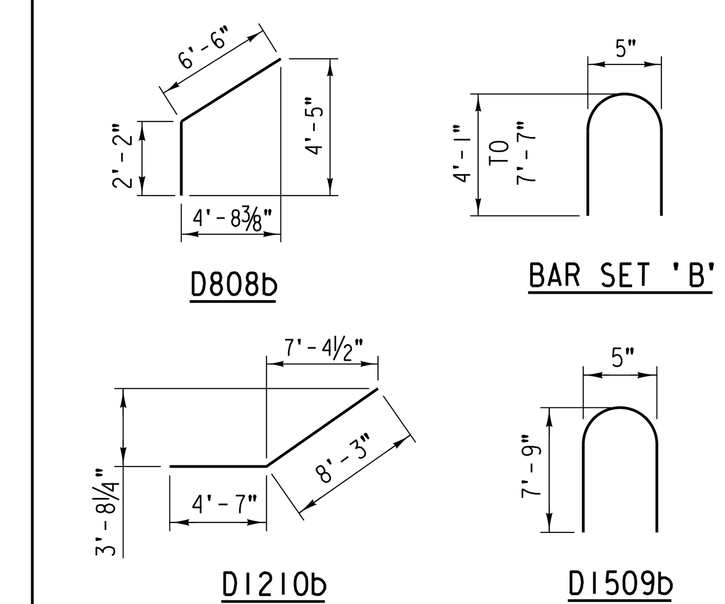
SET LIST

MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
BAR SET 'A'	#5	3'-1"	5'-0"	11½"	3	2	
BAR SET 'B'	#5	8'-5"	15'-5"	1'-0"	8	1	
BAR SET 'C'	#7	5'-9"	8'-9"	1'-0"	4	2	
BAR SET 'D'	#7	8'-5"	10'-0"	6⁵⁄₁₆" (+)	4	2	
BAR SET 'E'	#7	9'-5"	10'-4"	5½"	3	2	



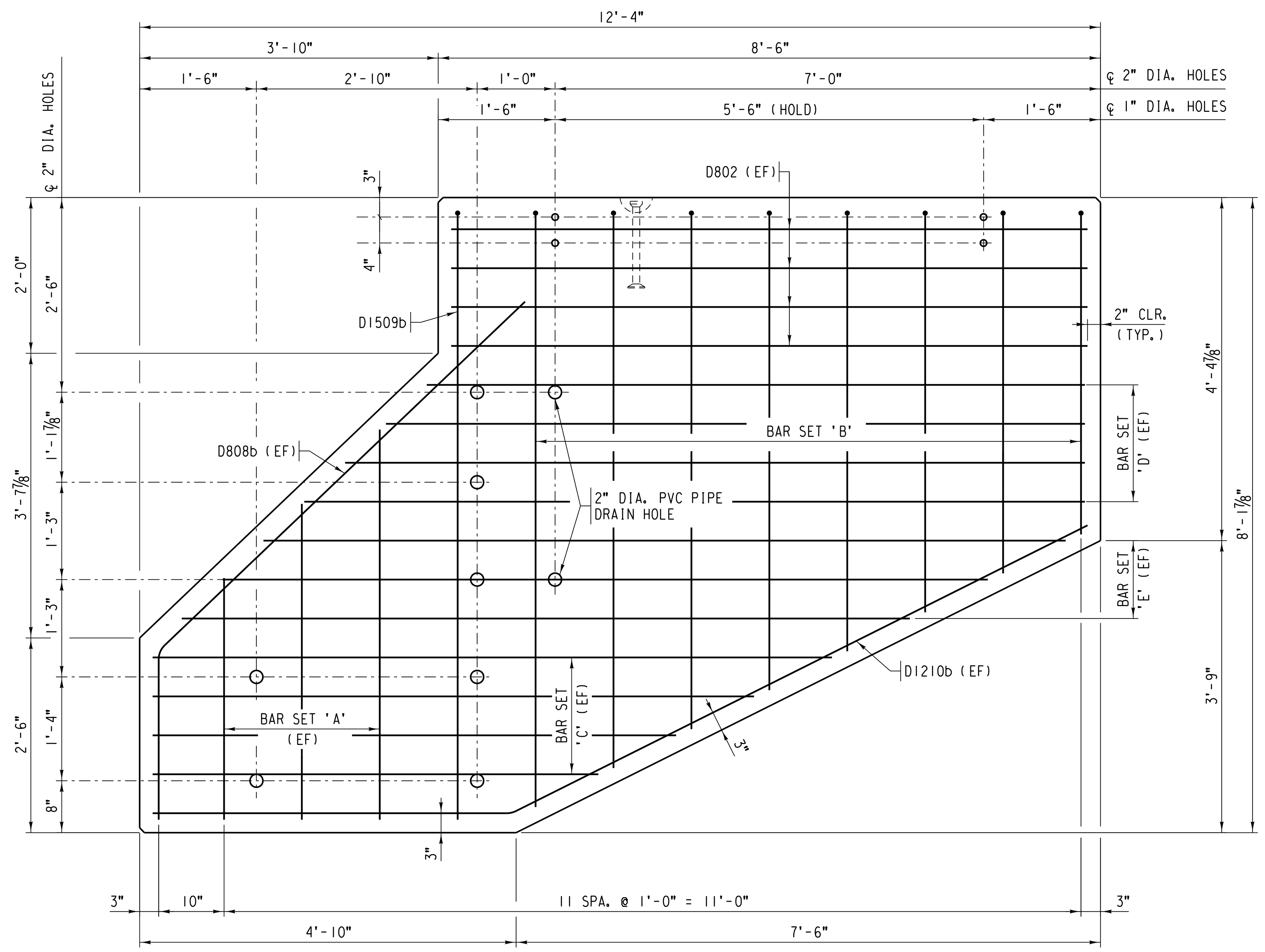
PLAN

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)

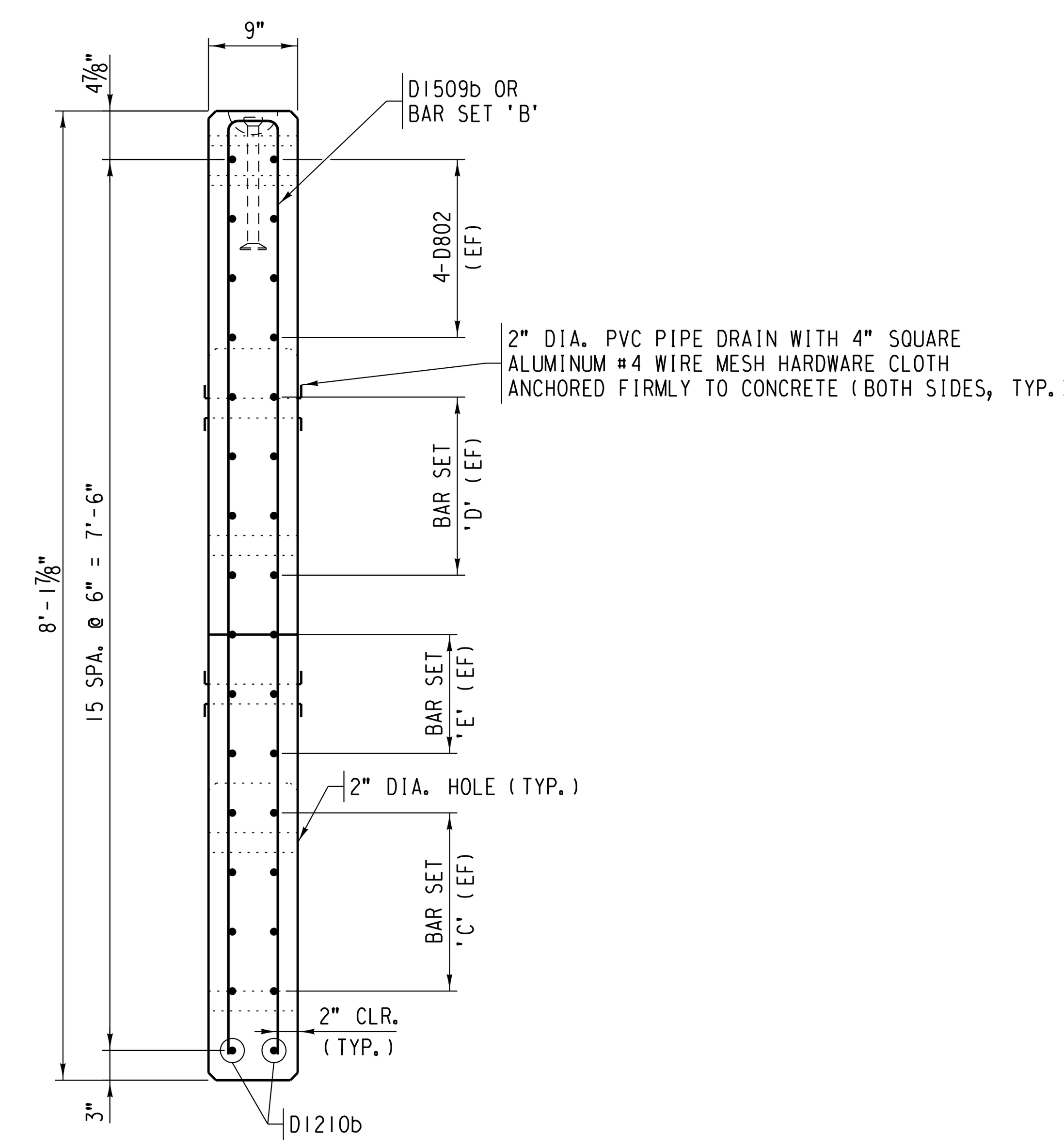


NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.

EST. WT. OF REINFORCING STEEL = 650 LB.



ELEVATION



SECTION

PRECAST CONCRETE WINGWALL PWW-1

SCALE: ¾"=1'-0"

SHIP WITH 7 - W100 WASHERS AND 7 - 1¼" DIA. x 13" COIL BOLTS

EST. WT. OF PRECAST CONCRETE

WINGWALL PWW-1 = 8,100 LB. (4.1 TON)

NOTES:

1. FOR PRECAST CONCRETE AND REINFORCING STEEL NOTES, SEE STD. PLAN NO. 531100 SHT. T3.
2. END CAP AND WINGWALLS SHALL BE FIT UP AT THE FABRICATION PLANT PRIOR TO SHIPMENT TO ENSURE ACCURACY OF CONNECTIONS.
3. MINIMALLY ADJUST REINFORCING AS REQUIRED TO CLEAR CAST HOLES AND EMBEDDED ITEMS.
4. EF = EACH FACE

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — STATUS
9/6/2023 — DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
117429	58028	122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: ABB / NJS
DRAWN/CHK BY: CIS / NJS
UPRR ENGINEER: DEH
SHT NO.: P3 of P3

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: PRECAST CONCRETE WINGWALL PWW-1

FILE NAME: pw://hqpwint01.ar-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC1011012301111/Bridge/Sheets/Br 81.79/cb08179_bia

PLOTTED: 9/12/2023 9:43:11 AM

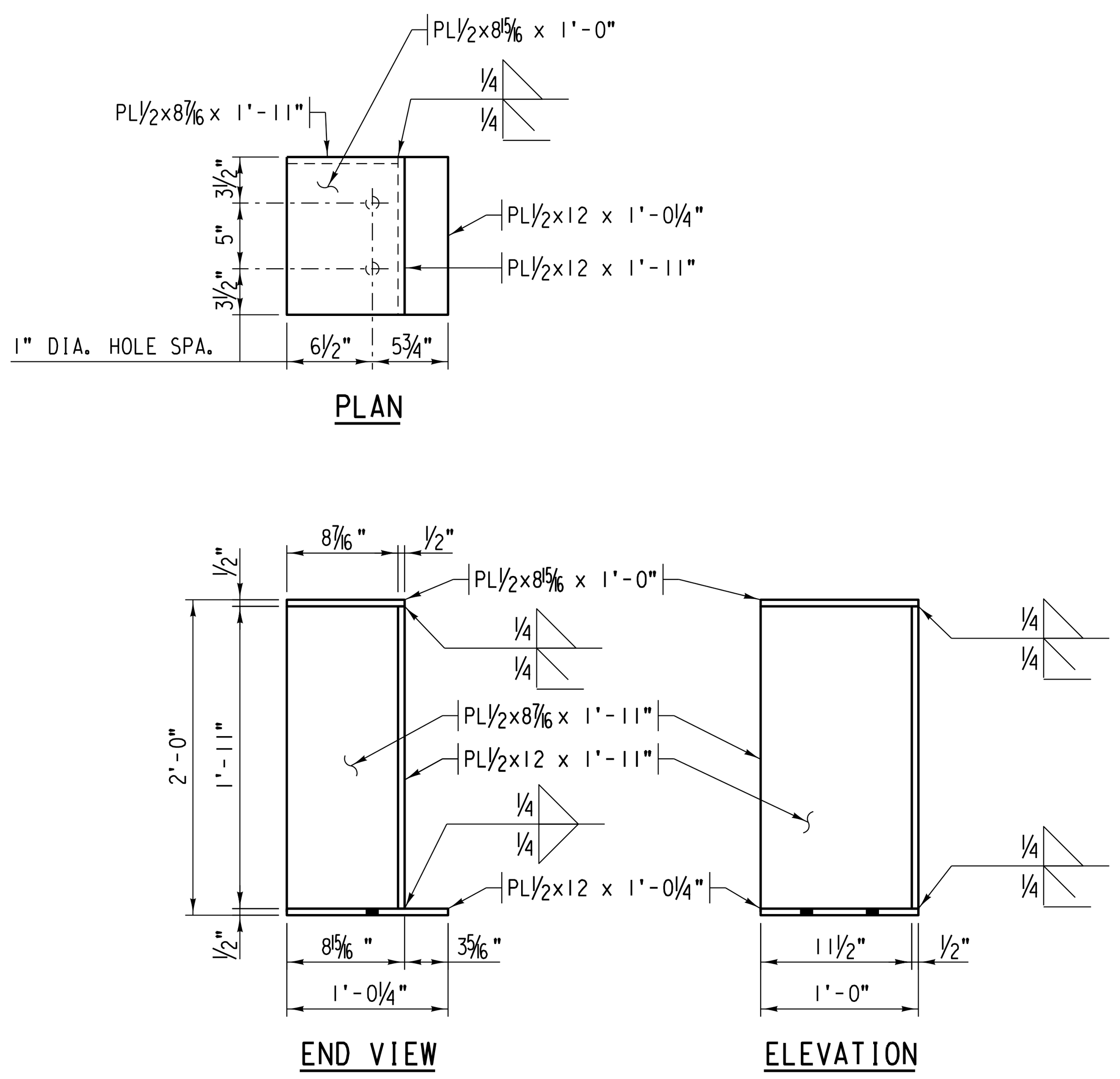
SHEET SIZE 22x34

DESIGN SHEET

NON-STANDARD MISCELLANEOUS STEEL SCHEDULE

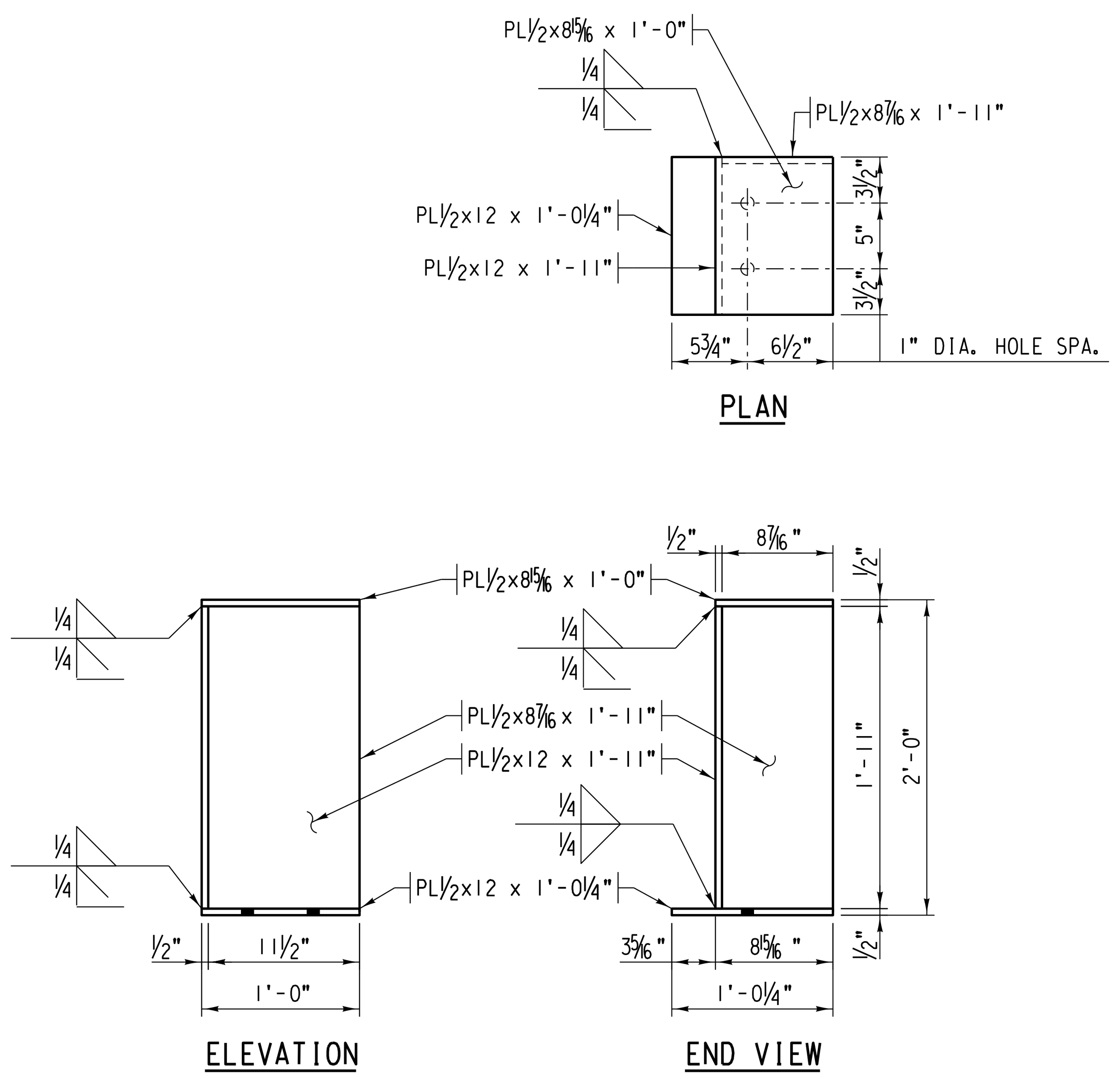
REQ'D.	UNIT	DESCRIPTION
2	EA.	BALLAST CURB BC-1L, GALVANIZED (PER NOTES STD. PLAN NO. 531100 SHT. T3 AND DETAILS THIS SHEET)
2	EA.	BALLAST CURB BC-1R, GALVANIZED (PER NOTES STD. PLAN NO. 531100 SHT. T3 AND DETAILS THIS SHEET)
4	EA.	NOSE ARMOR ANGLE NA-1, GALVANIZED (PER NOTES STD. PLAN NO. 531100 SHT. T3 AND DETAILS THIS SHEET)

EST. WT. OF MISCELLANEOUS STEEL = 1,710 LB.



