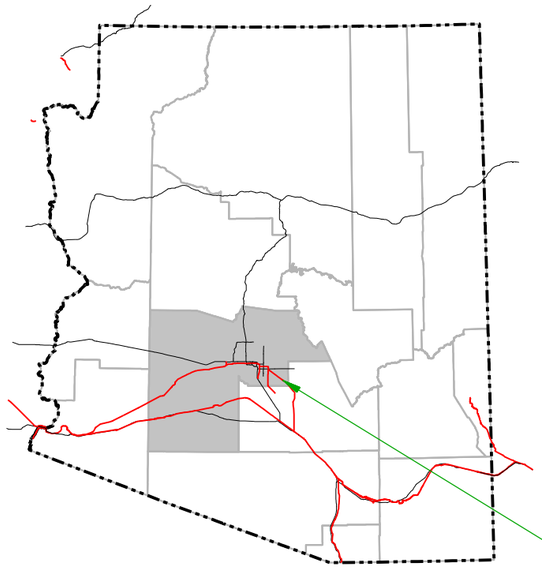
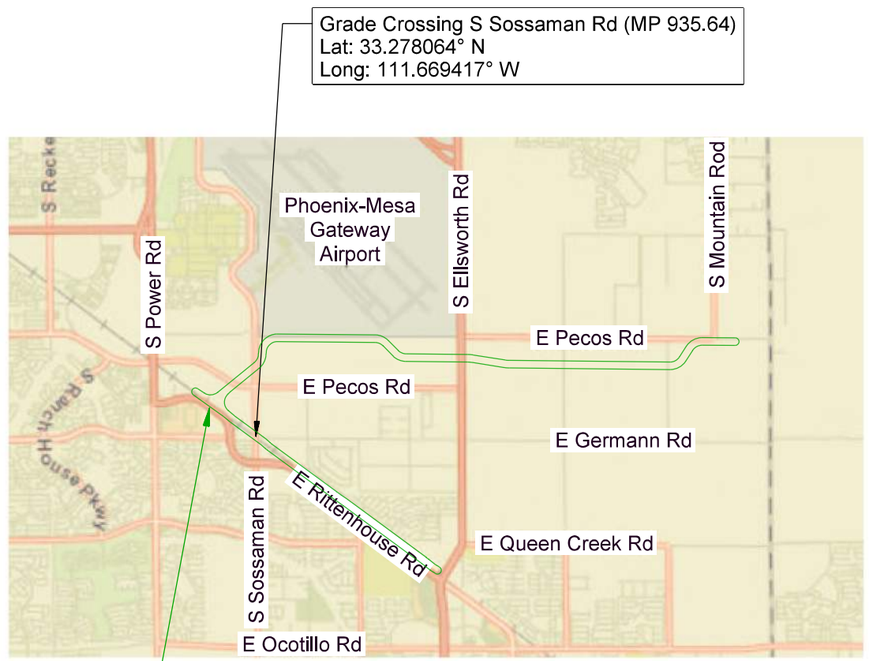
ENGINEERING DESIGN





State of Arizona

Project Location Map

MCESD SANITARY SEWER AND WATER APPROVAL

Qingyun Ping — 03/05/2026
MARICOPA COUNTY ENVIRONMENTAL SERVICES DEPARTMENT — DATE
DWR2500668
VWR2500593

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2610
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

MESA, ARIZONA
PHOENIX SUBDIVISION
MP 937.83
MP 934.78 TO MP 935.64
CONSTRUCT INDUSTRIAL LEAD TRACK

100% PLANS
ISSUED FOR BID

WORK ORDER: 54975
PROJECT NUMBER: 115884
BUDGET REFERENCE: 20CF060

LAST REVISED
03/09/2026

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G002	2	PROJECT INDEX & REVISIONS
G003 to G005	3-5	GENERAL NOTES & PROJECT CONTACTS
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G007	7	CONTROL POINTS & GEOMETRY
G008	8	SCHEMATIC PLAN
G009 to G011	9-11	PLAN OVERVIEW
P001 to P037	12-48	TRACK PLAN & PROFILE
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TC001 to TC012	124-135	PAVEMENT MARKINGS & SIGNING
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X195	435	PROJECT EARTHWORK SUMMARY

STANDARDS	DESCRIPTION
MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD DETAILS	
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (FCDMC) STANDARD DETAILS	
CITY OF MESA STANDARD DETAILS	
TOWN OF QUEEN CREEK DESIGN AND CONSTRUCTION STANDARDS FOR WATER, WASTEWATER, AND IRRIGATION SYSTEMS	
OLDCASTLE 13' X 7' PRECAST FIBER OPTIC VAULT (612-LA)	

STRUCTURES DESIGN	SHEET NO.	DESCRIPTION
CE 123084	436-445	TRIPLE CELL 12'-0" x 8'-0" RCB x 134'
CE 123075	446-459	DOUBLE CELL 6'-0" x 6'-0" RCB x 140'
CE 123076	460-469	TRIPLE CELL 12'-0" x 8'-0" RCB x 154'
CE 123077	470-475	2 - 60" DIA. CMP x 132'
CE 123078	476-486	DOUBLE CELL 6'-0" x 6'-0" RCB x 230'
CE 123079	487-498	DOUBLE CELL 6'-0" x 6'-0" RCB x 242'
CE 123080	499-504	4 - 60" DIA. CMP x 144'
CE 123081	505-514	TRIPLE CELL 9'-0" x 6'-0" RCB x 32'
CE 123082	515-518	3 - 72" DIA. SSP x 78'
CE 123083	519-522	4 - 54" DIA. SSP x 70'
CE 123249	523-531	1 - 36" DIA. SSP x 141' AND SIPHON BOXES
CE 123250	532-540	1 - 36" DIA. SSP x 126' AND SIPHON BOXES
CE 123251	541-549	1 - 36" DIA. SSP x 135' AND SIPHON BOXES

PROJECT INDEX (CONTINUED)

MECHANICAL DESIGN	SHEET NO.	DESCRIPTION
CP-1 to CP-2	550-551	CATHODIC PROTECTION DETAILS

ELECTRICAL DESIGN	SHEET NO.	DESCRIPTION
E001	552	ELEC ABBREVIATIONS & SUBMITTAL REQUIREMENTS
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E003	554	ELECTRICAL LEGEND
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E401 to E404	572-575	ELECTRICAL DETAILS
E501	576	ELECTRICAL SCHEDULES
LT01 to LT02	577-578	ROADWAY LIGHTING GENERAL NOTES & QUANTITIES
LT03 to LT07	579-583	ROADWAY LIGHTING
LT08 to LT11	584-587	PHOTOMETRIC PLANS

PROJECT REVISIONS

REV. #	BY	DATE:	SHEET:	DESCRIPTION

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: G002 of 011

UNION PACIFIC RAILROAD

Sheet 002 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
PROJECT INDEX & REVISIONS

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3/9/2026

GENERAL NOTES

1. Contractors shall notify UPRR Call Before You Dig (CBUD), by following instructions on UPRR's website, https://www.up.com/cbud, to arrange for locates prior to commencing work. The USA Authorization Numbers shall be kept at the job site.
2. No work whatsoever shall be commenced without first notifying the UPRR Engineer.
3. The Contractor shall comply with all Federal, State, County, and City Laws and Ordinances and Regulations of the Department of Industrial Relations, OSHA, NPDES and Industrial Accident Commission related to the safety and character of the work, equipment and labor personnel.
4. Contractor shall be responsible for coordinating with all Utility agencies.
5. Contractor shall protect in place (by any means necessary) all existing utilities to remain unless otherwise specified herein, contractor shall be responsible for the complete repair at his expense, for any damage to existing utilities, structures, or other site features, as a result of his work.
6. Prior to placing curbs, pavements, base, subbase, track, etc., all underground utilities shall be installed, backfill completed, and the Engineer notified by each of the utility companies having facilities within the work area, that the utility installation has satisfactorily passed acceptance tests.
7. All existing underground utilities, that are not to be re-used shall be abandoned in place. All existing pipelines to be abandoned in place shall be cement slurry filled and capped at least 3'-0" below top of proposed subgrade.
8. Contractor shall verify locations and elevations of existing utilities whether known or unknown prior to beginning construction.
9. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, and pipelines not located prior to construction shall be brought to the attention of the engineer for determination of appropriate action such as removal or treatment in a manner judged suitable to the engineer.
10. Contractor shall coordinate location of all proposed utilities with UPRR to assure accuracy of utility connections and compliance with local codes.
11. Any existing conditions found to be a variance with these drawings must be immediately reported to the Engineer.
12. Contractor shall maintain and clean to the satisfaction of the Engineer, all access and service roads used during construction.
13. Contractor shall perform all construction in such a manner as to protect adjacent existing buildings, and other site elements which are to remain in service.
14. Contractor shall provide As-built Drawings for all improvements.
15. No field changes will be permitted without direct written authorization from the UPRR Engineer or his representative.
16. Contractor shall coordinate work which affects adjacent property owners. Any questions or agreements between adjacent property owners and contractor shall be made in writing. A copy of such agreement shall be provided to the UPRR Engineer or his representative.
17. The contractor is responsible for preparing a Stormwater Pollution Prevention Plan (SWPPP) to comply with State regulations. General specifications and typical erosion control details are included in the plan set.
18. Right-of-way lines shown on the plans were taken from existing UPRR right-of-way map and are approximate.
19. Match lines for sheets are based on the existing Main Line stationing unless otherwise specified.
20. Track laying, ballasting, and installation of road crossing panels will be done by UPRR unless otherwise stated.
21. Where existing culverts are to be extended, the contractor shall expose existing drainage structures and field verify size and type before ordering.
22. The contractor is responsible for the removal of all pavement markings that will be in conflict with the proposed work.
23. Contractor shall comply with all agency standards, specifications, details, and requirements for those agencies having jurisdiction at locations where construction activities are performed.
24. Contractor shall maintain at least one access to all affected business. If necessary, multiphase construction shall be utilized.

DESIGN CRITERIA

1. UPRR standard plans and trackwork
2. City of Mesa 2023 Version, Engineering & Design Standards and Standard Details & Specifications
3. Town of Queen Creek Design Standards and Procedures Manual
4. Maricopa Association of Governments (MAG) Uniform Standard Specifications and Details for Public Works Construction 2025 Version
5. Flood Control District of Maricopa County (FCDMC) Drainage Design Manual, Drainage Policies and Standards Manual, Standard Details, and Standard Procedures

SURVEY NOTES

1. Railroad stationing for project profiles and alignments is based on stations established for chord definition spiraled curves at the centerline of the existing UPRR Main Line unless otherwise noted.
2. Roadway stationing for project profiles and alignments is based on stations established for arc definition curves at the centerline of the proposed roadway unless otherwise noted.
3. The contractor is responsible for the preservation of all survey control monuments. In the event monuments are damaged or destroyed by the contractor, the Engineer will replace the monument solely at the contractor's expense.

	DATUM
HORIZONTAL	NAD 83 ARIZONA CENTRAL STATE PLANE FIPSZONE 0202 SCALE FACTOR OF 0.99984662
VERTICAL	NAVD 88

TRAFFIC NOTES

1. All barricades, warning signs, lights, devices, etc. for the guidance of vehicle traffic and pedestrians must conform to the installation shown in the Manual on Uniform Traffic Control Devices (MUTCD), current edition.
2. Contractor shall make twice daily inspections of barricades and flashing lights to ensure proper placement and functioning of warning devices.
3. Grade crossings closed to traffic during construction shall be barricaded in accordance with the MUTCD.
4. At all grade crossings, all grade crossing warning signs (crossbuck) shall temporarily be relocated during construction and reset after the grade crossings construction is completed to a point adjacent to the roadway and 15 feet from the centerline of the near track as stated in the MUTCD except where automatic grade crossing warning signals/gates exist. All automatic warning devices are the responsibility of UPRR. At no time shall a crossing be left open without proper warning signs in place.
5. Contractor shall be responsible for obtainment of Temporary Traffic Control (TTC) Permits per conditions set forth in the City of Mesa Temporary Traffic Control Manual (TTCM). Traffic Control Plans (TCP) shall comply with Section 1.5 of the City of Mesa TTCM. Road closures require a minimum lead time of 30 calendar days for City of Mesa review and coordination.
6. Contractor shall comply with the Town of Queen Creek Roadway SIgning and Pavement Marking Guidelines document, specifications, and requirements. Contractor shall be responsible for coordination with the Town of Queen Creek, including obtainment of Full Road Closure Permits, notifications, scheduling, haul roads, and inspections. Requests for full road closures shall be submitted to the Town of Queen Creek at least 21 days prior to proposed closures.
7. The contractor is responsible for the prompt replacement and/or repair of all traffic control devices and appurtenances damaged or disturbed due to construction.

PROJECT CONTACTS

CONTACT	PHONE NUMBER	UPRR
Carlos Mendoza	(209) 663-5406	Civil Construction Project Manager
Levi Hawkins	(402) 544-3304	Project Design Manager
Justin Mohlman	(402) 938-2420	Project Design Sr. Project Designer
Ajmal Stanigzai	(402) 544-7164	Structures Design Sr. Manager
Marla Cox	(402) 544-2253	Information Technology - Fiber
Mark Mentele	(402) 544-8532	Real Estate - Utilities
Kris Anderson	(402) 544-3162	Real Estate - Acquisitions
Greg Brigham	(402) 544-8568	Real Estate - Acquisitions

CONTACT	PHONE NUMBER	FIBER

CONTACT	PHONE NUMBER	UTILITIES

CONTACT	PHONE NUMBER	FEDERAL AND LOCAL GOVERMENT AGENCY

PHONE NUMBER	GENERAL
https://www.up.com/cbud	UPRR CALL BEFORE YOU DIG (CBUD)
(888) 258-0808	CALL BEFORE YOU DIG (NATIONAL DIRECTORY)
(888) 877-7267	UPRR Response Management Communications Center (RMCC)
(800) 877-5591	UPRR Signal Operations Center

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 BLUE STAKE, INC.
Call 811 or click Arizona811.com

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

UNION PACIFIC

DRAWN BY: RSP
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DATE: 03/09/2026
SHEET NUMBER: G003 of 011

UNION PACIFIC RAILROAD
Sheet 003 of 587
LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track
SHEET TITLE:
GENERAL NOTES & PROJECT CONTACTS

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3/9/2026

CITY OF MESA GENERAL NOTES

(2025 VERSION, REVISED 07-10-25)

1. ALL WORK AND MATERIALS SHALL CONFORM TO CURRENT UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION AS PUBLISHED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS AND AS AMENDED BY THE CITY OF MESA, AND CITY OF MESA APPROVED PRODUCTS LISTS. ALL WORK AND MATERIALS NOT IN CONFORMANCE WITH THESE AMENDED SPECIFICATIONS, DETAILS, AND APPROVED PRODUCTS ARE SUBJECT TO REMOVAL AND REPLACEMENT AT THE CONTRACTOR'S EXPENSE.

   A. THE CITY OF MESA MAINTAINS APPROVED PRODUCTS LISTS INCLUDING:
      I. ASPHALT MIXES
      II. CONCRETE MIXES
      III. STREET LIGHT MATERIALS
      IV. WATER PRODUCTS
      V. WASTEWATER PRODUCTS
      VI. DETECTABLE WARNING PRODUCTS (TRUNCATED DOMES)
      VII. ITS & ITD COMMUNICATIONS SYSTEM PRODUCTS
      VIII. TRAFFIC SIGNAL EQUIPMENT

   B. CITY OF MESA APPROVED PRODUCT LISTS ARE AVAILABLE ELECTRONICALLY AT HTTPS://WWW.MESAAZ.GOV/BUSINESSDEVELOPMENT/ENGINEERING/APPROVED-PRODUCTS-EQUIPMENTCONTRACTORS AND HTTPS://WWW.MESAAZ.GOV/BUSINESSDEVELOPMENT/ENGINEERING/MESA-DESIGN-STANDARDS#SECTION-5

2. THE INFORMATION SHOWN ON DRAWINGS CONCERNING THE TYPE AND LOCATION OF EXISTING UNDERGROUND UTILITIES IS APPROXIMATE AND HAS NOT BEEN INDEPENDENTLY VERIFIED BY THE ENGINEER OR THE ENGINEER'S AGENT. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY OCCUR BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND AND OVERHEAD UTILITIES.

   A. CALL 602-263-1100 OR 811 FOR BLUE STAKE SERVICES.

   B. CALL SALT RIVER POWER FOR POLE BRACING, ELECTRIC SERVICE OR CONSTRUCTION SCHEDULING AT 602-236-8888.

   C. CALL CITY OF MESA ELECTRICAL FOR POLE BRACING, ELECTRICAL SERVICE OR CONSTRUCTION SCHEDULING AT 480-644-2251 WITHIN CITY OF MESA ELECTRICAL SERVICE TERRITORY (DOWNTOWN MESA).

   D. WHEN EXCAVATING IN OR ADJACENT TO A CITY PARK OR AQUATIC FACILITY THE CONTRACTOR SHALL CONTACT AQUATICS AND PARKS MAINTENANCE AT 480-644-3097 TO REQUEST ASSISTANCE IN LOCATING UNDERGROUND UTILITY FACILITIES.

   E. WHEN EXCAVATING IN OR ADJACENT TO LANDSCAPING WITHIN THE RIGHTOF-WAY, THE CONTRACTOR SHALL CONTACT TRANSPORTATION FIELD OPERATIONS AT 480-644-3380 TO REQUEST ASSISTANCE IN LOCATING UNDERGROUND IRRIGATION FACILITIES.

3. TRAFFIC CONTROL SHALL CONFORM TO THE CITY OF MESA TEMPORARY TRAFFIC CONTROL MANUAL. ELECTRONIC COPIES ARE AVAILABLE AT M HARD COPIES CAN BE MADE AVAILABLE AT DEVELOPMENT SERVICES, 55 N. CENTER ST., MESA, ARIZONA

4. CONTRACTOR TO NOTIFY TRAFFIC OPERATIONS AT 480-644-3126 PRIOR TO SIGN REMOVAL AND WHEN READY TO PERMANENTLY RELOCATE SIGN.

5. CONTRACTOR TO OBTAIN ANY PERMITS REQUIRED UNLESS OTHERWISE INDICATED, AND COORDINATE ALL IRRIGATION DRY-UPS, RELOCATIONS, AND REMOVALS BY OTHERS.

6. CONTRACTOR SHALL POTHOLE EXISTING UTILITIES AHEAD OF CONSTRUCTION TO ALLOW FOR ANY NECESSARY ADJUSTMENTS IN GRADE LINE AND TO VERIFY PIPE MATERIALS FOR ORDERING THE APPROPRIATE TRANSITION AND TIE-IN FITTINGS THAT MAY BE REQUIRED.

7. THE CONTRACTOR IS RESPONSIBLE TO REMOVE ALL ABANDONED UTILITIES THAT INTERFERE WITH PROPOSED IMPROVEMENTS. THE CITY OF MESA UTILITIES DEPARTMENT LOCATING SECTION WILL ASSIST THE CONTRACTOR AS NEEDED, IN DETERMINING IF THE UTILITY (GAS, WATER, AND WASTEWATER ONLY) IS ABANDONED BY CALLING 480-644-4500.

8. PRIOR TO START OF CONSTRUCTION ON PRIVATE PROPERTY (EASEMENTS), THE CONTRACTOR SHALL GIVE THE OWNER SUFFICIENT TIME (MINIMUM 48 HOURS) TO REMOVE ANY ITEMS IN CONFLICT WITH CONSTRUCTION. THE CONTRACTOR SHALL ARRANGE TO REMOVE AND REPLACE ALL OTHER CONFLICTS AS REQUIRED.

9. THE CONTRACTOR SHALL COORDINATE WORK SCHEDULES TO PREVENT ANY CONFLICTING WORK CONDITIONS WITH THE CITY OF MESA UTILITY AND TRANSPORTATION CREWS.

10. THE CONTRACTOR IS ADVISED THAT A DUST CONTROL PERMIT AND A DUST CONTROL PLAN MAY BE REQUIRED BY THE MARICOPA COUNTY AIR QUALITY DEPARTMENT. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN THIS PERMIT, IF NECESSARY, AND COMPLY WITH ITS REQUIREMENTS. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL PROVIDE A COPY OF THE DUST CONTROL PERMIT AND DUST CONTROL PLAN TO THE CITY FOR REVIEW.

11. INSPECTIONS WILL BE PROVIDED BY THE CITY OF MESA. THE CONTRACTOR SHALL NOTIFY THE CITY INSPECTION DEPARTMENT AT LEAST 48 HOURS IN ADVANCE OF ANY CONSTRUCTION.

12. THE JOB SITE SHALL BE CLEANED OF ANY DEBRIS OR SPOIL RESULTING FROM THIS PROJECT AT THE COMPLETION OF CONSTRUCTION.

13. ALL EQUIPMENT AND MATERIALS NOT SHOWN OR SPECIFIED ON THE PLANS OR SPECIFICATIONS, BUT REQUIRED TO COMPLETE THIS PROJECT, SHALL BE SUPPLIED BY THE CONTRACTOR AS PART OF THIS CONTRACT WORK (NO ADDITIONAL COST TO THE CITY).

14. WHEREVER PAVEMENT REPLACEMENT PER MESA STD DETAIL M1200.1 (OLD M19.04.1) OR MAG STD DETAIL 200 IS REFERRED TO WITHIN THESE PLANS, BACKFILLING SHALL BE PER THE CITY OF MESA STREET TRENCH BACKFILLING AND PAVEMENT REPLACEMENT POLICY STATEMENT, REVISED SEPTEMBER 29, 1999 AVAILABLE ELECTRONICALLY AT HTTPS://WWW.MESAAZ.GOV/BUSINESSDEVELOPMENT/ENGINEERING/ENGINEERING-CONSTRUCTION-POLICIES-FORMS.

CITY OF MESA GENERAL NOTES (CONTINUED)

15. FOR PURPOSES OF PAVEMENT PER MAG STD DETAIL 200 OR MESA STD DETAIL M1200.1 (OLD M-19.04.1), INTERSECTIONS ARE DEFINED BY THE CURB RETURNS IN ALL DIRECTIONS.

16. ANY SURVEY MARKERS DISTURBED OR DAMAGED BY THE CONTRACTOR SHALL BE REPLACED IN KIND BY A REGISTERED LAND SURVEYOR AT NO ADDITIONAL COST TO THE CITY.

17. ALL EXISTING PAVEMENT MARKINGS, SIGNS, AND SIGNAL EQUIPMENT THAT ARE NOT PART OF THIS PROJECT BUT NEED TO BE REMOVED, REPLACED, RELOCATED, OR REPAIRED BECAUSE OF CONTRACTOR'S WORK SHALL BE DONE AT THE CONTRACTOR'S EXPENSE.

18. THE CONTRACTOR IS ADVISED THAT DAMAGE TO ANY PUBLIC SERVICES OR SYSTEMS AS A RESULT OF THIS PROJECT SHALL BE REPAIRED BY THE CONTRACTOR AND INSPECTED BY THE CITY INSPECTOR. DEPENDING ON DAMAGES, ALL REPAIRS SHALL BE DONE WITHIN 24 HOURS. THE CONTRACTOR IS ADVISED THAT ANY COSTS RELATED TO REPAIR OR REPLACEMENT OF DAMAGED PUBLIC SERVICES OR SYSTEMS AS A RESULT OF CONTRACTOR'S NEGLIGENCE SHALL BE BORNE BY THE CONTRACTOR

CITY OF MESA PAVING GENERAL NOTES

(2025 VERSION, REVISED 07-15-25)

1. CONTRACTOR SHALL COORDINATE ALL DRIVEWAY LOCATIONS WITH PRIVATE PROPERTY OWNERS AND THE CITY INSPECTOR.

2. FOR THE APPROVED LIST OF PAVING PRODUCTS SEE: HTTP://WWW.MESAAZ.GOV/BUSINESS-DEVELOPMENT/ENGINEERING/APPROVE-PRODUCTS-EQUIPMENT-CONTRACTORS.

3. ALL GUTTER GRADES LESS THAN 0.0020 FT/FT SHALL BE STAKED ALONG THE ACTUAL GUTTER ALIGNMENT (NOT OFFSET) AND CHECKED BY CITY OF MESA INSPECTOR IMMEDIATELY PRIOR TO PLACEMENT OF CONCRETE.

4. BEFORE PAVING THE CONTRACTOR SHALL RECORD THE LOCATION OF ALL FRAMES, COVERS, VALVE BOXES, ETC. THAT WILL BE AFFECTED BY THE PLACEMENT OF PAVEMENT SO THEY CAN BE READILY LOCATED AND ADJUSTED TO GRADE AFTER PAVING.

5. ALL FRAMES, COVERS, VALVE BOXES, ETC. SHALL BE ADJUSTED BY THE CONTRACTOR TO FINISHED GRADE WITHIN 10 DAYS AFTER PLACEMENT OF ASPHALT CONCRETE SURFACE COURSE PER MAG STD DETAILS 270, 422, OR 391-1-C. IF THERE WILL BE A DELAY OF MORE THAN 3 WEEKS BETWEEN THE PLACEMENT OF BASE COURSE AND SURFACE COURSE, THE CONTRACTOR SHALL ALSO MAKE THE ADJUSTMENTS OF ALL GAS VALVES AFTER THE PLACEMENT OF BASE COURSE. IF THERE WILL BE A DELAY OF MORE THAN 8 WEEKS, THE CONTRACTOR SHALL MAKE ALL ADJUSTMENTS AFTER THE PLACEMENT OF BASE COURSE.

CITY OF MESA LANDSCAPE GENERAL NOTES

(2025 VERSION, REVISED 02-15-18)

1. LANDSCAPE CONTRACTOR SHALL CONFIRM LOCATION OF ALL UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATION AND SHALL BE RESPONSIBLE FOR THE FOLLOWING:
   A. DAMAGES TO SUCH UTILITIES CAUSED AS A RESULT OF THE CONTRACTOR'S ACTIVITIES.
   B. DAMAGES TO EXISTING WALKS, WALLS, DRIVES, CURBS, ETC.
   C. INSPECTING THE SITE IN ORDER TO BE FULLY AWARE OF EXISTING CONDITIONS PRIOR TO SUBMITTING A BID.

2. INSTALLATION OF ALL LANDSCAPE AND IRRIGATION MATERIALS SHALL COMPLY WITH SECTIONS 424, 425, 757, AND 795 OF THE MAG STANDARD SPECIFICATIONS.

3. CONTRACTOR SHALL REPAIR ANY DAMAGE MADE TO THE EXISTING SPRINKLER SYSTEM TO THE SATISFACTION OF THE CITY AT NO ADDITIONAL COST TO THE CITY.

4. LANDSCAPE REMOVAL IS A NON-PAY ITEM UNLESS OTHERWISE NOTED.

5. ALL EXISTING VEGETATION, WEEDS, DEBRIS, ETC. NOTED TO BE REMOVED ON THE PLANS AND SPECIFICATIONS SHALL BE REMOVED FROM PROJECT AREA AND DISPOSED OF PROPERLY OFF THE SITE AT THE CONTRACTOR'S EXPENSE (SCARIFY EXISTING SUBGRADE, MINIMUM SIX (6) INCHES DEPTH).

6. DAMAGE TO TURF SHALL BE REPAIRED BY CONTRACTOR, I.E., RUTS FILLED WITH CLEAN SOIL, COMPACTED TO MATCH SURROUNDING GRADES, EXCESS SOIL, ROCK, ETC. SHALL BE REMOVED TO LEAVE THE SITE CLEAN.

7. ALL PLANT MATERIAL, OTHER THAN TREES, SHALL CONFORM TO GRADING, TYPE, ETC. AS SET FORTH IN THE AMERICAN STANDARD FOR NURSERY STOCK BY THE AMERICAN ASSOCIATION OF NURSERYMEN. ALL TREES SHALL CONFORM TO THE CURRENT ARIZONA NURSERY ASSOCIATION TREE SPECIFICATIONS AND MAG SPEC 795.7. SHOULD ANY CONFLICTS IN THE SPECIFICATIONS OCCUR, THE ARIZONA NURSERY ASSOCIATION'S SPECIFICATIONS SHALL PREVAIL.

8. CITY RESERVES THE RIGHT TO INSPECT SHRUBS AND CONTAINERED TREES FOR CONDITION OF ROOT BALLS. FOR ANY SUCH INSPECTIONS WHICH MAY DESTROY ROOTBALL, CONTRACTOR SHALL SUPPLY ADDITIONAL PLANT AT NO COST TO CITY.

9. PLANT PITS SHALL BE INSPECTED BY CITY PRIOR TO PLANTING BY THE CONTRACTOR BY REQUESTING AN INSPECTION 48 HOURS IN ADVANCE.

10. ROUGH AND FINE GRADING TO ESTABLISH UNIFORM SMOOTH GRADE IS INCLUDED IN THIS PROJECT.

11. SOIL TEST FOR FERTILITY AND ADDITIVE RECOMMENDATIONS (FOR TURF AND ORNAMENTALS) SHALL BE COMPLETED BY CONTRACTOR TO DETERMINE IF ADDITIVES ARE REQUIRED. CONTRACTOR SHALL PROVIDE COPY OF SOIL TEST RESULTS FOR REVIEW AND APPROVAL TO ENGINEERING INSPECTOR AT LEAST SEVEN (7) DAYS PRIOR TO ANTICIPATED PLANTING. AFTER APPROVAL BY THE CITY, THE CONTRACTOR SHALL PROVIDE AND INCORPORATE ANY ADDITIVES REQUIRED PRIOR TO OR AT TIME OF PLANTING.

12. PLANT PIT SOIL MIXTURE SHALL CONSIST OF FOUR AND ONE-HALF PARTS NATURAL FERTILE, FRIABLE SOIL AND ONE PART HUMUS BY VOLUME, THOROUGHLY MIXED PRIOR TO BACKFILLING IN PITS. BACKFILLING SHALL BE IN 6" LIFTS WITH EACH LIFT WATER SETTLED WITHOUT PUDDLING.

CITY OF MESA LANDSCAPE GENERAL NOTES

13. CONTRACTOR SHALL STAKE TREE AND SHRUB LOCATIONS FOR 5-GALLON PLANTS AND LARGER. STAKES SHALL BE MARKED WITH PLANT NAME OR PLANT LEGEND ITEM NUMBER FROM PLANS.

14. ALL EXISTING (GAS, ELECTRIC, WATER, ETC.) COVERS AND BOXES SHALL REMAIN UNCOVERED. CONTRACTOR TO ADJUST TO FINAL GRADE AS NECESSARY. NON-PAY ITEM (NPI) UNLESS OTHERWISE NOTED.

15. THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING THE UNDERGROUND SPRINKLER SYSTEMS IN ADVANCE OF CONSTRUCTION. THE SPRINKLER SYSTEM LOCATIONS NOTED ON PLANS ARE FOR REFERENCE ONLY.

16. CONTRACTOR TO VERIFY DEPTH OF ALL INLET STRUCTURES AND SPRINKLER SYSTEMS PRIOR TO TRENCHING FOR LOW-FLOW CHANNEL.

17. CONTRACTOR TO PROVIDE PUMPING WITHIN FIVE (5) DAYS AFTER THE NOTICE TO PROCEED IS GIVEN AS REQUIRED TO DRY THE AREA SUFFICIENTLY TO BEGIN CONSTRUCTION.

18. CONTRACTOR SHALL ARRANGE FOR SPRINKLER SYSTEM SHUTDOWN DURING CONSTRUCTION BY CONTACTING THE ENGINEERING INSPECTOR.

19. NO ROCKS LARGER THAN 1" IN DIAMETER SHALL BE ALLOWED IN THE TOP SIX (6) INCHES OF TOPSOIL WHERE TURF ESTABLISHMENT IS SPECIFIED. ROCK REMOVAL AS NECESSARY IS A NON-PAY (NPI) ITEM UNLESS OTHERWISE NOTED.

20. WHERE CALICHE IS ENCOUNTERED IN PLANT PITS, DEPTH AND WIDTH OF PIT SHALL BE INCREASED BY ONE-THIRD (1/3) OVER SPECIFICATION, AND A LIQUID PENETRATOR, "AL-KALICHE" OR EQUAL, SHALL BE INCORPORATED FOR EACH PIT PER MANUFACTURER'S RECOMMENDATIONS.

21. CONTRACTOR SHALL INSTALL DECOMPOSED GRANITE TO A ROLLED DEPTH PER THE APPROVED PLANS AND SPECIFICATIONS. DECOMPOSED GRANITE SHALL BE PER THE APPROVED PLANS AND SPECIFICATIONS WITH THE COLOR AS SPECIFIED ON THE PLANS. PRE-EMERGENT HERBICIDE SHALL BE APPLIED BEFORE AND AFTER PLACEMENT OF DECOMPOSED GRANITE PER THE MANUFACTURER'S RECOMMENDATIONS. PRE-EMERGENT HERBICIDE SHALL BE SURFLAN, DACTHAL, OR APPROVED EQUAL. SAMPLE TO BE PROVIDED FOR CITY REVIEW AND APPROVAL. CONTRACTOR SHALL WASH OFF ROCK MULCH ONCE FINAL PLACEMENT HAS OCCURRED.

22. RESTORE ALL EXISTING LANDSCAPE IRRIGATION SYSTEMS, COMPONENTS AND LANDSCAPE AREAS IMPACTED BY ANY WORK UNDER THIS CONTRACT. RESTORE ALL EXISTING IRRIGATION AND LANDSCAPE IN ACCORDANCE WITH THE APPROVED PROJECT PLANS AND SPECIFICATIONS, INCLUDING ENGINEERING AND ARCHITECTURE PLANS. AT A MINIMUM, ALL RESTORATION SHALL BE IN ACCORDANCE WITH M.A.G. SPECIFICATION 107.9 - PROTECTION AND RESTORATION OF PROPERTY AND LANDSCAPE. ALL RESTORATION WORK SHALL BE COMPLETED TO THE SATISFACTION OF THE CITY OF MESA ENGINEER.

THE FLOOD CONTROL DISTRICT OF MARICOPA COUNTY GENERAL CONSTRUCTION NOTES

THE FOLLOWING NOTES BELOW SHALL BE PROVIDED ON ALL CIVIL, DRAINAGE AND LANDSCAPING CONSTRUCTION PLANS. IF PLANS ARE NOT REQUIRED, THEN NOTES SHALL BE PROVIDED ON THE PERMITTEE'S CONSTRUCTION WORK PLAN.

1. ALL WORK PERFORMED WITHIN FLOOD CONTROL DISTRICT OF MARICOPA COUNTY (DISTRICT) RIGHTS-OF-WAY (ROW) SHALL CONFORM TO THE LATEST DISTRICT STANDARD PROCEDURES AND DETAILS AS PUBLISHED ON THE DISTRICT'S WEB SITE.

2. THE PERMITTEE SHALL OBTAIN A COPY OF THE EXECUTED DISTRICT ROW USE PERMIT PRIOR TO COMMENCEMENT OF WORK WITHIN DISTRICT RIGHT-OF-WAY, MAINTAIN A COPY OF THE PERMIT AND STAMPED APPROVED PLANS ON THE PROJECT SITE AT ALL TIMES, AND SHALL BE AVAILABLE UPON REQUEST.

3. THE PERMITTEE SHALL NOTIFY THE DISTRICT'S ASSIGNED OPERATIONS AND MAINTENANCE (O&M) INSPECTOR OR DAM SAFETY INSPECTOR AT LEAST 48 HOURS IN ADVANCE PRIOR TO ANY EXCAVATION, BACKFILL, SLURRY, CONCRETE, AND/OR RIPRAP PLACEMENT BEING PERFORMED WITHIN THE DISTRICT'S ROW. REFER TO THE EXECUTED DISTRICT PERMIT FOR THE O&M INSPECTOR'S CONTACT INFORMATION. IF WORK IS IMPACTING A DISTRICT LEVEE, DAM OR FLOOD RETARDING STRUCTURE (FRS), REFER TO THE EXECUTED DISTRICT PERMIT FOR THE LEVEE/DAM SAFETY INSPECTOR'S CONTACT INFORMATION.

4. THE PERMITTEE PERFORMING EXCAVATION OPERATIONS IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UNDERGROUND UTILITIES. TO EXPEDITE THIS PROCESS, THE PERMITTEE SHALL CALL ARIZONA 811 (FORMALLY ARIZONA BLUE STAKE) AT 811 OR 1-800-782-5348 TO IDENTIFY UNDERGROUND UTILITIES AT LEAST 48 HOURS IN ADVICE PRIOR TO START OF THE WORK.

5. ANY DAMAGE OR DISTURBANCE TO DISTRICT STRUCTURES, EQUIPMENT, MATERIALS, VEGETATION, OR SURROUNDING DISTRICT ROW SHALL BE REPLACED OR REPAIRED, IN-KIND, TO THE SATISFACTION OF THE DISTRICT'S O&M INSPECTOR OR LEVEE/DAM SAFETY INSPECTOR.

6. IN THE EVENT THE TERMS AND CONDITIONS IN THE DISTRICT'S PERMIT ARE NOT CONSISTENT WITH THE DISTRICT-APPROVED PLANS, THE DISTRICT'S PERMIT WILL HAVE PRECEDENCE. 2801 WEST DURANGO STREET PHOENIX, ARIZONA 85009 PHONE: 602-506-1501

7. IN ORDER TO CLOSE OUT THE DISTRICT'S PERMIT AND RELEASE PERFORMANCE BONDS, ALL WORK (INCLUDED ASSOCIATED PUNCH-LIST ITEMS) MUST BE COMPLETED IN FULL TO THE SATISFACTION OF THE DISTRICT'S INSPECTOR AND ENGINEER. CERTIFIED AS-BUILT PLANS ALONG WITH REQUIRED QUALITY ASSURANCE TESTS MUST BE PROVIDED AND ACCEPTED BY THE DISTRICT, AND ALL EASEMENTS REQUIRED BY THE PROJECT MUST BE RECORDED PRIOR TO PERMIT CLOSEOUT. IF THE WORK ONLY INVOLVES GEOTECHNICAL ANALYSIS, SITE INVESTIGATIONS, SURVEYS, OR FLOOD RELATED STUDIES, THEN FINALIZED REPORTS, STUDIES AND/OR SURVEY PLANS MUST BE PROVIDED AND ACCEPTED BY THE DISTRICT PRIOR TO PERMIT CLOSEOUT

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

UNION PACIFIC

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UNION PACIFIC RAILROAD — Sheet 004 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
GENERAL NOTES & PROJECT CONTACTS

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TOWN OF QUEEN CREEK GENERAL NOTES

"ALL IMPROVEMENTS SHALL CONFORM TO THE LATEST MAG STANDARDS AND SPECIFICATIONS OR THE LATEST STANDARDS AND SPECIFICATION ADOPTED BY THE TOWN."

"THE TOWN PUBLIC WORKS DIRECTOR SHALL BE NOTIFIED 48 HOURS PRIOR TO ANY CONSTRUCTION ON THE PROJECT SITE."

"ALL IMPROVEMENTS SHALL BE CONSTRUCTED WITH THE INSPECTION AND APPROVAL OF THE TOWN PUBLIC WORKS DEPARTMENT AND WILL REQUIRE A TOWN CONSTRUCTION PERMIT. CONSTRUCTION WILL NOT BEGIN UNTIL A PERMIT HAS BEEN ISSUED. IF THE WORK IS DISCONTINUED, IT SHALL NOT RESUME UNTIL AFTER NOTIFYING THE TOWN PUBLIC WORKS DIRECTOR."

"UTILITIES MUST BE INSTALLED EITHER IN DEDICATED PUBLIC RIGHT-OF-WAYS OR IN PUBLIC UTILITY EASEMENTS DEDICATED BY THE LAND OWNER FOR SUCH USAGE AND MAINTENANCE. THE DEVELOPER/OWNER IS RESPONSIBLE FOR THE COORDINATION OF THE RELOCATION OF UTILITIES ON SITE."

"ALL UNDERGROUND UTILITY INSTALLATION IN STREETS OR PUBLIC ACCESS WAYS SHALL BE CONSTRUCTED PRIOR TO SURFACING SUCH STREET OR PUBLIC ACCESS WAY."

"THE DEVELOPER SHALL PROVIDE FOR AN ARIZONA REGISTERED ENGINEER TO BE PRESENT ON THE SITE FOR SUFFICIENT TIME TO ASSESS COMPLIANCE WITH THE PLANS AND SPECIFICATIONS FOR EACH ELEMENT OF CONSTRUCTION AND NO LESS THAN ONCE A DAY WHEN CONSTRUCTION IS IN PROGRESS."

"THE TOWN PUBLIC WORKS DIRECTOR SHALL BE NOTIFIED UPON COMPLETION OF ALL UNDERGROUND UTILITIES WITHIN THE STREET RIGHT-OF-WAYS AND PRIOR TO ANY STREET PREPARATION WORK. INTERIM AS-BUILT PLANS OF THE UTILITIES AND ALL PASSING TEST RESULTS WILL BE SUBMITTED FOR REVIEW. UPON REVIEW AND APPROVAL OF THE SUPPLIED INFORMATION, THE DEVELOPER MAY PROCEED WITH THE INSTALLATION OF STREET IMPROVEMENTS."

"THE DEVELOPER'S ENGINEER SHALL REQUEST THE TOWN PUBLIC WORKS DIRECTOR PERFORM INSPECTION OF THE SUB GRADE BASE PRIOR TO PLACEMENT OF THE OVERLAYING MATERIALS. IN ADDITION, THE TOWN PUBLIC WORKS DIRECTOR SHALL PERFORM PERIODIC INSPECTIONS THROUGHOUT THE COURSE OF CONSTRUCTION. THESE INSPECTIONS OR APPROVALS DO NOT SIGNIFY THAT THE TOWN HAS ACCEPTED ANY OF THE IMPROVEMENTS FOR MAINTENANCE."

"THE DEVELOPER'S ENGINEER SHALL SUBMIT WEEKLY PROGRESS REPORTS TO THE TOWN PUBLIC WORKS DIRECTOR THROUGHOUT THE CONSTRUCTION. THE WEEKLY PROGRESS REPORTS WILL INCLUDE THE RESULTS OF ALL TESTS TAKEN DURING THE WEEK."

"CONSTRUCTION MATERIALS TESTING SHALL BE PERFORMED AT THE DIRECTION OF THE TOWN PUBLIC WORKS DIRECTOR OR HIS REPRESENTATIVE AND AT THE EXPENSE OF THE OWNER/DEVELOPER."

"THE CONTRACTOR IS RESPONSIBLE FOR NOTIFYING INDIVIDUAL UTILITY COMPANIES FOR UTILITY LOCATION, OR FOR CALLING BLUE STAKE TO COORDINATE UTILITY LOCATION, AT LEAST 48 HOURS PRIOR TO EXCAVATION OF ALL UNDERGROUND UTILITIES."

"THE ENGINEER CERTIFIES THAT HE HAS CONTACTED ALL APPLICABLE UTILITY COMPANIES AND HAS SHOWN ALL EXISTING AND/OR PROPOSED UTILITY LINES AND PERTINENT INFORMATION TO THESE PLANS, AND HAS PLOTTED CORRECTLY THE EXISTING AND PROPOSED UTILITY RIGHT-OF-WAY AND/OR EASEMENT LINES ON THE PLANS."

TOWN OF QUEEN CREEK GRADING & DRAINAGE NOTES

1. A GRADING PERMIT SHALL BE REQUIRED.
2. AN APPROVED GRADING AND DRAINAGE PLAN SHALL BE ON THE JOB SITE AT ALL TIMES. DEVIATIONS FROM THE PLAN MUST BE PRECEDED BY A TOWN OF QUEEN CREEK APPROVED PLAN REVISION.
3. ALL DRAINAGE PROTECTIVE DEVICES SUCH AS SWALES, PIPES, OR OTHER MEASURES DESIGNED TO PROTECT BUILDINGS OR PROPERTY FROM STORM RUNOFF MUST BE COMPLETED PRIOR TO ANY STRUCTURE BEING BUILT. 2/4/2020GRADING & DRAINAGE NOTES
4. PREPARATION OF GROUND: THE AREA OVER WHICH FILLS ARE TO BE MADE SHALL BE CLEARED OF ALL TRASH, TREES, STUMPS, DEBRIS OR OTHER MATERIAL NOT SUITABLE AS A FOUNDATION FOR FILL.
5. LOCATION OF ALL UTILITIES SHOWN ON THIS PLAN ARE BASED ON INFORMATION SUPPLIED TO THE ENGINEER BY THE APPROPRIATE UTILITY COMPANIES, NO GUARANTEE ON LOCATIONS OR ACCURACY IS IMPLIED OR GIVEN. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT BLUE STAKE (602)263-1100 AND ANY OTHER INVOLVED AGENCIES TO LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION.
6. DISTURBED AREAS SHALL BE (RE)VEGETATED WITH TOWN APPROVED DESERT PLANTS OR DROUGHT RESISTANT PLANS. EXISTING VEGETION SHALL BE RELOCATED IF DISTURBED BY CONSTRUCTION.
7. SWALES SHALL BE LINED WITH 6" MINIMUM DIAMETER ROCK SIZE AND THE DEPTH SHALL MATCH THE APPROVED SWALE DETAIL.
8. CONTRACTOR/BUILDER SHALL NOTIFY THE ENGINEER OF ANY VARIANCES BETWEEN THESE PLANS NOTIFY THE ENGINEER OF ANY VARIANCES BETWEEN THESE PLANS AND ONSITE CONDITIONS.
9. ALL DRAINAGE SWALES SHALL BE FREE OF TRASH, DELETROUS MATERIAL, SILT, VEGATION, AND DEBRIS. MAINTAINENCE SHALL BE BY THE HOMEOWNERS ASSOCIATION.
10. DROPS IN GRADE OF 30" OR MORE IN OR ADJACENT TO TRAILS, SIDEWALKS ETC. SHALL BE PROTECTED BY SAFETY RAIL THAT IS OSHA COMPLIANT.
11. CONTRACTOR SHALL VERIFY PROPERTY LINE LOCATIONS PRIOR TO PROCEEDING WITH WORK.
12. FINISHED GRADE SHALL SLOPE AWAY FROM RESIDENCE AT 5% FOR A MINIMUM DISTANCE OF 5' TO AN APPROVED WATER DISPOSAL AREA.
13. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT MAG SPECIFICATIONS AND/OR TOWN OF QUEEN CREEK STANDARD DETAILS .
14. CONTRACTORS SHALL OBTAIN ALL REQUIRED PERMITS PRIOR TO STARTING CONSTRUCTION.
15. CONTRACTOR SHALL UNCOVER ALL UTILITIES BEING TIED INTO TO VERIFY THEIR LOCATION PRIOR TO STARTING NEW LINES.
16. CONTRACTOR SHALL ADHERE TO THE REQUIREMENTS OF THE APPROVED PROJECT SOIL INVESTIGATION REPORT

TOWN OF QUEEN CREEK PAVING NOTES

1. THE BASE COURSE WILL NOT BE PLACED ON SUBGRADE UNTIL BASE REQUIREMENTS HAVE BEEN COMPLETED AND ACCEPTED BY THE ENGINEERING MANAGER AND/OR HIS REPRESENTATION
2. BLUE REFLECTIVE SPOTTERS SHALL BE INSTALLED ON THE STREET PAVEMENT AT FIRE HYDRANT LOCATION IN ACCORDANCE WITH MAG STANDARDS.
3. STREET NAME SIGNS WILL BE INSTALLED AT THE DEVELOPERS' EXPENSE.
4. ALL WORK UNDER THE ENCROACHMENT PERMITS SHALL BE DONE IN ACCORDANCE WITH LATEST REVISIONS OF THE MARICOPA ASSOCIATION OF GOVERNMENTS UNIFORM STANDARD SPECIFICATION AND DETAILS (MAG SPECIFICATION AND DETAILS), TOWN OF QUEEN CREEK SUPPLEMENT TO THE MAG SPECIFICATION AND DETAILS, AND MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.
5. A RIGHT-OF-WAY ENCROCHMENT PERMIT ISSUED BY THE TOWN ENGINEERING DIVISION SHALL BE REQUIRED FOR ALL WORK IN THE TOWN OF QUEEN CREEK RIGHT-OF-WAYS.
6. THE PUBLIC WORKS DEPARTMENT (480-358-3003) SHALL BE NOTIFIED 24 HOURS PRIOR TO STATRING THE DIFFERENT PHASES OF CONSTRUCTION FOR SCHEDULING INSPECTIONS.
7. ACCEPTANCE OF THE COMPLETED RIGHT-OF-WAY IMPROVEMENTS WILL NOT BE GIVEN UNTIL 4 MIL MYLAR REPRODUCIBLE AS-BUILTS AND CD IN PDF FORMAT HAVE BEEN SUBMITTED TO AND APPOVED BY THE TOWN'S ENGINEERING DIVISION.
8. LOCATION OF ALL WATER VALVES, MANHOLES AND CLEANOUTS MUST BE REFERENCED AT ALL TIMES DURING CONSTRUCTION AND ACCES MADE AVAILABLE TO THE PRIVATE WATER COMPANYS AND THE TOWN PUBLIC WORKS DEPARTMENT.
9. NO PAVING CONSTRUCTION SHALL BE STARTED UNTIL ALL UNDERGROUND UTILITIES WITHIN THE ROADWAY PRISM AND ON-SITE ARE COMPLETED.
10. STAKING SHALL INCLUDE:
    A. RIGHT-OF-WAY LINES AT 100'
    B. PRE-GRADE AND REFERENCE CONTROL -AS NECESSARY
    C. CULVERT, STORM DRAIN AND DITCH INVERTS AT 50' INTERVALS AND BREAKS IN GRADE
    D. BLUETOP SUBGRADE AT CENTERLINE AND UNCURBED EDGE OF PAVEMENT AT 50' INTERVALS
    E. BLUETOP ABC AT CENTERLINE, UNCURBED EDGE OF PAVEMENT AND 1/4 POINTS AT 50' INTERVALS.
    F. STRADDLE POINTS FOR PERMANENT MONUMENTS. PUNCH THE MONUMENT CAP AFTER SETTING.
    G. STRUCTURE LOCATION AND GRADES.
    H. CONCRETE CURB AND GUTTER AT 50' INTERVALS MAXIMUM. ON HORIZONTAL OR VERTICAL CURVES, AND ON GRADES LESS THAN 05%, STAKE AT 25' MAXIMUM INTERVALS. STAKE ALL CURB RETURNS AT THE P.C. AND THE 1/4 POINTS OF RETURN.
11. GUTTERS SHALL BE WATER TESTED IN THE PRESENCE OF THE PUBLIC WORKS DEPARTMENT TO INSURE PROPER DRAINAGE PRIOR TO THE FINAL APPROVAL BY THE TOWN ENGINEERING DIVISION AND PUBLIC WORKS DEPARTMENT.
12. EXACT POINT OF MATCHING, TERMINATION AND OVERLAY, IF NECESSARY, MAY BE DETERMINED IN THE FIELD BY THE TOWN ENGINEERING DIVISION AND/OR THE PUBLIC WORKS DEPARTMENT.
13. NO JOB WILL BE CONSIDERED COMPLETE UNTIL ALL CURBS, PAVEMENT AND SIDEWALKS HAVE BEEN SWEPT CLEAN OF ALL DIRT AND DEBRIS AND ALL SURVEY MONUMENTS ARE INSTALLED ACCORDING TO THE PLANS.
14. THE TOWN WILL NOT PARTICIPATE IN THE COST OF CONSTRUCTION OR UTILITY RELOCATION UNLESS OTHERWISE SPECIFIED ON THESE PLANS.
15. THE CONTRACTOR SHALL UNCOVER ALL EXISTING LINES BEING TIED INTO TO VERIFY THEIR LOCATIONS. THE CONTRACTOR SHALL LOCATE OR HAVE LOCATED ALL EXISTING UNDERGROUND PIPELINES, TELEPHONE AND ELECTRICAL CONDUITS, AND STRUCTURES IN ADVANCE OF CONTRUCTION AND WILL OBSERVE ALL POSSIBLE PRECAUTIONS TO AVOID DAMAGE TO SAME. CALL BLUE STAKE AT 1-800-STAKE-IT.
16. FACILITIES WHICH ARE NOT SPECIFICALLY LOCATED WITH ACTUAL VERTICAL AND HORIZONTAL CONTROLS, ARE LOCATED ONLY APPROXIMATELY AND TO THE BEST AVAILABLE KNOWLEDGE.
17. CONSTRUCTION LIMITS- ADEQUATELY STAKE, FENCE, AND SIGN THE CONSTRUCTION LIMITS. THE CONSTRUCTION LIMITS SHALL REMAIN MARKED THROUGHOUT THE CONSTRUCTION PERIOD.
18. EARTHWORK SHALL BE PERFORMED ACCORDING TO THE GEOTECHNICAL REPORT DONE BY _____ DATED _____. ALL COMPACTION UNDER PAVEMENT AREAS SHALL BE PREFORMED ACCORDING TO MAG SPECIFICATIONS AND/OR THE SOILS REPORT RECOMMANDATIONS.
19. PRIOR TO CONSTRUCTION:
    A TRAFFIC CONTROL PLAN FOR WORK WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE PROVIDED TO THE TOWN PUBLIC WORKS DEPARTMENT FOR REVIEW AND APPROVAL. PAD COMPACTION CERTIFICATION SHALL BE SUBMITTED TO THE PUBLIC WORKS DESIGNATED INSPECTOR PRIOR TO ANY BUILDING CONSTRUCTION. SCHEDULE ALL PRECONSTRUCTION MEETINGS THROUGH THE TOWN PUBLIC WORKS DESIGNATED INSPECTOR.
20. AN APPROVED (SIGNED-OFF) GRADING, DRAINAGE AND PAVING PLAN SHALL BE ON THE JOB SITE AT ALL TIMES. DEVIATIONS FROM THE PLANS MUST BE PRECEDED BY AN APPROVED PLAN REVISION, OR SUBJECT TO ?WORK STOP ORDER? BY THE TOWN PUBLIC WORKS DEPARTMENT INSPECTOR TO REMOVE ANY WORK THAT DOES NOT REFLECT THE APPROVED IMPROVEMENT PLANS.

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

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UNION PACIFIC RAILROAD
Sheet 005 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
GENERAL NOTES & PROJECT CONTACTS

Color table:K:\Bentley\WorkspaceV8i\projects\Clients\UPRR_Track\UPRR_Track_V8i\color\UPRR.tbl
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ABBREVIATIONS

MISCELLANEOUS

Ac.	Acres
Ave.	Avenue
Blvd.	Boulevard
Bldg.	Building
BNSF	BNSF Railway
C.Y.	Cubic Yards
Conc.	Concrete
°	Degree (s)
Dia.	Diameter
Dr.	Drive
Dwg.	Drawing
E	East
Elev.	Elevation
Exist.	Existing
'	Foot, Feet or Minute (s)
F.S.	Finished Surface
Horiz.	Horizontal
"	Inch, Inches or Second (s)
Inv.	Invert
Lt.	Left
L	Length
L.F.	Lineal Feet
Max.	Maximum
Min.	Minimum
N	North
NTS	Not to Scale
No.	Number
OH	Overhead
Prop.	Proposed
RR	Railroad
Rwy	Railway
R/W	Right of Way
Rt.	Right
S	South
S.F.	Square Feet
Sta.	Station
Std.	Standard
St.	Street
Twp.	Township
Typ.	Typical
UG	Underground
UPRR	Union Pacific Railroad
V	Velocity
Wt.	Weight
W	West
X-ing	Crossing

SIGNAL

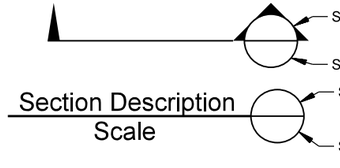
ABS	Automatic Block Signal
ATC	Automatic Train Control
CTC	Centralized Traffic Control
DED	Dragging Equipment Detector
DTC	Direct Traffic Control
ELTO	Electric Lock Turnout
HBD	Hot Box Detector
HTTO	Hand Throw Turnout
HWD	High Wide Dectector
POTO	Power Operated Turnout
TWC	Track Warrant Control
WILD	Wheel Impact Load Dectector

STRUCTURES

Bldg.	Building
Br.	Bridge
CB	Catch Basin
CPT	Concrete Pile Trestle - Ballast Deck
CIP	Cast Iron Pipe
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CSP	Corrugated Steel Pipe
Culv.	Culvert
DI	Drop Inlet
DPGBD	Deck Plate Girder - Ballast Deck
DPGOD	Deck Plate Girder - Open Deck
EBW	East Backwall
F.L.	Flowline
F.F.	Finished Floor
GIP	Galvanized Iron Pipe
Hdwl	Headwall
NBW	North Backwall
PCB	Prestressed Concrete Box
PSCT	Prestressed Concrete Trestle
RCA	Reinforced Concrete Arch
RCB	Reinforced Concrete Box
RCP	Reinforced Concrete Pipe
SBW	South Backwall
SSP	Smooth Steel Pipe
SPTBD	Steel Pile Trestle - Ballast Deck
SPTOD	Steel Pile Trestle - Open Deck
SPP	Structural Plate Pipe
TPGBD	Through Plate Girder - Ballast Deck
TPGOD	Through Plate Girder - Open Deck
TPTBD	Timber Pile Trestle - Ballast Deck
TPTOD	Timber Pile Trestle - Open Deck
TTBD	Through Truss - Ballast Deck
TTOD	Through Truss - Open Deck
TWB	Treated Wood Box
VCP	Vitrified Clay Pipe
Viad.	Viaduct
WBW	West Backwall
WIP	Wrought Iron Pipe

TRACK

ATR	Above Top of Rail
Align.	Alignment
BBR	Below Base of Rail
Cntrs.	Centers
CWR	Continuous Welded Rail
DSPD	Double Switch Point Derail
EOT	End of Track
HH	Head Hardened
Jtd.	Jointed Rail
LH	Left Hand
ML	Main Line
MM	Mile Marker
MP	Mile Post
NSC	Not Sufficient Clearance
OTM	Other Track Material
PCC	Point of Compound Curve
PC	Point of Curve
PCS	Point of Curve to Spiral
POC	Point on Curve
PF	1/2" Point of Frog
PI	Point of Intersection
PITO	Point of Intersection of Turnout
PS	Point of Spiral
PSC	Point of Spiral to Curve
POS	Point on Spiral
PT	Point of Tangent
POT	Point on Tangent
Pt. Sw.	Point of Switch
PVC	Point of Vertical Curve
PVI	Point of Vertical Intersection
PVT	Point of Vertical Tangent
RH	Right Hand
SH	Second Hand
SSPD	Single Switch Point Derail
TC	Track Centers
T.F.	Track Feet
Trk.	Track
UXO	Universal Cross-Over
X-Over	Cross-Over



SYMBOLS

UTILITIES

- Compressed Air (AIR)
- Fiber Optic Cable (F/O)
- Gas Pipeline (G)
- Overhead Power Line (OHP)
- Sanitary Sewer (SS)
- Overhead Signal Line
- Underground Signal Line (UGS)
- Steam Line
- Storm Sewer (S)
- Telephone (T)
- Underground Electric (UGE)
- Water Main (W)
- Underground Wire
- Under Drain (UD)
- Valve (V.)
- Manhole (M.H.)
- Catch Basin (C.B.)
- Fire Hydrant (F.H.)
- Junction Box
- Electric Meter
- Gas Meter
- Water Meter (M.W.)
- Monitoring Well (M.W.)
- Pump (PUMP)

TRACK

- Existing Mainline
- Existing Siding or Spur
- Proposed
- Remove
- Shift
- Relay
- Surface & Line
- Future
- Foreign Railroad or Industry
- In Buildings or Under Structures
- Turnout
- Power Turnout
- Bumping Post
- Earthen Bumper
- Inert Retarder (56')
- Dowty Retarder (52')
- Hayes Derail
- Double Switch Point Derail

PROPERTY

- Section Line
- Center Section Line
- Parcel or Easement Line
- Right of Way
- Former Right of Way
- Right of Way to be Acquired
- Temporary Construction Easement
- Foreign Right of Way

ROAD CROSSING WARNING DEVICES

- Crossbuck Sign
- Flashing Light Warning Device
- Flashing Light Warning Device with Gate
- Cantilever Flashing Light Warning Device
- Cantilever Flashing Light Signal with Gate

SIGNAL

- Absolute Signal
- Signal Bridge
- Cantilever Signal
- ACS or CTC Signal
- Dwarf Signal
- Begin CTC
- Microwave Tower
- AEI
- Battery Box (BB)
- Dragging Equipment Detector
- Generator (GEN.)
- Hot Box Detector

STRUCTURES

- Culvert
- Culvert with Headwalls
- Double Culvert
- Railroad Bridge
- Highway Overpass
- Highway Underpass
- Tunnel
- Building
- Flag Pole (FP)

OTHER

- Embankment
- Control Point (15)
- Flow Line
- Revision Number (1)
- Milepost
- Revision Cloud
- Milemarker (MM)

SIGNS

- Stop
- Yard Limit
- 1 Mile to Yard Limit
- Whistle Post (W)
- Flanger
- Station
- Reduce Speed
- Resume Speed
- General Purpose

FENCES

- Barbed Wire
- Chain Link
- Snow / Sand
- Cattle Guard

ROADS

- Paved Road
- Unimproved Road
- Interstate Highway (80)
- Federal Highway (20)
- State Highway (58)
- County Highway (0003)

PERMITTING

- Temporary Workspace - Permitted
- Sensitive Resources - Impacted / Permitted
- Sensitive Resources - Do Not Impact
- FEMA Floodplain/Floodway Boundary

CONSTRUCTION

- Note (Work by Contractor)
- Note (Work by Others)
- Cut Lines
- Fill Lines
- Grading Limits

LIGHTING

- Light Pole
- Light Tower

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
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UNION PACIFIC

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	G006 of 011

UNION PACIFIC RAILROAD

Sheet 006 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
ABBREVIATIONS & LEGEND

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3/9/2026

To Kendall & Hyder Timetable West

MP 934.38 DOT# 741833U

(2) CMP 18" X 124'
(4) CMP 60" X 144'
Pt. Sw. #11 LH HTTO
Pt. Sw. #11 RH HTTO
Pt. Sw. #11 RH HTTO
Pt. Sw. #11 RH HTTO
Pt. Sw. #11 LH HTTO
Pt. Sw. #11 LH HTTO
Pt. Sw. #11 LH HTTO
Pt. Sw. #11 LH HTTO
Pt. Sw. #11 RH HTTO

TRACK E
TRACK D
TRACK C
TRACK 750
TRACK 749
TRACK 101

Track 749: 3,053' Clear
Track 750: 3,054' Clear (2,736' Future)
Track C: 2,406' Clear
Track D: 2,065' Clear
Track E: 2,065' Clear

MP 0.81 DOT# 980159X

Sossaman Rd. Xing
Pecos Rd. Xing
MP 935
(1) CMP 36" X 56'
(2) RCB 6' X 6' X 230'
MP 0.52 DOT# 980158R

Power Rd. Xing
Pecos Rd. Xing

TRACK 101
TRACK 751
TRACK 120

MP 935.64 DOT# 741834B
MP 935.70 Pt. Sw. #11 LH HTTO
RH HT DERAIL
MP 935.77 (1) SSP 36" X 76'
(1) CMPA 3.2' X 1.5' X 44'
MP 935.93
MP 936
MP 936.16 Pt. Sw. #10 RH HTTO
5,000'
TRACK 121
MP 936.75 (1) SSP 36" X 80'
LH HT DERAIL
(1) CMPA 4.1' X 2.5' X 56'
MP 936.75
MP 936.86 Pt. Sw. #11 RH HTTO
MP 937
MAIN TRACK
TRACK 120
15,000' Signal to Signal
Sossaman Rd. Xing

MP 934.78 Pt. Sw. #15 RH PO/TO
MP 934.82 Pt. Sw. #15 LH PO/TO
RH PO DSPD
MP 934.96 (2) WBC 4' X 1.5' X 22'
Access Road
(3) RCB 12' X 8' X 154'
Access Road
Pt. Sw. #11 LH HTTO
(2) CMP 60" X 132'
Access Road
(3) RCB 12' X 8' X 134'
Access Road
(1) SSP 36" X 84'
(1) CMP 36" X 112'
LH HT DSPD
Pt. Sw. #15 RH HTTO
MP 935.22
MP 935.33
TRACK 101
TRACK 751
TRACK 120
MP 935

EL 1429
GERMANN
LB400
931.03
8207

MP 937.83 Pt. Sw. #15 LH PO/TO
MP 937.83 Pt. Sw. #10 LH HTTO
MP 937.84 Pt. Sw. #10 LH HTTO
MP 937.89 (2) DPG 146' [SIMN]
MP 938
TRACK 744

To Magma & West Picacho Timetable East

MP 3.03 DOT# 980160S
(3) RCB 9' X 6' X 32'
(1) CMP 36" X 50'
Ellsworth Rd. Xing
(1) CMP 36" X 46'
Pt. Sw. #11 RH HTTO
MP 4.03 DOT# 980161Y
Crismon Rd. Xing
(3) SSP 72" X 78'
Merrill Road
(4) SSP 54" X 70'
(1) SSP 36" x 141'
(1) SSP 18" x 125'
(1) SSP 36" x 126'
Pt. Sw. #11 LH HTTO
(1) SSP 18" x 135'
(1) SSP 36" x 135'
MP 5.04 DOT# 980163M
Signal Butte Rd. Xing
(1) CMP 36" X 67'
Pt. Sw. #9 LH HTTO
(1) CMP 36" X 100'
(1) CMP 36" X 50'
Pt. Sw. #11 RH HTTO
(1) CMP 36" X 84'

TRACK 101
TRACK 752
5,000'

LEGEND

	EXISTING	REMOVE	SHIFT	PROPOSED
TRACK				
ACCESS ROAD				
XING PANEL				
HAND THROW SWITCH				
POWER OPERATED SWITCH				
DERAIL				
ABSOLUTE SIGNAL				
CULVERT				
BRIDGE				

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UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: G008 of 011

UNION PACIFIC RAILROAD

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
SCHEMATIC PLAN

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3/9/2026

Restricted Work Area

Phoenix-Mesa Gateway Airport

Williams Field Rd.

North Detention Cell

National Weather Service Weather Radar Site

City of Mesa Utility Station

Track 749 & Track 750

S. Power Rd.

031 032 033 034 035 036 037 038 039 040

E. Pecos Rd.

Retention Area 1 Outfall to Ellsworth Channel

South Detention Cell

030 029 026 027 028 025

Track 101

MESA

QUEEN CREEK

GILBERT

Diversion to North Detention Cell

Track 101

Retention Area 1

North Detention Cell Outfall to Trackside Ditch

Track 751

012 013 014 024

South Detention Cell to Rittenhouse Channel

935

E. Rittenhouse Rd.

S. Sossaman Rd.

S. 80th St.

S. Ellsworth Rd.

E. Germann Rd.

015 016 017 018 019

MESA

QUEEN CREEK

Rittenhouse Channel Outfall

Track 120 Extension

936

Restricted Work Area

Hawes Rd.

Phoenix Sub Main Track

1250 0 1250 2500

SCALE IN FEET

N

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UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: G009 of 011

UNION PACIFIC RAILROAD

Sheet 009 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
PLAN OVERVIEW

Color table: K:\Bentley\WorkspaceV8i\projects\Clients\UPRR_Track\UPRR_Track_V8i\color\UPRR.tbl
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3/9/2026

Restricted Work Area

SR 24

S. 222nd St.

S. Mountain Rd.

Retention Area 6 Outfall to Trackside Ditch

MESA CITY LIMITS

E. Pecos Rd.

047

048

Retention Areas 3 & 4 Outfall to Existing Retention

Track 101

040

041

042

043

044

045

046

Retention Area 6

Track 752

Retention Area 2

Retention Area 5

Retention Area 2 Outfall to Trackside Ditch

Retention Area 5 Outfall to Signal Butte Road

Crismon Rd.

S. Merrill Rd.

S. Signal Butte Rd.

S. Meridian Rd.

N IRONWOOD RD

E. Germann Rd.

MESA

QUEEN CREEK

MARICOPA COUNTY

PINAL COUNTY

N

1250 0 1250 2500

SCALE IN FEET

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Omaha, NE 68106-2810
TEL 402.341.1116
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UNION PACIFIC

DRAWN BY: RSP
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DATE: 03/09/2026
SHEET NUMBER: G010 of 011

UNION PACIFIC RAILROAD

Sheet 010 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
PLAN OVERVIEW

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3/9/2026

E. Pecos Rd.

S. 80th St.

E. Germann Rd.

MESA

QUEEN CREEK

936

Hawes Rd.

Restricted Work Area

E. Ryan Rd.

E. Fulton Pkwy.

S. Ellsworth Loop

Phoenix Sub Main Track

Track 744

015 016 017 E. Fulton Pkwy. 018 019 020 021 022 023

E. Rittenhouse Rd.

Track 120

Track 120

QUEEN CREEK

S. Sossaman Rd.

Hawes Rd.

Google Earth

Legend

800 0 800 1600

SCALE IN FEET

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Omaha, NE 68106-2810
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FAX 402.341.5895
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UNION PACIFIC

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	G011 of 011

UNION PACIFIC RAILROAD Sheet 011 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
PLAN OVERVIEW

Color table: K:\Bentley\Workspace\V8i\projects\Clients\UPRR_Track\UPRR_Track_V8i\color\UPRR.tbl
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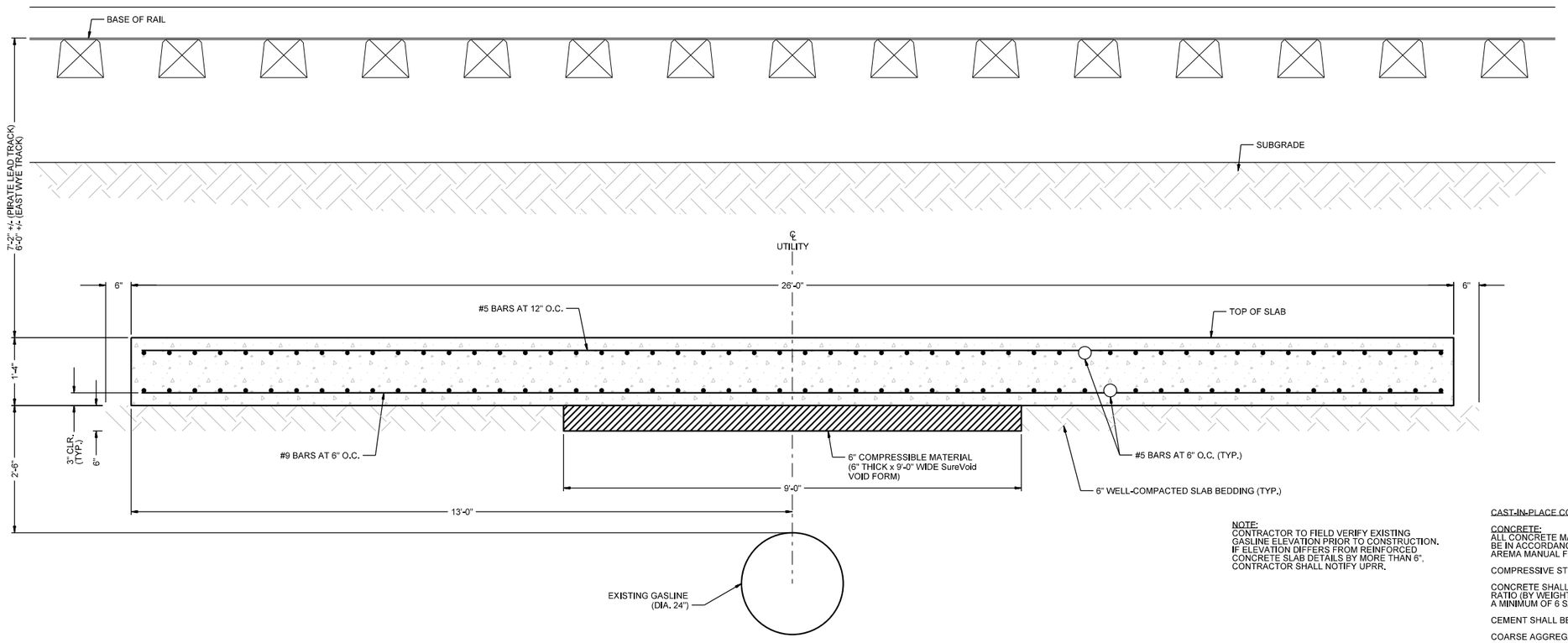
3/9/2026



REINFORCED CONCRETE SLAB DETAIL

NOT TO SCALE

NOTE:
CONTRACTOR TO FIELD VERIFY EXISTING GASLINE ELEVATION PRIOR TO CONSTRUCTION. IF ELEVATION DIFFERS FROM REINFORCED CONCRETE SLAB DETAILS BY MORE THAN 6", CONTRACTOR SHALL NOTIFY UPRR.

CAST-IN-PLACE CONCRETE SLAB NOTES:

CONCRETE:
ALL CONCRETE MATERIALS, PLACEMENT AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH PART 1, CHAPTER 8 OF THE CURRENT AREMA MANUAL FOR RAILWAY ENGINEERING.

COMPRESSIVE STRENGTH - 4000 LBS. PER SQUARE INCH AT 28 DAYS.

CONCRETE SHALL BE PROPORTIONED SUCH THAT THE WATER-CEMENT RATIO (BY WEIGHT) DOES NOT EXCEED 0.45. CONCRETE MUST CONTAIN A MINIMUM OF 6 SACKS OF CEMENT PER CUBIC YARD OF CONCRETE.

CEMENT SHALL BE EITHER TYPE I OR TYPE III PORTLAND CEMENT.

COARSE AGGREGATE SHALL BE SIZE NO. 67 PER ASTM C33.

FINE AGGREGATE SHALL BE NATURAL SAND.

AIR CONTENT SHALL BE BETWEEN 5% AND 7% BY VOLUME.

ADMIXTURES SHALL NOT BE USED WITHOUT APPROVAL OF ENGINEER.

CURING SHALL BE ACCOMPLISHED BY WET CURING OR THE APPLICATION OF A TYPE 2 MEMBRANE.

CONTROL JOINTS SHALL BE PLACED EVERY TWO SLAB WIDTHS MINIMUM.

REINFORCING STEEL:
REINFORCING STEEL SHALL BE DEFORMED, NEW BILLET BARS PER CURRENT ASTM A615 SPECIFICATIONS AND MEET GRADE 60 REQUIREMENTS.

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.

REINFORCING STEEL IS TO BE BLOCKED TO PROPER LOCATION AND SECURELY WIRED AGAINST DISPLACEMENT BEFORE CONCRETE IS POURED. TACK WELDING OF REINFORCING IS PROHIBITED. CLEAR DISTANCE FROM FACE OF CONCRETE TO NEAR REINFORCING BAR IS TO BE 3" UNLESS OTHERWISE NOTED OR SHOWN.

SLAB BEDDING:
SLAB BEDDING SHALL BE GRANULAR MATERIAL SUCH AS AGGREGATES ORDINARILY SPECIFIED AND USED IN THE CONSTRUCTION OF HIGHWAY BASE AND SUBBASE. THESE AGGREGATES INCLUDE CRUSHED STONE, NATURAL OR CRUSHED GRAVEL, NATURAL OR MANUFACTURED SANDS, CRUSHED SLAG OR A HOMOGENEOUS MIXTURE OF THESE MATERIALS. SLAB BEDDING SHALL BE COMPACTED TO 100% OF MAXIMUM DRY DENSITY AS DEFINED IN ASTM INTERNATIONAL D1557 (MODIFIED PROCTOR). IF 100% COMPACTION CANNOT BE ACHIEVED IN PROXIMITY OF EXISTING STRUCTURE, 95% COMPACTION MAY BE ACCEPTED. RECOMMENDED GRADATION IS AS FOLLOWS:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 INCH	100
1/2 INCH	60-90
3/8 INCH	20-40
NO. 4	10-20
NO. 200	LESS THAN 5%

UNION PACIFIC SEALANT BALLAST, ITEM NO. 562-5428, MAY BE USED.

DESIGN NOTES:

1. THE CAST-IN-PLACE CONCRETE TRACK SLAB HAS BEEN DESIGNED FOR COOPER E-80 LIVE LOAD WITH IMPACT AND COVER DEPTH OF 6'-0".
2. SLAB BEARING SUBGRADE AREA SHOULD BE PREPARED PER THE GEOTECH REPORT. SPECIAL CARE SHOULD BE TAKEN DURING SURFACE PREP OVER THE UTILITIES.

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UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: D003 of 008

UNION PACIFIC RAILROAD

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
UTILITY PROTECTION SLAB DETAIL

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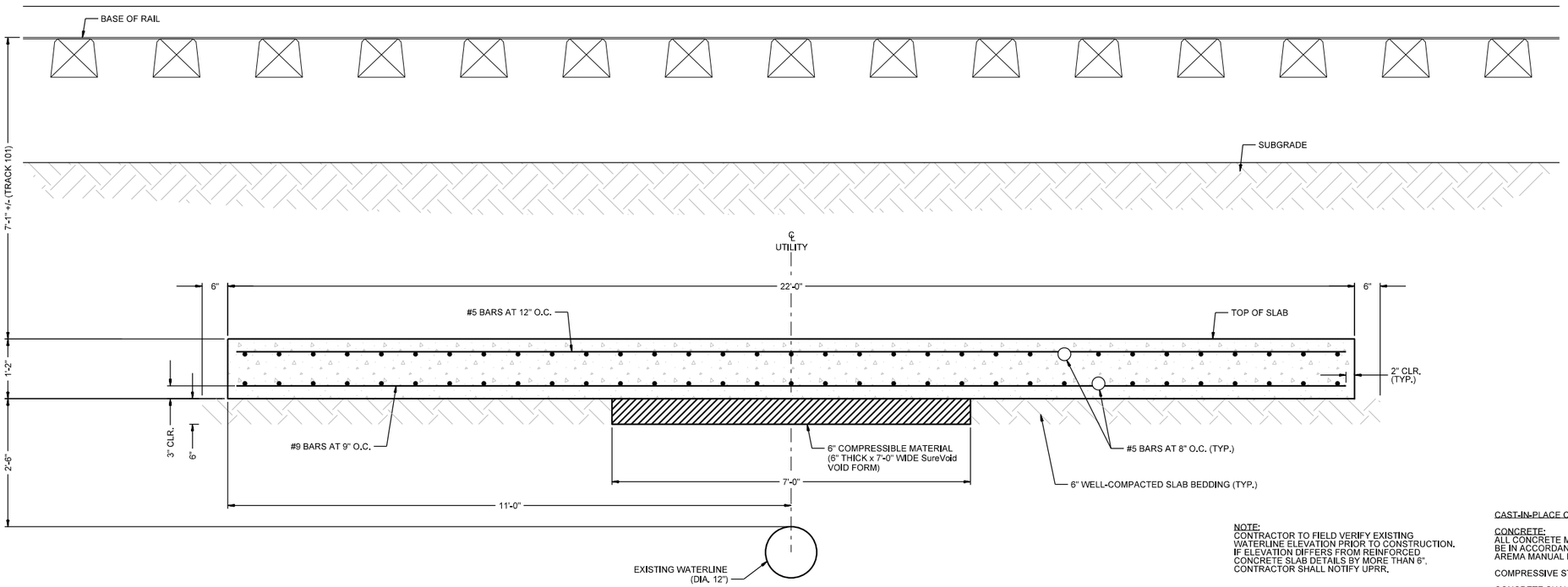

NOTE:
CONTRACTOR TO FIELD VERIFY EXISTING WATERLINE ELEVATION PRIOR TO CONSTRUCTION. IF ELEVATION DIFFERS FROM REINFORCED CONCRETE SLAB DETAILS BY MORE THAN 6", CONTRACTOR SHALL NOTIFY UPRR.

REINFORCED CONCRETE SLAB DETAIL

NOT TO SCALE

CAST-IN-PLACE CONCRETE SLAB NOTES:

CONCRETE:
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AIR CONTENT SHALL BE BETWEEN 5% AND 7% BY VOLUME.

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1 INCH	100
1/2 INCH	60-90
3/8 INCH	20-40
NO. 4	10-20
NO. 200	LESS THAN 5%

UNION PACIFIC SEALANT BALLAST, ITEM NO. 562-5428, MAY BE USED.

DESIGN NOTES:

1. THE CAST-IN-PLACE CONCRETE TRACK SLAB HAS BEEN DESIGNED FOR COOPER E-80 LIVE LOAD WITH IMPACT AND COVER DEPTH OF 7'-1".
2. SLAB BEARING SUBGRADE AREA SHOULD BE PREPARED PER THE GEOTECH REPORT. SPECIAL CARE SHOULD BE TAKEN DURING SURFACE PREP OVER THE UTILITIES.

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Omaha, NE 68106-2810
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UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: D006 of 008

UNION PACIFIC RAILROAD

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
UTILITY PROTECTION SLAB DETAIL

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3/9/2026

Restricted Work Area

Phoenix-Mesa Gateway Airport

Williams Field Rd.

North Detention Cell

Restricted Work Area

National Weather Service Weather Radar Site

City of Mesa Utility Station

Track 749 & Track 750

Retention Area 1 Outfall to Ellsworth Channel

S. Power Rd.

E. Pecos Rd.

Pecos Road Crossing See Sheets PH005 to PH012

Sossaman Road Crossing See Sheets PH019 to PH027

South Detention Cell

Diversion to North Detention Cell

Track 101

Track 101

GILBERT

MESA

QUEEN CREEK

North Detention Cell Outfall to Trackside Ditch

Retention Area 1

Sossaman Road Crossing See Sheets PH013 to PH018

E. Pecos Rd.

Track 751

South Detention Cell to Rittenhouse Channel

E. Rittenhouse Rd.

S. Sossaman Rd.

S. 80th St.

S. Ellsworth Rd.

935

Sossaman Road Crossing See Sheet PH004

E. Germann Rd.

MESA

QUEEN CREEK

E. Germann Rd.

Rittenhouse Channel Outfall

Restricted Work Area

Track 120 Extension

Hawes Rd.

NOTES:
1. SEE SHEET PH002 FOR NOTES

936

1250 0 1250 2500

SCALE IN FEET

Phoenix Sub Main Track

N

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Omaha, NE 68106-2810
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UNION PACIFIC

DRAWN BY: MHD
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH001 of 029

UNION PACIFIC RAILROAD

Sheet 212 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING

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3/9/2026

Restricted Work Area

SR 24

S. 222nd St.

S. Mountain Rd.

MESA CITY LIMITS

Retention Area 6 Outfall to Trackside Ditch

E. Pecos Rd.

Track 101

Retention Areas 3 & 4 Outfall to Existing Retention

Retention Area 6

Track 752

Retention Area 2

Signal Butte Road Crossing See Sheet PH029

Retention Area 5

Retention Area 2 Outfall to Trackside Ditch

Crismon Road Crossing See Sheet PH028

Retention Area 5 Outfall to Signal Butte Road

S. Crismon Rd.

S. Merrill Rd.

S. Signal Butte Rd.

S. Meridian Rd.

E. Germann Rd.

MESA

QUEEN CREEK

MARICOPA COUNTY

PINAL COUNTY

N

1250 0 1250 2500

SCALE IN FEET

NOTES:

1. CONSTRUCTION ACTIVITIES SHALL GENERALLY BE PERFORMED AS DEPICTED IN THE PLANS, WITHIN DESIGNATED WORK AREAS, AND IN ACCORDANCE WITH ALL PERMITS. ALL CONSTRUCTION ACTIVITIES, INCLUDING CONTRACTOR ACCESS, MOBILIZATION, AND STORAGE OF MATERIALS/EQUIPMENT, WITHIN RESTRICTED WORK AREAS ARE STRICTLY PROHIBITED UNTIL OBTAINMENT OF AGENCY APPROVALS AND RECEIVING WRITTEN AUTHORIZATION FROM UPRR.
2. ALL WORK SHALL BE PERFORMED IN CLOSE COORDINATION WITH SRP POWER SUPPLY/DISTRIBUTION, UPRR SIGNAL INSTALLATIONS, AND UPRR TRACK FOR TLM CONSTRUCTION AND CROSSING PANEL INSTALLATIONS.
3. THE CONTRACTOR SHALL COORDINATE ALL ASPECTS OF CONSTRUCTION, INCLUDING MATERIAL STORAGE AND STAGING AREAS, TEMPORARY TRAFFIC CONTROL, ACCESS, HAUL ROUTES, SCHEDULES, NOTIFICATIONS, TESTING, INSPECTIONS, AND DOCUMENTATION WITH ALL RELEVANT ENTITIES INCLUDING UPRR, PUBLIC AGENCIES, JURISDICTIONS HAVING AUTHORITY (JHA), UTILITY OWNERS, ADJACENT LANDOWNERS, SUBCONTRACTORS, AND/OR OTHER THIRD-PARTIES.
4. CONSTRUCTION PHASING AND DETOUR PLANS ARE STRICTLY CONCEPTUAL. THE CONTRACTOR IS RESPONSIBLE FOR ENGINEERING DESIGN, APPLICATION, AND OBTAINMENT OF ALL TEMPORARY TRAFFIC CONTROL (TTC) PERMITS PRIOR TO ALL CONSTRUCTION.
5. EACH ROAD CROSSING WILL REQUIRE, AT A MINIMUM, TWO PHASES OF CONSTRUCTION. THE FIRST PHASE OF CONSTRUCTION INCLUDES CONTRACTOR WORK CONSISTING OF UTILITY RELOCATIONS, GRADING AND DRAINAGE IMPROVEMENTS, AND ROADWAY RECONSTRUCTION THROUGH THE TRACK CROSSING. THE SECOND PHASE INCLUDES CONTRACTOR PAVEMENT REMOVAL AND TRACKBED PREPARATION, UPRR INSTALLATION OF TRACK AND CROSSING PANELS, CONTRACTOR INSTALLATION OF UNDERDRAINS AND PAVING ALONG THE CROSSING PANELS, AND ALL OTHER ITEMS AS NECESSARY FOR COMPLETION OF WORK. ALL ROAD CROSSINGS ADJACENT TO FULL-CLOSURE CONSTRUCTION SHALL REMAIN OPEN TO TRAFFIC AT ALL TIMES. AS NECESSARY, AND AS ACCEPTABLE TO LOCAL ORDINANCES, THE CONTRACTOR WILL BE REQUIRED TO WORK EVENINGS AND WEEKENDS DURING FULL-CLOSURE CONSTRUCTION.
6. IN ACCORDANCE WITH AGENCY SPECIFICATIONS AND REQUIREMENTS, THE CONTRACTOR SHALL TEMPORARILY RELOCATE, MAINTAIN, OR RESTORE EXISTING FEATURES CONFLICTING WITH PROPOSED CONSTRUCTION SUCH AS UTILITIES, PAVEMENT MARKINGS AND SIGNING, OR OTHER CONFLICTS ENCOUNTERED.
7. ALL ASPECTS OF CONSTRUCTION PHASING, INCLUDING ENGINEERING DESIGN, ALL COORDINATION, TESTING, INSPECTIONS, HAUL ROUTES, PERMITTING, AND INSTALLATION, MAINTENANCE, AND REMOVAL OF ALL TEMPORARY PAVEMENTS, TEMPORARY TRAFFIC CONTROL, BARRICADES, DETOURS, TEMPORARY SHORING, DEWATERING, AND RESTORATIONS SHALL BE MADE UNDER THE LUMP SUM LINE ITEM "TRFC, TRAFFIC CONTROL" FOR EACH RESPECTIVE WORK AREA.
8. ALL TEMPORARY TRAFFIC CONTROL SHALL COMPLY WITH THE CITY OF MESA TEMPORARY TRAFFIC CONTROL MANUAL STANDARDS AND REQUIREMENTS.

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CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH002 of 029

UNION PACIFIC RAILROAD

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING

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3/9/2026

E. Pecos Rd.

S. 80th St.

E. Germann Rd.

Hawes Rd.

Restricted Work Area

E. Ryan Rd.

E. Fulton Pkwy.

S. Ellsworth Loop

S. Sossaman Road Crossing
See Sheet PH004

MESA

QUEEN CREEK

936

Phoenix Sub Main Track

Track 744

E. Fulton Pkwy.

E. Rittenhouse Rd.

Track 120

Track 120

QUEEN CREEK

S. Sossaman Rd

Hawes Rd.

Google Earth

Legend

NOTES:
1. SEE SHEET PH002 FOR NOTES

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DATE: 03/09/2026
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UNION PACIFIC RAILROAD
Sheet 214 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING

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DETOUR NOTES

1. DETOURS AND TEMPORARY TRAFFIC CONTROL SHOWN IS CONCEPTUAL. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY TRAFFIC CONTROL REQUIRED FOR MULTIPLE PHASES OF CONSTRUCTION NECESSARY TO ACCOMMODATE ALL ASPECTS OF ROADWAY AND RAILROAD CONSTRUCTION.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINMENT OF TEMPORARY TRAFFIC CONTROL (TTC) PERMITS PER CONDITIONS SET FORTH IN THE CITY OF MESA TEMPORARY TRAFFIC CONTROL MANUAL (TTCM). TRAFFIC CONTROL PLANS (TCP) SHALL COMPLY WITH SECTION 1.5 OF THE CITY OF MESA TTCM. ROAD CLOSURES REQUIRE A MINIMUM LEAD TIME OF 30 CALENDAR DAYS FOR CITY OF MESA REVIEW AND COORDINATION.

3. CONTRACTOR SHALL COMPLY WITH THE TOWN OF QUEEN CREEK ROADWAY SIGNING AND PAVEMENT MARKING GUIDELINES DOCUMENT, SPECIFICATIONS, AND REQUIREMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE TOWN OF QUEEN CREEK, INCLUDING OBTAINMENT OF FULL ROAD CLOSURE PERMITS, NOTIFICATIONS, SCHEDULING, HAUL ROADS, AND INSPECTIONS. REQUESTS FOR FULL ROAD CLOSURES SHALL BE SUBMITTED TO THE TOWN OF QUEEN CREEK AT LEAST 21 DAYS PRIOR TO PROPOSED CLOSURES.

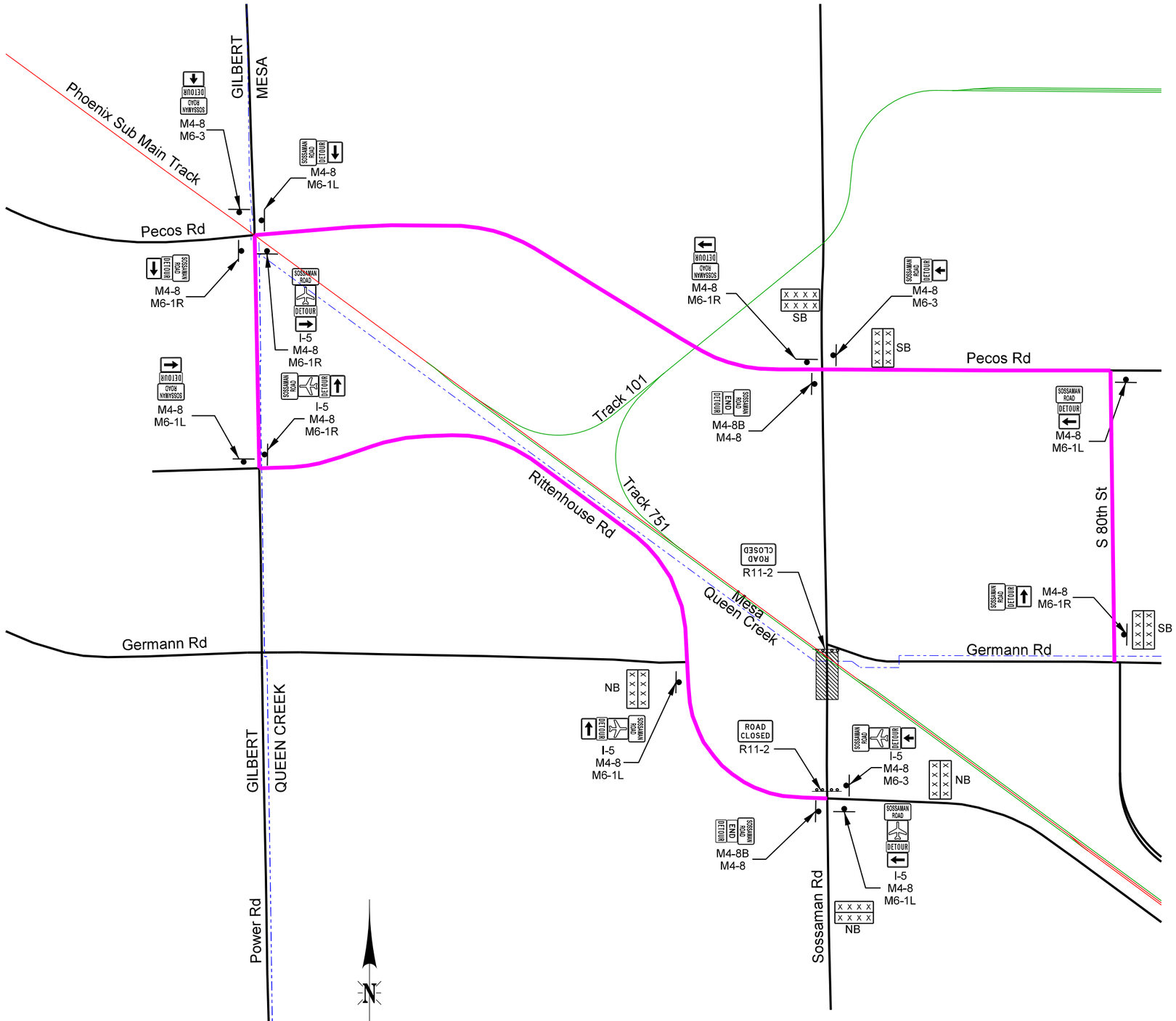
LEGEND

- VARIABLE MESSAGE BOARD
- CONSTRUCTION
- TYPE III BARRICADE
- SIGN
- DETOUR
- EXISTING TRACK
- PROPOSED TRACK

MESSAGE: PHASE I	MESSAGE: PHASE II
LINE 1: SOSSAMAN	LINE 1: XX/XX
LINE 2: ROAD (NB/SB)	LINE 2: TO
LINE 3: CLOSED	LINE 3: XX/XX
	(XX/XX INDICATES THE DATES OF CLOSURE)

LIST OF TRAFFIC CONTROL DEVICES*			
ITEM	MUTCD DEVICE NO.	SIZE	QTY
ROAD CLOSED	R11-2	48" X 30"	2
ROAD CLOSED TO THRU TRAFFIC	R11-4	60" X 30"	-
'SOSSAMAN ROAD' PLAQUE			15
STRAIGHT ARROW AUXILIARY	M6-3	21" X 15"	3
LEFT ARROW AUXILIARY	M6-1L	21" X 15"	5
RIGHT ARROW AUXILIARY	M6-1R	21" X 15"	5
DETOUR (LEFT ARROW)	M4-10L	48" X 18"	-
DETOUR (RIGHT ARROW)	M4-10R	48" X 18"	-
DETOUR	M4-8	24" X 12"	15
END	M4-8B	24" X 12"	2
AIRPORT PLAQUE	I-5	24" X 24"	5
TYPE III BARRICADE		60" X 48"	4
VARIABLE MESSAGE BOARDS			6

*NOTE: TEMPORARY TRAFFIC CONTROL QUANTITIES ARE SHOWN FOR INFORMATION ONLY. PAYMENT FOR THESE ITEMS SHALL BE MADE UNDER THE LUMP SUM LINE ITEM "TRFC, TRAFFIC CONTROL".



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UNION PACIFIC RAILROAD

Sheet 215 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN CROSSING DETOUR

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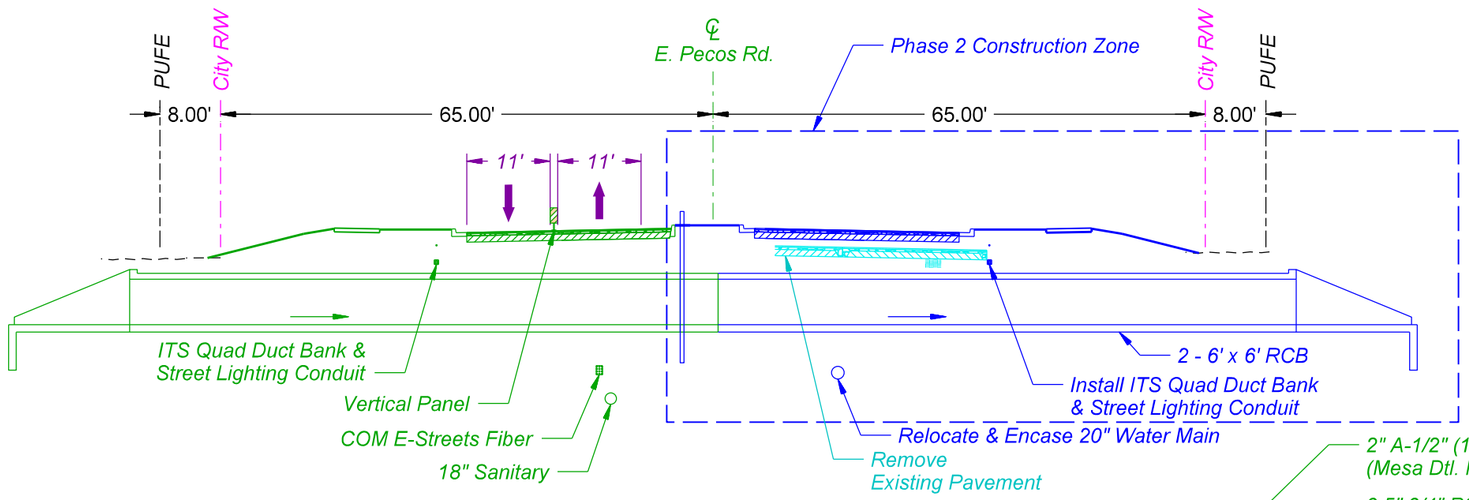
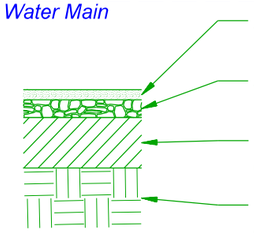
NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.

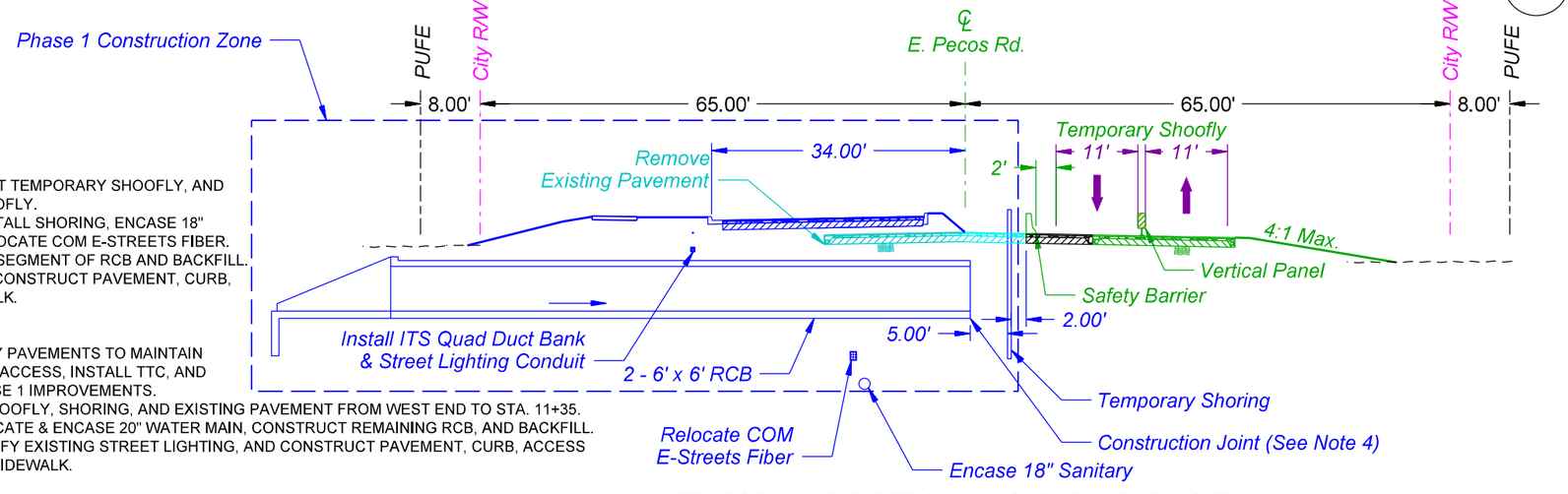


TYPICAL SECTION (LOOKING EAST)
PHASE 2 & 3 CONSTRUCTION



B TEMPORARY PAVEMENT SECTION

NOT TO SCALE



TYPICAL SECTION (LOOKING EAST)
PHASE 1 CONSTRUCTION

PHASE 1:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY, AND DIVERT TRAFFIC TO SHOOFLY.
B. REMOVE PAVEMENT, INSTALL SHORING, ENCASE 18" SANITARY LINE, AND RELOCATE COM E-STREETS FIBER.
C. CONSTRUCT UPSTREAM SEGMENT OF RCB AND BACKFILL.
D. INSTALL CONDUITS AND CONSTRUCT PAVEMENT, CURB, SCUPPERS, AND SIDEWALK.

PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENTS TO MAINTAIN TRAFFIC AND PROPERTY ACCESS, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT FROM WEST END TO STA. 11+35.
C. INSTALL SHORING, RELOCATE & ENCASE 20" WATER MAIN, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, MODIFY EXISTING STREET LIGHTING, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVES, SCUPPER, AND SIDEWALK.

PHASE 3:

A. COORDINATE TEMPORARY CLOSURE OF DRIVEWAY ENTRANCE W/ PROPERTY OWNER.
B. REMOVE TEMPORARY PAVEMENTS, EXISTING DRIVEWAY ENTRANCE, AND EXISTING PAVEMENT FROM STA. 11+35 TO EAST END.
B. CONSTRUCT REMAINING ROAD, RECONSTRUCT DRIVEWAY ENTRANCE, CONSTRUCT CURB AND SIDEWALK, AND RESTORE PROPERTY ACCCESS.

PHASE 4 (FULL-CLOSURE):

A. INSTALL TEMPORARY TRAFFIC CONTROL (DETOUR).
B. REMOVE TEMPORARY PAVEMENT AND FINALIZE GRADING.
C. PREPARE TRACKBED FOR UPRR TRACK/CROSSING CONSTRUCTION (SAW CUT AND REMOVE PAVEMENT, PREPARE SUBGRADE, PLACE SUBBALLAST, AND INSTALL UNDERDRAINS).
D. UPRR TO INSTALL TRACK (TLM), LINE/LEVEL BALLAST, AND INSTALL CROSSING PANELS.
E. CONSTRUCT PAVEMENT ALONG CROSSING PANELS, MILL/OVERLAY PAVEMENT AT EACH END, FINALIZE PERMANENT TRAFFIC CONTROL, AND OPEN TO TRAFFIC.

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY LANES

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UNION PACIFIC RAILROAD — Sheet 216 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - PECOS ROAD TYPICALS

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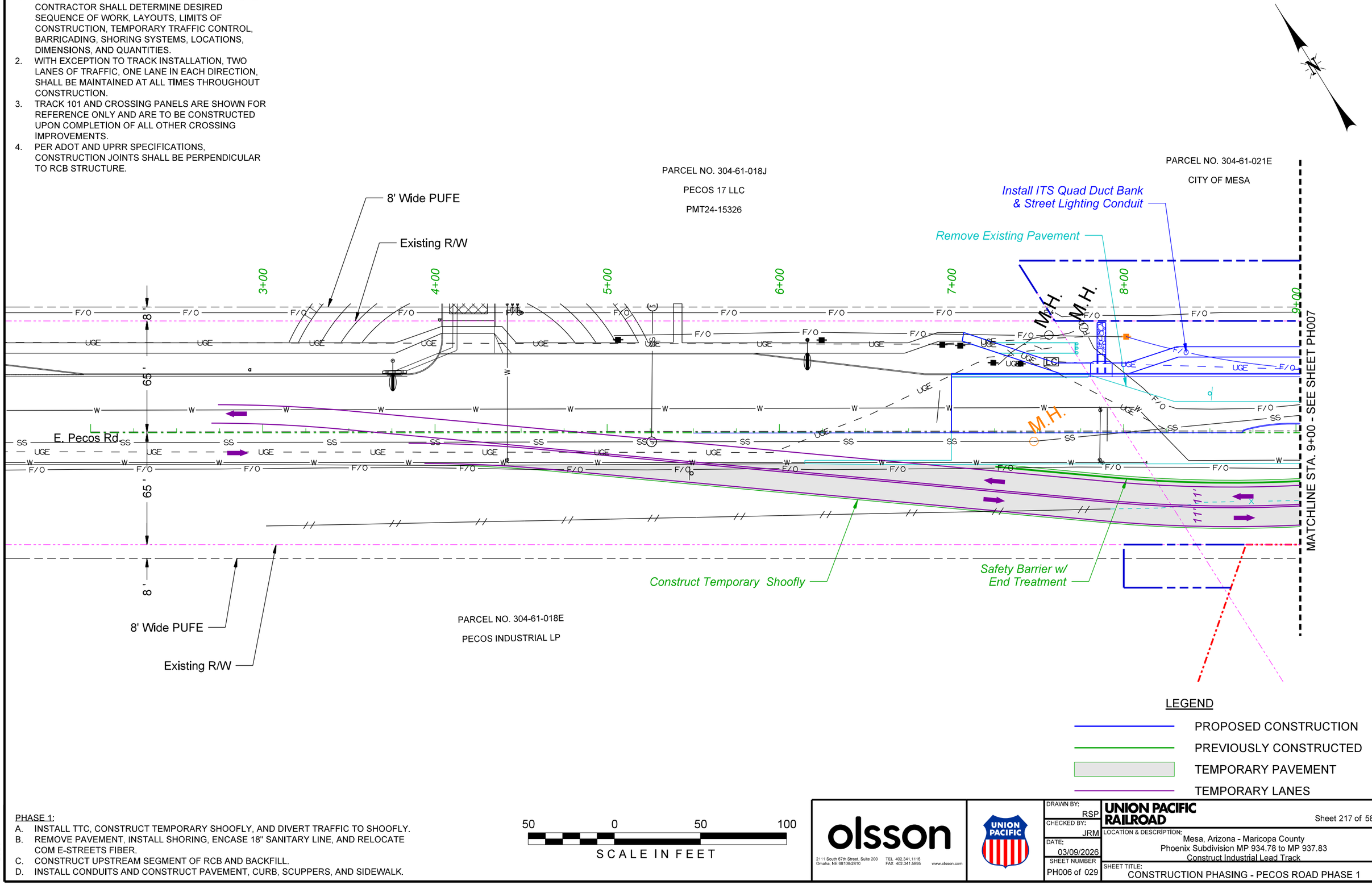
NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

PHASE 1:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY, AND DIVERT TRAFFIC TO SHOOFLY.
B. REMOVE PAVEMENT, INSTALL SHORING, ENCASE 18" SANITARY LINE, AND RELOCATE COM E-STREETS FIBER.
C. CONSTRUCT UPSTREAM SEGMENT OF RCB AND BACKFILL.
D. INSTALL CONDUITS AND CONSTRUCT PAVEMENT, CURB, SCUPPERS, AND SIDEWALK.

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UNION PACIFIC RAILROAD
Sheet 217 of 587
LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track
SHEET TITLE:
CONSTRUCTION PHASING - PECOS ROAD PHASE 1

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NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
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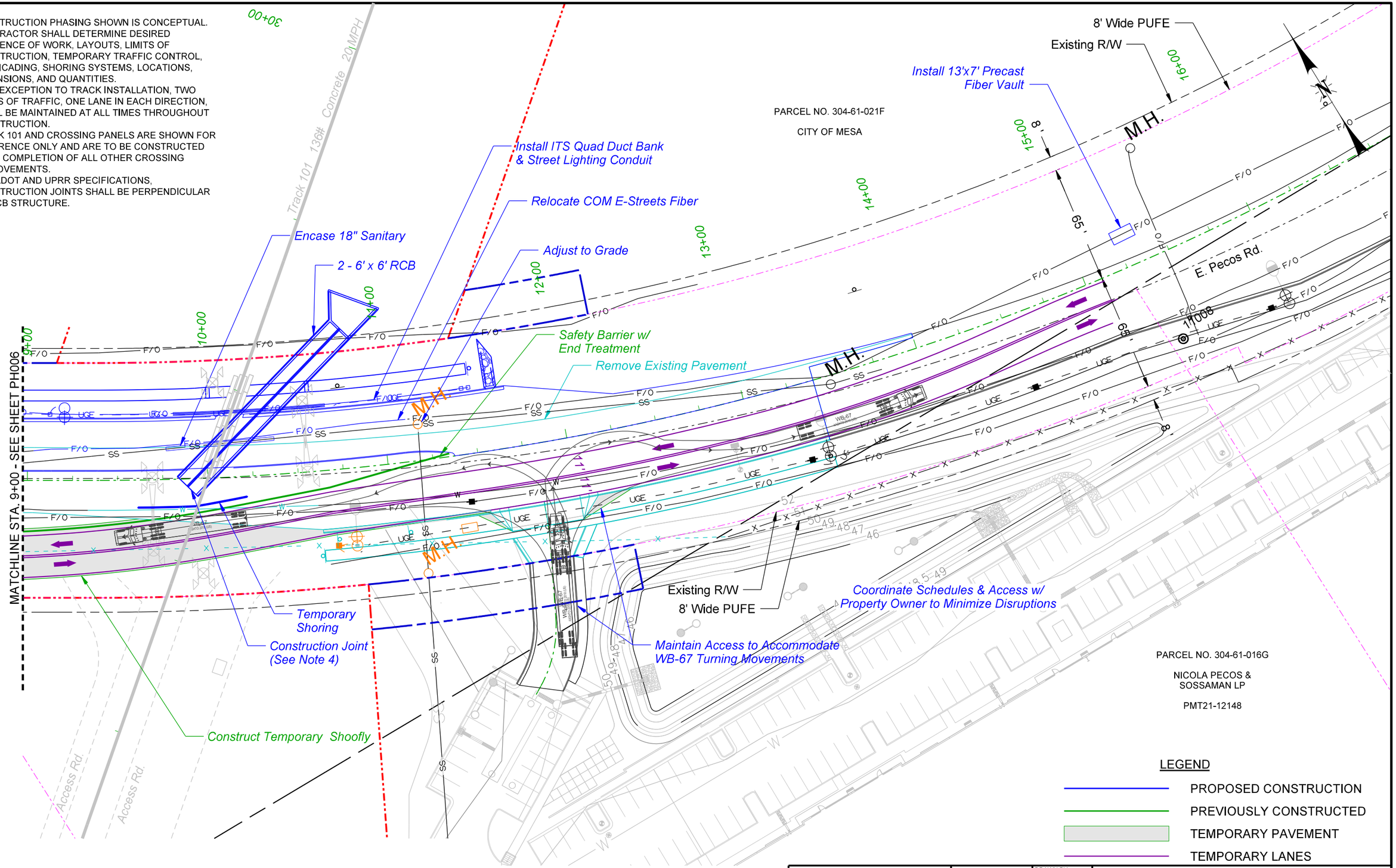
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



PHASE 1:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY, AND DIVERT TRAFFIC TO SHOOFLY.
B. REMOVE PAVEMENT, INSTALL SHORING, ENCASE 18" SANITARY LINE, AND RELOCATE COM E-STREETS FIBER.
C. CONSTRUCT UPSTREAM SEGMENT OF RCB AND BACKFILL.
D. INSTALL CONDUITS AND CONSTRUCT PAVEMENT, CURB, SCUPPERS, AND SIDEWALK.

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

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UNION PACIFIC RAILROAD
Sheet 218 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - PECOS ROAD PHASE 1

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NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
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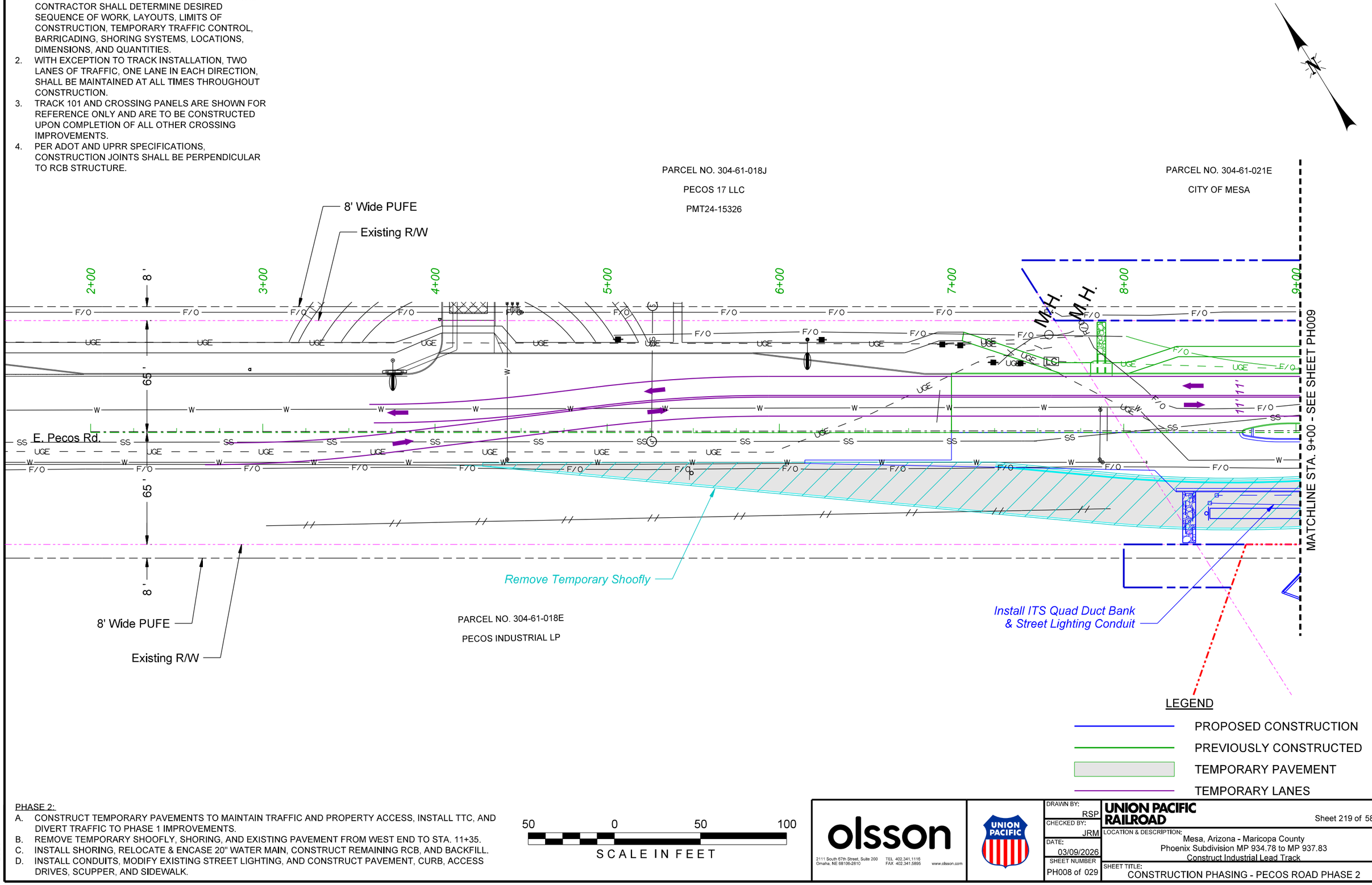
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENTS TO MAINTAIN TRAFFIC AND PROPERTY ACCESS, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT FROM WEST END TO STA. 11+35.
C. INSTALL SHORING, RELOCATE & ENCASE 20" WATER MAIN, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, MODIFY EXISTING STREET LIGHTING, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVES, SCUPPER, AND SIDEWALK.

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UNION PACIFIC RAILROAD
Sheet 219 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - PECOS ROAD PHASE 2

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NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.

Track 101 136# Concrete 20 MPH

8' Wide PUFE

Existing R/W

PARCEL NO. 304-61-021F

CITY OF MESA

Construct Temporary Pavement

Temporary Shoring

E. Pecos Rd.

MATCHLINE STA. 9+00 - SEE SHEET PH008

Existing R/W

8' Wide PUFE

Construct Temporary Pavement

Coordinate Schedules & Access w/ Property Owner to Minimize Disruptions

Relocate & Encase 20" Water Main

Maintain Access to Accommodate WB-67 Turning Movements

Adjust to Grade

Install ITS Quad Duct Bank & Street Lighting Conduit

Modify Existing Street Lighting

2 - 6' x 6' RCB

Remove Temporary Shoofly

Access Rd.

Access Rd.

PARCEL NO. 304-61-016G

NICOLA PECOS & SOSSAMAN LP

PMT21-12148

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENTS TO MAINTAIN TRAFFIC AND PROPERTY ACCESS, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT FROM WEST END TO STA. 11+35.
C. INSTALL SHORING, RELOCATE & ENCASE 20" WATER MAIN, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, MODIFY EXISTING STREET LIGHTING, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVES, SCUPPER, AND SIDEWALK.

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UNION PACIFIC RAILROAD

Sheet 220 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - PECOS ROAD PHASE 2

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3/9/2026

DETOUR NOTES

1. DETOURS AND TEMPORARY TRAFFIC CONTROL SHOWN IS CONCEPTUAL. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY TRAFFIC CONTROL REQUIRED FOR MULTIPLE PHASES OF CONSTRUCTION NECESSARY TO ACCOMMODATE ALL ASPECTS OF ROADWAY AND RAILROAD CONSTRUCTION.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINMENT OF TEMPORARY TRAFFIC CONTROL (TTC) PERMITS PER CONDITIONS SET FORTH IN THE CITY OF MESA TEMPORARY TRAFFIC CONTROL MANUAL (TTCM). TRAFFIC CONTROL PLANS (TCP) SHALL COMPLY WITH SECTIONS 1.5 OF THE CITY OF MESA TTCM. ROAD CLOSURES REQUIRE A MINIMUM LEAD TIME OF 30 CALENDAR DAYS FOR CITY OF MESA REVIEW AND COORDINATION.

3. CONTRACTOR SHALL COMPLY WITH THE TOWN OF QUEEN CREEK ROADWAY SIGNING AND PAVEMENT MARKING GUIDELINES DOCUMENT, SPECIFICATIONS, AND REQUIREMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE TOWN OF QUEEN CREEK, INCLUDING OBTAINMENT OF FULL ROAD CLOSURE PERMITS, NOTIFICATIONS, SCHEDULING, HAUL ROADS, AND INSPECTIONS. REQUESTS FOR FULL ROAD CLOSURES SHALL BE SUBMITTED TO THE TOWN OF QUEEN CREEK AT LEAST 21 DAYS PRIOR TO PROPOSED CLOSURES.

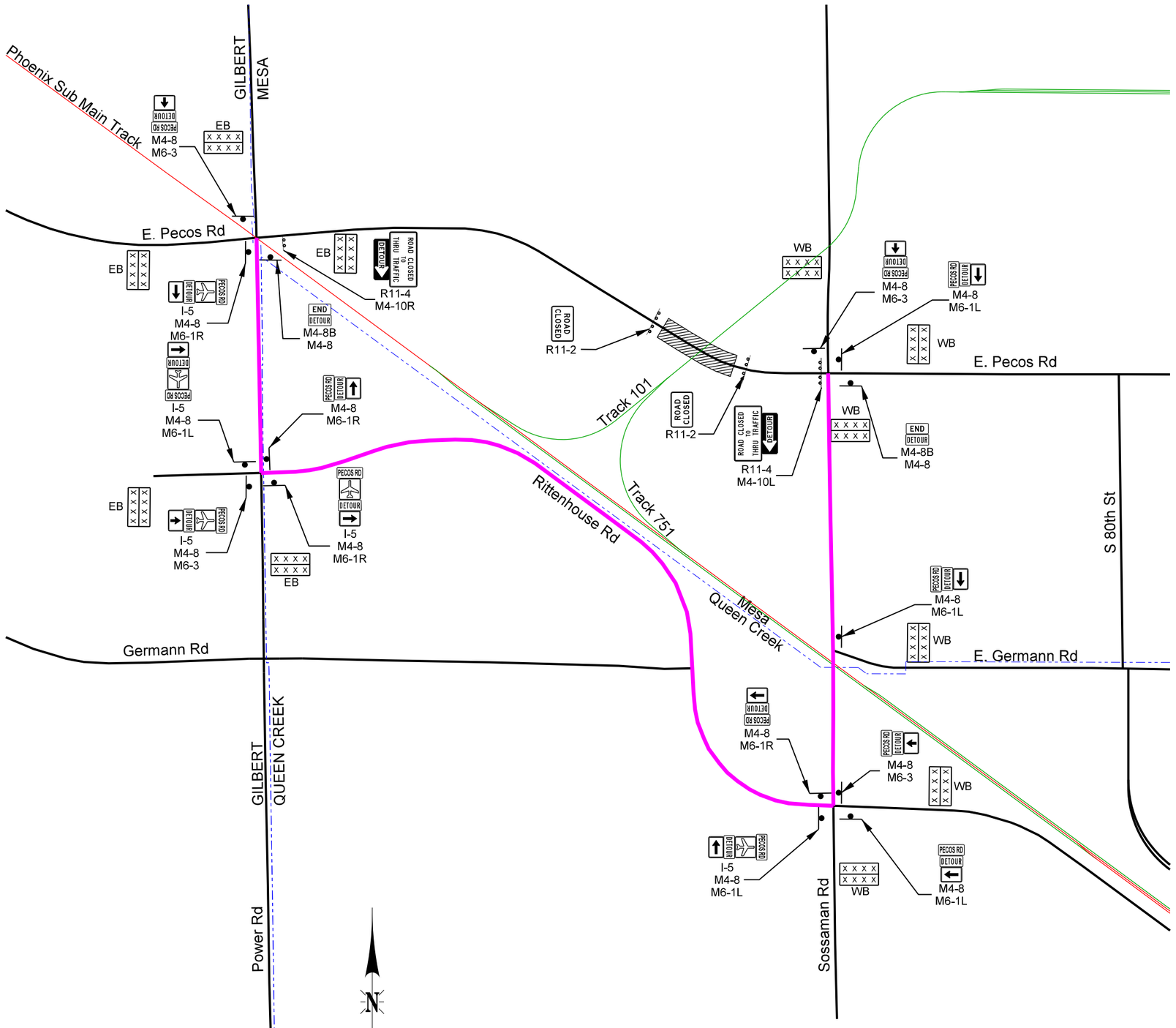
LEGEND

- VARIABLE MESSAGE BOARD (VMS)
- CONSTRUCTION
- TYPE III BARRICADE
- SIGN
- DETOUR
- EXISTING TRACK
- PROPOSED TRACK

MESSAGE: PHASE I	MESSAGE: PHASE II
LINE 1: PECOS	LINE 1: XX/XX
LINE 2: ROAD (EB/WB)	LINE 2: TO
LINE 3: CLOSED	LINE 3: XX/XX
	(XX/XX INDICATES THE DATES OF CLOSURE)

LIST OF TRAFFIC CONTROL DEVICES*			
ITEM	MUTCD DEVICE NO.	SIZE	QTY
ROAD CLOSED	R11-2	48" X 30"	2
ROAD CLOSED TO THRU TRAFFIC	R11-4	60" X 30"	2
'PECOS ROAD' PLAQUE			13
STRAIGHT ARROW AUXILIARY	M6-3	21" X 15"	4
LEFT ARROW AUXILIARY	M6-1L	21" X 15"	5
RIGHT ARROW AUXILIARY	M6-1R	21" X 15"	4
DETOUR (LEFT ARROW)	M4-10L	48" X 18"	1
DETOUR (RIGHT ARROW)	M4-10R	48" X 18"	1
DETOUR	M4-8	24" X 12"	15
END	M4-8B	24" X 12"	2
AIRPORT PLAQUE	I-5	24" X 24"	5
TYPE III BARRICADE		60" X 48"	7
VARIABLE MESSAGE BOARDS			9

*NOTE: TEMPORARY TRAFFIC CONTROL QUANTITIES ARE SHOWN FOR INFORMATION ONLY. PAYMENT FOR THESE ITEMS SHALL BE MADE UNDER THE LUMP SUM LINE ITEM "TRFC, TRAFFIC CONTROL".



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UNION PACIFIC

DRAWN BY: DMJ
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH012 of 029

UNION PACIFIC RAILROAD — Sheet 223 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - PECOS CROSSING DETOUR

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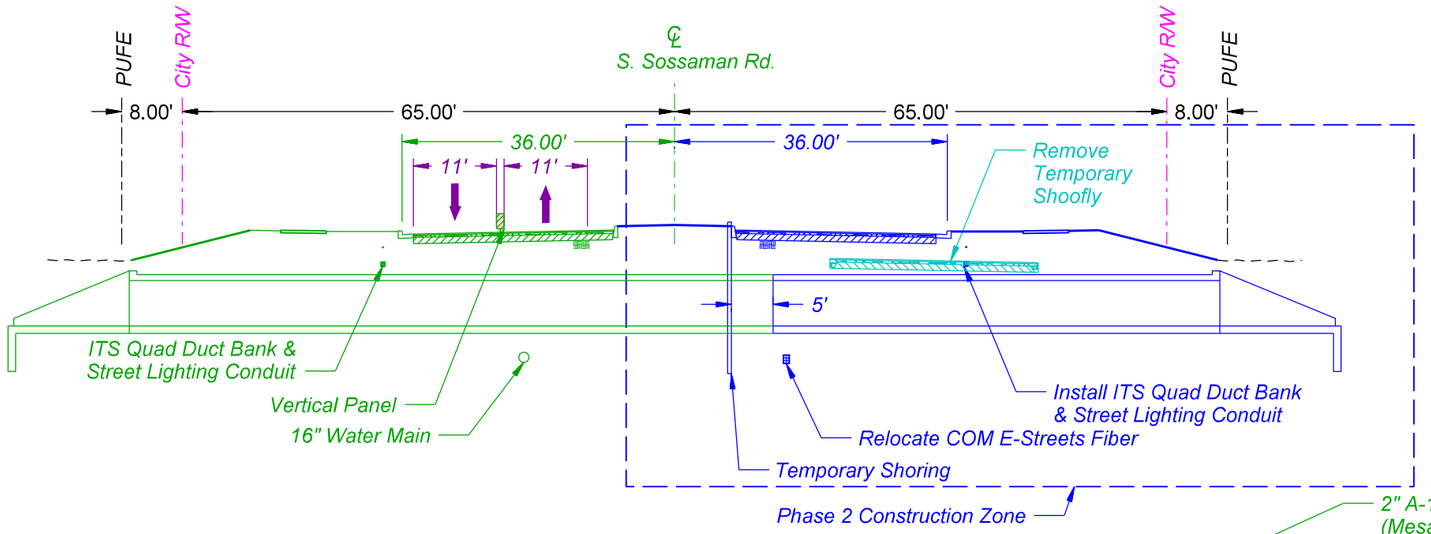
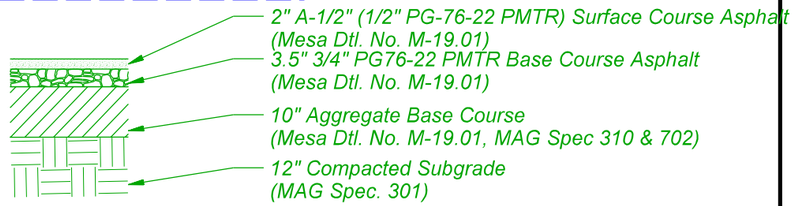
P_PH010_05 Pecos Detour_200927.dgn

NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.

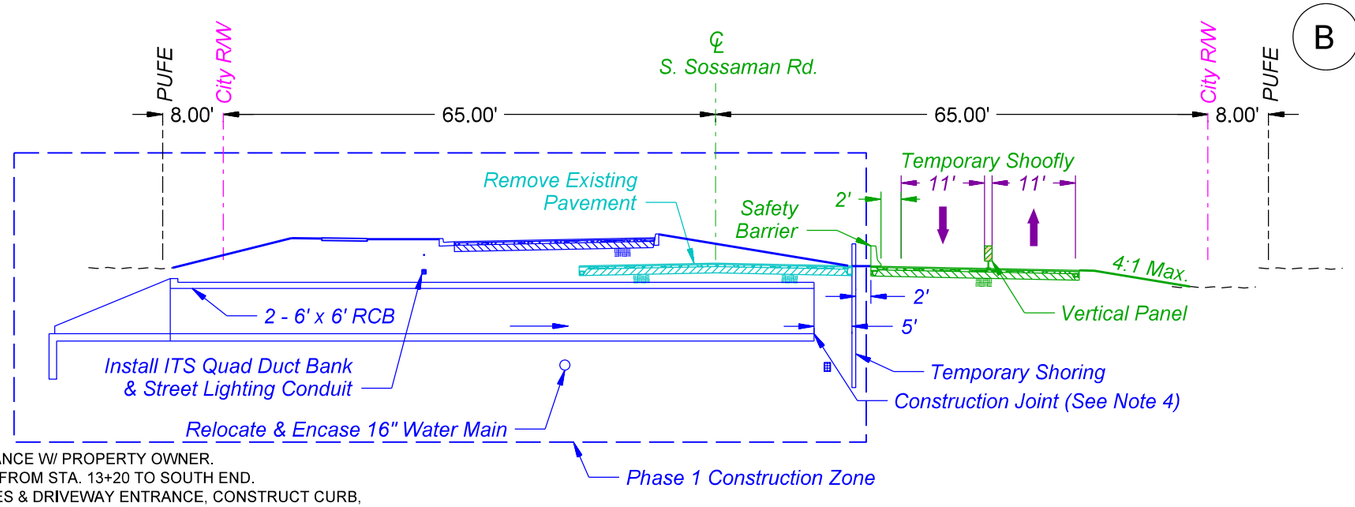


TYPICAL SECTION (LOOKING SOUTH)
PHASE 2 CONSTRUCTION



B TEMPORARY PAVEMENT SECTION

NOT TO SCALE



TYPICAL SECTION (LOOKING SOUTH)
PHASE 1 CONSTRUCTION

PHASE 1A:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY, AND DIVERT TRAFFIC TO SHOOFLY.
B. REMOVE PAVEMENT FROM NORTH END TO STA. 13+20, INSTALL SHORING, AND RELOCATE & ENCASE 16" WATER MAIN.
C. CONSTRUCT UPSTREAM SEGMENT OF RCB AND BACKFILL.
D. INSTALL CONDUITS, MODIFY EXISTING STREET LIGHTING, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVE, SCUPPER, AND SIDEWALK.

PHASE 1B:

A. COORDINATE TEMPORARY CLOSURE OF DRIVEWAY ENTRANCE W/ PROPERTY OWNER.
B. REMOVE EXISTING DRIVEWAY ENTRANCE AND PAVEMENT FROM STA. 13+20 TO SOUTH END.
C. CONSTRUCT REMAINING SEGMENT OF NORTHBOUND LANES & DRIVEWAY ENTRANCE, CONSTRUCT CURB, SIDEWALK, CATCH BASIN & 15" HDPE CULVERT, AND RESTORE PROPERTY ACCESS.

PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENT AT NORTH END, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT.
C. INSTALL SHORING, RELOCATE COM E-STREETS FIBER, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVE, SCUPPERS, AND SIDEWALK.

PHASE 3 (FULL-CLOSURE):

A. INSTALL TEMPORARY TRAFFIC CONTROL (DETOUR).
B. REMOVE TEMPORARY PAVEMENT AND FINALIZE GRADING.
C. PREPARE TRACKBED FOR UPRR TRACK/CROSSING CONSTRUCTION (SAW CUT AND REMOVE PAVEMENT, PREPARE SUBGRADE, PLACE SUBBALLAST, AND INSTALL UNDERDRAINS).
D. UPRR TO INSTALL TRACK (TLM), LINE/LEVEL BALLAST, AND INSTALL CROSSING PANELS.
E. CONSTRUCT PAVEMENT ALONG CROSSING PANELS, MILL/OVERLAY PAVEMENT AT NORTH END, FINALIZE PERMANENT TRAFFIC CONTROL, AND OPEN TO TRAFFIC.

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY LANES

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UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH013 of 029

UNION PACIFIC RAILROAD

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN ROAD TYPICALS

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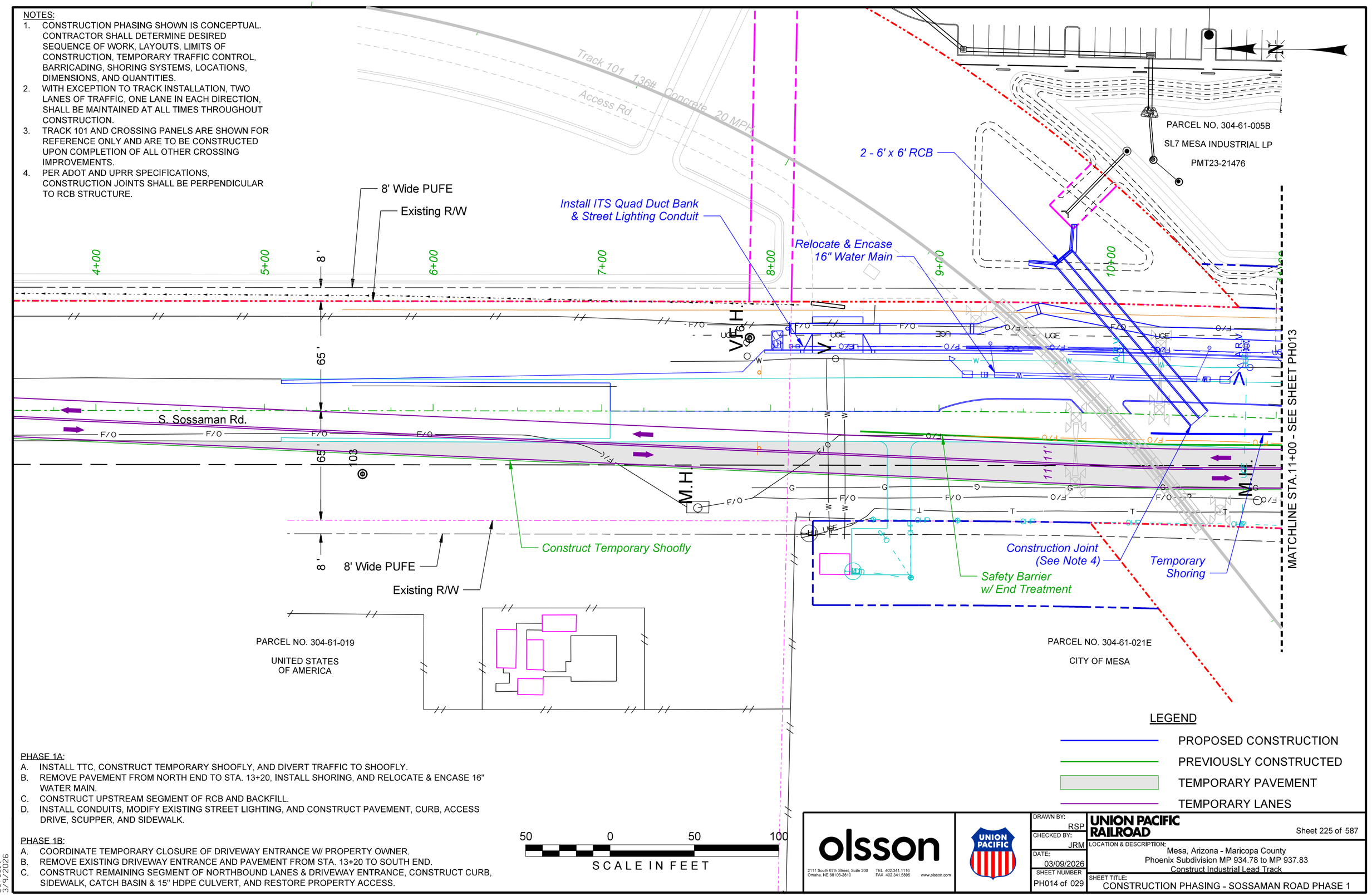
3/9/2026

NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



PHASE 1A:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY, AND DIVERT TRAFFIC TO SHOOFLY.
B. REMOVE PAVEMENT FROM NORTH END TO STA. 13+20, INSTALL SHORING, AND RELOCATE & ENCASE 16" WATER MAIN.
C. CONSTRUCT UPSTREAM SEGMENT OF RCB AND BACKFILL.
D. INSTALL CONDUITS, MODIFY EXISTING STREET LIGHTING, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVE, SCUPPER, AND SIDEWALK.

PHASE 1B:

A. COORDINATE TEMPORARY CLOSURE OF DRIVEWAY ENTRANCE W/ PROPERTY OWNER.
B. REMOVE EXISTING DRIVEWAY ENTRANCE AND PAVEMENT FROM STA. 13+20 TO SOUTH END.
C. CONSTRUCT REMAINING SEGMENT OF NORTHBOUND LANES & DRIVEWAY ENTRANCE, CONSTRUCT CURB, SIDEWALK, CATCH BASIN & 15" HDPE CULVERT, AND RESTORE PROPERTY ACCESS.

50 0 50 100
SCALE IN FEET

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

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UNION PACIFIC

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	PH014 of 029

UNION PACIFIC RAILROAD — Sheet 225 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN ROAD PHASE 1

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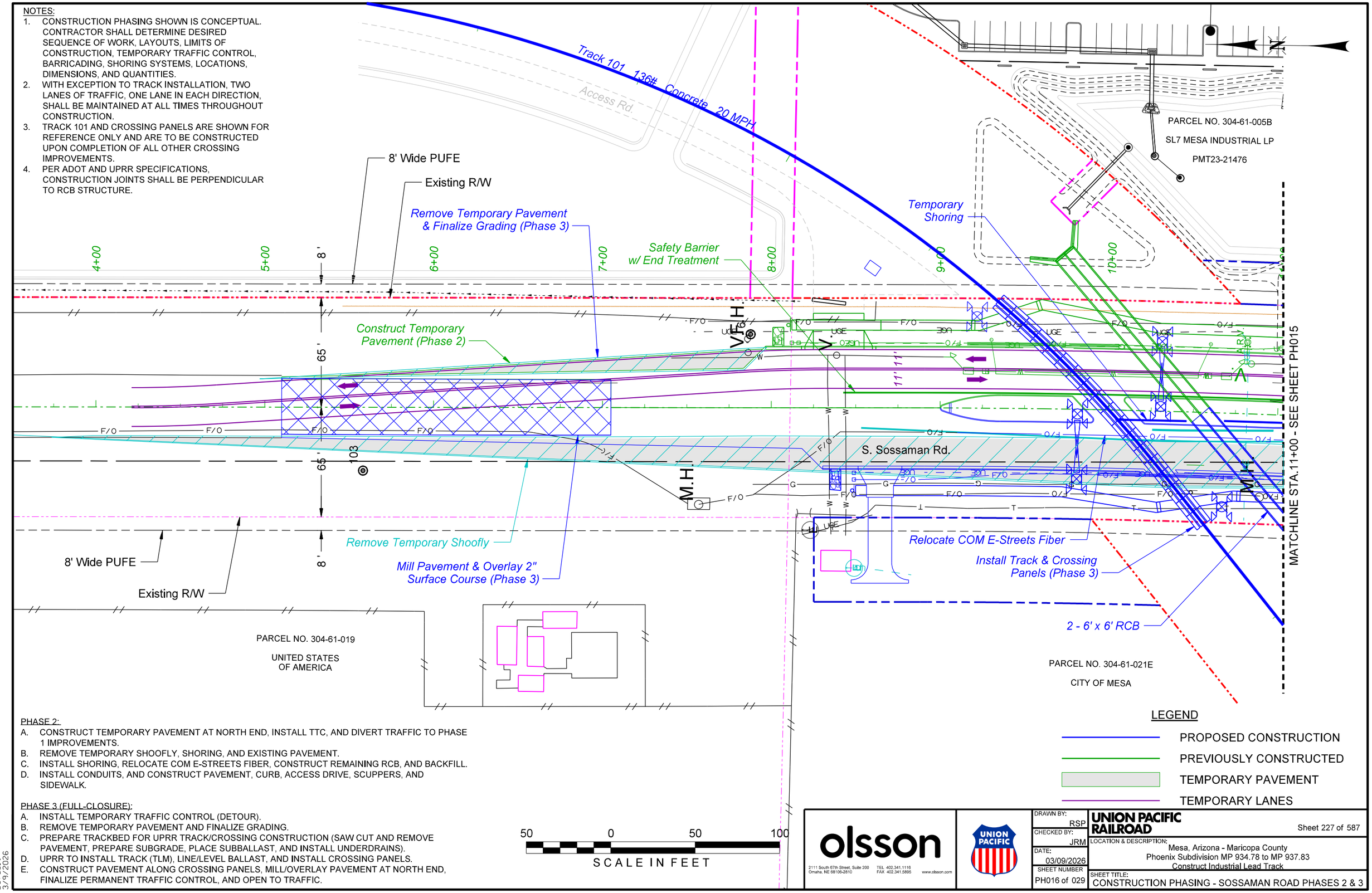
NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENT AT NORTH END, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT.
C. INSTALL SHORING, RELOCATE COM E-STREETS FIBER, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVE, SCUPPERS, AND SIDEWALK.

PHASE 3 (FULL-CLOSURE):

A. INSTALL TEMPORARY TRAFFIC CONTROL (DETOUR).
B. REMOVE TEMPORARY PAVEMENT AND FINALIZE GRADING.
C. PREPARE TRACKBED FOR UPRR TRACK/CROSSING CONSTRUCTION (SAW CUT AND REMOVE PAVEMENT, PREPARE SUBGRADE, PLACE SUBBALLAST, AND INSTALL UNDERDRAINS).
D. UPRR TO INSTALL TRACK (TLM), LINE/LEVEL BALLAST, AND INSTALL CROSSING PANELS.
E. CONSTRUCT PAVEMENT ALONG CROSSING PANELS, MILL/OVERLAY PAVEMENT AT NORTH END, FINALIZE PERMANENT TRAFFIC CONTROL, AND OPEN TO TRAFFIC.

50 0 50 100
SCALE IN FEET

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

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UNION PACIFIC

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	PH016 of 029

UNION PACIFIC RAILROAD — Sheet 227 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN ROAD PHASES 2 & 3

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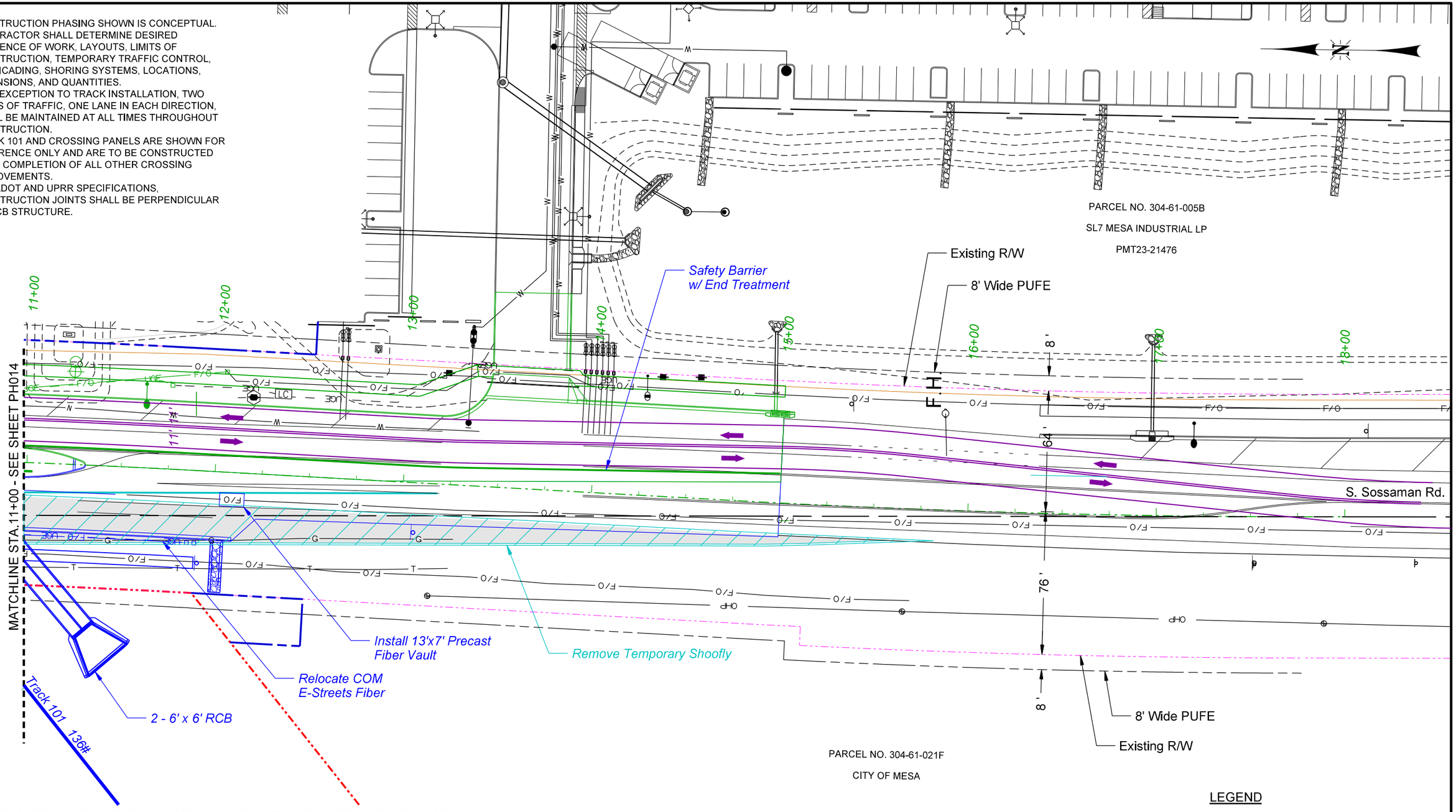
3/9/2026

NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, TWO LANES OF TRAFFIC, ONE LANE IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.
4. PER ADOT AND UPRR SPECIFICATIONS, CONSTRUCTION JOINTS SHALL BE PERPENDICULAR TO RCB STRUCTURE.



PHASE 2:

A. CONSTRUCT TEMPORARY PAVEMENT AT NORTH END, INSTALL TTC, AND DIVERT TRAFFIC TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY SHOOFLY, SHORING, AND EXISTING PAVEMENT.
C. INSTALL SHORING, RELOCATE COM E-STREETS FIBER, CONSTRUCT REMAINING RCB, AND BACKFILL.
D. INSTALL CONDUITS, AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVE, SCUPPERS, AND SIDEWALK.

PHASE 3 (FULL-CLOSURE):

A. INSTALL TEMPORARY TRAFFIC CONTROL (DETOUR).
B. REMOVE TEMPORARY PAVEMENT AND FINALIZE GRADING.
C. PREPARE TRACKBED FOR UPRR TRACK/CROSSING CONSTRUCTION (SAW CUT AND REMOVE PAVEMENT, PREPARE SUBGRADE, PLACE SUBBALLAST, AND INSTALL UNDERDRAINS).
D. UPRR TO INSTALL TRACK (TLM), LINE/LEVEL BALLAST, AND INSTALL CROSSING PANELS.
E. CONSTRUCT PAVEMENT ALONG CROSSING PANELS, MILL/OVERLAY PAVEMENT AT NORTH END, FINALIZE PERMANENT TRAFFIC CONTROL, AND OPEN TO TRAFFIC.

LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

50 0 50 100
SCALE IN FEET

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UNION PACIFIC

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	PH017 of 029

UNION PACIFIC RAILROAD — Sheet 228 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN ROAD PHASES 2 & 3

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3/9/2026

DETOUR NOTES

1. DETOURS AND TEMPORARY TRAFFIC CONTROL SHOWN IS CONCEPTUAL. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TEMPORARY TRAFFIC CONTROL REQUIRED FOR MULTIPLE PHASES OF CONSTRUCTION NECESSARY TO ACCOMMODATE ALL ASPECTS OF ROADWAY AND RAILROAD CONSTRUCTION.

2. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINMENT OF TEMPORARY TRAFFIC CONTROL (TTC) PERMITS PER CONDITIONS SET FORTH IN THE CITY OF MESA TEMPORARY TRAFFIC CONTROL MANUAL (TTCM). TRAFFIC CONTROL PLANS (TCP) SHALL COMPLY WITH SECTIONS 1.5 OF THE CITY OF MESA TTCM. ROAD CLOSURES REQUIRE A MINIMUM LEAD TIME OF 30 CALENDAR DAYS FOR CITY OF MESA REVIEW AND COORDINATION.

3. CONTRACTOR SHALL COMPLY WITH THE TOWN OF QUEEN CREEK ROADWAY SIGNING AND PAVEMENT MARKING GUIDELINES DOCUMENT, SPECIFICATIONS, AND REQUIREMENTS. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE TOWN OF QUEEN CREEK, INCLUDING OBTAINMENT OF FULL ROAD CLOSURE PERMITS, NOTIFICATIONS, SCHEDULING, HAUL ROADS, AND INSPECTIONS. REQUESTS FOR FULL ROAD CLOSURES SHALL BE SUBMITTED TO THE TOWN OF QUEEN CREEK AT LEAST 21 DAYS PRIOR TO PROPOSED CLOSURES.

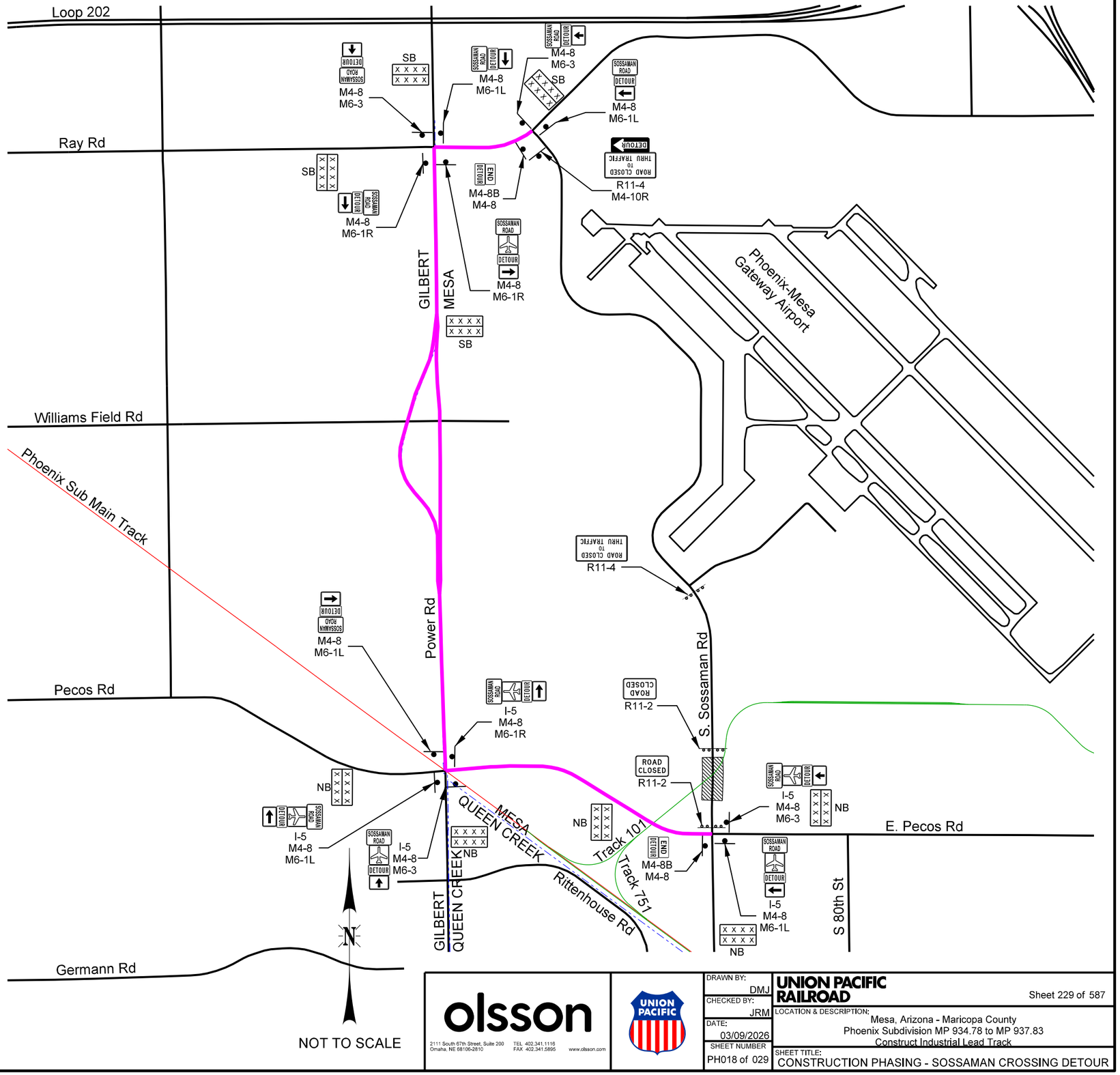
LEGEND

- VARIABLE MESSAGE BOARD (VMS)
- CONSTRUCTION
- TYPE III BARRICADE
- SIGN
- DETOUR
- EXISTING TRACK
- PROPOSED TRACK

	MESSAGE: PHASE I	MESSAGE: PHASE II
X X X X X X X X	LINE 1: SOSSAMAN LINE 2: ROAD (NB/SB) LINE 3: CLOSED	LINE 1: XX/XX LINE 2: TO LINE 3: XX/XX (XX/XX INDICATES THE DATES OF CLOSURE)

LIST OF TRAFFIC CONTROL DEVICES*			
ITEM	MUTCD DEVICE NO.	SIZE	QTY
ROAD CLOSED	R11-2	48" X 30"	2
ROAD CLOSED TO THRU TRAFFIC	R11-4	60" X 30"	2
'SOSSAMAN ROAD' PLAQUE			12
STRAIGHT ARROW AUXILIARY	M6-3	21" X 15"	4
LEFT ARROW AUXILIARY	M6-1L	21" X 15"	5
RIGHT ARROW AUXILIARY	M6-1R	21" X 15"	3
DETOUR (LEFT ARROW)	M4-10L	48" X 18"	-
DETOUR (RIGHT ARROW)	M4-10R	48" X 18"	1
DETOUR	M4-8	24" X 12"	14
END	M4-8B	24" X 12"	2
AIRPORT PLAQUE	I-5	24" X 24"	6
TYPE III BARRICADE		60" X 48"	6
VARIABLE MESSAGE BOARDS			7

*NOTE: TEMPORARY TRAFFIC CONTROL QUANTITIES ARE SHOWN FOR INFORMATION ONLY. PAYMENT FOR THESE ITEMS SHALL BE MADE UNDER THE LUMP SUM LINE ITEM "TRFC, TRAFFIC CONTROL".



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UNION PACIFIC

DRAWN BY: DMJ
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH018 of 029

UNION PACIFIC RAILROAD

Sheet 229 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - SOSSAMAN CROSSING DETOUR

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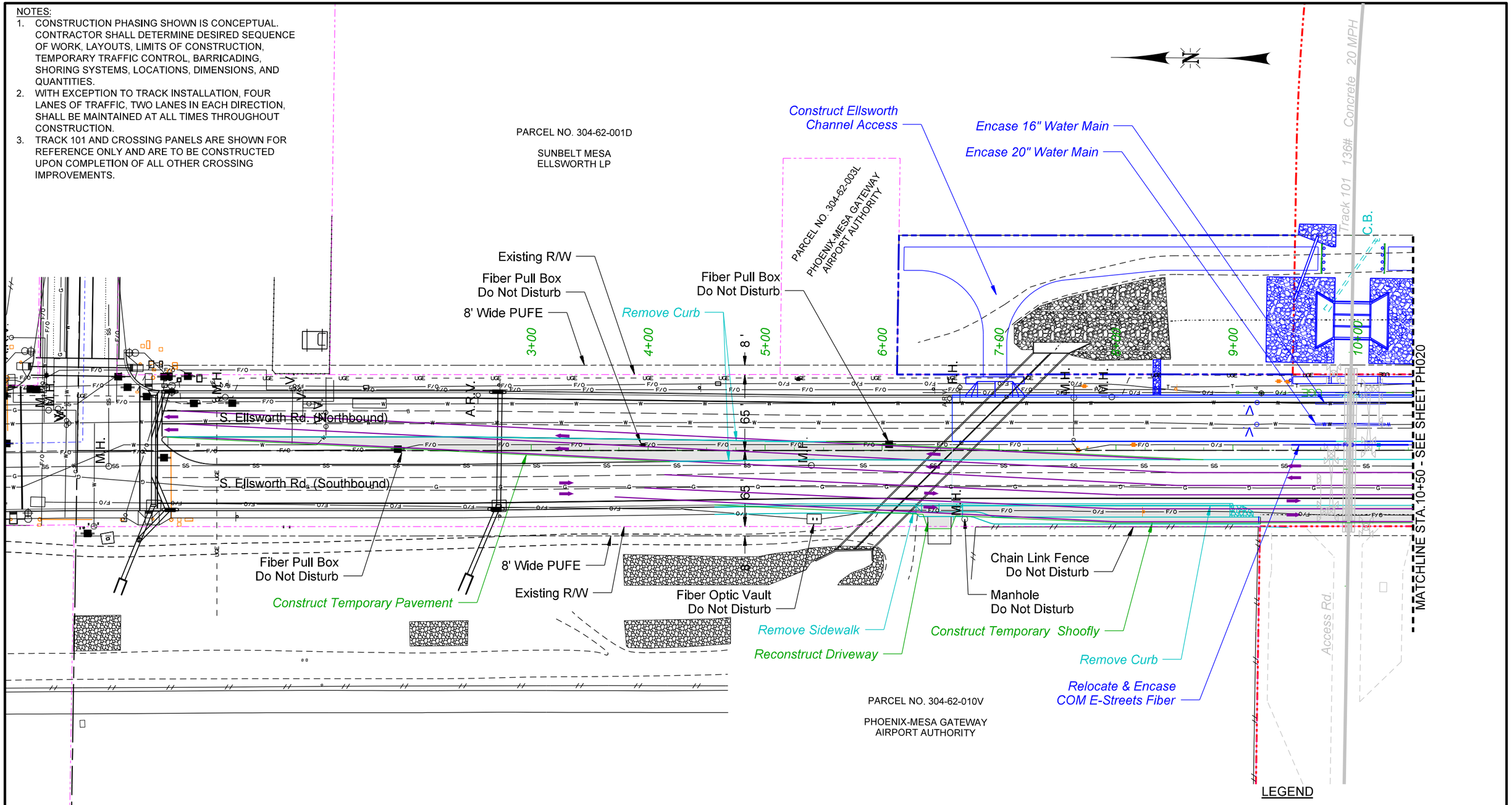
3/9/2026

NOTES:

1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, FOUR LANES OF TRAFFIC, TWO LANES IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.



LEGEND

- PROPOSED CONSTRUCTION
- PREVIOUSLY CONSTRUCTED
- TEMPORARY PAVEMENT
- TEMPORARY LANES

PHASE 1:

A. INSTALL TTC, CONSTRUCT TEMPORARY SHOOFLY AND MEDIAN PAVEMENT.
B. INSTALL TEMPORARY TRAFFIC CONTROL AND DIVERT TRAFFIC TO TEMPORARY SHOOFLY.
C. REMOVE EXISTING PAVEMENT, ENCASE WATER MAINS, RELOCATE & ENCASE COM E-STREETS FIBER, AND BACKFILL.
D. INSTALL CONDUITS AND CONSTRUCT PAVEMENT, CURB, ACCESS DRIVES, SCUPPERS, ELLSWORTH CHANNEL ACCESS, AND SIDEWALK.

80 0 80 160
SCALE IN FEET

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

DRAWN BY:	RSP
CHECKED BY:	JRM
DATE:	03/09/2026
SHEET NUMBER	PH021 of 029

UNION PACIFIC RAILROAD — Sheet 232 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - ELLSWORTH ROAD PHASE 1

Color table:K:\Bentley\WorkspaceV8i\projects\Clients\UPRR_Track\UPRR_Track_V8i\color_UPRR.tbl
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Default
3/9/2026

NOTES:
1. CONSTRUCTION PHASING SHOWN IS CONCEPTUAL. CONTRACTOR SHALL DETERMINE DESIRED SEQUENCE OF WORK, LAYOUTS, LIMITS OF CONSTRUCTION, TEMPORARY TRAFFIC CONTROL, BARRICADING, SHORING SYSTEMS, LOCATIONS, DIMENSIONS, AND QUANTITIES.
2. WITH EXCEPTION TO TRACK INSTALLATION, FOUR LANES OF TRAFFIC, TWO LANES IN EACH DIRECTION, SHALL BE MAINTAINED AT ALL TIMES THROUGHOUT CONSTRUCTION.
3. TRACK 101 AND CROSSING PANELS ARE SHOWN FOR REFERENCE ONLY AND ARE TO BE CONSTRUCTED UPON COMPLETION OF ALL OTHER CROSSING IMPROVEMENTS.

PARCEL NO. 304-62-001D

SUNBELT MESA
ELLSWORTH LP

PARCEL NO. 304-62-003L
PHOENIX-MESA GATEWAY
AIRPORT AUTHORITY

Reconstruct Curb
Fiber Pull Box
Adjust to Grade
Remove Temporary
Pavement
Fiber Pull Box
Do Not Disturb
Existing R/W
8' Wide PUFE
Fiber Pull Box
Do Not Disturb

3+00
4+00
5+00
6+00
7+00
9+00
10+00

S. Ellsworth Rd. (Northbound)
S. Ellsworth Rd. (Southbound)
Track 101 136# Concrete 20 MPH
MATCHLINE STA.10+50 - SEE SHEET PH022
Access Rd.

8' Wide PUFE
Existing R/W
Fiber Optic Vault
Do Not Disturb
Chain Link Fence
Do Not Disturb
Manhole
Do Not Disturb
Remove Pavement
Encase 18" Sanitary
160+00

PARCEL NO. 304-62-010V

PHOENIX-MESA GATEWAY
AIRPORT AUTHORITY

LEGEND

PROPOSED CONSTRUCTION
PREVIOUSLY CONSTRUCTED
TEMPORARY PAVEMENT
TEMPORARY LANES

PHASE 2:
A. INSTALL TTC AND DIVERT NORTHBOUND TRAFFIC (TWO LANES) TO PHASE 1 IMPROVEMENTS.
B. REMOVE TEMPORARY MEDIAN PAVEMENT, RECONSTRUCT MEDIAN CURB, AND BACKFILL.
C. ENCASE 18" SANITARY LINE, BACKFILL, AND CONSTRUCT PAVEMENT AND CURB.

80 0 80 160
SCALE IN FEET

olsson
2111 South 67th Street, Suite 200
Omaha, NE 68106-2810
TEL 402.341.1116
FAX 402.341.5895
www.olsson.com

UNION PACIFIC

DRAWN BY: RSP
CHECKED BY: JRM
DATE: 03/09/2026
SHEET NUMBER: PH023 of 029

UNION PACIFIC RAILROAD
Sheet 234 of 587

LOCATION & DESCRIPTION:
Mesa, Arizona - Maricopa County
Phoenix Subdivision MP 934.78 to MP 937.83
Construct Industrial Lead Track

SHEET TITLE:
CONSTRUCTION PHASING - ELLSWORTH ROAD PHASE 2

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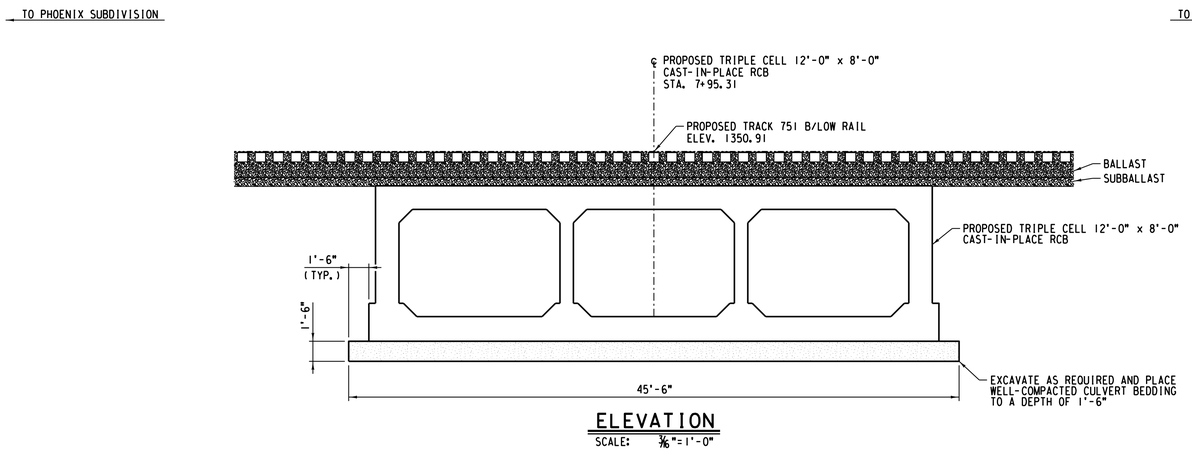
3/9/2026

DESIGN SHEET

DRAWING SCHEDULE

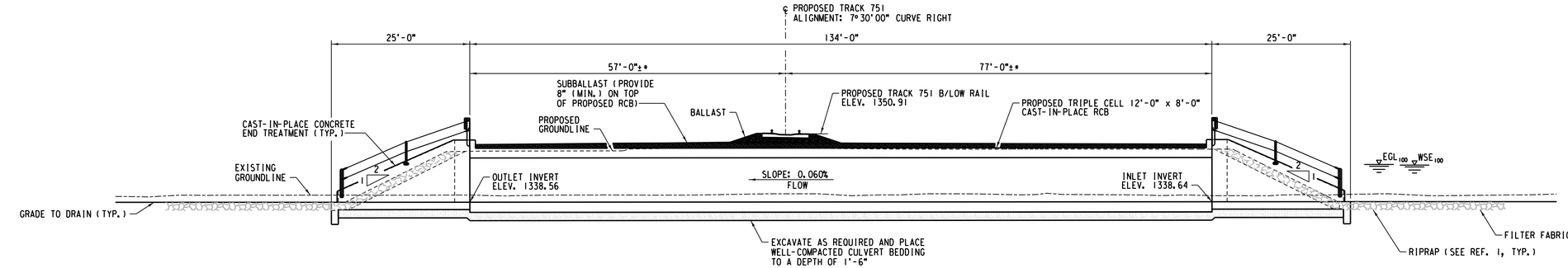
	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123084	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
	S2	123084	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
	S3	123084	END TREATMENT FRAMING DETAILS	DESIGN
	S4	123084	END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)	DESIGN
	S5	123084	END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)	DESIGN
	S6	123084	HANDRAIL DETAILS	DESIGN
	G1	680200	GENERAL NOTES	STANDARD
	G2	680200	GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS	STANDARD
	G5	680200	CONSTRUCTION SEQUENCE	STANDARD
	MC27	680200	12'-0"x8'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 3)	STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P013 OF 037 T006 OF 012 X028 OF 143 EC007 OF 036	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN



ELEVATION

SCALE: 3/16"=1'-0"



CROSS SECTION

RIGHT

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

WSE_{100} = 1345.27
EGL_{100} = 1345.39
VEL_{100} = 3.80fps

MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

NOTE:
SLOPES SHOWN ACCOUNT FOR CULVERT SKEW/ORIENTATION.

STANDARD VARIABLES:
L = 134 (FT)
NC = 3
NB = 269

TOTAL NUMBER OF BARS:
A = 538
B = 538
C = 334
D = 1076
E = 2152
F = 82
G = 128
H = 42
J = 42

LENGTH OF BARS:
P = 133'-8"
Q = 41'-2"
R = 29'-5"
S = 41'-10"
T = 63'-6"
U = 42'-5"
V = 63'-2"

FOR LIST OF VARIABLES, SEE STD. DWG. 680200, SHT. MC27.

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE ON STD. DWG. 680200 SHT. MC27 FOR LAP SPLICE REQUIREMENTS.

NOTES:
1. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
2. * MEASURED ALONG RITTENHOUSE CHANNEL CENTERLINE.
3. RCB = REINFORCED CONCRETE BOX

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
134	FT	12'-0" X 8'-0" TRIPLE-CELL BOX CULVERT (BARREL ONLY) (PER STD. PLAN NO. 680200, SHT. MC27)		CONSTRUCTOR
164	CU. YD.	4000 PSI CONCRETE FOR END TREATMENTS ONLY (PER DETAILS, SHEET. NOS. S3-S5, AND NOTES, PER STD. DWG. 680200 SHT. G1)		
1	LOT	REINFORCING STEEL FOR END TREATMENTS ONLY (PER SCHEDULE, SHEET NO. S5)		
2	EA.	HANDRAIL POST HP-25R (PER STD. DWG. 680160 SHT. H1)	513-2077	
2	EA.	HANDRAIL POST HP-25L (PER STD. DWG. 680160 SHT. H1)	513-2075	
8	EA.	HANDRAIL POST HP-26 (PER STD. DWG. 680160 SHT. H1)	513-2080	
4	EA.	HANDRAIL POST HP-27 (PER STD. DWG. 680160 SHT. H1)	513-2085	
43	EA.	¾" DIA. x 14" A307 HEAVY HEX BOLT, TYPE I WITH HEAVY ELASTIC LOCK NUT (MIL-N-32258) AND FLAT CIRCULAR WASHER (ASTM F436), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED		
27	EA.	⅜" EYE TYPE STRANDVISE CABLE GRIP CARTRIDGE (MACLEAN POWER PRODUCTS NO. 5102)	098-6081	
400	LIN. FT.	⅜" NOMINAL DIAMETER WIRE ROPE, 7 WIRE, GALVANIZED STEEL STRAND, SIEMENS MARTINS GRADE, A-COATING	050-5394	
27	EA.	½" DIA. EYEBOLT, 2" LONG SHANK WITH 1" I.D. EYE, PLAIN PATTERN GALVANIZED DROP FORGED STEEL (ASTM A489), WITH ZINC PLATED HEX NYLON INSERT LOCKNUT (ASTM A563) AND ZINC PLATED FLAT CIRCULAR WASHER (ASTM F436)	130-0370	
19	EA.	GALVANIZED MALLEABLE IRON U-BOLT WITH 2 ELASTIC LOCKNUTS (MIL-N-25027), ZINC PLATED, FOR ⅜" DIA. WIRE ROPE	050-6370	
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP (PER REF. 1)		
1	LOT	FILTER FABRIC (PER REF. 1)		
470	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
810	CU. YD.	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)**		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.
FILL QUANTITY INCLUDES 30% FOR COMPACTION.

**NOTE:
FILL QUANTITY ON THESE PLANS INCLUDES EXCESS FILL REQUIRED FOR ADDITIONAL GRADING TO MEET NECESSARY COVER REQUIREMENTS ON SKEWED RCB.

DESIGN NOTES

RIGHT-OF-WAY

1. Right-of-way: Varies, per Ref. 1.

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 11): Elev. 1347.99, NAVD 1988, ½" rebar located in ground Southeast of proposed Track 751 Culvert No. 7+95, 67.40' left of existing Phoenix Sub. Main Track centerline, Sta. 1506+01.02.
   TBM 2 (Olsson CP 12): Elev. 1345.52, NAVD 1988, ½" rebar located in ground West of proposed Track 751 Culvert No. 7+95, 71.58' left of existing Phoenix Sub. Main Track centerline, Sta. 1498+70.62.
4. Profile: Proposed Track 751 per Ref. 1.
5. Alignment: 7°30'00" curve right.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. This structure has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0".
2. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 01-05-2023 ARIZONA, U.S.A.

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

SECTION DESIGNATION

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

UNION PACIFIC

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S6

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 7+95, PHOENIX SUB
FURNISH & INSTALL
TRIPLE CELL 12'-0" x 8'-0" RCB x 134'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oasconsulting.com\fnts-na\projects\2020\0501\1000\020\0920.40\Design\Microstation\020-0920 RUBRCul_Sta. 7+95 (East Wye Track)\Track 751_7+95.cdz.dgn

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DESIGN SHEET

℄ EXISTING ACCESS ROAD

℄ PROPOSED TRACK 751
ALIGNMENT: 7°30'00" CURVE RIGHT

N

TO TRACK 101

FILTER FABRIC (SEE REF. 1)

RIPRAP (SEE REF. 1, TYP.)

PROPOSED TOP OF SUBGRADE (TYP.)

57'-0"±*

77'-0"±*

PROPOSED TRIPLE CELL 12'-0" x 8'-0"
CAST-IN-PLACE RCB

PROPOSED TRIPLE CELL 12'-0" x 8'-0"
CAST-IN-PLACE RCB
STA. 7+95.31

PROPOSED TOE OF SLOPE (TYP.)

ELEV. 1338.56

WP1

WP2

ELEV. 1338.64

FLOW
RITTENHOUSE CHANNEL

TO PHOENIX SUBDIVISION

TOP OF EXISTING ACCESS ROAD SHOULDER (TYP.)