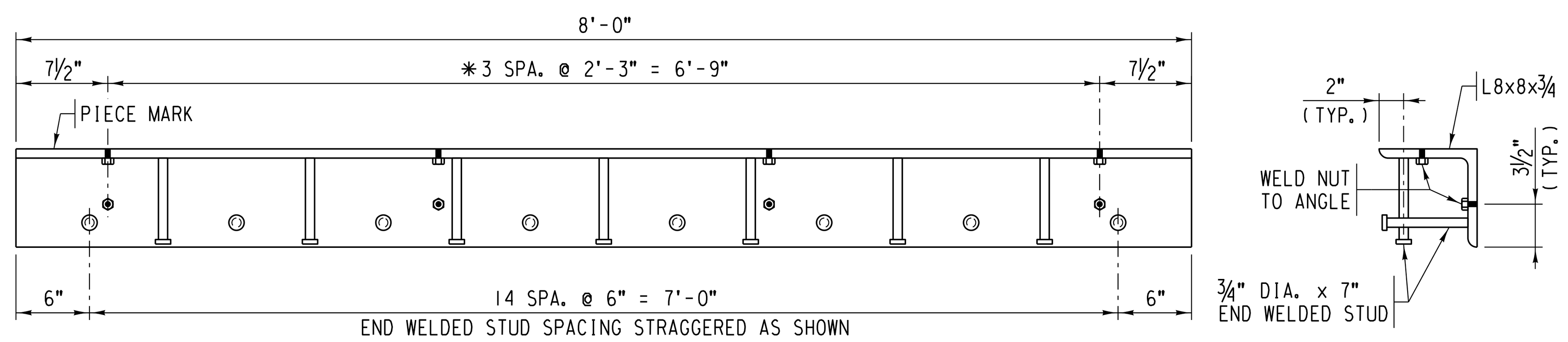
BALLAST CURB BC-1L

SCALE: 1"=1'-0"
EST. WT. = 102.6 LB. EA.
GALVANIZE AFTER FABRICATION



BALLAST CURB BC-1R

SCALE: 1"=1'-0"
EST. WT. = 102.6 LB. EA.
GALVANIZE AFTER FABRICATION



NOSE ARMOR ANGLE NA-1

SCALE: 1"=1'-0"
EST. WT. = 324 LB. EA.
GALVANIZE AFTER FABRICATION

NOTE:
✱ 9/16" DIA. HOLES FOR ½" BOLTS USED TO FASTEN NOSE ARMOR ANGLE TO FORMS. WELD NUTS ON INSIDE.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: FINAL — STATUS; 9/6/2023 — DATE

TRANSYSTEMS

APPROVED FOR UNION PACIFIC RAILROAD BY:
DESIGN ENGINEER OF RECORD — 9/6/2023 DATE

PROJECT ID: 117429 | WORK ORDER: 58028 | C E NUMBER: 122696

LATITUDE: 41.93722°N LONGITUDE: 91.69352°W

DSN/CHK BY: NJS / ABB
DRAWN/CHK BY: TLO / NJS
UPRR ENGINEER: DEH
SHT NO.: M1 of M1

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: BRIDGE 81.79 CLINTON SUB
5 SPAN BM (W40x431) x 313' REPLACING 4 SPAN DPGOD x 235' (2 TRACKS)

SHEET TITLE: MISCELLANEOUS STEEL DETAILS

FILE NAME: pw://hqpwint01.a-e.transyscorp.com:transyscorp-pw1/Documents/Projects_2023/KC101/101230111/Bridge/Sheets/Br 81.79/dc08179_bis

PLOTTED: 9/12/2023 9:43:11 AM

STANDARD SHEET

GENERAL NOTES

GENERAL

1. 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.
2. **Construction means and methods shall comply with the All Permits Issued (API) package.**
3. Field verify all dimensions, stations and elevations prior to start of construction.
4. 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.
5. **Visit 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 excavation can begin. Report emergency fiber optic issues to 1-800-336-9193.**
6. **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

1. **All piles shall be driven to capacity shown in design plan set.**
2. If any numbered pile cannot be driven to these capacities, the UPRR Office of Structures Design shall be notified.
3. 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.
4. Vibratory hammers shall not be permitted to drive any portion of any bearing piles.
5. 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.
6. 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.
7. **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

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 5/16" 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.

GRADING

1. 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.
2. 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

1. 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)

1. Remove ties, rail and OTM from existing bridge.
2. Provide and install ballast, ties, rail and OTM for proposed bridge.
3. Provide material as shown in the Bill of Material.
4. Provide and install Private Property/No Trespassing sign and bridge marker signs on right side at each end of bridge.

B. CONSTRUCTOR

1. Coordinate all construction activities with the Railroad.
2. **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.**
3. Any modifications to this design shall be approved by the UPRR Office of Structures Design prior to construction.
4. **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.**
5. Apply for and obtain all construction permits necessary to perform the work.
6. Bill of Material and Schedules are provided for information only. Constructor shall be responsible for providing all material, of not provided by the Railroad, required to complete the work.
7. Perform all work not performed by the Railroad.
8. 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.
9. 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.
10. 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.
11. Direct channel flow as required to perform work.
12. Remove debris and ballast from channel as directed by the Railroad.
13. Accomplish activities within the schedule specified in the approved construction plan.

GROUT NOTES

NON-SHRINK GROUT

1. Non-shrink grout shall conform to the requirements of ASTM C1107.
2. Non-shrink grout shall meet the following strength requirements:

   1 day: 3,200 psi
   7 days: 6,000 psi

EPOXY GROUT

1. Epoxy grout shall consist of a 3-component epoxy resin system.

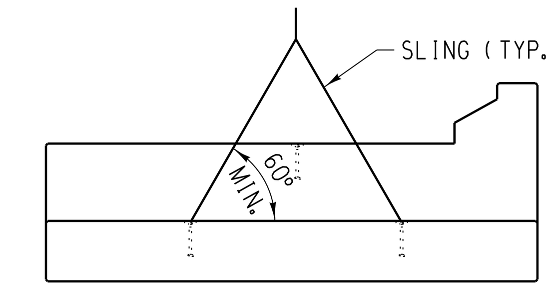
   Two liquid epoxy components.
   One inert aggregate filler component.

CONTROLLED LOW-STRENGTH MATERIAL (CLSM)

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 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.

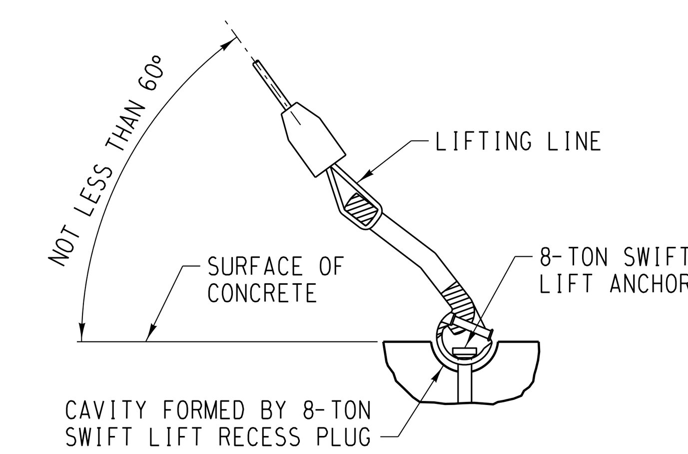
CONCRETE CAP NAMING CONVENTION KEY

P = Precast Concrete, C = Cast-in-Place Concrete
C = Cap, WW = Wingwall, A = Assembly, BW = Backwall, SC = Supercap
2 Digit Number for Beam Depth in Inches (14, 20, 30, or 42)
E = End, I = Interior
1 = 1 Piece, 2 = 2 Piece
S = Single Track, L = Left, R = Right, C = Center, D = Dowels
PC42E1S



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.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
05/23	B	UPDATED FIBER OPTIC NOTE
05/21	A	FCAW E71T-7 TO E71T-8 ELECTRODE

DESIGN BY: UPRR | DRAWN BY: UPRR | CHECKED BY: HDR
APPROVED:
05-04-2020
UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC
BRIDGE STANDARDS
CONCRETE BEAM BRIDGES
GENERAL NOTES
FILE OWNER: UPRR | DATE: APRIL, 2020
PLAN NO.: 531100 | SHEET: T2

 PLOTTED: 5/26/2023 8:48:16 AM

FILE NAME: P:\!Standards\0_Bridges (Concrete)\0-Active\5311XX - Single Track - Deep Caps\Staging\531100 - Single Track Construction Drawings.dgn

INCHES

STANDARD SHEET

PRECAST CONCRETE NOTES:

CONCRETE:

1. All concrete materials, placement and workmanship shall be in accordance with Part 1, Chapter 8 of the current AREMA Manual for Railway Engineering.
2. Minimum compressive strength - 4000 Lb. per square inch at 28 days.
3. Exposed surfaces shall be formed in a manner which will produce a smooth and uniform appearance without rubbing or plastering. Exposed edges of 90 degrees or less are to be chamfered ¾" x ¾". Top surface to have a smooth finish, free of all float or trowel marks.
4. Concrete shall be proportioned such that the water - cement ratio (by weight) does not exceed 0.45. Concrete must contain a minimum of 6½ sacks of cement per cubic yard of concrete. Flyash replacement may account for up to 25% of the cement.
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 specifications. Coarse aggregate shall be no. 67. Fine aggregate shall be natural sand.
7. Air content shall be between 5% and 7% (by volume).
8. Admixtures shall not be used without approval by Engineer.
9. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.
10. The fabricator shall stencil the item name, date manufactured, name of manufacturer and actual lifting weight at location shown.
11. Production procedures for the manufacture of precast members shall be in accordance with the AREMA Manual for Railway Engineering and the Precast/Prestressed Concrete Institute's Manual MNL 116 for Quality Control.
12. Dimensional tolerances governing the manufacture of precast members shall conform to Division VI, Section 6.4 of the Precast/Prestressed Concrete Institute's Manual MNL 116 for Quality Control. Tolerance for location of lifting devices shall be ±½".
13. The fabricator will be responsible for loading and properly securing all precast concrete members for shipment. All concrete components shall be made available for inspection by the Railroad at the fabricator's plant prior to shipment, at the Railroad's discretion.

REINFORCING STEEL:

1. Reinforcing steel shall be deformed, new billet bars per current ASTM A615 Specifications and to 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 is to be blocked to proper location and securely wired against displacement. 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. Minimum concrete cover on reinforcement not otherwise noted shall meet current AREMA Manual for Railway Engineering requirements.

EMBEDDED STEEL:

1. Steel plate shall conform to ASTM A36 OR A709-Grade 36 Specifications. Studs shall be C1015, C1017 or C1020 cold drawn steel which conform to ASTM A108 Specifications.
2. Deformed bar anchors shall conform to ASTM A706 specifications. Welding of deformed bar anchors shall conform to AWS D1.4. Welding shall be performed by certified welder.
3. Where galvanizing is not indicated, material shall be plain.

LIFTING ANCHORS:

1. Swift lift anchors shall be Dayton Superior P-52 anchors or approved alternate with a minimum safe working load sufficient for the weight of the precast element including form removal. The safe working load shall provide a minimum safety factor of 4.

MISCELLANEOUS HARDWARE:

1. 8" T-Bar Anchors as manufactured by Meadow Burke Company, or approved alternate.

BEARING PAD SPECIFICATIONS:

1. Bearing pads shall be Random Oriented Fiber elastomeric material comprised of high-quality ozone-resistant virgin elastomer and synthetic fibers. Pads shall conform to the following minimum material properties:

Hardness (Shore A, ASTM D2240)	80 ± 5
Tensile Strength, psi (ASTM D412, Die C)	1000 ± 100
Ultimate Elongation, minimum %	40
Heat Aging (ASTM D573, 70 Hrs. @ noted temperature):	
Durometer, 212 °F, maximum point change	± 10
Tensile Strength, 158 °F, maximum % change	± 25
Ultimate Elongation, 212 °F, maximum % change	± 25
Compression, minimum ultimate strength, psi	8000
Apparent Shear Modulus (GA), psi, based on tests conducted at 70 °F to 80 °F under uniform compressive stresses of 500, 1000, and 1500 psi and at applied horizontal shear plus slip strain of 50%. GA is constant in all directions parallel to the bearing plane.	230 ± 30

2. Bearing pads shall be Voss Engineering, Inc., "Fiberlast" expansion bearing pads or approved equal.
3. Cutting of the pads shall be done so that the edges have no tears or other jagged areas.
4. Permissible tolerances of the pad shall be as stated in Chapter 15, Section 5.12.6 of the 2019 AREMA Manual for Railway Engineering.
5. The cap fabricator shall fasten the bearing pads to the cap by using the following procedure: clean pads according to manufacturer's recommendations; prime contact surface and glue to cap with Sikadur 31 Hi-Mod Gel (1:1 mix ratio) or approved equal.

MISCELLANEOUS STEEL NOTES:

1. Materials, fabrication, workmanship and erection per the current AREMA Manual for Railway Engineering, Chapter 15, Steel Structures.
2. Material shall conform to the following requirements:

Rolled Shapes & Plates	ASTM A36
Pipe	ASTM A53 Gr. B
Bolts	ASTM A307 Gr. A
Elastic Locknut	MIL-DTL-32258
Steel Washer	ASTM F436

3. Grating panels and fasteners shall conform to the following requirements:

Grating Fasteners:

Saddle Clips	F-10 Galvanized Saddle Clips
Socket Cap Screws	SAE J429, Gr. 8, Zinc Coated
Elastic Locknut	MIL-DTL-32258
Steel Washer	ASTM F436
Nylon Washer	Nylon G16

Grating Panels:
Material shall comply with NAAMM Standard MBG 531-17
Size = W-19-4 (1¾ x 3/16 Serrated) Steel Galvanized.

4. Welding requirements:
   A. All welding shall be with the SAW, SMAW, or FCAW process.
   B. All welding per AWS D1.1, Structural Welding Code.
   C. Welders shall possess valid qualifications, including a Procedure Qualification Report (PQR) and Weld Procedure Specification (WPS) for each weld type to be performed as well as documentation verifying that they have performed the specific weld(s) within the prior six months.
5. Miscellaneous steel shall be plain unless noted otherwise.
6. Pieces or assemblies designated as galvanized shall be galvanized after fabrication in accordance with ASTM A123. After galvanizing, all elements shall be free of fins, abrasions, rough or sharp edges, and other surface defects.
7. Bolts and nuts to be zinc plated in accordance with ASTM A153 unless noted otherwise.

CAST-IN-PLACE CONCRETE NOTES:

CONCRETE:

1. All concrete materials, placement, workmanship and testing shall be in accordance with Part 1, Chapter 8 of the current AREMA Manual for Railway Engineering.
2. Minimum compressive strength at 28 days shall be as indicated on the design plans.
3. Exposed surfaces shall be formed in a manner which will produce a smooth and uniform appearance without rubbing or plastering. Exposed edges of 90 degrees or less are to be chamfered ¾" x ¾". Top surface to have a smooth finish, free of all float or trowel marks.
4. Concrete shall be proportioned as follows:

Concrete Strength:	3,000 psi	4,000 psi	5,000 psi	6,000 psi
Max. Water/Cement Ratio (by weight):	0.50	0.45	0.42	0.40
Min. Sacks of Cement per Cu. Yd.:	5.5	6.0	6.5	7.0

5. Flyash replacement may account for up to 25% of the cement by substitution.
6. Cement shall be Type I, Type II or Type III Portland Cement in accordance with ASTM C150 specifications.
7. Aggregates shall be graded in accordance with ASTM C33 specifications. Coarse aggregate shall be no. 67. Fine aggregate shall be natural sand.
8. Allowable 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 aggresive agents.

   Mild Exposure - 3% to 5%
   Not exposed to freezing, de-icers or other aggressive agents.
9. Admixtures shall not be used without approval by Engineer. Where multiple admixtures are used, it is recommended that all admixtures be obtained from the same company.
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. Apply a structural bonding agent to construction joints or when placing new concrete against existing concrete. Submit bonding agent to the Engineer for approval.

[Note 13 applies only when specifically stated in the Bill of Material descriptions.]

13. 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 lbs. per cubic yard chloride protection. Mix shall also include 7%, by weight of cement, force 10,000 microsillica 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 current ASTM A615 Specifications and to 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 is to be blocked to proper location and securely wired against displacement. 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. Minimum concrete cover on reinforcement not otherwise noted shall meet current AREMA Manual for Railway Engineering requirements.

[Note 4 applies only when specifically stated in the Bill of Material descriptions.]

4. Reinforcing steel shall be epoxy coated per ASTM A775 specifications meeting Annex A1 for epoxy coating.

EMBEDDED STEEL:

1. Steel plate shall conform to ASTM A36 OR A709-Grade 36 Specifications. Studs shall be C1015, C1017 or C1020 cold drawn steel which conform to ASTM A108 Specifications.
2. Deformed bar anchors shall conform to ASTM A706 specifications. Welding of deformed bar anchors shall conform to AWS D1.4. Welding shall be performed by certified welder.
3. Where galvanizing is not indicated, material shall be plain.