℄ EXISTING ACCESS ROAD

PROPOSED 36" DIA. CMP
(SEE REF. 1)

PROPOSED CONCRETE CROSSING (SEE REF. 1)

PROPOSED 36" DIA. CMP
(SEE REF. 1)

RIGHT

PROPOSED 36" DIA. SSP
(SEE REF. 1)

℄ EXISTING PHOENIX SUB MAIN TRACK
ALIGNMENT: TANGENT

℄ PROPOSED GERMANN SIDING
ALIGNMENT: TANGENT

EDGE OF S. RITTENHOUSE ROAD

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

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	830514.73	773775.67
WP2	830435.27	773883.56

F = FIBER OPTIC LINE
G = GAS PIPELINE
OHP = OVERHEAD POWER LINE
T = TELEPHONE LINE
UGE = UNDERGROUND ELECTRIC

NOTES:
1. * MEASURED ALONG RITTENHOUSE CHANNEL CENTERLINE.
2. RCB = REINFORCED CONCRETE BOX
3. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
75691
MARK J. HANIGAN
Date Signed 03-31-2023
ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — DATE: 01/13/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION:
CULVERT 7+95, PHOENIX SUB

FURNISH & INSTALL
TRIPLE CELL 12'-0" x 8'-0" RCB x 134'

SHEET TITLE:
GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-mil\projects\2020\0503-1000\020-0927-40 Design\Microstation\020-0927.RLBR.Culv.Sta. 7-95 (East Wye Track\Track 751_7-95_cuaz.dgn

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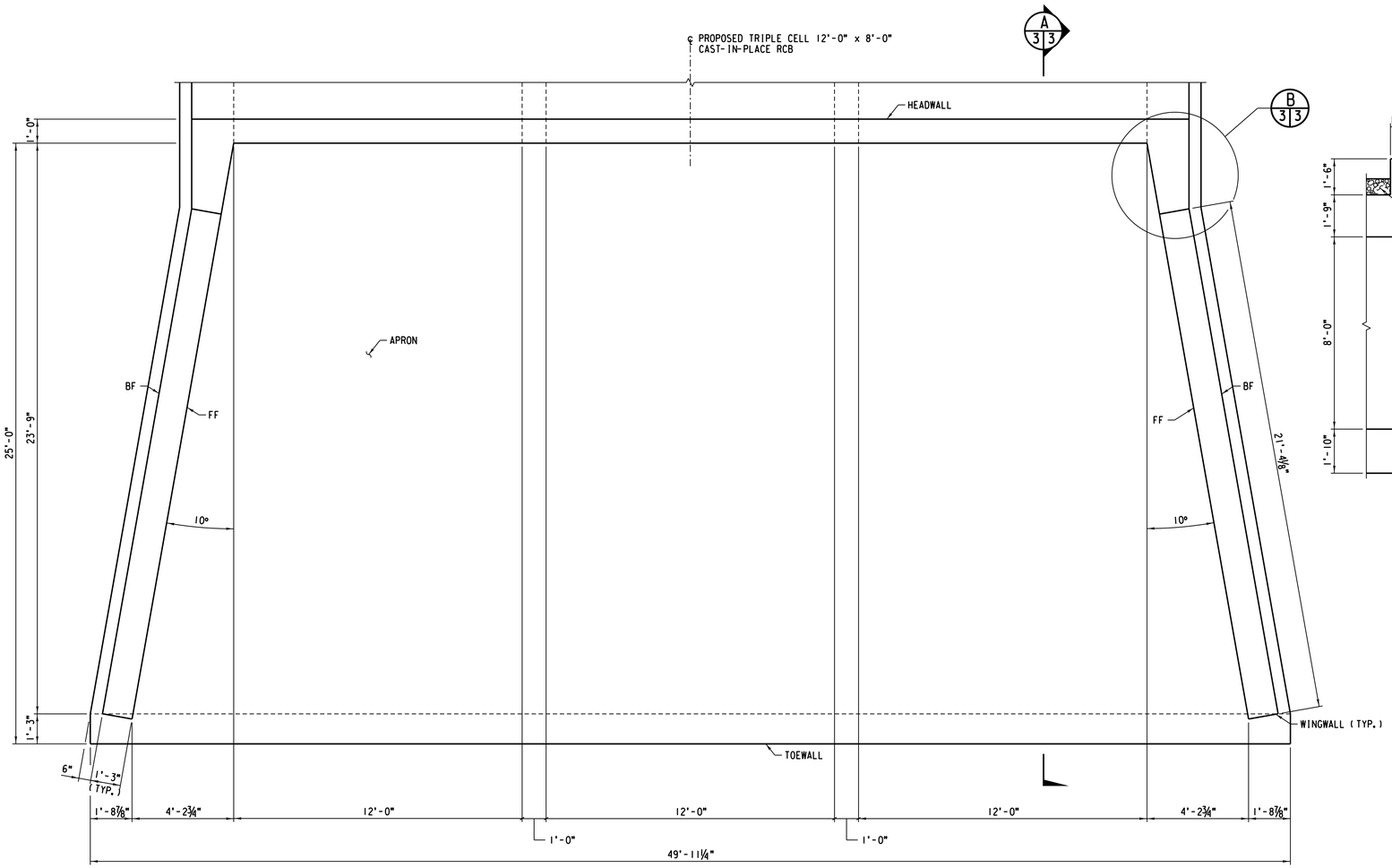
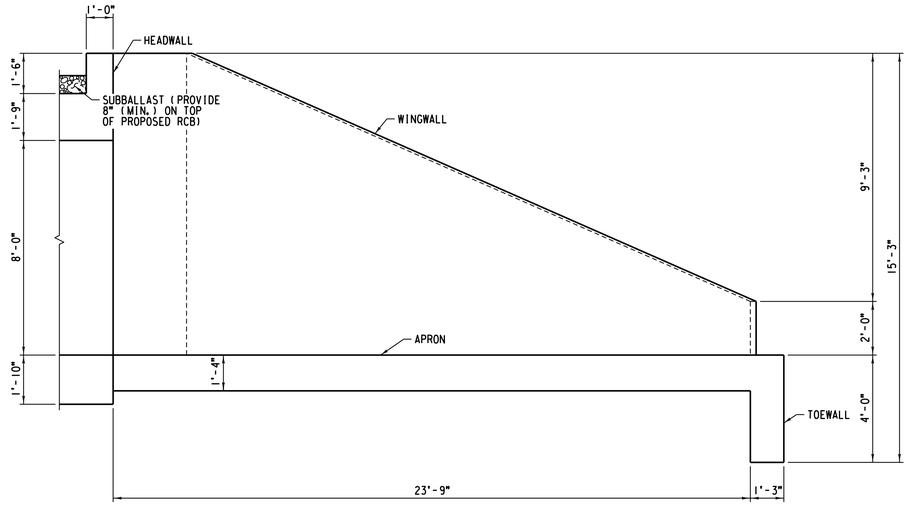
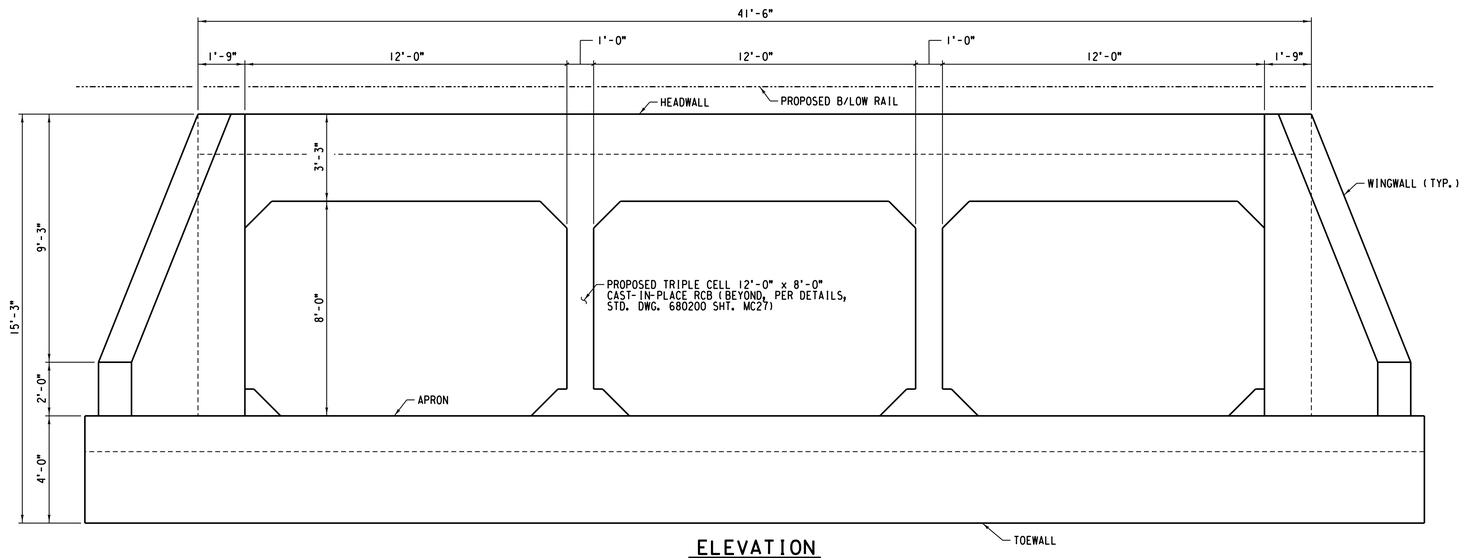
DESIGN SHEET



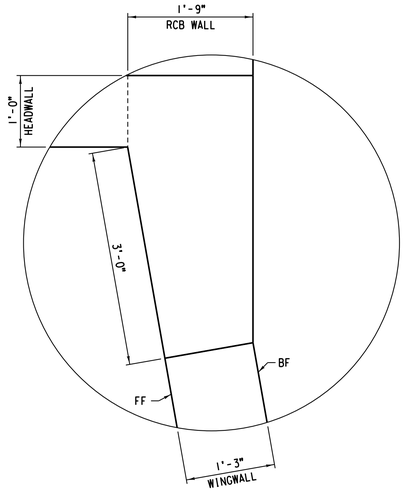
PLAN
SCALE: ⅜"=1'-0"



SECTION A 3|3
SCALE: ⅜"=1'-0"



ELEVATION
SCALE: ⅜"=1'-0"



DETAIL B 3|3
SCALE: 1"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
3. FOR END TREATMENT REINFORCING DETAILS, SEE SHEET NO. S4.
4. BF = BACK FACE
   FF = FRONT FACE
   RCB = REINFORCED CONCRETE BOX

CONCRETE PLACEMENT QUANTITIES

ITEM	UNIT	QTY.
RCB BARREL (BOTTOM SLAB)	CU. YD.	444
RCB BARREL (WALLS & TOP SLAB)	CU. YD.	567
APRON & TOEWALL	CU. YD.	126
WINGWALLS & HEADWALL	CU. YD.	38.0

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kyle Stubs
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

UNION PACIFIC

DSN/CHK BY: NAS/MJH	UNION PACIFIC RAILROAD — Office of Director Structures Design
DRAWN/CHK BY: NAS/KAS	LOCATION & DESCRIPTION: CULVERT 7+95, PHOENIX SUB
UPRR ENGINEER: ADS	FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 134'
SHT NO.: S3 of S6	SHEET TITLE: END TREATMENT FRAMING DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\050\1000\020\027\AD\Design\Micronstation\020-0927-RLBR-Culv.Sta. 7-95 (East Wye Track\Track 751_7-95.catz.dgn

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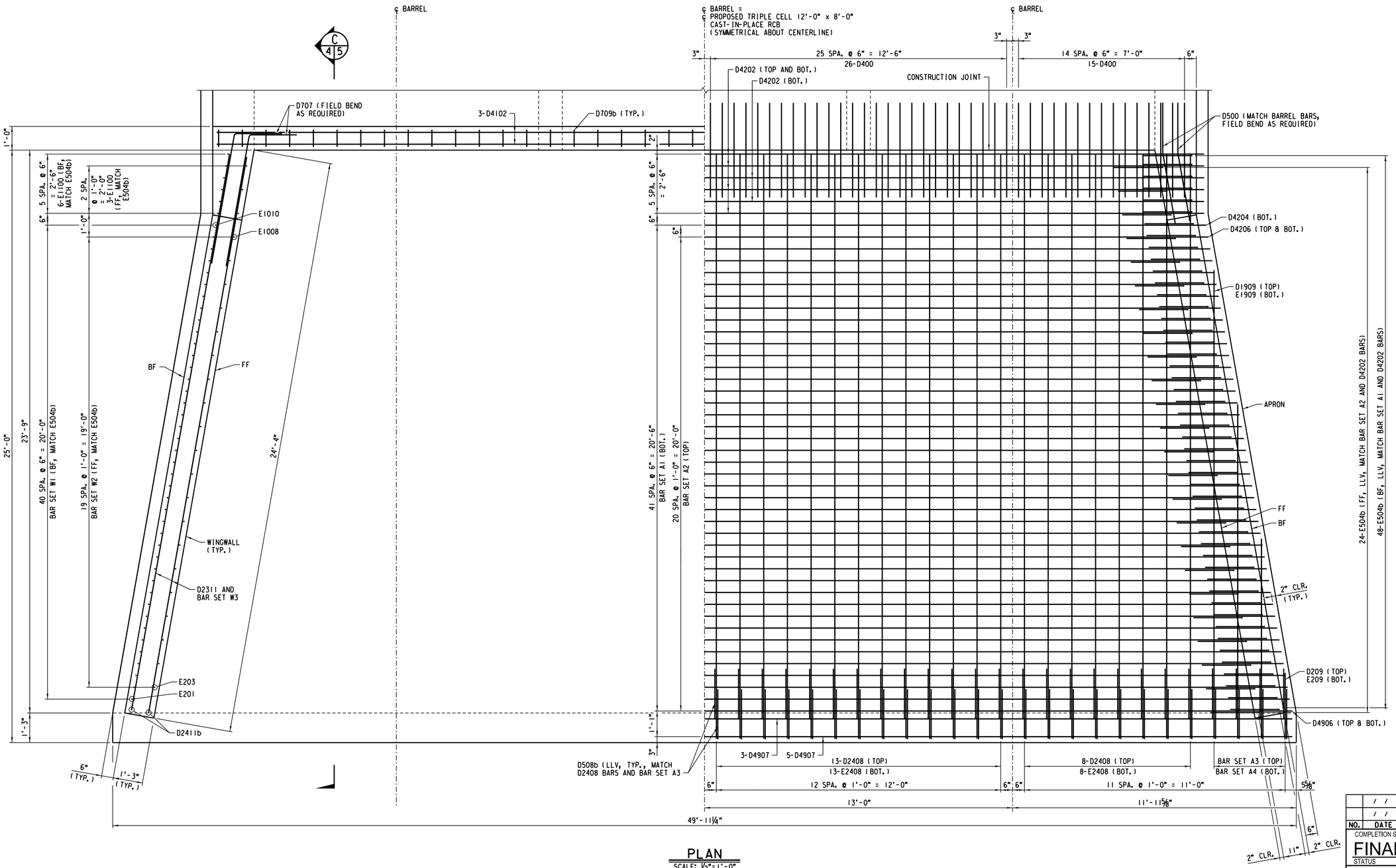
DESIGN SHEET



PLAN
SCALE: ½"=1'-0"

NOTES:
1. CONSTRUCTOR MAY SPLICE D4907 BARS WITH A 2'-9" MINIMUM LAP SPLICE IF PREFERRED.
2. FOR REINFORCING SCHEDULE, SEE SHEET NO. S5.
3. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
4. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
5. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA, U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S4 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 7+95, PHOENIX SUB
FURNISH & INSTALL
TRIPLE CELL 12'-0" x 8'-0" RCB x 134'

SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-nd\projects\2020\0501-1000\020-0927-40 Design\Microstation\020-0927_RCBCulv_Sta. 7+95 (East Wye Track\Track 751_7+95.cac.dgn

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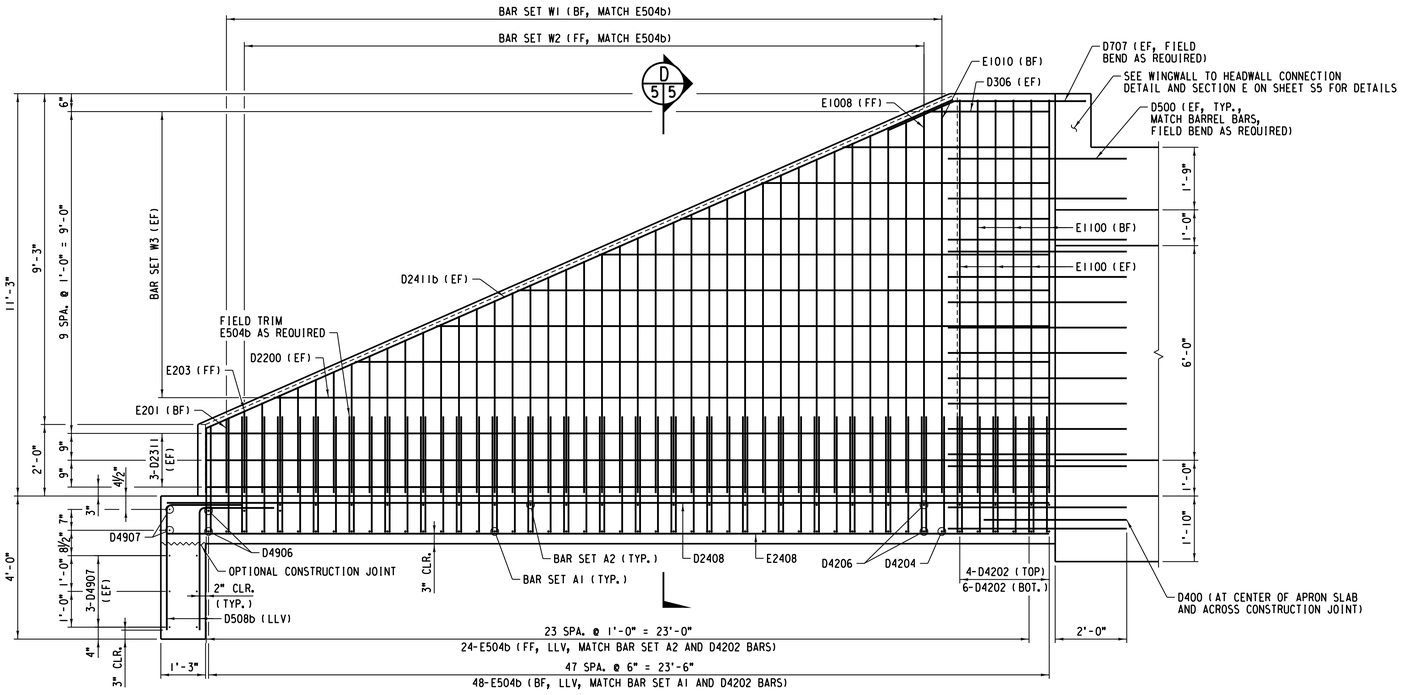
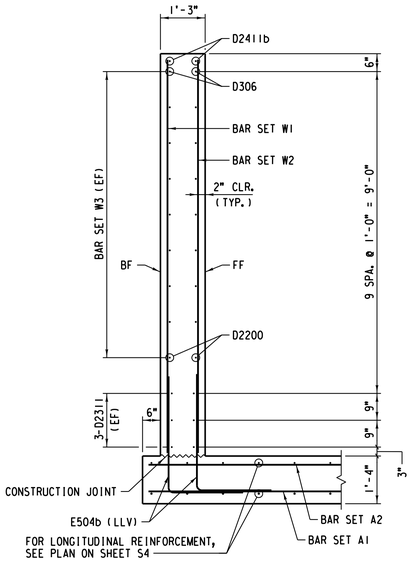
DESIGN SHEET



SECTION C
SCALE: ½"=1'-0"

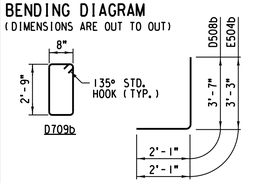


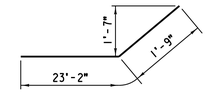
SECTION D
SCALE: ½"=1'-0"

REINFORCING SCHEDULE
(QUANTITY PER END TREATMENT)

TOTAL	MARK	SIZE	LENGTH	SHAPE
82	D400	#5	4'-0"	
60	D500	#5	5'-0"	
100	D508b	#5	5'-8"	
4	D707	#5	7'-7"	
42	D709b	#5	7'-9"	
12	D2311	#5	23'-11"	
4	D2411b	#5	24'-11"	
6	D4102	#5	41'-2"	
10	D4202	#5	42'-2"	
8	D4907	#5	49'-7"	
144	E504b	#6	5'-4"	
18	E1100	#6	11'-0"	
42	E2408	#6	24'-8"	

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



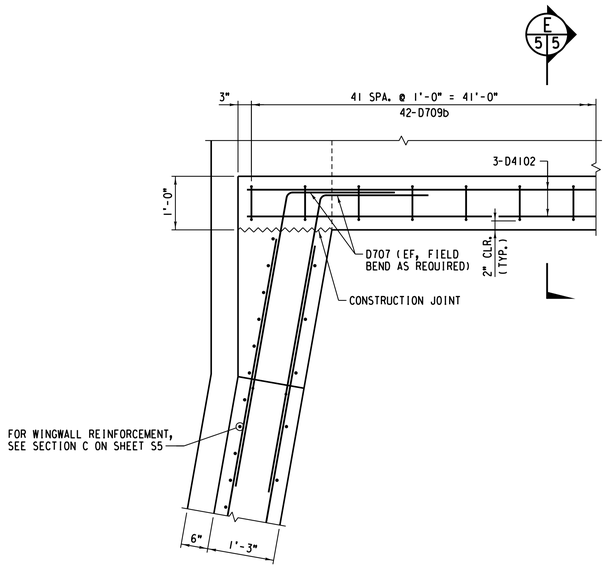


SET LIST

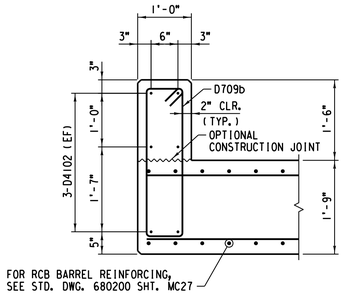
BAR SET DESIGNATION	MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE	MIN. A	MAX. A
A1	D4204-D4906	#5	42'-4"	49'-6"	2⅛"(-)	42	1		-	-
A2	D4206-D4906	#5	42'-6"	49'-6"	4¼"(-)	21	1		-	-
A3	D209-D1909	#5	2'-9"	19'-9"	5'-8"	4	2		-	-
A4	E209-E1909	#6	2'-9"	19'-9"	5'-8"	4	2		-	-
W1	E201-E1010	#6	2'-1"	10'-10"	2⅝"	41	2		-	-
W2	E203-E1008	#6	2'-3"	10'-8"	5⅜" (-)	20	2		-	-
W3	D306-D2200	#5	3'-6"	22'-0"	2'-3¾"	9	4		-	-

EST. WT. OF REINFORCING STEEL = 11,050 LB.

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.



WINGWALL TO HEADWALL CONNECTION DETAIL
SCALE: ¾"=1'-0"



SECTION E
SCALE: ¾"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
3. BF = BACK FACE
   EF = EACH FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

UNION PACIFIC

DSN/CHK BY: NAS/MJH	UNION PACIFIC RAILROAD
DRAWN/CHK BY: NAS/KAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 7+95, PHOENIX SUB
SHT NO.: S5 of S6	FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 134'
	SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501.1000\020-0927-40\Design\Microstation\020-0927-R_BRA.dgn, Sta. 7+95 (East Wye Track)\Track 751_7+95_cap.dgn

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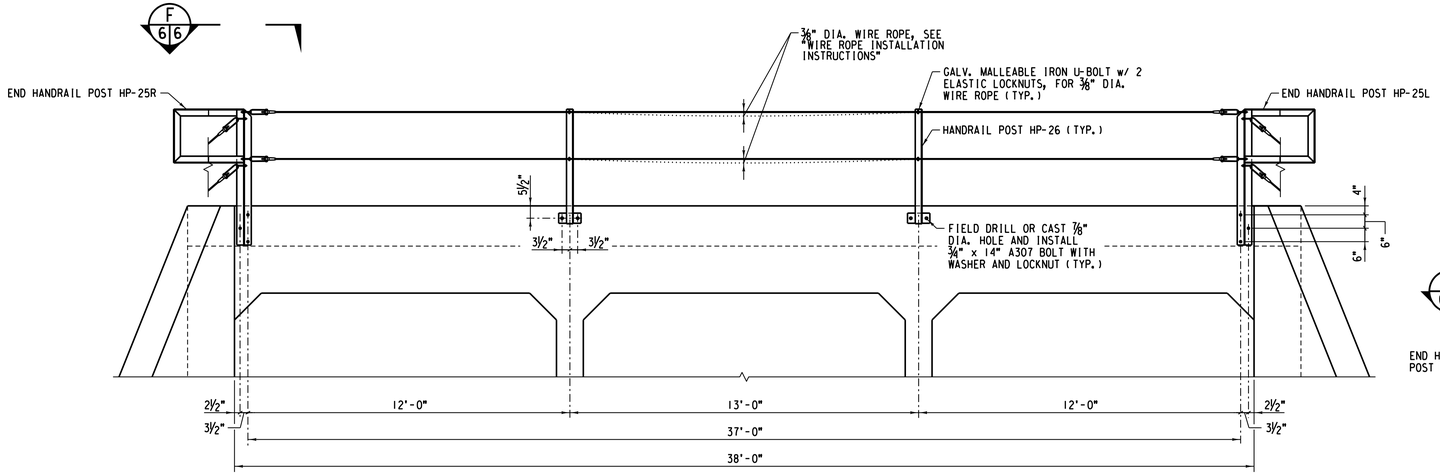
DESIGN SHEET



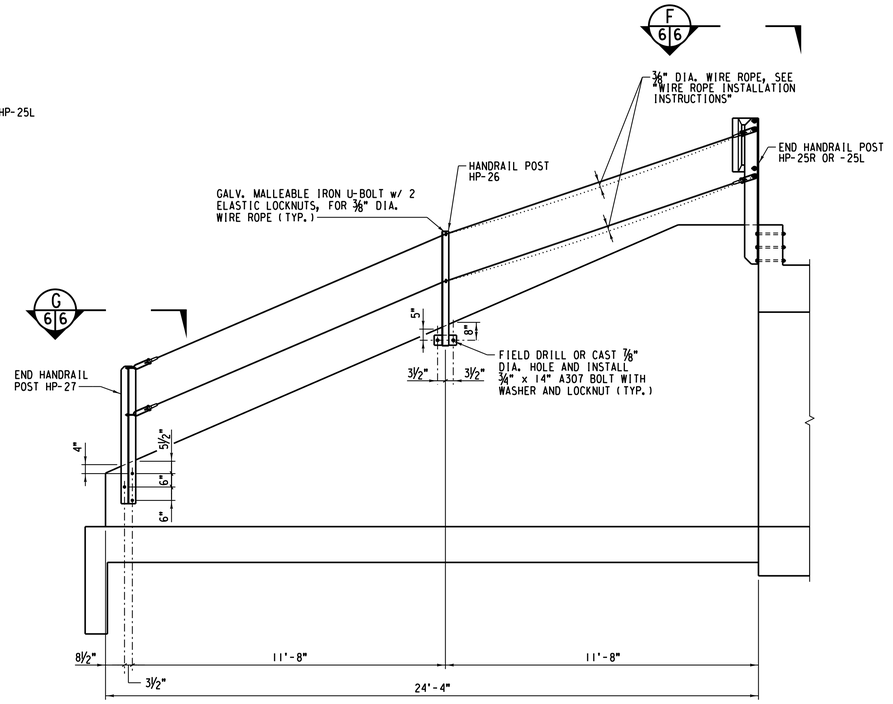
NOTE:
WINGWALL HANDRAIL NOT SHOWN FOR CLARITY.

BOX CULVERT HANDRAIL LAYOUT

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

WIRE ROPE INSTALLATION INSTRUCTIONS:

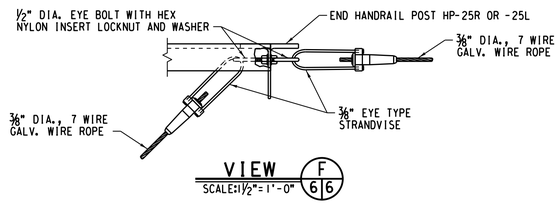
1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END HANDRAIL POST.
2. STRETCH WIRE ROPE, HANG A MINIMUM OF 10 LB. ON CABLE BETWEEN TWO POSTS AND REMOVE ALL SAG TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END HANDRAIL POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT & REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.



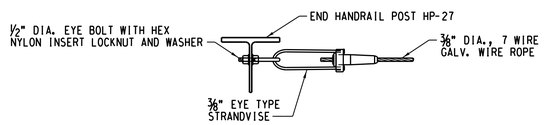
WINGWALL HANDRAIL LAYOUT

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

(LOOKING PERPENDICULAR TO FACE OF WINGWALL)



VIEW F 6 6
SCALE: 1½"=1'-0"



VIEW G 6 6
SCALE: 1½"=1'-0"

NOTES:
1. FOR HANDRAIL POST DETAILS, SEE STD. DWG. 680160 SHT. H1.
2. RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123084

LATITUDE: 33.28236°N LONGITUDE: 111.67547°W

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 12-26-2023 ARIZONA U.S.A.

UNION PACIFIC

DSN/CHK BY: NAS/MJH	UNION PACIFIC RAILROAD
DRAWN/CHK BY: NAS/KAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 7+95, PHOENIX SUB
SHT NO.: S6 of S6	FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 134'
	SHEET TITLE: HANDRAIL DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501-1000\020-0927-40 Design\Microstation\020-0927_RLBRCulv_Sta. 7+95 (East Wye Track\Track 751_7+95_cad-dgn

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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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G1

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PLOTTED: 1/3/2020 3:30:45 PM

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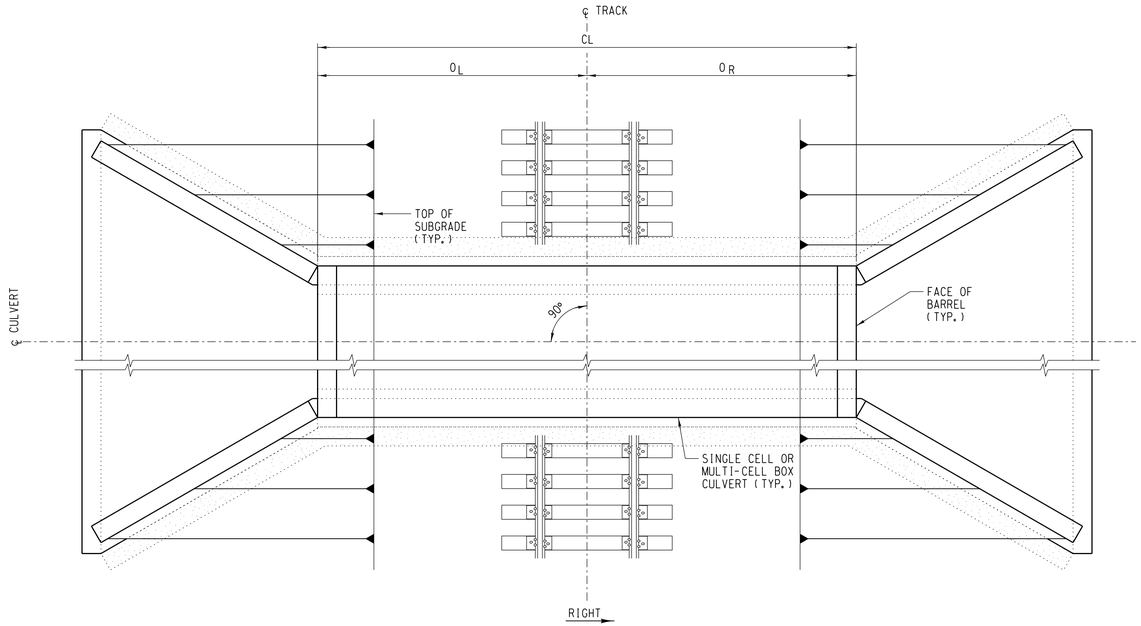
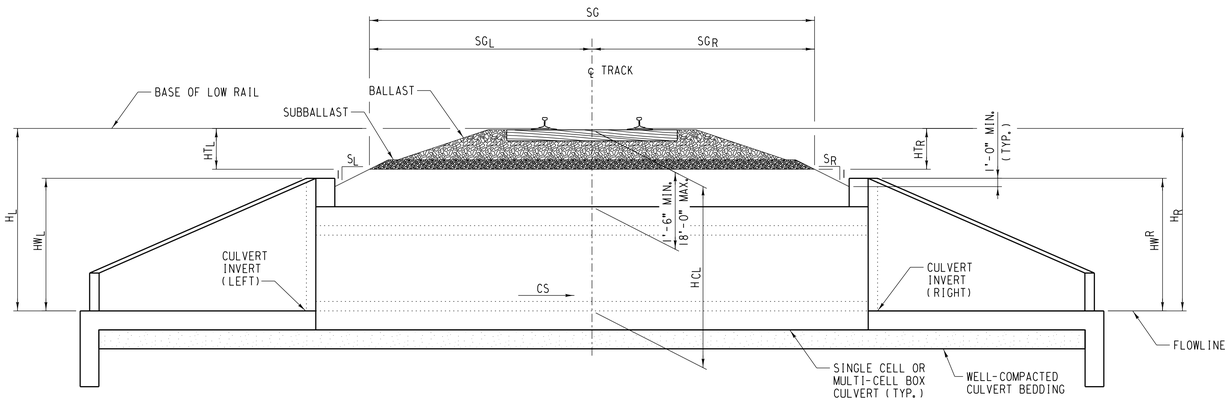


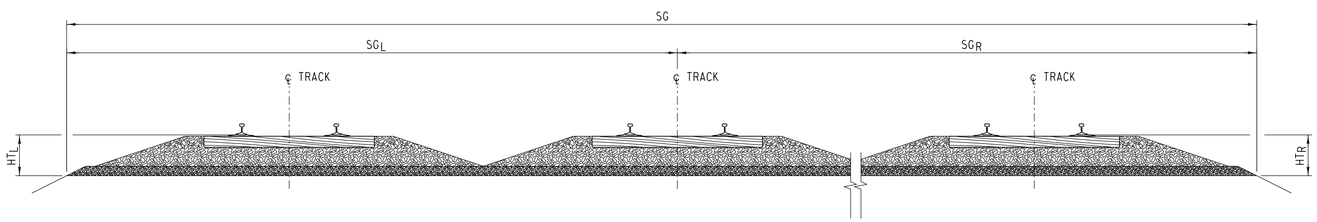
PLAN - SINGLE TRACK

SCALE: NONE



ELEVATION - SINGLE TRACK

SCALE: NONE



MULTIPLE TRACK DIAGRAM

SCALE: NONE

CULVERT LENGTH EQUATION:

$CL = O_L + O_R \geq SG + 2'$

$O_L = SG_L + S_L(H_L - HT_L + 1' - HW_L) + 1'$

$O_R = SG_R + S_R(H_R - HT_R + 1' - HW_R) + 1'$

$$H_L = \frac{H_{CL} + CS\,[SG_L - S_L(HT_L + HW_L - 1') + 1']}{[1 - CS(S_L)]}$$

$$H_R = \frac{H_{CL} - CS\,[SG_R - S_R(HT_R + HW_R - 1') + 1']}{[1 + CS(S_R)]}$$

$SG = SG_L + SG_R$

$H_{AVG} = (H_L + H_R) / 2$

KEY:

- CL = CULVERT LENGTH
- O_L = OFFSET LEFT
- O_R = OFFSET RIGHT
- H_{CL} = HEIGHT - BASE OF LOW RAIL TO FLOWLINE AT CENTERLINE OF TRACK
- CS = CULVERT SLOPE (RISE/RUN) LEFT TO RIGHT (+ UP, - DOWN)
- HT_L = BASE OF LOW RAIL TO TOP OF SUBGRADE LEFT EDGE
- HT_R = BASE OF LOW RAIL TO TOP OF SUBGRADE RIGHT EDGE
- H_L = HEIGHT - BASE OF LOW RAIL TO INVERT LEFT OF TRACK
- H_R = HEIGHT - BASE OF LOW RAIL TO INVERT RIGHT OF TRACK
- HW_L = HEIGHT OF WINGWALL LEFT OF TRACK
- HW_R = HEIGHT OF WINGWALL RIGHT OF TRACK
- SG = WIDTH OF SUBGRADE (24'-0" MINIMUM)
- SG_R = WIDTH OF SUBGRADE RIGHT OF ℄ TRACK (12'-0" MINIMUM)
- SG_L = WIDTH OF SUBGRADE LEFT OF ℄ TRACK (12'-0" MINIMUM)
- S_L = SIDE SLOPE LEFT OF TRACK (RUN PER FOOT OF RISE)
- S_R = SIDE SLOPE RIGHT OF TRACK (RUN PER FOOT OF RISE)

NOTE:
ALL DIMENSIONS ARE IN FEET.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G2

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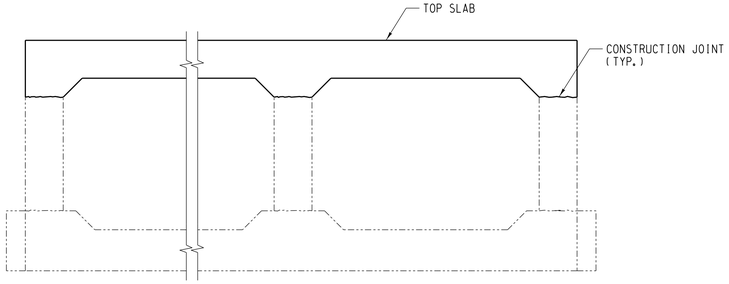
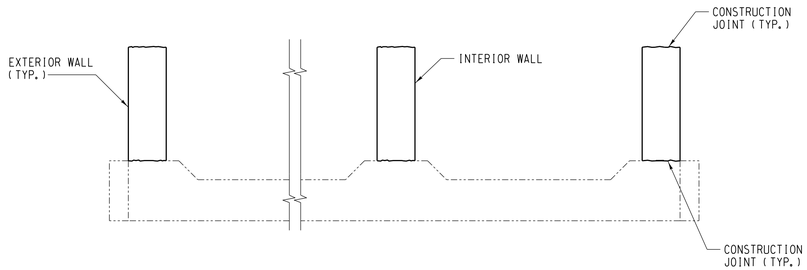
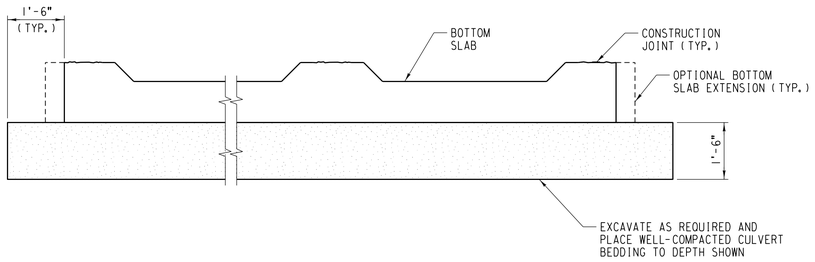


PHASE THREE



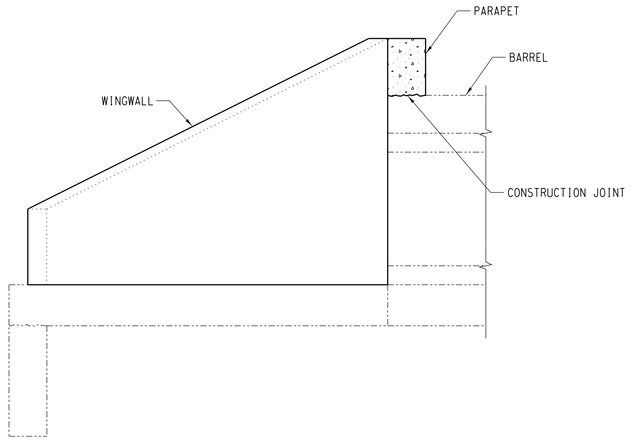
PHASE TWO



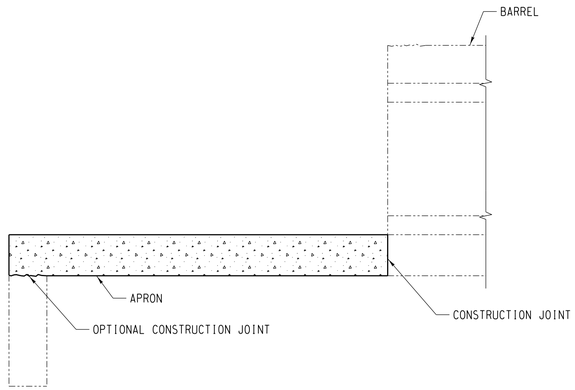
PHASE ONE

CONSTRUCTION SEQUENCE - BARREL

SCALE: ½"=1'-0"



PHASE THREE



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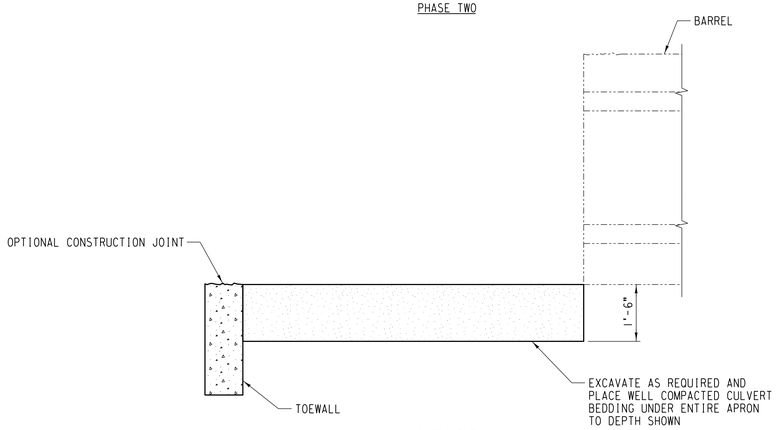


PHASE ONE

CONSTRUCTION SEQUENCE - PARAPET, APRON, TOEWALL AND WINGWALLS

SCALE: ½"=1'-0"

(LOOKING PERPENDICULAR TO ℄ CULVERT)

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

CONSTRUCTION SEQUENCE

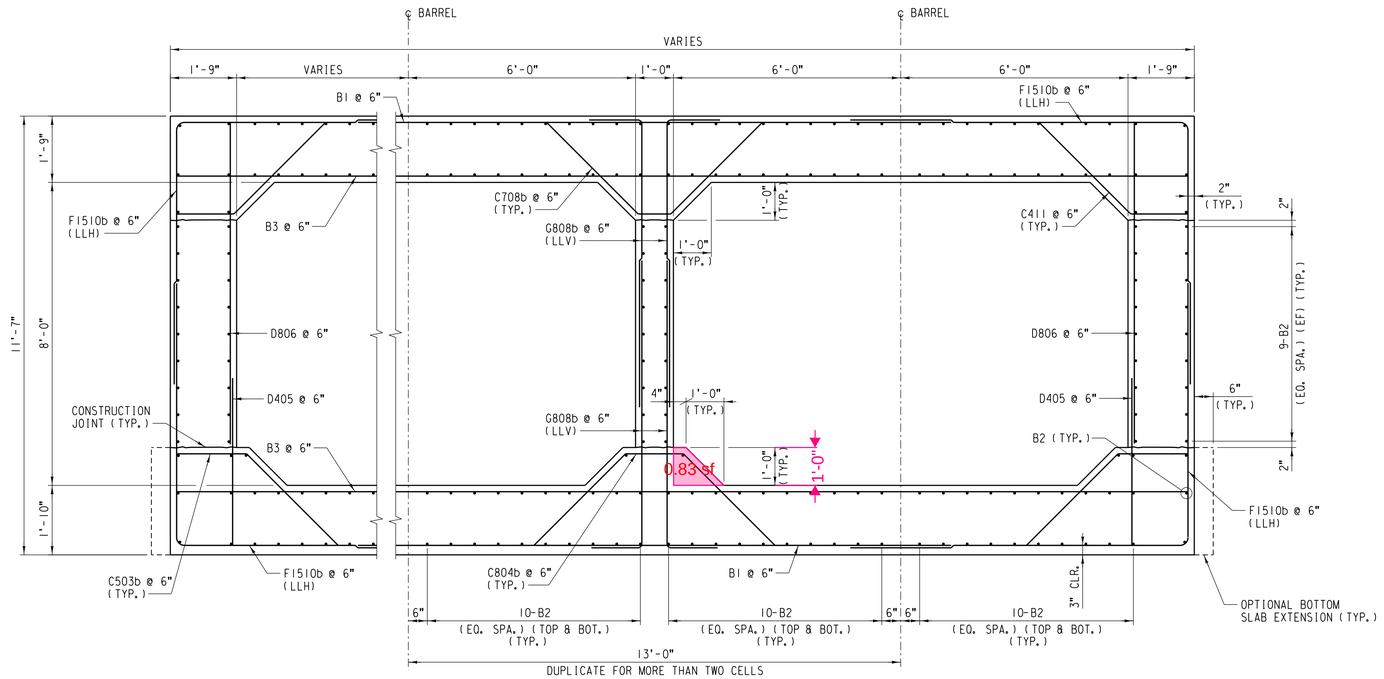
FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: G5

Copyright © 2020 by Union Pacific Railroad

PLOTTED: 1/3/2020 3:30:48 PM

FILE NAME: pw://HDR_US_National.01/41951019068897/680200_Concrete Box Culverts.dgn

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

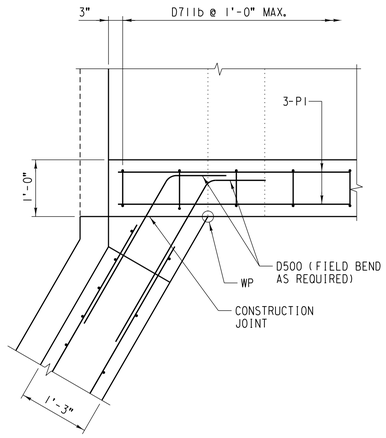


TYPICAL BARREL SECTION

SCALE: ½"=1'-0"

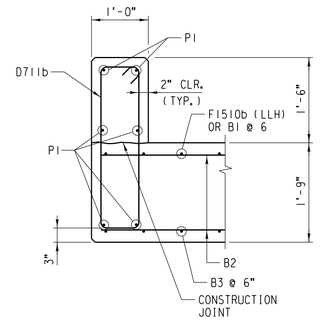
BAR SPLICE NOTE:

FOR B1 BAR USE 3'-5" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE AT MIDSPAN OF CULVERT OPENING, FOR B3 BAR USE 2'-7" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE OVER INTERIOR WALL, FOR B2 BAR USE 2'-1" MIN. LAP SPLICE WHEN NEEDED AND STAGGER SPLICE, FOR P1 BAR USE 1'-9" MIN. LAP SPLICE WHEN NEEDED AND STAGGER SPLICE.



WINGWALL TO PARAPET CONNECTION DETAIL

SCALE: ¾"=1'-0"



PARAPET DETAIL

SCALE: ¾"=1'-0"

NOTES:

1. FOR CAST-IN-PLACE CONCRETE NOTES AND REINFORCING STEEL NOTES, SEE SHEET NO. G1.
2. EF = EACH FACE
   FF = FAR FACE
   LLH = LONG LEG HORIZONTAL
   LLV = LONG LEG VERTICAL
   NF = NEAR FACE
   WP = WORKING POINT

CONCRETE QUANTITIES

	TOTAL	UNIT	DESCRIPTION
ONE END	AA	CU. YD./FT.	BARREL
	BB	CU. YD.	PARAPET
	CC	CU. YD.	TOEWALL
	DD	CU. YD.	APRON
	14.2	CU. YD.	TWO WINGWALLS

EQUATIONS FOR VARIABLES:

L = LENGTH OF BARREL (FT)
NC = NUMBER OF BOX CULVERT CELLS
NB = 2.0(L-0.33) + 1 (ROUND UP TO THE NEAREST INTEGER)

TOTAL NUMBER OF BARS

A = 2(NB)
B = NB(NC-1)
C = 134 + 100(NC-1)
D = 4(NB)
E = 4(NB)(NC-1)
F = 30 + 26(NC-1)
G = 76 + 26(NC-1)
H = 16 + 13(NC-1) (ROUND UP TO THE NEAREST INTEGER)
J = 16 + 13(NC-1)

LENGTH OF BARS

P = L - 0.33
Q = 15.17 + 13(NC-1)
R = 3.42 + 13(NC-1)
S = 15.83 + 13(NC-1)
T = 37.50 + 13(NC-1)
U = 16.42 + 13(NC-1)
V = 37.17 + 13(NC-1)

LENGTH OF BARS ARE CALCULATED IN FEET AND ROUNDED DOWN TO THE NEAREST WHOLE INCH.

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE FOR LAP SPLICE REQUIREMENTS.

CONCRETE QUANTITIES

AA = 3.19 + 2.12(NC-1)
BB = 0.86 + 0.72(NC-1)
CC = 4.68 + 1.6(NC-1)
DD = 27.53 + 12.95(NC-1)

ROUND CONCRETE QUANTITIES TO ONE DECIMAL PLACE.

REINFORCING SCHEDULE

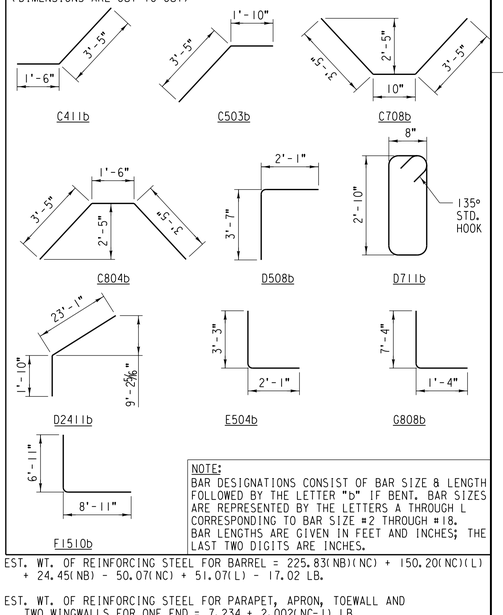
	TOTAL	MARK	SIZE	LENGTH	SHAPE
BARREL	A	C411b	#4	4'-11"	
	A	C503b	#4	5'-3"	
	B	C708b	#4	7'-8"	
	B	C804b	#4	8'-4"	
	A	D405	#5	4'-5"	
	A	D806	#5	8'-6"	
	C	B2	#6	P	
	D	F1510b	#7	15'-10"	
	A	B3	#7	Q	
	E	G808b	#8	8'-8"	
	A	B1	#8	R	
PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END	F	D400	#5	4'-0"	
	64	D500	#5	5'-0"	
	G	D508b	#5	5'-8"	
	H	D711b	#5	7'-11"	
	J	D1910	#5	19'-10"	
	12	D2109	#5	21'-9"	
	4	D2411b	#5	24'-11"	
	6	P1	#5	Q	
	2	A3	#5	S	
	8	T1	#5	T	
	114	E504b	#6	5'-4"	
	4	E1100	#6	11'-0"	
	J	E1910	#6	19'-10"	

SET LIST

MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
D103-D1909	#5	1'-3"	19'-9"	2'-3¾"	9	4	
D303-D1810	#5	3'-3"	18'-10"	1'-8¾"(+)	10	2	
A1	#5	U	V	6⅝"(-)	37	1	
A2	#5	U	V	1'-1⅞"(-)	19	1	
E203-E1009	#6	2'-3"	10'-9"	6"	18	2	
E203-E1100	#6	2'-3"	11'-0"	3"	36	2	
E303-E1810	#6	3'-3"	18'-10"	1'-8¾"(+)	10	2	

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 FOR BARREL = 225.83(NB)(NC) + 150.20(NC)(L) + 24.45(NB) - 50.07(NC) + 51.07(L) - 17.02 LB.

EST. WT. OF REINFORCING STEEL FOR PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END = 7,234 + 2,002(NC-1) LB.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

12'-0" x 8'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 3)

FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: MC27

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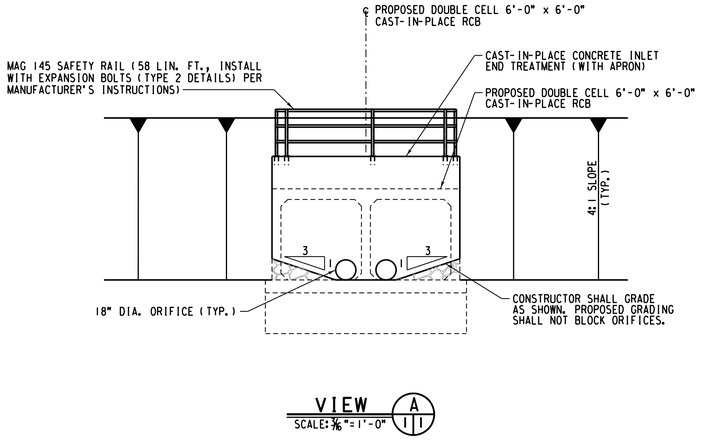
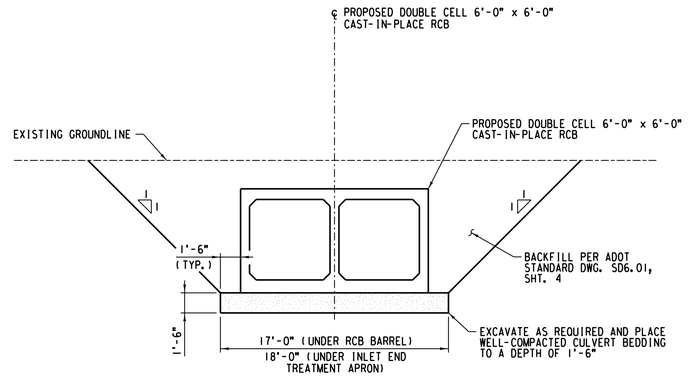
FILE NAME: pw://HDR_US_National.Oil/41190/10196897/680200_Concrete Box Culverts.dgn

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

DESIGN SHEET



VIEW A
SCALE: 3/16"=1'-0"

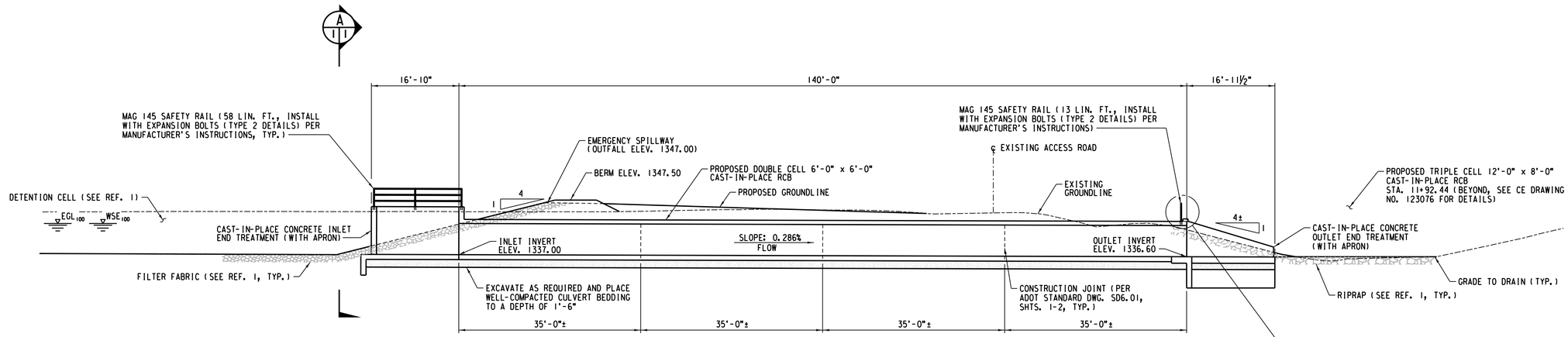


ELEVATION
SCALE: 3/16"=1'-0"

DRAWING SCHEDULE

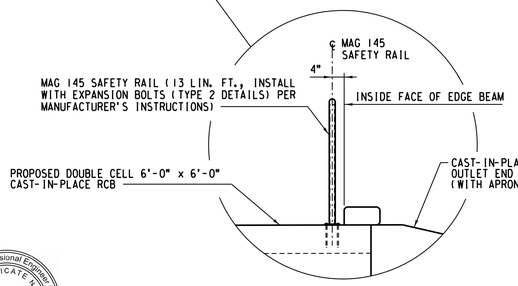
	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123075	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
	S2	123075	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
	S3	123075	INLET END TREATMENT DETAILS (SHEET 1 OF 2)	DESIGN
	S4	123075	INLET END TREATMENT DETAILS (SHEET 2 OF 2)	DESIGN
	G1	680200	GENERAL NOTES	STANDARD
	1	SD6.01	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS (1 OF 5)	ADOT STANDARD
	2	SD6.01	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS (2 OF 5)	ADOT STANDARD
	4	SD6.01	REINFORCED CONCRETE BOX CULVERTS STRUCTURAL EXCAVATION & STRUCTURE BACKFILL	ADOT STANDARD
	1	SD6.02	REINFORCED CONCRETE BOX CULVERTS DOUBLE BARREL (0'-15' FILLS)	ADOT STANDARD
	1	SD6.08	REINFORCED CONCRETE BOX CULVERTS OUTLET WINGS - SKEW 0° TO 20° CULVERT HEIGHT 3' TO 7'	ADOT STANDARD
	3	SD6.08	REINFORCED CONCRETE BOX CULVERTS INLET WINGS - SKEW 0° TO 20° CULVERT HEIGHT 3' TO 7'	ADOT STANDARD
	1	SD6.11	REINFORCED CONCRETE BOX CULVERTS OUTLET APRON DETAILS	ADOT STANDARD
	3	SD6.11	REINFORCED CONCRETE BOX CULVERTS OUTLET APRON - DIMENSIONS & QUANTITIES (4:1 SLOPE)	ADOT STANDARD
	145	-	SAFETY RAIL	MAG STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P016 OF 037 X037 OF 159 EC006 OF 036	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 17, 2023	DESIGN

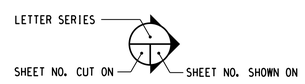


CROSS SECTION
SCALE: 1/32"=1'-0"

WSE_{50} =	1343.20
EGL_{100} =	1343.20
VEL_{100} =	1.00 fps



NOTES:
1. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
2. RCB = REINFORCED CONCRETE BOX



SECTION DESIGNATION

MATERIAL NOTES:
1. ALL CAST-IN-PLACE CONCRETE SHALL BE PER STD. DWG. 680200 SHT. G1 (4000 PSI AT 28 DAYS).
2. CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
140	FT	6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT BARREL (PER ADOT STANDARD DRAWINGS, PLAN SD6.01 SHEET 1 AND PLAN SD6.02, SHEET 1)		CONSTRUCTOR
1	EA.	OUTLET END TREATMENT FOR 6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT, SKEW = 0° (WITH APRON) (PER ADOT STANDARD DRAWINGS, PLAN SD6.01, SHEET 1 & 4, PLAN SD6.08, SHEET 1 AND PLAN SD6.11, SHEET 1 & 3)		
25.0	CU. YD.	4000 PSI CONCRETE FOR INLET END TREATMENT ONLY (PER DETAILS, SHEET NOS. S3-S4, AND NOTES, PER STD. DWG. 680200 SHT. G1)		
1	LOT	REINFORCING STEEL FOR INLET END TREATMENT (PER SCHEDULE, SHEET NO. S3 AND NOTES, PER STD. DWG. 680200 SHT. G1)		
71	LIN.FT.	MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) 145 SAFETY RAIL (FOR END TREATMENTS) WITH EXPANSION BOLTS (TYPE 2 DETAILS) AND ALL OTHER ASSOCIATED HARDWARE) OR APPROVED ALTERNATE		
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP, CLASS 1 (PER STD. DWG. 680000 SHT. 3 AND REF. 1)	562-2764	
1	LOT	FILTER FABRIC (PER REF. 1)		
180	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
275	CU. YD.	STRUCTURE BACKFILL (PER ADOT STANDARD DRAWINGS, PLAN SD6.01, SHEET 4)		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

DESIGN NOTES

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 12): Elev. 1345.52, NAVD 1988, ½" rebar located in ground East of proposed Track 101 Culvert No. 0.20, 71.58' left of existing Phoenix Sub. Main Track centerline, Sta. 1498+70.62.
   TBM 2 (Olsson CP 13): Elev. 1342.79, NAVD 1988, ½" rebar located in ground West of proposed Track 101 Culvert No. 0.20, 62.38' left of existing Phoenix Sub. Main Track centerline, Sta. 1491+33.87.
4. Profile: Proposed Track 101 per Ref. 1.
5. Alignment: Not applicable.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. The RCB and outlet end treatment have been designed for AASHTO HL-93 Live Load with impact and cover depth ranging from 0'-0" to 10'-0".
2. The inlet end treatment has been designed for full hydrostatic pressure on the walls, earth pressure and a 250 psf construction surcharge. No vehicular live load was considered in the design.
3. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 08-31-2023 ARIZONA U.S.A.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 09/01/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kyle Stubl
CONSULTANT ENGINEER 08/18/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123075

LATITUDE: 33.28409°N LONGITUDE: 111.67783°W

UNION PACIFIC

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

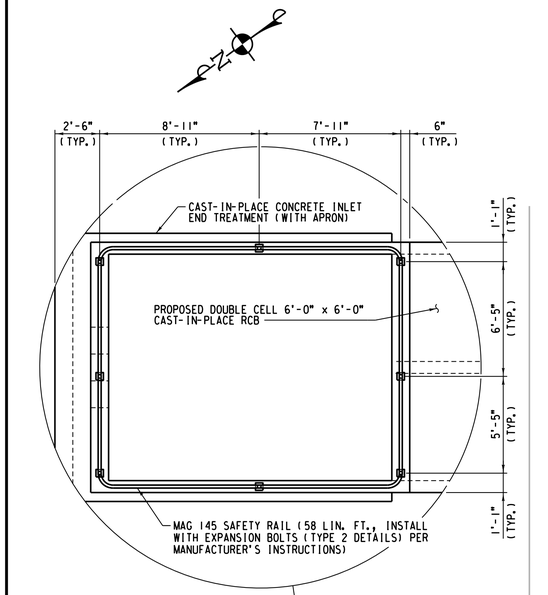
LOCATION & DESCRIPTION: CULVERT 0.20, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 140'

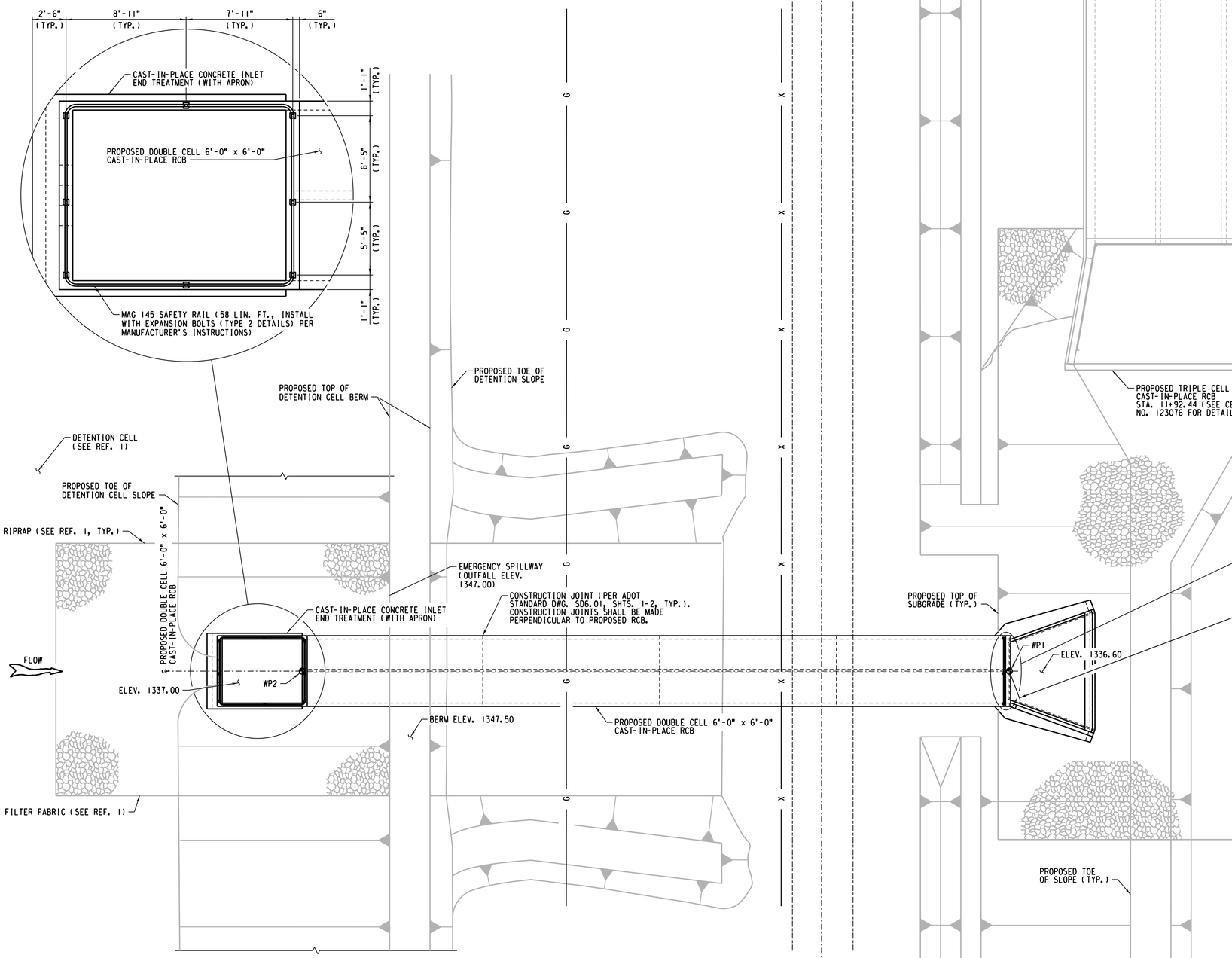
SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

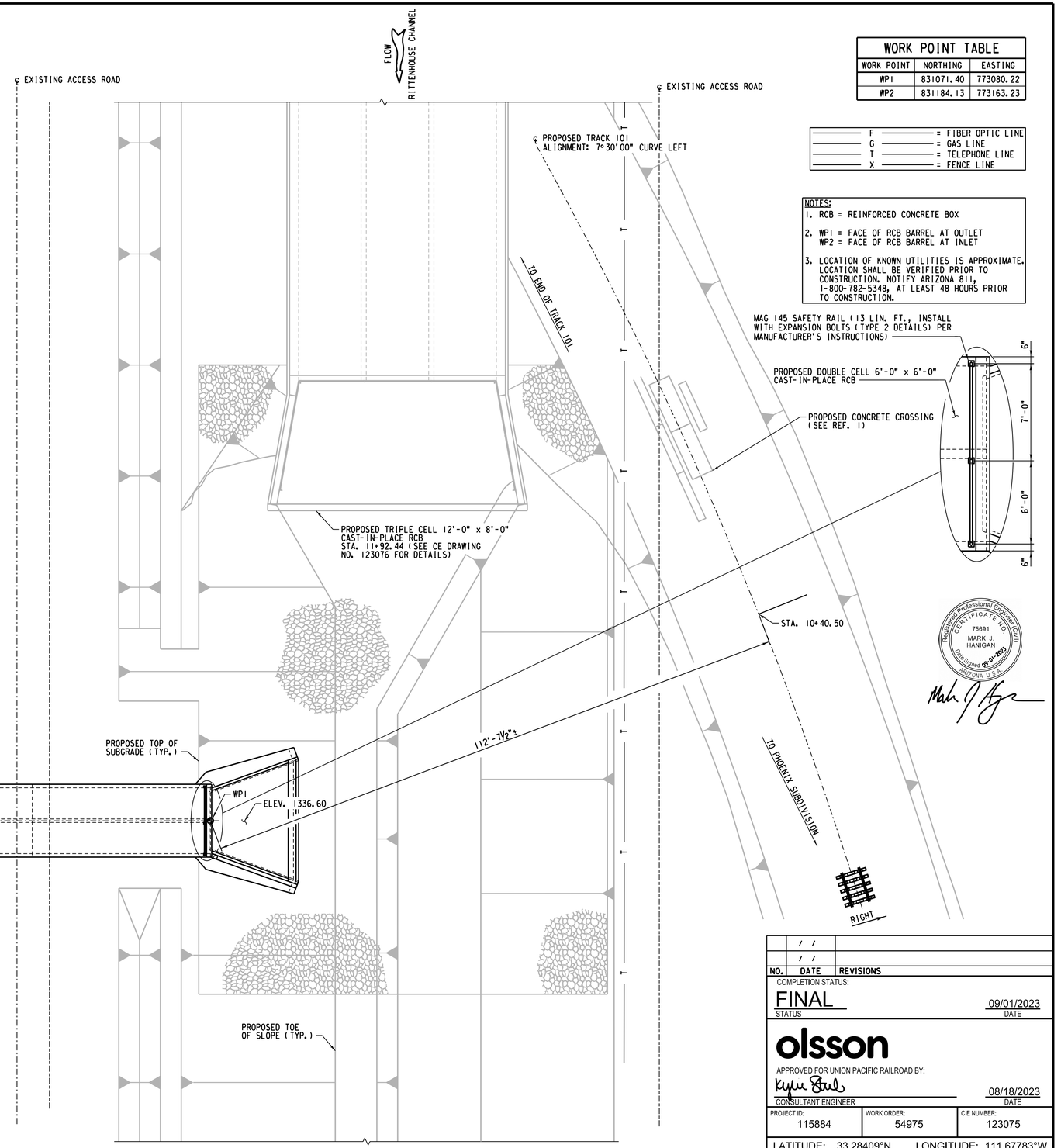
FILE NAME: \\oa.ad.oasconsulting.com\fnts-na1\projects\2020\050\1000\020\0920.70\Exchange\Dustin UPRR\UERR_2023-09-01_Final Submittal\Pirate Ind Lead_0.20_cae.dgn

PLOTTED: 9/1/2023 8:37:12 AM

DESIGN SHEET







WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	831071.40	773080.22
WP2	831184.13	773163.23

F = FIBER OPTIC LINE
G = GAS LINE
T = TELEPHONE LINE
X = FENCE LINE

NOTES:
1. RCB = REINFORCED CONCRETE BOX
2. WP1 = FACE OF RCB BARREL AT OUTLET
   WP2 = FACE OF RCB BARREL AT INLET
3. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 09-01-2023 ARIZONA U.S.A.

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

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL STATUS — 09/01/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 08/18/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123075

LATITUDE: 33.28409°N LONGITUDE: 111.67783°W

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.20, PIRATE IND LEAD

FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 140'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oasconsulting.com\fnts-mail\projects\2020\0501-10000\020-0927\70-Exchange\Out\to UPRR\UPRR_23-09-01_Final Submittal\Pirate Ind Lead 0.20_cover.dgn

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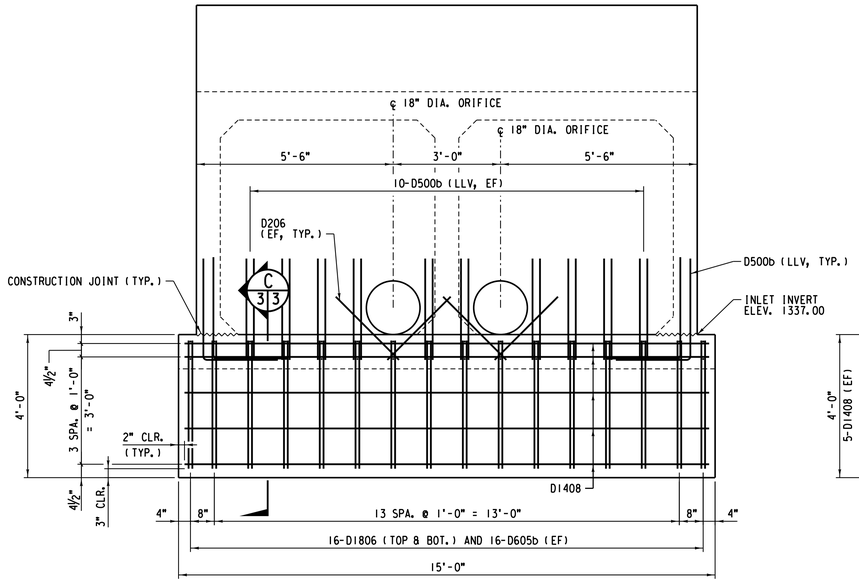
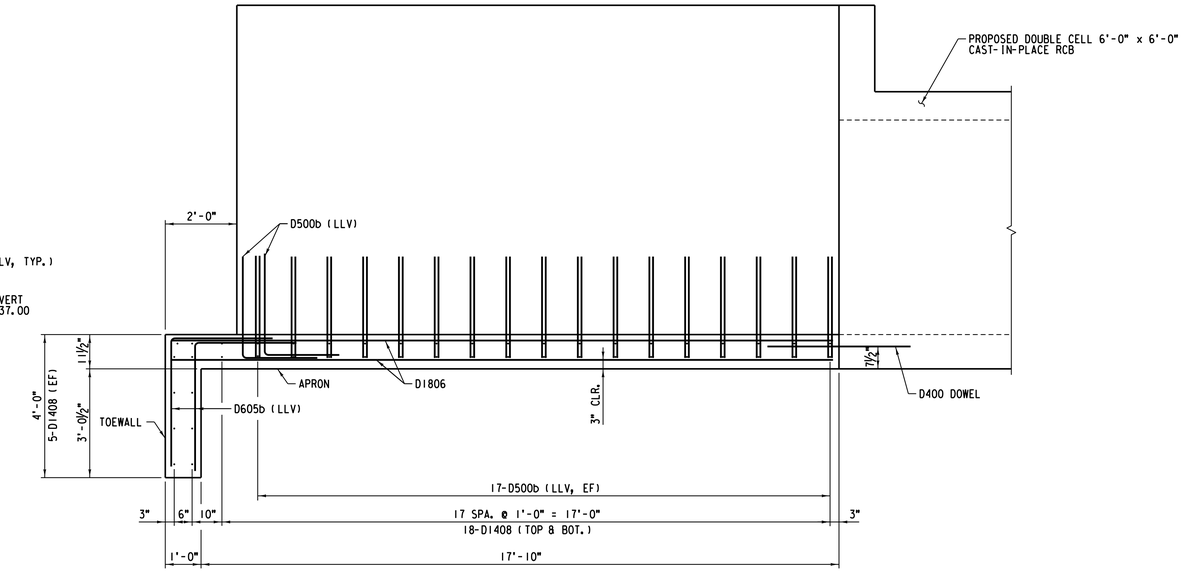
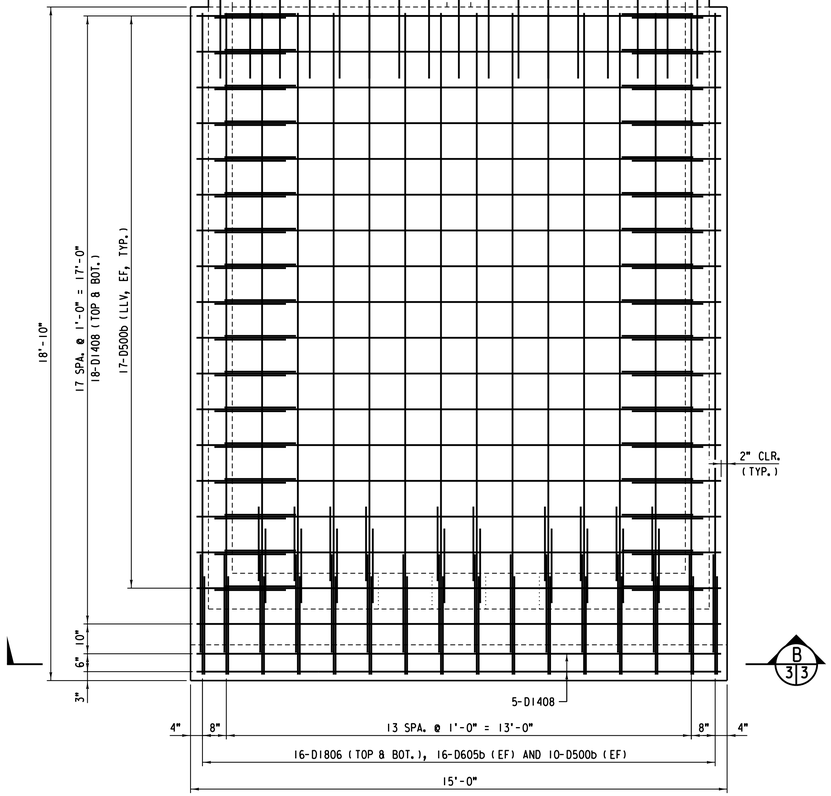
DESIGN SHEET



SECTION B
SCALE: ½"=1'-0" 3 3



SECTION C
SCALE: ½"=1'-0" 3 3

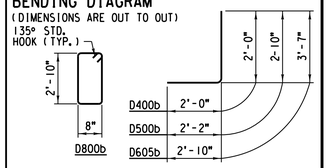


APRON PLAN
SCALE: ½"=1'-0"

REINFORCING SCHEDULE
(QUANTITY PER INLET END TREATMENT)

TOTAL	MARK	SIZE	LENGTH	SHAPE
84	C811	#4	8'-11"	——
44	C1606	#4	16'-6"	——
16	D206	#5	2'-6"	——
55	D400	#5	4'-0"	——
44	D400b	#5	4'-0"	⌐—
88	D500b	#5	5'-0"	⌐—⌐
32	D605b	#5	6'-5"	⌐——⌐
14	D800b	#5	8'-0"	⌐——⌐
32	D811	#5	8'-11"	——
30	D1308	#5	13'-8"	——
46	D1408	#5	14'-8"	——
32	D1806	#5	18'-6"	——

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)
135° STD. HOOK (TYP.)



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 = 4,280 LB.

CONCRETE PLACEMENT QUANTITIES

ITEM	UNIT	QTY.
APRON & TOEWALL	CU. YD.	11.7
WALLS & HEADWALL	CU. YD.	13.1

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE ADOT STD. DWG. SD6.01 AND SD6.02.
3. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
4. EF = EACH FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 09/01/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kyle Stubs 08/18/2023
CONSULTANT ENGINEER DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123075

LATITUDE: 33.28409°N LONGITUDE: 111.67783°W

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 09-01-2023 ARIZONA U.S.A.

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S3 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

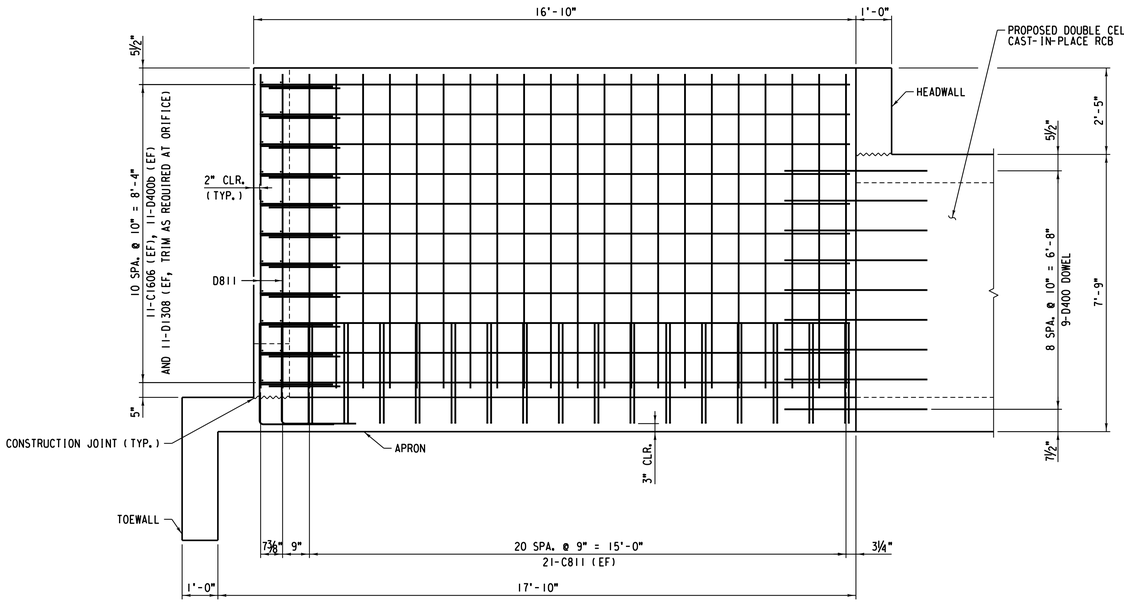
LOCATION & DESCRIPTION: CULVERT 0.20, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 140'

SHEET TITLE: INLET END TREATMENT DETAILS (SHEET 1 OF 2)

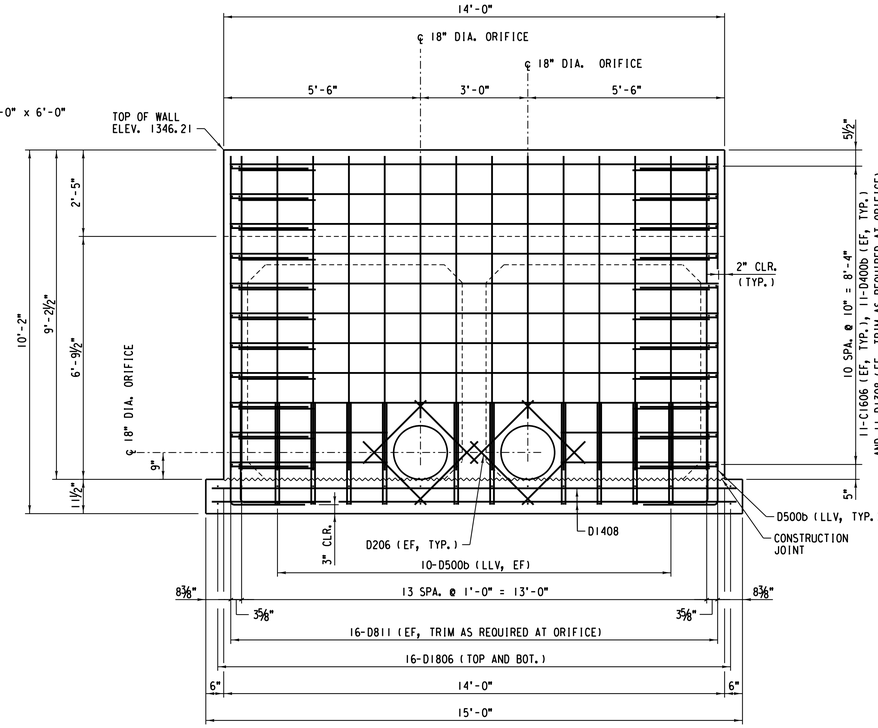
FILE NAME: \\oa.ad.oaconsulting.com\fnts-na\projects\2020\0501-1000\020\PROP\70-Exchange\Out\to UPRR\BLBR_2023-09-01_Final Submittal\Pirate Ind Lead_0.20_cuz.dgn

PLOTTED: 9/1/2023 8:37:13 AM

DESIGN SHEET



SECTION D
SCALE: ½"=1'-0"



SECTION E
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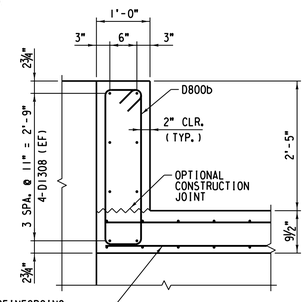

SECTION F
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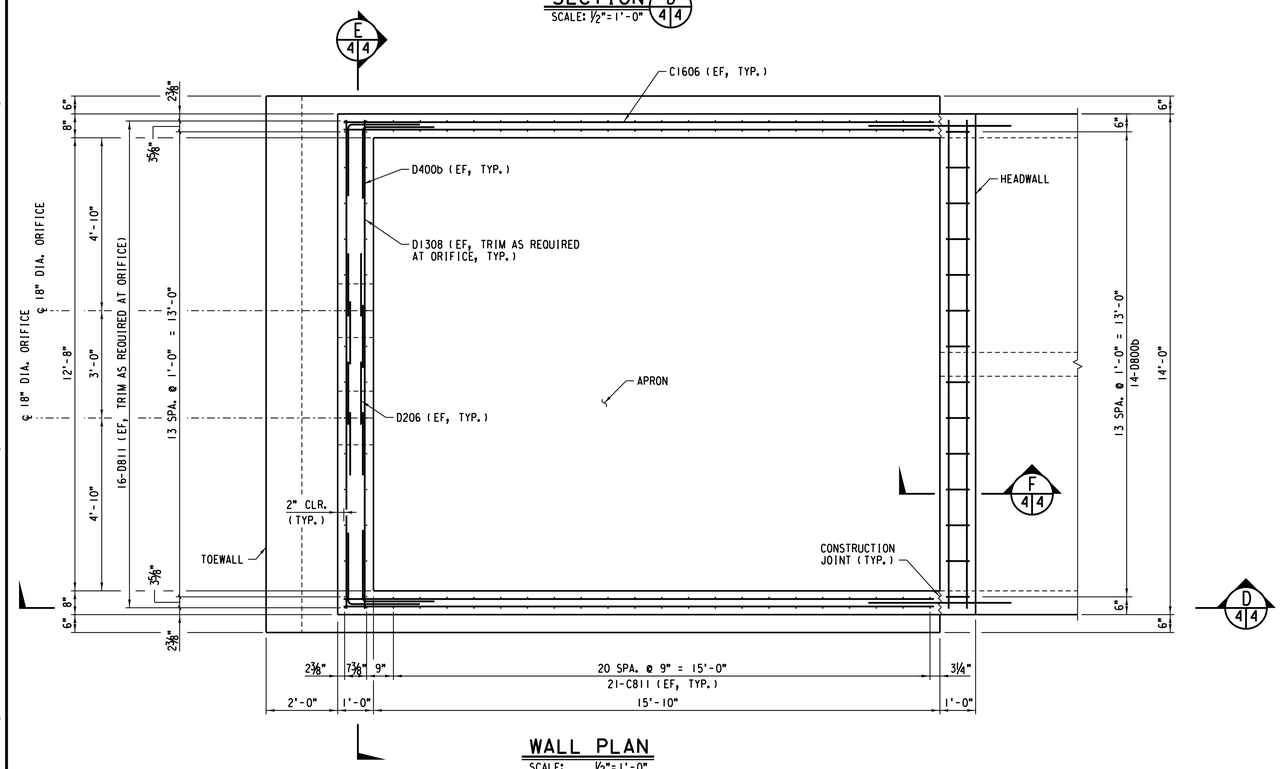
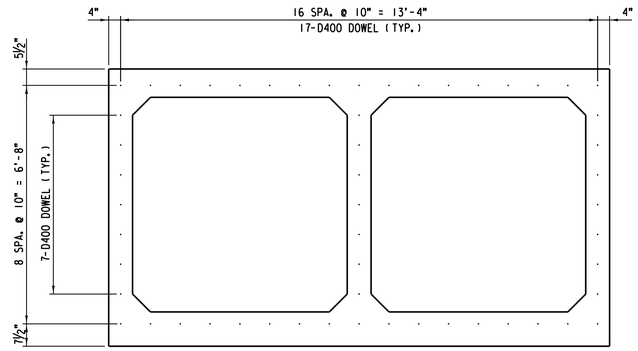


WALL PLAN
SCALE: ½"=1'-0"



DOWEL ELEVATION
SCALE: ½"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE ADOT STD. DWG. SD6.01 AND SD6.02.
3. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
4. EF = EACH FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 09/01/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 08/18/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123075

LATITUDE: 33.28409°N LONGITUDE: 111.67783°W

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 08-31-2023 ARIZONA U.S.A.

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S4 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.20, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 140'

SHEET TITLE: INLET END TREATMENT DETAILS (SHEET 2 OF 2)

PLOTTED: 9/1/2023 8:37:13 AM

FILE NAME: \\oa.ad.aecomcollab.com\fnts-na\projects\2020\0501-10000\020-0927\70-Exchange\Outputs\UPRR\UPRR_2023-09-01_Final Submittal\Pirate Ind Lead_0.20_cbc.dgn

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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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8. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

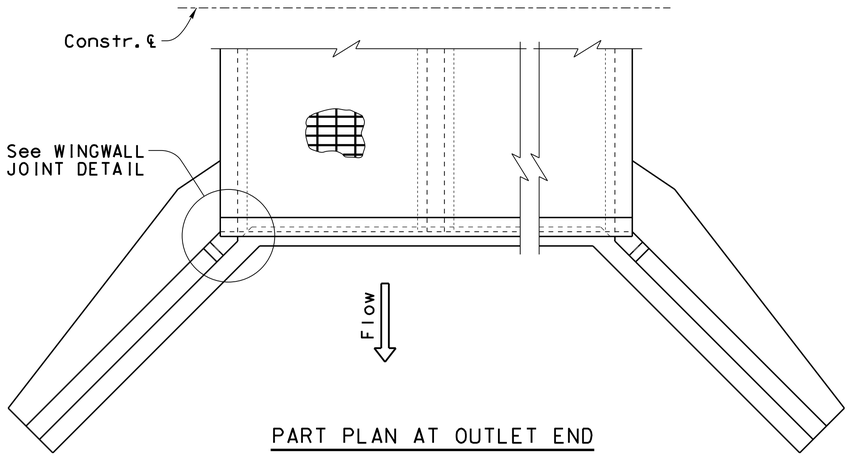
PLAN NO.: 680200 | SHEET: G1

Copyright © 2020 by Union Pacific Railroad

PLOTTED: 1/3/2020 3:30:45 PM

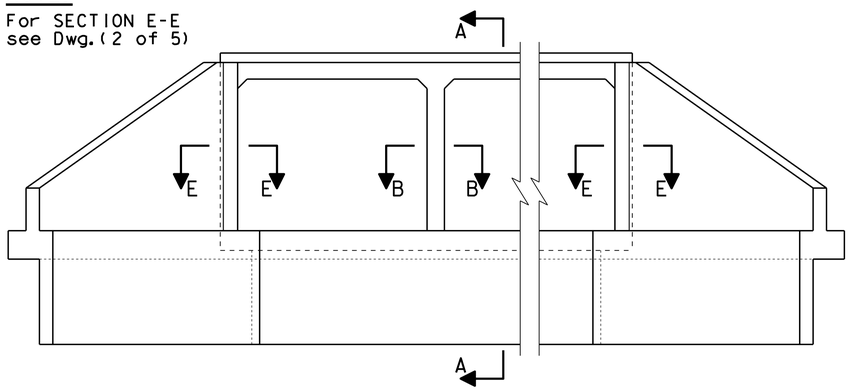
FILE NAME: pw://HDR_US_National.DI/4195/10196897/680200_Concrete Box Culverts.dgn

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



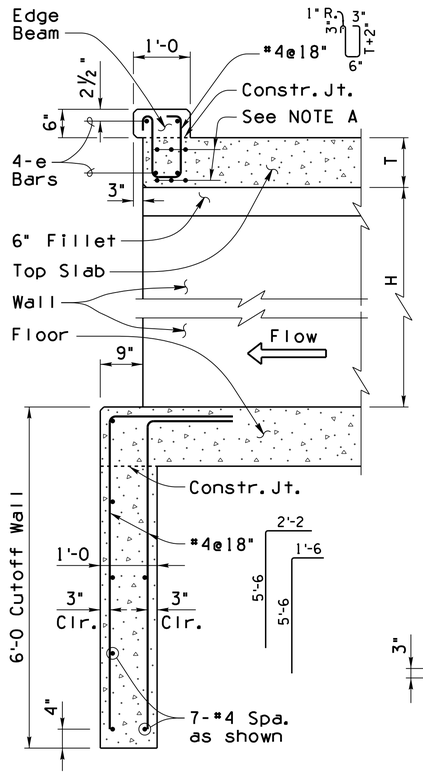
PART PLAN AT OUTLET END

NOTE:
For SECTION E-E see Dwg. (2 of 5)



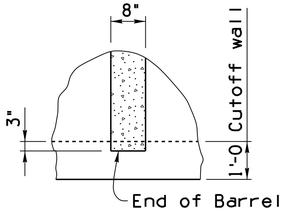
ELEVATION AT OUTLET END

NOTE A:
Use 3-#7 @3" spa. top and bott bars for culverts skewed 6° to 30°.
Use 3-#8 @3" spa. top and bott bars for culverts skewed 31° to 45°.
Culverts skewed over 45° require a special edge beam design.
Edge beam reinforcing quantity shall be added to table quantities.



SECTION A-A

e Bars			
Skew ∠	Span		
	6' & 8'	10'	12'
0° to 20°	#6	#6	#6
25° & 30°	#6	#6	#7
35°	#6	#7	#8
40° & 45°	#6	#7	#9



SECTION B-B

GENERAL NOTES:

Construction Specification - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, latest Edition.

Design Specifications - AASHTO LRFD Bridge Design Specifications, 7th Edition 2014.

Loading Class - HL-93.

Design:
Soil weight = 120 p.c.f.

All Concrete shall be Class "S" (f'c = 3000 psi).

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing shall be furnished as Grade 60.

All bends and hooks shall meet the requirements of AASHTO LRFD Article 5.10. All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2" clear cover unless noted otherwise.

Chamfer all exposed corners ¾" unless noted otherwise.

Compact backfill for footing and wing base minimum 100 percent of ASTM D698 maximum dry density.

All structures shall have formed Construction joints in the top slab and walls (optional in floor slab) and spaced not more than 38'-6" apart or as shown in Project Plans. Joints shall be perpendicular to the centerline of the box. Reinforcing steel shall project 1'-6 thru the joint. The joint shall be made with a ¼" plywood bulkhead which shall be left in place or the alternate joint detail shown on Dwg. (2 of 5) may be used.

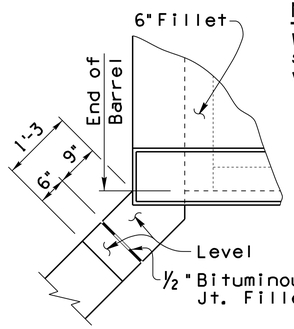
See Project Plans for culvert layout, invert elevations, finished grade elevations, headwall, apron, and other site specific details.

Dimensions shall not be scaled from drawings.

Pay item quantities of concrete and reinforcing steel include all labor and materials for box culvert, footing, headwalls, and aprons.
Total Quantities include Barrel and Headwall Quantities shown in Tables (plus added quantity for apron when used). Barrel Quantities Table is per linear foot of box (multiply by length of box to obtain barrel total). Headwall Quantities Table includes wings, edge beam, and cutoff wall.