REVISIONS		
DATE	LTR.	DESCRIPTION
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DESIGN BY: HDR | DRAWN BY: HDR | CHECKED BY: AJB

APPROVED:

05-04-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BEAM BRIDGES

PIECE FABRICATION NOTES

FILE OWNER: UPRR | DATE: APRIL, 2020

PLAN NO.: 531100 | SHEET: T3

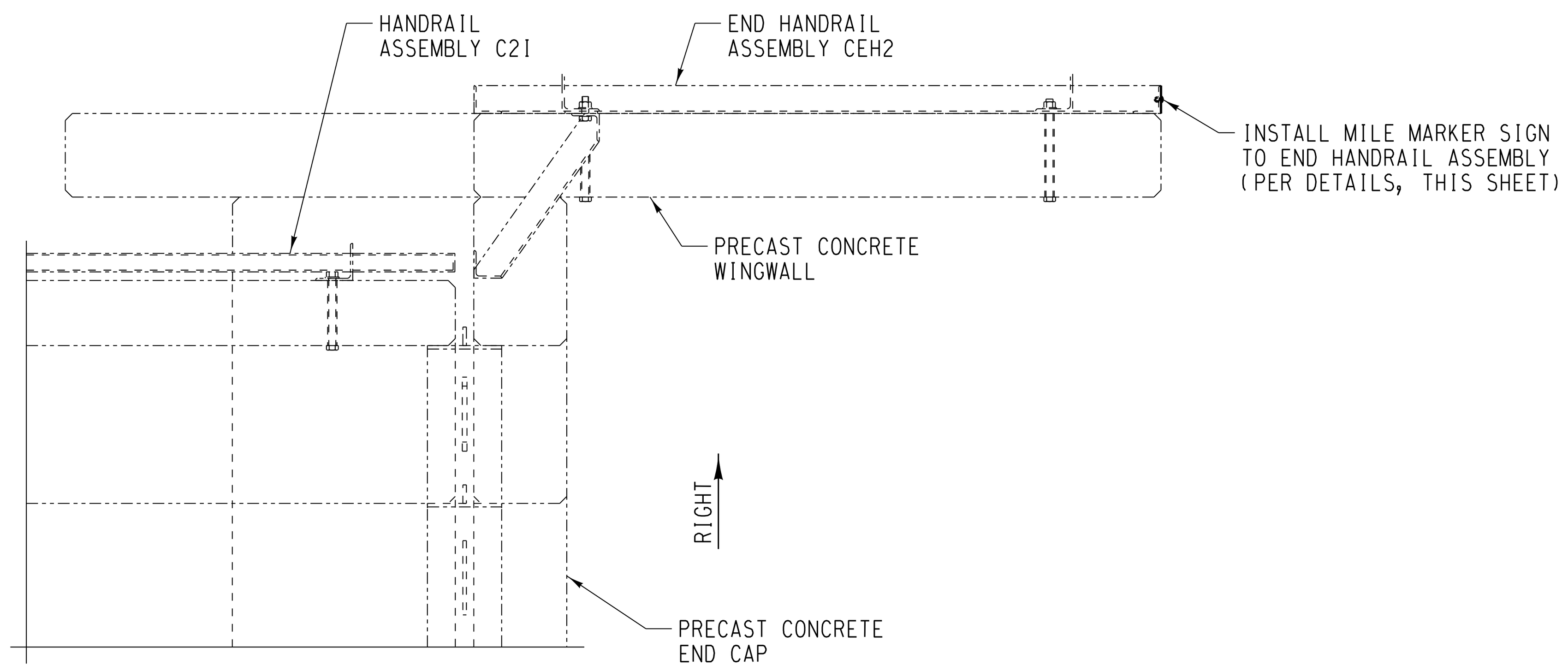
PLOTTED: 5/26/2023 8:48:17 AM

FILE NAME: P:\Standards\0_Bridges (Concrete)\0-Active\5311XX - Single Track - Deep Caps\Staging\531100 - Single Track Construction Drawings.dgn

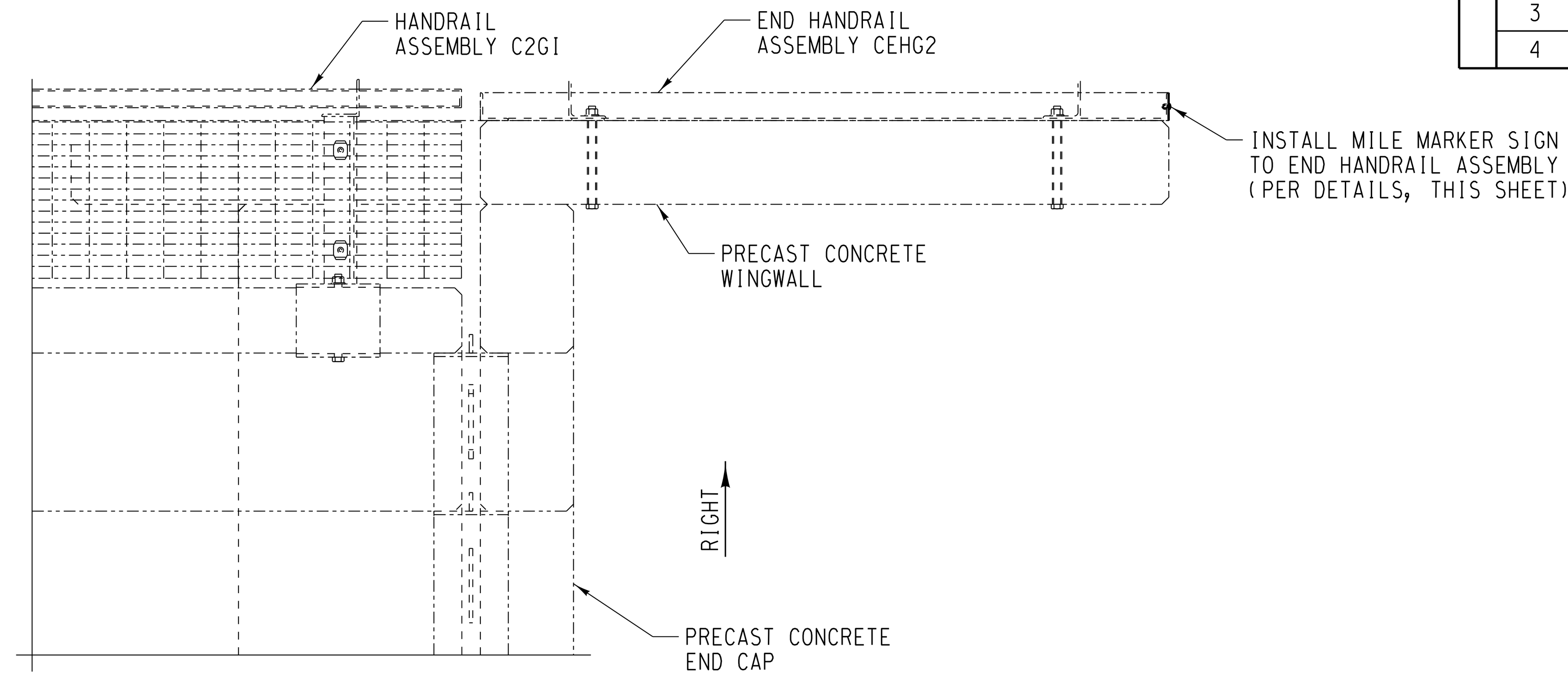
INCHES

STANDARD SHEET

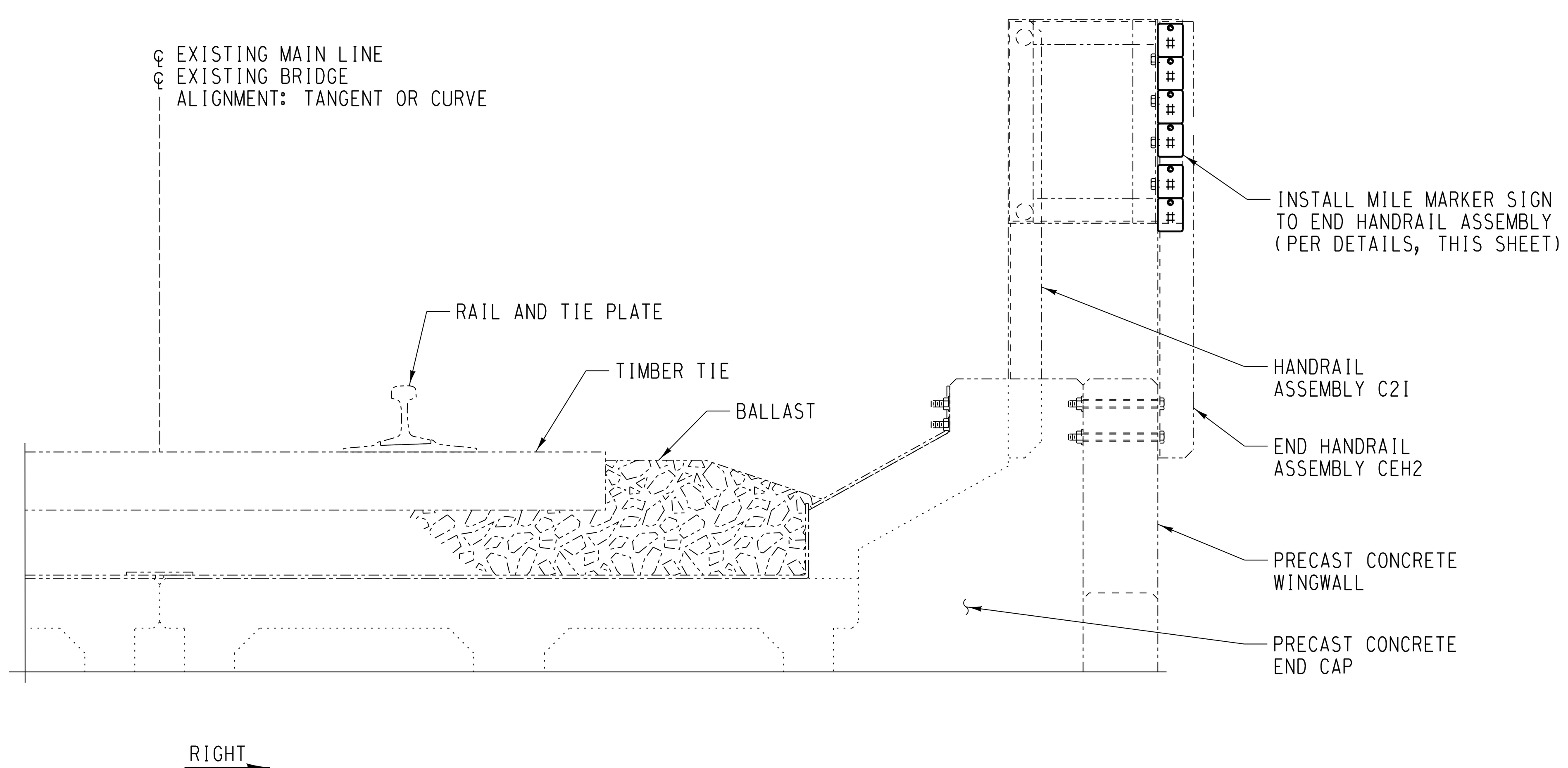
REFERENCE DRAWINGS					
	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION
REF.	1	0502B	1	-	SINGLE LETTER AND NUMBER SIGN
	2	0507B	1	-	STRUCTURE MARKER SIGNS
	3	0538F	1	-	PRIVATE PROPERTY AND NO DUMPING SIGNS
	4	0599J	1-2	-	SIGN POST SPECIFICATIONS AND INSTALLATION INSTRUCTIONS



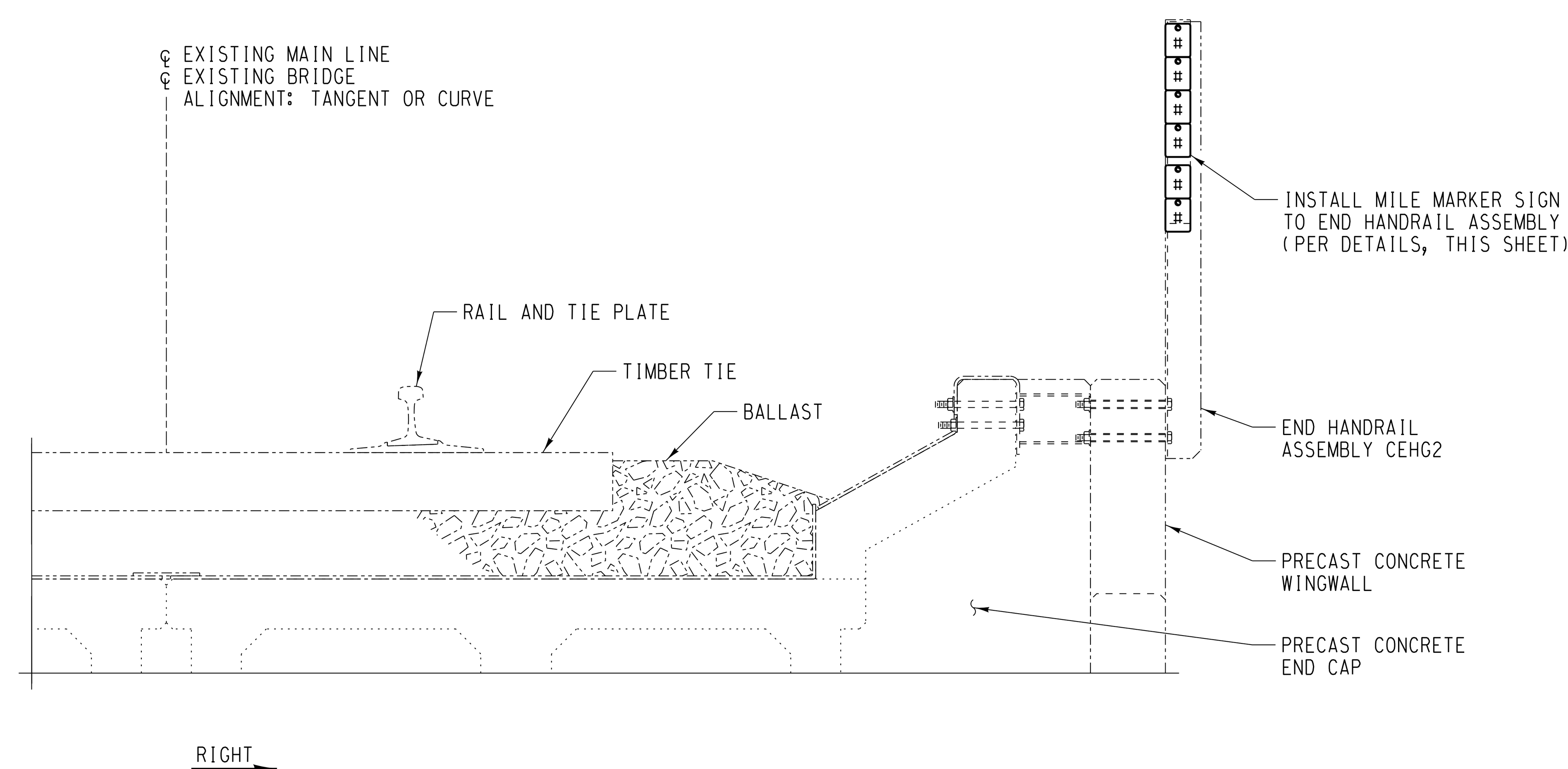
ATTACH MILE MARKER TO HANDRAIL ASSEMBLY CEH2
SCALE: 3/4" = 1'-0"



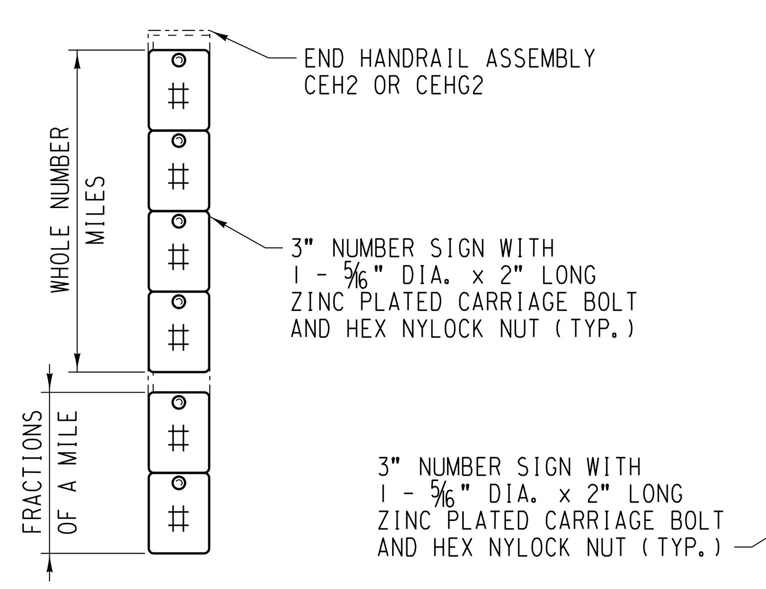
ATTACH MILE MARKER TO HANDRAIL ASSEMBLY CEHG2
SCALE: 3/4" = 1'-0"



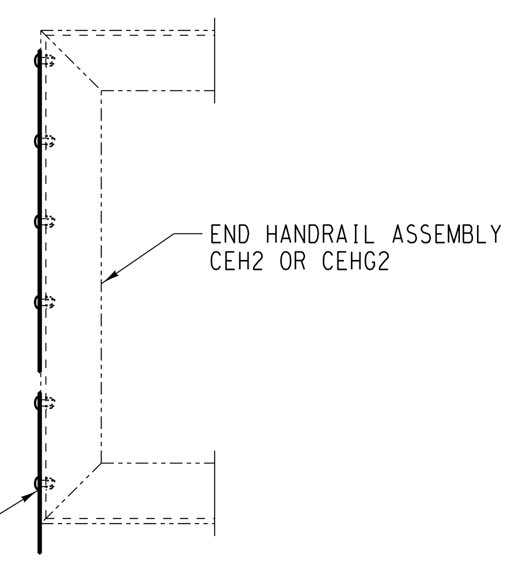
MILE MARKER TO HANDRAIL ASSEMBLY CEH2 - END VIEW
SCALE: 3/4" = 1'-0"
RIGHT SIDE INSTALLATION SHOWN - LEFT SIDE SIMILAR



MILE MARKER TO HANDRAIL ASSEMBLY CEHG2 - END VIEW
SCALE: 3/4" = 1'-0"
RIGHT SIDE INSTALLATION SHOWN - LEFT SIDE SIMILAR



END VIEW



SIDE VIEW

MILE MARKER INSTALLATION DETAIL
SCALE: 1 1/2" = 1'-0"

DESIGN NOTES

1. INSTALL STRUCTURE MARKER SIGNS PER DRAWING 0507B.
2. INSTALL NO TRESPASSING SIGNS PER DRAWING 0538D.

REVISIONS		
DATE	LTR.	DESCRIPTION
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DESIGN BY: UPRR | DRAWN BY: UPRR | CHECKED BY: HDR

APPROVED:

05-04-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BEAM BRIDGES

STRUCTURE MARKER & NO TRESPASSING SIGN INSTALLATION DETAILS

FILE OWNER: UPRR | DATE: APRIL, 2020

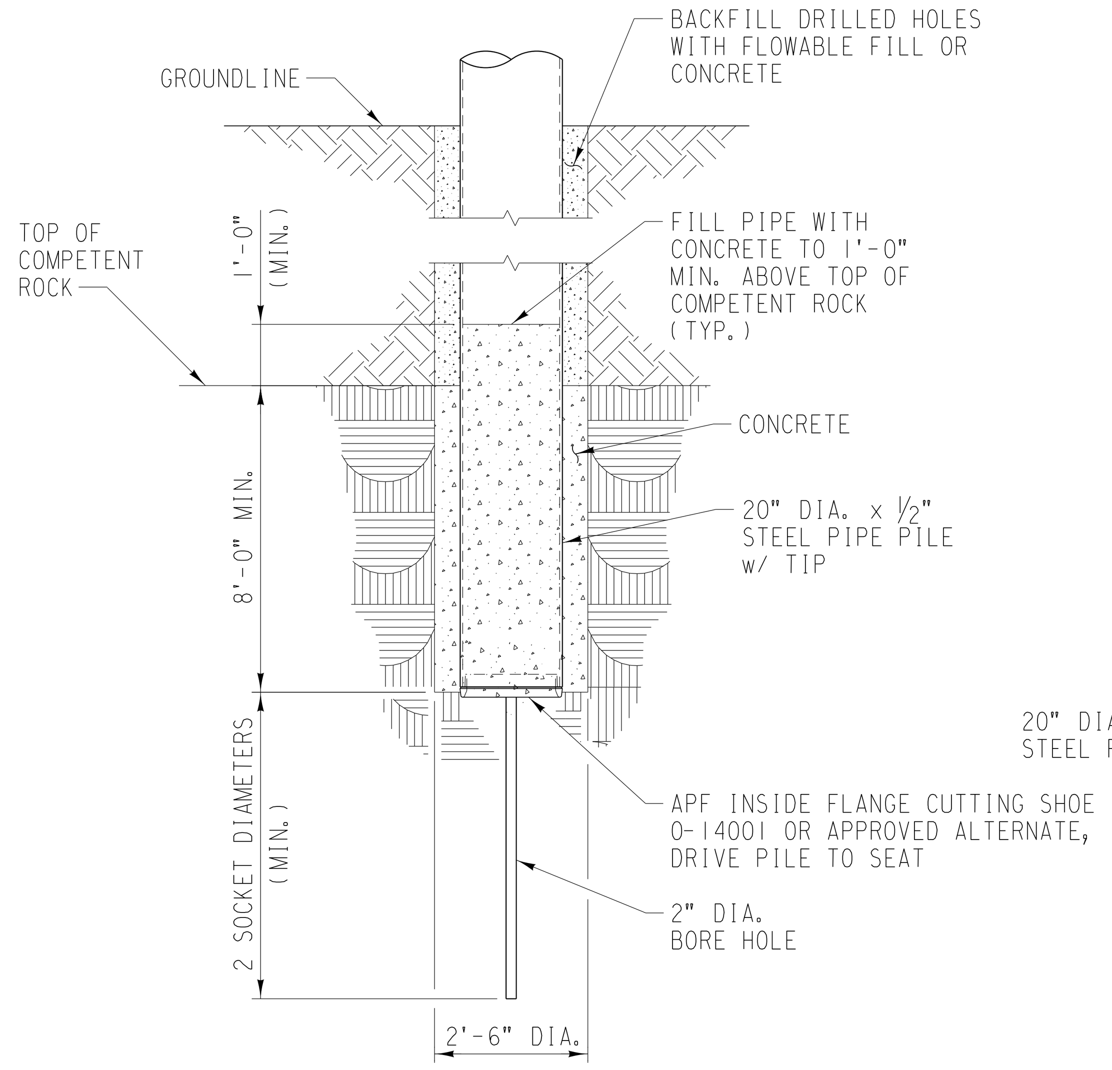
PLAN NO.: 531100 | SHEET: A2

PLOTTED: 5/26/2023 8:48:18 AM

FILE NAME: Pw:\Standards\0_Bridges (Concrete)\0-Active\5311XX - Single Track - Deep Caps\Staging\531100 - Single Track Construction Drawings.dgn

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

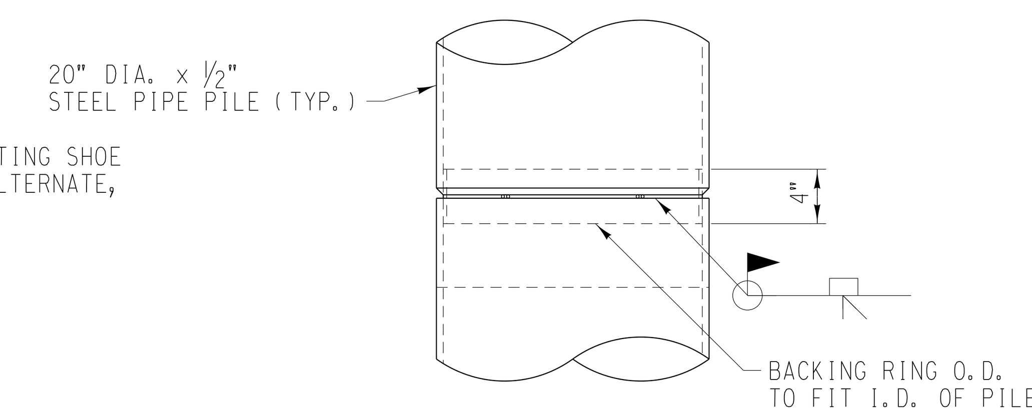
STANDARD SHEET



PIPE PILE SOCKET DETAIL

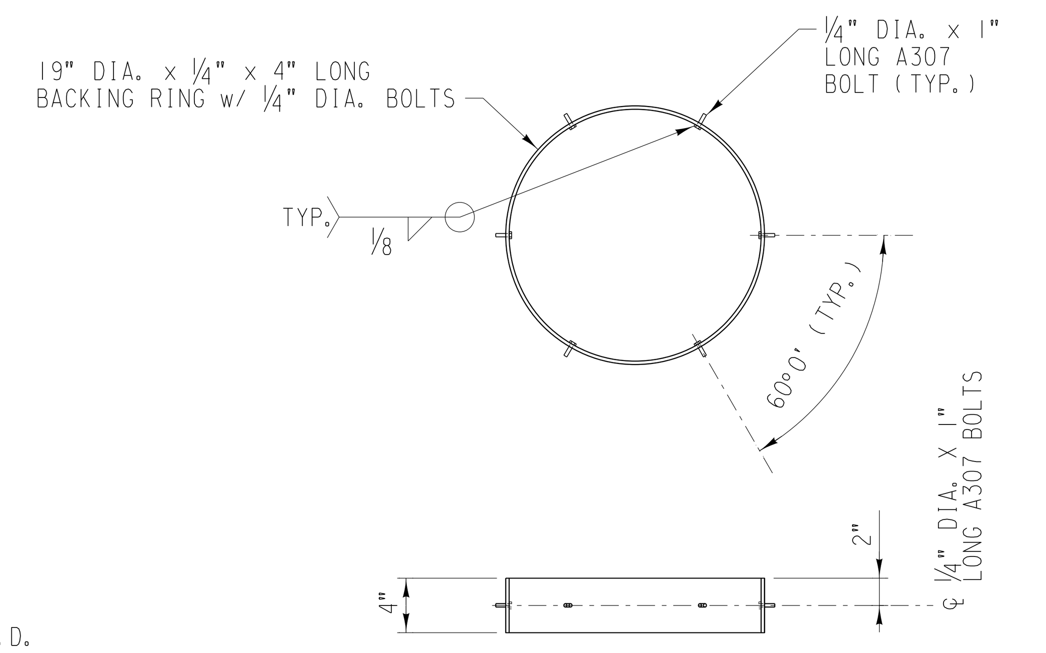
SCALE: NONE

EST. VOLUME OF CONCRETE = 1.5 CU. YD. PER 8' SOCKET DEPTH + 1'
(INCLUDES CONCRETE IN ANNULAR SPACE AND IN PILE)



SINGLE BEVEL SPLICE DETAIL

SCALE: 1"=1'-0"



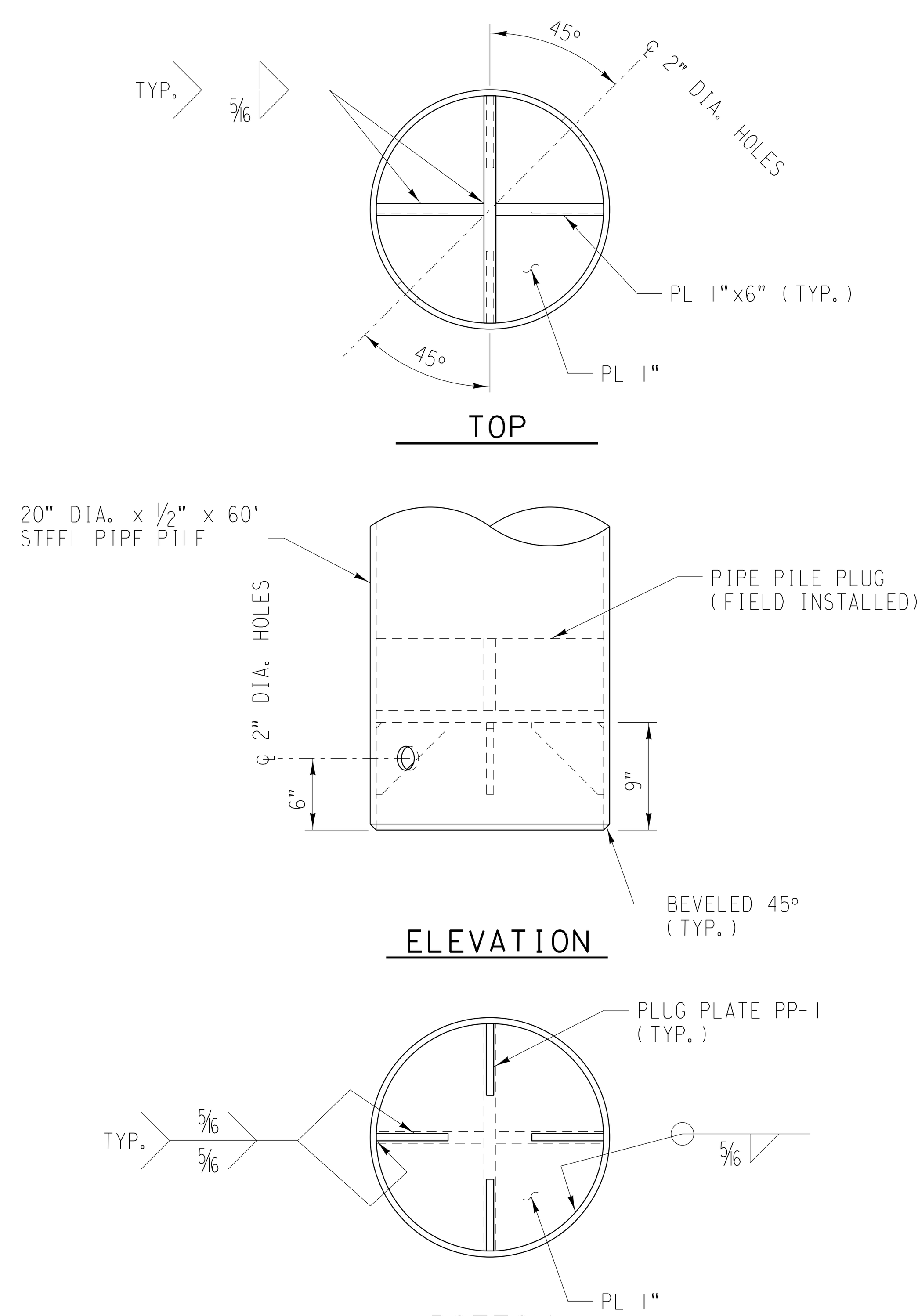
20" PIPE PILE BACKING RING

SCALE: 1"=1'-0"

STORE ITEM NO: 510-7619

PILE SOCKET NOTES:

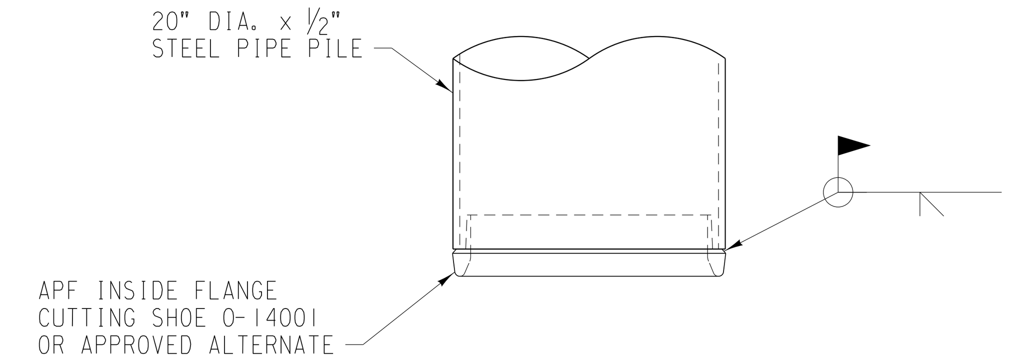
1. SEE BENT DESIGN NOTES TO DETERMINE WHEN PILE SOCKETING IS REQUIRED.
2. PILING SHALL BE SEATED IN PREDRILLED HOLES IN THE ROCK AND ENCASED IN CONCRETE WITHIN THE BEDROCK (SEE DETAIL).
3. MINIMUM DEPTH OF PILE SOCKET SHALL BE 8'-0" INTO COMPETENT ROCK.
4. BORE 2" DIA. HOLE IN CENTER OF PILE SEAT TO A MINIMUM DEPTH OF 2 SOCKET DIAMETERS.
5. PILING WITH TIP REINFORCEMENT SHALL BE PLACED INTO ROCK SOCKET AND DRIVEN TO ACHIEVE REQUIRED CAPACITY.
6. SEATED PILE SHALL BE ENCASED IN ROCK WITH CONCRETE.
7. PILING SHALL BE FILLED WITH CONCRETE TO 1'-0" MINIMUM ABOVE THE BEDROCK.
8. MINIMUM COMPRESSIVE STRENGTH OF CONCRETE SHALL BE 4000 PSI INCH AT 28 DAYS.



PIPE PILE PLUG DETAIL

SCALE: 1"=1'-0"

NOTE: PIPE PILE PLUG NOT TO BE USED WITH OPEN-ENDED PILE DESIGN

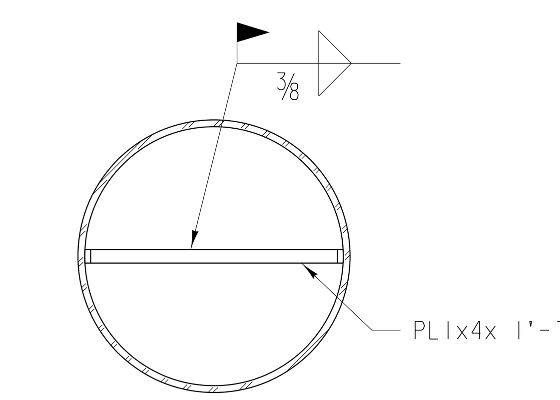


CUTTING SHOE DETAIL

SCALE: 1"=1'-0"

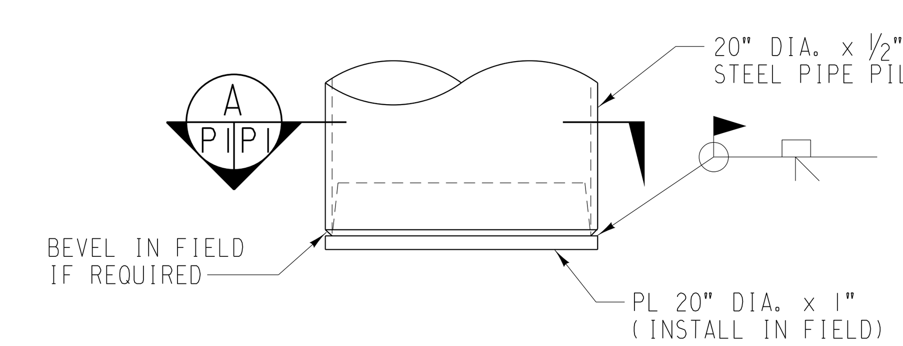
STORE ITEM NO: 510-7493

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



SECTION A / P1

SCALE: 1"=1'-0"

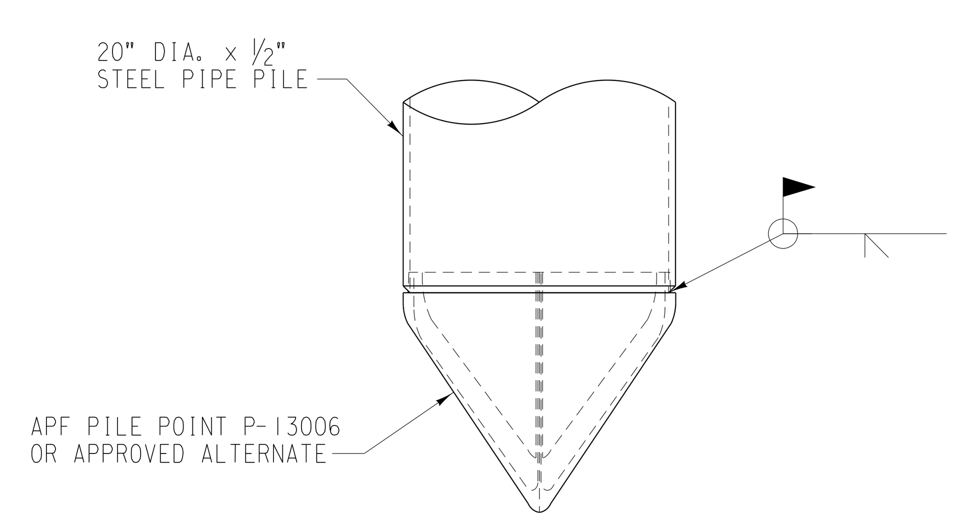


END PLATE DETAIL

SCALE: 1"=1'-0"

STORE ITEM NO: 510-7625

NOTE:
PILE PLATE TO BE UTILIZED ONLY WHEN SHOWN ON THE DESIGN PLANS.

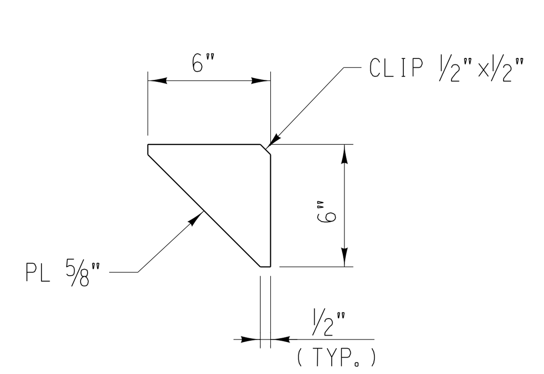


PILE POINT DETAIL

SCALE: 1"=1'-0"

STORE ITEM NO: 510-7621

NOTE:
PILE POINT TO BE UTILIZED ONLY WHEN SHOWN ON THE DESIGN PLANS.



PLUG PLATE PP-1 DETAIL

SCALE: 1½"=1'-0"

STORE ITEM NUMBERS FOR 20" PIPE PILE WITH PILE PLUG

PILE LENGTH	UNCOATED	COAL TAR EPOXY COATED
40'	XXX-XXXX	XXX-XXXX
60'	XXX-XXXX	XXX-XXXX

BENT DESIGN NOTES:

1. Selection of pile configuration and maximum heights based on equilibrium superelevation (regardless of actual superelevation installed). Refer to UPRR Track Standards Book, Std. DWG. 0020 latest revision.
2. Standard design is valid for minimun 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.
3. For span lengths less than 22', use values shown for 22' spans.
4. Bent shall be driven per requirements of longer span length supported. For example, for a bent supporting 30' and 34' spans, drive per 34' span requirements.
5. Maximum track affset (from bridge centerline) is 6" with this bent standard.

GENERAL NOTES:

1. 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.

Pile Capacities:
1. For required driven pile capacities, see "Maximum Pile Load" tables.

Steel:
1. Materials:

Piles	ASTM A252, GRADE 3
Pile Splices	ASTM A572, GRADE 50 OR A36
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. Use longitudinal welded pipe. Spiral welded pipe is prohibited.

Welding:
1. Use shielded metal arc welding (SMAW) or flux core arc welding (FCAW) process per AWS D1.5. Acceptable filler metal is E7018 electrode for SMAW and E71T-7 electrode for FCAW. For other acceptable electrodes, refer to AWS D1.5.

Splices:
1. Splices shall be made a sufficient distance above the ground or water (not less than one foot) so that the splice can be observed during driving.
2. The number of splices shall be kept to a minimum.
3. Splicing cut-offs or short pieces to make a main bearing pile is not permitted.
4. The pile shall be driven so that the upper splice is at least 10 feet below the ground surface.
5. 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.

Driving Tolerances:
1. Deviation shall not exceed ¼ inch per foot from vertical or batter line.
2. The deviation from the plan location at the top of pile shall not exceed 1½ inch.
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.
4. If any numbered pile cannot be driven to its capacity, notify the UPRR Office of Structures Design.

Coal Tar Epoxy Coating:
1. Where specified, coal tar 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 Mil 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.