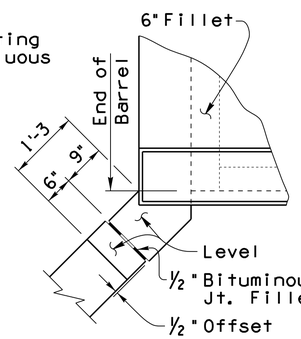
Culverts measuring 20 ft and greater to the inside faces of exterior walls, along the roadway centerline, shall be assigned a structure number. The structure number shall be referenced in the culvert summary sheet and drainage details.

NOTE:
For Dimensions, Quantities and additional Details, see SD 6.01 (2 to 5).



NOTE:
Wing wall footing shall be contiuous with no joint.

WINGWALL JOINT DETAIL
(For Barrel Height < 8 Ft.)



WINGWALL JOINT DETAIL
(For Barrel Height ≥ 8 Ft.)

NOTE:
Special design sections shall be adjoined with standard barrels when necessary.

Culvert barrels always begin and end with Table No. I.

Thickness of top and bottom slabs vary with depths of fill as shown.

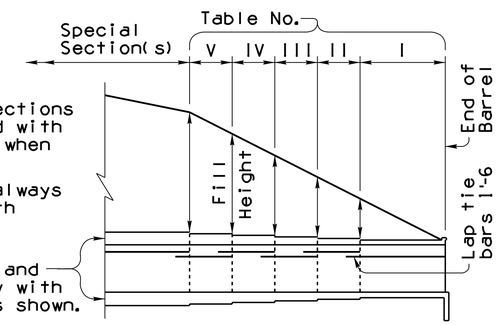


DIAGRAM SHOWING TABLE NO. TO BE USED FOR VARIOUS FILL HEIGHTS

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	S.U.H.	2-12
2	General updates	D.B.B.	5-15
3			
4			

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability and applicability by a licensed professional engineer. Contents within the inner border line shall not be altered.

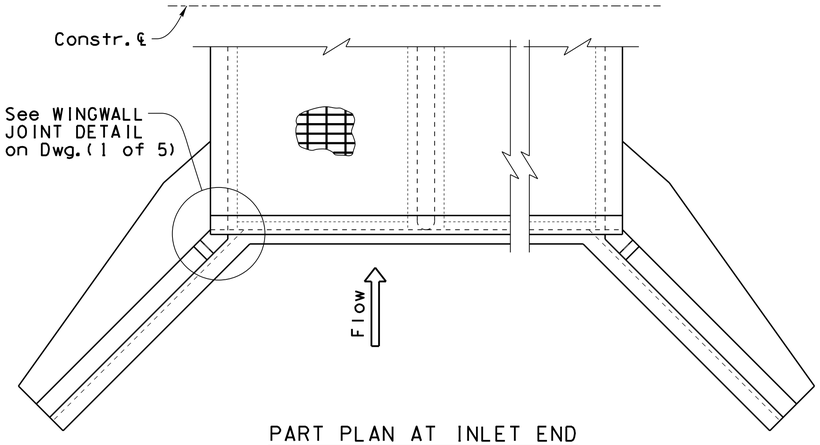
DESIGN APPROVED

APPROVED FOR DISTRIBUTION

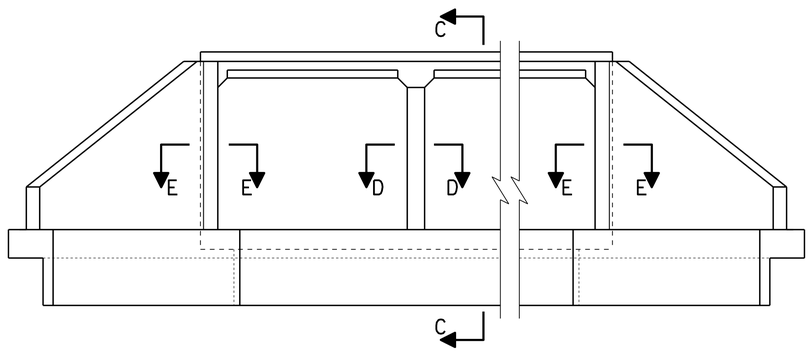
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
MISCELLANEOUS DETAILS

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.01 (1 of 5)
LOCATION			SHEET NO. OF



PART PLAN AT INLET END



ELEVATION AT INLET END

NOTE A:

Use 3-#7 @3" spa. top and bott bars for culverts skewed 6° to 30°.
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Culverts skewed over 45° require a special edge beam design.
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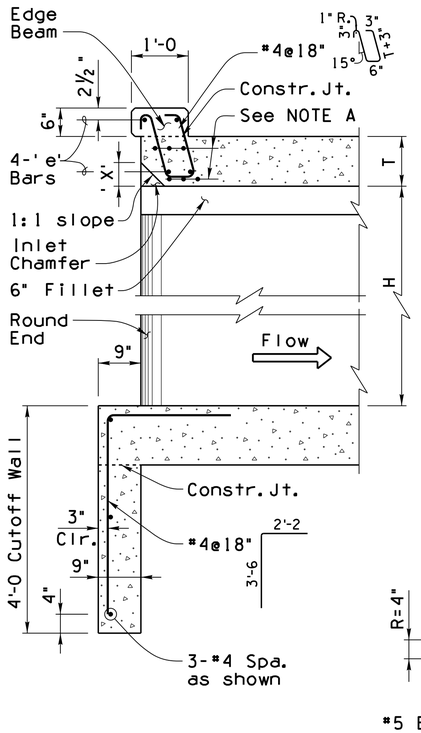
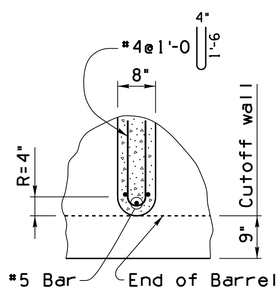
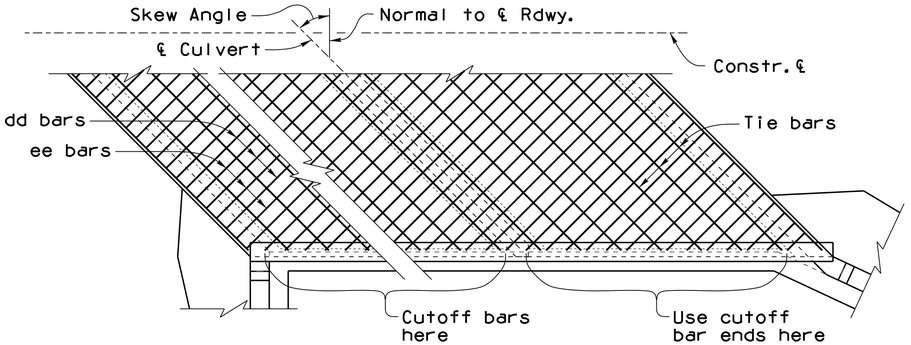


SECTION C-C



SECTION D-D



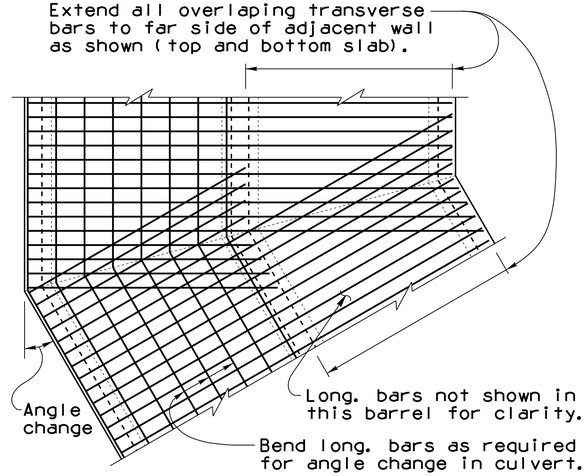
PART PLAN - SKEWED CULVERT

(Showing Reinf. Steel Placement)

NOTE:

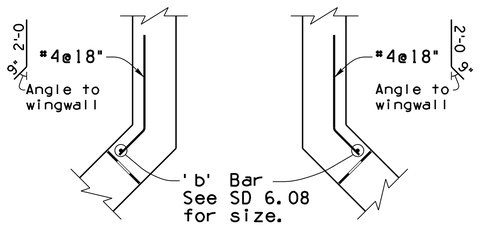
For 'e' Bars table, see Dwg. (1 of 5)

Span 'S'	Dim. 'X'
6'	3"
8'	4"
10'	5"
12'	6"

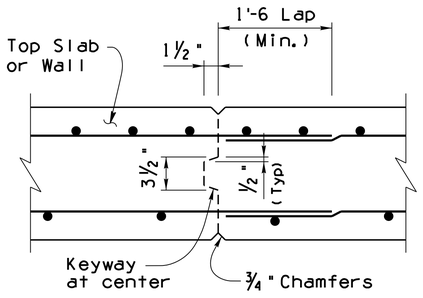


PART PLAN - ANGLED CULVERT

(Showing Reinf. Steel Placement)



SECTION E-E



ALT. CONSTRUCTION JOINT DETAIL

NOTE:

For General Notes, Dimensions, Quantities and additional Details, see SD 6.01 (1 & 3, 4, 5).

DESIGN APPROVED	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION BRIDGE GROUP STRUCTURE DETAIL
Shafi U. Hasan	
APPROVED FOR DISTRIBUTION Jean A. Nehme	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS
ROUTE / PROJECT NO. / FA NO.	DRAWING NO. SD 6.01 (2 of 5)
LOCATION	SHEET NO. OF

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SJUH.	2-12
2			
3			
4			

Note to Designer:
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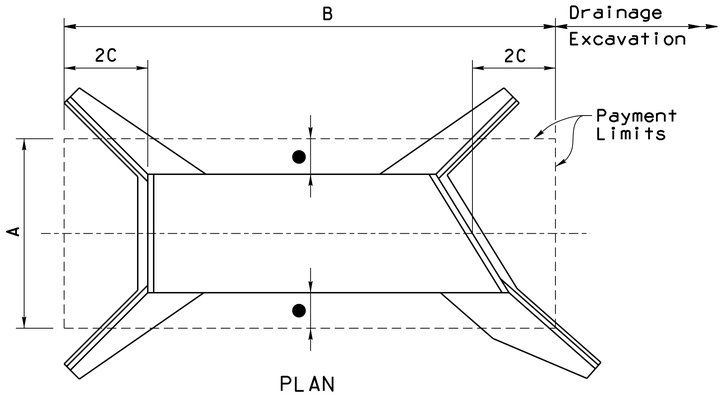
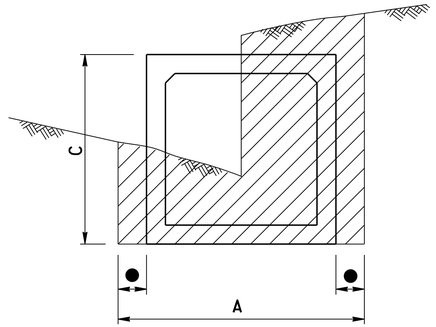
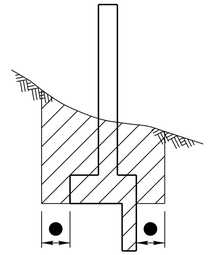


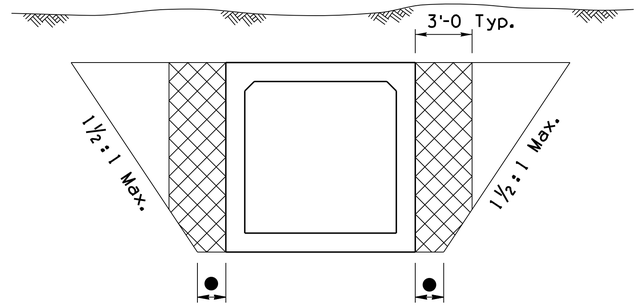
PLAN



SECTION



SECTION AT WING

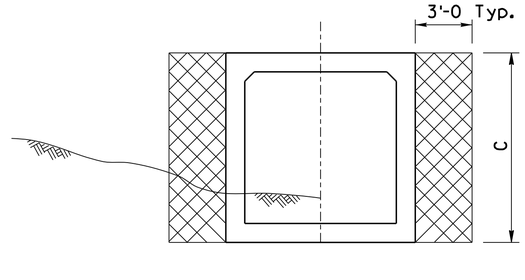


SECTION

STRUCTURAL EXCAVATION - PAYMENT LIMITS

NOTE:

Payment limits shown include structural excavation for headwalls, cutoffwalls, wingwalls, end sections, etc.



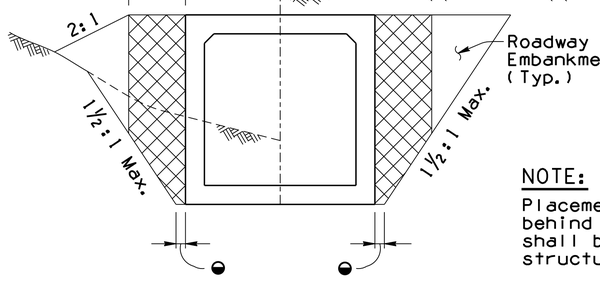
PLACEMENT DETAIL

SECTION

STRUCTURE BACKFILL - MEASUREMENT

NOTE:

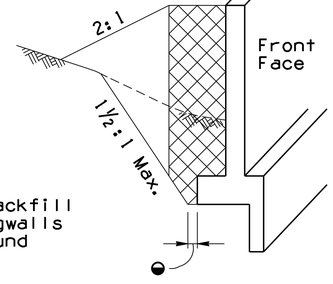
Computation of structure backfill quantities is based on the area of a typical installation times the total length of structure plus 2C.
Use C for box extensions on each end extended.
No measurment is necessary for wing arms.



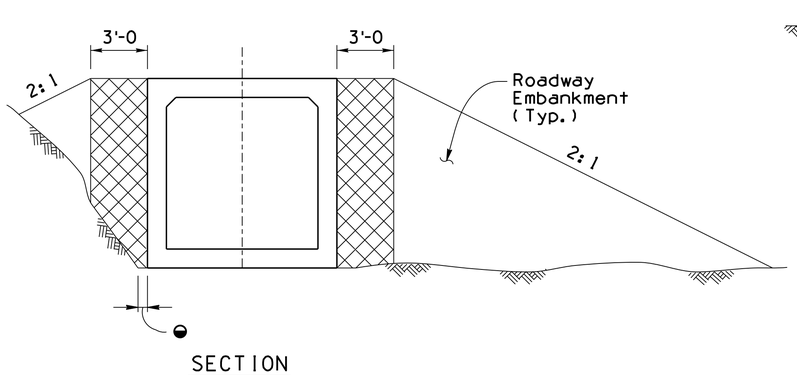
SECTION

NOTE:

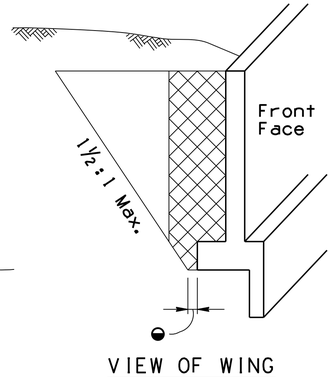
Placement of structure backfill behind headwalls and wingwalls shall be the same as around structures.



VIEW OF WING



SECTION



VIEW OF WING

STRUCTURE BACKFILL - PLACEMENT

LEGEND

A = Width
B = Length
C = Height of barrel or headwall without cutoff wall.
● = 6" Max. in rock and trench, 1'-6 max. all others
◒ = 6" Min. in rock and trench, 1'-6 min. all others
Indicates Structural Excavation
Indicates Structure Backfill
Indicates Roadway Embankment

NOTE:

For General Notes, Dimensions, Quantities and additional Details, see SD 6.01 (1, 2, 3 & 5).

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SAVK	2-12
2			
3			
4			

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability and applicability by a licensed professional engineer. Contents within the Inner border line shall not be altered.

DESIGN APPROVED: Shafi U. Hasan	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION BRIDGE GROUP STRUCTURE DETAIL
APPROVED FOR DISTRIBUTION: Jean A. Nehme	REINFORCED CONCRETE BOX CULVERTS STRUCTURAL EXCAVATION & STRUCTURE BACKFILL

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.01 (4 of 5)
LOCATION			SHEET NO. OF

20-JAN-2016 16:33 G:\Bridge\CADD\Standards\SD_Sheets\SD 6 Drainage Stuctures\SD 6.01-6.11 Series\SD6.01-1 to 5\sd601-4_1916.dgn

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability and applicability by a licensed professional engineer. Contents within the inner border line shall not be altered.

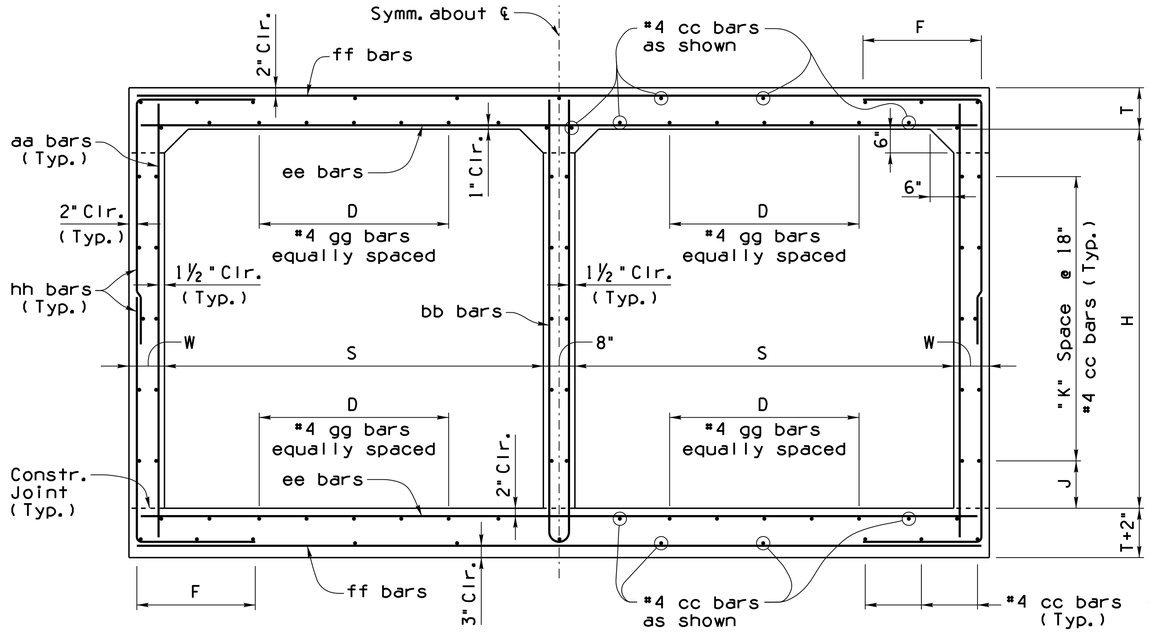
TABLE I
0'-10' FILL

Span "S"	Height "H"	Top Slab "T"	Walls "W"	aa Bar Size	aa Spacing	aa Length	bb Bar Size	bb Spacing	bb Length	cc Number ⌖	ee Bar Size	ee Spacing	ee Length	ff Bar Size	ff Spacing	ff Length	gg Number ⌖	gg D	hh Bar Size	hh Spacing	hh Length	hh F
6'	3'	9½"	8"	5	12"	4'-4	5	12"	8'-9	48	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	5'-1	2'-5
	4'	9½"	8"	5	12"	5'-4	5	12"	10'-9	54	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	5'-7	2'-5
	5'	9½"	8"	5	12"	6'-4	5	12"	12'-9	54	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	6'-1	2'-5
	6'	9½"	8"	5	12"	7'-4	5	12"	14'-9	60	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	6'-7	2'-5
	7'	9½"	8"	5	12"	8'-4	5	12"	16'-9	66	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	7'-1	2'-5
8'	3'	9½"	9"	5	12"	4'-4	5	12"	8'-8	48	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	5'-6	2'-6
	4'	9½"	9"	5	12"	5'-4	5	12"	10'-8	54	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	6'-0	2'-6
	5'	9½"	9"	5	12"	6'-4	5	12"	12'-8	54	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	6'-6	2'-6
	6'	9½"	9"	5	12"	7'-4	5	12"	14'-8	60	5	6	17'-9	6	8"	17'-9	28	4'-0	5	6"	7'-0	2'-6
	7'	9½"	9"	5	12"	8'-4	5	12"	16'-8	66	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	7'-5	2'-6
	8'	9½"	9"	5	12"	9'-4	5	12"	18'-8	66	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	8'-0	2'-6
10'	3'	10½"	11"	5	12"	4'-6	5	12"	8'-11	48	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-0	2'-8
	4'	10½"	11"	5	12"	5'-6	5	12"	10'-11	54	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-7	2'-8
	5'	10½"	11"	5	12"	6'-6	5	12"	12'-11	54	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-8	2'-8
	6'	10½"	11"	5	12"	7'-6	5	12"	14'-11	60	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	7'-2	2'-8
	7'	10½"	11"	5	12"	8'-6	5	12"	16'-11	66	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	7'-9	2'-8
	8'	10½"	11"	5	12"	9'-6	5	12"	18'-11	66	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	8'-3	2'-8
	9'	10½"	11"	5	12"	10'-6	5	12"	20'-11	72	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	8'-9	2'-8
	10'	10½"	11"	5	12"	11'-6	5	12"	22'-11	78	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	9'-3	2'-8
12'	8'	12½"	13"	5	12"	9'-10	5	12"	19'-7	66	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	8'-6	2'-10
	9'	12½"	13"	5	12"	10'-10	5	12"	21'-7	72	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	9'-0	2'-10
	10'	12½"	13"	5	12"	11'-10	5	12"	23'-7	78	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	9'-6	2'-10
	11'	12½"	13"	5	12"	12'-10	5	12"	25'-7	78	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	10'-0	2'-10
	12'	12½"	13"	5	12"	13'-10	5	12"	27'-7	84	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	10'-6	2'-10

TABLE NO. II
10'-15' FILL

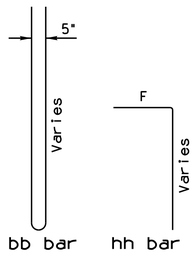
Span "S"	Height "H"	Top Slab "T"	Walls "W"	aa Bar Size	aa Spacing	aa Length	bb Bar Size	bb Spacing	bb Length	cc Number ⌖	ee Bar Size	ee Spacing	ee Length	ff Bar Size	ff Spacing	ff Length	gg Number ⌖	gg D	hh Bar Size	hh Spacing	hh Length	hh F
6'	3'	8"	8"	5	12"	4'-1	5	12"	8'-3	48	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	5'-0	2'-5
	4'	8"	8"	5	12"	5'-1	5	12"	10'-3	54	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	5'-6	2'-5
	5'	8"	8"	5	12"	6'-1	5	12"	12'-3	54	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	6'-0	2'-5
	6'	8"	8"	5	12"	7'-1	5	12"	14'-3	60	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	6'-6	2'-5
	7'	8"	8"	5	12"	8'-1	5	12"	16'-3	66	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	7'-0	2'-5
8'	3'	10½"	9"	5	12"	4'-6	5	12"	9'-1	48	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	5'-3	2'-6
	4'	10½"	9"	5	12"	5'-6	5	12"	11'-1	54	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	5'-9	2'-6
	5'	10½"	9"	5	12"	6'-6	5	12"	13'-1	54	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	6'-3	2'-6
	6'	10½"	9"	5	12"	7'-6	5	12"	15'-1	60	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	6'-9	2'-6
	7'	10½"	9"	5	12"	8'-6	5	12"	17'-1	66	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	7'-3	2'-6
	8'	10½"	9"	5	12"	9'-6	5	12"	19'-1	66	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	7"	7'-9	2'-6
10'	3'	12½"	11"	5	12"	4'-10	5	12"	9'-7	48	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	5'-10	2'-8
	4'	12½"	11"	5	12"	5'-10	5	12"	11'-7	54	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	6'-4	2'-8
	5'	12½"	11"	5	12"	6'-10	5	12"	13'-7	54	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	6'-10	2'-8
	6'	12½"	11"	5	12"	7'-10	5	12"	15'-7	60	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	7'-4	2'-8
	7'	12½"	11"	5	12"	8'-10	5	12"	17'-7	66	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	7'-10	2'-8
	8'	12½"	11"	5	12"	9'-10	5	12"	19'-7	66	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	8'-4	2'-8
	9'	12½"	11"	5	12"	10'-10	5	12"	21'-7	72	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	8'-10	2'-8
	10'	12½"	11"	5	12"	11'-10	5	12"	23'-7	78	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	9'-4	2'-8
12'	8'	15"	13"	5	12"	10'-3	5	12"	20'-4	66	6	7"	26'-5	7	7"	26'-5	28	6'-0	5	7"	8'-9	2'-11
	9'	15"	13"	5	12"	11'-3	5	12"	22'-4	72	6	7"	26'-5	7	7"	26'-5	28	6'-0	5	7"	9'-3	2'-11
	10'	15"	13"	5	12"	12'-3	5	12"	24'-4	78	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	9'-9	2'-11
	11'	15"	13"	5	10"	13'-3	5	12"	26'-4	78	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	10'-9	3'-5
	12'	15"	13"	5	10"	14'-3	5	12"	28'-4	84	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	11'-3	3'-5

⌖ Total number of bars in the cross-section.



TYPICAL SECTION
(Shown as 8'-0 x 8'-0 Table II)

Height "H"	"J" Dim.	"K" Spaces
3'	9"	1
4'	6"	2
5'	12"	2
6'	9"	3
7'	6"	4
8'	12"	4
9'	9"	5
10'	6"	6
11'	12"	6
12'	9"	7



BENDS

NOTE:
Reinforcing shown for 8'-0 x 8'-0 Table II box. Use the appropriate table to determine the reinforcing requirements of selected box.

NOTE:
For General Notes, Dimensions, and additional Details, see SD 6.01 (1 to 4). For Quantities and Tables III thru V see SD 6.02 (2 of 2).

New box culverts shall not be constructed using 3' or 4' heights without special approval from ADOT Bridge Group. Tables referencing these sizes are provided for extension of existing box culverts only.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original issue	S.U.H.	2-12
2	Added 3',4',5' height for existing box extensions only	D.B.B.	5-15
3			
4			

DESIGN APPROVED
APPROVED FOR DISTRIBUTION

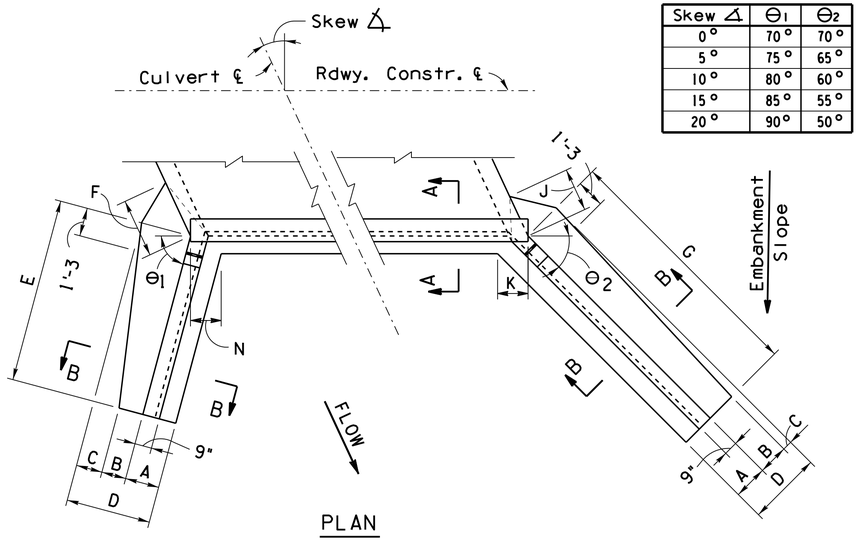
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
DOUBLE BARREL
(0' - 15' FILLS)

ROUTE | PROJECT NO. | FA NO. | DRAWING NO. SD 6.02 (1 of 2)
LOCATION | SHEET NO. OF

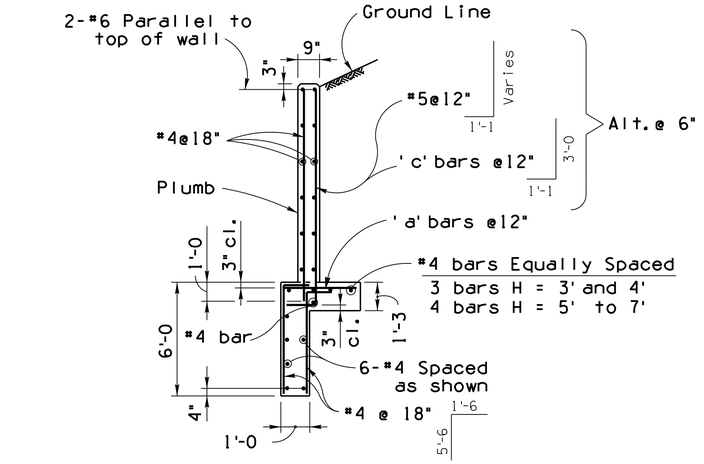
20-JAN-2016 16:47 G:\Bridge\CADD\Standards\SD_Sheets\SD 6 Drainage Stuctures\SD 6.01-6.11 Series\SD602-1 to 2\sd602-1_1916.dgn

Skew ∠	Θ1	Θ2
0°	70°	70°
5°	75°	65°
10°	80°	60°
15°	85°	55°
20°	90°	50°

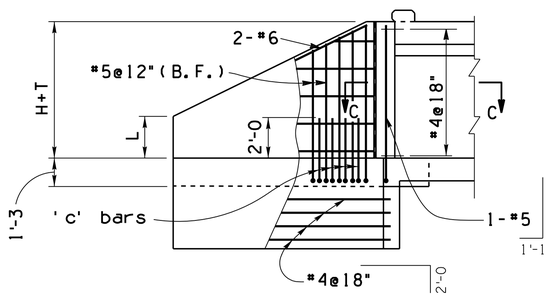


NOTE:

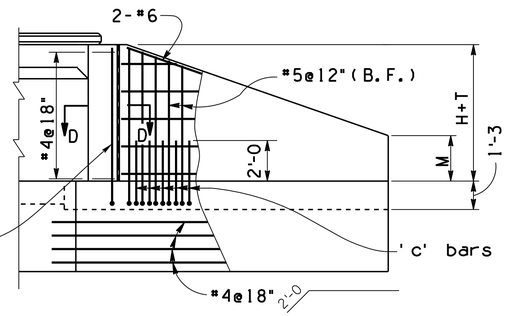
For SECTION A-A, see SD 6.01 (1 of 5).



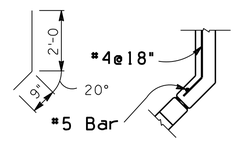
SECTION B-B



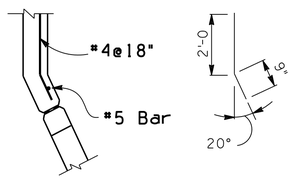
SHORT WING ELEVATION



LONG WING ELEVATION



SECTION C-C



SECTION D-D

2 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	7"	1'-0	1'-5	1'-10	4"	7"	1'-0	1'-5	1'-10	5"	8"	1'-1	1'-6	1'-11	5"	8"	1'-1	1'-7	2'-0	6"	9"	1'-2	1'-7	2'-1
	D	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-8	3'-2	3'-8	4'-2	4'-8	2'-8	3'-2	3'-8	4'-3	4'-9	2'-9	3'-3	3'-9	4'-3	4'-10
	E	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	9'-6	11'-0	12'-6	6'-0	7'-6	9'-0	10'-6	12'-0	6'-0	7'-6	9'-0	10'-6	12'-0
	F	1'-1	1'-9	2'-4	3'-0	3'-8	1'-1	1'-9	2'-4	3'-0	3'-8	1'-2	1'-10	2'-6	3'-1	3'-9	1'-2	1'-10	2'-6	3'-3	3'-10	1'-3	1'-11	2'-7	3'-3	4'-0
	G	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	10'-0	11'-6	13'-0	7'-0	8'-6	10'-0	12'-0	13'-6	7'-0	9'-0	10'-6	12'-6	14'-0	7'-6	9'-6	11'-0	13'-0	14'-6
	J	1'-1	1'-9	2'-4	3'-0	3'-8	1'-1	1'-9	2'-4	3'-0	3'-8	1'-2	1'-10	2'-6	3'-1	3'-9	1'-2	1'-10	2'-6	3'-3	3'-10	1'-3	1'-11	2'-7	3'-3	4'-0
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	1'-0	1'-4	1'-7	1'-11	2'-2	11"	1'-2	1'-6	1'-9	2'-0	10"	1'-1	1'-5	1'-8	1'-11	1'-1	1'-4	1'-7	1'-10	2'-1	1'-1	1'-4	1'-7	1'-10	2'-1
	M	1'-0	1'-4	1'-7	1'-11	2'-2	1'-1	1'-5	1'-6	1'-10	2'-2	1'-0	1'-5	1'-9	1'-10	2'-3	1'-2	1'-5	1'-9	1'-11	2'-4	1'-2	1'-5	1'-10	2'-1	2'-6
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

4 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9	3"	7"	1'-0	1'-5	1'-10
	D	2'-7	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-1	3'-7	4'-1	4'-7
	E	10'-0	12'-6	15'-0	17'-6	20'-0	10'-0	12'-6	15'-0	17'-0	19'-6	10'-0	12'-6	14'-6	17'-0	19'-6	10'-0	12'-0	14'-6	17'-0	19'-6	10'-0	12'-0	14'-6	17'-0	19'-6
	F	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-9	2'-4	3'-0	3'-8
	G	10'-0	12'-6	15'-0	17'-6	20'-0	10'-6	13'-0	15'-6	18'-0	20'-6	10'-6	13'-0	16'-0	18'-6	21'-0	11'-0	13'-6	16'-0	19'-0	21'-6	11'-6	14'-0	17'-0	19'-6	22'-6
	J	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-9	2'-4	3'-0	3'-8
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	1'-9	2'-2	2'-6	2'-11	3'-4	1'-8	2'-1	2'-5	2'-11	3'-4	1'-7	2'-0	2'-6	2'-11	3'-3	1'-7	2'-1	2'-5	2'-10	3'-2	1'-7	2'-1	2'-5	2'-10	3'-2
	M	1'-9	2'-2	2'-6	2'-11	3'-4	1'-8	2'-1	2'-7	3'-0	3'-5	1'-9	2'-3	2'-7	3'-1	3'-6	1'-10	2'-4	2'-9	3'-2	3'-8	1'-10	2'-5	2'-10	3'-4	3'-9
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

6 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9
	D	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6
	E	12'-6	15'-6	18'-6	21'-6	24'-6	12'-6	15'-6	18'-6	21'-6	24'-6	12'-0	15'-0	18'-0	21'-0	24'-0	12'-0	15'-0	18'-0	21'-0	24'-0	12'-0	15'-0	18'-0	21'-0	24'-0
	F	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6
	G	12'-6	15'-6	18'-6	21'-6	24'-6	12'-6	16'-0	19'-0	22'-0	25'-0	13'-0	16'-0	19'-6	22'-6	25'-6	13'-6	16'-6	20'-0	23'-0	26'-6	13'-6	17'-0	20'-6	23'-6	27'-0
	J	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	2'-1	2'-8	3'-2	3'-8	4'-3	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1
	M	2'-1	2'-8	3'-2	3'-8	4'-3	2'-2	2'-8	3'-2	3'-9	4'-3	2'-2	2'-9	3'-3	3'-10	4'-5	2'-3	2'-10	3'-4	3'-11	4'-5	2'-4	2'-11	3'-5	4'-1	4'-7
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

'c' bars			
Height H	Slope	Short Wing	Long Wing
		0° to 10°	0° to 20°
7'	2 : 1	3 - #5	3 - #5
	4 : 1	5 - #5	5 - #5

'a' bars			
Height H	Short Wing	Long Wing	
	0° to 20°	0° & 5°	10° to 20°
3'	#4	#4	#4
4'	#4	#4	#4
5'	#4	#4	#4
6'	#4	#4	#5
7'	#4	#4	#6

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (1 of 5). For Headwall Quantities see SD 6.09 (1 to 3).

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the Inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1.	Original Issue	S.J.H.	2-12
2.	Added 3'-6" height for existing box extensions only	D.B.B.	5-15
3.			
4.			

DESIGN APPROVED

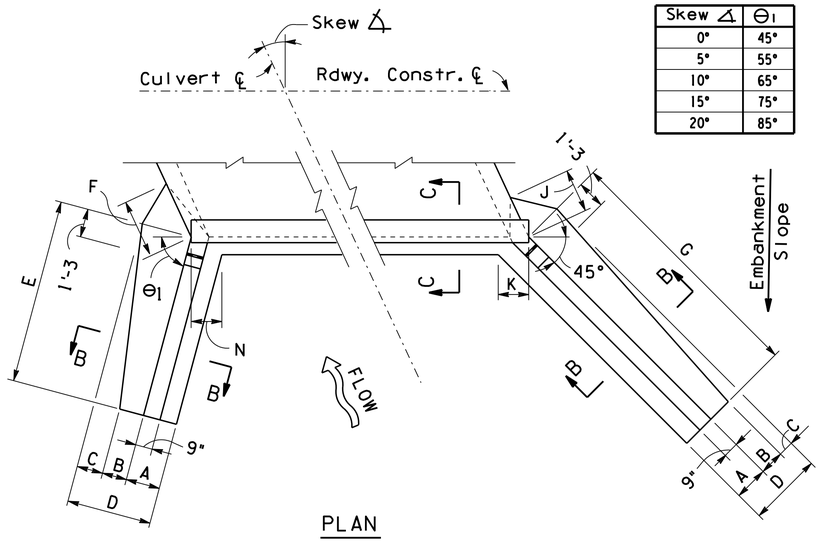
APPROVED FOR DISTRIBUTION

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
OUTLET WINGS - SKEW 0° to 20°
CULVERT HEIGHT 3' to 7'

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.08 (1 of 8)
LOCATION			SHEET NO. OF

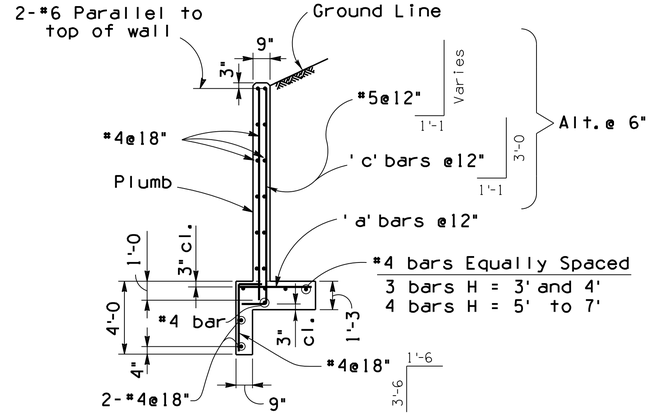
Skew ∠	Θ1
0°	45°
5°	55°
10°	65°
15°	75°
20°	85°



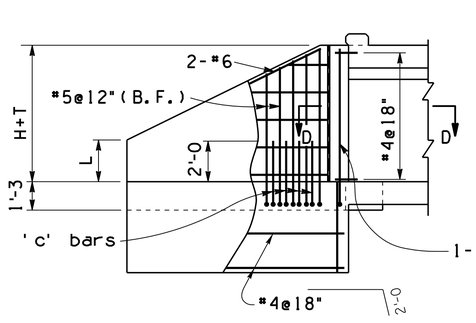
PLAN

NOTE:

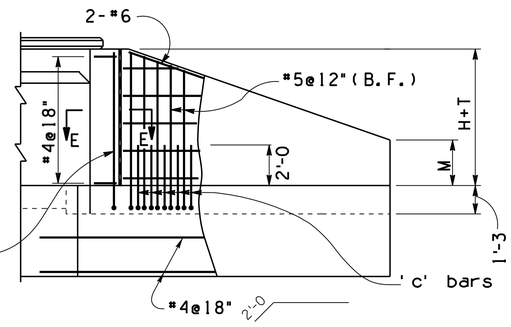
For SECTION C-C, see SD 6.01 (2 of 5).



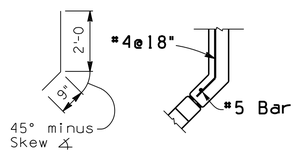
SECTION B-B



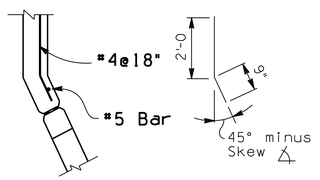
SHORT WING ELEVATION



LONG WING ELEVATION



SECTION D-D



SECTION E-E

2 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1
	D	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10
	E	6'-0	7'-6	8'-6	10'-0	11'-6	5'-6	7'-0	8'-6	10'-0	11'-0	5'-6	7'-0	8'-6	9'-6	11'-0	5'-6	7'-0	8'-6	10'-0	11'-0	6'-0	7'-6	8'-6	10'-0	11'-6
	F	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	2'-11	3'-8	4'-4	1'-5	2'-1	2'-11	3'-7	4'-3	1'-4	2'-0	2'-9	3'-5	4'-1
	G	6'-0	7'-6	8'-6	10'-0	11'-6	6'-0	7'-6	9'-6	10'-6	12'-0	6'-6	8'-0	9'-6	11'-0	12'-6	7'-0	8'-6	10'-0	12'-0	13'-6	7'-6	9'-0	11'-0	12'-6	14'-6
	J	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	2'-11	3'-8	4'-4	1'-5	2'-1	2'-11	3'-7	4'-3	1'-4	2'-0	2'-9	3'-5	4'-1
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	1'-11	2'-5	3'-1	3'-6	4'-0	1'-10	2'-2	2'-5	3'-0	3'-7	1'-7	1'-11	2'-3	2'-9	3'-1	1'-5	1'-8	1'-11	2'-3	2'-9	1'-1	1'-4	1'-10	2'-1	2'-4
	M	1'-11	2'-5	3'-1	3'-6	4'-0	1'-11	2'-5	2'-11	3'-4	3'-10	1'-9	2'-3	2'-8	3'-2	3'-8	1'-7	2'-1	2'-6	2'-10	3'-3	1'-5	1'-11	2'-2	2'-8	2'-11
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

4 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-4	1'-8	9"	1'-0	1'-1	1'-3	1'-7	9"	1'-0	1'-1	1'-2	1'-6	9"	1'-0	1'-1	1'-2	1'-5	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	7"	1'-0	1'-3	1'-5	4"	7"	1'-0	1'-4	1'-6	4"	7"	1'-0	1'-5	1'-7	4"	7"	1'-0	1'-5	1'-8	4"	7"	1'-0	1'-5	1'-10
	D	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7
	E	8'-0	9'-6	11'-6	13'-6	15'-6	8'-0	10'-0	11'-6	13'-6	15'-6	8'-0	10'-0	12'-0	14'-0	16'-0	8'-6	10'-6	12'-6	14'-6	16'-6	9'-0	11'-0	13'-6	15'-6	17'-6
	F	1'-3	1'-11	2'-8	3'-4	4'-1	1'-3	1'-11	2'-7	3'-4	4'-0	1'-2	1'-11	2'-7	3'-3	4'-0	1'-2	1'-10	2'-6	3'-3	3'-11	1'-2	1'-10	2'-5	3'-1	3'-9
	G	8'-0	9'-6	11'-6	13'-6	15'-6	8'-6	10'-6	12'-6	14'-6	16'-6	9'-0	11'-0	13'-0	15'-6	17'-6	9'-6	12'-0	14'-6	16'-6	19'-0	10'-6	13'-0	15'-6	18'-6	21'-0
	J	1'-3	1'-11	2'-8	3'-4	4'-1	1'-3	1'-11	2'-7	3'-4	4'-0	1'-2	1'-11	2'-7	3'-3	4'-0	1'-2	1'-10	2'-6	3'-3	3'-11	1'-2	1'-10	2'-5	3'-1	3'-9
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	2'-8	3'-5	4'-0	4'-8	5'-4	2'-5	3'-0	3'-8	4'-4	4'-11	2'-3	2'-10	3'-4	3'-11	4'-5	2'-0	2'-6	3'-1	3'-7	4'-1	1'-10	2'-4	2'-8	3'-2	3'-8
	M	2'-8	3'-5	4'-0	4'-8	5'-4	2'-7	3'-2	3'-10	4'-6	5'-2	2'-6	3'-1	3'-9	4'-4	5'-0	2'-5	2'-11	3'-6	4'-2	4'-8	2'-2	2'-9	3'-4	3'-10	4'-4
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

6 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-3	1'-7	2'-0	9"	1'-0	1'-2	1'-7	1'-11	9"	1'-0	1'-1	1'-6	1'-10	9"	1'-0	1'-1	1'-4	1'-8	9"	1'-0	1'-1	1'-3	1'-7
	C	3"	6"	9"	11"	1'-0	3"	6"	10"	11"	1'-1	3"	6"	11"	1'-0	1'-2	3"	6"	11"	1'-2	1'-4	3"	6"	11"	1'-3	1'-5
	D	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6
	E	8'-6	11'-0	13'-0	15'-0	17'-0	9'-0	11'-0	13'-6	15'-6	17'-6	9'-6	11'-6	14'-0	16'-6	18'-6	10'-0	12'-6	15'-0	17'-6	19'-6	11'-0	13'-6	16'-0	19'-0	21'-6
	F	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-9	2'-6	3'-2	3'-10	1'-1	1'-9	2'-5	3'-1	3'-9	1'-0	1'-8	2'-4	3'-0	3'-8
	G	8'-6	11'-0	13'-0	15'-0	17'-0	9'-6	11'-6	14'-0	16'-0	18'-6	10'-0	12'-6	15'-0	17'-6	20'-0	11'-0	14'-0	16'-6	19'-6	22'-0	12'-6	15'-6	18'-6	21'-6	24'-6
	J	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-9	2'-6	3'-2	3'-10	1'-1	1'-9	2'-5	3'-1	3'-9	1'-0	1'-8	2'-4	3'-0	3'-8
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	3'-1	3'-9	4'-6	5'-4	6'-1	2'-10	3'-7	4'-3	4'-11	5'-8	2'-8	3'-4	3'-11	4'-7	5'-3	2'-5	3'-1	3'-8	4'-3	4'-11	2'-3	2'-10	3'-5	3'-11	4'-6
	M	3'-1	3'-9	4'-6	5'-4	6'-1	2'-11	3'-8	4'-5	5'-2	5'-11	2'-11	3'-7	4'-4	5'-0	5'-8	2'-9	3'-5	4'-1	4'-9	5'-6	2'-7	3'-3	3'-11	4'-6	5'-2
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

'c' bars			
Height H	Slope	Short Wing 0° to 10°	Long Wing 0° to 20°
7'	2 : 1	3 - #5	3 - #5
	2 : 1	5 - #5	5 - #5

'a' bars			
Height H	Short Wing 0° to 10°	Short Wing 15° & 20°	Long Wing 0° to 20°
3'	#4	#4	#4
4'	#4	#4	#4
5'	#4	#4	#4
6'	#5	#4	#5
7'	#6	#4	#6

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (2 of 5). For Headwall Quantities see SD 6.09 (1 to 3).

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. Users should be aware that it may not be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the inner border line shall not be altered.

NO	DESCRIPTION OR REVISIONS	MADE BY	DATE
1	Original Issue	S.U.H.	2-12
2	Added 3'-6" height for existing box extensions only	D.B.B.	5-15
3			
4			

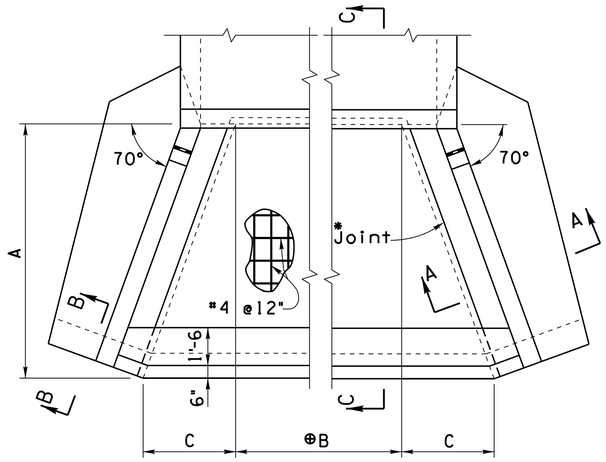
DESIGN APPROVED

APPROVED FOR DISTRIBUTION

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

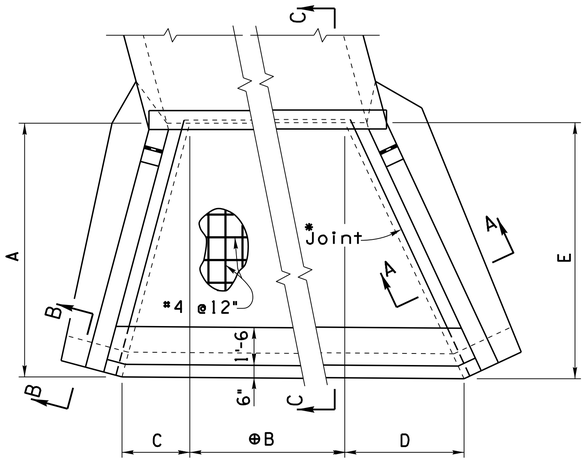
REINFORCED CONCRETE BOX CULVERTS
INLET WINGS - SKEW 0° to 20°
CULVERT HEIGHT 3' to 7'

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.08 (3 of 8)
LOCATION			SHEET NO. OF



PLAN

Apron for 0° skew box culvert

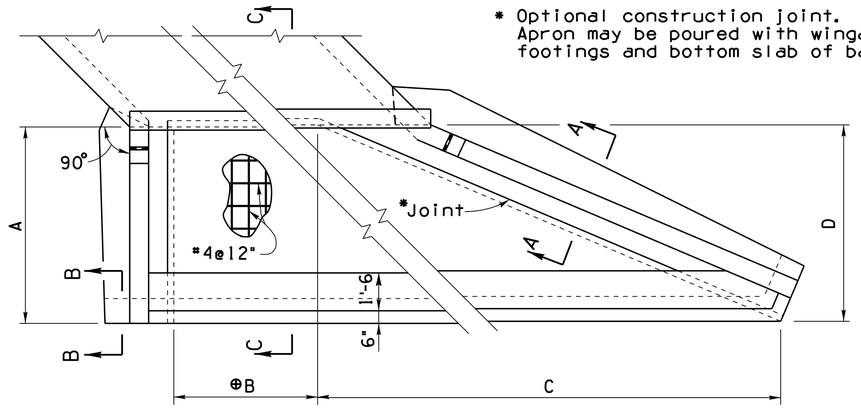


PLAN

Apron for 0° to 15° skew box culvert

Span	△									
	0° Skew	5° Skew	10° Skew	15° Skew	20° Skew	25° Skew	30° Skew	35° Skew	40° Skew	45° Skew
6'	6'-8	6'-8¼	6'-9¼	6'-10⅞	7'-1⅞	7'-4¼	7'-8⅜	8'-1⅝	8'-8⅜	9'-5⅛
8'	8'-9	8'-9⅜	8'-10⅝	9'-0¾	9'-3¾	9'-7⅞	10'-1¼	10'-8⅛	11'-5⅛	12'-4½
10'	10'-11	10'-11½	11'-1	11'-3⅝	11'-7⅜	12'-0½	12'-7¼	13'-3⅞	14'-3	15'-5¼
12'	13'-1	13'-1⅝	13'-3⅜	13'-6½	13'-11⅛	14'-5¼	15'-1¼	15'-11⅝	17'-1	18'-6

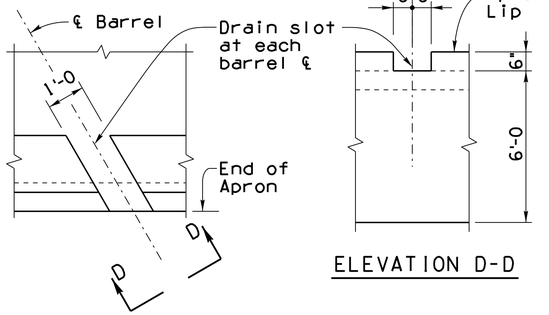
⊕Dimension varies with number of barrels. △equals length to be added to dimension 'B ' for each additional barrel.



PLAN

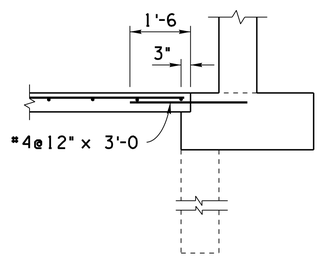
Apron for 20° to 45° skew box culvert

* Optional construction joint.
Apron may be poured with wingall footings and bottom slab of barrel.

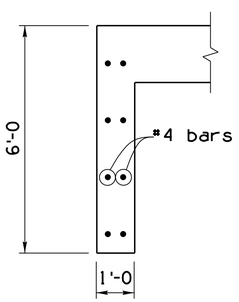


APRON DRAIN DETAIL

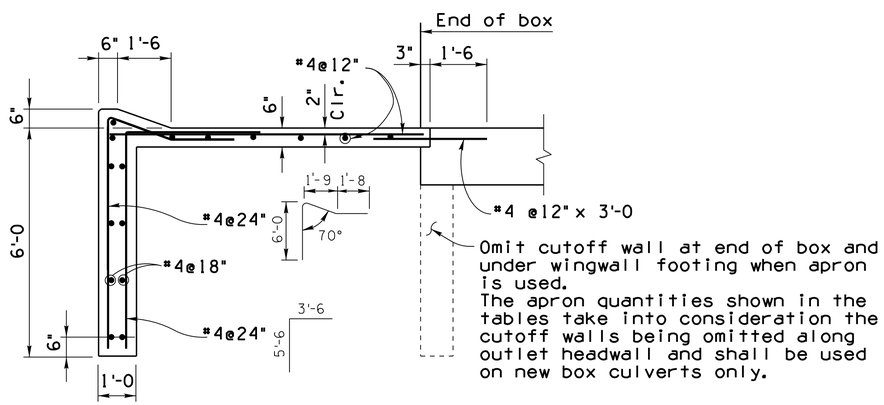
ELEVATION D-D



SECTION A-A



SECTION B-B



SECTION C-C

Omit cutoff wall at end of box and under wingwall footing when apron is used.
The apron quantities shown in the tables take into consideration the cutoff walls being omitted along outlet headwall and shall be used on new box culverts only.

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (1 & 2 of 5). For Apron Dimensions and Quantities see SD 6.11 (2 to 4).

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SJM	2-12
2			
3			
4			

DESIGN APPROVED: Shafi U. Hasan

APPROVED FOR DISTRIBUTION: Jean A. Nehme

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
OUTLET APRON DETAILS

ROUTE | PROJECT NO. | FA NO. | DRAWING NO. SD 6.11 (1 of 4)

LOCATION | SHEET NO. OF

DIMENSIONS

Span	Hgt.	0° Skew			5° Skew					10° Skew					15° Skew					20° Skew				25° Skew				30° Skew				35° Skew				40° Skew				45° Skew			
		A	B	C	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
6'	3'	9'-10⅞	4'-8¼	3'-7¼	10'-0⅝	4'-8½	2'-8¼	4'-8¾	10'-1¾	10'-1¼	4'-9⅛	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	4'-10⅛	10⅝"	6'-11	9'-10½	10'-0	4'-11¾	8'-2⅝	9'-9¼	9'-0	5'-2⅝	9'-6½	9'-6½	8'-6	5'-6⅜	10'-11⅜	9'-2¼	7'-6	5'-10⅞	12'-4⅞	8'-8¼	7'-0	6'-4½	14'-4½	8'-3⅝	7'-0	6'-11⅞	16'-6⅛	7'-8⅜
	4'	12'-3⅛	4'-8¼	4'-5½	12'-5½	4'-8½	3'-4⅛	5'-9½	12'-5	12'-6⅞	4'-9⅛	2'-2⅝	6'-11¼	12'-0⅛	12'-1	4'-10⅛	1'-0⅝	8'-4⅛	11'-11	12'-0	4'-11¾	9'-9¾	11'-8¼	11'-0	5'-2⅝	11'-3¾	11'-3¾	10'-6	5'-6⅜	13'-2⅞	11'-1⅜	9'-6	5'-10⅞	14'-10⅜	10'-4⅞	9'-0	6'-4½	16'-11⅝	9'-9⅝	8'-6	6'-11⅛	19'-8⅛	9'-2⅛
	5'	14'-7¼	4'-8¼	5'-3⅜	14'-10½	4'-8½	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	4'-9⅛	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	4'-10⅛	1'-3¼	9'-9⅜	13'-11⅝	14'-6	4'-11¾	11'-8⅞	13'-11⅞	13'-6	5'-2⅝	13'-5¼	13'-5¼	12'-6	5'-6⅜	15'-6½	13'-0½	11'-6	5'-10⅞	17'-8¾	12'-5	10'-6	6'-4½	20'-0	11'-6⅝	10'-0	6'-11⅛	22'-10¼	10'-7⅞
	6'	16'-11½	4'-8¼	6'-2⅛	16'-9¾	4'-8½	4'-6	7'-10⅞	16'-11⅜	17'-0	4'-9⅛	3'-0	9'-8¼	16'-9¼	17'-0⅜	4'-10⅛	1'-5⅞	11'-6	16'-5⅞	17'-0	4'-11¾	13'-4⅞	15'-10⅞	15'-6	5'-2⅝	15'-6⅝	15'-6⅝	14'-6	5'-6⅜	17'-10⅛	14'-11⅝	13'-6	5'-10⅞	20'-2¼	14'-1⅝	12'-6	6'-4½	23'-0⅜	13'-3⅝	12'-0	6'-11⅞	26'-0¼	12'-1⅝
	7'	19'-3⅝	4'-8¼	7'-0⅜	19'-2⅞	4'-8½	5'-1⅞	8'-11½	19'-2½	19'-5⅝	4'-9⅛	3'-5½	10'-11¼	18'-11¼	19'-6⅜	4'-10⅛	1'-8½	12'-11¼	18'-5⅝	19'-6	4'-11¾	15'-3¼	18'-2⅜	17'-6	5'-2⅝	17'-8⅛	17'-8⅛	16'-6	5'-6⅜	20'-1⅝	16'-10¾	15'-0	5'-10⅞	22'-7¾	15'-10¼	14'-0	6'-4½	26'-0¾	15'-0⅝	13'-6	6'-11⅛	29'-2⅜	13'-7⅜
8'	3'	9'-10⅜	6'-10¼	3'-7¼	10'-0⅝	6'-10½	2'-8¼	4'-8¾	10'-1¾	10'-1¼	6'-11½	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	7'-1⅛	10⅝"	6'-11	9'-10½	10'-0	7'-3⅜	8'-2⅝	9'-9¼	9'-0	7'-7⅛	9'-6½	9'-6½	8'-6	8'-0⅜	10'-11⅜	9'-2¼	7'-6	8'-6⅝	12'-4⅞	8'-8¼	7'-0	9'-2⅜	14'-4½	8'-3⅝	7'-0	9'-11⅞	16'-6⅛	7'-8⅜
	4'	12'-3⅛	6'-10¼	4'-5½	12'-5½	6'-10½	3'-4⅛	5'-9½	12'-5	12'-6⅞	6'-11½	2'-2⅝	6'-11¼	12'-0⅛	12'-1	7'-1⅛	1'-0⅝	8'-4⅛	11'-11	12'-0	7'-3⅜	9'-9¾	11'-8¼	11'-0	7'-7⅛	11'-3¾	11'-3¾	10'-6	8'-0⅜	13'-2⅞	11'-1⅜	9'-6	8'-6⅝	14'-10⅜	10'-4⅞	9'-0	9'-2⅜	16'-11⅝	9'-9⅝	8'-6	9'-11⅞	19'-8⅛	9'-2⅛
	5'	14'-7¼	6'-10¼	5'-3⅜	14'-10½	6'-10½	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	6'-11½	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	7'-1⅛	1'-3¼	9'-9⅜	13'-11⅝	14'-6	7'-3⅜	11'-8⅞	13'-11⅞	13'-6	7'-7⅛	13'-5¼	13'-5¼	12'-6	8'-0⅜	15'-6½	13'-0½	11'-6	8'-6⅝	17'-8¾	12'-5	10'-6	9'-2⅜	20'-0	11'-6⅝	10'-0	9'-11⅞	22'-10¼	10'-7⅛
	6'	16'-11½	6'-10¼	6'-2⅛	16'-9¾	6'-10½	4'-6	7'-10⅞	16'-11⅜	17'-0	6'-11½	3'-0	9'-8¼	16'-9¼	17'-0⅜	7'-1⅛	1'-5⅞	11'-6	16'-5⅞	17'-0	7'-3⅜	13'-4⅞	15'-10⅞	15'-6	7'-7⅛	15'-6⅝	15'-6⅝	14'-6	8'-0⅜	17'-10⅛	14'-11⅝	13'-6	8'-6⅝	20'-2¼	14'-1⅝	12'-6	9'-2⅜	23'-0⅜	13'-3⅝	12'-0	9'-11⅞	26'-0¼	12'-1⅝
	7'	19'-3⅝	6'-10¼	7'-0⅜	19'-2⅞	6'-10½	5'-1⅞	8'-11½	19'-2½	19'-5⅝	6'-11½	3'-5½	10'-11¼	18'-11¼	19'-6⅜	7'-1⅛	1'-8½	12'-11¼	18'-5⅝	19'-6	7'-3⅜	15'-3¼	18'-2⅜	17'-6	7'-7⅛	17'-8⅛	17'-8⅛	16'-6	8'-0⅜	20'-1⅝	16'-10¾	15'-0	8'-6⅝	22'-7¾	15'-10¼	14'-0	9'-2⅜	26'-0¾	15'-0⅝	13'-6	9'-11⅞	29'-2⅜	13'-7⅜
	8'	21'-9⅞	5'-9½	7'-11⅜	21'-9¼	5'-9¾	5'-10	10'-1⅜	21'-8¼	22'-0⅛	5'-10½	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	5'-11¾	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	6'-1½	17'-1¾	20'-5¼	20'-0	6'-4⅞	19'-9⅝	19'-9⅝	18'-6	6'-9	22'-10¾	19'-2½	17'-0	7'-2⅛	26'-1⅞	18'-3¼	16'-0	7'-8⅜	29'-5	16'-11¾	15'-0	8'-3¾	33'-9½	15'-9⅛
10'	3'	9'-10⅜	9'-0¼	3'-7¼	10'-0⅝	9'-0⅝	2'-8¼	4'-8¾	10'-1¾	10'-1¼	9'-1⅞	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	9'-4	10⅝"	6'-11	9'-10½	10'-0	9'-7	8'-2⅝	9'-9¼	9'-0	10'-0	9'-6½	9'-6½	8'-6	10'-6⅜	10'-11⅜	9'-2¼	7'-6	11'-2⅛	12'-4⅞	8'-8¼	7'-0	12'-0⅜	14'-4½	8'-3⅝	7'-0	13'-0¾	16'-6⅛	7'-8⅜
	4'	12'-3⅛	9'-0¼	4'-5½	12'-5½	9'-0⅝	3'-4⅛	5'-9½	12'-5	12'-6⅞	9'-1⅞	2'-2⅝	6'-11¼	12'-0⅛	12'-1	9'-4	1'-0⅝	8'-4⅛	11'-11	12'-0	9'-7	9'-9¾	11'-8¼	11'-0	10'-0	11'-3¾	11'-3¾	10'-6	10'-6⅜	13'-2⅞	11'-1⅜	9'-6	11'-2⅛	14'-10⅜	10'-4⅞	9'-0	12'-0⅜	16'-11⅝	9'-9⅝	8'-6	13'-0¾	19'-8⅛	9'-2⅛
	5'	14'-7¼	9'-0¼	5'-3⅜	14'-10½	9'-0⅝	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	9'-1⅞	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	9'-4	1'-3¼	9'-9⅜	13'-11⅝	14'-6	9'-7	11'-8⅞	13'-11⅞	13'-6	10'-0	13'-5¼	13'-5¼	12'-6	10'-6⅜	15'-6½	13'-0½	11'-6	11'-2⅛	17'-8¾	12'-5	10'-6	12'-0⅜	20'-0	11'-6⅝	10'-0	13'-0¾	22'-10¼	10'-7⅛
	6'	16'-11½	9'-0¼	6'-2⅛	16'-9¾	9'-0⅝	4'-6	7'-10⅞	16'-11⅜	17'-0	9'-1⅞	3'-0	9'-8¼	16'-9¼	17'-0⅜	9'-4	1'-5⅞	11'-6	16'-5⅞	17'-0	9'-7	13'-4⅞	15'-10⅞	15'-6	10'-0	15'-6⅝	15'-6⅝	14'-6	10'-6⅜	17'-10⅛	14'-11⅝	13'-6	11'-2⅛	20'-2¼	14'-1⅝	12'-6	12'-0⅜	23'-0⅜	13'-3⅝	12'-0	13'-0¾	26'-0¼	12'-1⅝
	7'	19'-3⅝	9'-0¼	7'-0⅜	19'-2⅞	9'-0⅝	5'-1⅞	8'-11½	19'-2½	19'-5⅝	9'-1⅞	3'-5½	10'-11¼	18'-11¼	19'-6⅜	9'-4	1'-8½	12'-11¼	18'-5⅝	19'-6	9'-7	15'-3¼	18'-2⅜	17'-6	10'-0	17'-8⅛	17'-8⅛	16'-6	10'-6⅜	20'-1⅝	16'-10¾	15'-0	11'-2⅛	22'-7¾	15'-10¼	14'-0	12'-0⅜	26'-0¾	15'-0⅝	13'-6	13'-0¾	29'-2⅜	13'-7⅜
	8'	21'-9⅞	7'-11½	7'-11⅜	21'-9¼	7'-11¾	5'-10	10'-1⅜	21'-8¼	22'-0⅛	8'-0⅝	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	8'-2⅝	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	8'-5¼	17'-1¾	20'-5¼	20'-0	8'-9½	19'-9⅝	19'-9⅝	18'-6	9'-3	22'-10¾	19'-2½	17'-0	9'-9⅞	26'-1⅞	18'-3¼	16'-0	10'-6⅜	29'-5	16'-11¾	15'-0	11'-4½	33'-9½	15'-9⅛
	9'	24'-2½	7'-9⅜	8'-9¾	24'-2½	7'-9⅝	6'-5⅞	11'-2¼	23'-11⅞	24'-0	7'-10¾	4'-2¾	13'-7¼	23'-6¾	24'-1⅛	8'-0⅜	2'-1¼	16'-3⅞	23'-3¾	24'-0	8'-2⅞	19'-1½	22'-9½	22'-0	8'-7⅛	21'-11⅞	21'-11⅞	20'-6	9'-0½	25'-3¼	21'-2⅜	19'-0	9'-7⅛	28'-7¾	20'-0⅜	17'-6	10'-3⅜	32'-6⅞	18'-9⅝	17'-0	11'-1½	37'-1½	17'-3¾
	10'	26'-7	7'-7¼	9'-8⅛	26'-7¾	7'-7½	7'-1⅝	12'-3⅛	26'-3½	26'-5¾	7'-8½	4'-8	14'-10½	25'-9⅞	26'-7	8'-1⅞	2'-3⅝	17'-9½	25'-4⅞	26'-6	8'-5⅞	20'-9¼	24'-9⅞	24'-0	8'-4¾	24'-1⅞	24'-1⅞	22'-6	8'-9⅞	27'-7¾	23'-2⅝	20'-6	9'-4⅞	31'-7⅝	22'-1⅝	18'-6	10'-9¾	40'-5½	18'-10⅜
	8'	21'-9⅞	10'-3½	7'-11⅜	21'-9¼	10'-3⅞	5'-10	10'-1⅜	21'-8¼	22'-0⅛	10'-5¼	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	10'-7⅝	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	10'-11	17'-1¾	20'-5¼	20'-0	11'-4⅜	19'-9⅝	19'-9⅝	18'-6	11'-1⅛	22'-10¾	19'-2½	17'-0	12'-8⅞	26'-1⅞	18'-3¼	16'-0	13'-6⅞	29'-5	16'-11¾	15'-0	14'-8⅛	33'-9½	15'-9⅛
	9'	24'-2½	10'-1	8'-9¾	24'-2½	10'-1¾	6'-5⅞	11'-2¼	23'-11⅞	24'-0	10'-3⅛	4'-2¾	13'-7¼	23'-6¾	24'-1⅛	10'-5⅜	2'-1¼	16'-3⅞	23'-3¾	24'-0	10'-8¾	19'-1½	22'-9½	22'-0	11'-2	21'-11⅞	21'-11⅞	20'-6	11'-8⅞	25'-3¼	21'-2⅜	19'-0	12'-5⅜	28'-7¾	20'-0⅜	17'-6	13'-3⅞	32'-6⅞	18'-9⅝	17'-0	14'-4¾	37'-1½	17'-3¾
12'	10'	26'-7	9'-11¼	9'-8⅛	26'-7¾	9'-11⅝	7'-1⅝	12'-3⅛	26'-3½	26'-5¾	10'-1	4'-8	14'-10½	25'-9⅞	26'-7	10'-3⅛	2'-3⅜	17'-9½	25'-4⅞	26'-6	10'-6⅜	20'-9¼	24'-9⅞	24'-0	10'-11⅝	24'-1⅞	24'-1⅞	22'-6	11'-6¼	27'-7¾	23'-2⅝	20'-6	12'-2⅝	31'-7⅝	22'-1⅝	19'-6	13'-0⅞	35'-8¾	20'-7½	18'-6	14'-1⅜	40'-5½	18'-10⅜
	11'	28'-11½	9'-9⅞	10'-6½	29'-0⅞	9'-9½	7'-9½	13'-4	28'-7⅞	28'-11⅜	9'-10¾	5'-1¼	16'-1¾	27'-11⅝	29'-1	10'-0⅛	2'-6½	19'-3⅛	27'-6	29'-0	10'-4⅞	20'-9	27'-1¼	26'-6	10'-9⅛	26'-4⅛	26'-4⅛	24'-6	11'-3¾	30'-0⅛	25'-2¼	22'-6	11'-11⅞	34'-2	23'-11⅛	21'-0	12'-9⅞	38'-10⅝	22'-5⅜	20'-0	13'-10	43'-9⅝	20'-5⅛
	12'	31'-4	9'-7	11'-4⅞	31'-6⅞	9'-7⅝	8'-5⅜	14'-4⅞	30'-10¾	31'-5⅛	9'-8⅝	5'-6½	17'-8⅛	30'-7⅜	31'-1	9'-10¾	2'-8⅝	21'-0⅛	30'-0⅛	31'-0	10'-1¾	24'-4¾	29'-0⅞	28'-6	10'-6¾	28'-2	28'-2	26'-6	11'-1⅞	32'-4⅝	27'-2⅛	24'-6	11'-9⅛	36'-8¾	25'-8⅝	23'-0	12'-6⅞	41'-7¼	24'-0¼	22'-0	13'-6⅝	47'-7	22'-2¼

QUANTITIES

Span	Hgt.	0° Skew				5° Skew				10° Skew				15° Skew				20° Skew				25° Skew				30° Skew				35° Skew				40° Skew				45° Skew			
		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.	
		lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs
6'	3'	0.41	1.46	46	122	0.42	1.49	48	124	0.42	1.49	42	124	0.45	1.52	52	126	0.50	1.55	57	128	0.88	1.52	86	128	1.23	1.53	113	129	1.59	1.51	140	128	1.97	1.54	173	132	2.36	1.62	206	139
	4'	0.56	1.75	69	143	0.57	1.78	72	145	0.58	1.78	71	146	0.62	1.78	75	146	0.67	1.81	79	148	1.11	1.78	112	147	1.59	1.81	150	150	2.00	1.79	181	149	2.45	1.82	217	152	2.96	1.88	260	158
	5'	0.72	2.04	98	165	0.75	2.07	101	167	0.77	2.07	103	167	0.78	2.07	102	167	0.97	2.12	112	172	1.41	2.10	150	170	1.97	2.09	194	171	2.51	2.09	236	171	3.01	2.08	275	172	3.59	2.14	320	177
	6'	1.78	3.13	192	243	1.79	3.12	193	243	1.84	3.16	198	246	1.90	3.20	202	249	1.96	3.24	206	252	2.62	3.19	256	249	3.27	3.19	305	249	3.89	3.19	351	250	4.55	3.22	403	253	5.27	3.30	454	260
	7'	1.28	2.62	172	208	1.29	2.62	173	208	1.34	2.65	176	210	1.39	2.67	179	212	1.50	2.73	188	217	2.25	2.66	245	212	2.99	2.65	300	212	3.65	2.61	349	210	4.47	2.65	412	214	5.30	2.70	463	219
8'	3'	0.93	1.98	85	158	0.95	2.02	88	161	0.96	2.03	88	161	1.00	2.07	93	164	1.06	2.11	98	167	1.43	2.07	126	166	1.79	2.09	154	167	2.14	2.06	180	166	2.54	2.11	215	171	2.96	2.22	251	180
	4'	1.18	2.36	115	186	1.20	2.40	119	189	1.21	2.42	118	189	1.25	2.40	121	190	1.31	2.44	127	193	1.75	2.41	159	191	2.24	2.46	198	195	2.65	2.43	288	193	3.11	2.48	266	198	3.65	2.56	311	205
	5'	1.44	2.75	151	214	1.47	2.78	155	217	1.50	2.78	157	217	1.51	2.78	156	218	1.62	2.86	167	224	2.15	2.83	205	221	2.71	2.83	249	222	3.25	2.83	291	223	3.76	2.82	330	224	4.36	2.90	377	230
	6'	1.78	3.13	192	243	1.79	3.12	193	243	1.84	3.16	198	246	1.90	3.20	202	249	1.96	3.24	206	252	2.62	3.19	256	249	3.27	3.19	305	249	3.89	3.19	351	250	4.55	3.22	403	253	5.27	3.30	454	260
	7'	2.19	3.51	239	271	2.19	3.51	239	271	2.25	3.54	244	274	2.31	3.58	247	277	2.44	3.65	258	283	3.17	3.56	314	276	3.92	3.56	368	277	4.56	3.51	416	274	5.41	3.56	481	279	6.26	3.64	534	285
	8'	2.77	3.51	239	271	2.19	3.51	239	271	2.25	3.54	244	274	2.31	3.58	247	277	2.44	3.65	258	283	3.17	3.56	314	276	3.92	3.56	368	277	4.56	3.51	467	306	6.50	3.98	528	310	7.54	4.06	603	316
10'	3'	1.52	2.54	128	197	1.55	2.59	132	200	1.56	2.60	133	201	1.61	2.65	138	205	1.68	2.70	145	206	2.05	2.66	172	206	2.42	2.69	201	209	2.76	2.65	227	207	3.18	2.72	262	212	3.64	2.86	301	224
	4'	1.87	3.02	166	232	1.90	3.07	171	236	1.91	3.07	170	236	1.95	3.07	174	236	2.02	3.12	180	240	2.46	3.08	212	236	2.96	3.14	252	243	3.36	3.11	282	241	3.85	3.18	321	247	4.41	3.29	368	255
	5'	2.23	3.49	210	267	2.27	3.54	214	271	2.30	3.54	216	271	2.31	3.54	216	271	2.44	3.64	228	279	2.96	3.60	266	276	3.53	3.60	310	277	4.08	3.61	352	278	4.59	3.61	392	279	5.21	3.71	441	287
	6'	2.67	3.97	258	303	2.68	3.97	259	303	2.74	4.01	265	306	2.81	4.06	270	310	2.89	4.11	275	314	3.53	4.06	324	310	4.19	4.06	374	311	4.81	4.07	420	312	5.48	4.11	473	315	6.23	4.21	525	324
	7'	3.18	4.44	313	338	3.19	4.44	313	338	3.25	4.49	319	341	3.33	4.54	323	345	3.48	4.63	335	352	4.19	4.52	389	344	4.93	4.52	444	345	5.57	4.46	491	341	6.43	4.54	557	347	7.31	4.64	612	356
	8'	3.87	4.95	332	376	3.88	4.95	333	376	3.95	5.00	338	379	3.99	4.99	338	379	4.16	5.08	351	386	5.02	5.03	415	383	5.93	5.02	486	382	6.77	5.01	551	382	7.63	5.06	613	386	8.69	5.16	690	394
	9'	4.48	5.43	387	411	4.49	5.43	388	411	4.51	5.43	388	411	4.68	5.52	400	418	4.87	5.60	412	425	5.79	5.50	482	417	6.80	5.49	560	417	7.74	5.48	630	417	8.73	5.49	704	418	10.04	5.67	789	432
	10'	5.15	5.91	447	447	5.16	5.91	447	447	5.18	5.91	446	447	5.36	6.00	458	454	5.55	6.08	468	461	6.62	5.97	554	452	7.75	5.96	639	452	8.81	5.92	723	449	10.05	6.00	806	456	11.34	6.10	889	465
12'	8'	5.01	6.04	414	450	5.02	6.03	415	450	5.10	6.09	420	454	5.14	6.09	421	454	5.33	6.20	435	463	6.19	6.14	499	458	7.10	6.14	570	458	7.94	6.13	635	457	8.82	6.19	698	462	9.91	6.33	776	472
	9'	5.72	6.61	477	493	5.73	6.61	477	493	5.75	6.61	477	493	5.94	6.72	492	501	6.15	6.82	505	509	7.05	6.70	573	500	8.07	6.70	651	499	9.01	6.69	635	457	10.01	6.72	795	501	11.37	6.94	884	518
	10'	6.49	7.19	544	536	6.50	7.19	544	536	6.52	7.18	543	536	6.72	7.29	557	544	6.93	7.40	569	552	7.99	7.26	653	541	9.11	7.25	737	541	10.17	7.22	821	538	11.44	7.32	905	546	12.76	7.46	991	557
	11'	7.33	7.76	615	579	7.33	7.76	615	578	7.35	7.76	614	578	7.56	7.87	626	587	7.89	8.02	648	598	9.07	7.89	741	588	10.23	7.81	829	582	11.44	7.78	919	580	12.78	7.85	1016	585	14.23	7.98	1103	595
	12'	8.22	8.34	692	621	8.23	8.34	691	621	8.35	8.39	699	625	8.49	8.43	707	628	8.72	8.54	717	636	10.02	8.40	818	626	11.49	8.37	927	624	12.77	8.34	1023	622	14.26	8.41	1124	627	16.08	8.16	1245	643

Δc = Apron concrete quantity per additional barrel. Δs = Apron steel quantity per additional barrel.

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the Inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	S.J.U.H.	2-12
2	Added 3'-4.5' height for existing box extensions only	D.B.B.	5-15
3			
4			

DESIGN APPROVED

APPROVED FOR DISTRIBUTION

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

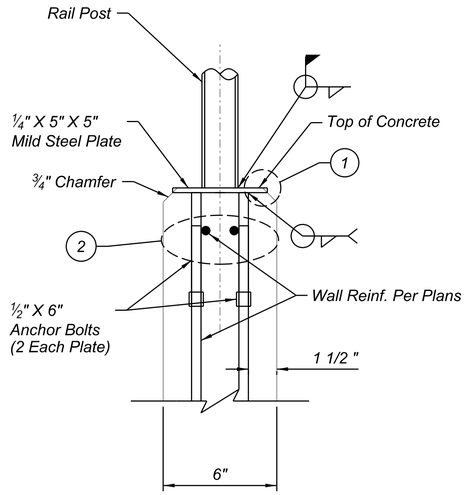
REINFORCED CONCRETE BOX CULVERTS
OUTLET APRON - DIMENSIONS & QUANTITIES (4 : 1 SLOPE)

ROUTE | PROJECT NO. | FA NO. | DRAWING NO. SD 6.11 (3 of 4)

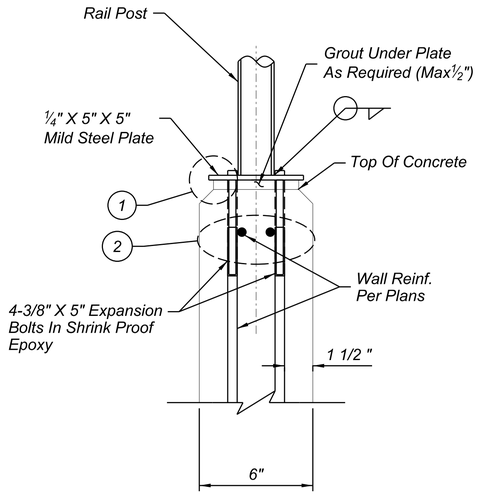
LOCATION | SHEET NO. OF

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	X	XXX	XX	

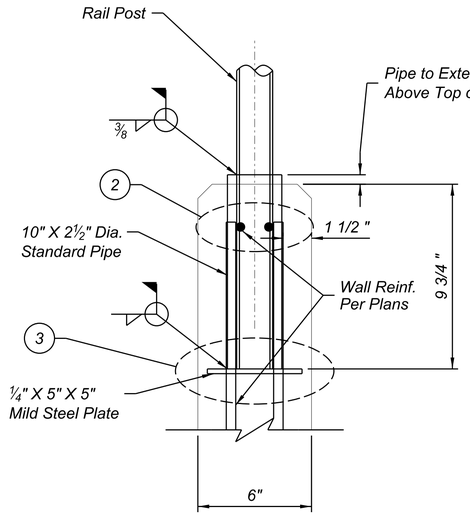
MAG DETAIL 145 EXISTING ISSUES



TYPE 1- (6" Wall)
Scale: 1"=0'-4"



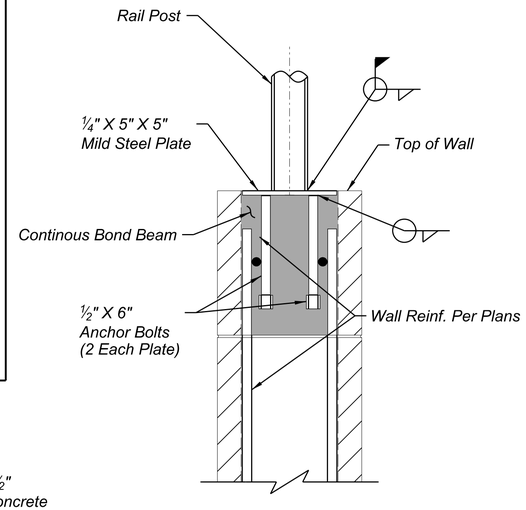
TYPE 2- (6" Wall)
Scale: 1"=0'-4"



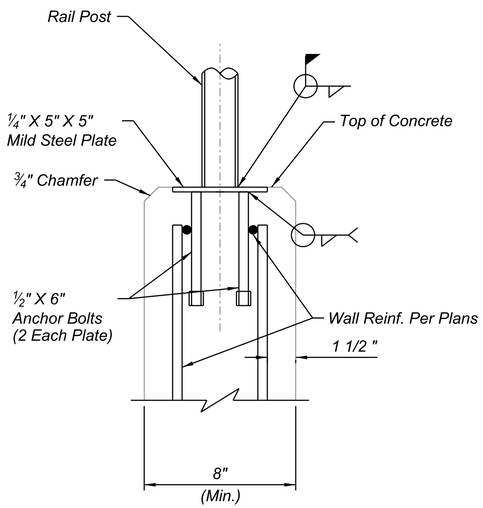
TYPE 3- (6" Wall)
Scale: 1"=0'-4"

STRUCTURAL PROBLEMS

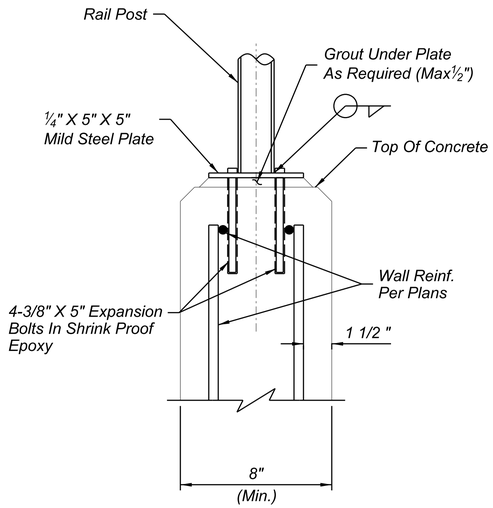
1. STEEL PLATE CORNER EXPOSED
2. CONFLICTS WITH NOTE 6. "THE EMBEDMENT FOR ANCHOR TYPES 1,2, & 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE".
3. LESS THAN MINIMUM REQUIRED CONCRETE COVER.



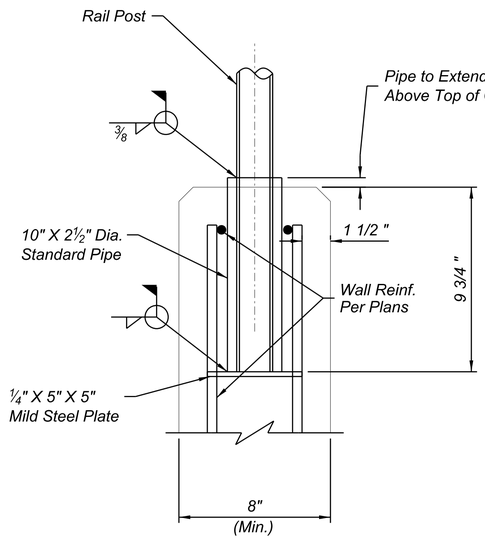
TYPE 5- (8" CMU Wall)
Scale: 1"=0'-4"



TYPE 1- (8" Wall)
Scale: 1"=0'-4"



TYPE 2- (8" Wall)
Scale: 1"=0'-4"



TYPE 3- (8" Wall)
Scale: 1"=0'-4"

MAG DETAIL 145 PROPOSED

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

MAG DETAIL 145

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	A.N. ENGINEER	XX/XX/XX
	DRAWN	A. TECHNICIAN	XX/XX/XX
	CHECKED	A.N. ENGINEER	XX/XX/XX

XXX

SHEET XXX OF XX

TRACS NO.

Contact Arizona 811 Two Working Days Before You Dig
ARIZONA811 BLUE STAKE, INC.
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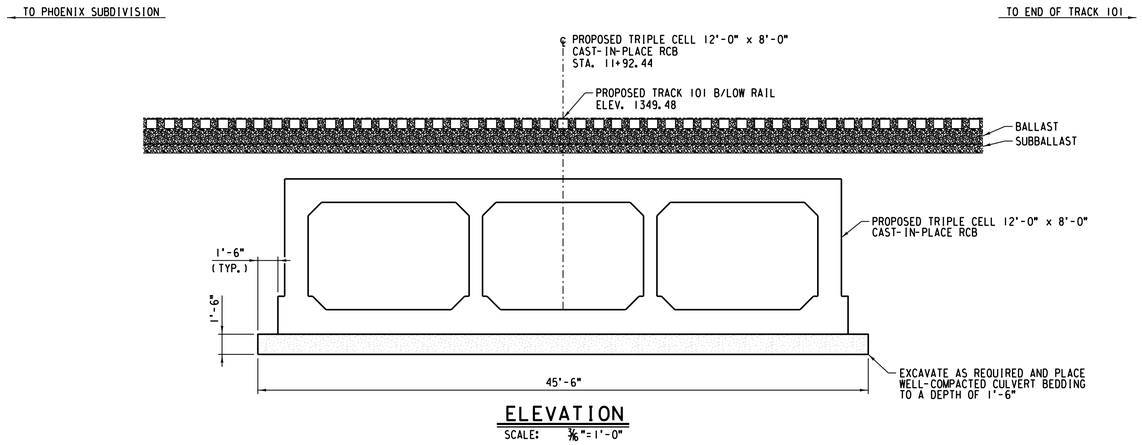
F:\Safety Rail\SD_Safety Rail Details.dgn

DESIGN SHEET



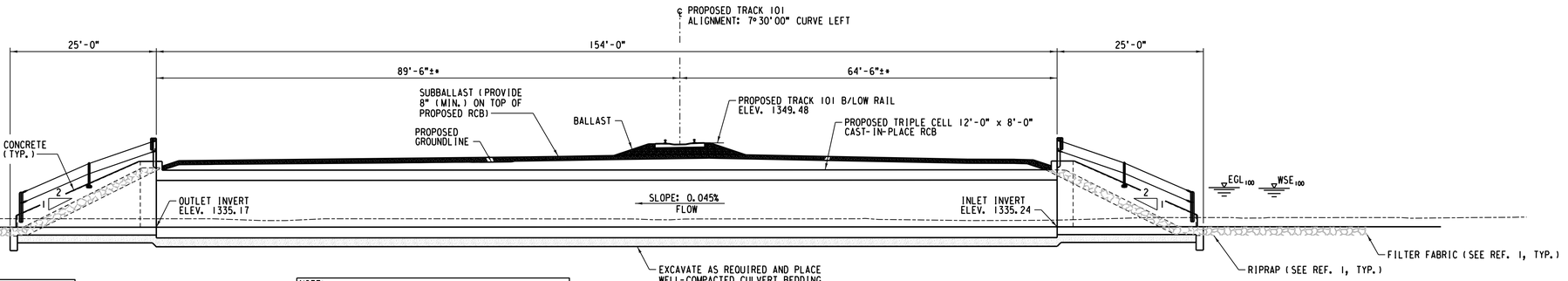
ELEVATION

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

DRAWING SCHEDULE

	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123076	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
	S2	123076	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
	S3	123076	END TREATMENT FRAMING DETAILS	DESIGN
	S4	123076	END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)	DESIGN
	S5	123076	END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)	DESIGN
	S6	123076	HANDRAIL DETAILS	DESIGN
	G1	680200	GENERAL NOTES	STANDARD
	G2	680200	GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS	STANDARD
	G5	680200	CONSTRUCTION SEQUENCE	STANDARD
	MC27	680200	12'-0"x8'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 3)	STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P016 OF 037 T006 OF 012 X036 OF 143 X037 OF 143 EC006 OF 036	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN



MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

NOTE:
SLOPES SHOWN ACCOUNT FOR CULVERT SKEW/ORIENTATION.