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DESIGN BY: UPRR | DRAWN BY: UPRR | CHECKED BY: HDR

APPROVED:

05-04-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

BRIDGE STANDARDS

CONCRETE BEAM BRIDGES

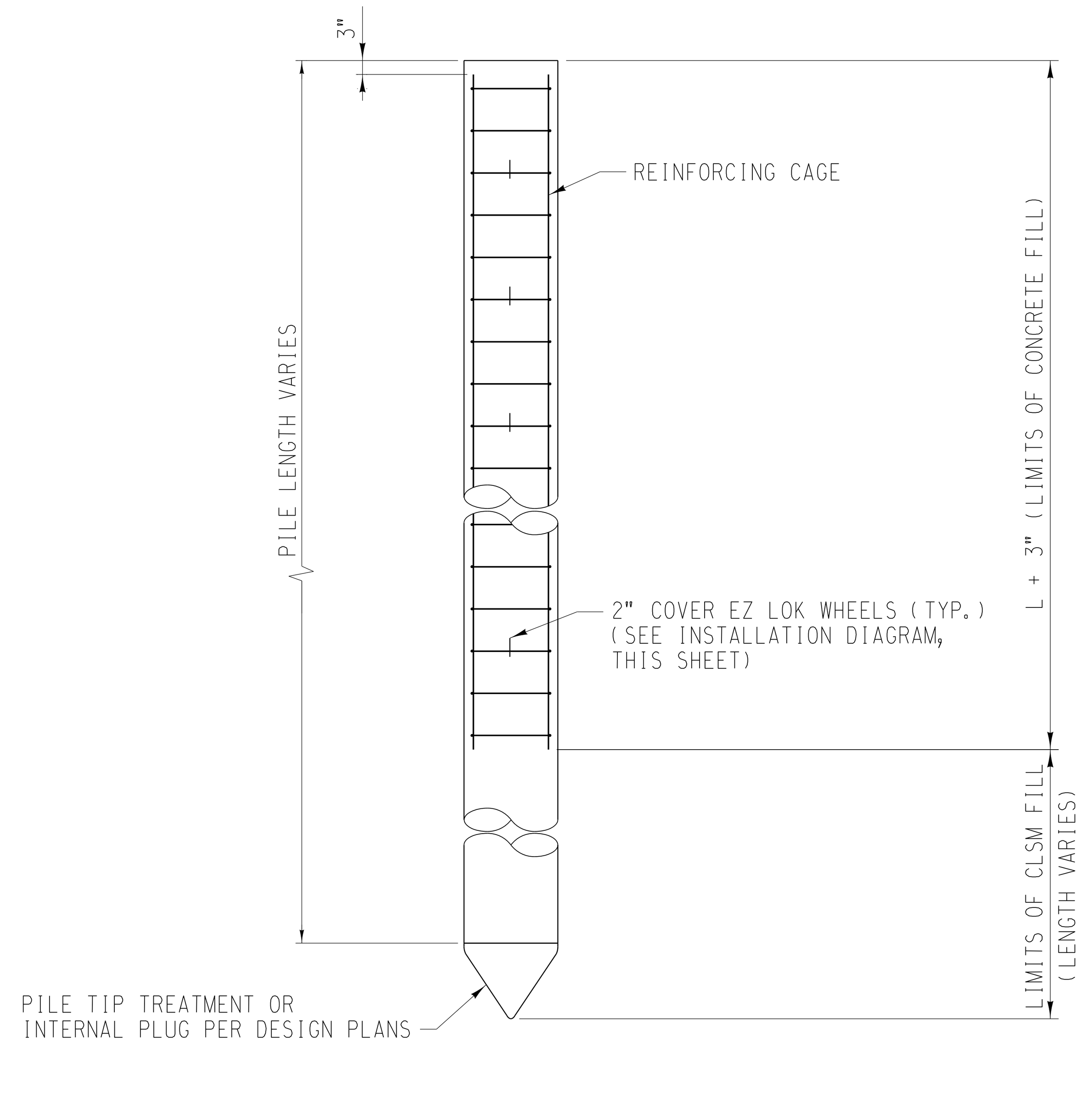
PIPE PILE FOUNDATIONS
PILE INSTALLATION NOTES AND DETAILS

FILE OWNER: UPRR | DATE: MAY, 2020

PLAN NO.: 531120 | SHEET: P1

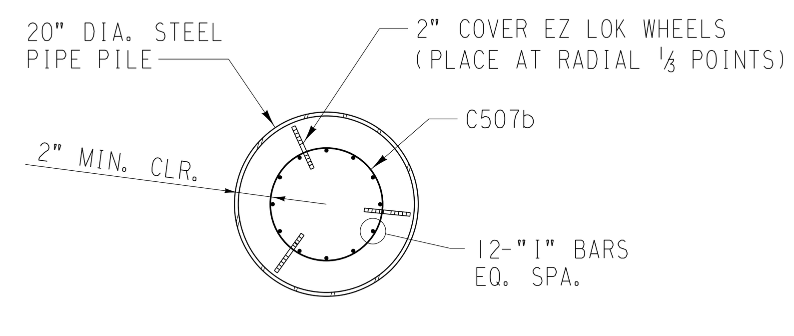
 PLOTTED: 5/28/2021 2:26:15 PM

STANDARD SHEET



REINFORCED CONCRETE CORE DETAIL

SCALE: 3/8" = 1'-0"



PILE SECTION

SCALE: NONE

PIPE PILE CONCRETE FILL NOTES:

1. For pipe pile concrete and reinforcing notes, see Plan No. 531121.
2. Pile shall be 20" outside diameter steel pipe with ½" wall thickness, and shall meet the requirements of ASTM A252 Grade 3 with a minimum yield stress of 45,000 psi.
3. Reinforcing cage to be securely tied, rigged, and ready for site installation.
4. Bracing bars can be cut as cage is lowered into pile to allow for tremie pipe placement.

MATERIAL SCHEDULE - REINFORCED CONCRETE CORE
(PER PIPE PILE)

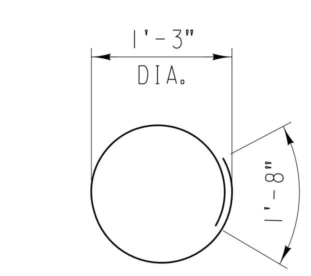
L	CONCRETE CU. YD.	2" EZ LOK WHEELS	REINFORCING CAGE			REINFORCING BARS					
			MARK	STORE ITEM NO.	EST. WT. LB.	C507b	I2000	I3000	I4000	I5000	I6000
20'-0"	1.5	12	RB-20	512-0000	1,135	27	12	-	-	-	-
30'-0"	2.2	15	RB-30	512-0001	1,705	41	-	12	-	-	-
40'-0"	3.0	21	RB-40	512-0002	2,270	54	-	-	12	-	-
50'-0"	3.7	27	RB-50	512-0003	2,835	67	-	-	-	12	-
60'-0"	4.4	30	RB-60	512-0004	3,405	81	-	-	-	-	12

NOTE: CONCRETE QUANTITIES ASSUME ONLY THE TOP L + 3" OF EACH PILE IS FILLED.
4000 PSI CONCRETE (PER SPECIFICATIONS, THIS SHEET)

REINFORCING SCHEDULE

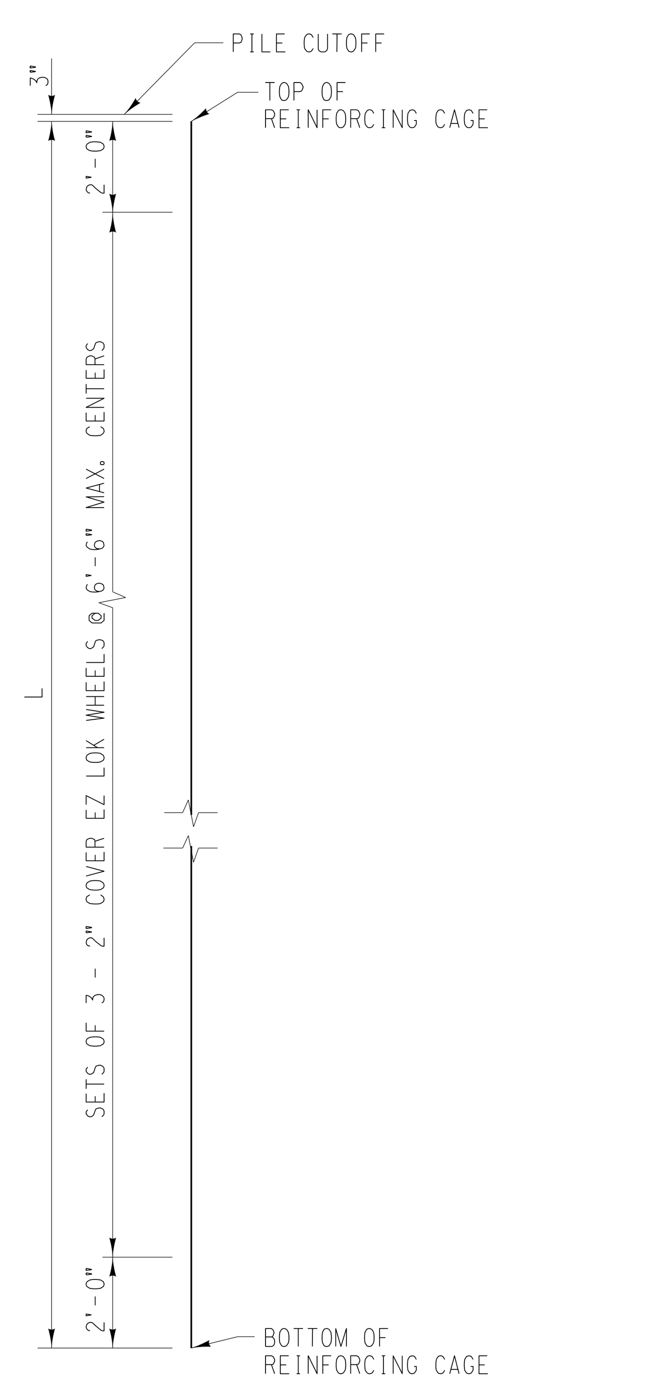
MARK	SIZE	LENGTH	SHAPE
C507b	#4	5'-7"	○
I2000	#10	20'-0"	——
I3000	#10	30'-0"	——
I4000	#10	40'-0"	——
I5000	#10	50'-0"	——
I6000	#10	60'-0"	——

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



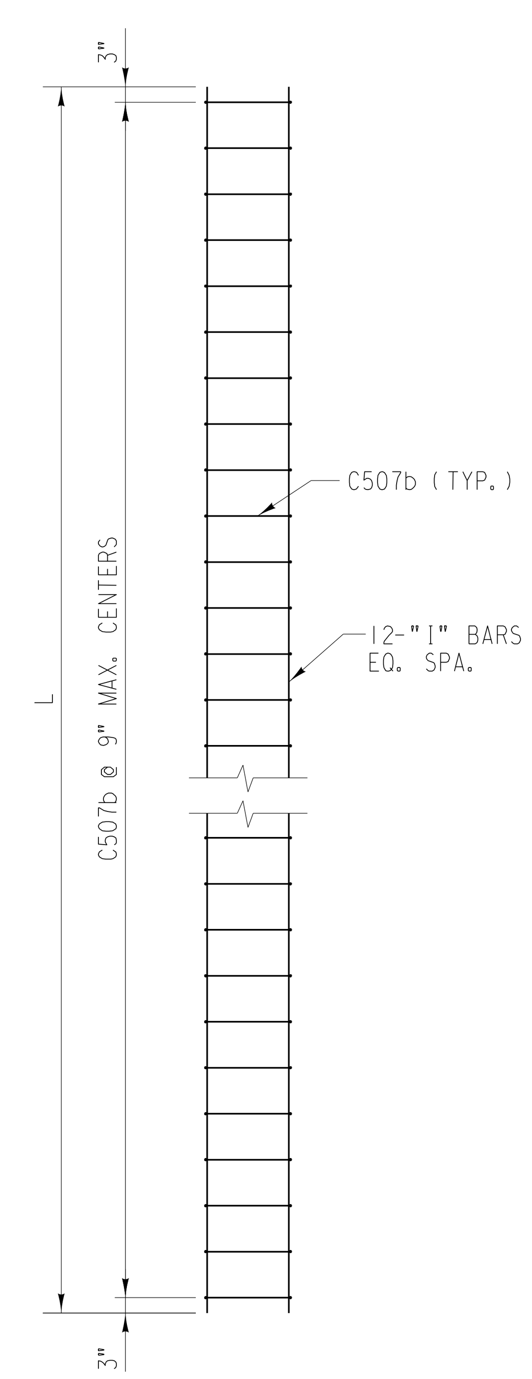
C507b

NOTE:
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.



EZ LOK WHEEL INSTALLATION DIAGRAM

SCALE: NONE



REINFORCING CAGE RB

SCALE: 3/8" = 1'-0"

SHIP 2" EZ LOK WHEELS LOOSE FOR EACH CAGE

REVISIONS		
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DESIGN BY: UPRR | DRAWN BY: HDR | CHECKED BY: HDR

APPROVED:

05-04-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

BRIDGE STANDARDS

CONCRETE BEAM BRIDGES

PIPE PILE FOUNDATIONS
REINFORCING NOTES AND DETAILS

FILE OWNER: UPRR | DATE: MAY, 2020

PLAN NO.: 531120 | SHEET: P5

 PLOTTED: 5/28/2021 2:26:17 PM

FILE NAME: ##upcorp.ad.uprr.com#engcad#Bridge#Standards#Bridges (Concrete)#0-Active#5311XX - Single Track - Deep Caps#531120 - Single Track Pipe Pile Foundations.dgn

INCHES

STANDARD SHEET

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 6½ 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 P124 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 microsilica 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 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.
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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DESIGN BY: HDR | DRAWN BY: HDR | CHECKED BY: AJB

APPROVED:

10/26/2021

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BEAM BRIDGES

DRIVEN PIPE PILE NOTES
20" TO 48" DIAMETER

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

 PLOTTED: 3/23/2023 9:48:04 AM

FILE NAME: Y:\Railroad\210100S\210104.89_Brooklyn_670.07\Eng_Docs\CAD\42in_Standards_Submittals\20230323_Rev_1_Submittal\533100_42 inch PCB_Rev1.dgn

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DRILLED SHAFT CONSTRUCTION NOTES

GENERAL

1. Drilled shafts have been designed in accordance with the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, Chapter 8, Part 2: Reinforced Concrete Design and Part 24: Drilled Shaft Foundations.

2. Drilled shafts shall derive their support from side friction and end bearing unless design drawings indicate otherwise.

3. Drilled shaft construction shall be in accordance with the AREMA Manual of Railway Engineering, Chapter 8: Concrete Structures and Foundations, Part 24: Drilled Shaft Foundations.

4. Contractor shall provide a submittal detailing proposed drilled shaft installation method with the bid. The submittal shall be subject to review and acceptance by Union Pacific Railroad (UPRR). Installation methods shall be compatible with subsurface conditions at the site, proposed shaft size and configuration, and the requirements of the design drawings. Submittal shall include information regarding equipment and procedures for excavation in soil or rock, permanent steel casing installation, temporary steel casing installation and withdrawal, and shaft bottom cleanout, as applicable.

5. Contractor shall install the non-destructive testing (NDT) components as required by the project documents. The costs for NDT activities shall be covered under bid item "NDT Instrumentation and Testing" Unless directed otherwise by the design drawings, Thermal Integrity Profiling (TIP) testing should be considered the minimum NDT requirement on all drilled shafts.

   Cross-hole Sonic Logging (CSL) testing may also be required by the project documents. CSL testing may be required based on the results of the visual observations during shaft construction, based on the results of the TIP testing, at the direction of UPRR, or required by the project documents in addition to TIP testing. The CSL tubes shall be included at the direction of the project documents. Upon UPRR's acceptance, the CSL tubes shall be filled with non-shrink grout of greater than or equal strength than the drilled shaft mix design.

6. If actual subsurface soil and rock conditions differ substantially from the soil profile indicated on the design drawings, notify the Engineer of record (EOR) and UPRR immediately by phone, e-mail, or in writing within 12 hours of such a determination.

7. The Contractor shall:

   a. Construct drilled shafts as detailed and noted on these drawings and in accordance with these notes.
   b. Provide an on-site supervisor and drillers having a minimum of five (5) years of acceptable experience with transportation projects using installation methods similar to the proposed installation methods within the region in which the work is being completed.
   c. Develop and adhere to a program for quality control. Provide an independent "Drilled Shaft Inspector" (DSI).
   d. Perform all excavation, shaft cleaning, rebar placement, concrete placement and testing work in the presence of the DSI and UPRR unless otherwise permitted.
   e. Schedule and provide means of access and suitable time for inspection of each drilled shaft excavation by the DSI and UPRR before and after steel reinforcement and concrete placement.
   f. Take concrete compression test samples and perform testing as required.
   g. Provide the means and opportunity for the DSI and UPRR to inspect and document on a full-time basis the concrete placement operation. This may require additional man-lifts, tie-offs or access to work platforms.

8. Contractor shall provide a Drilled Shaft Installation Plan that details all operations associated with the drilled shaft construction. Contractor shall submit the following to UPRR for acceptance at least 14 days prior to the start of the work, as applicable:

   a. Experience record of the drilling supervisor and drilling personnel.
   b. Professional Licensed Surveyor (PLS) responsible for shaft staking.
   c. Proposed shaft excavation equipment and tooling.
   d. Shaft bottom clean out procedures.
   e. Casing installation and removal, material properties and quantities.
   f. Slurry Management Plan.
   g. Concrete materials and mix proportions in accordance with these notes.
   h. Drilled shaft reinforcing cage shop drawings showing placement of reinforcing steel including splicing details and locations, and centralizer locations.
   i. NDT material installation plan.
   j. Engineered pick plan showing reinforcing cage picking, handling and placement.
   k. Welding Procedures for permanent steel casing.
   l. AWS welder certifications.
   m. Concrete placement procedures, methods and workability analysis.
   n. Required NDT procedures and NDT personnel qualifications.
   o. Construction sequence for drilling, cleaning, slurry management, rebar placement and concrete placement)
   p. Resume of the Drilled Shaft Inspector.

9. Contractor shall provide a Slurry Management Plan (if applicable) prepared by a qualified person trained by a slurry manufacturer experienced with mineral and polymer slurry management. Slurry Management Plan shall be submitted for UPRR's review a minimum of 14 days prior to shaft construction. The Slurry Management Plan shall detail all operations associated with the slurry usage for the shaft construction, including but not limited to:

   a. Slurry type.
   b. Mixing methods.
   c. Handling.
   d. Slurry specifications, sampling locations, and testing requirements.
   e. Cleaning operations.
   f. Recovery and disposal operations.
   g. Measures to reduce slurry loss.

10. Contractor shall submit the following to UPRR during construction:

   a. Notification 72 hours in advance of drilling to permit DSI and UPRR to have staff available for inspections of all drilled shaft activities.
   b. Reports of material quantities including concrete, reinforcing steel, steel casing, and slurry.
   c. Certified mill test reports for reinforcing steel, including bar markings, and permanent casing.
   d. Down-hole slurry test results in accordance with the requirements in these notes.
   e. Concrete batch-plant tickets containing the information required by ASTM C94.
   f. Reports of as-built location, alignment, elevations, and dimensions of drilled shafts, specifically identifying any shafts that are not in accordance with the notes and drawings.
   h. Results of concrete compressive tests at 7 days and 28 days per ACI requirements.
   i. Non-destructive testing results.

CAST-IN-PLACE CONCRETE

1. All concrete material, placement, and workmanship shall be in accordance with Chapter 8: Concrete Structures and Foundations of the AREMA Manual for Railway Engineering.

2. Minimum compressive strength at 28 days shall be as indicated on the design drawings.

3. Concrete shall be proportioned as follows:

CONCRETE STRENGTH:	3,000 PSI	4,000 PSI	5,000 PSI	6,000 PSI
MAX. WATER/CEMENT RATIO (BY WEIGHT):	0.50	0.45	0.42	0.40
MIN. SACKS OF CEMENT PER CU. YD.:	5.5	6.0	6.5	7.0

4. Cement shall be Type I or Type II Portland Cement in accordance with ASTM C150 Specifications.

5. Fly ash replacement may account for up to 25% of cement by substitution. Class C fly ash shall not be used when exposure to sulfates is moderate or higher. Fly ash substitute must be approved by UPRR.

6. Aggregates shall be graded in accordance with ASTM C33 specifications. Coarse aggregate shall be No. 67. Fine aggregate shall be natural sand.

7. Allowable air content shall be indicated on the design drawings 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 - 0% to 4%
   Not exposed to freezing, de-icers or other aggressive agents.

6. Admixtures or the addition of water shall not be used without prior approval by UPRR. If multiple admixtures are used, all admixtures should be obtained from the same manufacturer, or confirmation shall be obtained that admixtures from multiple manufacturers will be compatible. Modifying the concrete mix design, including the addition of water, in the field shall not be allowed without obtaining approval from UPRR.

7. 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 4 inches using the dry uncased or permanent steel casing method, not less than 7 inches using the temporary steel casing method, or not less than 9 inches using tremie placement and slurry displacement methods unless otherwise accepted by UPRR.

8. Curing shall be accomplished by wet curing or membrane curing compound. Membrane curing compound shall conform to ASTM C309, Type 2. If ambient temperatures drop below 40 degrees Fahrenheit in the first 72 hours following concrete placement, the top of the drilled shaft shall be insulated or heated.

9. Do not use calcium chloride or any admixture containing intentionally added chloride ions. Testing for chloride ions is not required.

REINFORCING STEEL

1. All reinforcing steel materials and placement shall be in accordance with Chapter 8: Concrete Structures and Foundations of the AREMA Manual for Railway Engineering.

2. Reinforcing steel shall be deformed, new billet bars per current ASTM A615 specifications and meet Grade 60 requirements. Bars to be welded shall conform to the requirements of ASTM A706.

3. 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.

4. Reinforcing steel cage shall be fully fabricated prior to placement. Reinforcing steel is to be securely tied to prevent deformation or relative displacement of bars during handling and concrete placement. Tack welding of reinforcing is prohibited. Unless specified otherwise in the plans, 100% ties between vertical and horizontal reinforcing are required when assembling the cage. Cages that exhibit any deflection or racking after picking shall be adjust as necessary to return the cage to vertical condition. Contractor must submit an engineered pick plan to UPRR for all drilled shaft cages tied on the ground. Pick plan must be reviewed by UPRR prior to cage pick.

5. Splice bars in conformance with the design drawings. Submit any alternative splice details to UPRR for acceptance.

6. The minimum clear distance between vertical reinforcing steel, including lapped bars, shall be 1.5 times the equivalent bundle bar diameter or four times the maximum aggregate size, whichever is larger.

7. Place reinforcing steel cage immediately prior to the start of concrete placement. Provide centralizer to maintain the reinforcing cage at the proper location. Provide bar boots to maintain minimum clearance at bottom of excavation. Secure the cage against displacement.

8. No vertical movement of reinforcing steel is permissible during or after concrete placement.

STEEL CASING

1. The installation of steel casing by driving or by vibratory hammer is prohibited unless accepted by UPRR. A proposed monitoring plan of the existing structure may be required as a part of the acceptance process. If the casing is permanent, voids around the casing after construction of the drilled shaft shall be backfilled as required by UPRR and engineer of record.

2. Permanent and temporary steel casing shall have sufficient strength to withstand handling stresses, installation methods, drilling stresses, concrete pressures, and surrounding earth and water pressures, if required. Steel for permanent casing shall conform to the requirements of ASTM A252 Grade 2. Submit size, wall thickness, type of steel, and length of permanent and temporary casing to UPRR for review and acceptance.

3. Submit the proposed method of steel casing installation and withdrawal, if any, prior to the mobilization of equipment to the site.

4. If steel casing splices are necessary, furnish full-penetration welds meeting the Structural Welding Code - Steel (ANSI/AWS D1.1) of the American Welding Society requirements for joints in non-corrugated permanent steel casings. Welders shall be AWS certified. Submit any alternative splice details to UPRR for acceptance.

5. Deliver steel casings to site in undamaged condition. Handle and protect steel casing to maintain diameter within two percent (2%). Stiffener rings to maintain casing round for drill tool advancement shall be provided in the Drilled Shaft Installation Plan details if they are required.

6. UPRR shall be notified immediately of any temporary casing that cannot be removed.

7. The inside diameter of temporary casing shall be at least 4 inches greater than the outside diameter of the steel reinforcement cage.

CONTROLLED SLURRY

1. Slurry shall consist of a stable colloidal suspension of polymers or pulverized clay minerals (bentonite/attapulgite) thoroughly mixed with water and shall meet the following specified properties at 60° F:

   a. Density of slurry at a distance of 1' from shaft bottom shall be measured by mud balance before concrete placement in accordance with ASTM D4380. For mineral slurries, maximum density shall be 85 pcf for shafts in side friction only and 70 pcf for shafts with end bearing capacity included. Maximum density shall be 64 pcf for polymer slurries.

   b. Marsh funnel viscosity shall be measured per the "Standard Procedure for Field Testing Water-Based Drilling Fluids" American Petroleum Institute API-RP13B-1, Section 2. The allowable range for entry shall be 26 to 50 seconds per quart for mineral slurries. For polymer slurries, the allowable range for entry shall be 40 to 90 seconds per quart, or as recommended by manufacturer and accepted by UPRR.

   c. Sand content at a distance of 1' from shaft bottom shall be measured by sand screen set before concrete placement in accordance with ASTM D4381. For mineral slurries, maximum sand content shall be no greater than 4% by volume. Maximum sand content shall be no more than 1% by volume for polymer slurries.

   d. During excavation, the pH of the slurry shall be measured in accordance with ASTM D4972. Allowable range of pH shall be 7 to 11.

2. Slurry shall be from sources acceptable to UPRR. Mix, store, and transport slurry using equipment made for these purposes. Mixing or storing slurry in an excavation onsite is not acceptable.

3. Water used to mix slurry shall be free from contaminants and be from sources acceptable to UPRR. Provide any physical or chemical treatment of the water or slurry that is necessary to meet the specified properties for controlled slurry required by these notes, subject to the acceptance of UPRR.

4. Required slurry properties shall be maintained before and during concrete placement to prevent settlement of soil solids and to maintain a stable hole.

REVISIONS		
DATE	LTR.	DESCRIPTION

DESIGN BY: OLS | DRAWN BY: OLS | CHECKED BY: AB

APPROVED:

Donovan Holder

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

FOUNDATIONS

DRILLED SHAFT CONSTRUCTION NOTES (SHEET 1 OF 2)

FILE OWNER: UPRR | DATE: 04/15/2021

PLAN NO.: 581001 | SHEET: D1

DRILLED SHAFT CONSTRUCTION NOTES (CONT'D.)

CONSTRUCTION

1. Qualified construction personnel shall be present during drilled shaft installation at all times. Appropriate fall protection shall be provided at all times when an open excavation is present. Tie off for fall protection shall be provided by the Contractor for all its staff, DSI, and UPRR representatives. Open excavations shall be covered with a cap secured against movement if construction activities are not ongoing.

2. Use tolerances for construction in accordance with ACI 117 Section 3, except as noted.

   a. The top of each shaft shall not vary from its design location by more than 1/24 of the shaft diameter, or 3 inches, whichever is less.
   b. The shaft shall not be out of plumb by more than 1.5 percent of the length, nor exceeding 12.5 percent of the shaft diameter.
   c. The bottom of a rock socket where end bearing is being relied upon shall not be out of level by more than ⅛" per foot.

3. Top of drilled shafts shall be at the elevations shown in the design drawings.

4. Drilled shafts shall be advanced to the tip elevations shown in the design drawings. Shafts drilled to greater depths will require lengthening of the reinforcing cage and NDT required by the project documents. Over drilling or deepening the shaft does not eliminate the need for the Contractor to clean the base of the drilled shaft.

5. Drilled shaft construction methods shall be determined by the Contractor based on site and subsurface conditions, unless otherwise specified on the design drawings. Construction methods are subject to acceptance by UPRR. These notes apply to the following methods, alone or in combination:

   a. Dry, Uncased or Open Hole
   b. Permanent Steel Casing
   c. Single or Multiple Temporary Steel Casing(s)
   e. Slurry Displacement

6. Provide temporary steel casing for shaft excavations as required. Make diameter of excavation such that the annular void space outside any permanent or temporary steel casing is minimized.

7. Embedment and overall length of temporary steel casing shall be selected by the Contractor based on the depth required for lateral stability of the steel casing. Permanent steel casing shall be detailed in design drawings and should not be modified unless approved by UPRR and the Geotechnical Engineer of record. Neither temporary nor permanent steel casing shall advance below the tip elevation of the drilled shaft.

8. Unless an appropriate drilling slurry is utilized, for drilled shafts constructed through water, temporary steel casing shall be used. Embedment and overall length of temporary steel casing shall be selected by the Contractor based on water depth at the time of drilling and the depth required for lateral stability of the excavation.

9. Use excavation methods that leave the sides and bottom of the hole free of loose material that would prevent intimate contact of the concrete with the in-situ soils/rock. If loose or unacceptable material is present at the base of the excavation, the excavation shall be re-cleaned in accordance with the design drawings and to the satisfaction of the DSI and UPRR.

10. Remove loose material and free water from bottom of drilled shafts. Provide bottom area not less than that shown on the design drawings or as acceptable to UPRR. Excavation shall be re-cleaned after any possible vibration of the ground or sloughing has occurred. Excavation shall be re-cleaned if rebar placement knocks any material down the shaft or when concrete placement does not occur within 24 hours of the completion of shaft excavation and cleaning. Excavation bottom cleanliness shall be confirmed by the DSI immediately prior to placing rebar cage.

11. Contractor shall use appropriate means to clean the excavated shaft bottom, such as a cleanout bucket or air lift. No more than 1 inch of loose or disturbed material is allowed across the base of the shaft unless noted in the plans. The shaft excavation bottom shall be documented by the DSI prior to installation of reinforcing steel or placing concrete.

12. Keep all soil and excavated materials away from each open shaft excavation to avoid contamination of the excavation after final clean out.

13. If possible, dewater drilled shaft excavation prior to placing concrete. Dewater in a manner that will not create subsidence or ground loss that might adversely affect the drilled shaft or existing adjacent structures.

14. If excessive water inflow or sidewall instability is encountered that exceeds the ability to maintain a dry hole, use alternative means to reduce inflow, such as extending steel casing, slurry displacement, installing dewatering wells, grouting, or other acceptable means. If excessive water inflow is anticipated, a drilling slurry and wet construction methods should be used.

15. Once the shaft excavation has been documented by the DSI, place concrete as soon as possible after shaft cleaning and rebar placement. Concrete placement shall begin within 2 hours of reinforcing steel placement, and shall be completed within 24 hours of the completion of the shaft excavation, unless waived by UPRR and Geotechnical Engineer of Record. Notification of planned concrete placement shall be provided to UPRR at least 24 hours in advance unless waived by UPRR.

16. Do not start concrete placement until a concrete supply adequate to fill the shaft is assured. Time between acceptance of shaft excavation and the beginning of concrete placement shall not exceed 4 hours; otherwise, shaft excavation shall be subject to reinspection and reacceptance by UPRR. Place concrete within the time period during which the excavation remains clean and stable and the concrete remains fluid.

17. A concrete workability analysis should be included in the Drilled Shaft Installation Plan for concrete placement operations that are anticipated to last more than 4 hours.

18. In dry shafts only (defined as less than 3 inches of water standing in the base of the excavation prior to concrete placement, and the inflow of water is not greater than 1 inch in 5 minutes), concrete may be placed using free-fall placement methods assuming the concrete can be placed without contacting the reinforcing steel cage or shaft side walls. When free-fall concrete placement is used, concrete should be directed so that the fall is vertical down the center of the shaft, the concrete does not contact sides of the hole or reinforcing steel cage, and the concrete does not free-fall more than 5 feet. The top of the shaft shall be vibrated as necessary to consolidate the concrete at the top 10 feet of the shaft. When free fall concrete methods are utilized, visual observations shall be maintained at all times. If clean and unobstructed visual observations cannot be maintained, the concrete shall be placed by a tremie.

19. For shafts with groundwater or a drilling fluid present, a tremie or concrete pumping shall be used with acceptable procedures in accordance with AREMA Manual of Railway Engineering, Chapter 8, Sections 1.14 and 1.15 unless noted otherwise in the plans.

20. Gravity tremie pipes shall have a minimum internal diameter of 8 inches, or 6 times the maximum aggregate size, whichever is greater. Pump pipes shall have a minimum diameter of 3 inches or 3 times the maximum aggregate size, whichever is greater. Segmental pipes shall be connected by fully watertight, structural connections.

CONSTRUCTION (CONT'D.

21. A sliding plug (pig) shall be placed in the top of the tremie pipe prior to placing concrete. The plug may consist of vermiculite granules, inflatable rubber balls, sponges or foam balls/cylinders. The plug shall have minimum length of 2 times the tremie pipe diameter. The tremie pipe shall be raised no more than 8 inches above the base of the excavation prior to placement of concrete.

22. Embed tremie or pump pipe sufficiently in concrete to maintain seal throughout concrete placement to prevent re-entry of slurry suspension into the pipe. The concrete level above the base of the shaft excavation shall be a minimum of 15 feet before the first split of the tremie pipe. Subsequent pipe sections shall be removed such that the pipe embedment is maintained between 10 and 25 feet at all times. Raise or lower the tremie pipe in an acceptable manner that does not break the seal and does not cause channelization or segregation. If the seal is lost, withdraw pipe, replace the seal and restart tremie operation using a capped tremie or a capped pump pipe.

23. Displace out of the shaft or remove from the shaft the first portion of concrete (laitance) that comes to the top of the shaft which contains concrete contaminated with slurry until only acceptable concrete is visible. Add or remove concrete to reach the specified top of drilled shaft elevation.

24. Do not use aluminum pipe or equipment for placing concrete.

25. Place concrete in shaft in one continuous operation unless otherwise directed by the design drawings or permitted by UPRR. Cold joints in the shaft are not acceptable and will require review by the EOR and UPRR. Level, roughen, and clean surface of construction joints to the satisfaction of the EOR and UPRR prior to recommencement of concrete placement. Provide reinforcing dowels or shear key when required by UPRR.

26. Top of the shaft shall be vibrated or consolidated in an industry-accepted method to a depth of at least 10 feet from the design top of shaft elevation.

27. Laitance shall be removed from the top of the drilled shaft to a depth exposing undisturbed structural concrete. After the shaft has completed the initial cure and the required testing, the top of the shaft shall be chipped or buffed as necessary to remove any excessive concrete paste, remaining laitance, or other unsuitable materials from the top of the shaft. If excessive laitance or "soft tops" are documented, UPRR shall be notified immediately.

28. Protect tops of shafts against damage and for curing to prevent moisture loss and temperature extremes in accordance with AREMA Manual of Railway Engineering, Chapter 8, Part 1: Materials, Tests and Construction Requirements.

29. Coordinate temporary steel casing withdrawal carefully with concrete placement. Maintain head of concrete to exceed the anticipated outside soil and water pressure above the bottom of the steel casing, but at least 10 feet at all times during steel casing withdrawal.

30. Where steel casing is withdrawn, provide concrete with a minimum slump of 7 inches and with a retarder to ensure minimum slump requirement during steel casing withdrawal. Check concrete level prior to, during, and after withdrawal of steel casing to confirm that separation of shaft concrete has not occurred. Do not vibrate concrete internally before the steel casing is withdrawn. Use of a steel casing vibratory extractor must be accepted by UPRR prior to use. Do not withdraw steel casing after concrete has attained initial set or as directed by UPRR.

31. Completely fill annular space between permanent steel casing and shaft excavation or between permanent (inner) steel casing and temporary steel casing with neat cement grout using a procedure acceptable to UPRR.

32. Perform concrete testing for quality control. Provide a minimum of 5 standard test cylinders per 50 cubic yards of concrete placement. A minimum one set of cylinders shall be collected per drilled shaft, and per day of concrete placement. Perform concrete compressive tests as follows: 1 cylinder at 3 days, 1 cylinder at 7 days and 2 cylinders at 28 days. Hold 1 cylinder for further testing as required.

CONSTRUCTION BY SLURRY DISPLACEMENT

1. For construction by slurry displacement, use controlled slurry to stabilize the excavation. Slurry consisting of water in combination with colloidal fines from the soil being excavated shall not be used unless the Contractor can demonstrate to the satisfaction of the EOR, DSI and UPRR that the slurry adequately stabilizes the hole.

2. Contractor shall follow the accepted Drilled Shaft Slurry Management Plan as required by the project documents.

3. Where drilled shafts are to be installed below groundwater or in caving soils, maintain the slurry level in the excavation not less than 5 feet above the groundwater level or higher if needed to provide a stable hole. Maintain the slurry level above any unstable zones a sufficient distance to prevent caving or sloughing of those zones. Contractor is responsible to assure that stable conditions are being maintained for the duration of the shaft construction.

4. As determined necessary by the Contractor, set a temporary surface steel casing to contain the slurry.

5. Provide any physical or chemical treatment of the water or slurry that is necessary to meet the specified properties for controlled slurry required by these notes, subject to the acceptance of UPRR.

6. Test slurry by the methods specified in these notes and as required by the Slurry Management Plan. Provide all equipment required for the tests specified. A slurry sampler capable of obtaining slurry samples at any depth within the drilled shaft excavation shall be available at the site. All testing shall be completed in the presence of the DSI.

7. The in-hole slurry shall meet the specified properties prior to concrete placement. Clean, re-circulate, remove sand from, or replace the slurry to maintain the required slurry properties. Recycling of slurry is permitted provided that the recycled slurry meets the specified properties. Submit a written record of results for the slurry tests for each drilled shaft installed to the DSI and UPRR.

8. Use drilling tools and excavation procedures that minimize negative pressure and avoid disturbance of surrounding material in the excavation. Raise and lower the drilling tool in the hole at a rate that does not agitate the slurry or affect the stability of the hole.

9. Complete concrete placement of the drilled shaft within 24 hours of the excavation is completed. If this is not possible, re-clean, and test the slurry in the excavation before concrete placement.

10. During concrete placement, pump the displaced slurry into holding tanks. Do not allow slurry to spill onto or contaminate the site.

11. Dispose of the slurry in a legal and acceptable manner.

12. Place concrete by tremie methods or by pumping in accordance with AREMA Manual of Railway Engineering, Chapter 8, Section 1.14: Depositing Concrete unless noted otherwise in the plans.