RIGHT

CROSS SECTION

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

WSE_{100} = 1341.82
EGL_{100} = 1341.94
VEL_{100} = 3.79fps

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
154	FT	12'-0" X 8'-0" TRIPLE-CELL BOX CULVERT (BARREL ONLY) (PER STD. PLAN NO. 680200, SHT. MC27)		CONSTRUCTOR
164	CU. YD.	4000 PSI CONCRETE FOR END TREATMENTS ONLY (PER DETAILS, SHEET. NOS. S3-S5, AND NOTES, PER STD. DWG. 680200 SHT. G1)		
1	LOT	REINFORCING STEEL FOR END TREATMENTS ONLY (PER SCHEDULE, SHEET NO. S5)		
2	EA.	HANDRAIL POST HP-25R (PER STD. DWG. 680160 SHT. H1)	513-2077	
2	EA.	HANDRAIL POST HP-25L (PER STD. DWG. 680160 SHT. H1)	513-2075	
8	EA.	HANDRAIL POST HP-26 (PER STD. DWG. 680160 SHT. H1)	513-2080	
4	EA.	HANDRAIL POST HP-27 (PER STD. DWG. 680160 SHT. H1)	513-2085	
43	EA.	3/4" DIA. x 14" A307 HEAVY HEX BOLT, TYPE 1 WITH HEAVY ELASTIC LOCK NUT (MIL-N-322581) AND FLAT CIRCULAR WASHER (ASTM F436), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED		
27	EA.	3/8" EYE TYPE STRANDVISE CABLE GRIP CARTRIDGE (MACLEAN POWER PRODUCTS NO. 5102)	098-6081	
400	LIN. FT.	3/8" NOMINAL DIAMETER WIRE ROPE, 7 WIRE, GALVANIZED STEEL STRAND, SIEMENS MARTINS GRADE, A-COATING	050-5394	
27	EA.	1/2" DIA. EYEBOLT, 2" LONG SHANK WITH 1" I.D. EYE, PLAIN PATTERN GALVANIZED DROP FORGED STEEL (ASTM A489), WITH ZINC PLATED HEX NYLON INSERT LOCKNUT (ASTM A563) AND ZINC PLATED FLAT CIRCULAR WASHER (ASTM F436)	130-0370	
19	EA.	GALVANIZED MALLEABLE IRON U-BOLT WITH 2 ELASTIC LOCKNUTS (MIL-N-25027), ZINC PLATED, FOR 3/8" DIA. WIRE ROPE	050-6370	
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP (PER REF. 1)		
1	LOT	FILTER FABRIC (PER REF. 1)		
520	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
1260	CU. YD.	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)**		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.
FILL QUANTITY INCLUDES 30% FOR COMPACTION.

**NOTE:
FILL QUANTITY ON THESE PLANS INCLUDES EXCESS FILL REQUIRED FOR ADDITIONAL GRADING TO MEET NECESSARY COVER REQUIREMENTS ON SKEWED RCB.

DESIGN NOTES

RIGHT-OF-WAY

1. Right-of-way: Varies, per Ref. 1.

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 12): Elev. 1345.52, NAVD 1988, 1/2" rebar located in ground East of proposed Track 101 Culvert No. 0.23, 71.58' left of existing Phoenix Sub. Main Track centerline, Sta. 1498+70.62.

   TBM 2 (Olsson CP 13): Elev. 1342.79, NAVD 1988, 1/2" rebar located in ground West of proposed Track 101 Culvert No. 0.23, 62.38' left of existing Phoenix Sub. Main Track centerline, Sta. 1491+33.87.
4. Profile: Proposed Track 101 per Ref. 1.
5. Alignment: 7°30'00" curve left.
6. Information used to prepare this drawing in addition to reference drawings:

   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. This structure has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0".
2. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

STANDARD VARIABLES:
L = 154 (FT)
NC = 3
NB = 309

TOTAL NUMBER OF BARS:
A = 618
B = 618
C = 334
D = 1236
E = 2472
F = 82
G = 128
H = 42
J = 42

LENGTH OF BARS:
P = 153'-8"
Q = 41'-2"
R = 29'-5"
S = 41'-10"
T = 63'-6"
U = 42'-5"
V = 63'-2"

FOR A LIST OF VARIABLES, SEE STD. DWG. 680200, SHT. MC27

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE ON STD. DWG. 680200 SHT. MC27 FOR LAP SPLICE REQUIREMENTS.

NOTES:
1. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
2. * MEASURED ALONG RITTENHOUSE CHANNEL CENTERLINE.
3. RCB = REINFORCED CONCRETE BOX

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

SECTION DESIGNATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 01-06-2023 ARIZONA U.S.A.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

UNION PACIFIC

DSN/CHK BY: NAS/MJH
DRAWN/CHK BY: NAS/KAS
UPRR ENGINEER: ADS
SHT NO.: S1 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 154'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oacomulting.com\fnts-na1\projects\2020\0501-1000\020-0927.40\Design\Microstation\020-0927.BUPR.Culv 0.23 Sta. 11-92.00-Pirate Ind Lead.0.23.cac.dgn

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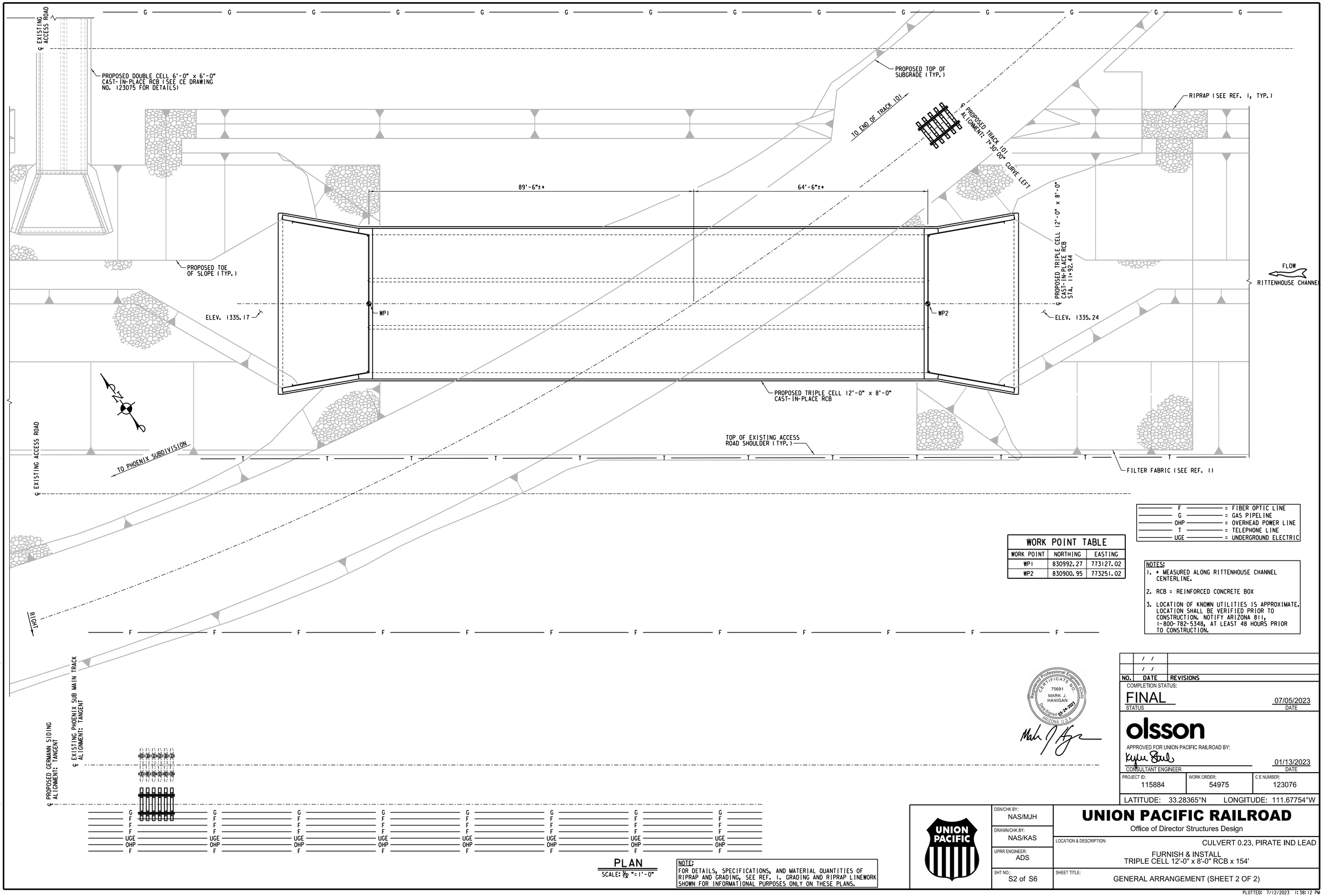
DESIGN SHEET



PLAN
SCALE: 1/20 " = 1'-0"

| = FIBER OPTIC LINE
| = GAS PIPELINE
| = OVERHEAD POWER LINE
| = TELEPHONE LINE
| = UNDERGROUND ELECTRIC

WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	830992.27	773127.02
WP2	830900.95	773251.02

NOTES:
1. * MEASURED ALONG RITTENHOUSE CHANNEL CENTERLINE.
2. RCB = REINFORCED CONCRETE BOX
3. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 12-26-2022 ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

UNION PACIFIC

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 154'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsult.com\fnts-na\projects\2020\0503.1000\020-0927\40-Design\Microstation\020-0927-RJBR\July 0.23_Sta. 11-92.00-Pirate Ind Lead_0.23.cadz.dgn

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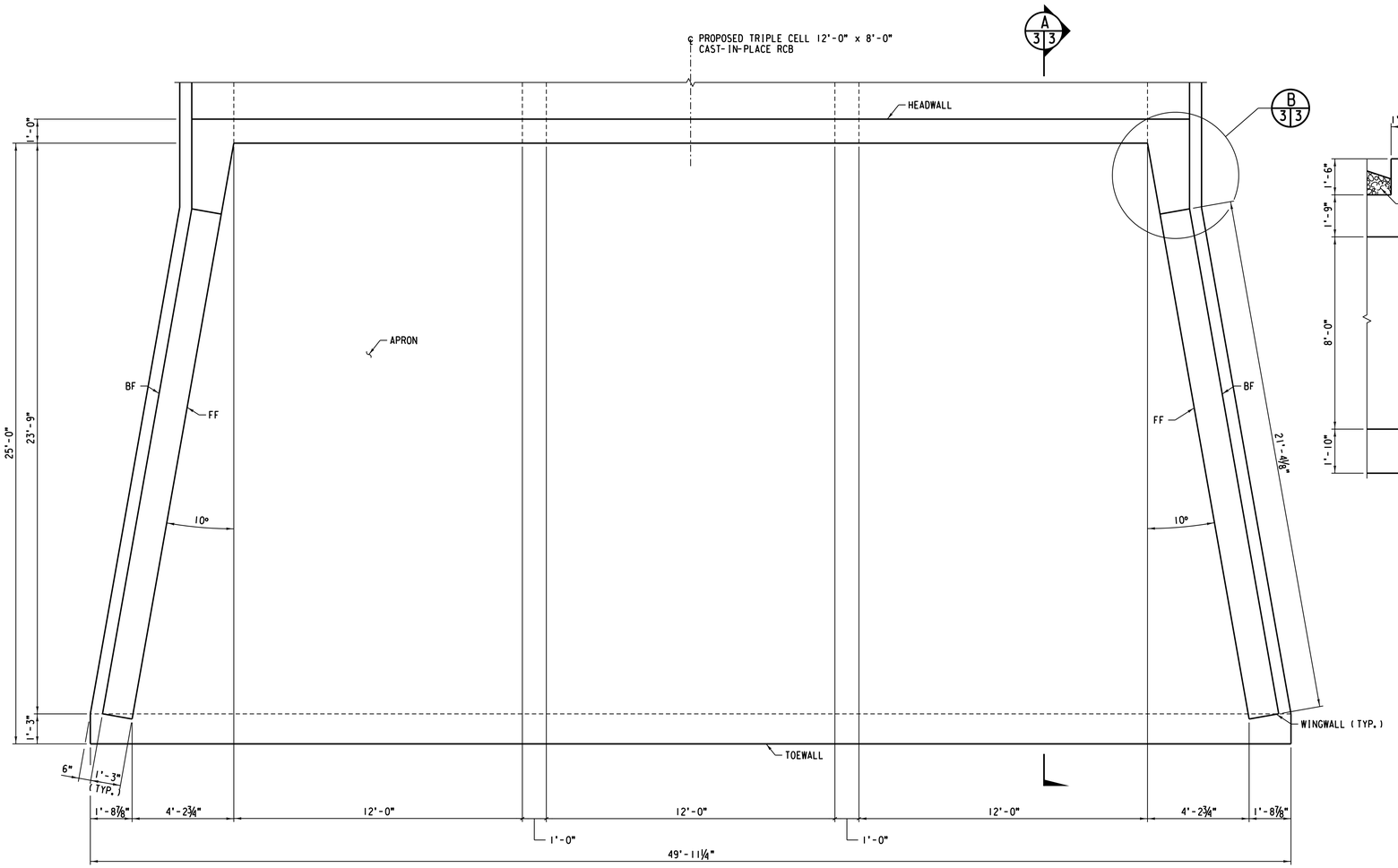
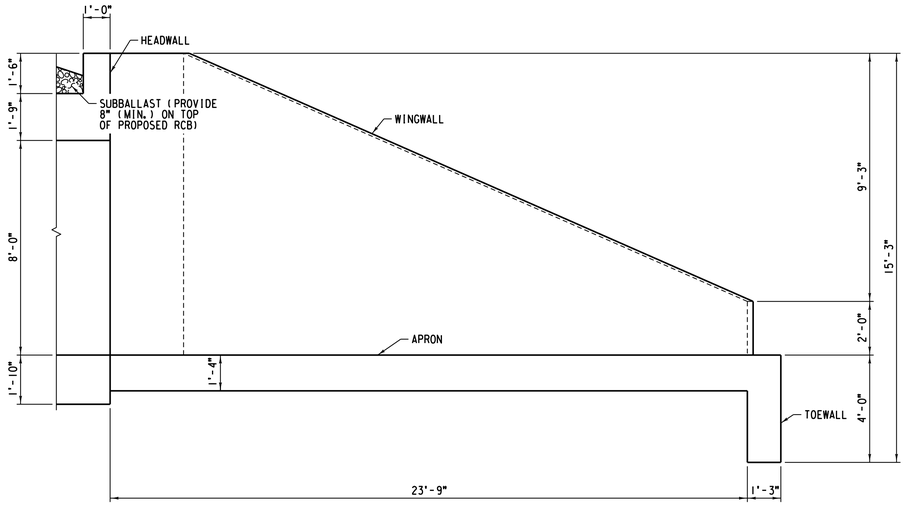
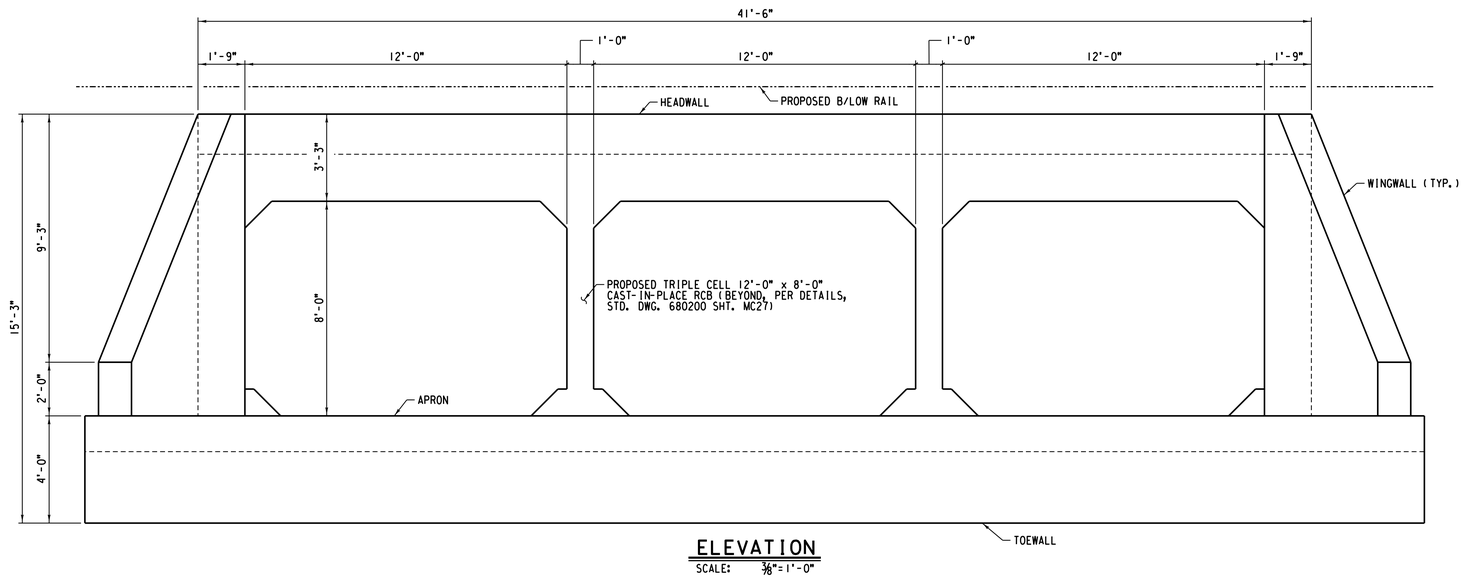
DESIGN SHEET



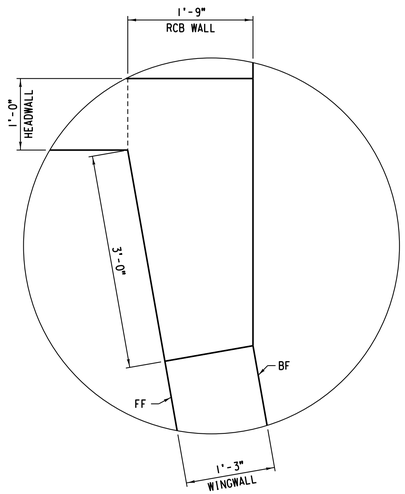
PLAN
SCALE: ⅜"=1'-0"



SECTION A 3|3
SCALE: ⅜"=1'-0"



ELEVATION
SCALE: ⅜"=1'-0"



DETAIL B 3|3
SCALE: 1"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
3. FOR END TREATMENT REINFORCING DETAILS, SEE SHEET NO. S4.
4. BF = BACK FACE
   FF = FRONT FACE
   RCB = REINFORCED CONCRETE BOX

CONCRETE PLACEMENT QUANTITIES

ITEM	UNIT	QTY.
RCB BARREL (BOTTOM SLAB)	CU. YD.	510
RCB BARREL (WALLS & TOP SLAB)	CU. YD.	651
APRON & TOEWALL	CU. YD.	126
WINGWALLS & HEADWALL	CU. YD.	38.0

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kylie Stubs
CONSULTANT ENGINEER
01/13/2023 — DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

UNION PACIFIC

DSN/CHK BY: NAS/MJH	UNION PACIFIC RAILROAD
DRAWN/CHK BY: NAS/KAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
SHT NO.: S3 of S6	FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 154'
	SHEET TITLE: END TREATMENT FRAMING DETAILS

FILE NAME: \\oa.aecomsvc.com\fnts-na1\projects\2020\0501:1000\020\0927.40\Design\Microstation\020-0927-RLBRCulv 0.23.5ta. 11-92.00\Pirate Ind Lead 0.23.cac.dgn

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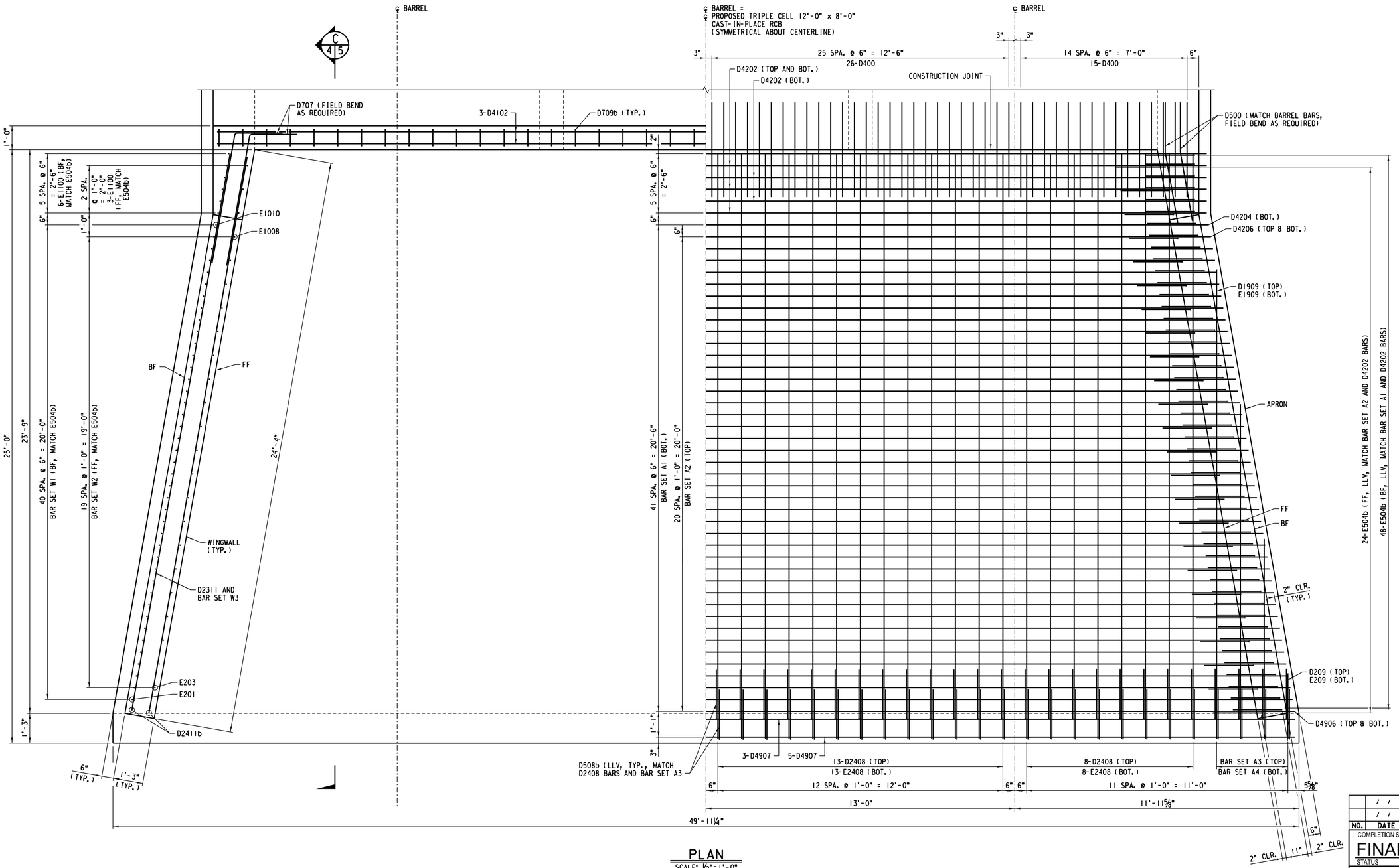
DESIGN SHEET



PLAN
SCALE: ½"=1'-0"

NOTES:
1. CONSTRUCTOR MAY SPLICE D4907 BARS WITH A 2'-9" MINIMUM LAP SPLICE IF PREFERRED.
2. FOR REINFORCING SCHEDULE, SEE SHEET NO. S5.
3. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
4. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
5. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S4 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
FURNISH & INSTALL
TRIPLE CELL 12'-0" x 8'-0" RCB x 154'

SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-nd\projects\2020\0501-1000\020-0927-40 Design\Micrositation\020-0927_RLBRCulv 0.23.Sta. 11-92.00\Pirate Ind Lead_0.23_csz.dgn

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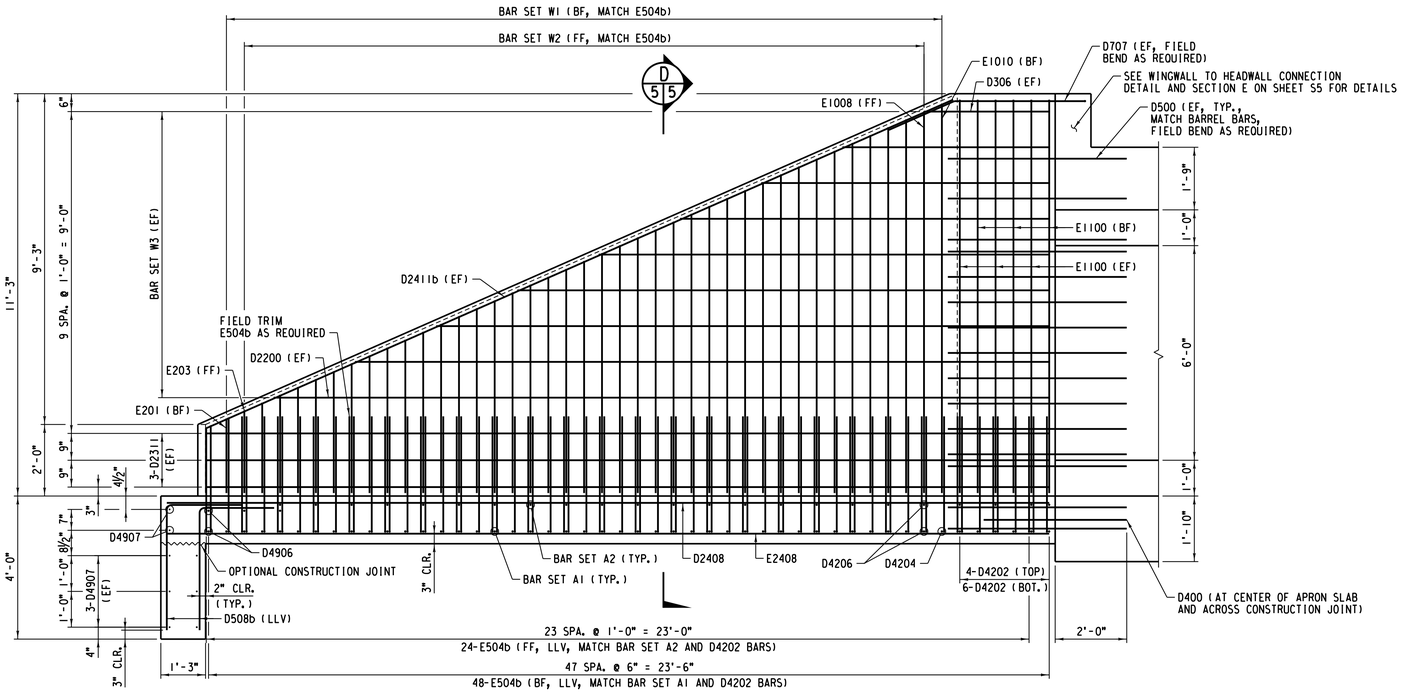
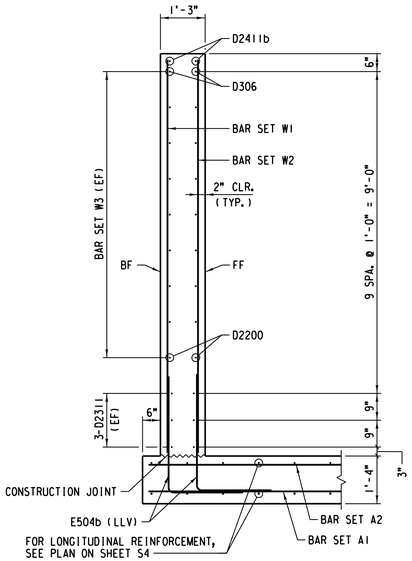


SECTION C
SCALE: ½"=1'-0"

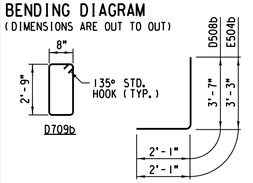


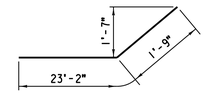
SECTION D
SCALE: ½"=1'-0"

REINFORCING SCHEDULE
(QUANTITY PER END TREATMENT)

TOTAL	MARK	SIZE	LENGTH	SHAPE
82	D400	#5	4'-0"	
60	D500	#5	5'-0"	
100	D508b	#5	5'-8"	
4	D707	#5	7'-7"	
42	D709b	#5	7'-9"	
12	D2311	#5	23'-11"	
4	D2411b	#5	24'-11"	
6	D4102	#5	41'-2"	
10	D4202	#5	42'-2"	
8	D4907	#5	49'-7"	
144	E504b	#6	5'-4"	
18	E1100	#6	11'-0"	
42	E2408	#6	24'-8"	

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



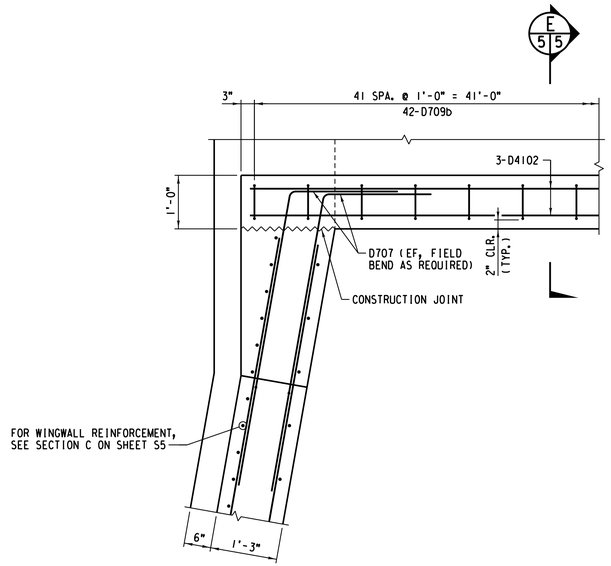


SET LIST

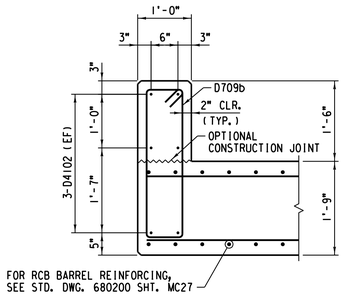
BAR SET DESIGNATION	MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE	MIN. A	MAX. A
A1	D4204-D4906	#5	42'-4"	49'-6"	2⅛"(-)	42	1		-	-
A2	D4206-D4906	#5	42'-6"	49'-6"	4¼"(-)	21	1		-	-
A3	D209-D1909	#5	2'-9"	19'-9"	5'-8"	4	2		-	-
A4	E209-E1909	#6	2'-9"	19'-9"	5'-8"	4	2		-	-
W1	E201-E1010	#6	2'-1"	10'-10"	2⅝"	41	2		-	-
W2	E203-E1008	#6	2'-3"	10'-8"	5⅜" (-)	20	2		-	-
W3	D306-D2200	#5	3'-6"	22'-0"	2'-3¾"	9	4		-	-

EST. WT. OF REINFORCING STEEL = 11,050 LB.

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.



WINGWALL TO HEADWALL CONNECTION DETAIL
SCALE: ¾"=1'-0"



SECTION E
SCALE: ¾"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC27.
3. BF = BACK FACE
   EF = EACH FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 01-24-2023 ARIZONA U.S.A.

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

UNION PACIFIC

DSN/CHK BY: NAS/MJH	UNION PACIFIC RAILROAD
DRAWN/CHK BY: NAS/KAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
SHT NO.: S5 of S6	FURNISH & INSTALL TRIPLE CELL 12'-0" x 8'-0" RCB x 154'
	SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-ndl\projects\2020\0501-1000\020-0927\40-Design\Microstation\020-0927-BJRA.U.v 0.23.Sta. 11+92.00\Pirate Ind Lead 0.23.cac.dgn

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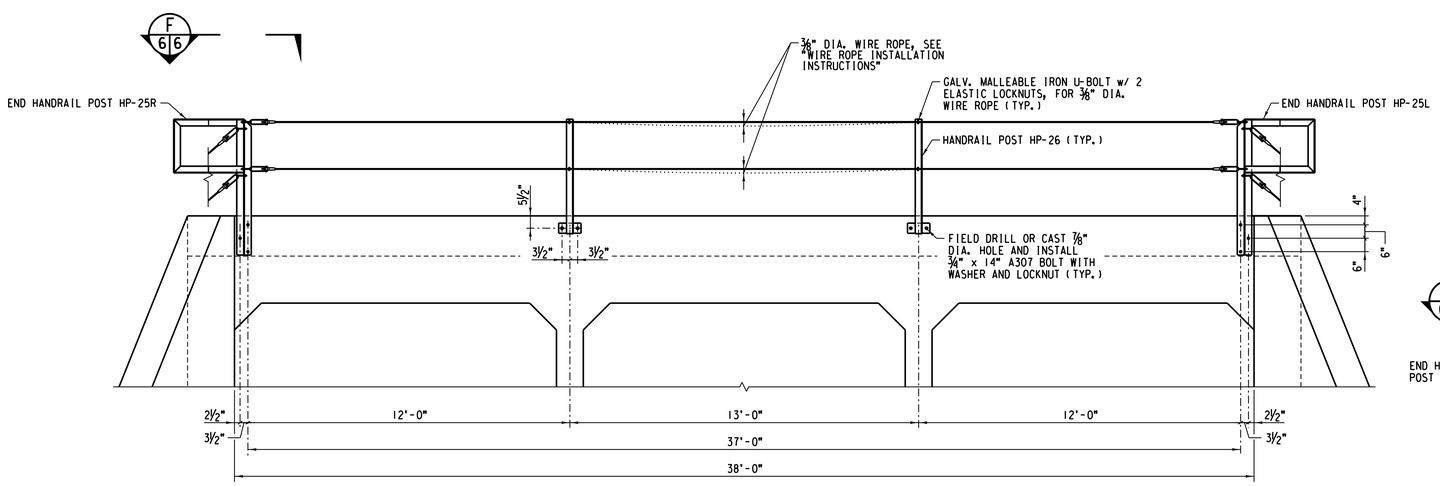
DESIGN SHEET



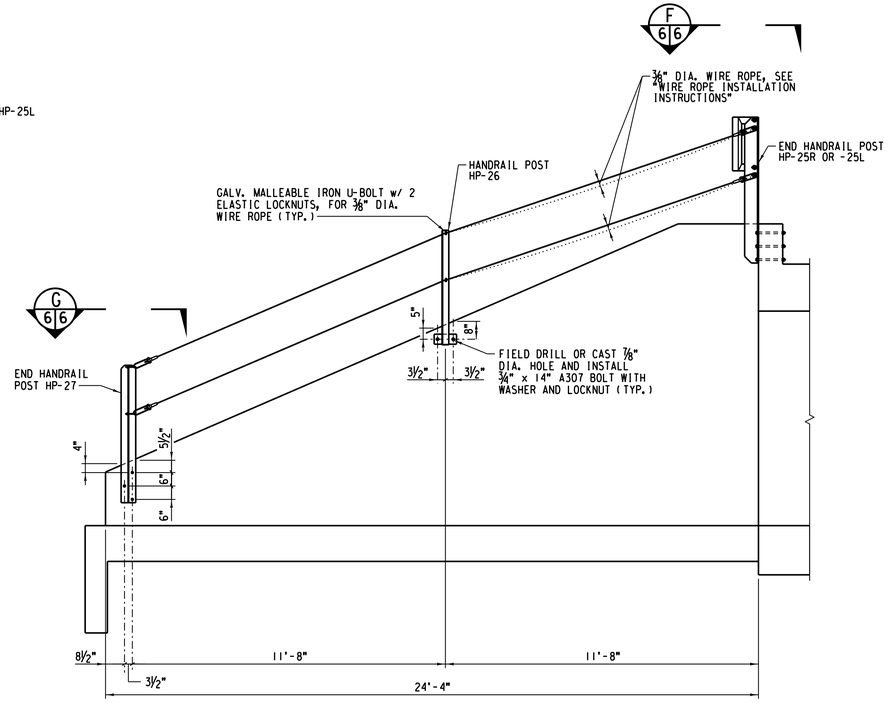
NOTE:
WINGWALL HANDRAIL NOT SHOWN FOR CLARITY.

BOX CULVERT HANDRAIL LAYOUT

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

WIRE ROPE INSTALLATION INSTRUCTIONS:

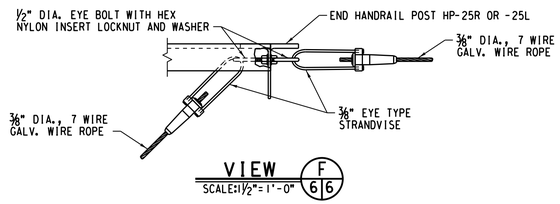
1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END HANDRAIL POST.
2. STRETCH WIRE ROPE, HANG A MINIMUM OF 10 LB. ON CABLE BETWEEN TWO POSTS AND REMOVE ALL SAG TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END HANDRAIL POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT & REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.



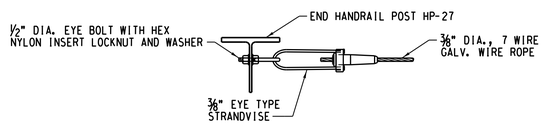
WINGWALL HANDRAIL LAYOUT

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

(LOOKING PERPENDICULAR TO FACE OF WINGWALL)



VIEW F 6 6
SCALE: 1½"=1'-0"



VIEW G 6 6
SCALE: 1½"=1'-0"

NOTES:
1. FOR HANDRAIL POST DETAILS, SEE STD. DWG. 680160 SHT. H1.
2. RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 01/13/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123076

LATITUDE: 33.28365°N LONGITUDE: 111.67754°W

UNION PACIFIC

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/KAS
UPRR ENGINEER:	ADS
SHT NO.:	S6 of S6

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.23, PIRATE IND LEAD
FURNISH & INSTALL
TRIPLE CELL 12'-0" x 8'-0" RCB x 154'

SHEET TITLE: HANDRAIL DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501-1000\020-0927-40 Design\Microstation\020-0927_RLBRO.dlv 0.23.5ta. 11-92.00\Pirate Ind Lead 0.23.cax.dgn

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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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G1

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PLOTTED: 1/3/2020 3:30:45 PM

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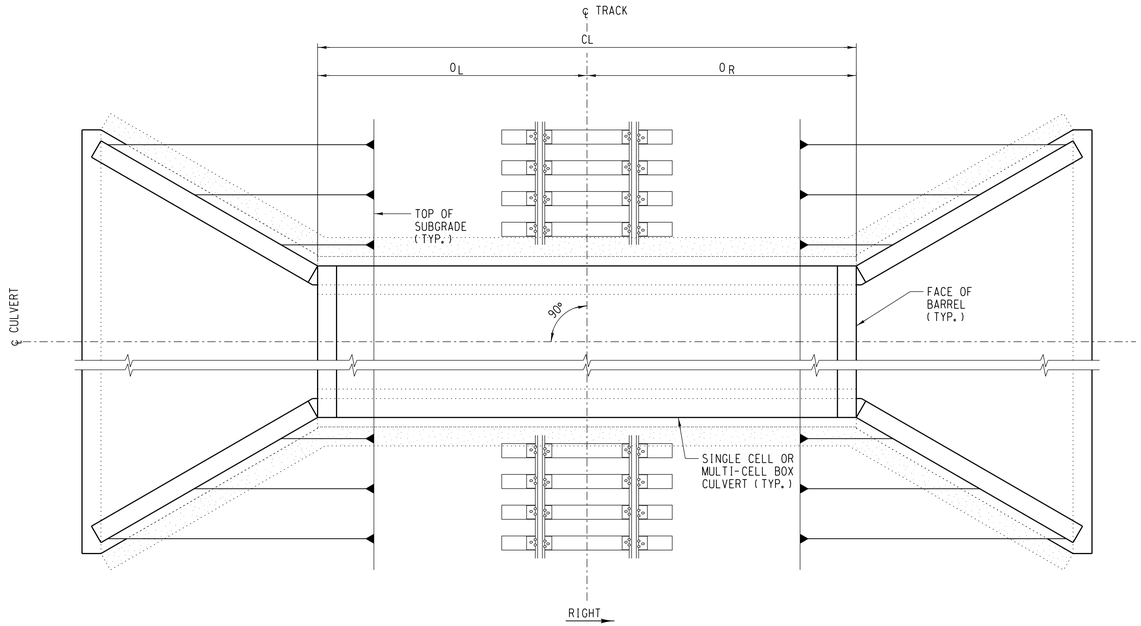
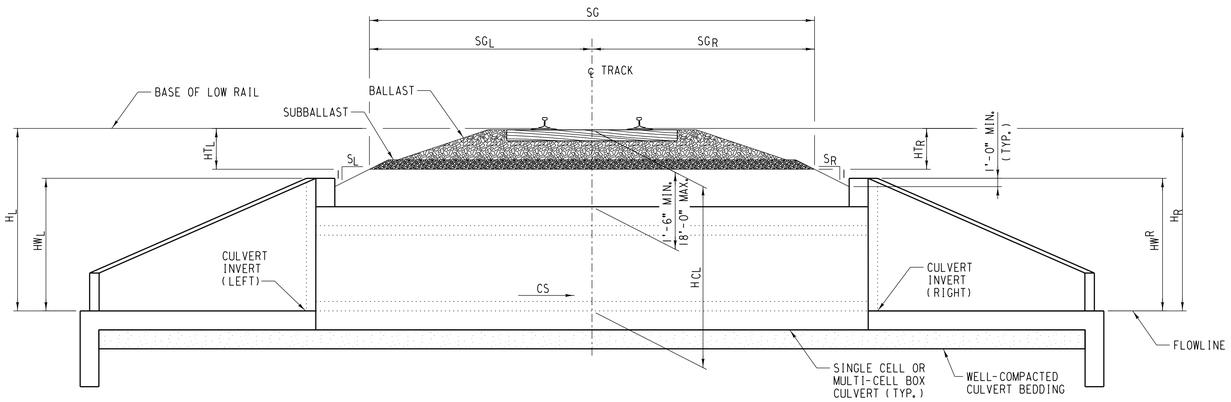


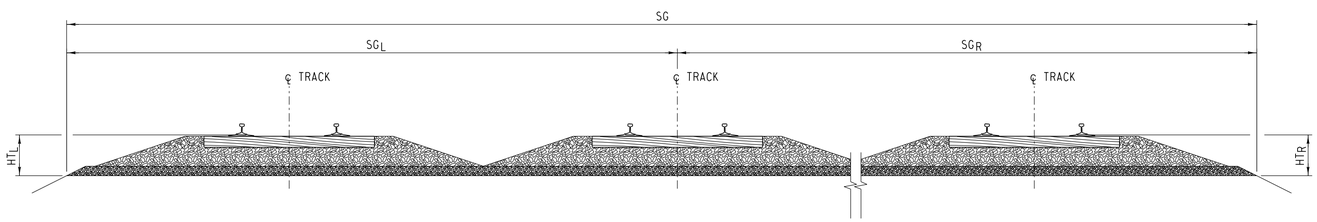
PLAN - SINGLE TRACK

SCALE: NONE



ELEVATION - SINGLE TRACK

SCALE: NONE



MULTIPLE TRACK DIAGRAM

SCALE: NONE

CULVERT LENGTH EQUATION:

$CL = O_L + O_R \geq SG + 2'$

$O_L = SG_L + S_L(H_L - HT_L + 1' - HW_L) + 1'$

$O_R = SG_R + S_R(H_R - HT_R + 1' - HW_R) + 1'$

$$H_L = \frac{H_{CL} + CS\,[SG_L - S_L(HT_L + HW_L - 1') + 1']}{[1 - CS(S_L)]}$$

$$H_R = \frac{H_{CL} - CS\,[SG_R - S_R(HT_R + HW_R - 1') + 1']}{[1 + CS(S_R)]}$$

$SG = SG_L + SG_R$

$H_{AVG} = (H_L + H_R) / 2$

KEY:

- CL = CULVERT LENGTH
- O_L = OFFSET LEFT
- O_R = OFFSET RIGHT
- H_{CL} = HEIGHT - BASE OF LOW RAIL TO FLOWLINE AT CENTERLINE OF TRACK
- CS = CULVERT SLOPE (RISE/RUN) LEFT TO RIGHT (+ UP, - DOWN)
- HT_L = BASE OF LOW RAIL TO TOP OF SUBGRADE LEFT EDGE
- HT_R = BASE OF LOW RAIL TO TOP OF SUBGRADE RIGHT EDGE
- H_L = HEIGHT - BASE OF LOW RAIL TO INVERT LEFT OF TRACK
- H_R = HEIGHT - BASE OF LOW RAIL TO INVERT RIGHT OF TRACK
- HW_L = HEIGHT OF WINGWALL LEFT OF TRACK
- HW_R = HEIGHT OF WINGWALL RIGHT OF TRACK
- SG = WIDTH OF SUBGRADE (24'-0" MINIMUM)
- SG_R = WIDTH OF SUBGRADE RIGHT OF ℄ TRACK (12'-0" MINIMUM)
- SG_L = WIDTH OF SUBGRADE LEFT OF ℄ TRACK (12'-0" MINIMUM)
- S_L = SIDE SLOPE LEFT OF TRACK (RUN PER FOOT OF RISE)
- S_R = SIDE SLOPE RIGHT OF TRACK (RUN PER FOOT OF RISE)

NOTE:
ALL DIMENSIONS ARE IN FEET.

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G2

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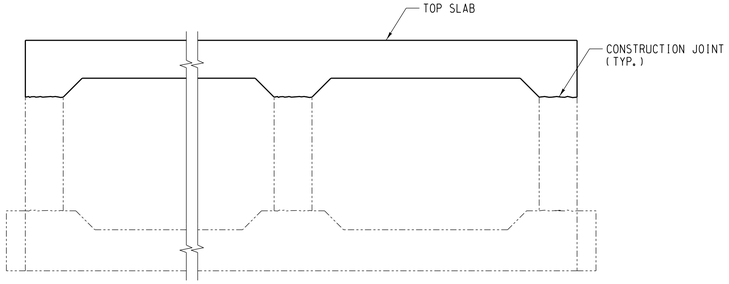
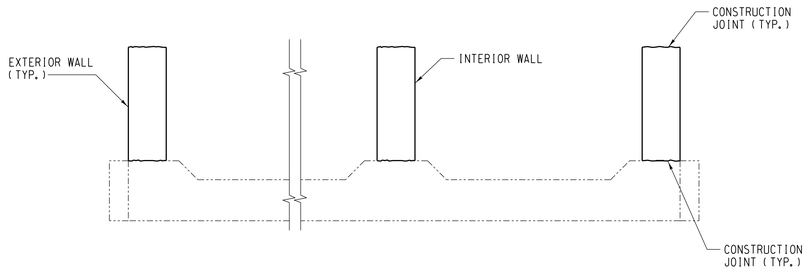


PHASE THREE



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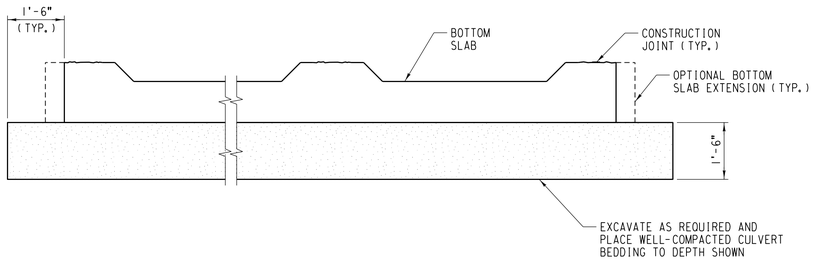
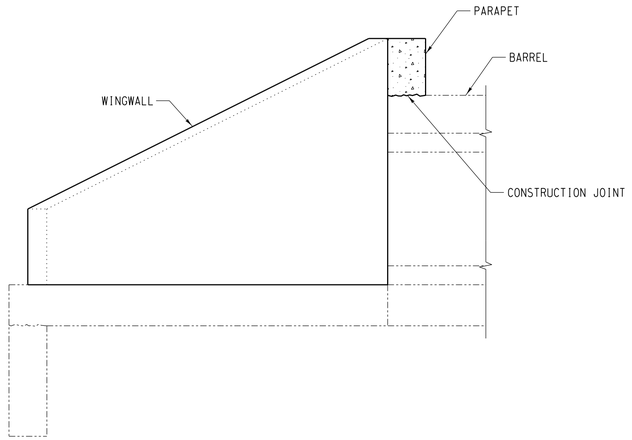


PHASE ONE

CONSTRUCTION SEQUENCE - BARREL

SCALE: ½"=1'-0"



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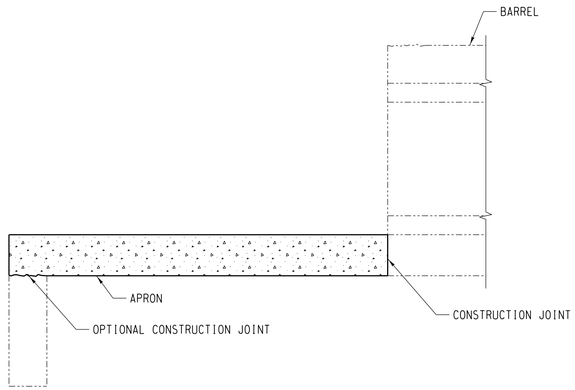

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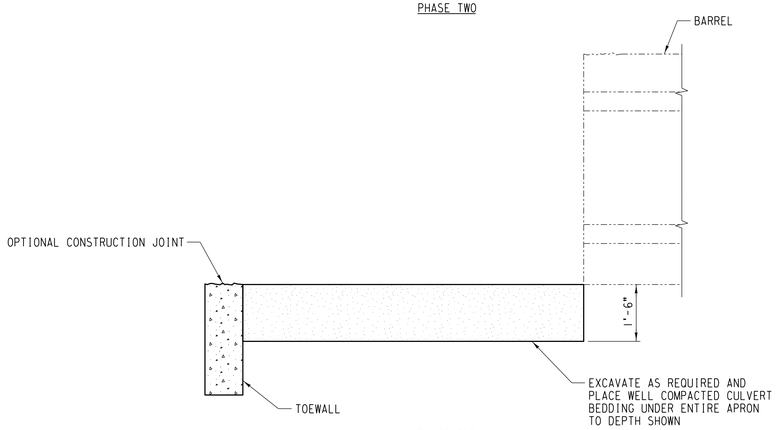

PHASE ONE

CONSTRUCTION SEQUENCE - PARAPET, APRON, TOEWALL AND WINGWALLS

SCALE: ½"=1'-0"

(LOOKING PERPENDICULAR TO ℄ CULVERT)

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

CONSTRUCTION SEQUENCE

FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: G5

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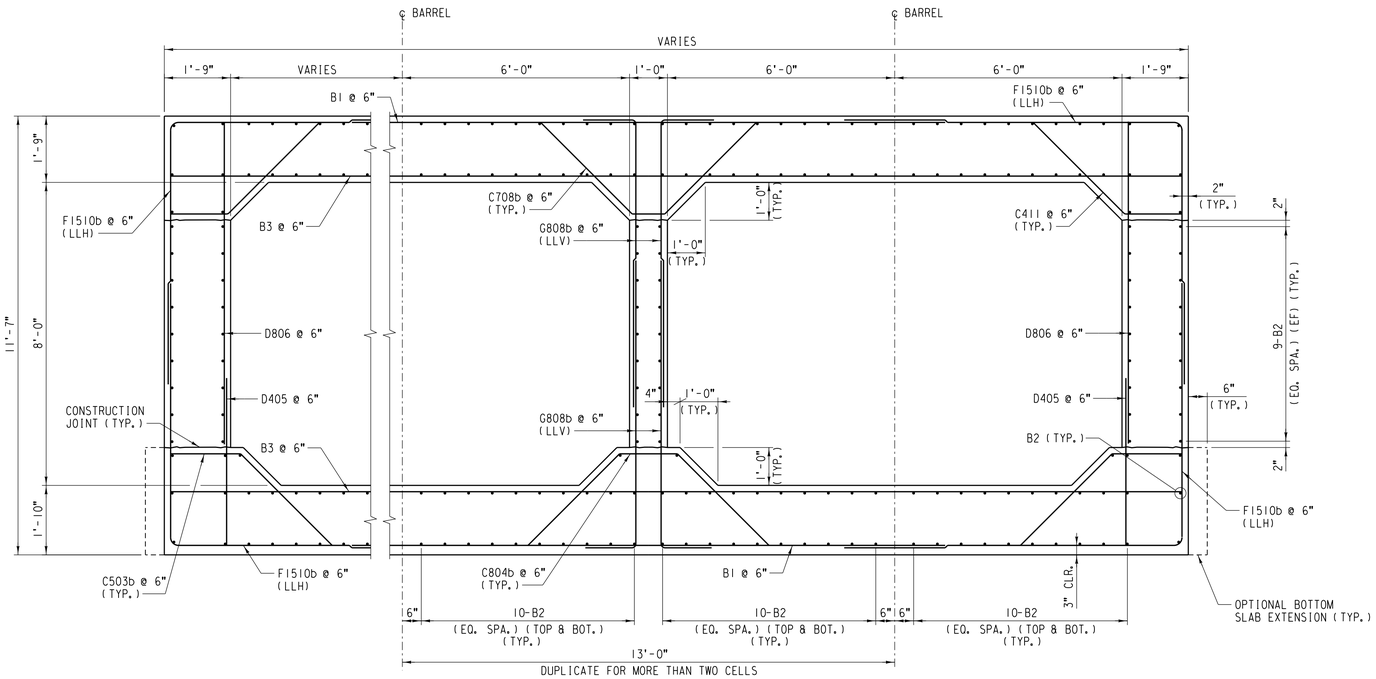
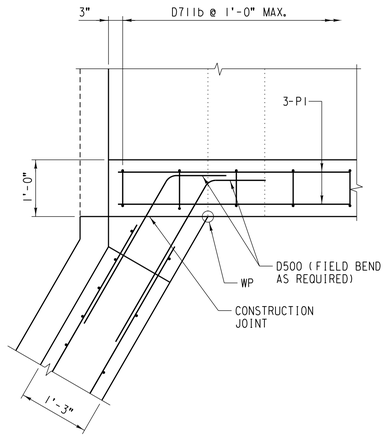


TYPICAL BARREL SECTION

SCALE: ½"=1'-0"

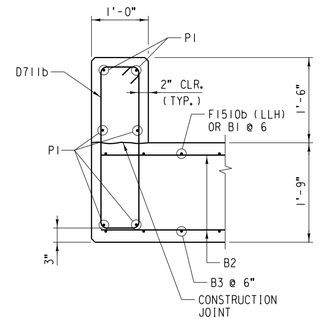
BAR SPLICE NOTE:

FOR B1 BAR USE 3'-5" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE AT MIDSPAN OF CULVERT OPENING, FOR B3 BAR USE 2'-7" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE OVER INTERIOR WALL, FOR B2 BAR USE 2'-1" MIN. LAP SPLICE WHEN NEEDED AND STAGGER SPLICE, FOR P1 BAR USE 1'-9" MIN. LAP SPLICE WHEN NEEDED AND STAGGER SPLICE.



WINGWALL TO PARAPET CONNECTION DETAIL

SCALE: ¾"=1'-0"



PARAPET DETAIL

SCALE: ¾"=1'-0"

NOTES:

1. FOR CAST-IN-PLACE CONCRETE NOTES AND REINFORCING STEEL NOTES, SEE SHEET NO. G1.
2. EF = EACH FACE
   FF = FAR FACE
   LLH = LONG LEG HORIZONTAL
   LLV = LONG LEG VERTICAL
   NF = NEAR FACE
   WP = WORKING POINT

CONCRETE QUANTITIES

	TOTAL	UNIT	DESCRIPTION
ONE END	AA	CU. YD./FT.	BARREL
	BB	CU. YD.	PARAPET
	CC	CU. YD.	TOEWALL
	DD	CU. YD.	APRON
	14.2	CU. YD.	TWO WINGWALLS

EQUATIONS FOR VARIABLES:

L = LENGTH OF BARREL (FT)
NC = NUMBER OF BOX CULVERT CELLS
NB = 2.0(L-0.33) + 1 (ROUND UP TO THE NEAREST INTEGER)

TOTAL NUMBER OF BARS

A = 2(NB)
B = NB(NC-1)
C = 134 + 100(NC-1)
D = 4(NB)
E = 4(NB)(NC-1)
F = 30 + 26(NC-1)
G = 76 + 26(NC-1)
H = 16 + 13(NC-1) (ROUND UP TO THE NEAREST INTEGER)
J = 16 + 13(NC-1)

LENGTH OF BARS

P = L - 0.33
Q = 15.17 + 13(NC-1)
R = 3.42 + 13(NC-1)
S = 15.83 + 13(NC-1)
T = 37.50 + 13(NC-1)
U = 16.42 + 13(NC-1)
V = 37.17 + 13(NC-1)

LENGTH OF BARS ARE CALCULATED IN FEET AND ROUNDED DOWN TO THE NEAREST WHOLE INCH.

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE FOR LAP SPLICE REQUIREMENTS.

CONCRETE QUANTITIES

AA = 3.19 + 2.12(NC-1)
BB = 0.86 + 0.72(NC-1)
CC = 4.68 + 1.6(NC-1)
DD = 27.53 + 12.95(NC-1)

ROUND CONCRETE QUANTITIES TO ONE DECIMAL PLACE.

REINFORCING SCHEDULE

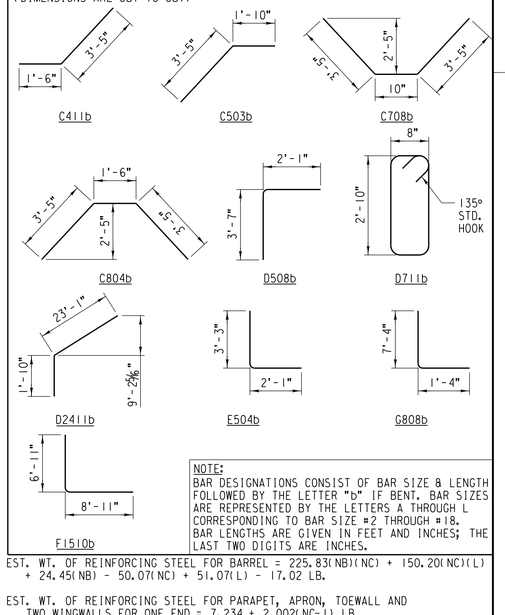
	TOTAL	MARK	SIZE	LENGTH	SHAPE
BARREL	A	C411b	#4	4'-11"	
	A	C503b	#4	5'-3"	
	B	C708b	#4	7'-8"	
	B	C804b	#4	8'-4"	
	A	D405	#5	4'-5"	
	A	D806	#5	8'-6"	
	C	B2	#6	P	
	D	F1510b	#7	15'-10"	
	A	B3	#7	Q	
	E	G808b	#8	8'-8"	
	A	B1	#8	R	
PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END	F	D400	#5	4'-0"	
	64	D500	#5	5'-0"	
	G	D508b	#5	5'-8"	
	H	D711b	#5	7'-11"	
	J	D1910	#5	19'-10"	
	12	D2109	#5	21'-9"	
	4	D2411b	#5	24'-11"	
	6	P1	#5	Q	
	2	A3	#5	S	
	8	T1	#5	T	
	114	E504b	#6	5'-4"	
	4	E1100	#6	11'-0"	
	J	E1910	#6	19'-10"	

SET LIST

MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
D103-D1909	#5	1'-3"	19'-9"	2'-3¾"	9	4	
D303-D1810	#5	3'-3"	18'-10"	1'-8¾"(+)	10	2	
A1	#5	U	V	6⅝"(-)	37	1	
A2	#5	U	V	1'-1⅞"(-)	19	1	
E203-E1009	#6	2'-3"	10'-9"	6"	18	2	
E203-E1100	#6	2'-3"	11'-0"	3"	36	2	
E303-E1810	#6	3'-3"	18'-10"	1'-8¾"(+)	10	2	

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 FOR BARREL = 225.83(NB)(NC) + 150.20(NC)(L) + 24.45(NB) - 50.07(NC) + 51.07(L) - 17.02 LB.

EST. WT. OF REINFORCING STEEL FOR PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END = 7,234 + 2,002(NC-1) LB.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

12'-0" x 8'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 3)

FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: MC27

Copyright © 2020 by Union Pacific Railroad PLOTTED: 1/3/2020 3:31:30 PM

FILE NAME: pw://HDR_US_National.Oil/41190/10196897/680200_Concrete Box Culverts.dgn

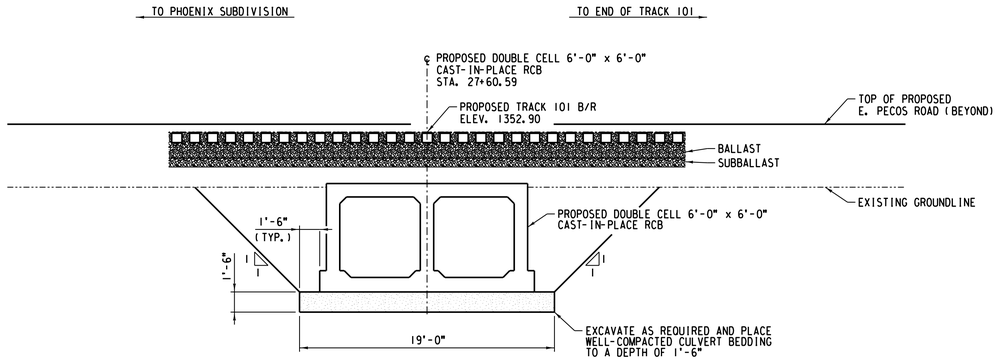
INCHES 1 2 3 4 5 6 7 8 9 10 11 12

DESIGN SHEET

DRAWING SCHEDULE

	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123078	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
	S2	123078	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
	S3	123078	END TREATMENT FRAMING DETAILS	DESIGN
	S4	123078	END TREATMENT REINFORCING DETAILS (SHEET 1 OF 3)	DESIGN
	S5	123078	END TREATMENT REINFORCING DETAILS (SHEET 2 OF 3)	DESIGN
	S6	123078	END TREATMENT REINFORCING DETAILS (SHEET 3 OF 3)	DESIGN
	S7	123078	HANDRAIL DETAILS	DESIGN
	G1	680200	GENERAL NOTES	STANDARD
	G2	680200	GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS	STANDARD
	G5	680200	CONSTRUCTION SEQUENCE	STANDARD
	MC3	680200	6'-0"x6'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 2)	STANDARD

	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
REF.	1	-	P017 OF 037 T008 OF 012 X043 OF 143 EC010 OF 036 PH005 OF 024	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN



ELEVATION

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

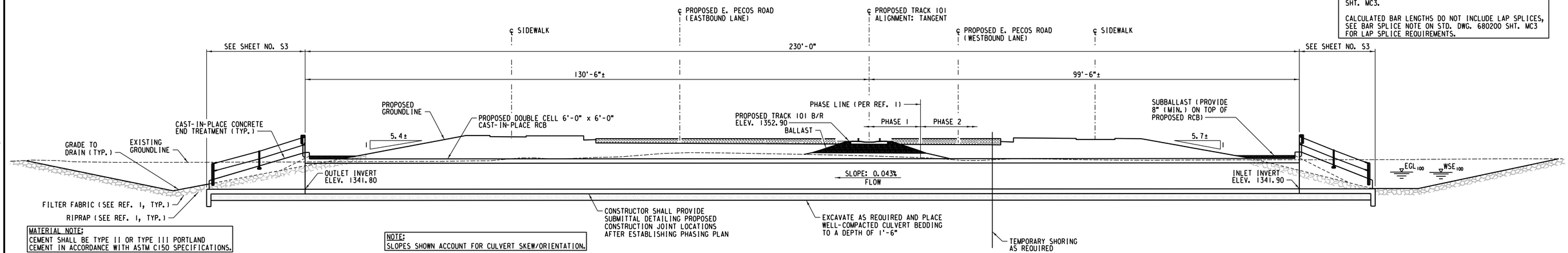
STANDARD VARIABLES:
L = 230 (FT)
NC = 2
NB = 307

TOTAL NUMBER OF BARS:
A = 614
B = 307
C = 1228
D = 112
E = 1228
F = 30
G = 62
H = 16

LENGTH OF BARS:
P = 229'-8"
Q = 14'-8"
R = 9'-7"
S = 16'-0"
T = 30'-10"
U = 16'-7"
V = 30'-6"

FOR A LIST OF VARIABLES, SEE STD. DWG. 680200, SHT. MC3.

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE ON STD. DWG. 680200 SHT. MC3 FOR LAP SPLICE REQUIREMENTS.



MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

NOTE:
SLOPES SHOWN ACCOUNT FOR CULVERT SKEW/ORIENTATION.

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
230	FT	6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT (BARREL ONLY) (PER STD. PLAN NO. 680200, SHT. MC3)		CONSTRUCTOR
63	CU. YD.	4000 PSI CONCRETE FOR END TREATMENTS ONLY (PER DETAILS, SHEET NOS. S3-S5, AND NOTES, PER STD. DWG. 680200 SHT. G1)		
1	LOT	REINFORCING STEEL FOR END TREATMENTS ONLY (PER SCHEDULE, SHEET NO. S5)		
2	EA.	HANDRAIL POST HP-25R (PER STD. DWG. 680160 SHT. H1)	513-2077	
2	EA.	HANDRAIL POST HP-25L (PER STD. DWG. 680160 SHT. H1)	513-2075	
6	EA.	HANDRAIL POST HP-26 (PER STD. DWG. 680160 SHT. H1)	513-2080	
4	EA.	HANDRAIL POST HP-27 (PER STD. DWG. 680160 SHT. H1)	513-2085	
39	EA.	3/4" DIA. x 14" A307 HEAVY HEX BOLT, TYPE 1 WITH HEAVY ELASTIC LOCK NUT (MIL-N-32258) AND FLAT CIRCULAR WASHER (ASTM F436), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED		
27	EA.	3/8" EYE TYPE STRANDVISE CABLE GRIP CARTRIDGE (MACLEAN POWER PRODUCTS NO. 5102)	098-6081	
280	LIN. FT.	3/8" NOMINAL DIAMETER WIRE ROPE, 7 WIRE, GALVANIZED STEEL STRAND, SIEMENS MARTINS GRADE, A-COATING	050-5394	
27	EA.	1/2" DIA. EYEBOLT, 2" LONG SHANK WITH 1" I.D. EYE, PLAIN PATTERN GALVANIZED DROP FORGED STEEL (ASTM A489), WITH ZINC PLATED HEX NYLON INSERT LOCKNUT (ASTM A563) AND ZINC PLATED FLAT CIRCULAR WASHER (ASTM F436)	130-0370	
15	EA.	GALVANIZED MALLEABLE IRON U-BOLT WITH 2 ELASTIC LOCKNUTS (MIL-N-25027), ZINC PLATED, FOR 3/8" DIA. WIRE ROPE	050-6370	
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP (PER REF. 1)		
1	LOT	FILTER FABRIC (PER REF. 1)		
340	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY SHORING		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

RIGHT

CROSS SECTION

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

WSE_{100} = 1345.67
EGL_{100} = 1345.77
VEL_{100} = 8.47 fps

NOTES:
1. FOR PROPOSED ROADWAY AND PHASING DETAILS, SEE REF. 1.
2. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
3. RCB = REINFORCED CONCRETE BOX

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

SECTION DESIGNATION

DESIGN NOTES

RIGHT-OF-WAY

1. Right-of-way: Varies, per Ref. 1.

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 11): Elev. 1347.99, NAVD 1988, 1/2" rebar located in ground South of proposed Track 101 Culvert No. 0.52, 67.40' left of existing Phoenix Sub. Main Track centerline, Sta. 1506+01.02.
   TBM 2 (Olsson CP 12): Elev. 1345.52, NAVD 1988, 1/2" rebar located in ground South of proposed Track 101 Culvert No. 0.52, 71.58' left of existing Phoenix Sub. Main Track centerline, Sta. 1498+70.62.
4. Profile: Proposed Track 101 per Ref. 1.
   Proposed Pecos Road Profile per Ref. 1.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson. dated September 2022.

DESIGN

1. This structure has been designed for Cooper E80 Live Load with impact, HS-20 Live Load and cover depth ranging from 1'-6" to 18'-0".
2. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date signed 07-06-2023 ARIZONA U.S.A.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD
FURNISH & INSTALL DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oasconsulting.com\fs-na1\projects\2020\0501.1000\020-0927\40-Design\Microstation\020-0927_RJBR.Cyl v 0.52.Station 27+60.43\Pirate Ind Lead_0.52.dgn

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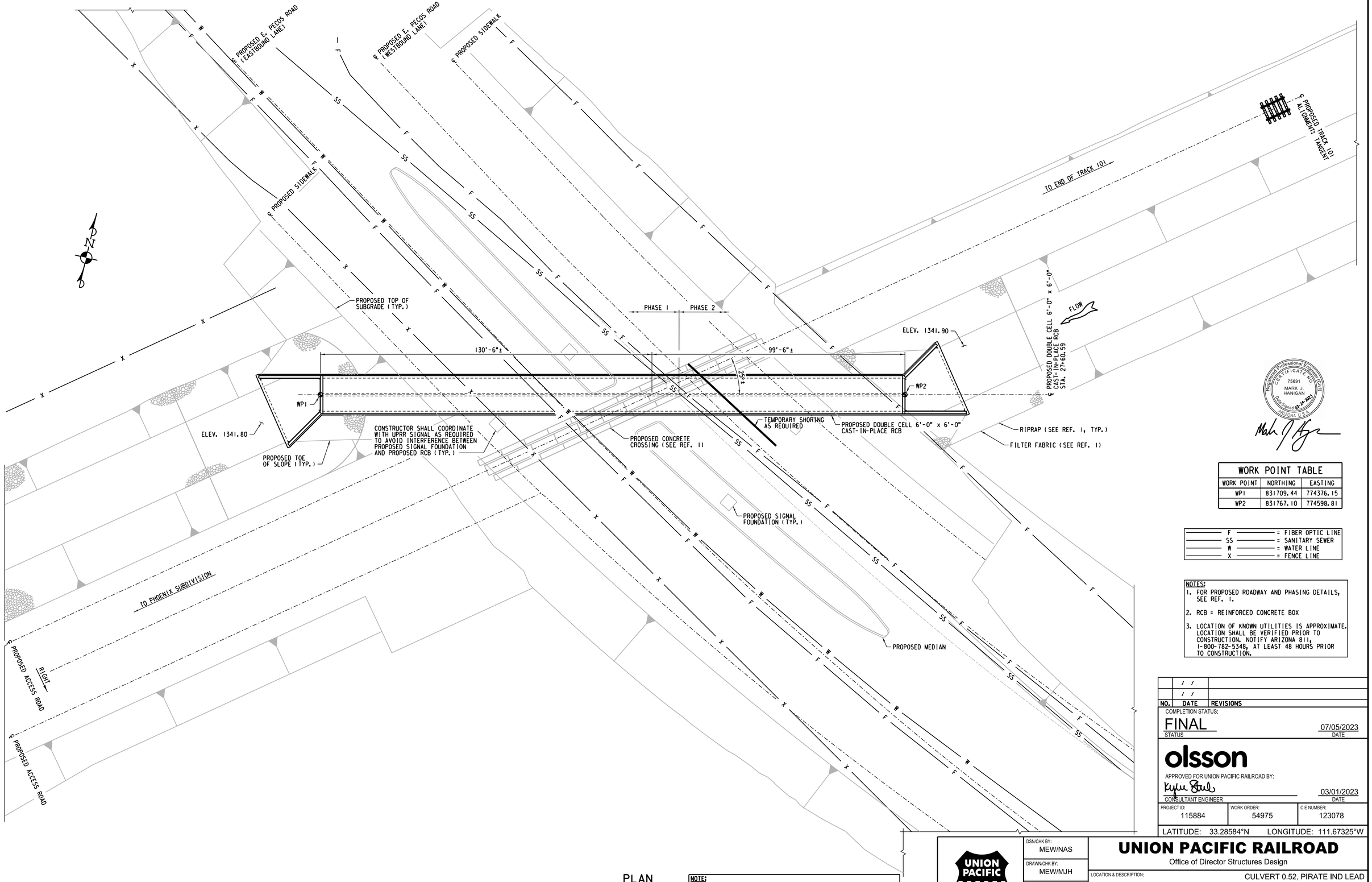
DESIGN SHEET



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

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	831709.44	774376.15
WP2	831767.10	774598.81

F ——— = FIBER OPTIC LINE
SS ——— = SANITARY SEWER
W ——— = WATER LINE
X ——— = FENCE LINE

NOTES:
1. FOR PROPOSED ROADWAY AND PHASING DETAILS, SEE REF. 1.
2. RCB = REINFORCED CONCRETE BOX
3. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oasconsulting.com\fnts-na1\projects\2220\050\1000\020\0927.40 Design\Microstation\020-0927 RLBR Culv 0.52_Station 27-60.43\Pirate Ind Lead_0.52.dgn

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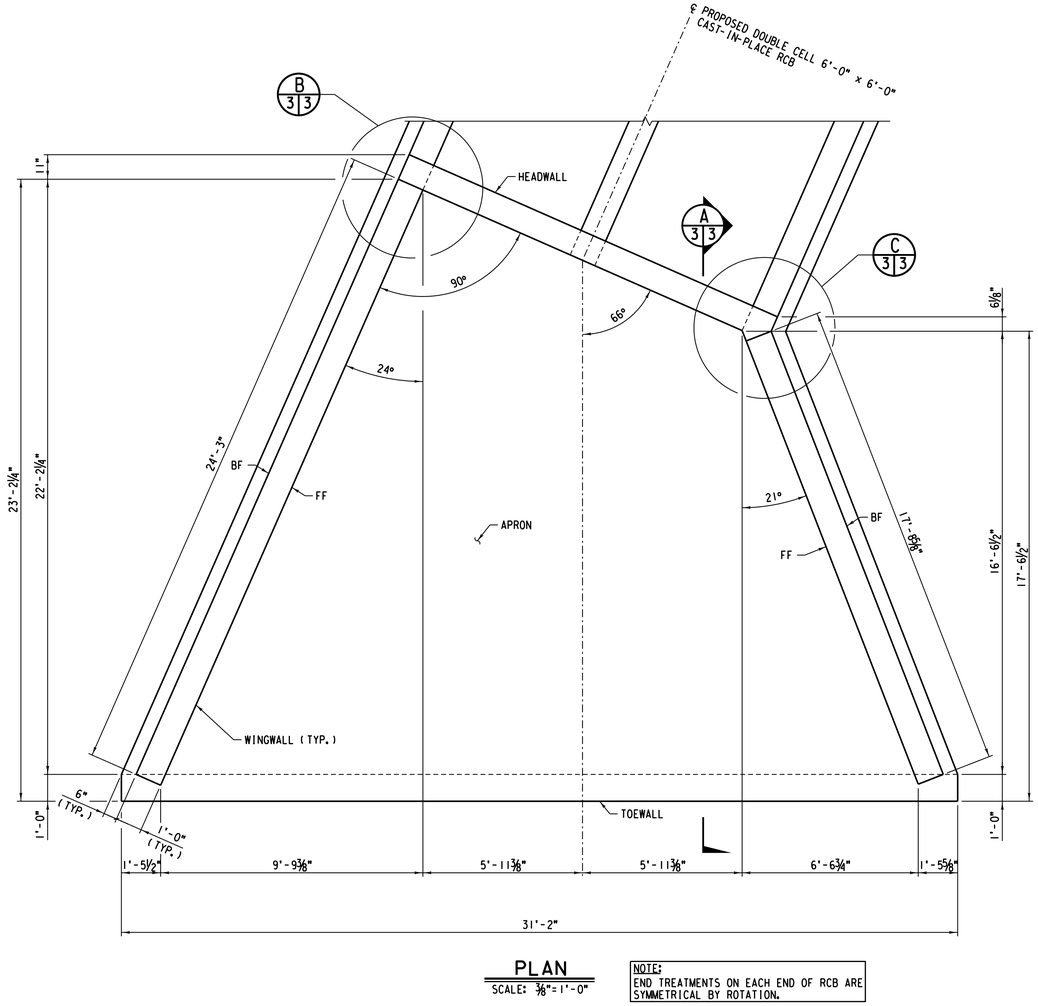
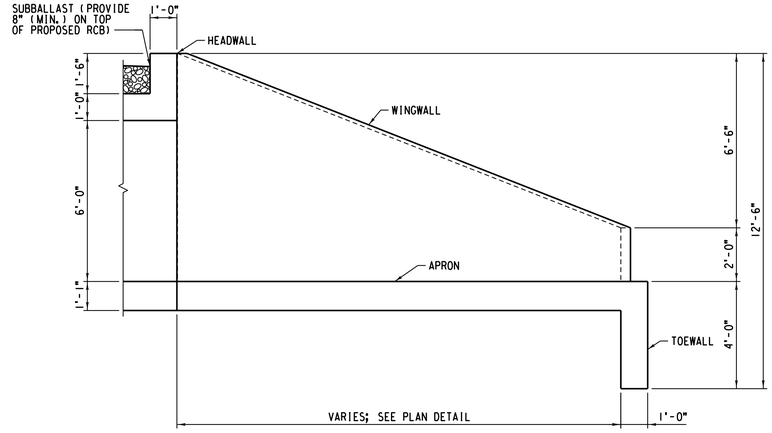
DESIGN SHEET

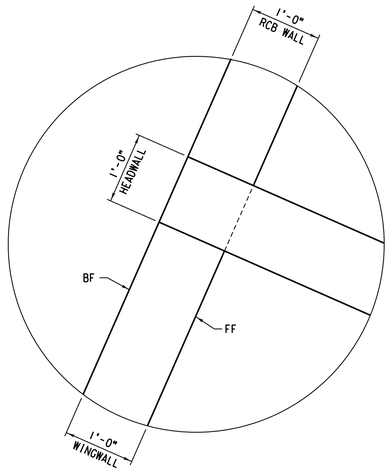


PLAN
SCALE: ⅜"=1'-0"

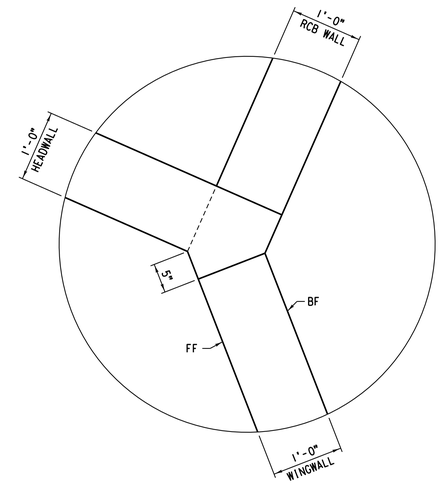
NOTE:
END TREATMENTS ON EACH END OF RCB ARE SYMMETRICAL BY ROTATION.



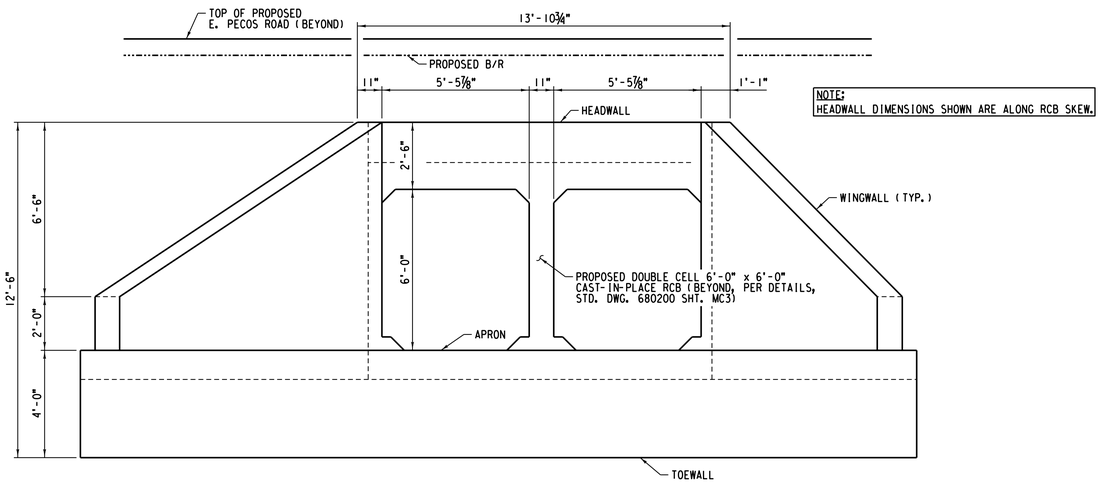
SECTION A 3 3
SCALE: ⅜"=1'-0"



DETAIL B 3 3
SCALE: 1"=1'-0"



DETAIL C 3 3
SCALE: 1"=1'-0"



NOTE:
HEADWALL DIMENSIONS SHOWN ARE ALONG RCB SKEW.

ELEVATION
SCALE: ⅜"=1'-0"

CONCRETE PLACEMENT QUANTITIES		
ITEM	UNIT	QTY.
RCB BARREL (BOTTOM SLAB)	CU. YD.	175
RCB BARREL (WALLS & TOP SLAB)	CU. YD.	273
APRON & TOEWALL	CU. YD.	44.9
WINGWALLS & HEADWALL	CU. YD.	18.0

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA, U.S.A.

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC3.
3. FOR END TREATMENT REINFORCING DETAILS, SEE SHEET NO. S4.
4. BF = BACK FACE
   FF = FRONT FACE
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S3 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION:
CULVERT 0.52, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE:
END TREATMENT FRAMING DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2220\050\1000\020\0927.40 Design\Microstation\020-0927 RLBR Culv 0.52_Station 27-60.43\Pirate Ind Lead_0.52.dgn

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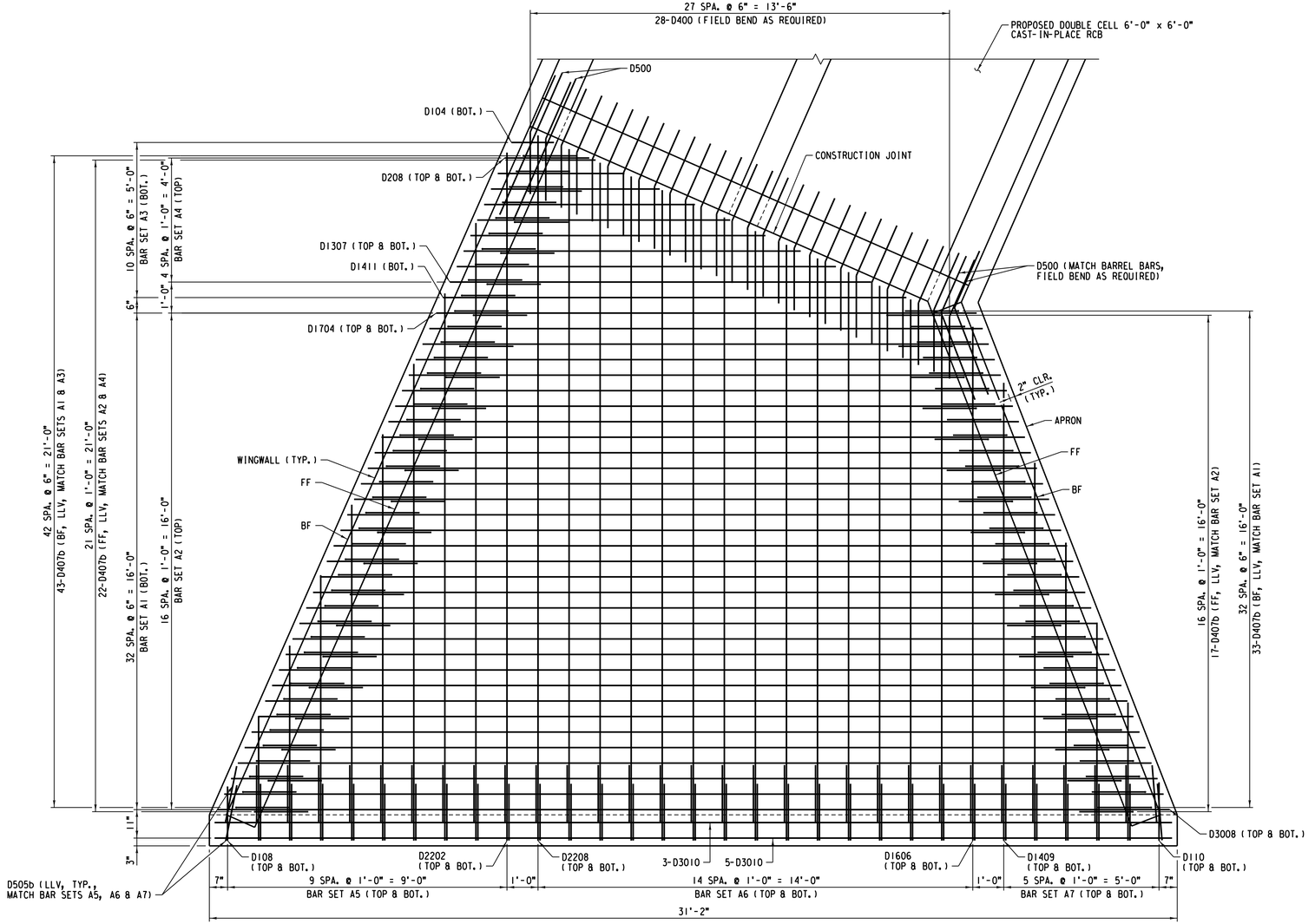
DESIGN SHEET



APRON PLAN

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

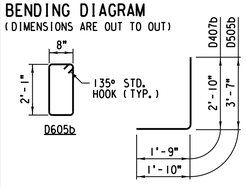
REINFORCING SCHEDULE

(QUANTITY PER END TREATMENT)

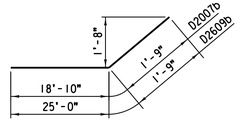
TOTAL	MARK	SIZE	LENGTH	SHAPE
28	D400	#5	4'-0"	
115	D407b	#5	4'-7"	
40	D500	#5	5'-0"	
62	D505b	#5	5'-5"	
15	D605b	#5	6'-5"	
4	D800	#5	8'-0"	
6	D1408	#5	14'-8"	
6	D1709	#5	17'-9"	
2	D2007b	#5	20'-7"	
6	D2311	#5	23'-11"	
2	D2609b	#5	26'-9"	
8	D3010	#5	30'-10"	

BENDING DIAGRAM

(DIMENSIONS ARE OUT TO OUT)



D407b, D505b



D2007b, D2609b

SET LIST

BAR SET DESIGNATION	MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
A1	D1704-D3008	#5	17'-4"	30'-8"	5"	33	1	
A2	D1704-D3008	#5	17'-4"	30'-8"	10"	17	1	
A3	D104-D1411	#5	1'-4"	14'-11"	1'-4 1/4"(+)	11	1	
A4	D208-D1307	#5	2'-8"	13'-7"	2'-8 3/4"	5	1	
A5	D108-D2202	#5	1'-8"	22'-2"	2'-3 3/8"(-)	10	2	
A6	D1606-D2208	#5	16'-6"	22'-8"	5 1/4"(+)	15	2	
A7	D110-D1409	#5	1'-10"	14'-9"	2'-7"	6	2	
W1	D110-D802	#5	1'-10"	8'-2"	1 3/4"(+)	44	1	
W2	D110-D800	#5	1'-10"	8'-0"	3 1/2"(+)	22	1	
W3	D111-D2007	#5	1'-11"	20'-7"	3'-8 3/4"(+)	6	2	
W4	D111-D802	#5	1'-11"	8'-2"	2 3/8"(-)	33	1	
W5	D111-D802	#5	1'-11"	8'-2"	4 3/4"(-)	17	1	
W6	D109-D1504	#5	1'-9"	15'-4"	2'-8 5/8"(-)	6	2	

EST. WT. OF REINFORCING STEEL = 5,275 LB.

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.