REVISIONS		
DATE	LTR.	DESCRIPTION

DESIGN BY: OLS | DRAWN BY: OLS | CHECKED BY: AB

APPROVED:

Donovan Holder

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

FOUNDATIONS

DRILLED SHAFT CONSTRUCTION NOTES (SHEET 2 OF 2)

FILE OWNER: UPRR | DATE: 04/15/2021

PLAN NO.: 581001 | SHEET: D2

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

DRILLED SHAFT INSPECTION NOTES

GENERAL

1. "Drilled Shaft Inspector" is referred to as "DSI" and "Drilled Shaft" is referred to as "DS" throughout this standard document.
2. The contractor shall hire a third party resident engineer or geotechnical engineer to observe, inspect, and document all deep foundation construction activities on a full-time basis. This person shall perform the duties required of the DSI and must be a licensed professional engineer. The costs for these activities shall be covered under bid item "Drilled Shaft Inspection and Documentation".
3. The DSI retained by the contractor shall be a competent engineer with experience on at least 5 DS inspection projects over the past 5 years related to transportation, railroad, or similar related projects. The experience should include shaft integrity inspections that incorporate non-destructive testing, such as CSL, TIP, etc. Contractor's DSI is responsible for Quality Control (QC) inspection and is responsible for overseeing, testing, and inspecting all aspects (slurry control tests, bottom hole tests, shaft excavation inspections, obstructions, deviations from the approved plan, etc.) of the DS construction. The Contractor's DSI will also be responsible for completing and signing the DS Inspection Reports. The superintendent cannot fulfill the role of the DSI.
4. Submit the following to the railroad at least 14 days prior to the start of the work, as applicable:
   a. Resume/Experience record of the engineer responsible for the shaft inspections.
5. DSI shall thoroughly review the geotechnical report, soil boring logs, contract documents, contractor's installation/slurry plans, and construction schedule prior to the scheduled start date.
6. The details described in these standards are considered the minimum for UPRR. If local conditions or practice require additional inspection, they should be completed in addition to the UPRR standard and reviewed and approved by UPRR prior to DS construction at no additional cost.
7. All DS construction shall be completed in the presence of the DSI. The DSI should monitor shaft installation on a full-time basis.
8. Where potential conflicts may exist between the UPRR General Conditions and Specifications, Project plans, DS Installation Plan, DS Slurry Management Plan, Special Conditions, or other construction contract documents, the more stringent inspection requirement will be required unless approval has been provided by UPRR in writing prior to the work being completed.
9. Contractor shall provide suitable access at all times to the DS work area for the DSI to complete the needed inspections. If the shaft will be constructed above grade, or in areas with difficult access, measures such as work platforms, walkways, guard rails, or manlifts shall be provided to facilitate inspections.
10. If the DSI observes DS construction discrepancies that cause concern, the DSI shall provide to UPRR the details summarizing the discrepancies and/or concerns and recommendations on what is necessary of the contractor to allow the DSI the ability to certify the shaft construction.
    a. UPRR and Engineer of Record(s) will review any discrepancies documented by the DSI to determine if the recommended corrective measures are acceptable.
11. Upon completion of the DS installation operations for the project, the DSI shall provide in writing a signed and sealed "Drilled Shaft Certification Memo" to UPRR including:
    a. A DS summary certifying the shafts were installed and constructed under full-time observation of the DSI and shafts were constructed per the project plans and specification.
    b. The DS installation log for each shaft installed, the DS daily field reports, and all testing results completed.
    c. If pre-coring is required by the project documents, the DSI shall be present during the pre-coring operations to observe and review the samples obtained, and notify UPRR immediately of any changes in the subsurface conditions from that assumed in the project documents.

INSPECTIONS AND REPORTING MINIMUM EXPECTATIONS

GENERAL

1. The DSI shall have a pre-excavation call with UPRR and the geotechnical engineer of record. Call must discuss shaft design assumptions, geology concerns at the site, approved drilling procedures and DS log. Date of meeting, time, and meeting minutes must be documented, signed by the DSI and geotechnical engineer of record, and submitted to UPRR prior to start of drilling.
2. Geotechnical engineer of record will provide to UPRR a Drilled Shaft Report form that is modified for specific site conditions. If modifications to the provided UPRR Drilled Shaft Report form are requested by the Contractor or the DSI, the proposed modifications shall be provided to UPRR for review and approval at least 7 days prior to the start of work.
3. An approved DS installation plan, that is the responsibility of the Contractor, shall be kept on site continuously during DS construction. If changes to the DS installation plan are requested and the previously approved drilling plan becomes obsolete, it should be updated and resubmitted for UPRR's review and approval prior to continuing work activities.
4. All elevation references in inspection reports shall be of the same datum utilized by the plans.
5. If discrepancies or unforeseen conditions are recorded, the contractor and UPRR shall be notified immediately.
6. All inspection paperwork related to DS construction shall be signed and dated by the on-site DSI.
7. The DSI shall provide:
   a. Inspection report and site activity logs daily during DS construction.
   b. A photo log of the required items for each DS within 24 hours of completion.
   c. The inspection logs for each DS within 24 hours of completion.
   d. A list of any and all outstanding unresolved discrepancies weekly for UPRR review.
   e. The results of any specialty foundation testing (CSL, TIP, etc.) within 3 days of completion.
   f. The certification memo, signed and stamped by a professional engineer licensed in the state where the project is constructed, within 10 days of the completion of all DS construction and inspection and testing activities.
   g. UPRR will review and comment on all submittals within 3 business days.

EQUIPMENT

1. All equipment delivered to the project site for DS construction shall be documented for each day's work associated with DS construction.
2. Note if additional or different equipment other than what was described in the contractor's approved DS installation plan is being utilized.
3. Any equipment failures or breakdowns shall be documented in the daily inspection logs.
4. Obtain photos of the drilling equipment and tooling being used in the photo log completed for each DS.

EXCAVATION OPERATIONS

1. DSI shall maintain a DS inspection log of all drilling activities and document the following:
   a. Date and time of the start and end of shaft excavation.
   b. Details regarding the drill tool used including a field measured diameter checked.
   c. Ground surface elevation.
   d. Ground water depth/elevation.
   e. Time required to advance drill tooling.
   f. Whether permanent or temporary casing is utilized.
   g. Whether drilling fluid/slurry is used.
   h. Description of the soils/rock formations excavated.
      i. Log the depth/elevation where the formation changes occur.
      ii. Soils shall be described in detail per the Unified Soil Classification System (USCS) and not generalized as simply "Overburden" or "Rock".
   i. Any variations between excavation logs and the nearest soil test boring or soil profile assumed for design.
      i. If substantial variations exist, notify the Engineer of record and UPRR immediately by phone, e-mail, or in writing within 12 hours of such a determination.
   j. The contractor has verified the horizontal shaft location with onsite surveyor and plumbness throughout drilling operations.
   k. The contractor is maintaining and checking shaft for vertical plumbness throughout the drilling operations. Document the shaft has achieved either the required design depth/length and/or minimum embedment into the approved bearing layer.
   l. Any locations of shaft instability.
   m. The adjacent site conditions around the DS.
   n. Obtain photos of the excavating operations documenting the various activities in the photo log.

SHAFT CLEANLINESS

1. Document whether the shaft cleaning operations meet the minimum requirements of the project documents. Document contractor means and methods used for shaft cleaning, including use of a cleanout bucket, airlift, or other tools.
2. Document condition of shaft bottom. No more than 2 inches of loose or disturbed material shall be present at the bottom of the shaft. If more stringent cleanliness requirements are required by the construction drawings, those requirements shall apply.
3. Where required by project documents, provide video documentation of the shaft base cleanliness.
   a. When visual inspections are required in shafts drilled using slurry or other drilling fluids, a device capable of displacing the slurry to facilitate inspection shall be utilized such as a MiniSID by GPE, Inc. or similar devices.
4. Collect photos of the shaft cleaning operations documenting the various activities in the photo log. When recording the sediment in the base of the shaft, include an item such as weighted tape marker or similar object in photos to provide a frame of reference.
5. Shaft to be documented for cleanliness before and after reinforcing steel has been placed within the DS excavation.

CASING OPERATIONS

1. Document casing (temporary or permanent) used for DS, including thickness, diameter, length and that casing is installed to the elevations described by either the construction drawings or DS installation plan.
2. Document whether casing is clean and free of concrete remnants, debris, and damage.
3. Document the thickness of soil or rock plug maintained in casing as the excavation proceeds.
4. Document whether minimum temporary casing embedment into fluid concrete is being maintained while the casing is being broken loose and removed.
5. Document casing withdrawal rate and operations.
6. If a temporary casing cannot be removed, UPRR shall be notified immediately so the foundation design can be reevaluated.
7. Obtain photos of the casing installation and removal operations for the photo log.

SLURRY OPERATIONS

1. Slurry referred to in this section includes mineral or synthetic slurry or polymer-based additive slurries.
2. Document whether slurry is handled as not to contaminate the project site and disposed of in a proper, legal manner.
3. Document and record the slurry level in the shaft.
4. Document whether slurry provides excavation support and, if not, what actions were taken by the contractor.
5. Note any variation from the DS installation plan and slurry management plan.
6. Document when and where the contractor has determined density, viscosity, pH, and sand content as required by the contract documents.
7. Document when and where slurry testing is being completed and report results obtained. Document whether results are in conformance with the project documents.

REINFORCING STEEL

1. The DSI shall inspect the reinforcing steel for compliance with the construction documents. The DSI shall document in detail the following:
   a. The revision and date of the approved shop drawing being referenced on-site.
   b. Cage is free of mud, oil, coatings, debris, and surface rust prior to placement.
   c. Mill cert, bar number, sizes, spacing, lengths, and clearances are per plans.
   d. Tie spacing, mechanical couplers, and lap splicing are per plans.
   e. Cage diameter matches plans and length has been adjusted to meet field drilling depths, with adjustments approved by the Structural Engineer.
   f. Chairs, bar boots, and centralizers are utilized to support the cage during construction and provide concentric alignment of the cage within the shaft.
   g. Location and spacing of the centralizers along the cage.
   h. Required minimum concrete cover is present between reinforcing steel and shaft sidewalls prior to concrete placement.
   i. Cage is free of deformation and/or racking.
   j. Cage location in the DS is within the project tolerances.
   k. The total amount of vertical movement of the reinforcing cage during or after concrete placement and whether the amount of movement is within project tolerances.
   l. CSL tubes (if used) are at proper spacing, proper material, alignment and filled with water and capped prior to concrete placement.
   m. Thermal Integrity Profiler (TIP) Thermal wires and/or CSL tubes (if used) are installed per the manufacturer's installation guidelines.

CONCRETE PLACEMENT OPERATIONS

1. The DSI shall document in detail the following related to the concrete placement operations:
   a. That the contractor is using an approved concrete mix design.
   b. Whether the approved mix design has been altered onsite by the addition of water or admixtures and whether the alterations were approved by the Structural Engineer. Details should include:
      i. The adjusted water/cement ratio of the modified mix.
      ii. Whether preapproved admixtures were used.
      iii. Whether additional concrete test samples were taken on the field modified concrete mix.
   c. A copy of each concrete mix ticket used for shaft construction.
   d. The trial batch or workability analysis completed on the mix design to determine slump retention.
   e. The rate of concrete placement (proposed or actual) during shaft construction and whether this rate corresponds to the established slump retention period of the mix design.
   f. Temperature, slump, air content, and compressive strength testing being completed as required by the plans.
   g. When allowed, free fall concrete placement does not contact the reinforcing steel or segregate while falling, shaft is dry, and upper 10 feet of concrete is manually vibrated.
   h. When used, the tremie pipe or pump pipe is steel, clean, smooth, and has watertight connections. Tremie pipe has a minimum internal diameter of 8 inches, or 6 times the maximum aggregate size, whichever is greater. Pump pipe has a minimum diameter of 4 inches. The tremie or pump pipe maintained the minimum embedment required by the plans throughout concrete placement.
   i. That the difference in the level of concrete inside and outside the steel reinforcing cage is less than 1 foot.
   j. That concrete was placed in a single continuous pour.
   k. Any delays associated with concrete placement.
   l. Size and type of pig used within the tremie.
   m. The top of shaft elevation and horizontal dimension after the initial concrete set has occurred.
   n. Any laitance has been removed and the top of the DS consists of suitable concrete free of contaminates.
   o. The volume of concrete placed versus the depth of the shaft.
2. Concrete placement shall begin within 1 hour of shaft cleaning and inspection. If the concrete is not placed within this time frame, the hole must be re-inspected and accepted by the DSI prior to concrete placement.

SPECIALTY SHAFT TESTING

1. The DSI shall oversee all non-destructive specialty foundation testing required by the plans.
2. Specialty testing shall be completed in accordance with the applicable ASTM. The DSI shall deliver specialty testing data to UPRR and the Geotechnical Engineer for review.
3. If a third party non-destructive testing consultant is used, separate from the DSI, the DSI must verify the inputs and assumptions used in analysis of the testing results, such as the volume of concrete used in the TIP analysis is correct.

REVISIONS		
DATE	LTR.	DESCRIPTION

DESIGN BY: OLS | DRAWN BY: OLS | CHECKED BY: AB

APPROVED:

Donovan Holder

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

FOUNDATIONS

DRILLED SHAFT INSPECTION NOTES

FILE OWNER: UPRR | DATE: 04/15/2021

PLAN NO.: 581001 | SHEET: D3

INCHES

NON-DESTRUCTIVE TESTING GENERAL NOTES

1. Non-destructive Testing (NDT) shall be performed using the Thermal Integrity Profiler Wire Cable methodology, or equal, to provide analytical data for the entire shaft (cage and cover) radius.

2. TIP measurements that are cooler than normal generally indicate inclusions, necks, or poor quality concrete; while warmer than normal measurements are indicative of bulges outside of the cage diameter. Variations in temperature between diagonally opposite pairs of Thermal Wire Cables reveal cage eccentricities, such as cage misalignment.

3. The TIP measurements shall be used in conjunction with the other documentation recorded during the shaft drilling, cleaning, sounding, cage and concrete placement by the independent geotechnical engineer monitoring drilled shaft construction and quality. The cost for NDT activities shall be covered under bid item "NDT Instrumentation and Testing".

TIP EQUIPMENT, PERSONNEL & CONSTRUCTOR ASSISTANCE

The qualifications of the TIP Consultant and the specifications for the equipment shall be submitted to UPRR for approval prior to shaft installation.

EQUIPMENT

1. A Thermal Integrity Profiler (TIP), as manufactured by Pile Dynamics, Inc. (30725 Aurora Road, Cleveland, Ohio 44139, (216) 831-6131; www.pile.com/pdi), or equal, shall be provided.

2. The Equipment shall have the following minimum requirements:

   a. A computer-based TIP Data Acquisition System to monitor and download temperature versus time after casting.
   b. Ability to automatically collect data at user defined time intervals (maximum 15-minute interval).
   c. Thermal sensor wires are a one-time use and are not reusable on other project. All Thermal sensor wires shall be Made in the USA and supplied by the manufacturer of the TIP equipment.
   d. Using the temperature probes to complete the analysis will not be allowed.

QUALIFICATIONS OF TIP CONSULTANT

1. The TIP Consultant shall have a licensed Professional Engineer to either supervise or oversee the testing and interpretation of results.

   a. This includes all functions of the TIP testing and shaft construction including but not limited to:

      Observing the attachment of the TIP wire to the cage/reinforcing steel
      Cage installation in the excavation
      Protection of the TIP wires
      All TIP wire continuity checks
      Concrete placement
      Casing and tremie removal
      Installation of TAP boxes
      Recovering/downloading of data
      Determining the maximum heat of hydration
      Processing, reviewing and reporting the data

2. The TIP Consultant shall have documented and approved experience in TIP testing.

   a. TIP Consultant shall have completed a TIP training program provided by the equipment supplier.
   b. TIP Consultant shall own and be familiar with the testing equipment being used.
   c. TIP Consultant shall provide UPRR a list of the applicable experience with similar projects.
   d. The TIP Consultant shall have completed TIP on a minimum of 5 deep foundation projects in the last 5 year period.
   e. The qualifications of the TIP consultant shall be provided in a submittal for UPRR's review and approval prior to foundation construction.

ASSISTANCE BY THE SHAFT CONSTRUCTOR TO THE TIP TESTING CONSULTANT

1. The constructor and Drilled Shaft Inspector (DSI) shall provide cooperative assistance, suitable access to the site and shafts to be tested, and labor as required to assist the TIP Consultant in performing the required tests.

2. The constructor and DSI shall coordinate with the TIP Consultant and install the necessary TIP instrumentation prior to concrete placement.

3. Prior to TIP testing, the constructor and DSI shall provide the TIP consultant all the require information to complete the TIP measurements. This includes but is not limited to:

   a. Shaft lengths
   b. Wire positions
   c. Drilling and excavation dates
   d. Concrete inspection and placement records
   e. Concrete placement details to the TIP Consultant

4. Constructor and the DSI must accurately document the concrete volumes in the shaft to the nearest .10 cubic yards or to the most recent ASTM standard.

THERMAL WIRE CABLE INSTALLATION CONSTRUCTOR REQUIREMENTS

1. The constructor or TIP Consultant is responsible for installing the Thermal Wire Cable assemblies. Wire installer shall be required to obtain training from the Manufacturer on proper installation practices prior to actual installation.

2. Wires shall be placed along vertical bars and tied every 12 inches for the entire length of the wire.

3. The thermal sensors of each wire in the foundation shall be at the same elevation as the corresponding sensors of the other wires.

4. If the reinforcing cage is not full depth, the constructor shall extend the cages with extensions to the base of the shafts as required by the engineer. The bottom sensor shall be located within 6 inches of the base of the drilled shaft.

5. Where rebar splices or mechanical couplers are required, the installation records shall be noted where the distance between the thermal wires may vary at localize areas.

6. The cage shall be measured for proper length and diameter. The cage diameter shall be checked over the entire length of the shaft for tapering or oblong conditions, and if observed it shall be corrected.

7. Cage shifts that occur while lifting and setting the cage shall be corrected prior to concrete placement. Cages that are racked or skewed shall be corrected prior to placement.

THERMAL WIRE CABLE INSTALLATION CONSTRUCTOR REQUIREMENTS (CONT'D)

8. Probe wire continuity shall be confirmed by the TIP consultant prior to removing the thermal wire from the spool, after wire is attached to the cage, after cage positioned in the excavation, any time the cage is moved, and after concrete placement. If at any time a wire is damaged, the constructor shall remove the cage and repair or replace the damaged TIP sensor wires. Splicing the damaged sensor wire is only allowed with UPRR approval.

9. Constructor shall protect Thermal wires as required and be responsible for the integrity of the wires for the duration of shaft construction and the initial curing period. If a wire is damaged at any time, the TIP consultant/constructor shall notify UPRR immediately.

TIP TESTING PROCEDURE

Testing procedures and equipment shall conform to ASTM D7949 - "Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations".

SHAFT PREPARATION FOR THERMAL WIRE CABLES

1. Prior to thermal wire installation, the reinforcing cage shall be inspected for tie wires, centralizers, pinch points, bracing, or other mechanisms that could snag, pinch, or damage the wires.