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC3.
3. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA, U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

UNION PACIFIC

DSN/CHK BY: MEW/NAS	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: MEW/MJH	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD
SHT NO.: S4 of S7	FURNISH & INSTALL DOUBLE CELL 6'-0" x 6'-0" RCB x 230'
	SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 1 OF 3)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-nd\projects\2020\0501-1000\020-0927-40 Design\Microstation\020-0927_RLBRA.dgn\v 0.52_Station 27-60.43\Pirate Ind Lead_0.52.dgn

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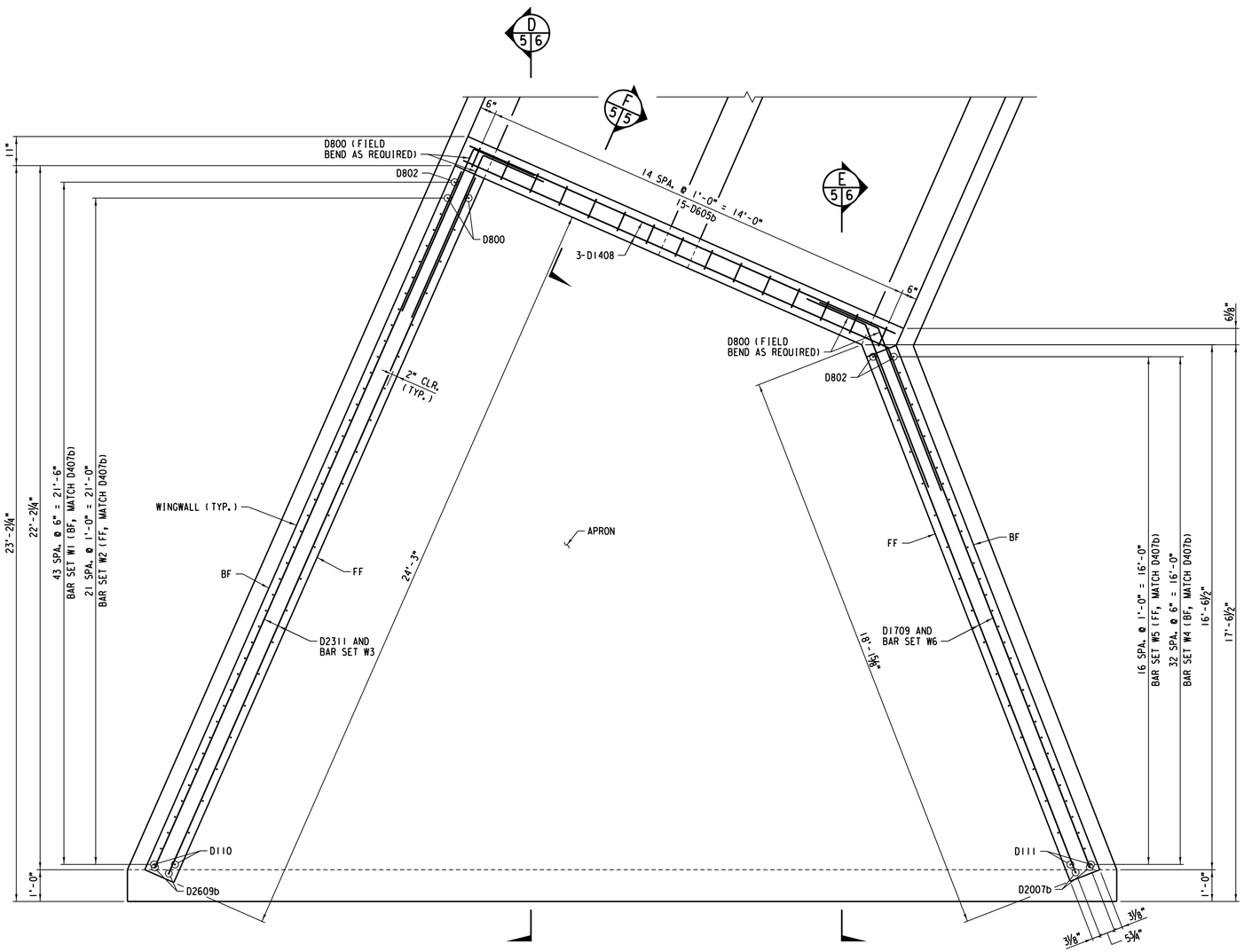
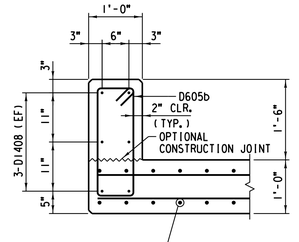
DESIGN SHEET



PLAN THROUGH WINGWALL AND HEADWALL

SCALE: ½"=1'-0"



SECTION F 5 5

SCALE: ¾"=1'-0"

NOTES:
1. FOR REINFORCING SCHEDULE, SEE SHEET NO. S4.
2. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
3. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. MC3.
4. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:

FINAL — STATUS — 07/05/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 05-24-2023 ARIZONA, U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:

CONSULTANT ENGINEER — 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

UNION PACIFIC

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S5 of S7

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD

FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 2 OF 3)

FILE NAME: \\oa.ad.oasconsulting.com\fnts-na1\projects\2020\0501.1000\020-0927.40\Design\Microstation\020-0927.40-Design-Culvert 0.52_Station 27-60_43-Pirate Ind Lead_0.52.dgn

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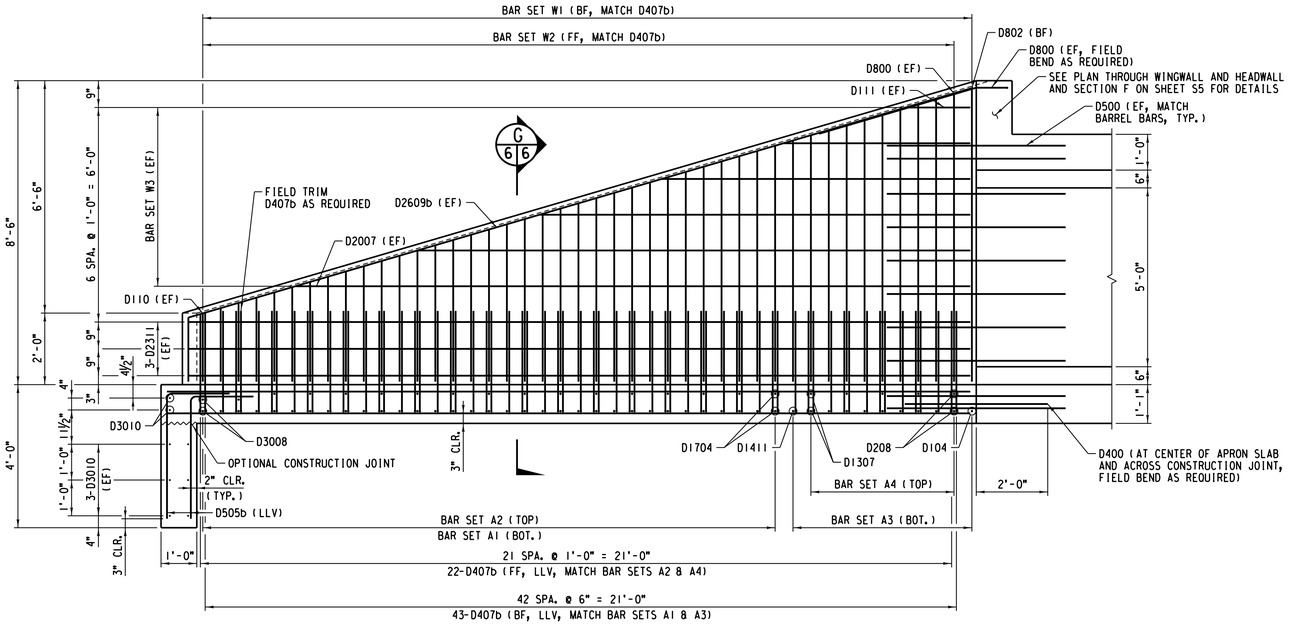
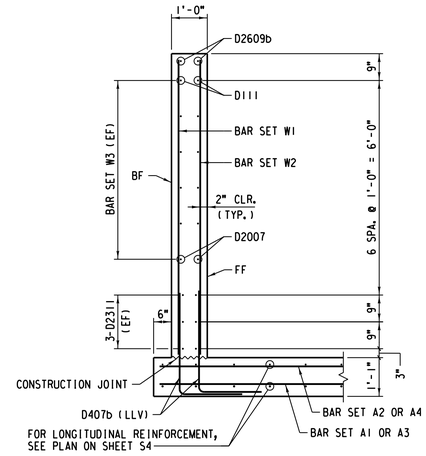


SECTION D
SCALE: ½"=1'-0" 5 6



SECTION G
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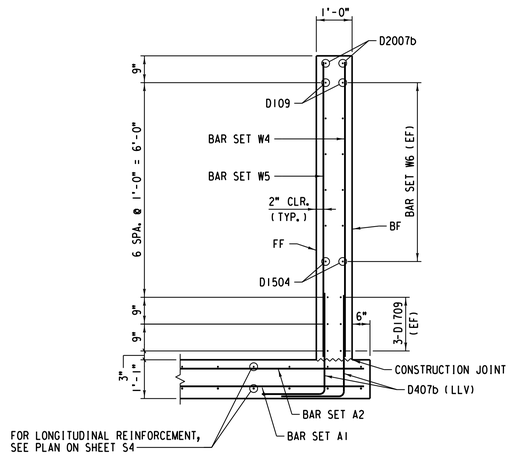
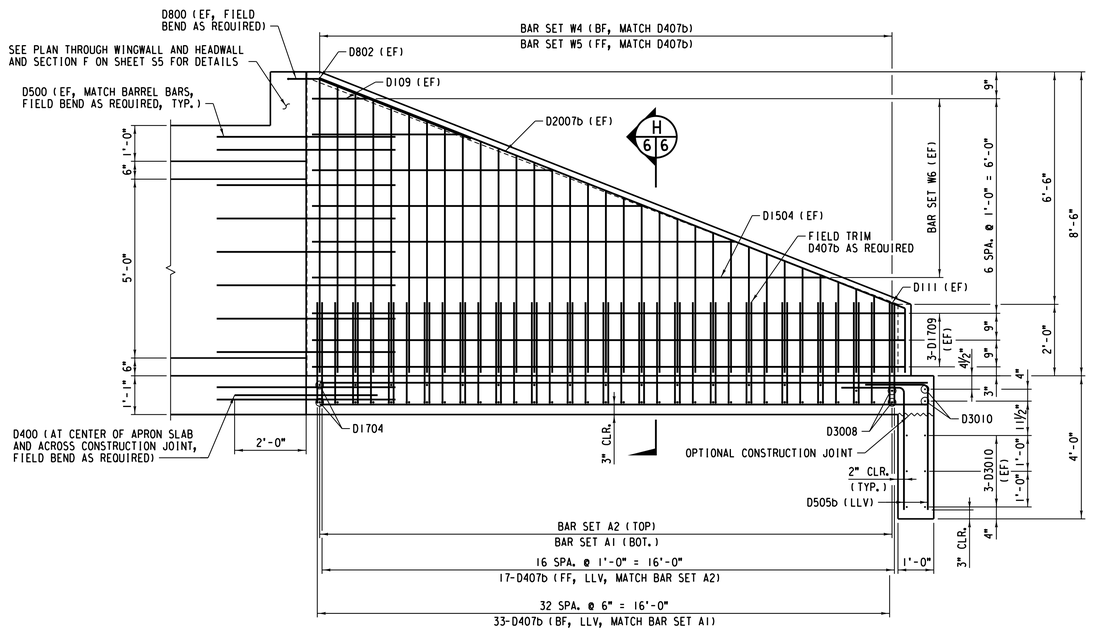


SECTION H
SCALE: ½"=1'-0" 6 6



SECTION E
SCALE: ½"=1'-0" 5 6

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-24-2023 ARIZONA U.S.A.

NOTES:
1. FOR REINFORCING SCHEDULE, SEE SHEET NO. S4.
2. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
3. FOR REINFORCED CONCRETE BOX DETAILS, SEE STD. DWG. 680200 SHT. WC3.
4. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

UNION PACIFIC

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S6 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 3 OF 3)

FILE NAME: \\oa.ad.oaconsulting.com\fnte-na\Projects\2020\0501.1000\020-0927-40-Design\Microstation\020-0927_RLBR.Culv 0.52,Station 27-60,43-Pirate Ind Lead,0.52.dgn

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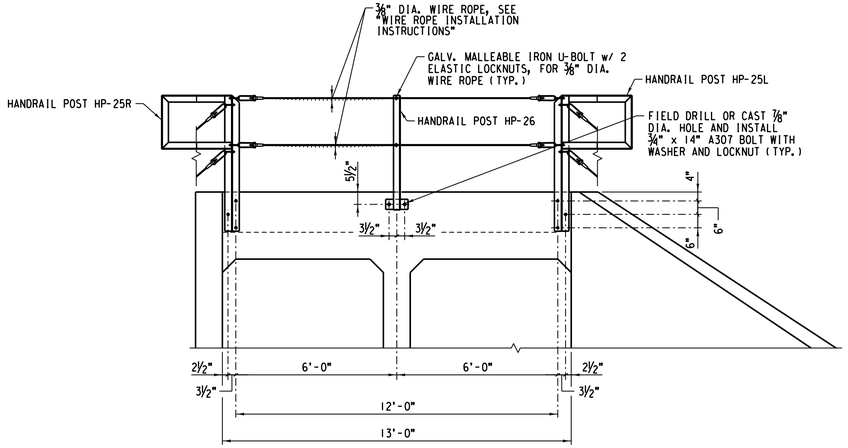
DESIGN SHEET



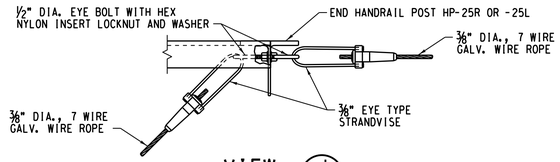
NOTE:
WINGWALL HANDRAIL NOT SHOWN FOR CLARITY.

BOX CULVERT HANDRAIL LAYOUT

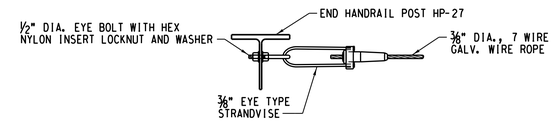
SCALE: 3/8"=1'-0"

WIRE ROPE INSTALLATION INSTRUCTIONS:

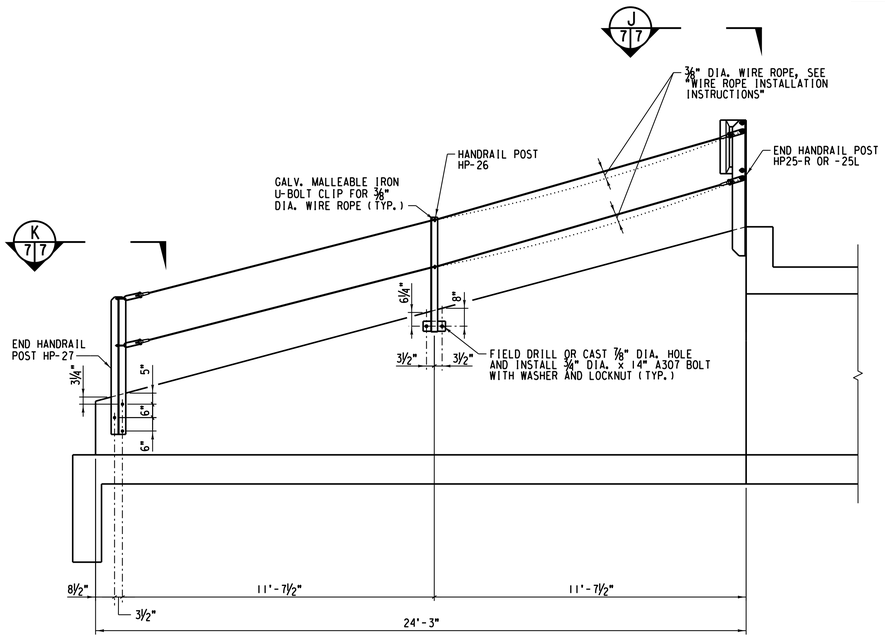
1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END HANDRAIL POST.
2. STRETCH WIRE ROPE, HANG A MINIMUM OF 10 LB. ON CABLE BETWEEN TWO POSTS AND REMOVE ALL SAG TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END HANDRAIL POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT & REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.



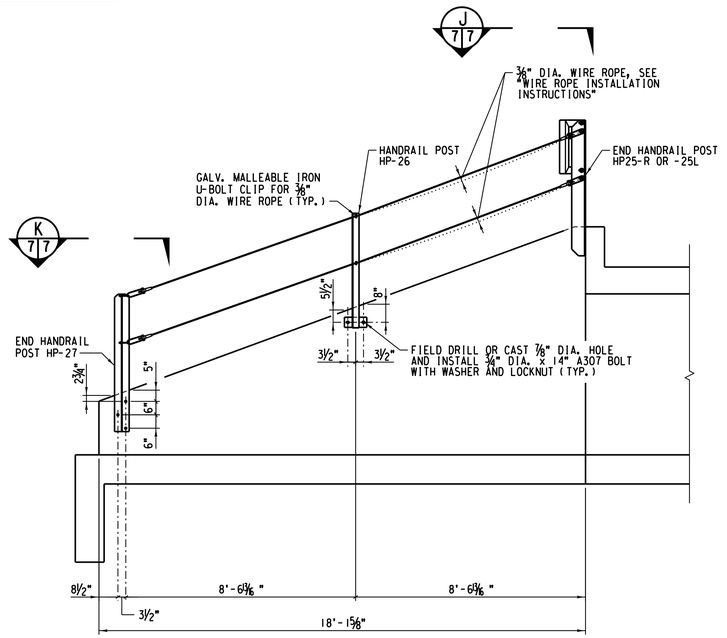
VIEW J 7|7
SCALE:1 1/2"=1'-0"



VIEW K 7|7
SCALE:1 1/2"=1'-0"



24'-3" WINGWALL



18'-1 5/8" WINGWALL

WINGWALL HANDRAIL LAYOUT

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

(LOOKING PERPENDICULAR TO FACE OF WINGWALL)

NOTES:
1. FOR HANDRAIL POST DETAILS, SEE STD. DWG. 680160 SHT. H1.
2. RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 03/01/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123078

LATITUDE: 33.28584°N LONGITUDE: 111.67325°W

Registered Professional Engineer CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 03-14-2023 ARIZONA, U.S.A.

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S7 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.52, PIRATE IND LEAD
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 230'

SHEET TITLE: HANDRAIL DETAILS

PLOTTED: 7/7/2023 12:35:27 PM

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501.1000\020-0927\40-Design\Microstation\020-0927_RJBR.Cul v 0.52,Station 27-60,43-Pirate Ind Lead,0.52.dgn

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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G1

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PLOTTED: 1/3/2020 3:30:45 PM

FILE NAME: pw://HDR_US_National.DI/4195/10196897/680200_Concrete Box Culverts.dgn

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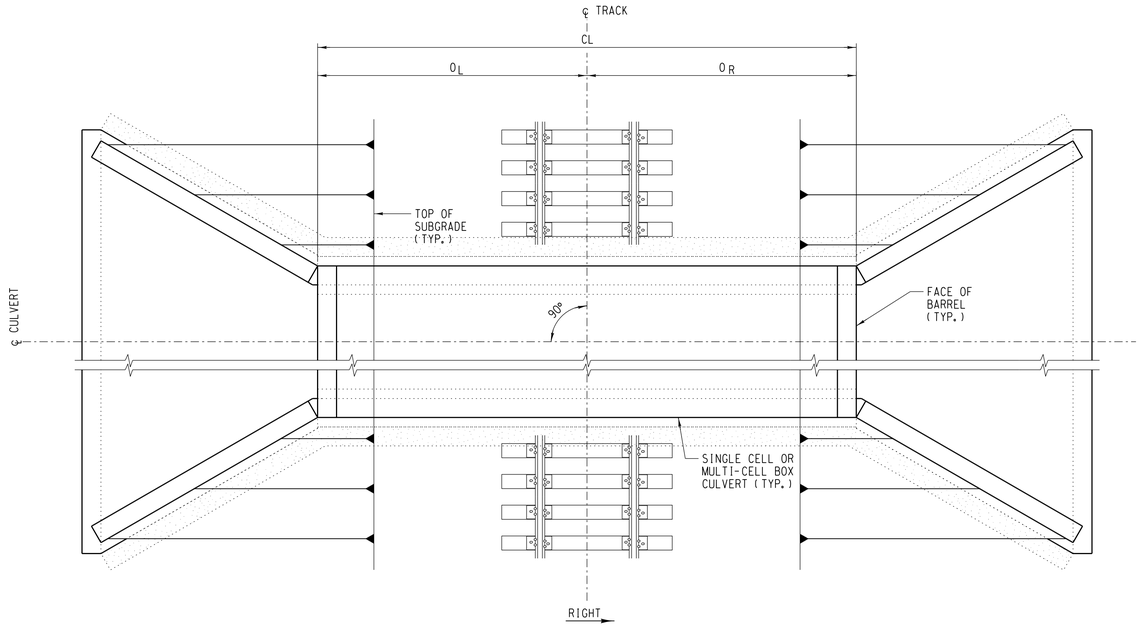
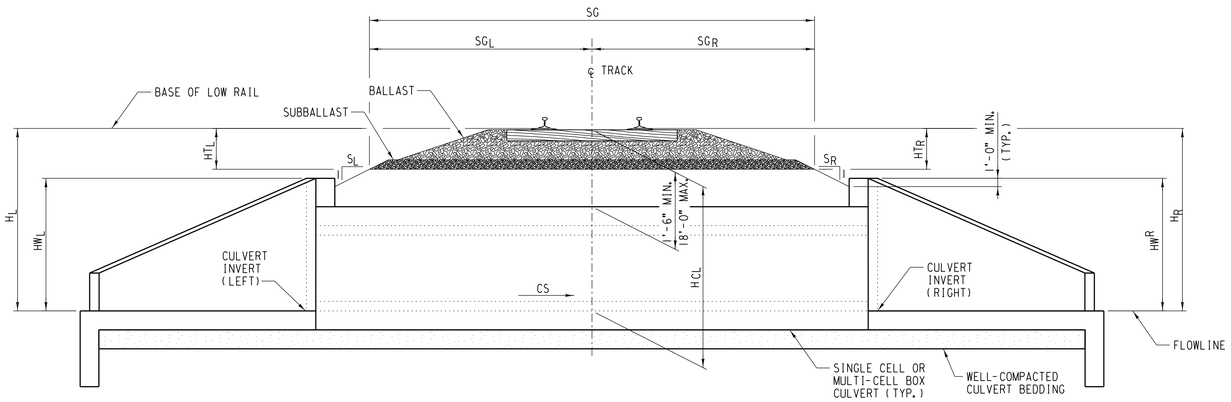


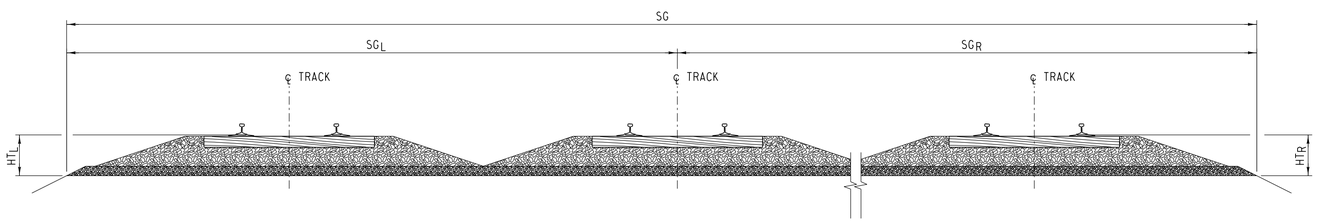
PLAN - SINGLE TRACK

SCALE: NONE



ELEVATION - SINGLE TRACK

SCALE: NONE



MULTIPLE TRACK DIAGRAM

SCALE: NONE

CULVERT LENGTH EQUATION:

$CL = O_L + O_R \geq SG + 2'$

$O_L = SG_L + S_L(H_L - HT_L + 1' - HW_L) + 1'$

$O_R = SG_R + S_R(H_R - HT_R + 1' - HW_R) + 1'$

$$H_L = \frac{H_{CL} + CS\,[SG_L - S_L(HT_L + HW_L - 1') + 1']}{[1 - CS(S_L)]}$$

$$H_R = \frac{H_{CL} - CS\,[SG_R - S_R(HT_R + HW_R - 1') + 1']}{[1 + CS(S_R)]}$$

$SG = SG_L + SG_R$

$H_{AVG} = (H_L + H_R) / 2$

KEY:

- CL = CULVERT LENGTH
- O_L = OFFSET LEFT
- O_R = OFFSET RIGHT
- H_{CL} = HEIGHT - BASE OF LOW RAIL TO FLOWLINE AT CENTERLINE OF TRACK
- CS = CULVERT SLOPE (RISE/RUN) LEFT TO RIGHT (+ UP, - DOWN)
- HT_L = BASE OF LOW RAIL TO TOP OF SUBGRADE LEFT EDGE
- HT_R = BASE OF LOW RAIL TO TOP OF SUBGRADE RIGHT EDGE
- H_L = HEIGHT - BASE OF LOW RAIL TO INVERT LEFT OF TRACK
- H_R = HEIGHT - BASE OF LOW RAIL TO INVERT RIGHT OF TRACK
- HW_L = HEIGHT OF WINGWALL LEFT OF TRACK
- HW_R = HEIGHT OF WINGWALL RIGHT OF TRACK
- SG = WIDTH OF SUBGRADE (24'-0" MINIMUM)
- SG_R = WIDTH OF SUBGRADE RIGHT OF ℄ TRACK (12'-0" MINIMUM)
- SG_L = WIDTH OF SUBGRADE LEFT OF ℄ TRACK (12'-0" MINIMUM)
- S_L = SIDE SLOPE LEFT OF TRACK (RUN PER FOOT OF RISE)
- S_R = SIDE SLOPE RIGHT OF TRACK (RUN PER FOOT OF RISE)

NOTE:
ALL DIMENSIONS ARE IN FEET.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G2

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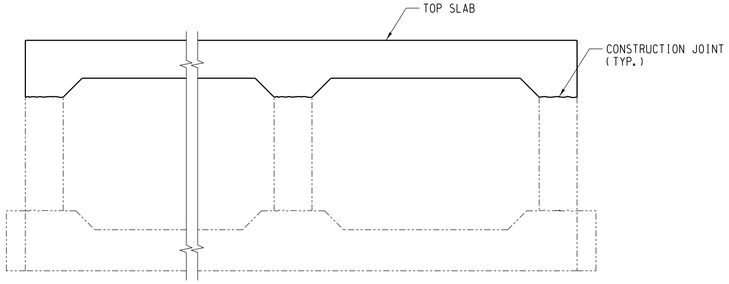
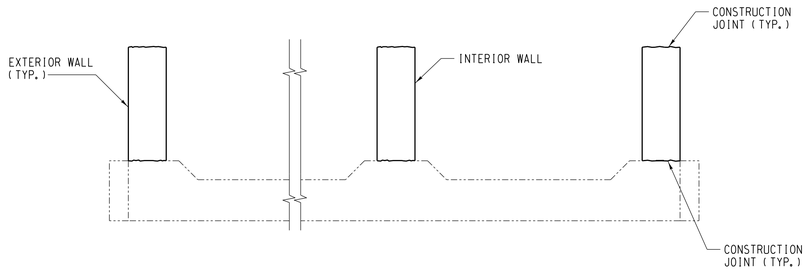
FILE NAME: pw://HDR_US_National.01/4195/10196897/680200_Concrete Box Culverts.dgn

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



PHASE THREE



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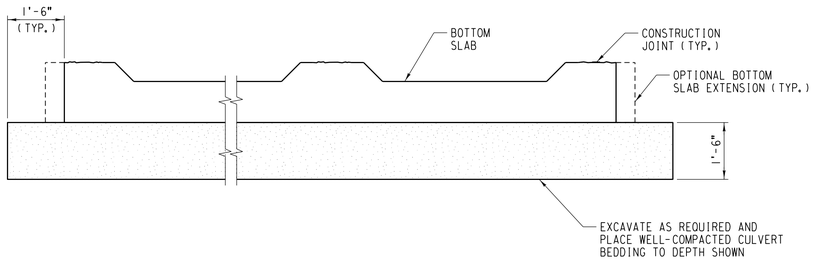
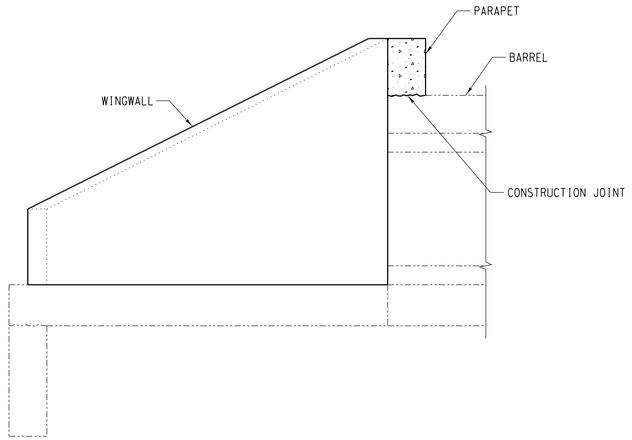


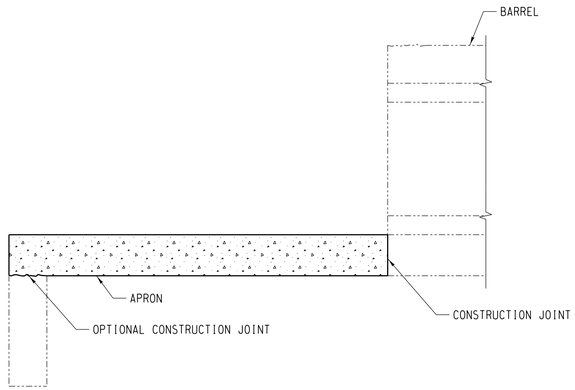
PHASE ONE

CONSTRUCTION SEQUENCE - BARREL

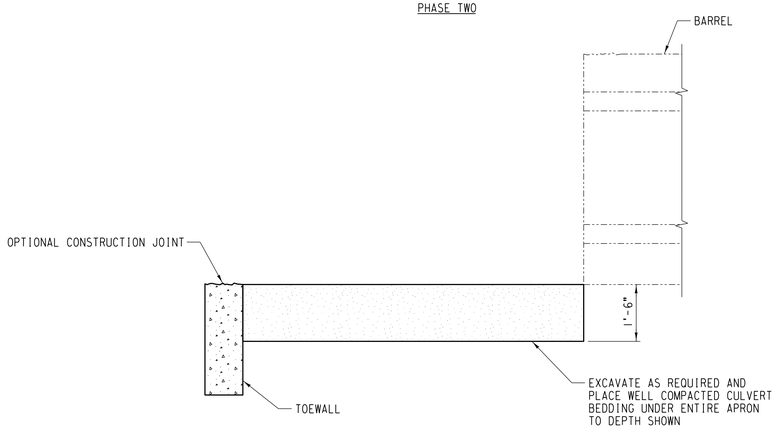
SCALE: ½"=1'-0"



PHASE THREE



PHASE TWO



PHASE ONE

CONSTRUCTION SEQUENCE - PARAPET, APRON, TOEWALL AND WINGWALLS

SCALE: ½"=1'-0"

(LOOKING PERPENDICULAR TO ℄ CULVERT)

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

CONSTRUCTION SEQUENCE

FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: G5

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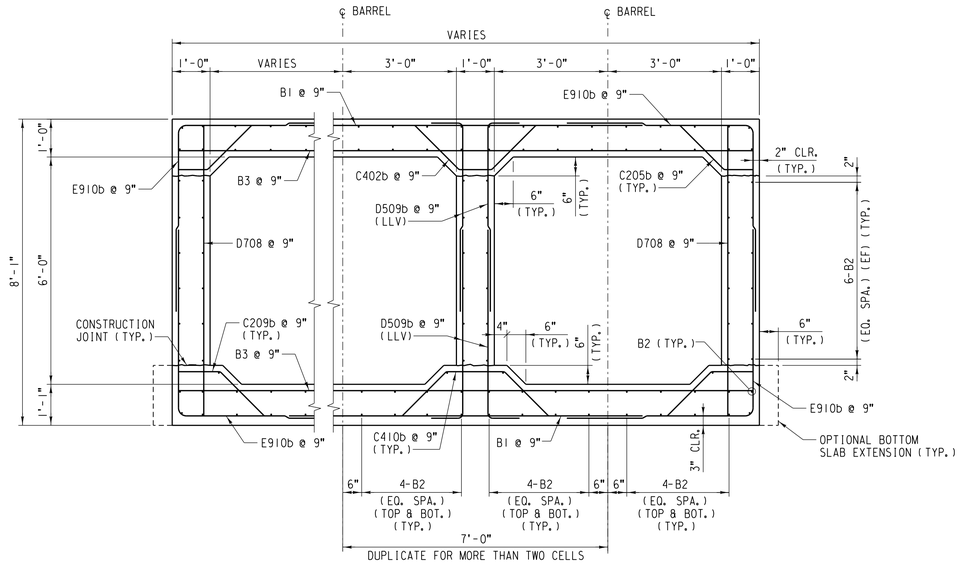
PLOTTED: 1/3/2020 3:30:48 PM

FILE NAME: pw://HDR_US_National.01/41951019068897/680200_Concrete Box Culverts.dgn

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

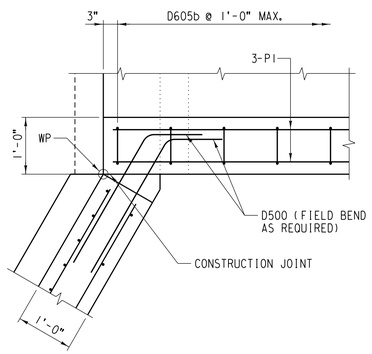


TYPICAL BARREL SECTION

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

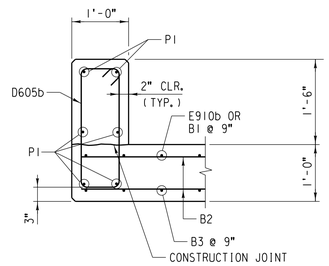
BAR SPLICE NOTE:

FOR B1 BAR USE 2'-7" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE AT MIDSPAN OF CULVERT OPENING, FOR B3 BAR USE 2'-1" MIN. LAP SPLICE WHEN NEEDED AND CENTER SPLICE OVER INTERIOR WALL, FOR B2 AND P1 BARS USE 1'-9" MIN. LAP SPLICE WHEN NEEDED AND STAGGER SPLICE.



WINGWALL TO PARAPET CONNECTION DETAIL

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



PARAPET DETAIL

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

NOTES:

1. FOR CAST-IN-PLACE CONCRETE NOTES AND REINFORCING STEEL NOTES, SEE SHEET NO. G1.
2. EF = EACH FACE
   FF = FAR FACE
   LLH = LONG LEG HORIZONTAL
   LLV = LONG LEG VERTICAL
   NF = NEAR FACE
   WP = WORKING POINT

CONCRETE QUANTITIES

	TOTAL	UNIT	DESCRIPTION
ONE END	AA	CU. YD. /FT.	BARREL
	BB	CU. YD.	PARAPET
	CC	CU. YD.	TOEWALL
	DD	CU. YD.	APRON
	6.0	CU. YD.	TWO WINGWALLS

EQUATIONS FOR VARIABLES:

L = LENGTH OF BARREL (FT)
NC = NUMBER OF BOX CULVERT CELLS
NB = 1.33(L-0.33) + 1 (ROUND UP TO THE NEAREST INTEGER)

TOTAL NUMBER OF BARS

A = 2(NB)
B = NB(NC-1)
C = 4(NB)(NC-1)
D = 66 + 46(NC-1)
E = 4(NB)
F = 16 + 14(NC-1)
G = 48 + 14(NC-1)
H = 8.5 + 7(NC-1) (ROUND UP TO THE NEAREST INTEGER)

LENGTH OF BARS

P = L - 0.33
Q = 7.67 + 7(NC-1)
R = 2.58 + 7(NC-1)
S = 9 + 7(NC-1)
T = 23.83 + 7(NC-1)
U = 9.58 + 7(NC-1)
V = 23.50 + 7(NC-1)

LENGTH OF BARS ARE CALCULATED IN FEET AND ROUNDED DOWN TO THE NEAREST WHOLE INCH.

CALCULATED BAR LENGTHS DO NOT INCLUDE LAP SPLICES, SEE BAR SPLICE NOTE FOR LAP SPLICE REQUIREMENTS.

CONCRETE QUANTITIES

AA = 1.09 + 0.79(NC-1)
BB = 0.44 + 0.39(NC-1)
CC = 2.61 + 0.76(NC-1)
DD = 9.66 + 3.93(NC-1)

ROUND CONCRETE QUANTITIES TO ONE DECIMAL PLACE.

REINFORCING SCHEDULE

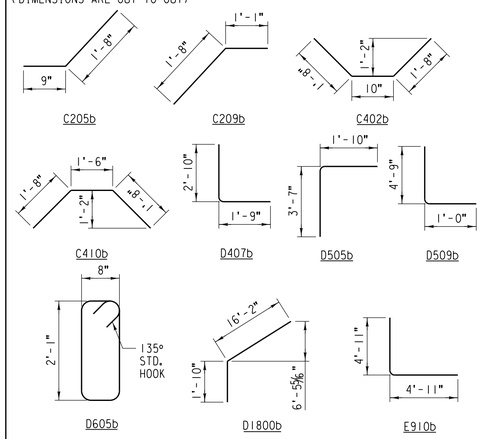
	TOTAL	MARK	SIZE	LENGTH	SHAPE
BARREL	A	C205b	#4	2'-5"	
	A	C209b	#4	2'-9"	
	B	C402b	#4	4'-2"	
	B	C410b	#4	4'-10"	
	C	D509b	#5	5'-9"	
	A	D708	#5	7'-8"	
	D	B2	#5	P	
	E	E910b	#6	9'-10"	
	A	B3	#6	Q	
	A	B1	#7	R	
PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END	F	D400	#5	4'-0"	
	78	D407b	#5	4'-7"	
	44	D500	#5	5'-0"	
	G	D505b	#5	5'-5"	
	H	D605b	#5	6'-5"	
	F	D1308	#5	13'-8"	
	12	D1409	#5	14'-9"	
	4	D1800b	#5	18'-0"	
	6	P1	#5	Q	
	2	A3	#5	S	
	8	T1	#5	T	

SET LIST

MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
D103-D1209	#5	1'-3"	12'-9"	2'-3 5/16"(+)	6	4	
D201-D801	#5	2'-1"	8'-1"	6"	13	2	
D202-D802	#5	2'-2"	8'-2"	3"	25	2	
D303-D1307	#5	3'-3"	13'-7"	1'-8 5/16"(+)	7	4	
A1	#5	U	V	6 5/16"(+)	25	1	
A2	#5	U	V	1'-1 7/8"(+)	13	1	

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 FOR BARREL = 79.63(NB)(NC) + 47.98(NC)(L) + 35.90(NB) - 15.99(NC) + 20.86(L) - 6.95 LB.

EST. WT. OF REINFORCING STEEL FOR PARAPET, APRON, TOEWALL AND TWO WINGWALLS FOR ONE END = 3,238 + 779(NC-1) LB.

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

6'-0" x 6'-0" MULTI-CELL BOX CULVERT DETAILS (SHEET 1 OF 2)

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: MC3

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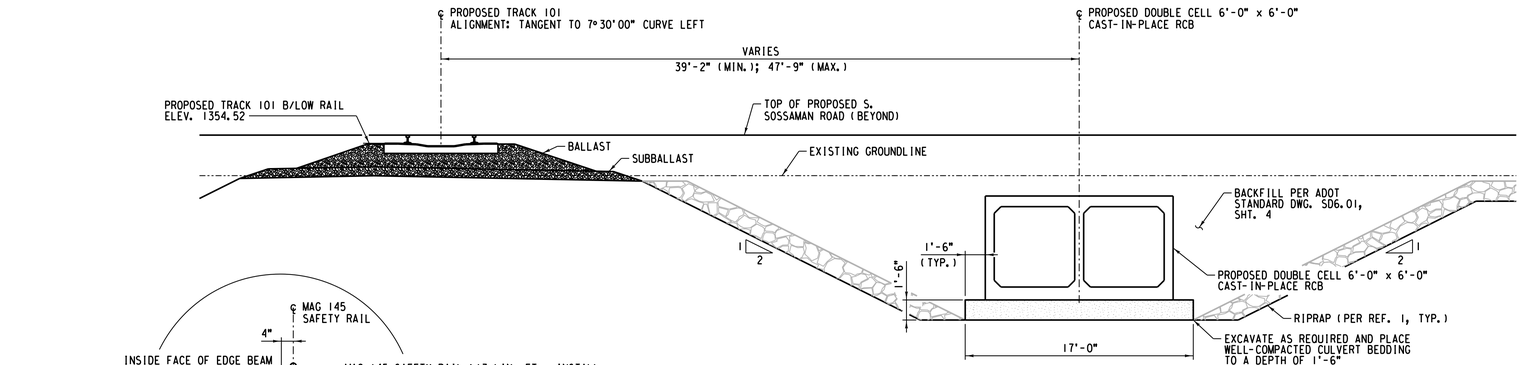
PLOTTED: 1/3/2020 3:31:06 PM

FILE NAME: pw://HDR_US_National.01/4195/10196897/680200_Concrete Box Culverts.dgn

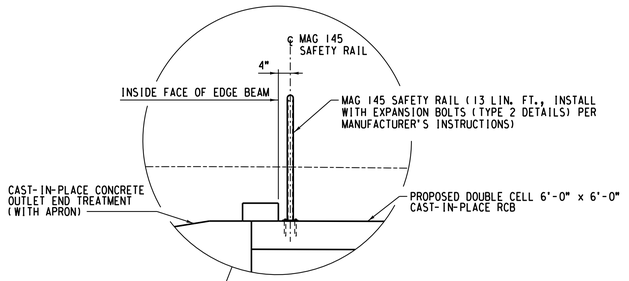
INCHES 1 2 3 4 5 6 7 8 9 10 11 12

DESIGN SHEET



ELEVATION

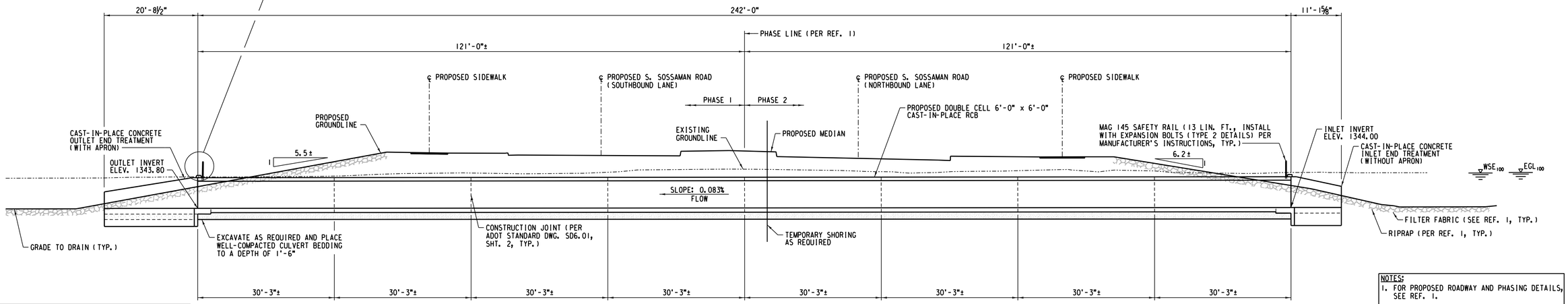
SCALE: 1/32"=1'-0"



NOTES:
1. SECTION SHOWN AT STA. 41+00. S. SOSSAMAN ROAD AND CROSSING DETAILS (BEYOND) NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR MAY PROPOSE STEEPER TEMPORARY OPEN CUT IF REQUIRED FOR CONSTRUCTION (1:1 MAX).

TO PHOENIX SUBDIVISION

TO END OF TRACK 101



CROSS SECTION

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

WSE_{100} = 1347.81
EGL_{100} = 1347.87
VEL_{100} = 6.80 fps

NOTES:
1. FOR PROPOSED ROADWAY AND PHASING DETAILS, SEE REF. 1.
2. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
3. RCB = REINFORCED CONCRETE BOX

MATERIAL NOTES:
1. ALL CAST-IN-PLACE CONCRETE SHALL BE PER STD. DWG. 680200 SHT. G1.
2. CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
242	FT	6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT BARREL (PER ADOT STANDARD DRAWINGS, PLAN SD6.01 SHEET 1 AND PLAN SD6.02, SHEET 1)		CONSTRUCTOR
1	EA.	OUTLET END TREATMENT FOR 6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT, SKEW = 0° (WITH APRON) (PER ADOT STANDARD DRAWINGS, PLAN SD6.01, SHEET 1 & 4, PLAN SD6.08, SHEET 1 AND PLAN SD6.11, SHEET 1 & 3)		
1	EA.	INLET END TREATMENT FOR 6'-0" X 6'-0" DOUBLE-CELL BOX CULVERT, SKEW = 0° (WITHOUT APRON) (PER ADOT STANDARD DRAWINGS, PLAN SD6.01, SHEET 2 & 4, AND PLAN SD6.08, SHEET 3)		
26	LIN.FT.	MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) 145 SAFETY RAIL (TWO HEADWALLS, WITH EXPANSION BOLTS (TYPE 2 DETAILS) AND ALL OTHER ASSOCIATED HARDWARE) OR APPROVED ALTERNATE		
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP (PER REF. 1)		
1	LOT	FILTER FABRIC (PER REF. 1)		
265	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
445	CU. YD.	STRUCTURE BACKFILL (PER ADOT STANDARD DRAWINGS, PLAN SD6.01, SHEET 4)		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY SHORING		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

DESIGN NOTES

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 6): Elev. 1352.34, NAVD 1988, ½" rebar located in ground North of proposed Track 101 Culvert No. 0.80, 3208.83' left of existing Phoenix Sub. Main Track centerline, Sta. 1504+80.52.
   TBM 2 (Olsson CP 103): Elev. 1352.47, NAVD 1988, ½" rebar located in ground North of proposed Track 101 Culvert No. 0.80, 3342.95' left of existing Phoenix Sub. Main Track centerline, Sta. 1502+77.39.
4. Profile: Proposed Track 101 per Ref. 1.
5. Alignment: Not applicable.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. This structure has been designed for AASHTO HL-93 Live Load with impact and cover depth ranging from 0'-0" to 10'-0".
2. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

DRAWING SCHEDULE

THIS SET

SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
S1	123079	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
S2	123079	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
G1	680200	GENERAL NOTES	STANDARD
1	SD6.01	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS (1 OF 5)	ADOT STANDARD
2	SD6.01	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS (2 OF 5)	ADOT STANDARD
4	SD6.01	REINFORCED CONCRETE BOX CULVERTS STRUCTURAL EXCAVATION & STRUCTURE BACKFILL	ADOT STANDARD
1	SD6.02	REINFORCED CONCRETE BOX CULVERTS DOUBLE BARREL (0'-15' FILLS)	ADOT STANDARD
1	SD6.08	REINFORCED CONCRETE BOX CULVERTS OUTLET WINGS - SKEW 0° TO 20° CULVERT HEIGHT 3' TO 7'	ADOT STANDARD
3	SD6.08	REINFORCED CONCRETE BOX CULVERTS INLET WINGS - SKEW 0° TO 20° CULVERT HEIGHT 3' TO 7'	ADOT STANDARD
1	SD6.11	REINFORCED CONCRETE BOX CULVERTS OUTLET APRON DETAILS	ADOT STANDARD
3	SD6.11	REINFORCED CONCRETE BOX CULVERTS OUTLET APRON - DIMENSIONS & QUANTITIES (6:1 SLOPE)	ADOT STANDARD
145	-	SAFETY RAIL	MAG STANDARD

REF.

NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
1	-	P018 OF 037 T008 OF 012 X045 OF 143 X046 OF 143 EC011 OF 036 PH011 OF 024	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — DATE: 02/08/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123079

LATITUDE: 33.28826°N LONGITUDE: 111.66946°W

UNION PACIFIC

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S2

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.80, PIRATE IND LEAD

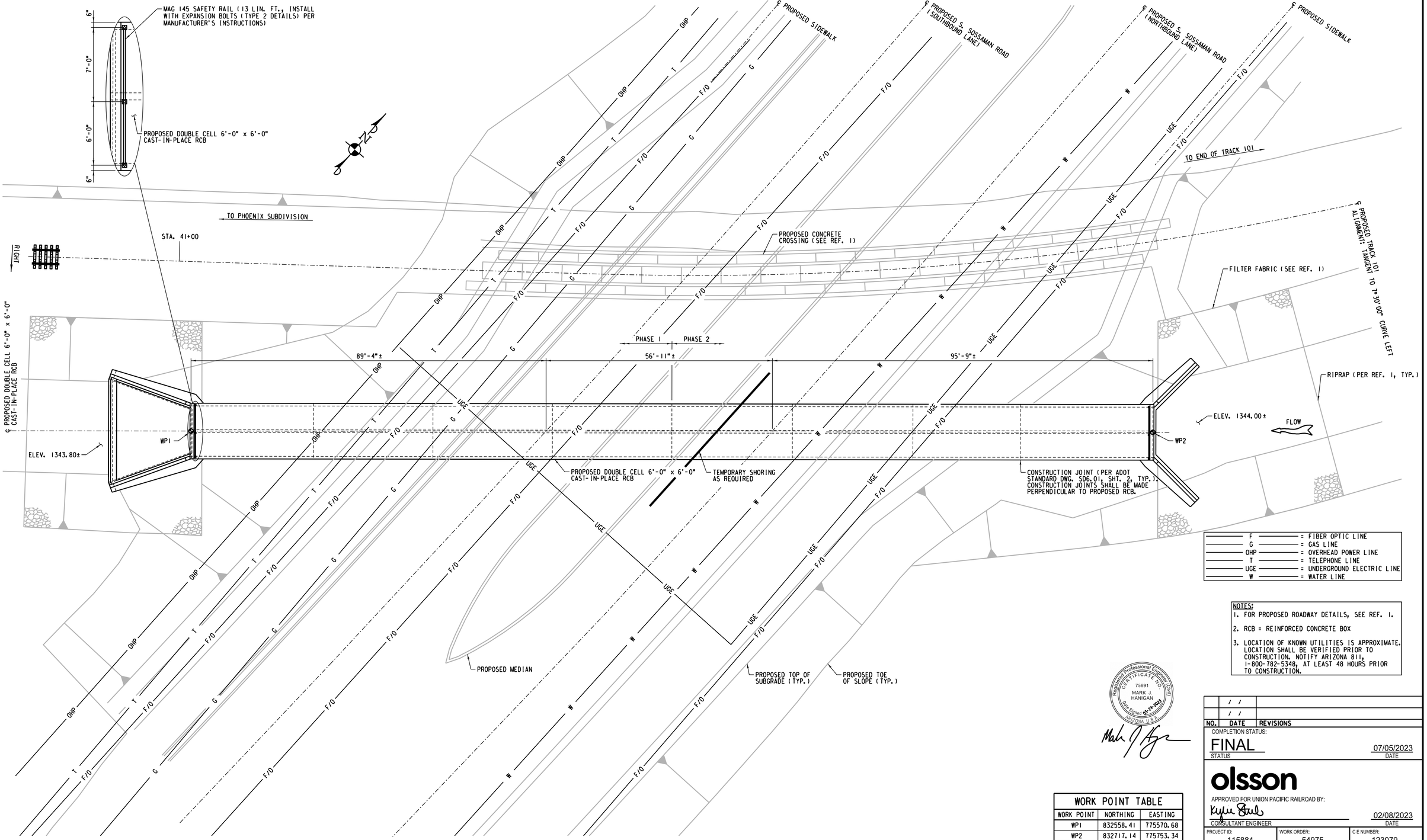
FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 242'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

PLOTTED: 7/5/2023 12:15:52 PM

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na\projects\20200\0501-10000\020-0927\40-Design\Microstation\020-0927_RLBRA.dgn,v 0.80,Station 40-86.59,ar-r00080.cel,dgn

DESIGN SHEET



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

F	= FIBER OPTIC LINE
G	= GAS LINE
OHP	= OVERHEAD POWER LINE
T	= TELEPHONE LINE
UGE	= UNDERGROUND ELECTRIC LINE
W	= WATER LINE

NOTES:
1. FOR PROPOSED ROADWAY DETAILS, SEE REF. 1.
2. RCB = REINFORCED CONCRETE BOX
3. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 02-24-2023 ARIZONA, U.S.A.

WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	832558.41	775570.68
WP2	832717.14	775753.34

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 02/08/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123079

LATITUDE: 33.28826°N LONGITUDE: 111.66946°W

DSN/CHK BY:	NAS/MJH
DRAWN/CHK BY:	NAS/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S2

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 0.80, PIRATE IND LEAD

FURNISH & INSTALL
DOUBLE CELL 6'-0" x 6'-0" RCB x 242'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oasconsulting.com\rtc-nal\projects\2020\0501.1000\020-0927\40-Design\Microstation\020-0927.RLBRA.July 0.80.Station 40+86.59.pri-r00080.cad.dgn

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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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

REVISIONS		
DATE	LTR.	DESCRIPTION
/		
/		
/		
/		
/		
/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

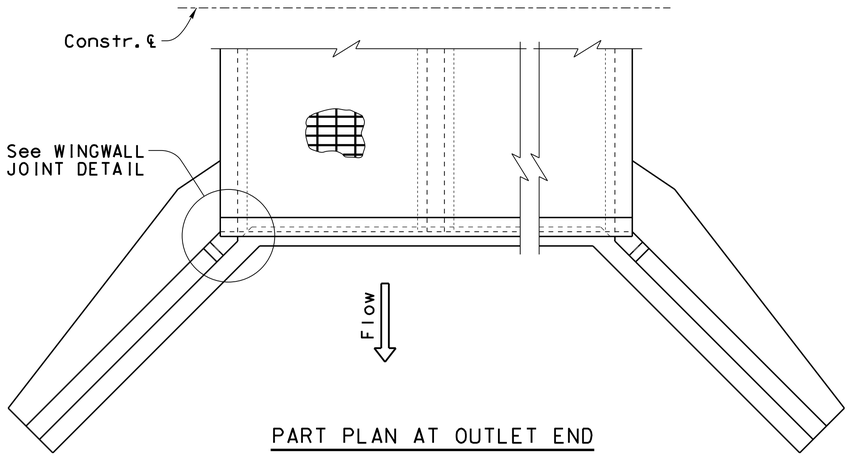
PLAN NO.: 680200 | SHEET: G1

Copyright © 2020 by Union Pacific Railroad

PLOTTED: 1/3/2020 3:30:45 PM

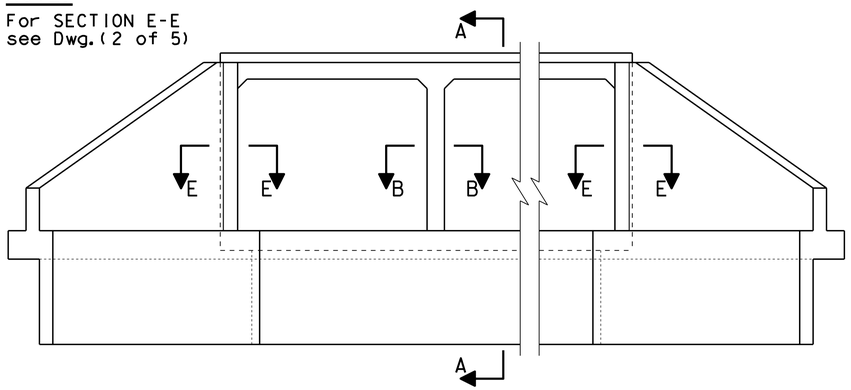
FILE NAME: pw://HDR_US_National.DI/4195/10196897/680200_Concrete Box Culverts.dgn

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



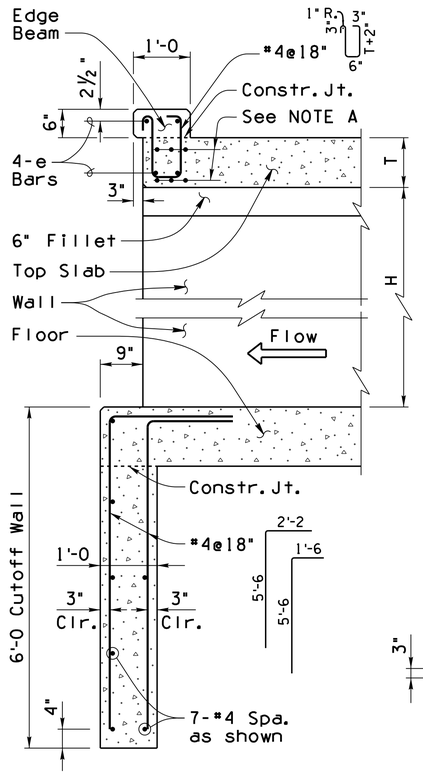
PART PLAN AT OUTLET END

NOTE:
For SECTION E-E see Dwg. (2 of 5)



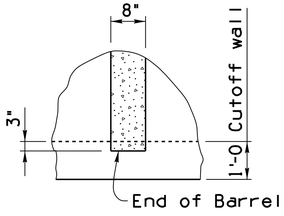
ELEVATION AT OUTLET END

NOTE A:
Use 3-#7 @3" spa. top and bott bars for culverts skewed 6° to 30°.
Use 3-#8 @3" spa. top and bott bars for culverts skewed 31° to 45°.
Culverts skewed over 45° require a special edge beam design.
Edge beam reinforcing quantity shall be added to table quantities.



SECTION A-A

e Bars			
Skew ∠	Span		
	6' & 8'	10'	12'
0° to 20°	#6	#6	#6
25° & 30°	#6	#6	#7
35°	#6	#7	#8
40° & 45°	#6	#7	#9



SECTION B-B

GENERAL NOTES:

Construction Specification - Arizona Department of Transportation Standard Specifications for Road and Bridge Construction, latest Edition.

Design Specifications - AASHTO LRFD Bridge Design Specifications, 7th Edition 2014.

Loading Class - HL-93.

Design:
Soil weight = 120 p.c.f.

All Concrete shall be Class "S" (f'c = 3000 psi).

Reinforcing steel shall conform to ASTM Specification A615. All reinforcing shall be furnished as Grade 60.

All bends and hooks shall meet the requirements of AASHTO LRFD Article 5.10. All bend dimensions for reinforcing steel shall be out-to-out of bars. All placement dimensions for reinforcing steel shall be to center of bars unless noted otherwise.

All reinforcing steel shall have 2" clear cover unless noted otherwise.

Chamfer all exposed corners ¾" unless noted otherwise.

Compact backfill for footing and wing base minimum 100 percent of ASTM D698 maximum dry density.

All structures shall have formed Construction joints in the top slab and walls (optional in floor slab) and spaced not more than 38'-6" apart or as shown in Project Plans. Joints shall be perpendicular to the centerline of the box. Reinforcing steel shall project 1'-6 thru the joint. The joint shall be made with a ¼" plywood bulkhead which shall be left in place or the alternate joint detail shown on Dwg. (2 of 5) may be used.

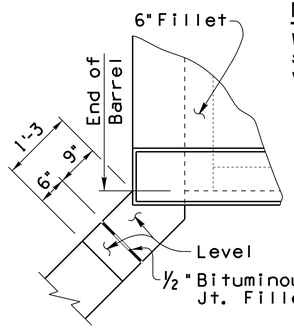
See Project Plans for culvert layout, invert elevations, finished grade elevations, headwall, apron, and other site specific details.

Dimensions shall not be scaled from drawings.

Pay item quantities of concrete and reinforcing steel include all labor and materials for box culvert, footing, headwalls, and aprons.
Total Quantities include Barrel and Headwall Quantities shown in Tables (plus added quantity for apron when used). Barrel Quantities Table is per linear foot of box (multiply by length of box to obtain barrel total). Headwall Quantities Table includes wings, edge beam, and cutoff wall.

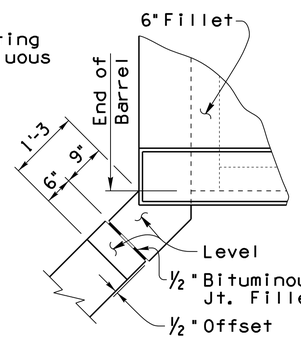
Culverts measuring 20 ft and greater to the inside faces of exterior walls, along the roadway centerline, shall be assigned a structure number. The structure number shall be referenced in the culvert summary sheet and drainage details.

NOTE:
For Dimensions, Quantities and additional Details, see SD 6.01 (2 to 5).



NOTE:
Wing wall footing shall be contiuous with no joint.

WINGWALL JOINT DETAIL
(For Barrel Height < 8 Ft.)



WINGWALL JOINT DETAIL
(For Barrel Height ≥ 8 Ft.)

NOTE:
Special design sections shall be adjoined with standard barrels when necessary.

Culvert barrels always begin and end with Table No. I.

Thickness of top and bottom slabs vary with depths of fill as shown.

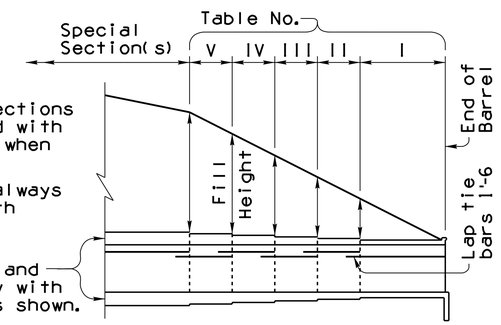


DIAGRAM SHOWING TABLE NO. TO BE USED FOR VARIOUS FILL HEIGHTS

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	S.U.H.	2-12
2	General updates	D.B.B.	5-15
3			
4			

Note to Designer:
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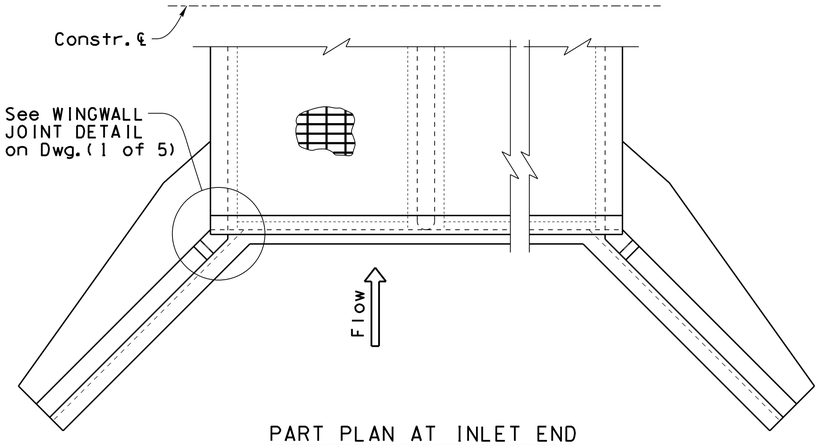
DESIGN APPROVED

APPROVED FOR DISTRIBUTION

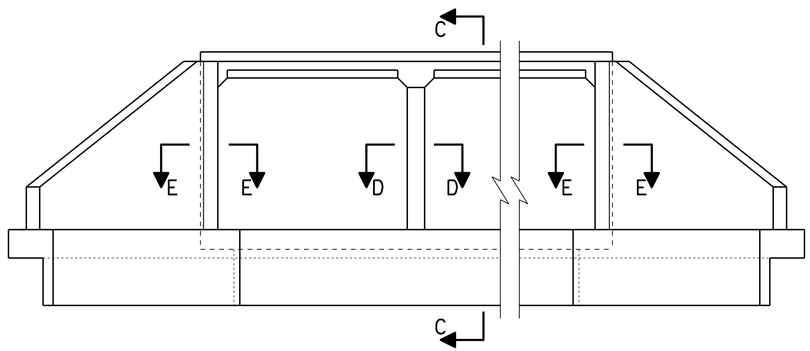
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
MISCELLANEOUS DETAILS

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.01 (1 of 5)
LOCATION			SHEET NO. OF



PART PLAN AT INLET END



ELEVATION AT INLET END

NOTE A:

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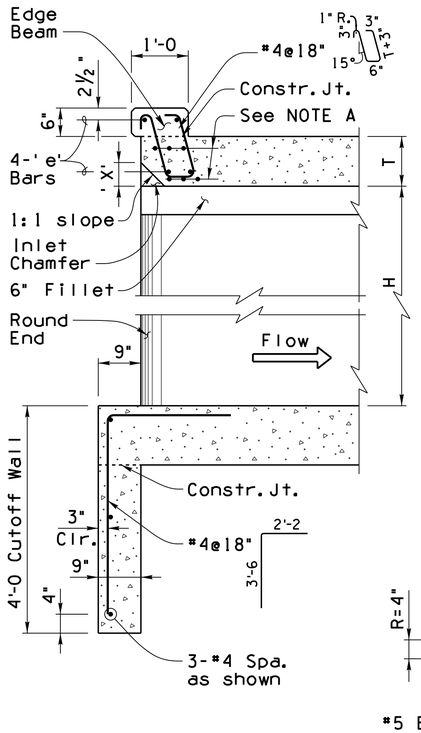
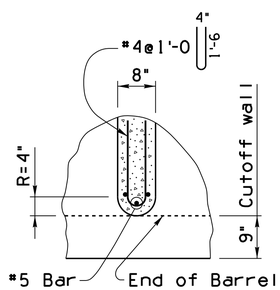
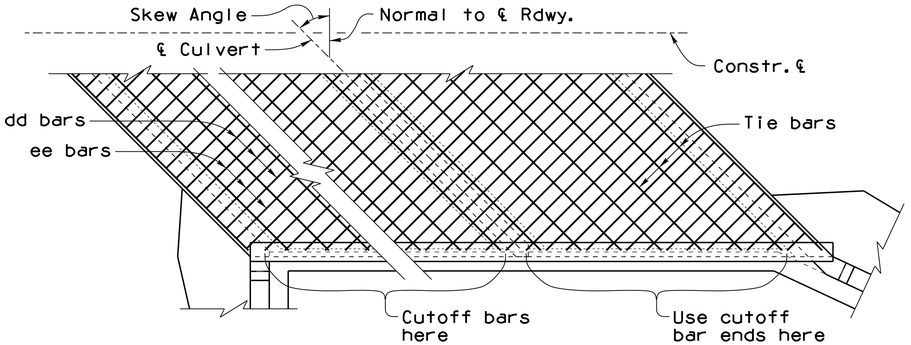
Culverts skewed over 45° require a special edge beam design.
Edge beam reinforcing quantity shall be added to table quantities.



SECTION C-C



SECTION D-D



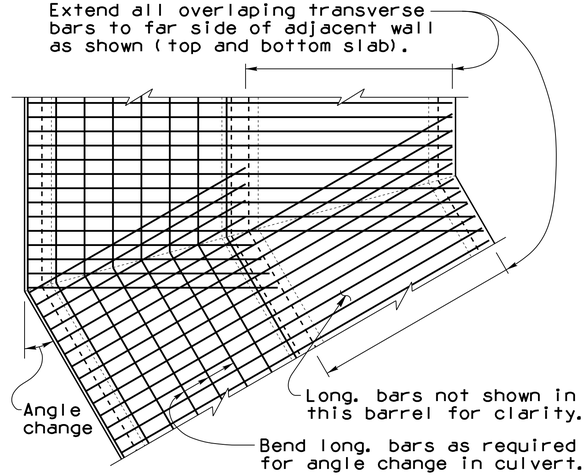
PART PLAN - SKEWED CULVERT

(Showing Reinf. Steel Placement)

NOTE:

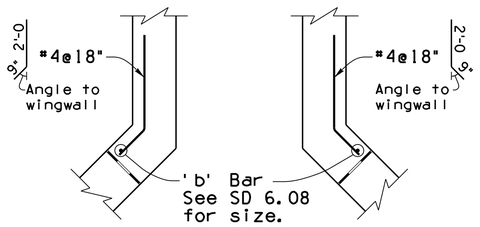
For 'e' Bars table, see Dwg. (1 of 5)

Span 'S'	Dim. 'X'
6'	3"
8'	4"
10'	5"
12'	6"

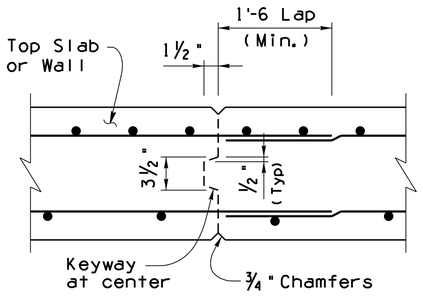


PART PLAN - ANGLED CULVERT

(Showing Reinf. Steel Placement)



SECTION E-E



ALT. CONSTRUCTION JOINT DETAIL

NOTE:

For General Notes, Dimensions, Quantities and additional Details, see SD 6.01 (1 & 3, 4, 5).

DESIGN APPROVED	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION BRIDGE GROUP STRUCTURE DETAIL
Shafi U. Hasan	
APPROVED FOR DISTRIBUTION Jean A. Nehme	REINFORCED CONCRETE BOX CULVERTS MISCELLANEOUS DETAILS
ROUTE / PROJECT NO. / FA NO.	DRAWING NO. SD 6.01 (2 of 5)
LOCATION	SHEET NO. OF

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SJUH.	2-12
2			
3			
4			

Note to Designer:
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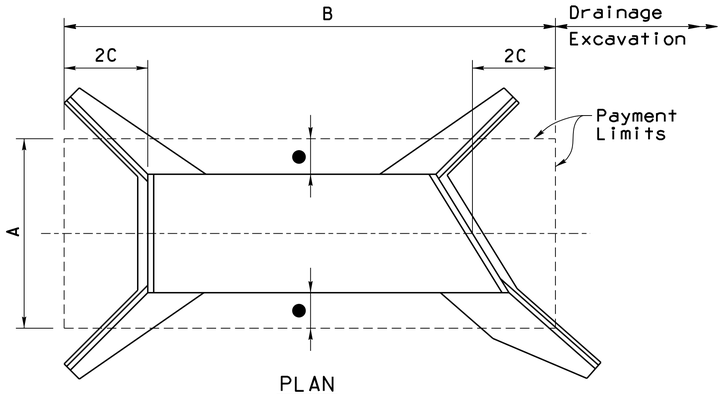
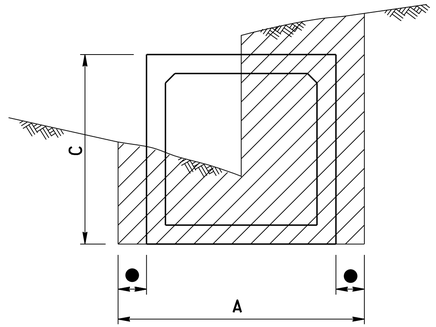
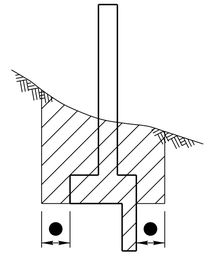


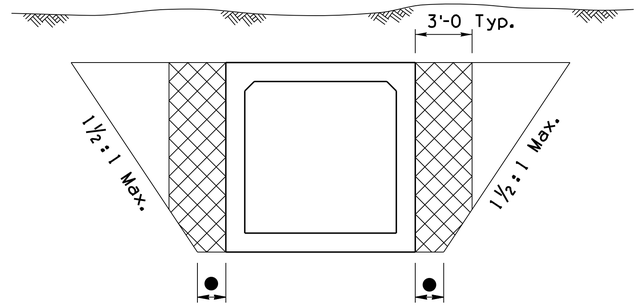
PLAN



SECTION



SECTION AT WING

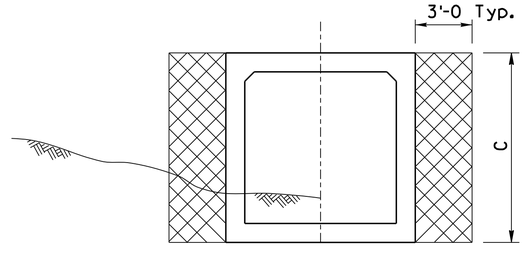


SECTION

STRUCTURAL EXCAVATION - PAYMENT LIMITS

NOTE:

Payment limits shown include structural excavation for headwalls, cutoffwalls, wingwalls, end sections, etc.



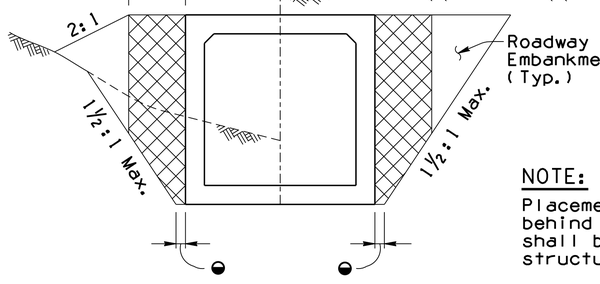
PLACEMENT DETAIL

SECTION

STRUCTURE BACKFILL - MEASUREMENT

NOTE:

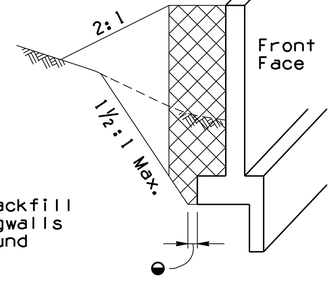
Computation of structure backfill quantities is based on the area of a typical installation times the total length of structure plus 2C.
Use C for box extensions on each end extended.
No measurment is necessary for wing arms.



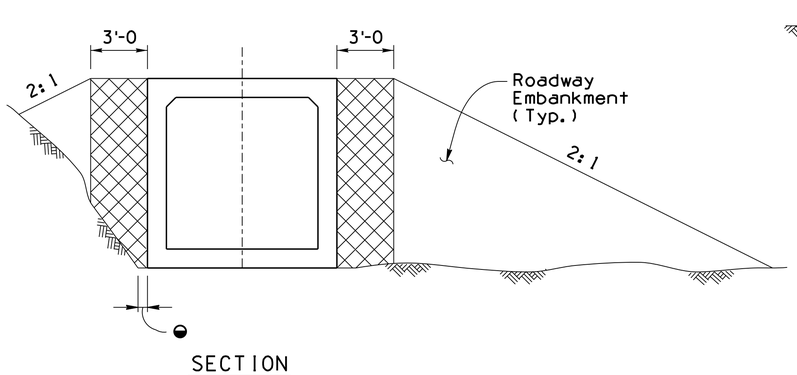
SECTION

NOTE:

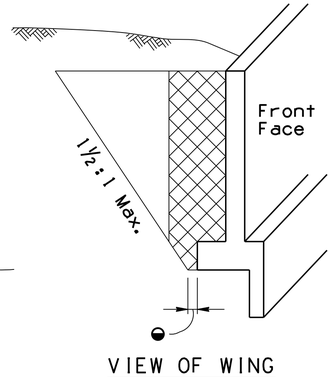
Placement of structure backfill behind headwalls and wingwalls shall be the same as around structures.



VIEW OF WING



SECTION



VIEW OF WING

STRUCTURE BACKFILL - PLACEMENT

LEGEND

A = Width
B = Length
C = Height of barrel or headwall without cutoff wall.
● = 6" Max. in rock and trench, 1'-6 max. all others
◒ = 6" Min. in rock and trench, 1'-6 min. all others
Indicates Structural Excavation
Indicates Structure Backfill
Indicates Roadway Embankment

NOTE:

For General Notes, Dimensions, Quantities and additional Details, see SD 6.01 (1, 2, 3 & 5).

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SAVK	2-12
2			
3			
4			

Note to Designer:
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DESIGN APPROVED: Shafi U. Hasan	ARIZONA DEPARTMENT OF TRANSPORTATION INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION BRIDGE GROUP STRUCTURE DETAIL
APPROVED FOR DISTRIBUTION: Jean A. Nehme	REINFORCED CONCRETE BOX CULVERTS STRUCTURAL EXCAVATION & STRUCTURE BACKFILL

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.01 (4 of 5)
LOCATION			SHEET NO. OF

20-JAN-2016 16:33 G:\Bridge\CADD\Standards\SD_Sheets\SD 6 Drainage Stuctures\SD 6.01-6.11 Series\SD6.01-1 to 5\sd601-4_1916.dgn

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NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original issue	S.U.H.	2-12
2	Added 3',4',5' height for existing box extensions only	D.B.B.	5-15
3			
4			

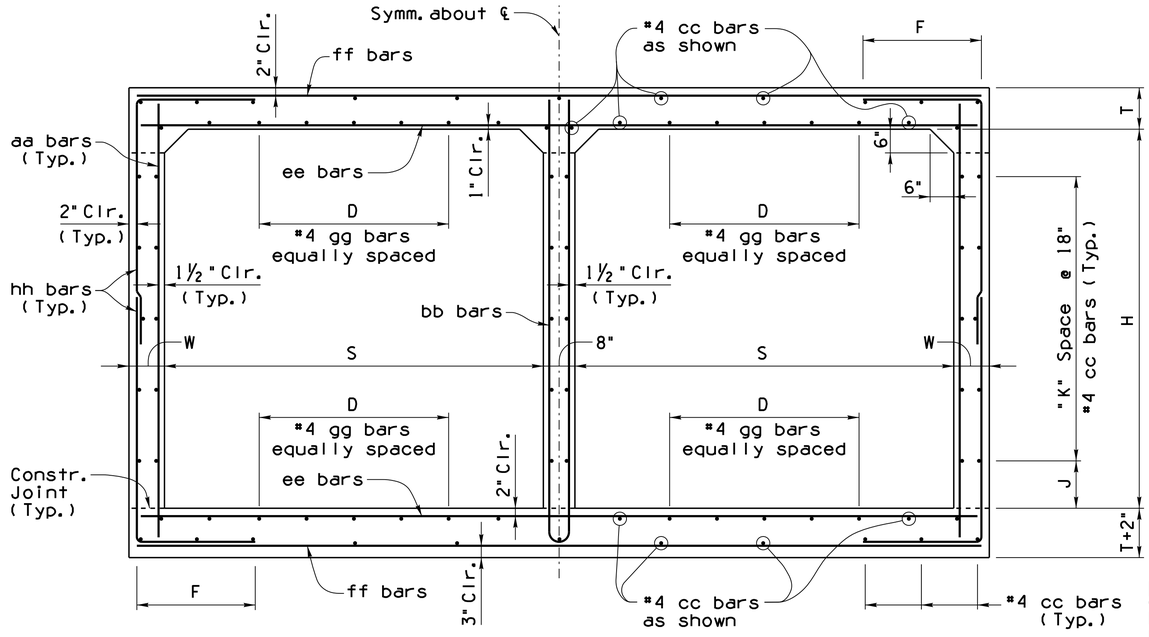
TABLE I
0'-10' FILL

Span "S"	Height "H"	Top Slab "T"	Walls "W"	aa			bb			cc	ee			ff			gg		hh			
				Bar Size	Spacing	Length	Bar Size	Spacing	Length	Number ⌖	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Number ⌖	D	Bar Size	Spacing	Length	F
6'	3'	9½"	8"	5	12"	4'-4	5	12"	8'-9	48	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	5'-1	2'-5
	4'	9½"	8"	5	12"	5'-4	5	12"	10'-9	54	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	5'-7	2'-5
	5'	9½"	8"	5	12"	6'-4	5	12"	12'-9	54	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	6'-1	2'-5
	6'	9½"	8"	5	12"	7'-4	5	12"	14'-9	60	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	6'-7	2'-5
	7'	9½"	8"	5	12"	8'-4	5	12"	16'-9	66	5	7"	13'-7	5	8"	13'-7	20	3'-0	5	8"	7'-1	2'-5
8'	3'	9½"	9"	5	12"	4'-4	5	12"	8'-8	48	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	5'-6	2'-6
	4'	9½"	9"	5	12"	5'-4	5	12"	10'-8	54	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	6'-0	2'-6
	5'	9½"	9"	5	12"	6'-4	5	12"	12'-8	54	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	6'-6	2'-6
	6'	9½"	9"	5	12"	7'-4	5	12"	14'-8	60	5	6	17'-9	6	8"	17'-9	28	4'-0	5	6"	7'-0	2'-6
	7'	9½"	9"	5	12"	8'-4	5	12"	16'-8	66	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	7'-5	2'-6
	8'	9½"	9"	5	12"	9'-4	5	12"	18'-8	66	5	6"	17'-9	6	8"	17'-9	28	4'-0	5	6"	8'-0	2'-6
10'	3'	10½"	11"	5	12"	4'-6	5	12"	8'-11	48	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-0	2'-8
	4'	10½"	11"	5	12"	5'-6	5	12"	10'-11	54	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-7	2'-8
	5'	10½"	11"	5	12"	6'-6	5	12"	12'-11	54	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	6'-8	2'-8
	6'	10½"	11"	5	12"	7'-6	5	12"	14'-11	60	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	7'-2	2'-8
	7'	10½"	11"	5	12"	8'-6	5	12"	16'-11	66	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	7'-9	2'-8
	8'	10½"	11"	5	12"	9'-6	5	12"	18'-11	66	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	8'-3	2'-8
	9'	10½"	11"	5	12"	10'-6	5	12"	20'-11	72	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	8'-9	2'-8
	10'	10½"	11"	5	12"	11'-6	5	12"	22'-11	78	5	6"	22'-1	6	6"	22'-1	32	5'-0	5	6"	9'-3	2'-8
12'	8'	12½"	13"	5	12"	9'-10	5	12"	19'-7	66	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	8'-6	2'-10
	9'	12½"	13"	5	12"	10'-10	5	12"	21'-7	72	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	9'-0	2'-10
	10'	12½"	13"	5	12"	11'-10	5	12"	23'-7	78	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	9'-6	2'-10
	11'	12½"	13"	5	12"	12'-10	5	12"	25'-7	78	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	10'-0	2'-10
	12'	12½"	13"	5	12"	13'-10	5	12"	27'-7	84	6	7"	26'-5	7	7"	26'-5	40	6'-0	6	7"	10'-6	2'-10

TABLE NO. II
10'-15' FILL

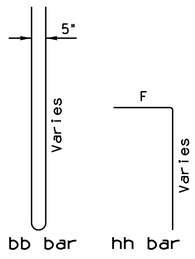
Span "S"	Height "H"	Top Slab "T"	Walls "W"	aa			bb			cc	ee			ff			gg		hh			
				Bar Size	Spacing	Length	Bar Size	Spacing	Length	Number ⌖	Bar Size	Spacing	Length	Bar Size	Spacing	Length	Number ⌖	D	Bar Size	Spacing	Length	F
6'	3'	8"	8"	5	12"	4'-1	5	12"	8'-3	48	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	5'-0	2'-5
	4'	8"	8"	5	12"	5'-1	5	12"	10'-3	54	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	5'-6	2'-5
	5'	8"	8"	5	12"	6'-1	5	12"	12'-3	54	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	6'-0	2'-5
	6'	8"	8"	5	12"	7'-1	5	12"	14'-3	60	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	6'-6	2'-5
	7'	8"	8"	5	12"	8'-1	5	12"	16'-3	66	5	7"	13'-7	5	7"	13'-7	16	3'-0	5	8"	7'-0	2'-5
8'	3'	10½"	9"	5	12"	4'-6	5	12"	9'-1	48	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	5'-3	2'-6
	4'	10½"	9"	5	12"	5'-6	5	12"	11'-1	54	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	5'-9	2'-6
	5'	10½"	9"	5	12"	6'-6	5	12"	13'-1	54	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	6'-3	2'-6
	6'	10½"	9"	5	12"	7'-6	5	12"	15'-1	60	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	6'-9	2'-6
	7'	10½"	9"	5	12"	8'-6	5	12"	17'-1	66	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	8"	7'-3	2'-6
	8'	10½"	9"	5	12"	9'-6	5	12"	19'-1	66	5	6"	17'-9	6	7"	17'-9	20	4'-0	5	7"	7'-9	2'-6
10'	3'	12½"	11"	5	12"	4'-10	5	12"	9'-7	48	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	5'-10	2'-8
	4'	12½"	11"	5	12"	5'-10	5	12"	11'-7	54	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	6'-4	2'-8
	5'	12½"	11"	5	12"	6'-10	5	12"	13'-7	54	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	6'-10	2'-8
	6'	12½"	11"	5	12"	7'-10	5	12"	15'-7	60	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	7'-4	2'-8
	7'	12½"	11"	5	12"	8'-10	5	12"	17'-7	66	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	7'-10	2'-8
	8'	12½"	11"	5	12"	9'-10	5	12"	19'-7	66	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	8'-4	2'-8
	9'	12½"	11"	5	12"	10'-10	5	12"	21'-7	72	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	8'-10	2'-8
	10'	12½"	11"	5	12"	11'-10	5	12"	23'-7	78	5	6"	22'-1	7	7"	22'-1	24	5'-0	5	7"	9'-4	2'-8
12'	8'	15"	13"	5	12"	10'-3	5	12"	20'-4	66	6	7"	26'-5	7	7"	26'-5	28	6'-0	5	7"	8'-9	2'-11
	9'	15"	13"	5	12"	11'-3	5	12"	22'-4	72	6	7"	26'-5	7	7"	26'-5	28	6'-0	5	7"	9'-3	2'-11
	10'	15"	13"	5	12"	12'-3	5	12"	24'-4	78	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	9'-9	2'-11
	11'	15"	13"	5	10"	13'-3	5	12"	26'-4	78	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	10'-9	3'-5
	12'	15"	13"	5	10"	14'-3	5	12"	28'-4	84	6	7"	26'-5	7	7"	26'-5	28	6'-0	6	7"	11'-3	3'-5

⌖ Total number of bars in the cross-section.



TYPICAL SECTION
(Shown as 8'-0 x 8'-0 Table II)

Height "H"	"J" Dim.	"K" Spaces
3'	9"	1
4'	6"	2
5'	12"	2
6'	9"	3
7'	6"	4
8'	12"	4
9'	9"	5
10'	6"	6
11'	12"	6
12'	9"	7



BENDS

NOTE:
Reinforcing shown for 8'-0 x 8'-0 Table II box. Use the appropriate table to determine the reinforcing requirements of selected box.

NOTE:
For General Notes, Dimensions, and additional Details, see SD 6.01 (1 to 4). For Quantities and Tables III thru V see SD 6.02 (2 of 2).

New box culverts shall not be constructed using 3' or 4' heights without special approval from ADOT Bridge Group. Tables referencing these sizes are provided for extension of existing box culverts only.

DESIGN APPROVED
APPROVED FOR DISTRIBUTION

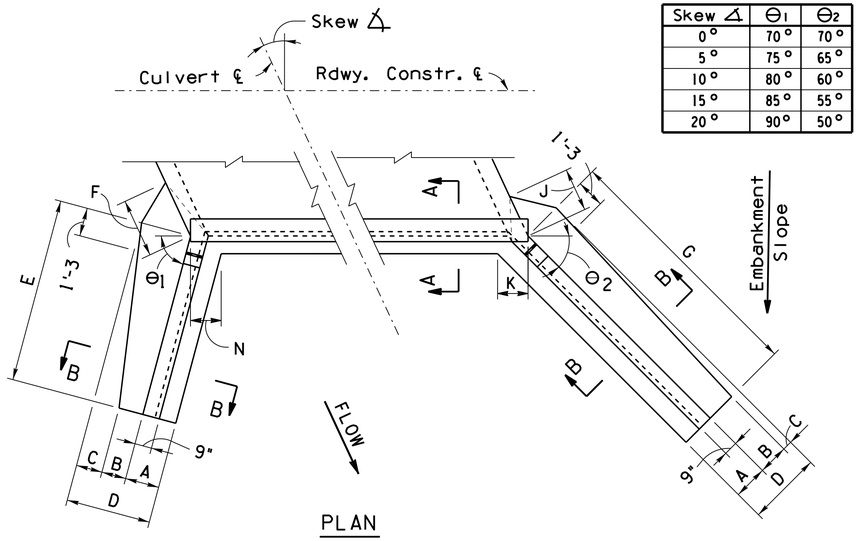
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
DOUBLE BARREL
(0' - 15' FILLS)

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.02 (1 of 2)
LOCATION			SHEET NO. OF

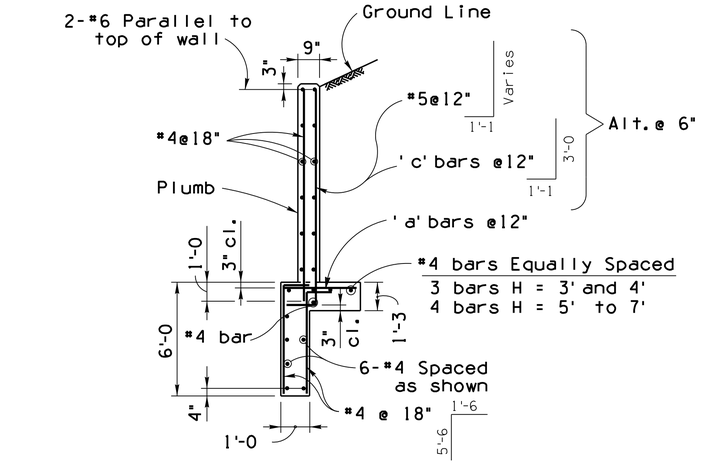
20-JAN-2016 16:47 G:\Bridge\CADD\Standards\SD_Sheets\SD 6 Drainage Stuctures\SD 6.01-6.11 Series\SD602-1 to 2\sd602-1_1916.dgn

Skew ∠	Θ1	Θ2
0°	70°	70°
5°	75°	65°
10°	80°	60°
15°	85°	55°
20°	90°	50°

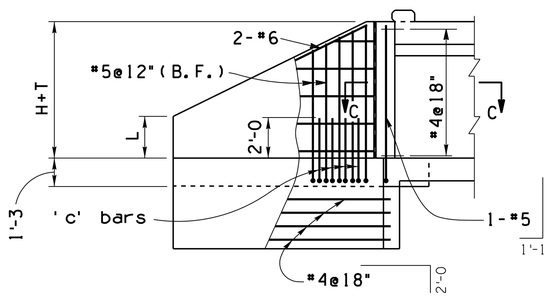


NOTE:

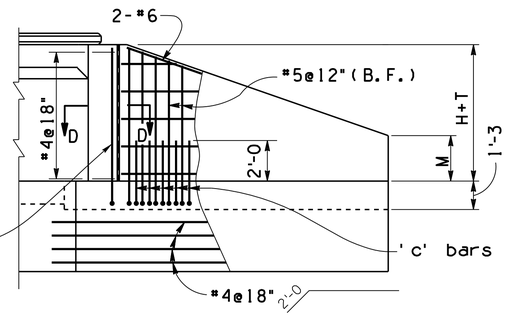
For SECTION A-A, see SD 6.01 (1 of 5).



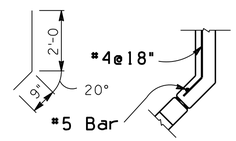
SECTION B-B



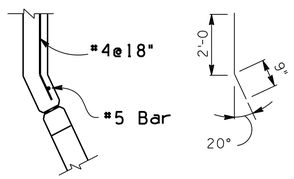
SHORT WING ELEVATION



LONG WING ELEVATION



SECTION C-C



SECTION D-D

2 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	7"	1'-0	1'-5	1'-10	4"	7"	1'-0	1'-5	1'-10	5"	8"	1'-1	1'-6	1'-11	5"	8"	1'-1	1'-7	2'-0	6"	9"	1'-2	1'-7	2'-1
	D	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-8	3'-2	3'-8	4'-2	4'-8	2'-8	3'-2	3'-8	4'-3	4'-9	2'-9	3'-3	3'-9	4'-3	4'-10
	E	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	9'-6	11'-0	12'-6	6'-0	7'-6	9'-0	10'-6	12'-0	6'-0	7'-6	9'-0	10'-6	12'-0
	F	1'-1	1'-9	2'-4	3'-0	3'-8	1'-1	1'-9	2'-4	3'-0	3'-8	1'-2	1'-10	2'-6	3'-1	3'-9	1'-2	1'-10	2'-6	3'-3	3'-10	1'-3	1'-11	2'-7	3'-3	4'-0
	G	6'-6	8'-0	9'-6	11'-0	12'-6	6'-6	8'-0	10'-0	11'-6	13'-0	7'-0	8'-6	10'-0	12'-0	13'-6	7'-0	9'-0	10'-6	12'-6	14'-0	7'-6	9'-6	11'-0	13'-0	14'-6
	J	1'-1	1'-9	2'-4	3'-0	3'-8	1'-1	1'-9	2'-4	3'-0	3'-8	1'-2	1'-10	2'-6	3'-1	3'-9	1'-2	1'-10	2'-6	3'-3	3'-10	1'-3	1'-11	2'-7	3'-3	4'-0
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	1'-0	1'-4	1'-7	1'-11	2'-2	11"	1'-2	1'-6	1'-9	2'-0	10"	1'-1	1'-5	1'-8	1'-11	1'-1	1'-4	1'-7	1'-10	2'-1	1'-1	1'-4	1'-7	1'-10	2'-1
	M	1'-0	1'-4	1'-7	1'-11	2'-2	1'-1	1'-5	1'-6	1'-10	2'-2	1'-0	1'-5	1'-9	1'-10	2'-3	1'-2	1'-5	1'-9	1'-11	2'-4	1'-2	1'-5	1'-10	2'-1	2'-6
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

4 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9	3"	7"	1'-0	1'-5	1'-10
	D	2'-7	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-1	3'-7	4'-1	4'-7
	E	10'-0	12'-6	15'-0	17'-6	20'-0	10'-0	12'-6	15'-0	17'-0	19'-6	10'-0	12'-6	14'-6	17'-0	19'-6	10'-0	12'-0	14'-6	17'-0	19'-6	10'-0	12'-0	14'-6	17'-0	19'-6
	F	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-9	2'-4	3'-0	3'-8
	G	10'-0	12'-6	15'-0	17'-6	20'-0	10'-6	13'-0	15'-6	18'-0	20'-6	10'-6	13'-0	16'-0	18'-6	21'-0	11'-0	13'-6	16'-0	19'-0	21'-6	11'-6	14'-0	17'-0	19'-6	22'-6
	J	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-9	2'-4	3'-0	3'-8
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	1'-9	2'-2	2'-6	2'-11	3'-4	1'-8	2'-1	2'-5	2'-11	3'-4	1'-7	2'-0	2'-6	2'-11	3'-3	1'-7	2'-1	2'-5	2'-10	3'-2	1'-7	2'-1	2'-5	2'-10	3'-2
	M	1'-9	2'-2	2'-6	2'-11	3'-4	1'-8	2'-1	2'-7	3'-0	3'-5	1'-9	2'-3	2'-7	3'-1	3'-6	1'-10	2'-4	2'-9	3'-2	3'-8	1'-10	2'-5	2'-10	3'-4	3'-9
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

6 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-8	3"	6"	11"	1'-4	1'-9	3"	6"	11"	1'-4	1'-9
	D	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-5	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6
	E	12'-6	15'-6	18'-6	21'-6	24'-6	12'-6	15'-6	18'-6	21'-6	24'-6	12'-0	15'-0	18'-0	21'-0	24'-0	12'-0	15'-0	18'-0	21'-0	24'-0	12'-0	15'-0	18'-0	21'-0	24'-0
	F	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6
	G	12'-6	15'-6	18'-6	21'-6	24'-6	12'-6	16'-0	19'-0	22'-0	25'-0	13'-0	16'-0	19'-6	22'-6	25'-6	13'-6	16'-6	20'-0	23'-0	26'-6	13'-6	17'-0	20'-6	23'-6	27'-0
	J	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-5	1'-0	1'-7	2'-3	2'-11	3'-6	1'-0	1'-7	2'-3	2'-11	3'-6
	K	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4	1'-4	1'-4	1'-4	1'-4
	L	2'-1	2'-8	3'-2	3'-8	4'-3	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1	2'-1	2'-7	3'-1	3'-7	4'-1
	M	2'-1	2'-8	3'-2	3'-8	4'-3	2'-2	2'-8	3'-2	3'-9	4'-3	2'-2	2'-9	3'-3	3'-10	4'-5	2'-3	2'-10	3'-4	3'-11	4'-5	2'-4	2'-11	3'-5	4'-1	4'-7
	N	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-3⅞	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-4¾	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-6	1'-6	1'-6	1'-6	1'-6

'c' bars			
Height H	Slope	Short Wing	Long Wing
		0° to 10°	0° to 20°
7'	2 : 1	3 - #5	3 - #5
	4 : 1	5 - #5	5 - #5

'a' bars			
Height H	Short Wing	Long Wing	
	0° to 20°	0° & 5°	10° to 20°
3'	#4	#4	#4
4'	#4	#4	#4
5'	#4	#4	#4
6'	#4	#4	#5
7'	#4	#4	#6

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (1 of 5). For Headwall Quantities see SD 6.09 (1 to 3).

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the Inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1.	Original Issue	S.J.H.	2-12
2.	Added 3'-6" height for existing box extensions only	D.B.B.	5-15
3.			
4.			

DESIGN APPROVED

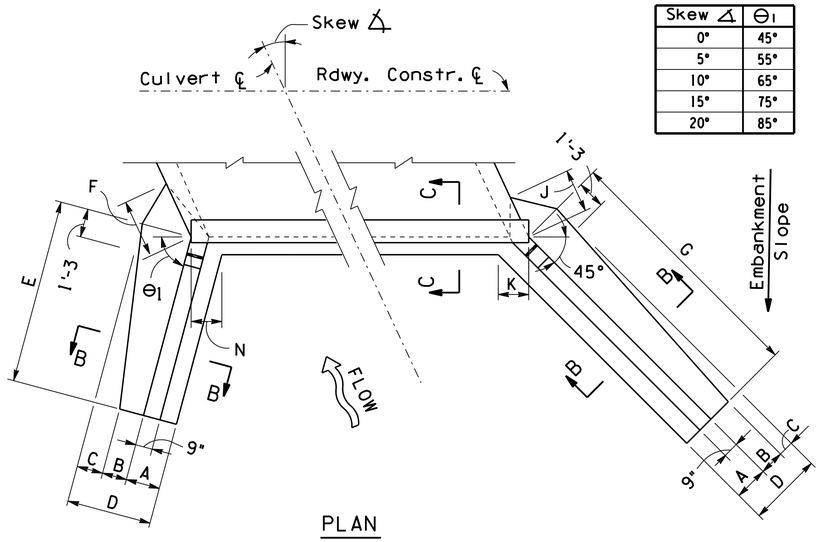
APPROVED FOR DISTRIBUTION

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
OUTLET WINGS - SKEW 0° to 20°
CULVERT HEIGHT 3' to 7'

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.08 (1 of 8)
LOCATION			SHEET NO. OF

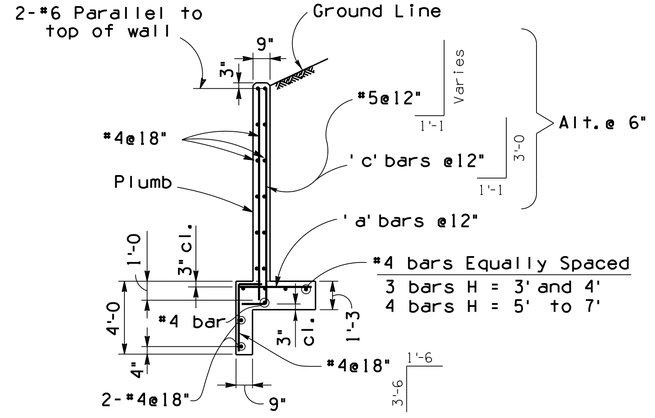
Skew ∠	Θ1
0°	45°
5°	55°
10°	65°
15°	75°
20°	85°



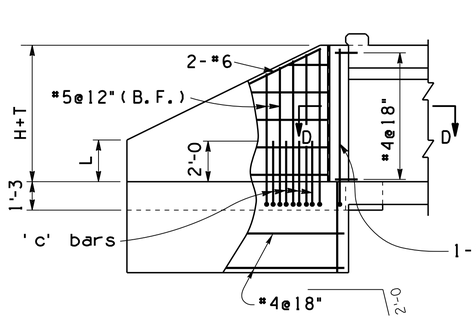
PLAN

NOTE:

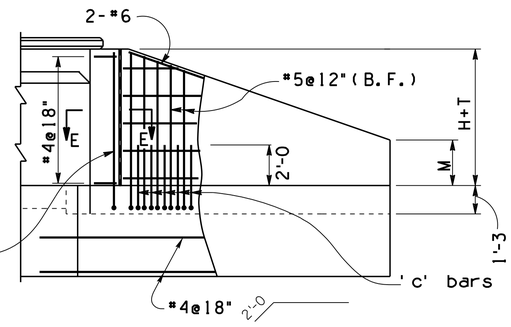
For SECTION C-C, see SD 6.01 (2 of 5).



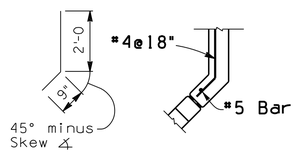
SECTION B-B



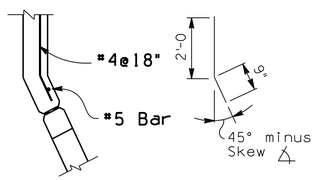
SHORT WING ELEVATION



LONG WING ELEVATION



SECTION D-D



SECTION E-E

2 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3	9"	1'-0	1'-1	1'-2	1'-3
	C	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1	6"	9"	1'-3	1'-8	2'-1
	D	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10	2'-9	3'-3	3'-10	4'-4	4'-10
	E	6'-0	7'-6	8'-6	10'-0	11'-6	5'-6	7'-0	8'-6	10'-0	11'-0	5'-6	7'-0	8'-6	9'-6	11'-0	5'-6	7'-0	8'-6	10'-0	11'-0	6'-0	7'-6	8'-6	10'-0	11'-6
	F	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	2'-11	3'-8	4'-4	1'-5	2'-1	2'-11	3'-7	4'-3	1'-4	2'-0	2'-9	3'-5	4'-1
	G	6'-0	7'-6	8'-6	10'-0	11'-6	6'-0	7'-6	9'-6	10'-6	12'-0	6'-6	8'-0	9'-6	11'-0	12'-6	7'-0	8'-6	10'-0	12'-0	13'-6	7'-6	9'-0	11'-0	12'-6	14'-6
	J	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	3'-0	3'-8	4'-5	1'-5	2'-2	2'-11	3'-8	4'-4	1'-5	2'-1	2'-11	3'-7	4'-3	1'-4	2'-0	2'-9	3'-5	4'-1
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	1'-11	2'-5	3'-1	3'-6	4'-0	1'-10	2'-2	2'-5	3'-0	3'-7	1'-7	1'-11	2'-3	2'-9	3'-1	1'-5	1'-8	1'-11	2'-3	2'-9	1'-1	1'-4	1'-10	2'-1	2'-4
	M	1'-11	2'-5	3'-1	3'-6	4'-0	1'-11	2'-5	2'-11	3'-4	3'-10	1'-9	2'-3	2'-8	3'-2	3'-8	1'-7	2'-1	2'-6	2'-10	3'-3	1'-5	1'-11	2'-2	2'-8	2'-11
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

4 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-1	1'-4	1'-8	9"	1'-0	1'-1	1'-3	1'-7	9"	1'-0	1'-1	1'-2	1'-6	9"	1'-0	1'-1	1'-2	1'-5	9"	1'-0	1'-1	1'-2	1'-3
	C	4"	7"	1'-0	1'-3	1'-5	4"	7"	1'-0	1'-4	1'-6	4"	7"	1'-0	1'-5	1'-7	4"	7"	1'-0	1'-5	1'-8	4"	7"	1'-0	1'-5	1'-10
	D	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7	2'-7	3'-1	3'-7	4'-1	4'-7
	E	8'-0	9'-6	11'-6	13'-6	15'-6	8'-0	10'-0	11'-6	13'-6	15'-6	8'-0	10'-0	12'-0	14'-0	16'-0	8'-6	10'-6	12'-6	14'-6	16'-6	9'-0	11'-0	13'-6	15'-6	17'-6
	F	1'-3	1'-11	2'-8	3'-4	4'-1	1'-3	1'-11	2'-7	3'-4	4'-0	1'-2	1'-11	2'-7	3'-3	4'-0	1'-2	1'-10	2'-6	3'-3	3'-11	1'-2	1'-10	2'-5	3'-1	3'-9
	G	8'-0	9'-6	11'-6	13'-6	15'-6	8'-6	10'-6	12'-6	14'-6	16'-6	9'-0	11'-0	13'-0	15'-6	17'-6	9'-6	12'-0	14'-6	16'-6	19'-0	10'-6	13'-0	15'-6	18'-6	21'-0
	J	1'-3	1'-11	2'-8	3'-4	4'-1	1'-3	1'-11	2'-7	3'-4	4'-0	1'-2	1'-11	2'-7	3'-3	4'-0	1'-2	1'-10	2'-6	3'-3	3'-11	1'-2	1'-10	2'-5	3'-1	3'-9
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	2'-8	3'-5	4'-0	4'-8	5'-4	2'-5	3'-0	3'-8	4'-4	4'-11	2'-3	2'-10	3'-4	3'-11	4'-5	2'-0	2'-6	3'-1	3'-7	4'-1	1'-10	2'-4	2'-8	3'-2	3'-8
	M	2'-8	3'-5	4'-0	4'-8	5'-4	2'-7	3'-2	3'-10	4'-6	5'-2	2'-6	3'-1	3'-9	4'-4	5'-0	2'-5	2'-11	3'-6	4'-2	4'-8	2'-2	2'-9	3'-4	3'-10	4'-4
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

6 : 1 Slope Dimensions	Skew ∠	0°					5°					10°					15°					20°				
	Height H	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'	3'	4'	5'	6'	7'
	A	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6	1'-6
	B	9"	1'-0	1'-3	1'-7	2'-0	9"	1'-0	1'-2	1'-7	1'-11	9"	1'-0	1'-1	1'-6	1'-10	9"	1'-0	1'-1	1'-4	1'-8	9"	1'-0	1'-1	1'-3	1'-7
	C	3"	6"	9"	11"	1'-0	3"	6"	10"	11"	1'-1	3"	6"	11"	1'-0	1'-2	3"	6"	11"	1'-2	1'-4	3"	6"	11"	1'-3	1'-5
	D	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6	2'-6	3'-0	3'-6	4'-0	4'-6
	E	8'-6	11'-0	13'-0	15'-0	17'-0	9'-0	11'-0	13'-6	15'-6	17'-6	9'-6	11'-6	14'-0	16'-6	18'-6	10'-0	12'-6	15'-0	17'-6	19'-6	11'-0	13'-6	16'-0	19'-0	21'-6
	F	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-9	2'-6	3'-2	3'-10	1'-1	1'-9	2'-5	3'-1	3'-9	1'-0	1'-8	2'-4	3'-0	3'-8
	G	8'-6	11'-0	13'-0	15'-0	17'-0	9'-6	11'-6	14'-0	16'-0	18'-6	10'-0	12'-6	15'-0	17'-6	20'-0	11'-0	14'-0	16'-6	19'-6	22'-0	12'-6	15'-6	18'-6	21'-6	24'-6
	J	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-10	2'-6	3'-3	3'-11	1'-1	1'-9	2'-6	3'-2	3'-10	1'-1	1'-9	2'-5	3'-1	3'-9	1'-0	1'-8	2'-4	3'-0	3'-8
	K	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½
	L	3'-1	3'-9	4'-6	5'-4	6'-1	2'-10	3'-7	4'-3	4'-11	5'-8	2'-8	3'-4	3'-11	4'-7	5'-3	2'-5	3'-1	3'-8	4'-3	4'-11	2'-3	2'-10	3'-5	3'-11	4'-6
	M	3'-1	3'-9	4'-6	5'-4	6'-1	2'-11	3'-8	4'-5	5'-2	5'-11	2'-11	3'-7	4'-4	5'-0	5'-8	2'-9	3'-5	4'-1	4'-9	5'-6	2'-7	3'-3	3'-11	4'-6	5'-2
	N	1'-4½	1'-4½	1'-4½	1'-4½	1'-4½	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-3⅝	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-4¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼	1'-5¼

'c' bars			
Height H	Slope	Short Wing 0° to 10°	Long Wing 0° to 20°
7'	2 : 1	3 - #5	3 - #5
	2 : 1	5 - #5	5 - #5

'a' bars			
Height H	Short Wing 0° to 10°	Short Wing 15° & 20°	Long Wing 0° to 20°
3'	#4	#4	#4
4'	#4	#4	#4
5'	#4	#4	#4
6'	#5	#4	#5
7'	#6	#4	#6

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (2 of 5). For Headwall Quantities see SD 6.09 (1 to 3).

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NO	DESCRIPTION OR REVISIONS	MADE BY	DATE
1	Original Issue	S.U.H.	2-12
2	Added 3'-6" height for existing box extensions only	D.B.B.	5-15
3			
4			

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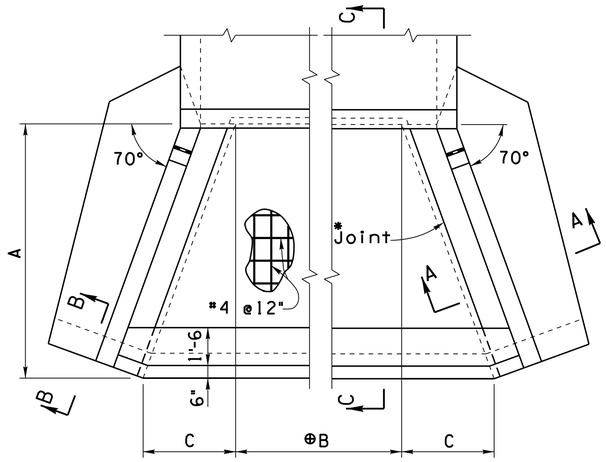
ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

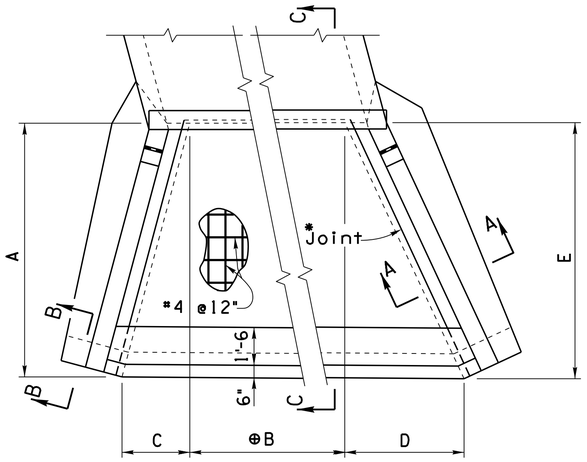
REINFORCED CONCRETE BOX CULVERTS
INLET WINGS - SKEW 0° to 20°
CULVERT HEIGHT 3' to 7'

ROUTE	PROJECT NO.	FA NO.	DRAWING NO.
			SD 6.08 (3 of 8)
LOCATION			SHEET NO. OF



PLAN

Apron for 0° skew box culvert

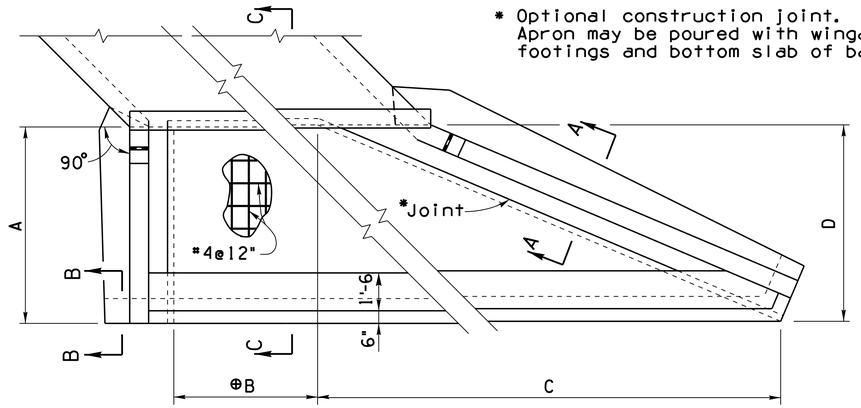


PLAN

Apron for 0° to 15° skew box culvert

Span	△									
	0° Skew	5° Skew	10° Skew	15° Skew	20° Skew	25° Skew	30° Skew	35° Skew	40° Skew	45° Skew
6'	6'-8	6'-8¼	6'-9¼	6'-10⅞	7'-1⅞	7'-4¼	7'-8⅜	8'-1⅝	8'-8⅜	9'-5⅛
8'	8'-9	8'-9⅜	8'-10⅝	9'-0¾	9'-3¾	9'-7⅞	10'-1¼	10'-8⅛	11'-5⅛	12'-4½
10'	10'-11	10'-11½	11'-1	11'-3⅝	11'-7⅜	12'-0½	12'-7¼	13'-3⅞	14'-3	15'-5¼
12'	13'-1	13'-1⅝	13'-3⅜	13'-6½	13'-11⅛	14'-5¼	15'-1¼	15'-11⅝	17'-1	18'-6

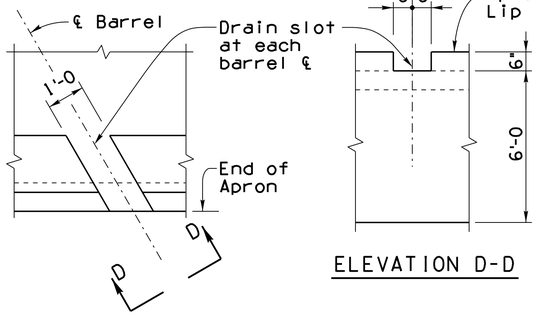
⊕Dimension varies with number of barrels. △equals length to be added to dimension 'B ' for each additional barrel.



PLAN

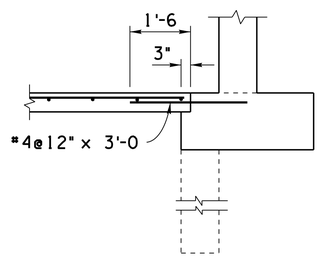
Apron for 20° to 45° skew box culvert

* Optional construction joint.
Apron may be poured with wingall footings and bottom slab of barrel.

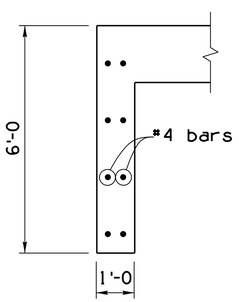


APRON DRAIN DETAIL

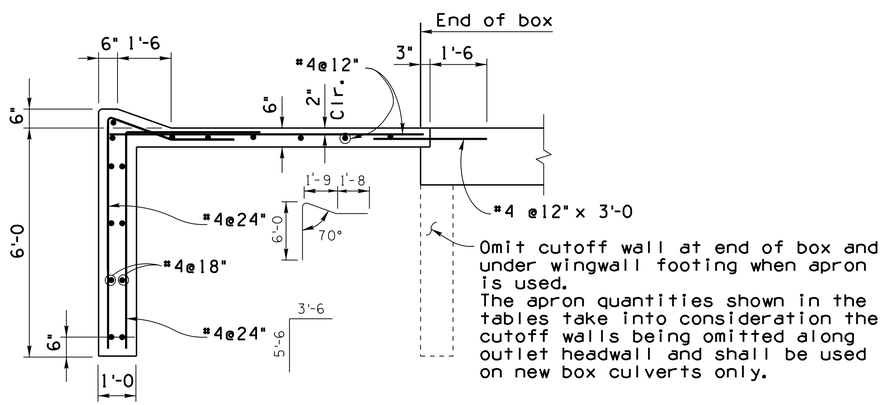
ELEVATION D-D



SECTION A-A



SECTION B-B



SECTION C-C

Omit cutoff wall at end of box and under wingwall footing when apron is used.
The apron quantities shown in the tables take into consideration the cutoff walls being omitted along outlet headwall and shall be used on new box culverts only.

NOTE:

For General Notes, Dimensions, and additional Details, see SD 6.01 (1 & 2 of 5). For Apron Dimensions and Quantities see SD 6.11 (2 to 4).

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	SJM	2-12
2			
3			
4			

DESIGN APPROVED: Shafi U. Hasan

APPROVED FOR DISTRIBUTION: Jean A. Nehme

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
OUTLET APRON DETAILS

ROUTE | PROJECT NO. | FA NO. | DRAWING NO. SD 6.11 (1 of 4)

LOCATION | SHEET NO. OF

DIMENSIONS

Span	Hgt.	0° Skew			5° Skew					10° Skew					15° Skew					20° Skew				25° Skew				30° Skew				35° Skew				40° Skew				45° Skew			
		A	B	C	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
6'	3'	9'-10⅞	4'-8¼	3'-7¼	10'-0⅝	4'-8½	2'-8¼	4'-8¾	10'-1¾	10'-1¼	4'-9⅛	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	4'-10⅛	10⅝"	6'-11	9'-10½	10'-0	4'-11¾	8'-2⅝	9'-9¼	9'-0	5'-2⅝	9'-6½	9'-6½	8'-6	5'-6⅜	10'-11⅜	9'-2¼	7'-6	5'-10⅞	12'-4⅞	8'-8¼	7'-0	6'-4½	14'-4½	8'-3⅝	7'-0	6'-11⅞	16'-6⅛	7'-8⅜
	4'	12'-3⅛	4'-8¼	4'-5½	12'-5½	4'-8½	3'-4⅛	5'-9½	12'-5	12'-6⅞	4'-9⅛	2'-2⅝	6'-11¼	12'-0⅛	12'-1	4'-10⅛	1'-0⅝	8'-4⅛	11'-11	12'-0	4'-11¾	9'-9¾	11'-8¼	11'-0	5'-2⅝	11'-3¾	11'-3¾	10'-6	5'-6⅜	13'-2⅞	11'-1⅜	9'-6	5'-10⅞	14'-10⅜	10'-4⅞	9'-0	6'-4½	16'-11⅝	9'-9⅝	8'-6	6'-11⅛	19'-8⅛	9'-2⅛
	5'	14'-7¼	4'-8¼	5'-3⅜	14'-10½	4'-8½	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	4'-9⅛	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	4'-10⅛	1'-3¼	9'-9⅜	13'-11⅝	14'-6	4'-11¾	11'-8⅞	13'-11⅞	13'-6	5'-2⅝	13'-5¼	13'-5¼	12'-6	5'-6⅜	15'-6½	13'-0½	11'-6	5'-10⅞	17'-8¾	12'-5	10'-6	6'-4½	20'-0	11'-6⅝	10'-0	6'-11⅛	22'-10¼	10'-7⅞
	6'	16'-11½	4'-8¼	6'-2⅛	16'-9¾	4'-8½	4'-6	7'-10⅞	16'-11⅜	17'-0	4'-9⅛	3'-0	9'-8¼	16'-9¼	17'-0⅜	4'-10⅛	1'-5⅞	11'-6	16'-5⅞	17'-0	4'-11¾	13'-4⅞	15'-10⅞	15'-6	5'-2⅝	15'-6⅝	15'-6⅝	14'-6	5'-6⅜	17'-10⅛	14'-11⅝	13'-6	5'-10⅞	20'-2¼	14'-1⅝	12'-6	6'-4½	23'-0⅜	13'-3⅝	12'-0	6'-11⅞	26'-0¼	12'-1⅝
	7'	19'-3⅝	4'-8¼	7'-0⅜	19'-2⅞	4'-8½	5'-1⅞	8'-11½	19'-2½	19'-5⅝	4'-9⅛	3'-5½	10'-11¼	18'-11¼	19'-6⅜	4'-10⅛	1'-8½	12'-11¼	18'-5⅝	19'-6	4'-11¾	15'-3¼	18'-2⅜	17'-6	5'-2⅝	17'-8⅛	17'-8⅛	16'-6	5'-6⅜	20'-1⅝	16'-10¾	15'-0	5'-10⅞	22'-7¾	15'-10¼	14'-0	6'-4½	26'-0¾	15'-0⅝	13'-6	6'-11⅛	29'-2⅜	13'-7⅜
8'	3'	9'-10⅜	6'-10¼	3'-7¼	10'-0⅝	6'-10½	2'-8¼	4'-8¾	10'-1¾	10'-1¼	6'-11½	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	7'-1⅛	10⅝"	6'-11	9'-10½	10'-0	7'-3⅜	8'-2⅝	9'-9¼	9'-0	7'-7⅛	9'-6½	9'-6½	8'-6	8'-0⅜	10'-11⅜	9'-2¼	7'-6	8'-6⅝	12'-4⅞	8'-8¼	7'-0	9'-2⅜	14'-4½	8'-3⅝	7'-0	9'-11⅞	16'-6⅛	7'-8⅜
	4'	12'-3⅛	6'-10¼	4'-5½	12'-5½	6'-10½	3'-4⅛	5'-9½	12'-5	12'-6⅞	6'-11½	2'-2⅝	6'-11¼	12'-0⅛	12'-1	7'-1⅛	1'-0⅝	8'-4⅛	11'-11	12'-0	7'-3⅜	9'-9¾	11'-8¼	11'-0	7'-7⅛	11'-3¾	11'-3¾	10'-6	8'-0⅜	13'-2⅞	11'-1⅜	9'-6	8'-6⅝	14'-10⅜	10'-4⅞	9'-0	9'-2⅜	16'-11⅝	9'-9⅝	8'-6	9'-11⅞	19'-8⅛	9'-2⅛
	5'	14'-7¼	6'-10¼	5'-3⅜	14'-10½	6'-10½	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	6'-11½	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	7'-1⅛	1'-3¼	9'-9⅜	13'-11⅝	14'-6	7'-3⅜	11'-8⅞	13'-11⅞	13'-6	7'-7⅛	13'-5¼	13'-5¼	12'-6	8'-0⅜	15'-6½	13'-0½	11'-6	8'-6⅝	17'-8¾	12'-5	10'-6	9'-2⅜	20'-0	11'-6⅝	10'-0	9'-11⅞	22'-10¼	10'-7⅛
	6'	16'-11½	6'-10¼	6'-2⅛	16'-9¾	6'-10½	4'-6	7'-10⅞	16'-11⅜	17'-0	6'-11½	3'-0	9'-8¼	16'-9¼	17'-0⅜	7'-1⅛	1'-5⅞	11'-6	16'-5⅞	17'-0	7'-3⅜	13'-4⅞	15'-10⅞	15'-6	7'-7⅛	15'-6⅝	15'-6⅝	14'-6	8'-0⅜	17'-10⅛	14'-11⅝	13'-6	8'-6⅝	20'-2¼	14'-1⅝	12'-6	9'-2⅜	23'-0⅜	13'-3⅝	12'-0	9'-11⅞	26'-0¼	12'-1⅝
	7'	19'-3⅝	6'-10¼	7'-0⅜	19'-2⅞	6'-10½	5'-1⅞	8'-11½	19'-2½	19'-5⅝	6'-11½	3'-5½	10'-11¼	18'-11¼	19'-6⅜	7'-1⅛	1'-8½	12'-11¼	18'-5⅝	19'-6	7'-3⅜	15'-3¼	18'-2⅜	17'-6	7'-7⅛	17'-8⅛	17'-8⅛	16'-6	8'-0⅜	20'-1⅝	16'-10¾	15'-0	8'-6⅝	22'-7¾	15'-10¼	14'-0	9'-2⅜	26'-0¾	15'-0⅝	13'-6	9'-11⅞	29'-2⅜	13'-7⅜
	8'	21'-9⅞	5'-9½	7'-11⅜	21'-9¼	5'-9¾	5'-10	10'-1⅜	21'-8¼	22'-0⅛	5'-10½	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	5'-11¾	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	6'-1½	17'-1¾	20'-5¼	20'-0	6'-4⅞	19'-9⅝	19'-9⅝	18'-6	6'-9	22'-10¾	19'-2½	17'-0	7'-2⅛	26'-1⅞	18'-3¼	16'-0	7'-8⅜	29'-5	16'-11¾	15'-0	8'-3¾	33'-9½	15'-9⅛
10'	3'	9'-10⅜	9'-0¼	3'-7¼	10'-0⅝	9'-0⅝	2'-8¼	4'-8¾	10'-1¾	10'-1¼	9'-1⅞	1'-9⅜	5'-8¼	9'-10⅛	10'-1⅛	9'-4	10⅝"	6'-11	9'-10½	10'-0	9'-7	8'-2⅝	9'-9¼	9'-0	10'-0	9'-6½	9'-6½	8'-6	10'-6⅜	10'-11⅜	9'-2¼	7'-6	11'-2⅛	12'-4⅞	8'-8¼	7'-0	12'-0⅜	14'-4½	8'-3⅝	7'-0	13'-0¾	16'-6⅛	7'-8⅜
	4'	12'-3⅛	9'-0¼	4'-5½	12'-5½	9'-0⅝	3'-4⅛	5'-9½	12'-5	12'-6⅞	9'-1⅞	2'-2⅝	6'-11¼	12'-0⅛	12'-1	9'-4	1'-0⅝	8'-4⅛	11'-11	12'-0	9'-7	9'-9¾	11'-8¼	11'-0	10'-0	11'-3¾	11'-3¾	10'-6	10'-6⅜	13'-2⅞	11'-1⅜	9'-6	11'-2⅛	14'-10⅜	10'-4⅞	9'-0	12'-0⅜	16'-11⅝	9'-9⅝	8'-6	13'-0¾	19'-8⅛	9'-2⅛
	5'	14'-7¼	9'-0¼	5'-3⅜	14'-10½	9'-0⅝	3'-11⅞	6'-10⅛	14'-8⅛	14'-6½	9'-1⅞	2'-6¾	8'-5¼	14'-7¼	14'-6⅞	9'-4	1'-3¼	9'-9⅜	13'-11⅝	14'-6	9'-7	11'-8⅞	13'-11⅞	13'-6	10'-0	13'-5¼	13'-5¼	12'-6	10'-6⅜	15'-6½	13'-0½	11'-6	11'-2⅛	17'-8¾	12'-5	10'-6	12'-0⅜	20'-0	11'-6⅝	10'-0	13'-0¾	22'-10¼	10'-7⅛
	6'	16'-11½	9'-0¼	6'-2⅛	16'-9¾	9'-0⅝	4'-6	7'-10⅞	16'-11⅜	17'-0	9'-1⅞	3'-0	9'-8¼	16'-9¼	17'-0⅜	9'-4	1'-5⅞	11'-6	16'-5⅞	17'-0	9'-7	13'-4⅞	15'-10⅞	15'-6	10'-0	15'-6⅝	15'-6⅝	14'-6	10'-6⅜	17'-10⅛	14'-11⅝	13'-6	11'-2⅛	20'-2¼	14'-1⅝	12'-6	12'-0⅜	23'-0⅜	13'-3⅝	12'-0	13'-0¾	26'-0¼	12'-1⅝
	7'	19'-3⅝	9'-0¼	7'-0⅜	19'-2⅞	9'-0⅝	5'-1⅞	8'-11½	19'-2½	19'-5⅝	9'-1⅞	3'-5½	10'-11¼	18'-11¼	19'-6⅜	9'-4	1'-8½	12'-11¼	18'-5⅝	19'-6	9'-7	15'-3¼	18'-2⅜	17'-6	10'-0	17'-8⅛	17'-8⅛	16'-6	10'-6⅜	20'-1⅝	16'-10¾	15'-0	11'-2⅛	22'-7¾	15'-10¼	14'-0	12'-0⅜	26'-0¾	15'-0⅝	13'-6	13'-0¾	29'-2⅜	13'-7⅜
	8'	21'-9⅞	7'-11½	7'-11⅜	21'-9¼	7'-11¾	5'-10	10'-1⅜	21'-8¼	22'-0⅛	8'-0⅝	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	8'-2⅝	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	8'-5¼	17'-1¾	20'-5¼	20'-0	8'-9½	19'-9⅝	19'-9⅝	18'-6	9'-3	22'-10¾	19'-2½	17'-0	9'-9⅞	26'-1⅞	18'-3¼	16'-0	10'-6⅜	29'-5	16'-11¾	15'-0	11'-4½	33'-9½	15'-9⅛
	9'	24'-2½	7'-9⅜	8'-9¾	24'-2½	7'-9⅝	6'-5⅞	11'-2¼	23'-11⅞	24'-0	7'-10¾	4'-2¾	13'-7¼	23'-6¾	24'-1⅛	8'-0⅜	2'-1¼	16'-3⅞	23'-3¾	24'-0	8'-2⅞	19'-1½	22'-9½	22'-0	8'-7⅛	21'-11⅞	21'-11⅞	20'-6	9'-0½	25'-3¼	21'-2⅜	19'-0	9'-7⅛	28'-7¾	20'-0⅜	17'-6	10'-3⅜	32'-6⅞	18'-9⅝	17'-0	11'-1½	37'-1½	17'-3¾
	10'	26'-7	7'-7¼	9'-8⅛	26'-7¾	7'-7½	7'-1⅝	12'-3⅛	26'-3½	26'-5¾	7'-8½	4'-8	14'-10½	25'-9⅞	26'-7	8'-1⅞	2'-3⅝	17'-9½	25'-4⅞	26'-6	8'-5⅞	20'-9¼	24'-9⅞	24'-0	8'-4¾	24'-1⅞	24'-1⅞	22'-6	8'-9⅞	27'-7¾	23'-2⅝	20'-6	9'-4⅞	31'-7⅝	22'-1⅝	18'-6	10'-9¾	40'-5½	18'-10⅜
	8'	21'-9⅞	10'-3½	7'-11⅜	21'-9¼	10'-3⅞	5'-10	10'-1⅜	21'-8¼	22'-0⅛	10'-5¼	3'-10⅝	12'-3⅞	21'-4¼	21'-7⅛	10'-7⅝	1'-10⅝	14'-6⅞	20'-9⅝	21'-6	10'-11	17'-1¾	20'-5¼	20'-0	11'-4⅜	19'-9⅝	19'-9⅝	18'-6	11'-1⅛	22'-10¾	19'-2½	17'-0	12'-8⅞	26'-1⅞	18'-3¼	16'-0	13'-6⅞	29'-5	16'-11¾	15'-0	14'-8⅛	33'-9½	15'-9⅛
	9'	24'-2½	10'-1	8'-9¾	24'-2½	10'-1¾	6'-5⅞	11'-2¼	23'-11⅞	24'-0	10'-3⅛	4'-2¾	13'-7¼	23'-6¾	24'-1⅛	10'-5⅜	2'-1¼	16'-3⅞	23'-3¾	24'-0	10'-8¾	19'-1½	22'-9½	22'-0	11'-2	21'-11⅞	21'-11⅞	20'-6	11'-8⅞	25'-3¼	21'-2⅜	19'-0	12'-5⅜	28'-7¾	20'-0⅜	17'-6	13'-3⅞	32'-6⅞	18'-9⅝	17'-0	14'-4¾	37'-1½	17'-3¾
12'	10'	26'-7	9'-11¼	9'-8⅛	26'-7¾	9'-11⅝	7'-1⅝	12'-3⅛	26'-3½	26'-5¾	10'-1	4'-8	14'-10½	25'-9⅞	26'-7	10'-3⅛	2'-3⅜	17'-9½	25'-4⅞	26'-6	10'-6⅜	20'-9¼	24'-9⅞	24'-0	10'-11⅝	24'-1⅞	24'-1⅞	22'-6	11'-6¼	27'-7¾	23'-2⅝	20'-6	12'-2⅝	31'-7⅝	22'-1⅝	19'-6	13'-0⅞	35'-8¾	20'-7½	18'-6	14'-1⅜	40'-5½	18'-10⅜
	11'	28'-11½	9'-9⅞	10'-6½	29'-0⅞	9'-9½	7'-9½	13'-4	28'-7⅞	28'-11⅜	9'-10¾	5'-1¼	16'-1¾	27'-11⅝	29'-1	10'-0⅛	2'-6½	19'-3⅛	27'-6	29'-0	10'-4⅞	20'-9	27'-1¼	26'-6	10'-9⅛	26'-4⅛	26'-4⅛	24'-6	11'-3¾	30'-0⅛	25'-2¼	22'-6	11'-11⅞	34'-2	23'-11⅛	21'-0	12'-9⅞	38'-10⅝	22'-5⅜	20'-0	13'-10	43'-9⅝	20'-5⅛
	12'	31'-4	9'-7	11'-4⅞	31'-6⅞	9'-7⅝	8'-5⅜	14'-4⅞	30'-10¾	31'-5⅛	9'-8⅝	5'-6½	17'-8⅛	30'-7⅜	31'-1	9'-10¾	2'-8⅝	21'-0⅛	30'-0⅛	31'-0	10'-1¾	24'-4¾	29'-0⅞	28'-6	10'-6¾	28'-2	28'-2	26'-6	11'-1⅞	32'-4⅝	27'-2⅛	24'-6	11'-9⅛	36'-8¾	25'-8⅝	23'-0	12'-6⅞	41'-7¼	24'-0¼	22'-0	13'-6⅝	47'-7	22'-2¼

QUANTITIES

Span	Hgt.	0° Skew				5° Skew				10° Skew				15° Skew				20° Skew				25° Skew				30° Skew				35° Skew				40° Skew				45° Skew			
		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.		Conc. C.Y.		Steel lbs.	
		lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs	lBbl.	Δc	lBbl.	Δs
6'	3'	0.41	1.46	46	122	0.42	1.49	48	124	0.42	1.49	42	124	0.45	1.52	52	126	0.50	1.55	57	128	0.88	1.52	86	128	1.23	1.53	113	129	1.59	1.51	140	128	1.97	1.54	173	132	2.36	1.62	206	139
	4'	0.56	1.75	69	143	0.57	1.78	72	145	0.58	1.78	71	146	0.62	1.78	75	146	0.67	1.81	79	148	1.11	1.78	112	147	1.59	1.81	150	150	2.00	1.79	181	149	2.45	1.82	217	152	2.96	1.88	260	158
	5'	0.72	2.04	98	165	0.75	2.07	101	167	0.77	2.07	103	167	0.78	2.07	102	167	0.97	2.12	112	172	1.41	2.10	150	170	1.97	2.09	194	171	2.51	2.09	236	171	3.01	2.08	275	172	3.59	2.14	320	177
	6'	1.78	3.13	192	243	1.79	3.12	193	243	1.84	3.16	198	246	1.90	3.20	202	249	1.96	3.24	206	252	2.62	3.19	256	249	3.27	3.19	305	249	3.89	3.19	351	250	4.55	3.22	403	253	5.27	3.30	454	260
	7'	1.28	2.62	172	208	1.29	2.62	173	208	1.34	2.65	176	210	1.39	2.67	179	212	1.50	2.73	188	217	2.25	2.66	245	212	2.99	2.65	300	212	3.65	2.61	349	210	4.47	2.65	412	214	5.30	2.70	463	219
8'	3'	0.93	1.98	85	158	0.95	2.02	88	161	0.96	2.03	88	161	1.00	2.07	93	164	1.06	2.11	98	167	1.43	2.07	126	166	1.79	2.09	154	167	2.14	2.06	180	166	2.54	2.11	215	171	2.96	2.22	251	180
	4'	1.18	2.36	115	186	1.20	2.40	119	189	1.21	2.42	118	189	1.25	2.40	121	190	1.31	2.44	127	193	1.75	2.41	159	191	2.24	2.46	198	195	2.65	2.43	288	193	3.11	2.48	266	198	3.65	2.56	311	205
	5'	1.44	2.75	151	214	1.47	2.78	155	217	1.50	2.78	157	217	1.51	2.78	156	218	1.62	2.86	167	224	2.15	2.83	205	221	2.71	2.83	249	222	3.25	2.83	291	223	3.76	2.82	330	224	4.36	2.90	377	230
	6'	1.78	3.13	192	243	1.79	3.12	193	243	1.84	3.16	198	246	1.90	3.20	202	249	1.96	3.24	206	252	2.62	3.19	256	249	3.27	3.19	305	249	3.89	3.19	351	250	4.55	3.22	403	253	5.27	3.30	454	260
	7'	2.19	3.51	239	271	2.19	3.51	239	271	2.25	3.54	244	274	2.31	3.58	247	277	2.44	3.65	258	283	3.17	3.56	314	276	3.92	3.56	368	277	4.56	3.51	416	274	5.41	3.56	481	279	6.26	3.64	534	285
	8'	2.77	3.51	239	271	2.19	3.51	239	271	2.25	3.54	244	274	2.31	3.58	247	277	2.44	3.65	258	283	3.17	3.56	314	276	3.92	3.56	368	277	4.56	3.51	467	306	6.50	3.98	528	310	7.54	4.06	603	316
10'	3'	1.52	2.54	128	197	1.55	2.59	132	200	1.56	2.60	133	201	1.61	2.65	138	205	1.68	2.70	145	206	2.05	2.66	172	206	2.42	2.69	201	209	2.76	2.65	227	207	3.18	2.72	262	212	3.64	2.86	301	224
	4'	1.87	3.02	166	232	1.90	3.07	171	236	1.91	3.07	170	236	1.95	3.07	174	236	2.02	3.12	180	240	2.46	3.08	212	236	2.96	3.14	252	243	3.36	3.11	282	241	3.85	3.18	321	247	4.41	3.29	368	255
	5'	2.23	3.49	210	267	2.27	3.54	214	271	2.30	3.54	216	271	2.31	3.54	216	271	2.44	3.64	228	279	2.96	3.60	266	276	3.53	3.60	310	277	4.08	3.61	352	278	4.59	3.61	392	279	5.21	3.71	441	287
	6'	2.67	3.97	258	303	2.68	3.97	259	303	2.74	4.01	265	306	2.81	4.06	270	310	2.89	4.11	275	314	3.53	4.06	324	310	4.19	4.06	374	311	4.81	4.07	420	312	5.48	4.11	473	315	6.23	4.21	525	324
	7'	3.18	4.44	313	338	3.19	4.44	313	338	3.25	4.49	319	341	3.33	4.54	323	345	3.48	4.63	335	352	4.19	4.52	389	344	4.93	4.52	444	345	5.57	4.46	491	341	6.43	4.54	557	347	7.31	4.64	612	356
	8'	3.87	4.95	332	376	3.88	4.95	333	376	3.95	5.00	338	379	3.99	4.99	338	379	4.16	5.08	351	386	5.02	5.03	415	383	5.93	5.02	486	382	6.77	5.01	551	382	7.63	5.06	613	386	8.69	5.16	690	394
	9'	4.48	5.43	387	411	4.49	5.43	388	411	4.51	5.43	388	411	4.68	5.52	400	418	4.87	5.60	412	425	5.79	5.50	482	417	6.80	5.49	560	417	7.74	5.48	630	417	8.73	5.49	704	418	10.04	5.67	789	432
	10'	5.15	5.91	447	447	5.16	5.91	447	447	5.18	5.91	446	447	5.36	6.00	458	454	5.55	6.08	468	461	6.62	5.97	554	452	7.75	5.96	639	452	8.81	5.92	723	449	10.05	6.00	806	456	11.34	6.10	889	465
12'	8'	5.01	6.04	414	450	5.02	6.03	415	450	5.10	6.09	420	454	5.14	6.09	421	454	5.33	6.20	435	463	6.19	6.14	499	458	7.10	6.14	570	458	7.94	6.13	635	457	8.82	6.19	698	462	9.91	6.33	776	472
	9'	5.72	6.61	477	493	5.73	6.61	477	493	5.75	6.61	477	493	5.94	6.72	492	501	6.15	6.82	505	509	7.05	6.70	573	500	8.07	6.70	651	499	9.01	6.69	635	457	10.01	6.72	795	501	11.37	6.94	884	518
	10'	6.49	7.19	544	536	6.50	7.19	544	536	6.52	7.18	543	536	6.72	7.29	557	544	6.93	7.40	569	552	7.99	7.26	653	541	9.11	7.25	737	541	10.17	7.22	821	538	11.44	7.32	905	546	12.76	7.46	991	557
	11'	7.33	7.76	615	579	7.33	7.76	615	578	7.35	7.76	614	578	7.56	7.87	626	587	7.89	8.02	648	598	9.07	7.89	741	588	10.23	7.81	829	582	11.44	7.78	919	580	12.78	7.85	1016	585	14.23	7.98	1103	595
	12'	8.22	8.34	692	621	8.23	8.34	691	621	8.35	8.39	699	625	8.49	8.43	707	628	8.72	8.54	717	636	10.02	8.40	818	626	11.49	8.37	927	624	12.77	8.34	1023	622	14.26	8.41	1124	627	16.08	8.16	1245	643

Δc = Apron concrete quantity per additional barrel. Δs = Apron steel quantity per additional barrel.

Note to Designer:
The information presented in this Standard Detail has been prepared in accordance with recognized engineering principles and is for general use. It should not be used for specific application without competent professional examination and verification of its suitability by a licensed professional engineer. Contents within the Inner border line shall not be altered.

NO	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	Original Issue	S.J.U.H.	2-12
2	Added 3'-4.5' height for existing box extensions only	D.B.B.	5-15
3			
4			

DESIGN APPROVED

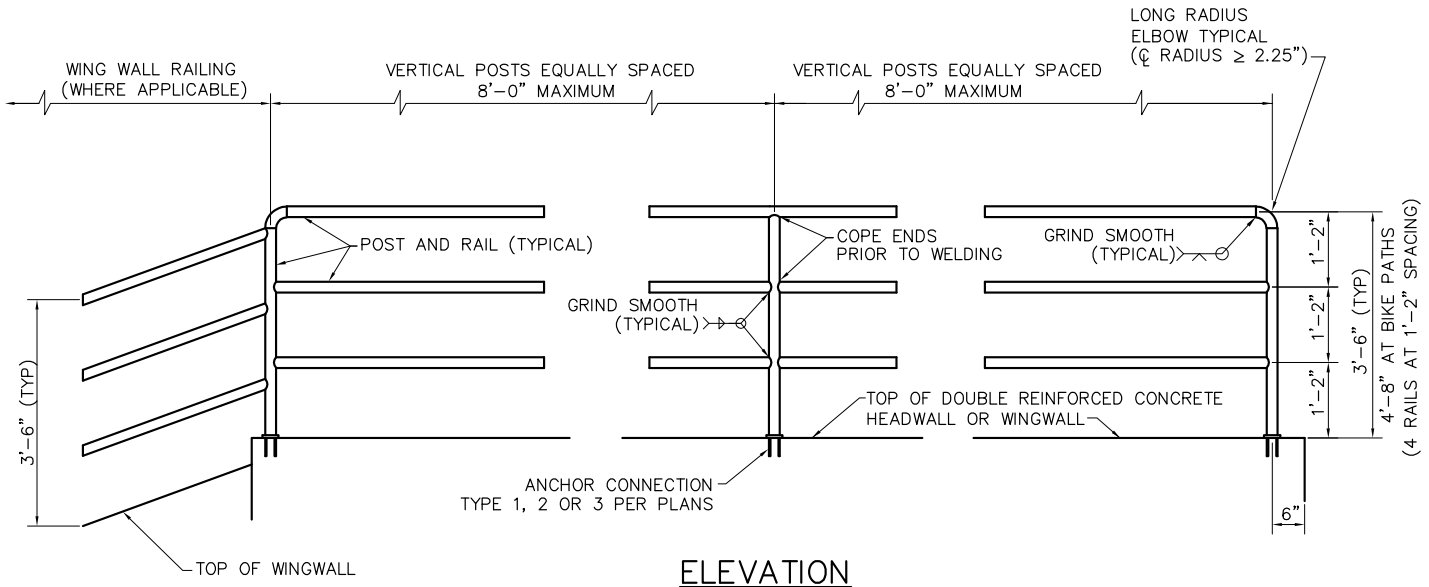
APPROVED FOR DISTRIBUTION

ARIZONA DEPARTMENT OF TRANSPORTATION
INFRASTRUCTURE DELIVERY AND OPERATIONS DIVISION
BRIDGE GROUP STRUCTURE DETAIL

REINFORCED CONCRETE BOX CULVERTS
OUTLET APRON - DIMENSIONS & QUANTITIES (4 : 1 SLOPE)

ROUTE | PROJECT NO. | FA NO. | DRAWING NO. SD 6.11 (3 of 4)

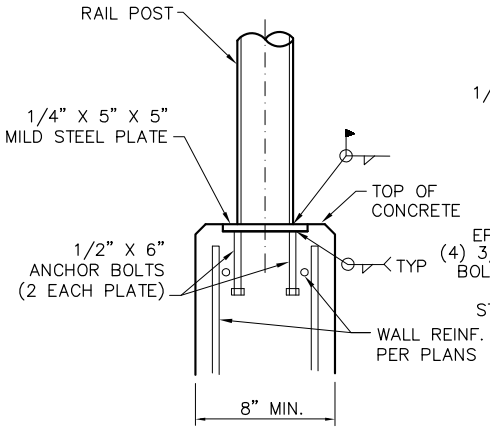
LOCATION | SHEET NO. OF



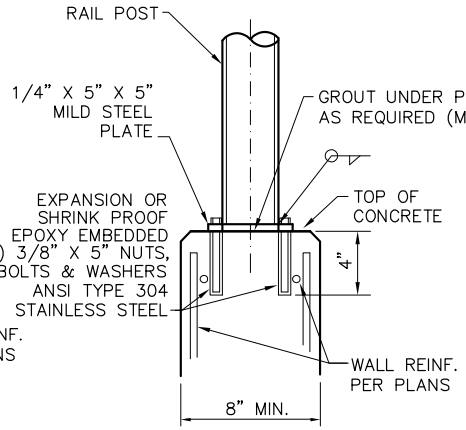
ELEVATION

NOTES:

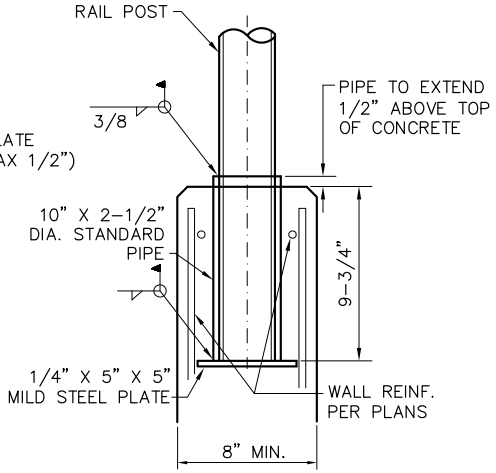
1. POSTS AND RAILS SHALL BE 1.90 INCH OUTSIDE DIAMETER, HIGH STRENGTH HEAVY INDUSTRIAL STEEL PIPE CONFORMING TO ASTM F1043 MATERIAL GROUP IA-2 (2.72 LB/FT, MINIMUM YIELD STRENGTH=50 KSI) OR MATERIAL GROUP IC GALVANIZED AFTER FORMING (2.28 LB/FT, MINIMUM YIELD STRENGTH=50 KSI)
2. PAINT RAIL PER MAG SPECIFICATIONS SECTION 530 WHEN REQUIRED BY PLANS, SHOP PRIME WITH RUST INHIBITING PRIMER (FIELD REPAIR PRIMER AS NEEDED). COLOR PER PLANS.
3. VERTICAL POSTS TO BE EVENLY SPACED.
4. REMOVE ALL SHARP EDGES.
5. INSTALL SAFETY RAIL AS REQUIRED BY PLANS OR SPECIFICATIONS.
6. THE EMBEDMENT FOR ANCHOR TYPES 1, 2, AND 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE.
7. SAFETY RAIL IS NOT TO BE USED AS A PEDESTRIAN BRIDGE RAIL.
8. FOR SAFETY RAIL ON 8" BLOCK (CMU) WALLS, THE TOP COURSE SHALL BE A BOND BEAM WITH 2-#4 LONGITUDINAL REBAR AND GROUT.



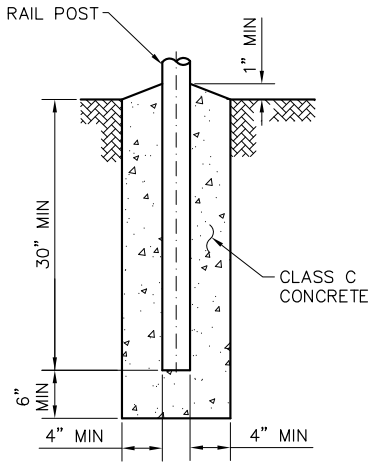
TYPE 1
ANCHOR PLATE DETAIL



TYPE 2
EXPANSION BOLT DETAIL



TYPE 3
PIPE SLEEVE DETAIL

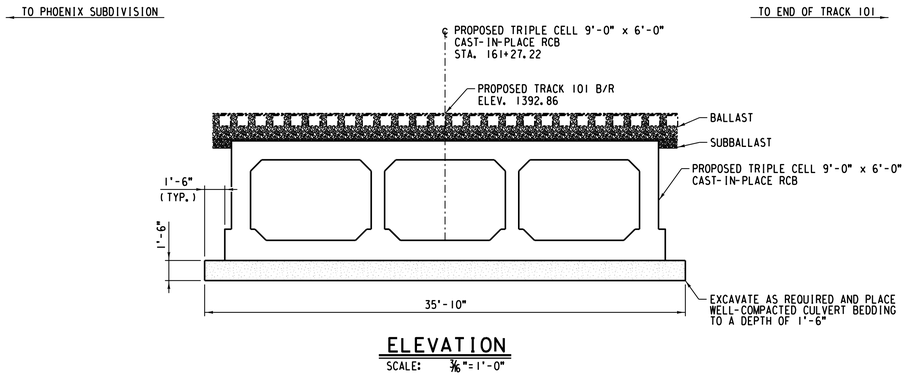


TYPE 4
GROUND INSTALLATION DETAIL

NOTE: SEE PLANS FOR ANCHORAGE DETAILS FOR ATTACHMENT TO SINGULARLY REINFORCED AND NON-REINFORCED WALLS.

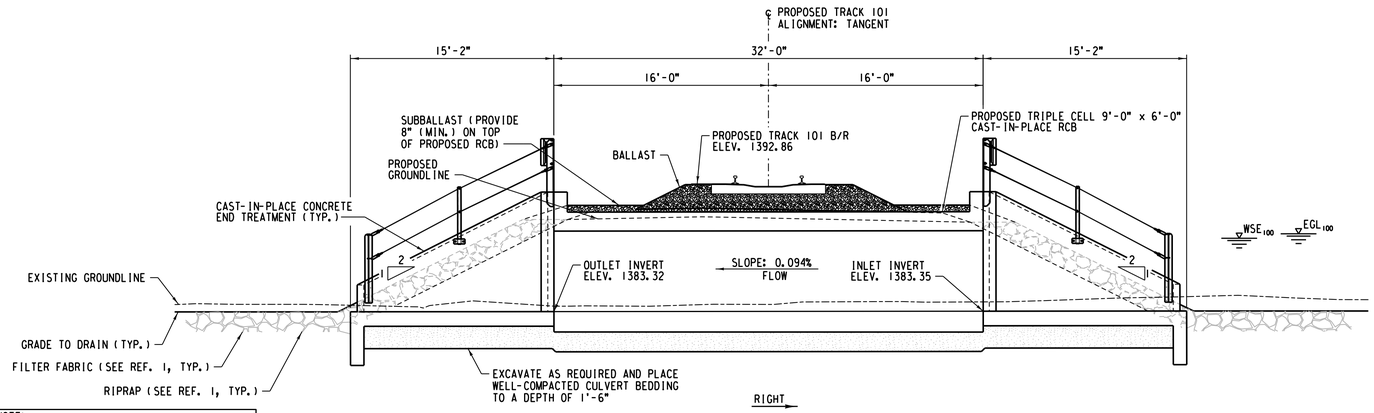
DETAIL NO.			REVISED	DETAIL NO.
145	MARICOPA ASSOCIATION of GOVERNMENTS — STANDARD DETAIL ENGLISH	SAFETY RAIL	01-01-2020	145

DESIGN SHEET



ELEVATION

SCALE: 3/16"=1'-0"



MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

RIGHT →

CROSS SECTION

SCALE: 3/16"=1'-0"

WSE_{100} = 1388.79
EGL_{100} = 1389.12
VEL_{100} = 5.20 fps

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
155	CU. YD.	4000 PSI CONCRETE FOR TRIPLE CELL 9'-0" X 6'-0" BOX CULVERT (BARREL ONLY) (PER DETAILS, SHEET NO. S3 AND NOTES, PER STD. DWG. 680200 SHT. G1)		CONSTRUCTOR
1	LOT	REINFORCING STEEL FOR BARREL (PER SCHEDULE, SHEET NO. S3)		
79	CU. YD.	4000 PSI CONCRETE FOR END TREATMENTS ONLY (PER DETAILS, SHEET. NOS. S4-S6, AND NOTES, PER STD. DWG. 680200 SHT. G1)		
1	LOT	REINFORCING STEEL FOR END TREATMENTS ONLY (PER SCHEDULE, SHEET NO. S6)		
2	EA.	HANDRAIL POST HP-25R (PER STD. DWG. 680160 SHT. H1)	513-2077	
2	EA.	HANDRAIL POST HP-25L (PER STD. DWG. 680160 SHT. H1)	513-2075	
8	EA.	HANDRAIL POST HP-26 (PER STD. DWG. 680160 SHT. H1)	513-2080	
4	EA.	HANDRAIL POST HP-27 (PER STD. DWG. 680160 SHT. H1)	513-2085	
43	EA.	¾" DIA. x 14" A307 HEAVY HEX BOLT, TYPE 1 WITH HEAVY ELASTIC LOCK NUT (MIL-N-32258) AND FLAT CIRCULAR WASHER (ASTM F436), EACH COMPONENT HOT DIP OR MECHANICALLY ZINC COATED		
27	EA.	⅜" EYE TYPE STRANDVISE CABLE GRIP CARTRIDGE (MACLEAN POWER PRODUCTS NO. 5102)	098-6081	
330	LIN. FT.	⅜" NOMINAL DIAMETER WIRE ROPE, 7 WIRE, GALVANIZED STEEL STRAND, SIEMENS MARTINS GRADE, A-COATING	050-5394	
27	EA.	½" DIA. EYEBOLT, 2" LONG SHANK WITH 1" I.D. EYE, PLAIN PATTERN GALVANIZED DROP FORGED STEEL (ASTM A489), WITH ZINC PLATED HEX NYLON INSERT LOCKNUT (ASTM A563) AND ZINC PLATED FLAT CIRCULAR WASHER (ASTM F436)	130-0370	
19	EA.	GALVANIZED MALLEABLE IRON U-BOLT WITH 2 ELASTIC LOCKNUTS (MIL-N-25027), ZINC PLATED, FOR ⅜" DIA. WIRE ROPE	050-6370	
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	RIPRAP (PER REF. 1)		
1	LOT	FILTER FABRIC (PER REF. 1)		
135	CU. YD.	CULVERT BEDDING (PER STD. DWG. 680200 SHT. G1)		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	LOT	TEMPORARY FORMWORK MATERIAL		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

DESIGN NOTES

RIGHT-OF-WAY

1. Right-of-way: Varies, per Ref. 1.

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 4): Elev. 1390.42, NAVD 1988, established by ½" rebar located in ground Northwest of proposed Track 101 Culvert No. 3.05, 9,606.96' left of existing Phoenix Sub. Main Track centerline, Sta. 1588+58.48.

   TBM 2 (Olsson CP 5): Elev. 1391.63, NAVD 1988, established by ½" rebar located in ground Southwest of proposed Track 101 Culvert No. 3.05, 9,311.99' left of existing Phoenix Sub. Main Track centerline, Sta. 1590+90.31.
4. Profile: Proposed Track 101 per Ref. 1.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawings:

   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. This structure has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0".
2. Constructor shall be responsible for determining construction loads and providing necessary supplemental cover, or support of structural elements, to accommodate construction activities as required.

DRAWING SCHEDULE

	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123081	GENERAL ARRANGEMENT (SHEET 1 OF 2)	DESIGN
	S2	123081	GENERAL ARRANGEMENT (SHEET 2 OF 2)	DESIGN
	S3	123081	RCB BARREL DETAILS	DESIGN
	S4	123081	END TREATMENT FRAMING DETAILS	DESIGN
	S5	123081	END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)	DESIGN
	S6	123081	END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)	DESIGN
	S7	123081	HANDRAIL DETAILS	DESIGN
	G1	680200	GENERAL NOTES	STANDARD
	G2	680200	GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS	STANDARD
	G5	680200	CONSTRUCTION SEQUENCE	STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P027 OF 037 T010 OF 012 X078 OF 143 EC014 OF 036	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN

NOTES:
1. CROSS SECTION SHOWN ALONG CENTERLINE OF PROPOSED RCB.
2. RCB = REINFORCED CONCRETE BOX

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

SECTION DESIGNATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 01-05-2023 ARIZONA U.S.A.

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 02/17/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD
FURNISH & INSTALL
TRIPLE CELL 9'-0" x 6'-0" RCB x 32'

SHEET TITLE: GENERAL ARRANGEMENT (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oacconsulting.com\fnts-na\projects\2020\050\1-1000\020-0927\40-Design\Microstation\020-0927-RLBR-Culv 3.05 Sta. 161+27 Pirate Ind Lead 3.05.dgn

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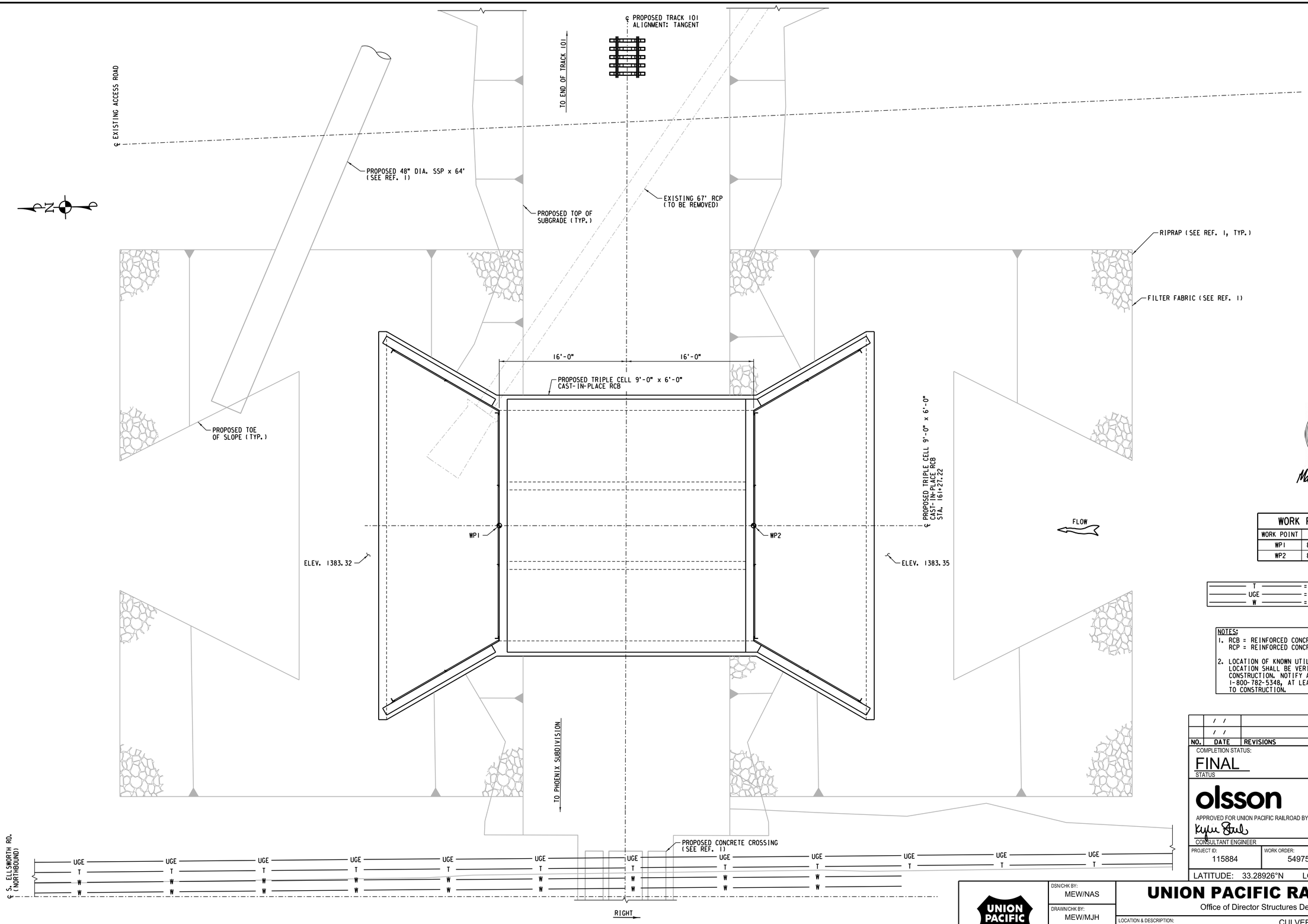
DESIGN SHEET



PLAN
SCALE: 3/16"=1'-0"

NOTE:
FOR DETAILS, SPECIFICATIONS, AND MATERIAL QUANTITIES OF RIPRAP AND GRADING, SEE REF. 1. GRADING AND RIPRAP LINEWORK SHOWN FOR INFORMATIONAL PURPOSES ONLY ON THESE PLANS.

WORK POINT TABLE		
WORK POINT	NORTHING	EASTING
WP1	833034.17	786317.91
WP2	833002.17	786317.67

T = TELEPHONE LINE
UGE = UNDERGROUND ELECTRIC
W = WATER LINE

NOTES:
1. RCB = REINFORCED CONCRETE BOX
RCP = REINFORCED CONCRETE PIPE

2. LOCATION OF KNOWN UTILITIES IS APPROXIMATE. LOCATION SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

Registered Professional Engineer (Civil)
CERTIFICATE NO. 75691
MARK J. HANIGAN
Date Signed 02-24-2023
ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — DATE: 02/17/2023

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

UNION PACIFIC

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S2 of S7

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION:
CULVERT 3.05, PIRATE IND LEAD
FURNISH & INSTALL
TRIPLE CELL 9'-0" x 6'-0" RCB x 32'

SHEET TITLE:
GENERAL ARRANGEMENT (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501.1000\020-0927-40 Design\Microstation\020-0927.RLBR\July 3.05_Sta. 161-27\Pirate Ind Lead_3.05.dgn

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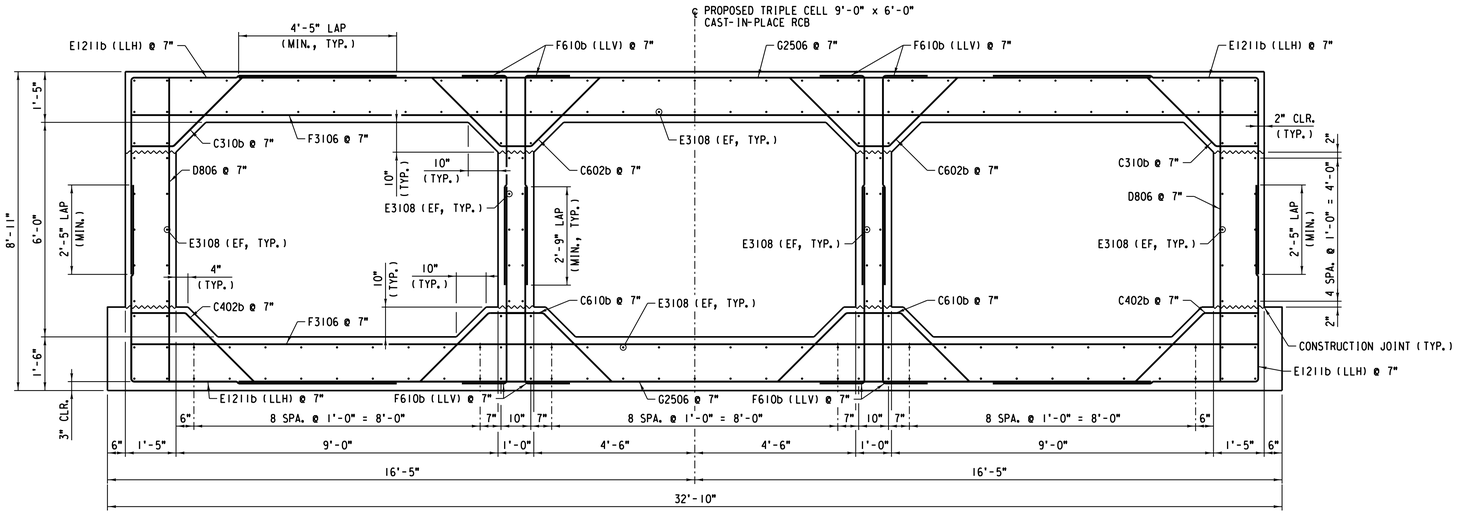
DESIGN SHEET



TYPICAL RCB BARREL SECTION

SCALE: ½"=1'-0"

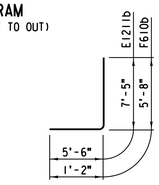
REINFORCING SCHEDULE

(QUANTITY PER BARREL ONLY)

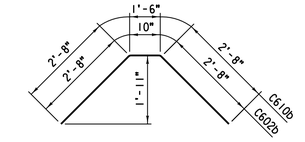
TOTAL	MARK	SIZE	LENGTH	SHAPE
110	C310b	#4	3'-10"	
110	C402b	#4	4'-2"	
110	C602b	#4	6'-2"	
110	C610b	#4	6'-10"	
110	D806	#5	8'-6"	
220	E1211b	#6	12'-11"	
196	E3108	#6	31'-8"	
440	F610b	#7	6'-10"	
110	F3106	#7	31'-6"	
110	G2506	#8	25'-6"	

BENDING DIAGRAM

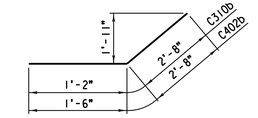
(DIMENSIONS ARE OUT TO OUT)



E1211b, F610b



C602b, C610b



C310b, C402b

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 = 36,830 LB.

CONCRETE PLACEMENT QUANTITIES

ITEM	UNIT	QTY.
RCB BARREL (BOTTOM SLAB)	CU. YD.	68.6
RCB BARREL (WALLS & TOP SLAB)	CU. YD.	85.5
APRON & TOEWALL	CU. YD.	60.7
WINGWALLS & HEADWALL	CU. YD.	17.5

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. EF = EACH FACE
   LLH = LONG LEG HORIZONTAL
   LLV = LONG LEG VERTICAL

Registered Professional Engineer (Civil)
CERTIFICATE NO.
75691
MARK J. HANIGAN
Date Signed 03-24-2023
ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:

FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:

Kyle Stubs — CONSULTANT ENGINEER — 02/17/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

UNION PACIFIC

DSN/CHK BY:	MEW/NAS
DRAWN/CHK BY:	MEW/MJH
UPRR ENGINEER:	ADS
SHT NO.:	S3 of S7

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD

FURNISH & INSTALL
TRIPLE CELL 9'-0" x 6'-0" RCB x 32'

SHEET TITLE: RCB BARREL DETAILS

FILE NAME: \\oa.ad.oasconsulting.com\fnts-mp\projects\2020\0501-10000\020-0927\40-Design\Microstation\020-0927_RLBR.Calv 3.05.Sta 161+27\Pirate Ind Lead_3.05.dgn

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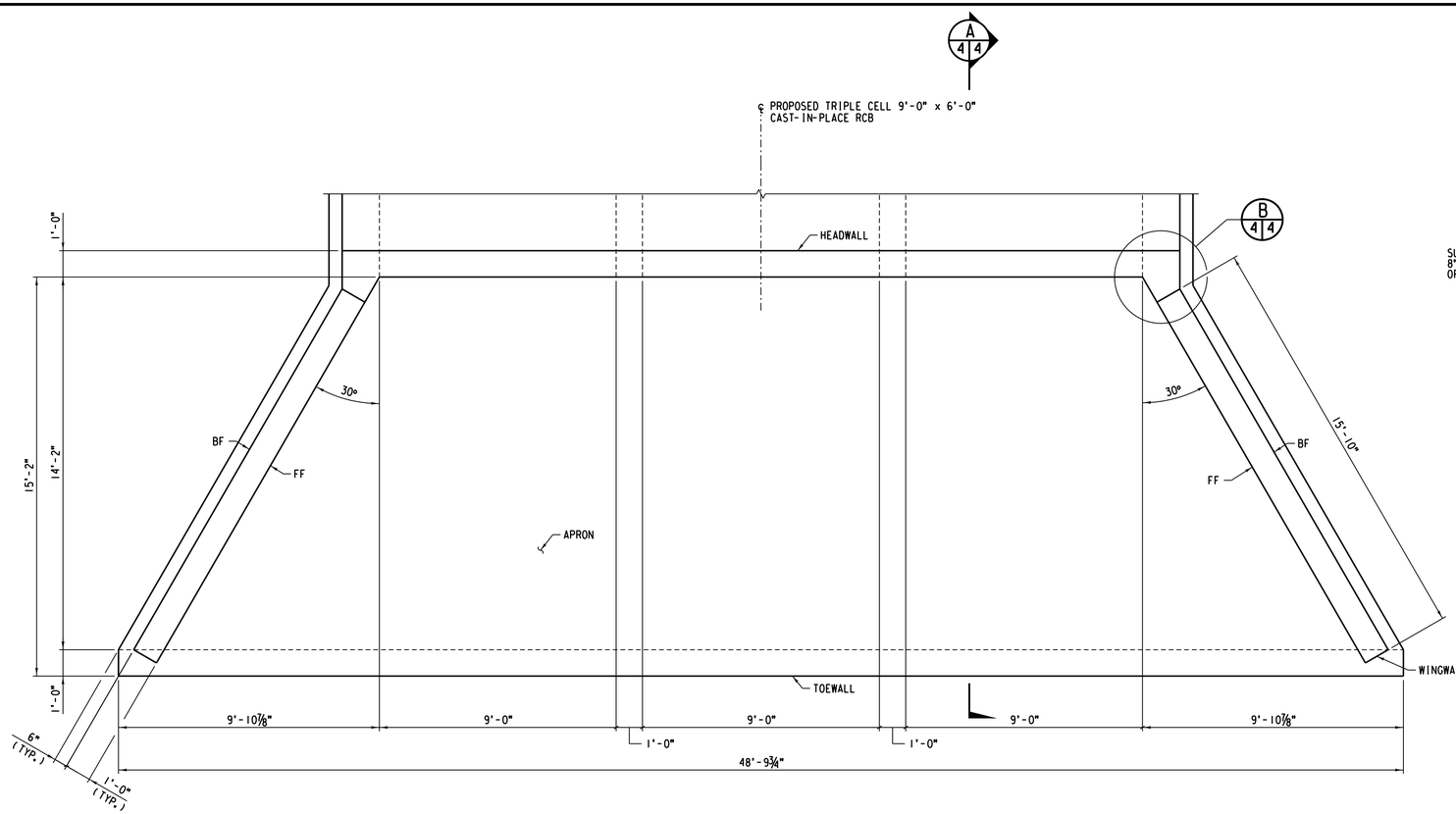
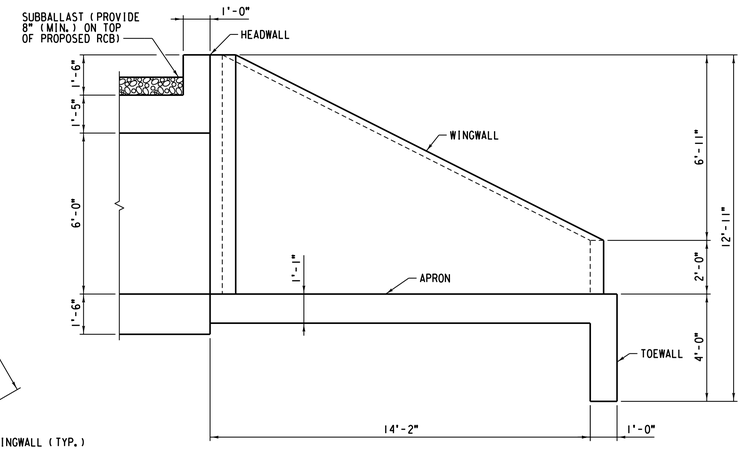
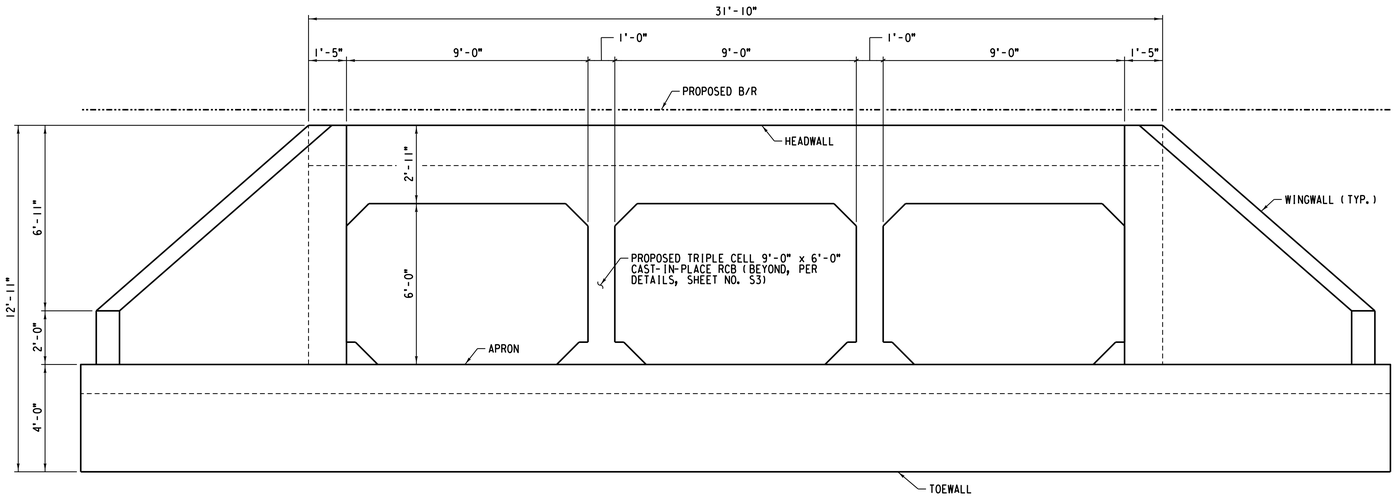
DESIGN SHEET



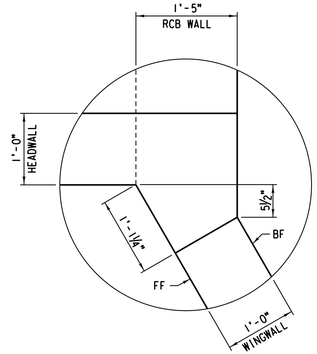
PLAN
SCALE: ⅜"=1'-0"



SECTION A 4 4
SCALE: ⅜"=1'-0"



ELEVATION
SCALE: ⅜"=1'-0"



DETAIL B 4 4
SCALE: 1"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE SHEET NO. S3.
3. FOR END TREATMENT REINFORCING DETAILS, SEE SHEET NO. S5.
4. BF = BACK FACE
   FF = FRONT FACE
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 02-24-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 02/17/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

UNION PACIFIC

DSN/CHK BY: MEW/NAS	UNION PACIFIC RAILROAD
DRAWN/CHK BY: MEW/MJH	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD
SHT NO.: S4 of S7	FURNISH & INSTALL TRIPLE CELL 9'-0" x 6'-0" RCB x 32'
	SHEET TITLE: END TREATMENT FRAMING DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na\projects\2020\0501-1000\020-0927-40 Design\Microstation\020-0927_RLBRA.dlv 3.05_Sta. 161-22\Pirate Ind Lead_3.05.dgn

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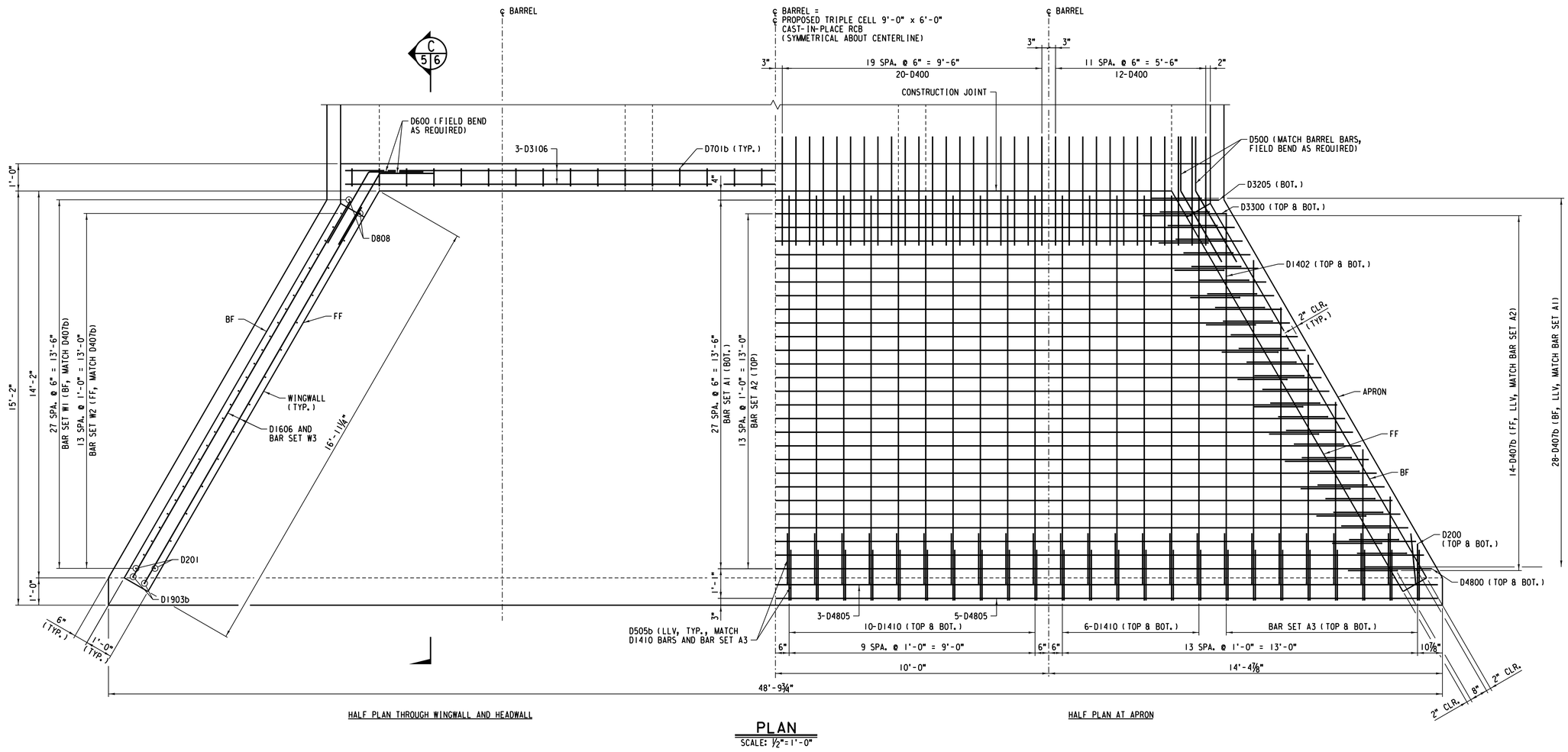
DESIGN SHEET



HALF PLAN THROUGH WINGWALL AND HEADWALL

HALF PLAN AT APRON

PLAN
SCALE: ½"=1'-0"

NOTES:
1. CONSTRUCTOR MAY SPLICE D BARS WITH A 2'-9" MINIMUM LAP SPLICE IF PREFERRED.
2. FOR REINFORCING SCHEDULE, SEE SHEET NO. S6.
3. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
4. FOR REINFORCED CONCRETE BOX DETAILS, SEE SHEET NO. S3.
5. BF = BACK FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

Registered Professional Engineer (Civil)
CERTIFICATE NO. 75691
MARK J. HANIGAN
Date Signed 02-24-2023
ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kyle Stubs — CONSULTANT ENGINEER — 02/17/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

DSN/CHK BY: MEW/NAS	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: MEW/MJH	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD
SHT NO.: S5 of S7	FURNISH & INSTALL TRIPLE CELL 9'-0" x 6'-0" RCB x 32'
	SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 1 OF 2)

FILE NAME: \\oa.aecomultrng.com\fnts-na1\projects\2020\0501\1000\020\0927\40\Design\Microstation\020-0927-RLBRCulv 3.05.5ta. 161-27\Pirate Ind Lead_3.05.dgn
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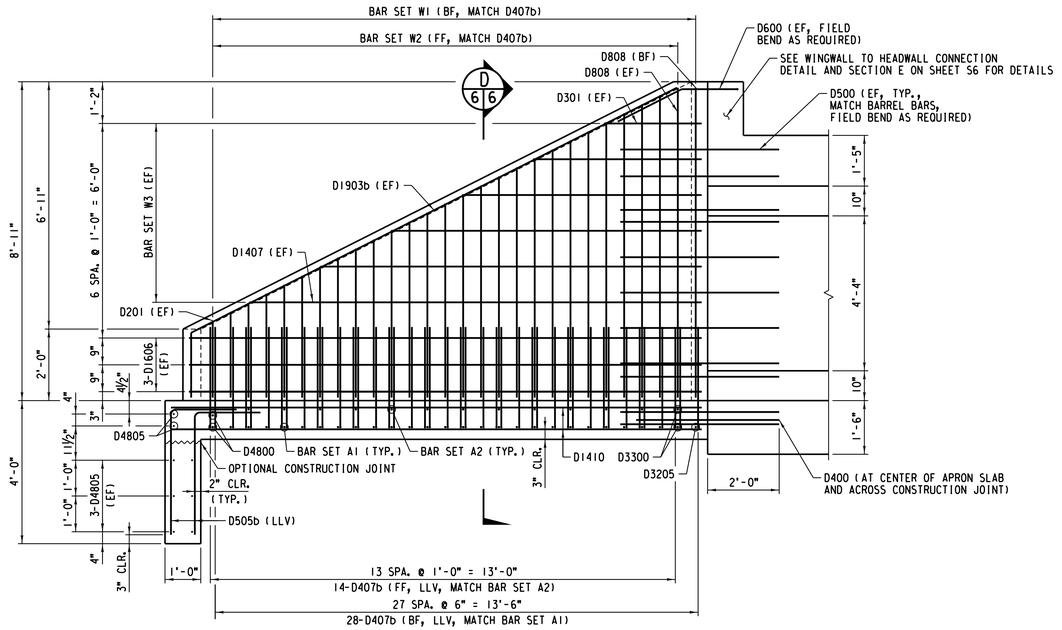
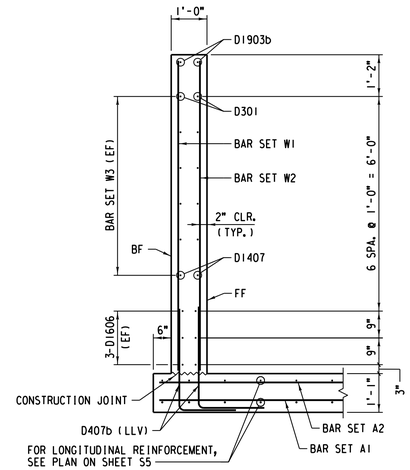
DESIGN SHEET



SECTION C
SCALE: ½"=1'-0"

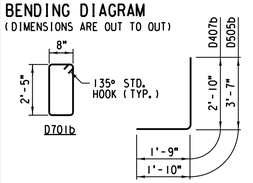


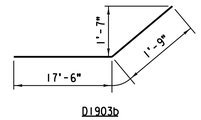
SECTION D
SCALE: ½"=1'-0"

REINFORCING SCHEDULE
(QUANTITY PER END TREATMENT)

TOTAL	MARK	SIZE	LENGTH	SHAPE
64	D400	#5	4'-0"	
84	D407b	#5	4'-7"	
44	D500	#5	5'-0"	
96	D505b	#5	5'-5"	
4	D600	#5	6'-0"	
32	D701b	#5	7'-1"	
64	D1410	#5	14'-10"	
12	D1606	#5	16'-6"	
4	D1903b	#5	19'-3"	
6	D3106	#5	31'-6"	
8	D4805	#5	48'-5"	

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



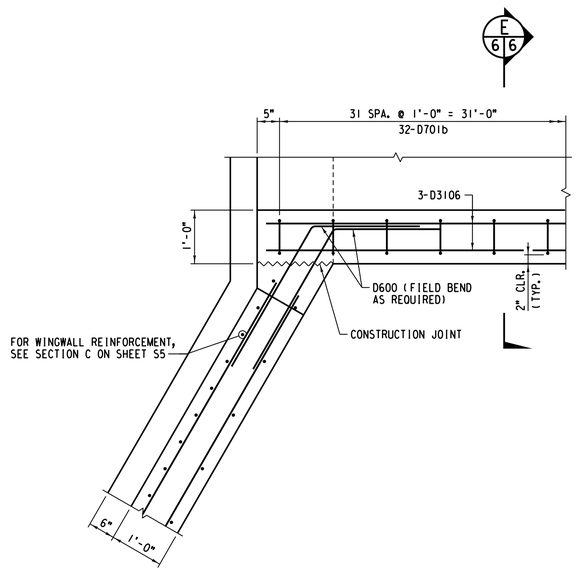


SET LIST

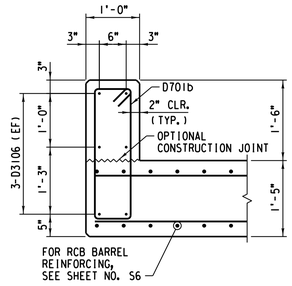
BAR SET DESIGNATION	MARK	SIZE	MIN. LENGTH	MAX. LENGTH	INCREMENT	NO. OF BARS/SET	NO. OF SETS	SHAPE
A1	D3205-D4800	#5	32'-5"	48'-0"	6⅞"(+)	28	1	
A2	D3300-D4800	#5	33'-0"	48'-0"	1'-1⅞"(-)	14	1	
A3	D200-D1402	#5	2'-0"	14'-2"	1'-8⅛"(-)	8	4	
W1	D201-D808	#5	2'-1"	8'-8"	2⅞"(+)	28	2	
W2	D201-D808	#5	2'-1"	8'-8"	6⅛"(-)	14	2	
W3	D301-D1407	#5	3'-1"	14'-7"	2'-3⅝"(-)	6	4	

EST. WT. OF REINFORCING STEEL = 6,310 LB.