2. Thermal Wires shall not be installed next to reinforcing steel centralizers.

3. Thermal Wires shall be placed in pairs with 1 wire for every 10 to 14 inches of shaft/foundation diameter. A minimum of 4 wires are required for shafts of 24 inches or greater in diameter. Shafts with a diameter less than 24 inches may be set up using a single wire on a center bar. Shafts with different diameters at the same site may require a different number of Thermal Wire Cables. Unless approved by UPRR, Thermal wires shall be used in pairs.

4. Thermal wires shall not be attached to other full-length testing devices such as CSL tubes.

5. Each shaft shall be equipped with the appropriate number of Thermal Wires to permit integrity evaluation by the TIP consultant.

6. The number of shafts to be tested by TIP is 100% unless stated otherwise by UPRR.

TIP PROCEDURE

1. Prior to TIP testing, the constructor shall provide the UPRR and TIP Consultant with a complete record of the following:

   a. Shaft drill lengths
   b. Elevations of the top and bottom of the shaft to the nearest tenth of a foot
   c. Elevations of the top and bottom of the reinforcing cage to the nearest tenth of a foot
   d. Shaft concrete placement logs with volume measurement to the nearest .1 CY. Logs shall also include overall concrete placement start and stop times.
   e. Thermal Wire Cable serial numbers installed with corresponding location in the shaft
   f. Number of additional sensors located above top of concrete. Note sensors that are partially embedded in concrete. If necessary, note additional sensors embedded in the shaft.
   g. Installation date and times for all shafts

2. Thermal Wire Cables shall be connected to a Thermal Access Port (TAP) immediately before or after concrete placement. Care shall be taken to record the position of each cable in the cage by serial number. TAP box shall be protected for the duration of the TIP testing measurement period.

   a. Cables should be checked for damage prior to and after setting the cage. The contractor is responsible to guarantee the performance of the wires until completion of concrete placement. Damaged wire must be replaced prior to concrete placement.

3. Data shall be collected by the TAP at a maximum time interval of 15 minutes for the duration of the data collection time period. Data shall be collected for up to 72 continuous hours after concrete placement or until the maximum heat of hydration has occurred.

   a. The TIP consultant shall determine when the TAP can be removed
   b. In the event peak temperature is not reached within the specified time period, the TAP units shall remain connected to the Thermal Wire Cables for a longer duration as directed by the TIP Consultant

4. After completion of the data collection period, the TAP shall be connected to the main TIP data acquisition unit and the data files shall be downloaded for inspection of temperatures versus depth.

5. Potential local anomalies indicated by locally low temperatures relative to the average temperature at that depth, or average temperatures significantly lower than the average temperatures at other depths, shall be immediately reported to the Engineer and UPRR.

TIP TESTING RESULTS

Results of the TIP testing shall be presented in a written report that has been signed and sealed by a licensed engineer within 5 working days of foundation concrete placement by the TIP consultant's licensed Professional Engineer and delivered to the DSI. The report shall present results of TIP tests by including:

1. The final analysis must include top of shaft and bottom of shaft adjustments per the manufacturer's recommendations, so that the temperature plots are adjusted for end effects. If mid shaft adjustment is required, this shall also be performed per the manufacturer's recommendations.

2. Graphical displays of all temperature measurements versus depth and elevation. Elevations datum used to match project plans.

3. Record of installed wires, including serial numbers, and location with the foundation where the wire is installed.

4. Copy of shaft drilling, installation, and concrete placement records.

5. Indication of unusual temperatures, particularly significantly cooler local deviations of the average at any depth from the overall average over the entire length.

   a. If required, provide explanation for temperature variations

6. The overall average temperature. This temperature is proportional to the average radius computed from the actual total concrete volume installed.

7. Foundation radius at any point can then be determined from the temperature at that point compared to the overall average temperature.

   a. Report maximum and minimum shaft diameter

8. Variations in temperature between Thermal Wire Cables (at each depth) which in turn correspond to potential variations in cage alignment.

   a. State if minimum concrete cover is provided per project requirements

9. Provide graphical output including the following:

   a. Temperature vs. Depth/Elevation graph
   b. Adjusted Temperature vs. Depth/Elevation graph
   c. Radius vs. Depth/Elevation graph
   d. 3D Cage View to describe all view of shaft

10. The written report shall include photos of the installed wires on the reinforcing cage prior to installation describing how the wire was installed. A photo shall also be provided showing the top of the completed shaft and for any out of specification or non-typical construction related activities observed.

11. The TIP consultant shall provide an opinion on if the shaft meets the acceptance criteria of either the ASTM, the manufacturer's guidance, or limits described by the project documents. If acceptance can not be provided, explain to UPRR what is out of tolerance and what potential remedial measures should be considered by the design team to address the concern and make the shaft acceptable for service.

12. If required by UPRR, provide the TIP Reporter data file in a commonly readable format that does not require proprietary software for third party review.

CROSS-HOLE SONIC LOG (CSL) TESTING (WHEN REQUIRED)

1. Drilled shafts may be evaluated by cross-hole sonic log (CSL) testing.

2. The requirement to complete CSL testing may be required by the project design or be contingent on the results of other NDT testing or drilled shaft inspection observations. When required based on the design drawings, CSL tubes shall be installed at all drilled shaft locations.

3. The CSL consultant shall have a licensed Professional Engineer to either supervise or oversee the testing and interpretation of results.

4. The CSL consultant shall have with experience on at least 5 drilled shaft projects over the past 5 years related to transportation, railroad, or similar related projects. Submit the following to the railroad at least 14 days prior to the start of the work, as applicable:

   a. Resume/Experience record of the engineer responsible for the CSL shaft Testing.

5. CSL testing shall be completed on each drilled shaft as described by the project documents. CSL testing shall be completed no sooner than 3 days but within 14 days of concrete placement.

6. CSL testing shall be implemented per ASTM D6760-16 or the latest approved ASTM standard.

7. Furnish and install standard 2-inch nominal diameter steel pipes per the following requirements:

   a. Shall be regular and free of defects.
   b. Permit the free and unobstructed passage of the CSL probes.
   c. One pipe per foot of drilled shaft diameter.
   d. Shall be free and clean of oil, soil, concrete, rust, and other unsuitable materials.
   e. Be equally spaced inside the reinforcing steel cage or supplementary steel bracing and be securely fixed to the interior of the reinforcing steel cage prevent deformation, damage, or relative displacement during handling and concrete placement.
   f. 2" (min.) clearance between longitudinal drilled shaft bars and CSL pipe.
   g. Lower end of pipes shall extend to the base of the drilled shaft.
   h. Shall be fitted with a screw-on watertight shoe and/or caps.
   i. Shall be filled with water and plugged or capped before concrete placement.
   j. Pipe shall not be left open during or after concrete placement.
   k. Shall be installed so that internal joints are flush.
   l. Shall meet the requirements of ASTM A53, Grade B.
   m. Extend at least 2'-6" above the top of the drilled shaft concrete elevation.
   n. CSL tubes shall be positioned as far away from TIP wires as practical.

8. If necessary, additional reinforcing steel or steel bracing shall be used to secure pipes not adjacent to or below the bottom elevation of the reinforcing steel cage.

9. Submit shop drawings of the proposed CSL testing procedures, equipment to be used, pipe configurations, and names of individuals completing the CSL testing for approval by UPRR.

10. Upon completion of the review of the CSL results by UPRR, the tubes shall be filled with cementitious non-shrink grout of equal or greater strength than the approved drilled shaft concrete mix.

11. The CSL report shall include recommendations as to the acceptability, unacceptability, soundness, etc. of the drilled shaft construction. The test results shall include at a minimum, the CSL logs, with analysis of the initial pulse arrival time versus depth and pulse amplitude versus depth. Acceptance criteria for CSL testing shall be according to latest DFI Terminology and Evaluation Criteria of CSL as Applied to deep foundations.

12. CSL test results shall be supplied to the DSI for the project and incorporated in to final certification memo.

REVISIONS		
DATE	LTR.	DESCRIPTION
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DESIGN BY: OLS | DRAWN BY: OLS | CHECKED BY: AB

APPROVED:

Donovan Holder

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

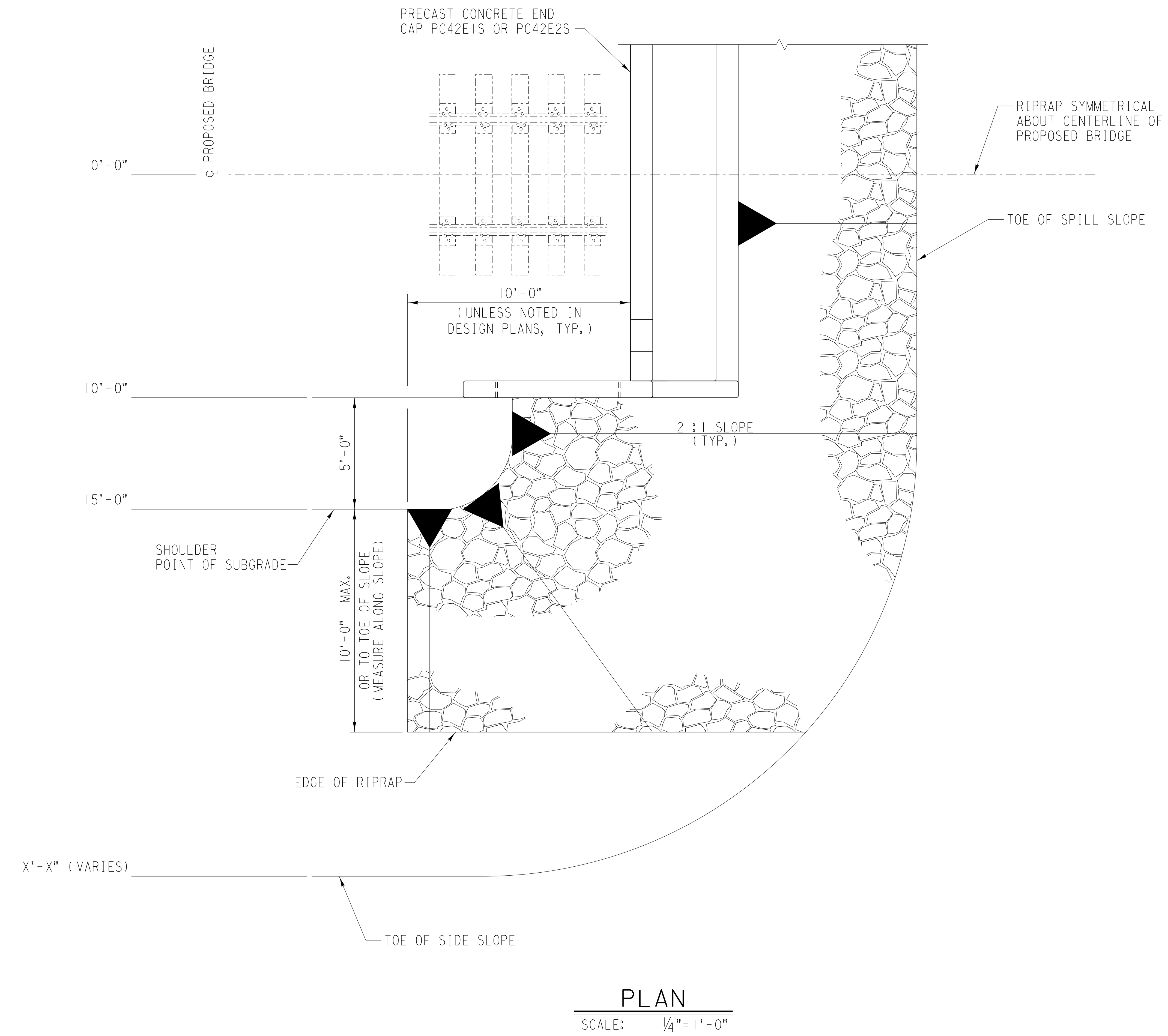
BRIDGE STANDARDS

FOUNDATIONS

DRILLED SHAFT NON-DESTRUCTIVE TESTING NOTES

FILE OWNER: UPRR	DATE: 04/15/2021
PLAN NO.: 581001	SHEET: D4

STANDARD SHEET



PLAN

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

RIPRAP QUANTITIES
(IN TONS FOR ONE EMBANKMENT)

HEIGHT, H	CLASS 1 2:1	CLASS 2 2:1	CLASS 3 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:

1. CLASS 3 AND CLASS 4 RIPRAP NOT TO BE USED WITHOUT APPROVAL FROM UPRR DESIGN MANAGER.
2. 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

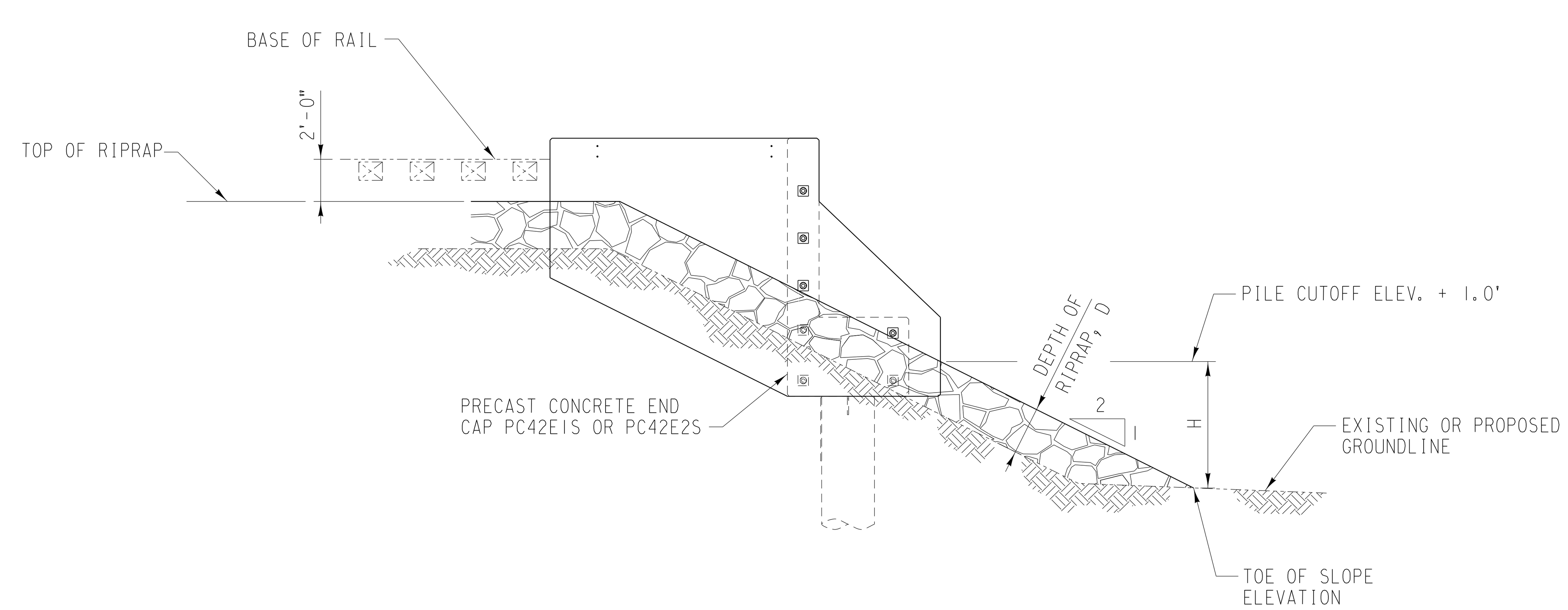
1. Riprap shall be placed in such a manner as to avoid segregation of the various sizes of rock, Individual rocks shall be placed in tight contact with one another in such a way to produce the least amount of void spaces.
2. Riprap shall be solid, unfractured rock or concrete, bulky in shape with sharp 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

1. 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.
2. 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.

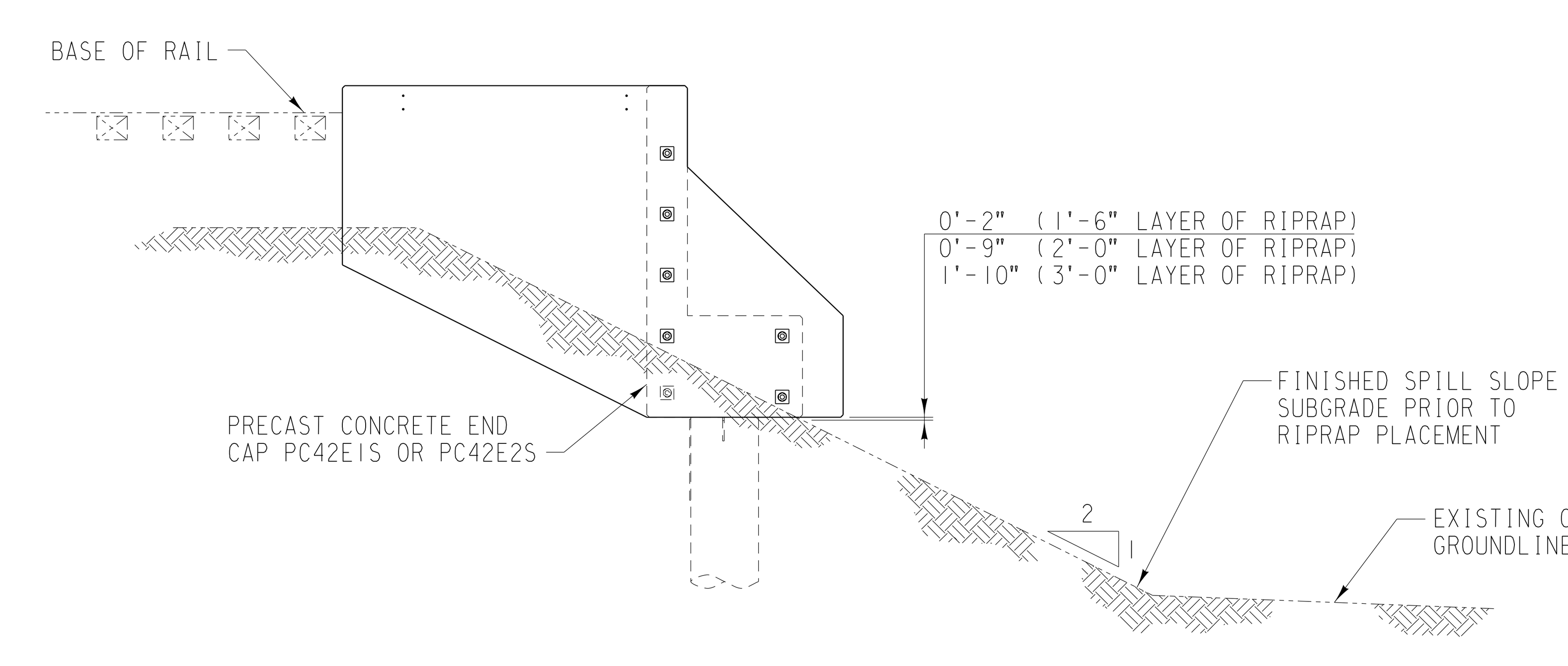
CLASS 3 RIPRAP

1. 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.
2. 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.



ELEVATION

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



SPILL SLOPE ELEVATION

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

REVISIONS		
DATE	LTR.	DESCRIPTION
03/23	A	REVISED DIMENSIONS
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/		
/		
/		
/		

DESIGN BY: DEH | DRAWN BY: KJK | CHECKED BY: JRB

APPROVED:

03/18/2021

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

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

PLOTTED: 3/23/2023 9:55:55 AM