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.



WINGWALL TO HEADWALL CONNECTION DETAIL
SCALE: ¾"=1'-0"



SECTION E
SCALE: ¾"=1'-0"

NOTES:
1. FOR CAST-IN-PLACE CONCRETE NOTES, SEE STD. DWG. 680200 SHT. G1.
2. FOR REINFORCED CONCRETE BOX DETAILS, SEE SHEET NO. S3.
3. BF = BACK FACE
   EF = EACH FACE
   FF = FRONT FACE
   LLV = LONG LEG VERTICAL
   RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 02-24-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 02/17/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

UNION PACIFIC

DSN/CHK BY: MEW/NAS	UNION PACIFIC RAILROAD
DRAWN/CHK BY: MEW/MJH	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD
SHT NO.: S6 of S7	FURNISH & INSTALL TRIPLE CELL 9'-0" x 6'-0" RCB x 32'
	SHEET TITLE: END TREATMENT REINFORCING DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\0501.1000\020-0927\40-Design\Microstation\020-0927.R.UPR.Culv 3.05.Sta. 161+27\Pirate Ind Lead_3.05.dgn

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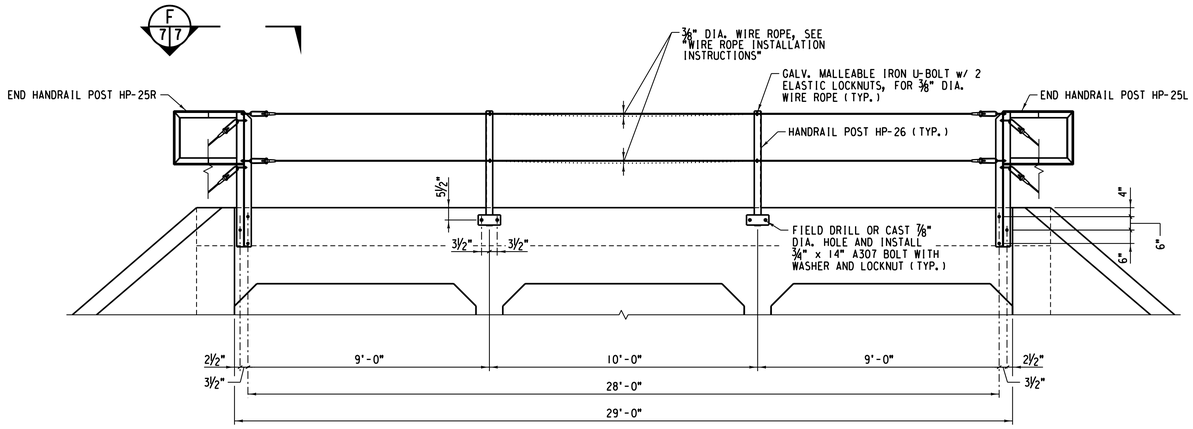
DESIGN SHEET



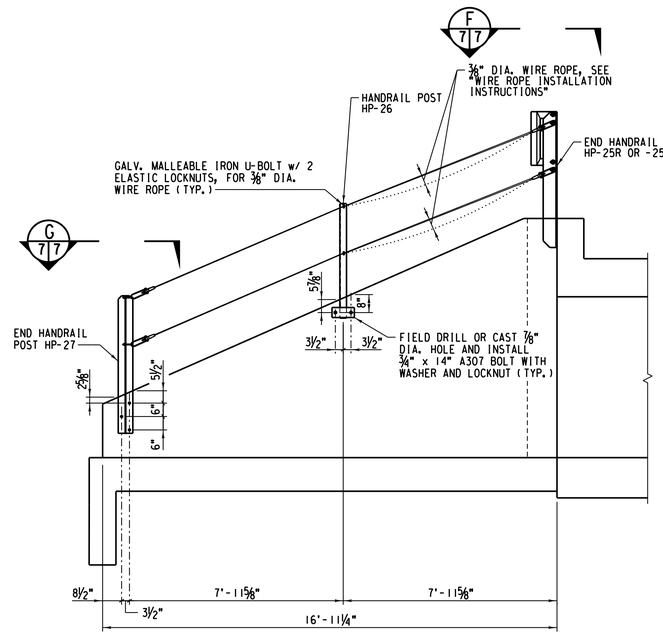
NOTE:
WINGWALL HANDRAIL NOT SHOWN FOR CLARITY.

BOX CULVERT HANDRAIL LAYOUT

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

WIRE ROPE INSTALLATION INSTRUCTIONS:

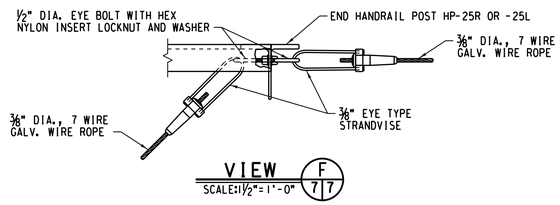
1. THREAD WIRE ROPE THROUGH ALL CLIPS AND BARREL ANCHORS AND SEAT RETAINING WEDGES ON ONE END HANDRAIL POST.
2. STRETCH WIRE ROPE, HANG A MINIMUM OF 10 LB. ON CABLE BETWEEN TWO POSTS AND REMOVE ALL SAG TO A MAXIMUM OF 2 INCHES.
3. SEAT RETAINING WEDGES AT REMAINING END HANDRAIL POST.
4. REMOVE WEIGHTS.
5. TIGHTEN CLIPS AT INTERMEDIATE POSTS.
6. CUT & REMOVE EXCESS WIRE ROPE, COAT CUT PORTIONS OF WIRE ROPE WITH COLD GALVANIZING COMPOUND.



WINGWALL HANDRAIL LAYOUT

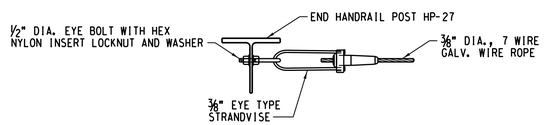
SCALE: 3/8"=1'-0"

(LOOKING PERPENDICULAR TO FACE OF WINGWALL)



VIEW F 7 7

SCALE: 1½"=1'-0"



VIEW G 7 7

SCALE: 1½"=1'-0"

NOTES:
1. FOR HANDRAIL POST DETAILS, SEE STD. DWG. 680160 SHT. H1.
2. RCB = REINFORCED CONCRETE BOX

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS: 95% STATUS — / / DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 02-24-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:

CONSULTANT ENGINEER — 02/17/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123081

LATITUDE: 33.28926°N LONGITUDE: 111.63457°W

UNION PACIFIC

DSN/CHK BY: MEW/NAS	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: MEW/MJH	Office of Director Structures Design
UPRR ENGINEER:	LOCATION & DESCRIPTION: CULVERT 3.05, PIRATE IND LEAD
SHT NO.: S7 of S7	FURNISH & INSTALL TRIPLE CELL 9'-0" x 6'-0" RCB x 32'
	SHEET TITLE: HANDRAIL DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\rtc-nal\projects\2020\0501.1000\020-0927\40-Design\Microstation\020-0927.R.UPR.Culv 3.05.Sta. 161-27 Pirate Ind Lead.3.05.dgn

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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. All structures were designed in accordance with the AREMA Manual, Chapter 8 - Concrete Structures and Foundations.

3. Box culverts designed for a min. 1'-6" cover and a max. 18'-0" cover. Cover is measured from base of rail to top of the concrete box.

4. Construction means and methods shall comply with the All Permits Issued (API) package.

5. Field verify all dimensions, stations and elevations prior to start of construction.

6. Contact the Union Pacific "Call Before You Dig" number 90 days (not less than 60 days) prior to proposed construction start date. Prior to construction, confirm that all necessary relocations have been completed. The CBYD number is: 1-800-336-9193.

7. 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.

PRECAST 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 psi 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.

CAST-IN-PLACE 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. Formwork tolerances shall be in accordance with ACI 347 specifications.

3. Minimum compressive strength - 4000 psi at 28 days.

4. 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.

5. 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.

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. Air content shall be between 5% and 7% (by volume).

9. Admixtures shall not be used without approval by Engineer.

10. Curing shall be accomplished by wet curing or the application of a Type 2 membrane.

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.

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.

CONSTRUCTOR NOTES (WHEN APPLICABLE)

CONSTRUCTOR DEFINITION

CONSTRUCTOR DESIGNATES MANAGER BRIDGE CONSTRUCTION IF CONSTRUCTION BY UPRR AND CONTRACTOR IF CONSTRUCTION BY CONTRACTOR.

DIVISION OF RESPONSIBILITY

A. RAILROAD

1. Remove ties, rail and OTM from project area as required.

2. Provide and install ballast, ties, rail and OTM at proposed culvert.

3. Provide material as shown in the Bill of Material.

4. Provide and install Private Property/No Trespassing sign and culvert marker signs on right side at each end of culvert.

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, 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 well-compacted bedding as required to establish grade of the culvert. Bedding for the box culvert shall consist of a minimum of 1'-6" of culvert bedding material. Over excavate 1'-6" each side of box. If loose, soft, or excessively wet soils are encountered at this depth, a 6" lift of granular bedding shall be placed on these soils and compressed into the subgrade. This procedure shall continue until a stable subgrade is produced. If a stable subgrade can not be achieved, the UPRR Office of Structures Design shall be notified.

11. 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.

DIVISION OF RESPONSIBILITY

12. Direct channel flow as required to perform work.

13. Remove debris and ballst from channel as directed by the Railroad.

14. Accomplish activities within the schedule specified in the approved construction plan.

CULVERT BEDDING

Culvert bedding shall be granular material such as aggregates ordinarily specified and used in the construction of highway base and subbase. These aggregates include crushed stone, natural or crushed gravel, natural or manufactured sands, crushed slag or a homogeneous mixture of these materials. Culvert bedding shall be compacted to 95% of maximum dry density as defined in ASTM International D1557 (Modified Proctor). Recommended gradation is as follows:

SCREEN SIZE	% PASSING (BY WEIGHT)
1 inch	100
½ inch	60-90
⅜ inch	20-40
No. 4	10-20
No. 200	less than 5%

Union Pacific Sealant Ballast SB-2, item no. 562-5428, may be used.

BOX CULVERT OPENING AREA

CELL WIDTH (FT)	CELL HEIGHT (FT)	SINGLE CELL OPENING (FT^2)	DOUBLE CELL OPENING (FT^2)
6	4	23.1	46.2
6	6	35.1	70.2
8	4	30.6	61.2
8	6	46.6	93.2
8	8	62.6	125.2
10	4	38.0	76.0
10	6	58.0	116.0
10	8	78.0	156.0
10	10	98.0	196.0
10	12	118.0	236.0
12	8	93.3	186.6
12	10	117.3	234.6
12	12	141.3	282.6

REVISIONS		
DATE	LTR.	DESCRIPTION
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/		

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL NOTES

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G1

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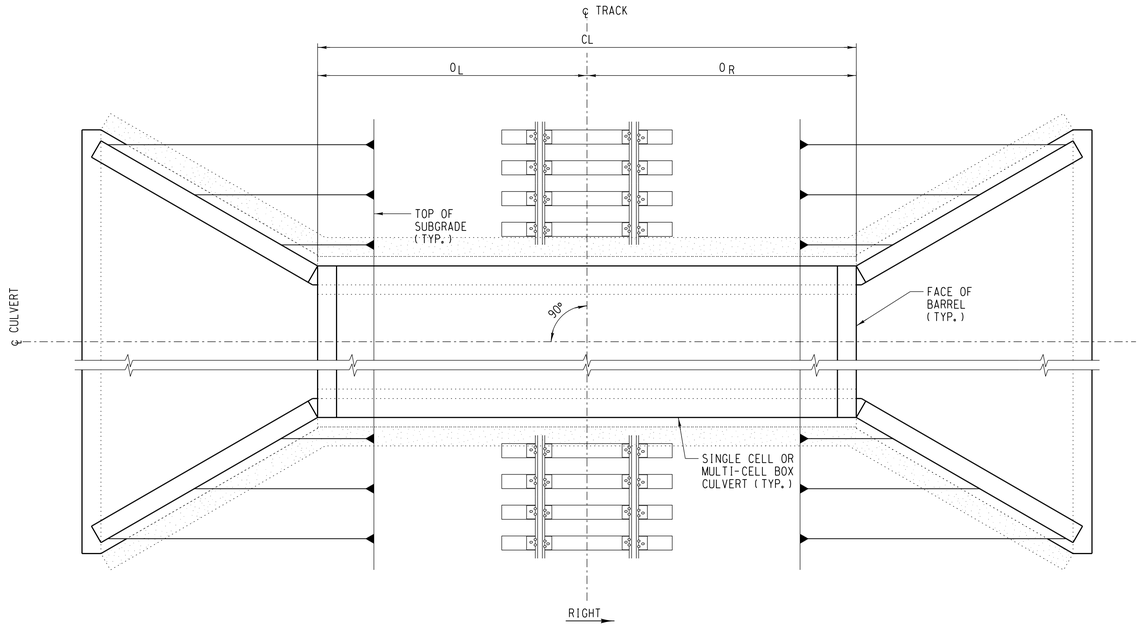
PLOTTED: 1/3/2020 3:30:45 PM

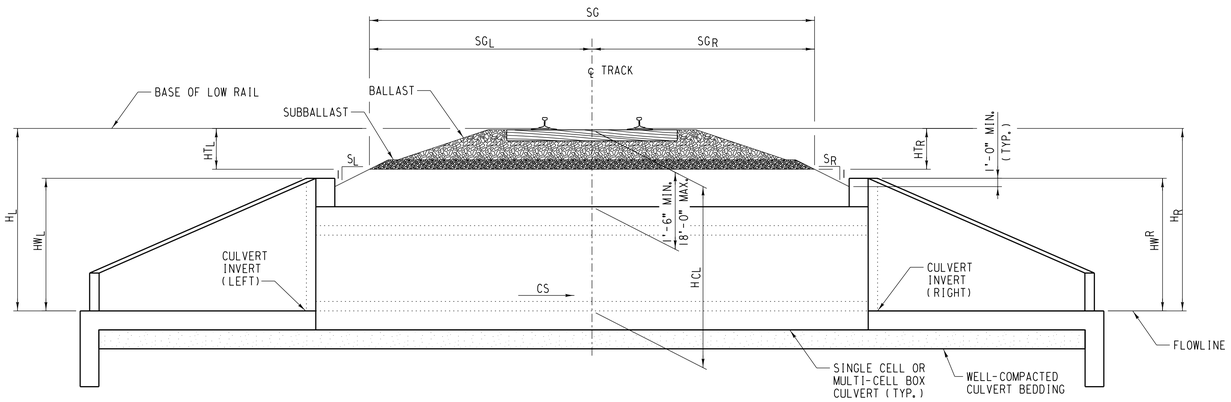
FILE NAME: pw://HDR_US_National.DI/4195/10196897/680200_Concrete Box Culverts.dgn

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



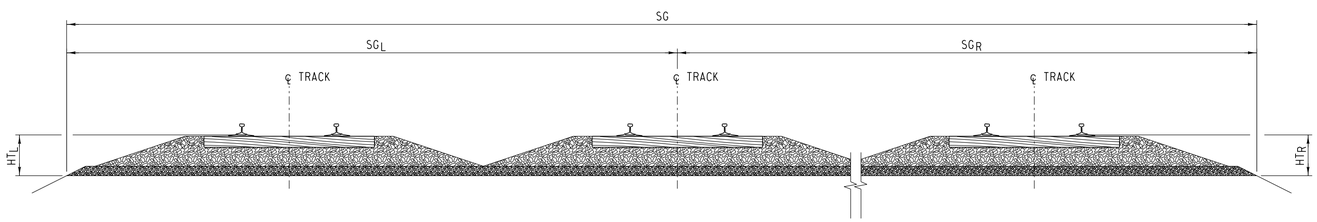
PLAN - SINGLE TRACK

SCALE: NONE



ELEVATION - SINGLE TRACK

SCALE: NONE



MULTIPLE TRACK DIAGRAM

SCALE: NONE

CULVERT LENGTH EQUATION:

$CL = O_L + O_R \geq SG + 2'$

$O_L = SG_L + S_L(H_L - HT_L + 1' - HW_L) + 1'$

$O_R = SG_R + S_R(H_R - HT_R + 1' - HW_R) + 1'$

$$H_L = \frac{H_{CL} + CS\,[SG_L - S_L(HT_L + HW_L - 1') + 1']}{[1 - CS(S_L)]}$$

$$H_R = \frac{H_{CL} - CS\,[SG_R - S_R(HT_R + HW_R - 1') + 1']}{[1 + CS(S_R)]}$$

$SG = SG_L + SG_R$

$H_{AVG} = (H_L + H_R) / 2$

KEY:

- CL = CULVERT LENGTH
- O_L = OFFSET LEFT
- O_R = OFFSET RIGHT
- H_{CL} = HEIGHT - BASE OF LOW RAIL TO FLOWLINE AT CENTERLINE OF TRACK
- CS = CULVERT SLOPE (RISE/RUN) LEFT TO RIGHT (+ UP, - DOWN)
- HT_L = BASE OF LOW RAIL TO TOP OF SUBGRADE LEFT EDGE
- HT_R = BASE OF LOW RAIL TO TOP OF SUBGRADE RIGHT EDGE
- H_L = HEIGHT - BASE OF LOW RAIL TO INVERT LEFT OF TRACK
- H_R = HEIGHT - BASE OF LOW RAIL TO INVERT RIGHT OF TRACK
- HW_L = HEIGHT OF WINGWALL LEFT OF TRACK
- HW_R = HEIGHT OF WINGWALL RIGHT OF TRACK
- SG = WIDTH OF SUBGRADE (24'-0" MINIMUM)
- SG_R = WIDTH OF SUBGRADE RIGHT OF ℄ TRACK (12'-0" MINIMUM)
- SG_L = WIDTH OF SUBGRADE LEFT OF ℄ TRACK (12'-0" MINIMUM)
- S_L = SIDE SLOPE LEFT OF TRACK (RUN PER FOOT OF RISE)
- S_R = SIDE SLOPE RIGHT OF TRACK (RUN PER FOOT OF RISE)

NOTE:
ALL DIMENSIONS ARE IN FEET.

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

GENERAL ARRANGEMENT FOR SINGLE CELL AND MULTI-CELL BOX CULVERTS

FILE OWNER: UPRR | DATE: JANUARY, 2020

PLAN NO.: 680200 | SHEET: G2

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FILE NAME: pw://HDR_US_National.01/4195/10196897/680200_Concrete Box Culverts.dgn

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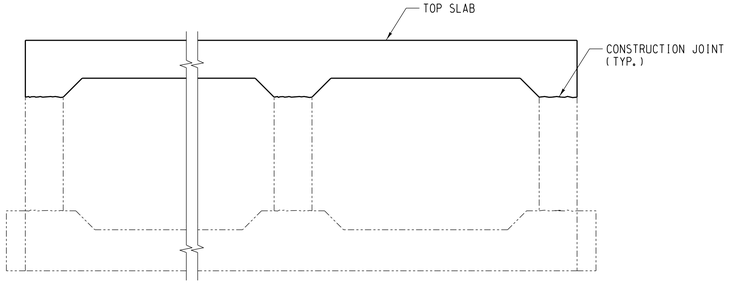
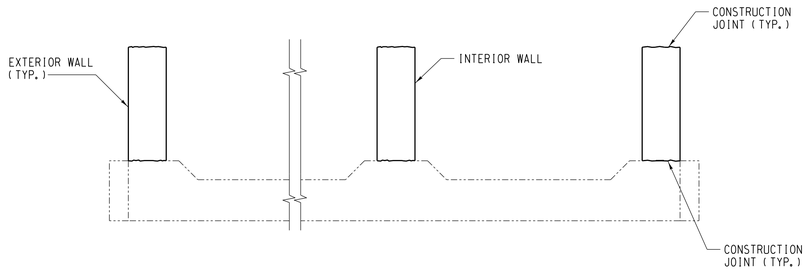


PHASE THREE



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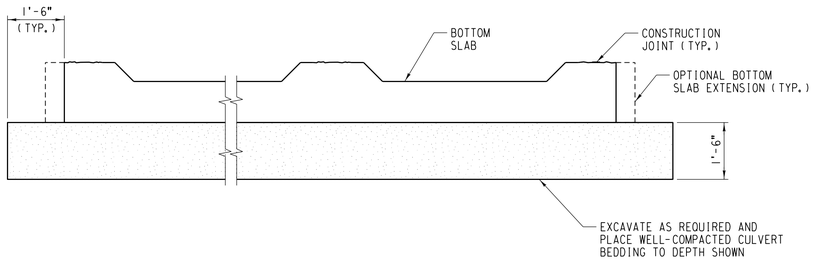
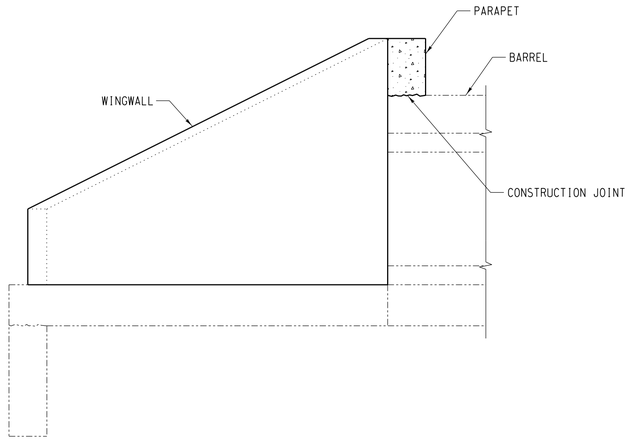


PHASE ONE

CONSTRUCTION SEQUENCE - BARREL

SCALE: ½"=1'-0"



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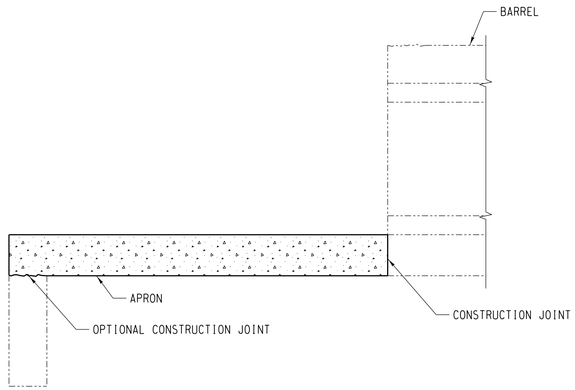

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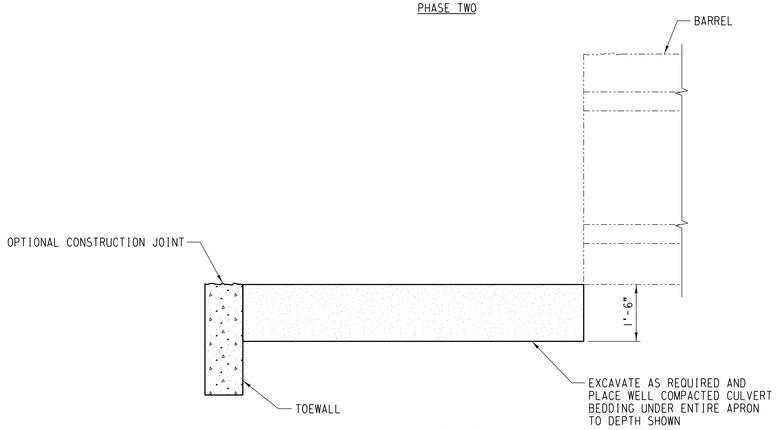

PHASE ONE

CONSTRUCTION SEQUENCE - PARAPET, APRON, TOEWALL AND WINGWALLS

SCALE: ½"=1'-0"

(LOOKING PERPENDICULAR TO ℄ CULVERT)

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

APPROVED:

01-03-2020

UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN

UNION PACIFIC

BRIDGE STANDARDS

CONCRETE BOX CULVERTS

CONSTRUCTION SEQUENCE

FILE OWNER: UPRR	DATE: JANUARY, 2020
PLAN NO.: 680200	SHEET: G5

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PLOTTED: 1/3/2020 3:30:48 PM

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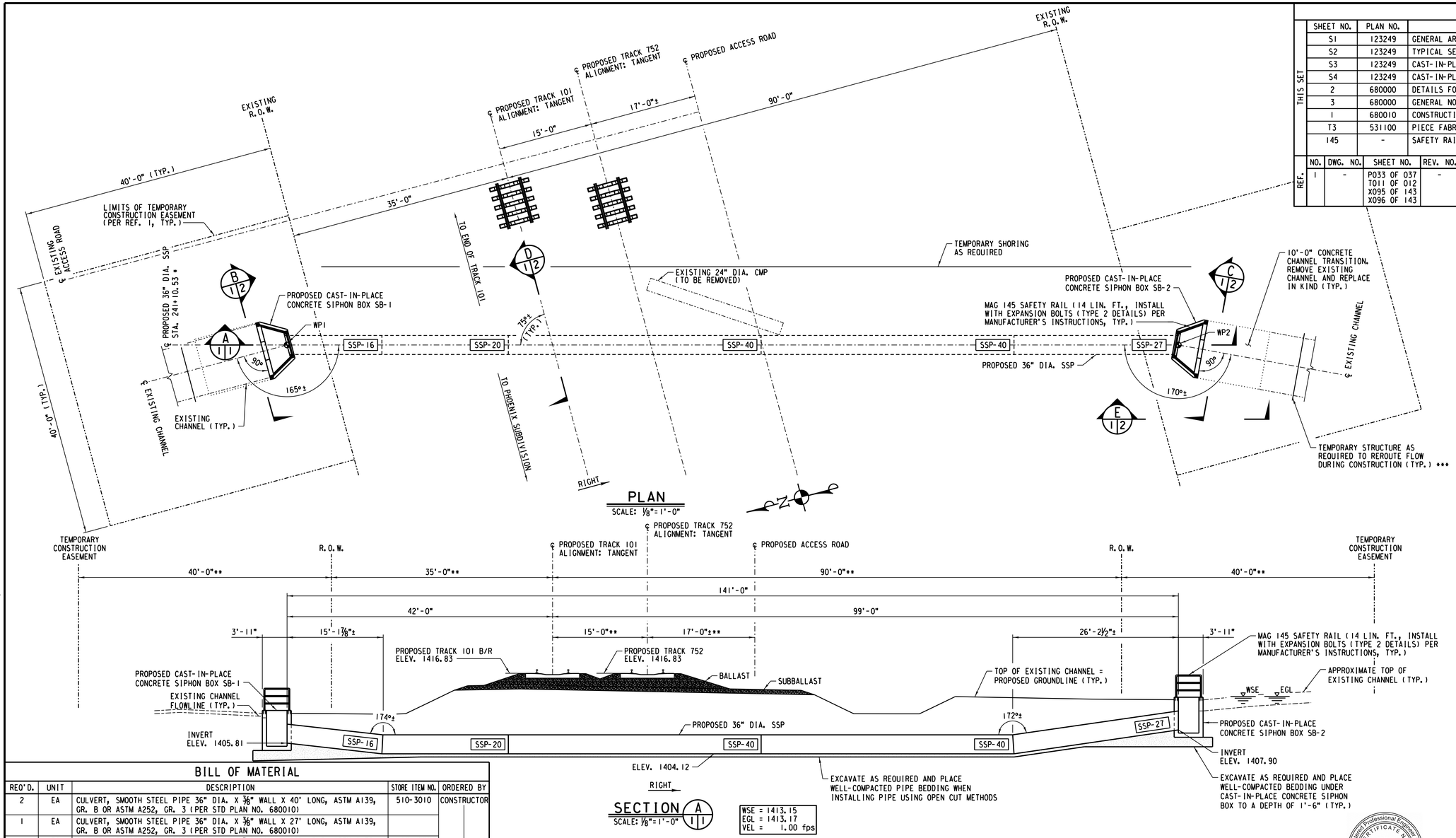
DESIGN SHEET



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

RIGHT

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

WSE = 1413.15
EGL = 1413.17
VEL = 1.00 fps

DRAWING SCHEDULE

	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123249	GENERAL ARRANGEMENT	DESIGN
	S2	123249	TYPICAL SECTIONS AND CONSTRUCTION DETAILS	DESIGN
	S3	123249	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)	DESIGN
	S4	123249	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)	DESIGN
	2	680000	DETAILS FOR ROUND STEEL PIPE CULVERTS	STANDARD
	3	680000	GENERAL NOTES FOR ROUND STEEL PIPE CULVERTS	STANDARD
	1	680010	CONSTRUCTION NOTES AND TABLE FOR SMOOTH STEEL PIPE CULVERTS	STANDARD
	T3	531100	PIECE FABRICATION NOTES	STANDARD
	145	-	SAFETY RAIL	MAG STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P033 OF 037 T011 OF 012 X095 OF 143 X096 OF 143	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN

***NOTES:
1. FLOW SHALL BE REROUTED TEMPORARILY AS REQUIRED FOR CONSTRUCTION. CONSTRUCTOR IS RESPONSIBLE FOR ANY TEMPORARY STRUCTURES REQUIRED AND SHALL SUBMIT PLANS AND CALCULATIONS TO UPRR FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION.
2. AFTER CONSTRUCTION, CONSTRUCTOR SHALL REROUTE FLOW BACK TO ORIGINAL ALIGNMENT AND RESTORE AREA TO ORIGINAL CONDITION OR BETTER.

WORK POINT TABLE

WORK POINT	NORTHING	EASTING
WP1	832709.14	794290.52
WP2	832573.40	794252.36

NOTES:
1. * = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.
2. ** = MEASURED PERPENDICULAR TO PROPOSED TRACK 101.
3. CONSTRUCTOR TO FIELD VERIFY ALL STATIONS ELEVATIONS AND DIMENSIONS PRIOR TO CONSTRUCTION. IF CONFLICTS OR INCONSISTENCIES ARE ANTICIPATED, NOTIFY UPRR.

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
2	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 40' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)	510-3010	CONSTRUCTOR
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 27' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)		
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 20' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)	510-3006	
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 16' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)	510-3003	
28	LIN. FT.	MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) 145 SAFETY RAIL (TWO LOCATIONS, WITH EXPANSION BOLTS (TYPE 2 DETAILS) AND ALL OTHER ASSOCIATED HARDWARE) OR APPROVED ALTERNATE		
8	EA	¾" DIA. x 8" WELDED STUD (PER DETAILS, SHEET NO. S2)		
45	CU. YD.	PIPE BEDDING (PER STD. DWG. 680000 SHT. 3)		
1	LOT	REINFORCING STEEL FOR CONCRETE SIPHON BOX SB-1 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND SCHEDULE, SHEET NO. S3)		
5	CU. YD.	4000 PSI CONCRETE FOR CONCRETE SIPHON BOX SB-1 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND DETAILS, SHEET NO. S3)		
1	LOT	REINFORCING STEEL FOR CONCRETE SIPHON BOX SB-2 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND SCHEDULE, SHEET NO. S4)		
5	CU. YD.	4000 PSI CONCRETE FOR CONCRETE SIPHON BOX SB-2 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND DETAILS, SHEET NO. S4)		
20	LIN. FT.	SIKA HYDROTITE WATERSTOP, PROFILE CJ-0725-3K, OR APPROVED ALTERNATE		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
1	LOT	CHANNEL TRANSITION MATERIAL		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	TEMPORARY FORMWORK MATERIAL		
1	LOT	TEMPORARY SHORING		
1	LOT	TEMPORARY STRUCTURE TO REROUTE FLOW		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

DESIGN NOTES

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 4): Elev. 1390.42, NAVD 1988, established by ½" rebar located in ground West of proposed Culvert No. 4.57, 9,606.96' left of existing Phoenix Sub. Main Track centerline, Sta. 1588+58.48.
   TBM 2 (Olsson CP 5): Elev. 1391.63, NAVD 1988, established by ½" rebar located in ground West of proposed Culvert No. 4.57, 9,311.99' left of existing Phoenix Sub. Main Track centerline, Sta. 1590+90.31
4. Profile: Proposed Track 101 per Ref. 1.
   Proposed Track 752 per Ref. 1.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. The proposed cast-in-place concrete siphon box has been designed in accordance with the AREMA Manual for Railway Engineering, Chapter 8: Concrete Structures and Foundations The proposed cast-in-place concrete siphon box has been designed for railroad surcharge, lateral earth pressure and a construction surcharge of 250 psf.
2. The SSP has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0".

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

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

SECTION DESIGNATION

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 04/04/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123249

LATITUDE: 33.28824°N LONGITUDE: 111.60853°W

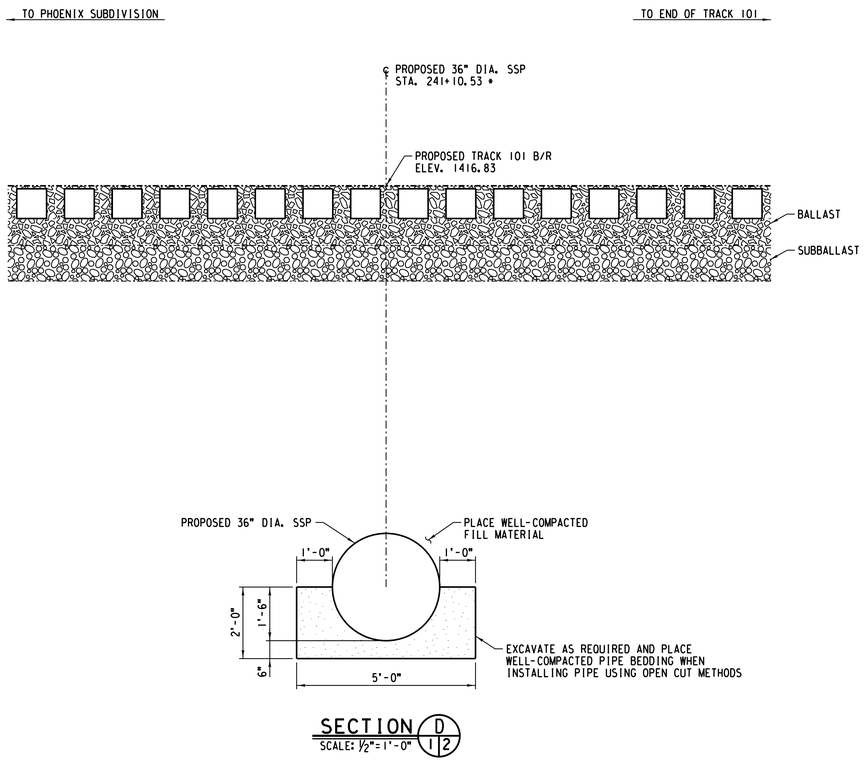
UNION PACIFIC

DSN/CHK BY: JAS/MJH	UNION PACIFIC RAILROAD Office of Director Structures Design
DRAWN/CHK BY: FAM/JAS	LOCATION & DESCRIPTION: CULVERT 4.57, PIRATE IND LEAD
UPRR ENGINEER: ADS	FURNISH & INSTALL 1-36" DIA. SSP x 141' AND SIPHON BOXES
SHT NO.: S1 of S4	SHEET TITLE: GENERAL ARRANGEMENT

FILE NAME: \\olsondata.sharepoint.com\sites\olsonconsulting\projects\2020\050\1000\020\052\020-0527-RLBRCulv 4.57_5ta. 241-10.00\Pirate Ind Lead 4.57.dgn

PLOTTED: 7/7/2023 12:48:00 PM

DESIGN SHEET



SECTION D
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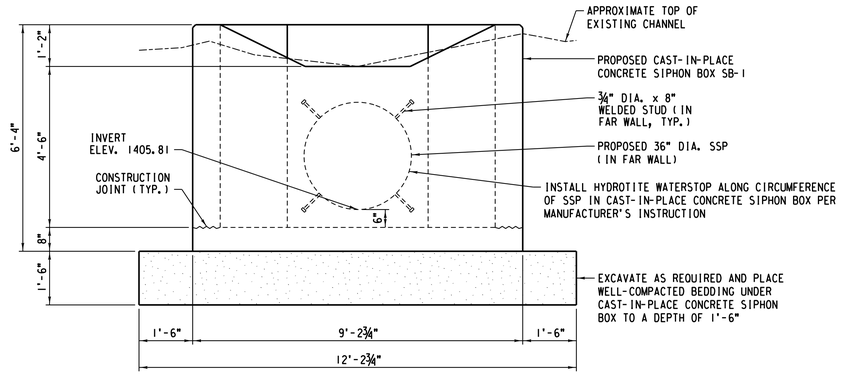
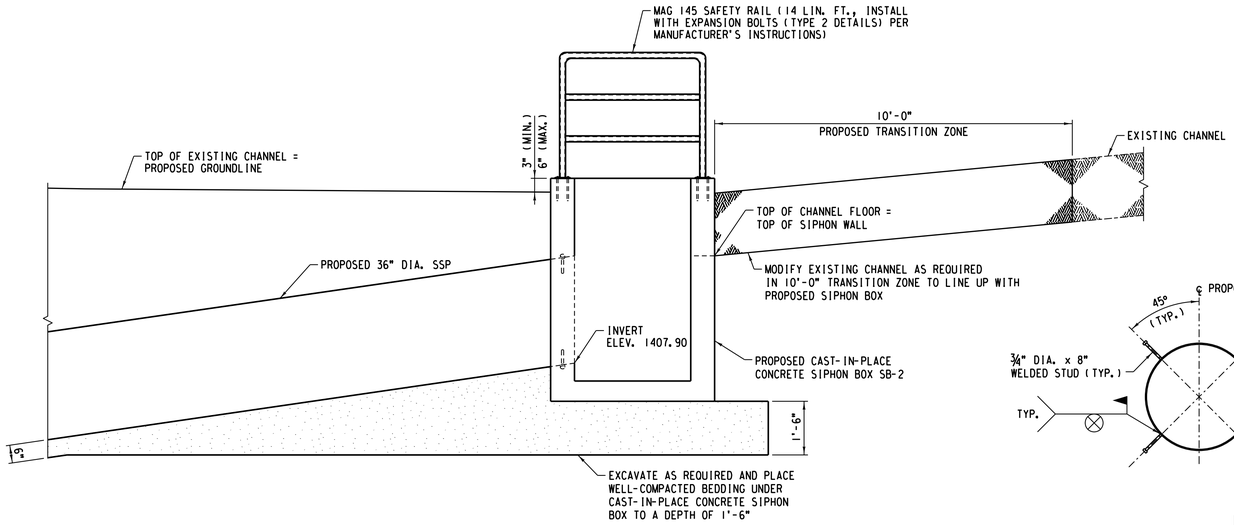


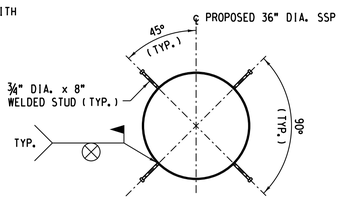
SECTION B
SCALE: ½"=1'-0"

NOTES:
1. PROPOSED MAG 145 SAFETY RAIL NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR SHALL COORDINATE TEMPORARY OPEN CUT AND/OR SHORING WITH UPRR AND ARIZONA STATE LAND DEPARTMENT PRIOR TO CONSTRUCTION.



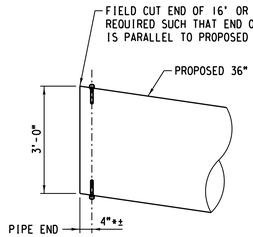
SECTION E
SCALE: ½"=1'-0"

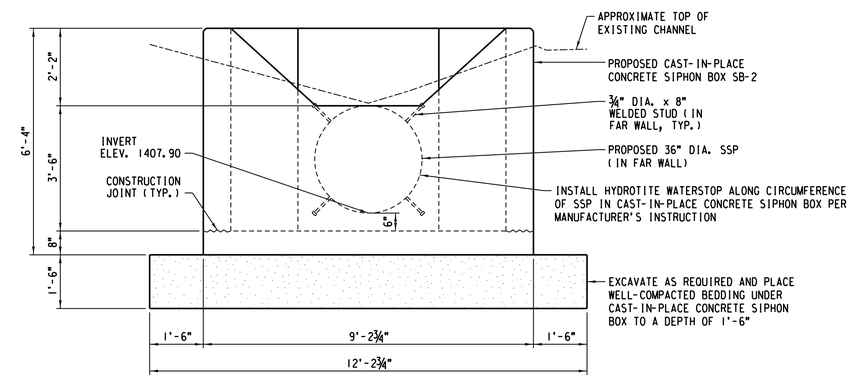
SIPHON BOX SB-2 SHOWN,
SIPHON BOX SB-1 SIMILAR



NOTES:
1. INSTALL STUDS AFTER PIPE IS IN PLACE.
2. * MINIMALLY ADJUST OFFSET FROM PIPE END AS REQUIRED SUCH THAT WELDED STUDS ARE CENTERED WITHIN THE PROPOSED HEADWALL. 3" (MIN.) CLEARANCE TO HEADWALL FACE (EACH WAY) SHALL BE MAINTAINED.
3. STUDS SHALL BE C1015, C1017 OR C1020 COLD DRAWN STEEL WHICH CONFORMS TO ASTM A108 SPECIFICATIONS.

ANCHOR LOCATION DETAIL
SCALE: ½"=1'-0"





SECTION C
SCALE: ½"=1'-0"

NOTES:
1. PROPOSED MAG 145 SAFETY RAIL NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR SHALL COORDINATE TEMPORARY OPEN CUT AND/OR SHORING WITH UPRR AND ARIZONA STATE LAND DEPARTMENT PRIOR TO CONSTRUCTION.

NOTE:
* = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.

Professional Engineer's CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kylie Stults
CONSULTANT ENGINEER 04/04/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123249

LATITUDE: 33.28824°N LONGITUDE: 111.60853°W

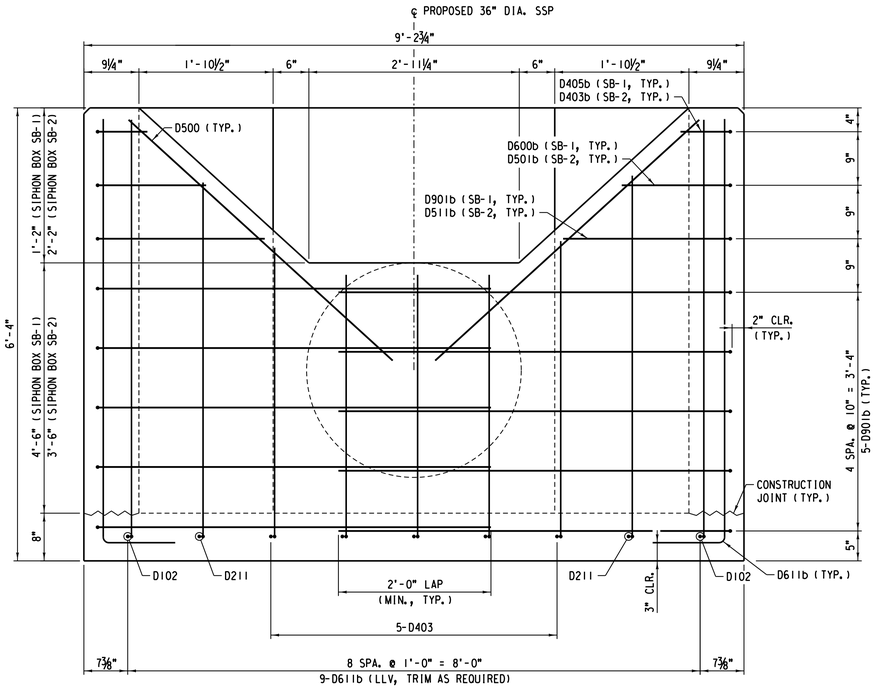
UNION PACIFIC

DSN/CHK BY: JAS/MJH	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: FAM/JAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 4.57, PIRATE IND LEAD
SHT NO.: S2 of S4	FURNISH & INSTALL 1-36" DIA. SSP x 141' AND SIPHON BOXES
	SHEET TITLE: TYPICAL SECTIONS AND CONSTRUCTION DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-mel\projects\2020\050\1000\020-0927.40-Design\Microstation\020-0927.RLBR.Culv 4.57.Sta. 241+10.00.Pirate Ind Lead.4.57_cax.dgn

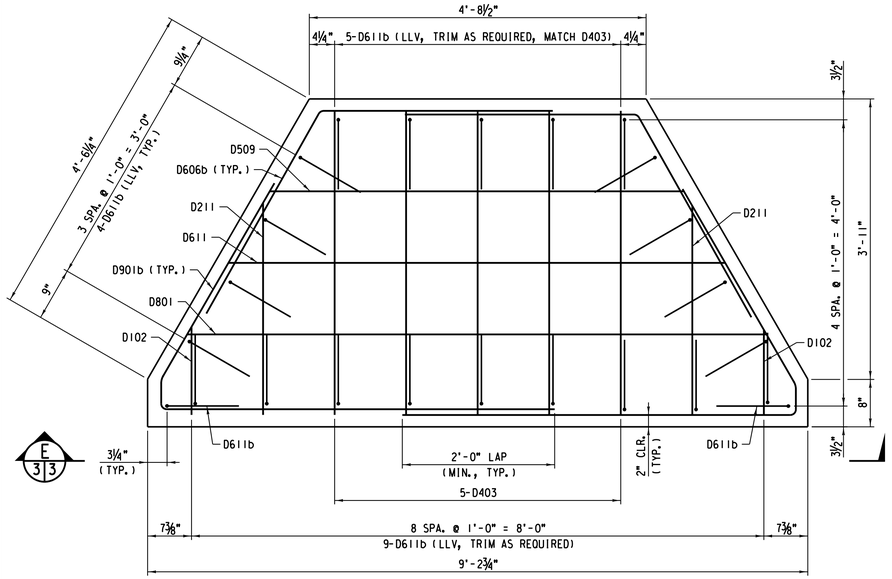
PLOTTED: 7/7/2023 12:48:00 PM

DESIGN SHEET

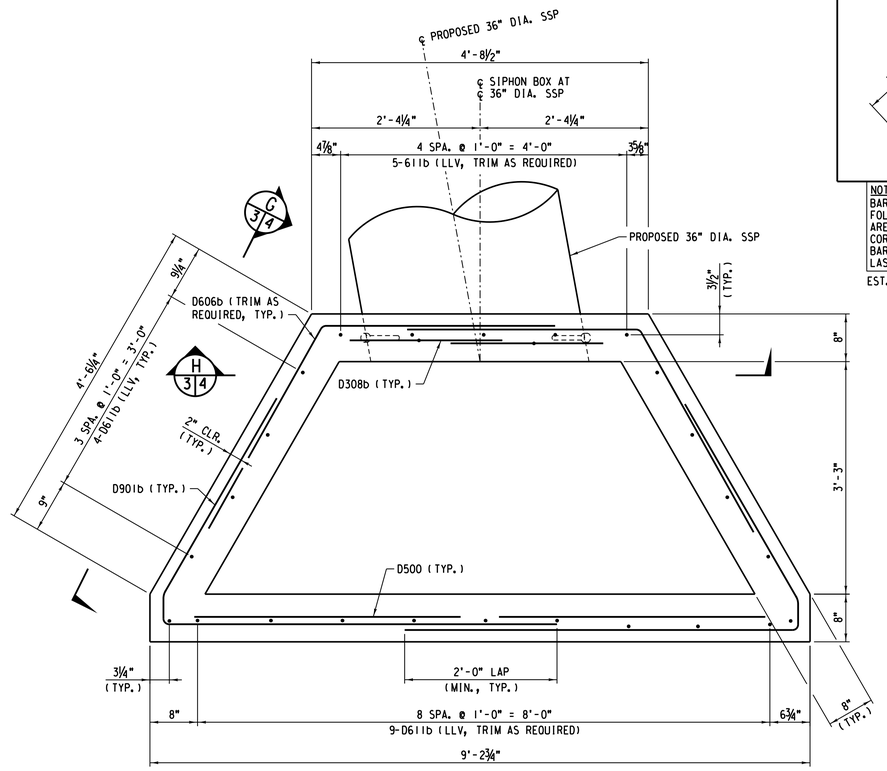


F 3|3

VIEW E 3|3
SCALE: 1"=1'-0"



REINFORCING PLAN AT APRON
SCALE: 1"=1'-0"



SECTION F 3|3
SCALE: 1"=1'-0"
SIPHON BOX SB-2 SHOWN,
SIPHON BOX SB-1 SIMILAR

CONCRETE PLACEMENT QUANTITIES
(PER SIPHON BOX SB-1)

ITEM	UNIT	QTY.
BOTTOM SLAB	CU. YD.	0.9
WALLS	CU. YD.	3.0

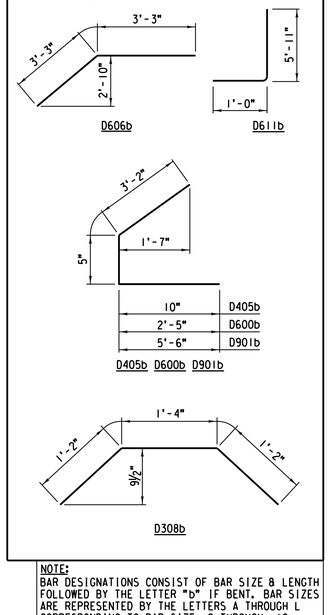
CONCRETE PLACEMENT QUANTITIES
(PER SIPHON BOX SB-2)

ITEM	UNIT	QTY.
BOTTOM SLAB	CU. YD.	0.9
WALLS	CU. YD.	2.8

REINFORCING SCHEDULE
(QUANTITY PER SIPHON BOX SB-1)

TOTAL	MARK	SIZE	LENGTH	SHAPE
2	D102	#5	1'-2"	—
2	D211	#5	2'-11"	—
4	D308b	#5	3'-8"	⌒
5	D403	#5	4'-3"	—
2	D405b	#5	4'-5"	⌐
2	D500	#5	5'-0"	—
1	D509	#5	5'-9"	—
2	D600b	#5	6'-0"	⌐
16	D606b	#5	6'-6"	⌐
1	D611	#5	6'-11"	—
24	D611b	#5	6'-11"	⌐
1	D801	#5	8'-1"	—
12	D901b	#5	9'-1"	⌐

BENDING DIAGRAM
(DIMENSIONS ARE OUT TO OUT)



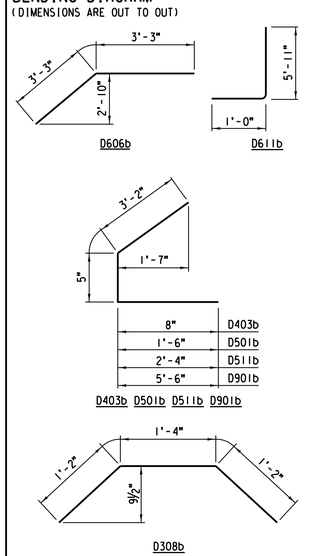
NOTE:
BAR DESIGNATIONS CONSIST OF BAR SIZE & LENGTH FOLLOWED BY THE LETTER "b" IF BENT. BAR SIZES ARE REPRESENTED BY THE LETTERS A THROUGH L CORRESPONDING TO BAR SIZE #2 THROUGH #18. BAR LENGTHS ARE GIVEN IN FEET AND INCHES; THE LAST TWO DIGITS ARE INCHES.

EST. WT. OF REINFORCING STEEL = 500 LB.

REINFORCING SCHEDULE
(QUANTITY PER SIPHON BOX SB-2)

TOTAL	MARK	SIZE	LENGTH	SHAPE
2	D102	#5	1'-2"	—
2	D211	#5	2'-11"	—
4	D308b	#5	3'-8"	⌒
5	D403	#5	4'-3"	—
2	D403b	#5	4'-3"	⌐
2	D500	#5	5'-0"	—
2	D501b	#5	5'-1"	⌐
1	D509	#5	5'-9"	—
2	D511b	#5	5'-11"	⌐
16	D606b	#5	6'-6"	⌐
1	D611	#5	6'-11"	—
24	D611b	#5	6'-11"	⌐
1	D801	#5	8'-1"	—
10	D901b	#5	9'-1"	⌐

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 = 490 LB.

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS
07/05/2023 — DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 04/04/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123249

LATITUDE: 33.28824°N LONGITUDE: 111.60853°W

UNION PACIFIC

DSN/CHK BY: JAS/MJH	**UNION PACIFIC RAILROAD** — Office of Director Structures Design
DRAWN/CHK BY: FAM/JAS	LOCATION & DESCRIPTION: CULVERT 4.57, PIRATE IND LEAD
UPRR ENGINEER: ADS	FURNISH & INSTALL 1-36" DIA. SSP x 141' AND SIPHON BOXES
SHT NO.: S3 of S4	SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)

FILE NAME: \\oa.aecomnet.com\fnts-na1\projects\2020\0501-1000\020-0927\40-Design\Micrositation\020-0927_RLBRA.dgn 4.57.Sta. 241-10.00.Pirate Ind Lead 4.57_caz.dgn

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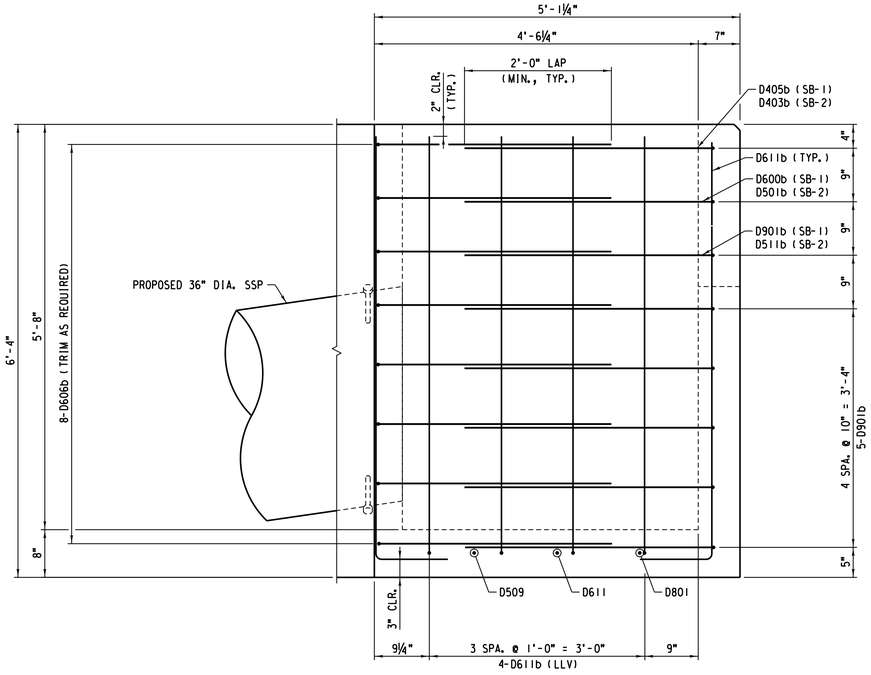
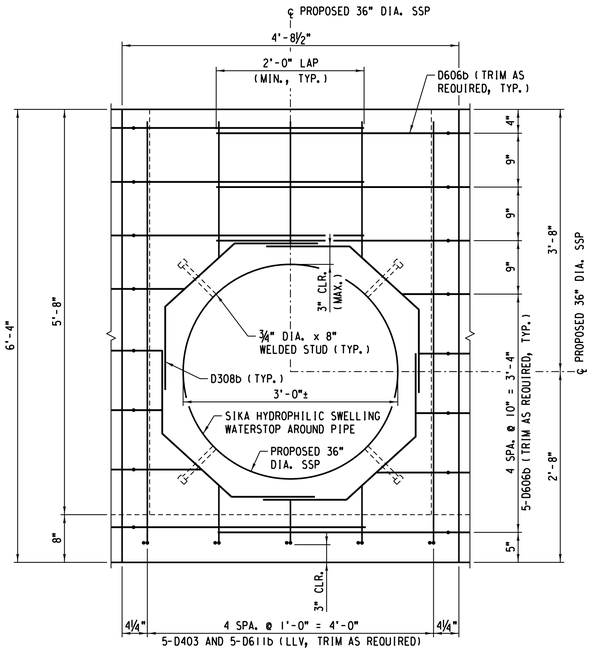
DESIGN SHEET



VIEW G
SCALE: 1"=1'-0" 3|4



SECTION H
SCALE: 1"=1'-0" 3|4

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kylie Stubs
CONSULTANT ENGINEER 04/04/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123249

LATITUDE: 33.28824°N LONGITUDE: 111.60853°W

UNION PACIFIC

DSN/CHK BY: JAS/MJH
DRAWN/CHK BY: FAM/JAS
UPRR ENGINEER: ADS
SHT NO.: S4 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 4.57, PIRATE IND LEAD

FURNISH & INSTALL
1-36" DIA. SSP x 141' AND SIPHON BOXES

SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2220\050\-1000\020\0927.40\Design\Microstation\020-0927-RLSPA Culv 4.57-Sta. 241+10.00 Pirate Ind Lead 4.57_csz.dgn

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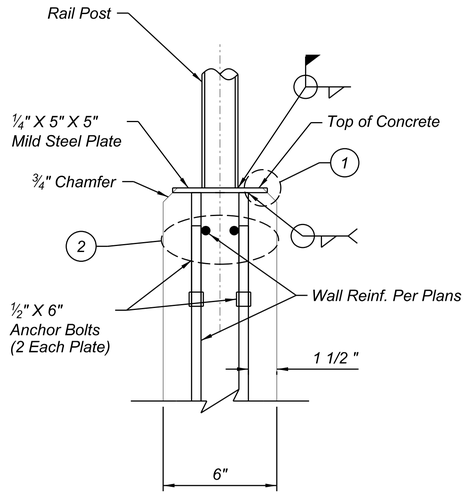
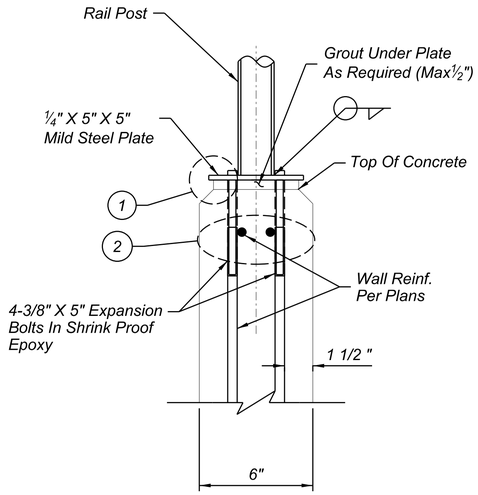
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	X	XXX	XX	

MAG DETAIL 145 EXISTING ISSUES



TYPE 1- (6" Wall)
Scale: 1"=0'-4"



TYPE 2- (6" Wall)
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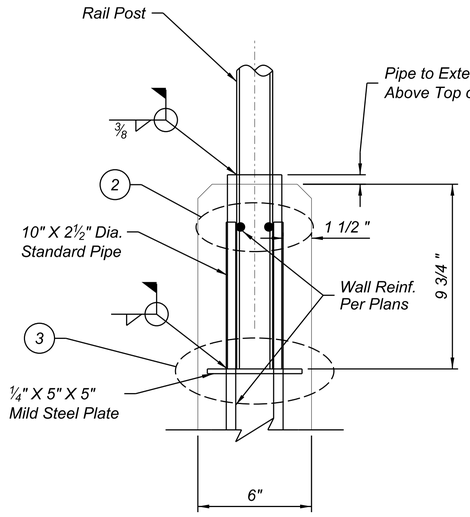
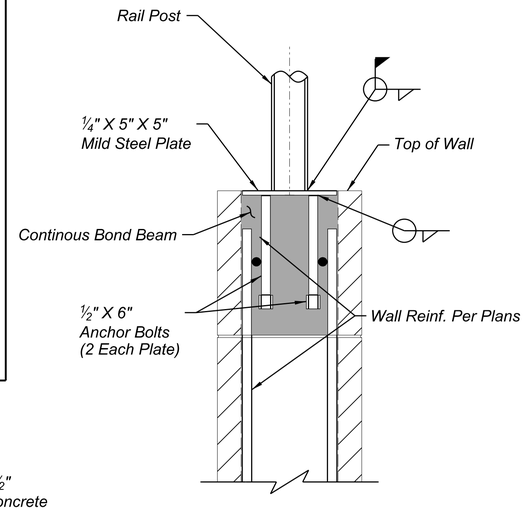


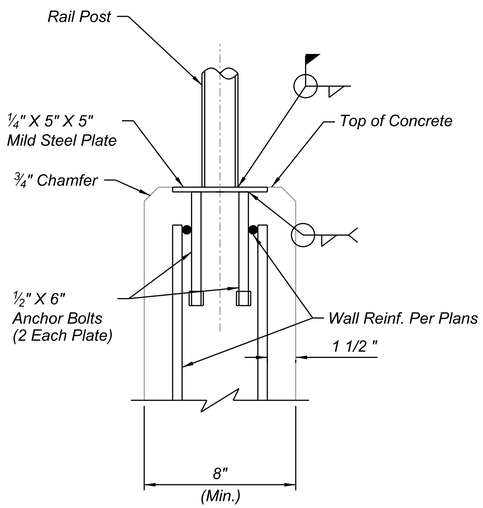
TYPE 3- (6" Wall)
Scale: 1"=0'-4"

STRUCTURAL PROBLEMS

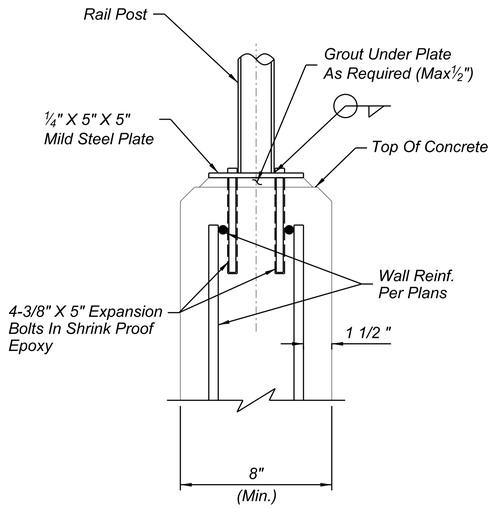
1. STEEL PLATE CORNER EXPOSED
2. CONFLICTS WITH NOTE 6. "THE EMBEDMENT FOR ANCHOR TYPES 1,2, & 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE".
3. LESS THAN MINIMUM REQUIRED CONCRETE COVER.



TYPE 5- (8" CMU Wall)
Scale: 1"=0'-4"



TYPE 1- (8" Wall)
Scale: 1"=0'-4"



TYPE 2- (8" Wall)
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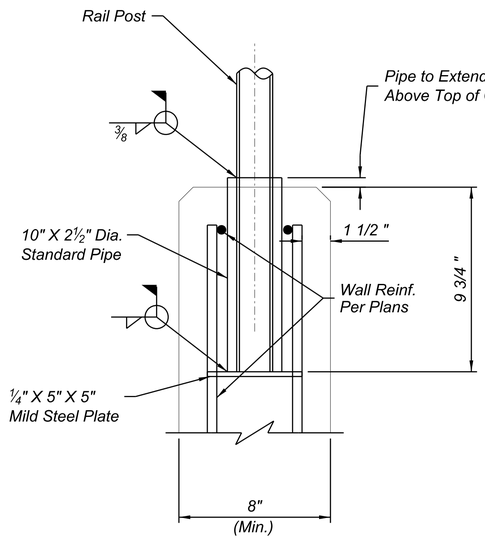


TYPE 3- (8" Wall)
Scale: 1"=0'-4"

MAG DETAIL 145 PROPOSED

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

MAG DETAIL 145

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	A.N. ENGINEER	XX/XX/XX
	DRAWN	A. TECHNICIAN	XX/XX/XX
	CHECKED	A.N. ENGINEER	XX/XX/XX

XXX

SHEET XXX OF XX

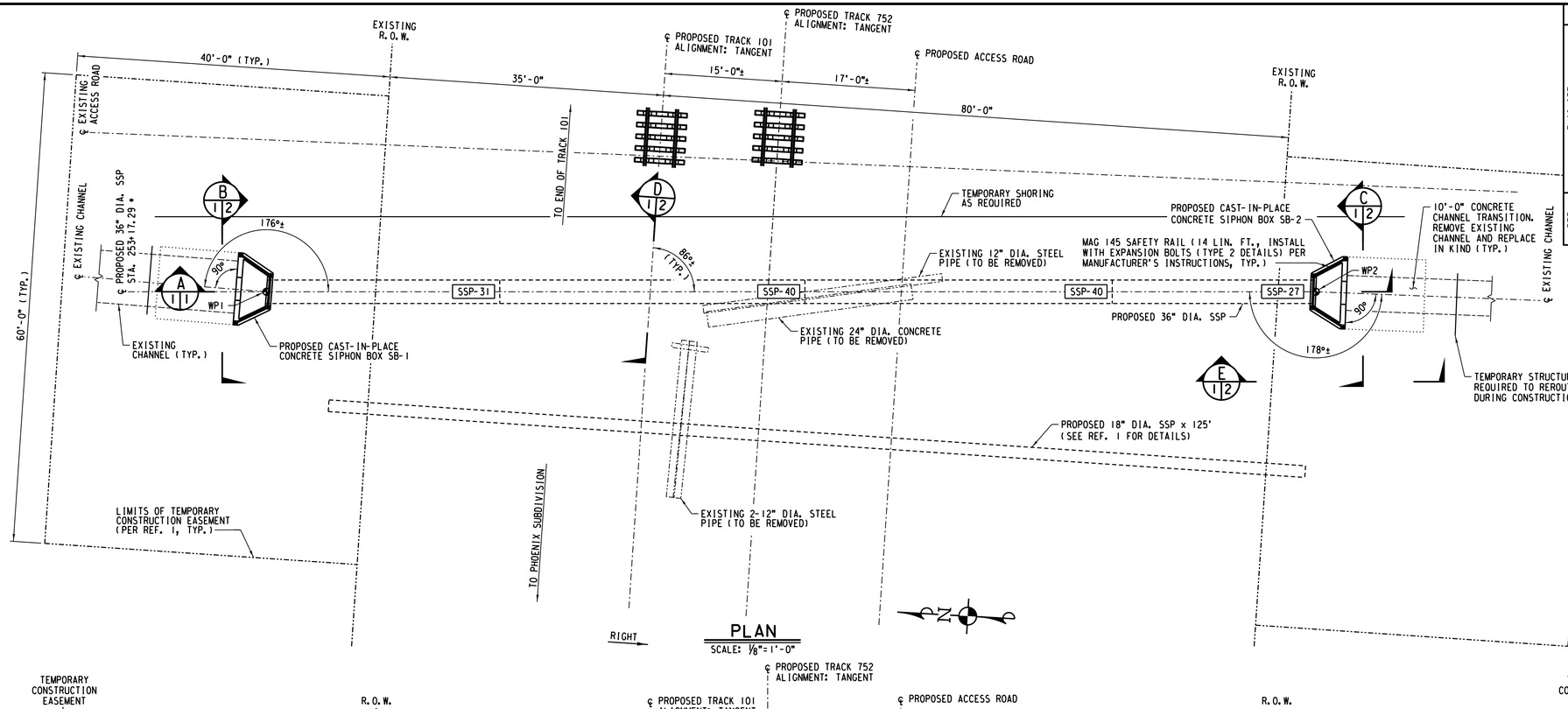
TRACS NO.

Contact Arizona 811 Two Working Days Before You Dig
ARIZONA811 BLUE STAKE, INC.
Call 811 or Click Arizona811.com

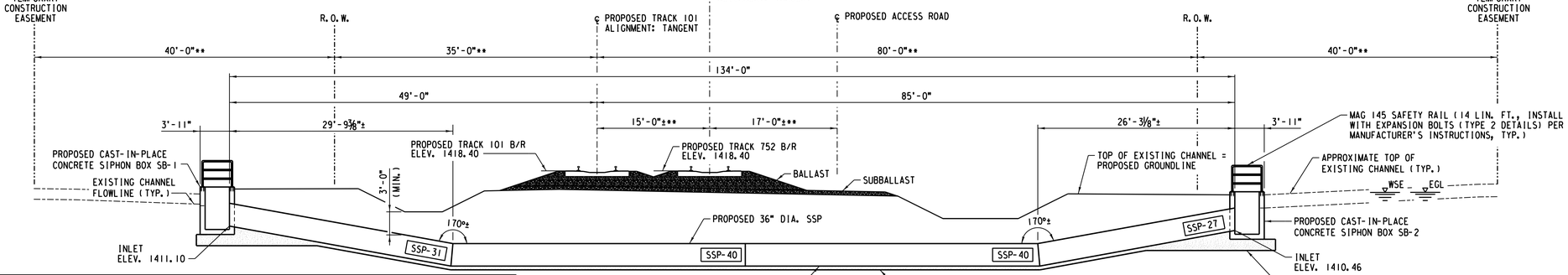
8:16:49 AM 3/8/2018

F:\Safety Rail\SD_Safety Rail Details.dgn

DESIGN SHEET



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



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

WSE = 1415.54
EGL = 1415.55
VEL = 0.85 fps

DRAWING SCHEDULE

THIS SET	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
	S1	123250	GENERAL ARRANGEMENT	DESIGN
	S2	123250	TYPICAL SECTIONS AND CONSTRUCTION DETAILS	DESIGN
	S3	123250	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)	DESIGN
	S4	123250	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)	DESIGN
	2	680000	DETAILS FOR ROUND STEEL PIPE CULVERTS	STANDARD
	3	680000	GENERAL NOTES FOR ROUND STEEL PIPE CULVERTS	STANDARD
	1	680010	CONSTRUCTION NOTES AND TABLE FOR SMOOTH STEEL PIPE CULVERTS	STANDARD
	T3	531100	PIECE FABRICATION NOTES	STANDARD
	145	-	SAFETY RAIL	MAG STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P033 OF 037 T012 OF 012 X098 OF 143	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN

***NOTES:
1. FLOW SHALL BE REROUTED TEMPORARILY AS REQUIRED FOR CONSTRUCTION. CONSTRUCTOR IS RESPONSIBLE FOR ANY TEMPORARY STRUCTURES REQUIRED AND SHALL SUBMIT PLANS AND CALCULATIONS TO UPRR FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION.
2. AFTER CONSTRUCTION, CONSTRUCTOR SHALL REROUTE FLOW BACK TO ORIGINAL ALIGNMENT AND RESTORE AREA TO ORIGINAL CONDITION OR BETTER.

WORK POINT TABLE

WORK POINT	NORTHING	EASTING
WP1	832705.75	795483.03
WP2	832571.95	795490.74

NOTES:
1. * = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.
2. ** = MEASURED PERPENDICULAR TO PROPOSED TRACK 101.
3. CONSTRUCTOR TO FIELD VERIFY ALL STATIONS ELEVATIONS AND DIMENSIONS PRIOR TO CONSTRUCTION. IF CONFLICTS OR INCONSISTENCIES ARE ANTICIPATED, NOTIFY UPRR.

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

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
2	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 40' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)	510-3010	CONSTRUCTOR
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 31' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)		
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 27' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)		
28	LIN. FT.	MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) 145 SAFETY RAIL (TWO LOCATIONS, WITH EXPANSION BOLTS (TYPE 2 DETAILS) AND ALL OTHER ASSOCIATED HARDWARE) OR APPROVED ALTERNATE		
8	EA	3/4" DIA. x 8" WELDED STUD (PER DETAILS, SHEET NO. S2)		
50	CU. YD.	PIPE BEDDING (PER STD. DWG. 680000 SHT. 3)		
1	LOT	REINFORCING STEEL FOR CONCRETE SIPHON BOX SB-1 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND SCHEDULE, SHEET NO. S3)		
5	CU. YD.	4000 PSI CONCRETE FOR CONCRETE SIPHON BOX SB-1 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND DETAILS, SHEET NO. S3)		
1	LOT	REINFORCING STEEL FOR CONCRETE SIPHON BOX SB-2 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND SCHEDULE, SHEET NO. S4)		
5	CU. YD.	4000 PSI CONCRETE FOR CONCRETE SIPHON BOX SB-2 (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND DETAILS, SHEET NO. S4)		
20	LIN. FT.	SIKA HYDROTITE WATERSTOP, PROFILE CJ-0725-3K, OR APPROVED ALTERNATE		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
2	LOT	CHANNEL TRANSITION MATERIAL		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	TEMPORARY FORMWORK MATERIAL		
1	LOT	TEMPORARY SHORING		
1	LOT	TEMPORARY STRUCTURE TO REROUTE FLOW		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

DESIGN NOTES

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 4): Elev. 1390.42, NAVD 1988, established by 1/2" rebar located in ground West of proposed Culvert No. 4.80, 9,606.96' left of existing Phoenix Sub. Main Track centerline, Sta. 1588+58.48.
   TBM 2 (Olsson CP 5): Elev. 1391.63, NAVD 1988, established by 1/2" rebar located in ground West of proposed Culvert No. 4.80, 9,311.99' left of existing Phoenix Sub. Main Track centerline, Sta. 1590+90.31.
4. Profile: Proposed Track 101 per Ref. 1.
   Proposed Track 752 per Ref. 1.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. The proposed cast-in-place concrete siphon box has been designed in accordance with the AREMA Manual for Railway Engineering, Chapter 8: Concrete Structures and Foundations The proposed cast-in-place concrete siphon box has been designed for railroad surcharge, lateral earth pressure and a construction surcharge of 250 psf.
2. The SSP has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0".

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

SECTION DESIGNATION

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 04/05/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123250

LATITUDE: 33.28820°N LONGITUDE: 111.60458°W

DSN/CHK BY:	DRAWN/CHK BY:	UPRR ENGINEER:	SHT NO.:
JAS/MJH	FAM/JAS	ADS	S1 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

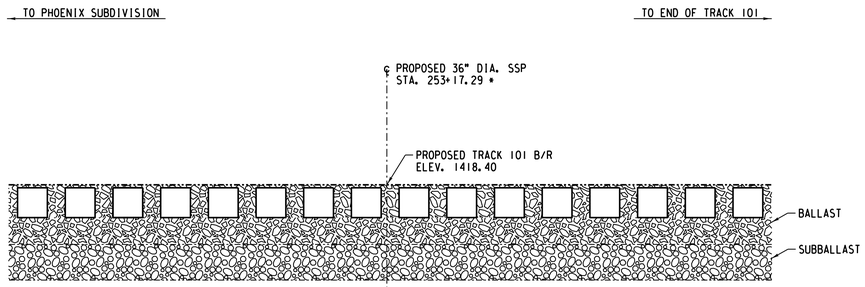
LOCATION & DESCRIPTION: CULVERT 4.80, PIRATE IND LEAD
FURNISH & INSTALL
1-36" DIA. SSP x 134' AND SIPHON BOXES

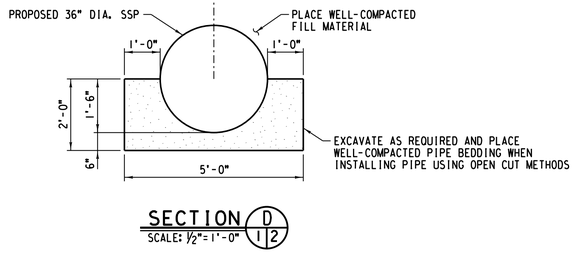
SHEET TITLE: GENERAL ARRANGEMENT

FILE NAME: \\oa.ad.oasconsulting.com\fnts-nal\projects\2020\0501.1000\020-0920.40-Design\Micronstation\020-0920.40-Design_RLBRA.dgn 4.80,Sta. 253+17.00,Pirate Ind Lead 4.80.cat.dgn

PLOTTED: 7/11/2023 8:38:53 AM

DESIGN SHEET





SECTION D
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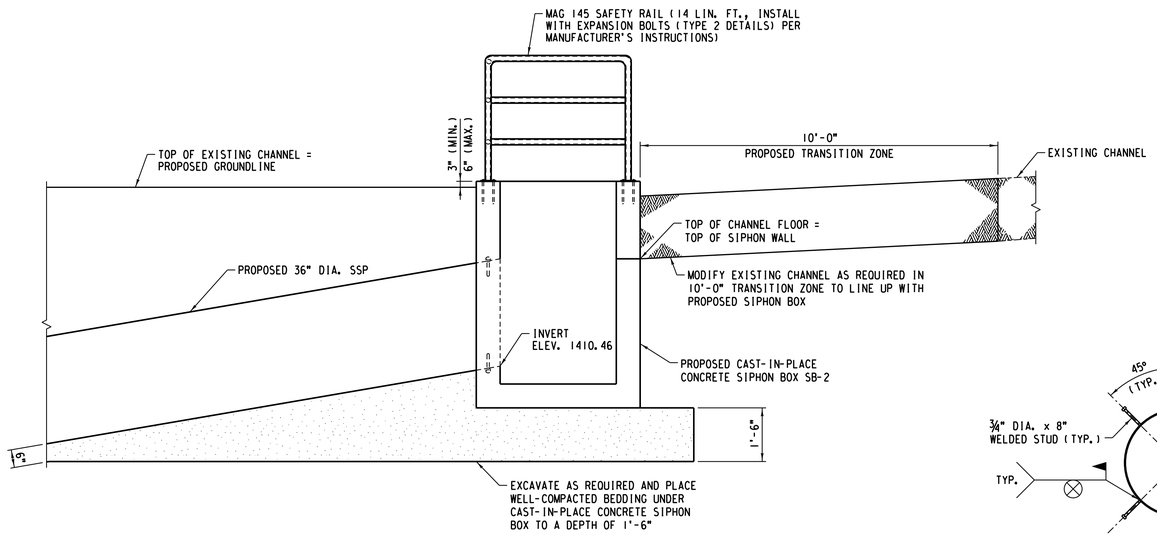
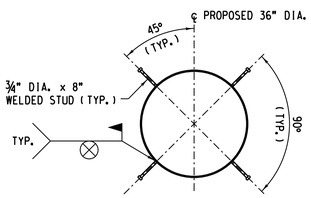
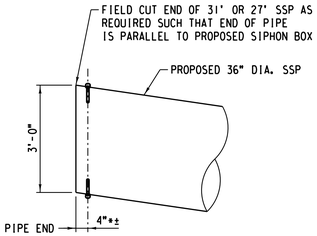


SECTION E
SCALE: ½"=1'-0"

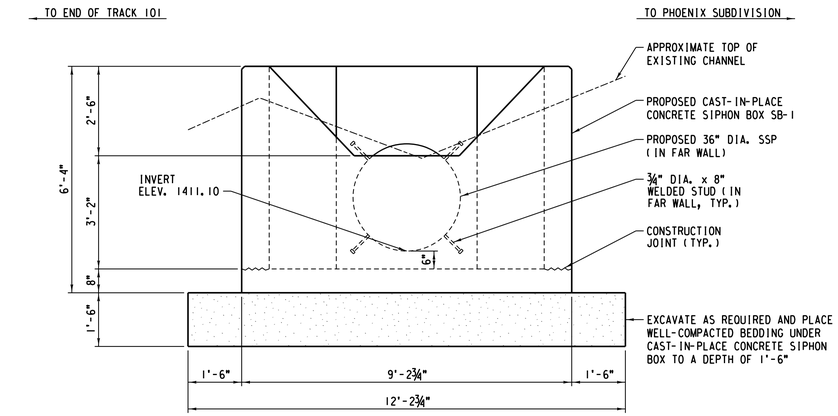
SIPHON BOX SB-2 SHOWN,
SIPHON BOX SB-1 SIMILAR





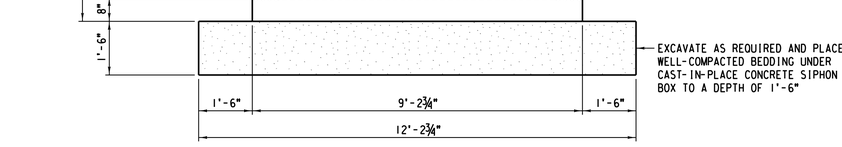
NOTES:
1. INSTALL STUDS AFTER PIPE IS IN PLACE.
2. * MINIMALLY ADJUST OFFSET FROM PIPE END AS REQUIRED SUCH THAT WELDED STUDS ARE CENTERED WITHIN THE PROPOSED HEADWALL. 3" (MIN.) CLEARANCE TO HEADWALL FACE (EACH WAY) SHALL BE MAINTAINED.
3. STUDS SHALL BE C1015, C1017 OR C1020 COLD DRAWN STEEL WHICH CONFORMS TO ASTM A108 SPECIFICATIONS.

ANCHOR LOCATION DETAIL
SCALE: ½"=1'-0"



NOTES:
1. PROPOSED MAG 145 SAFETY RAIL NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR SHALL COORDINATE TEMPORARY OPEN CUT AND/OR SHORING WITH UPRR AND ARIZONA STATE LAND DEPARTMENT PRIOR TO CONSTRUCTION.

SECTION B
SCALE: ½"=1'-0"



NOTES:
1. PROPOSED MAG 145 SAFETY RAIL NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR SHALL COORDINATE TEMPORARY OPEN CUT AND/OR SHORING WITH UPRR AND ARIZONA STATE LAND DEPARTMENT PRIOR TO CONSTRUCTION.

SECTION C
SCALE: ½"=1'-0"

NOTE:
* = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kylie Stark
CONSULTANT ENGINEER 04/05/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123250

LATITUDE: 33.28820°N LONGITUDE: 111.60458°W

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

Mark J. Hanigan

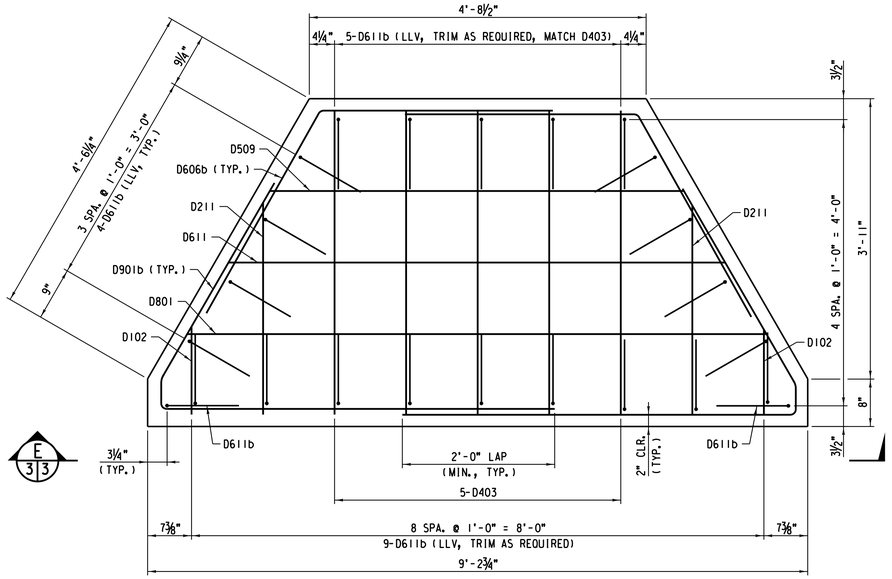
UNION PACIFIC

DSN/CHK BY: JAS/MJH	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: FAM/JAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 4.80, PIRATE IND LEAD
SHT NO.: S2 of S4	FURNISH & INSTALL 1-36" DIA. SSP x 134' AND SIPHON BOXES
	SHEET TITLE: TYPICAL SECTIONS AND CONSTRUCTION DETAILS

FILE NAME: \\oa.ad.oacon sulting.com\fnts-mail\projects\2020\050\1-1000\020-0927.40-Design\Microstation\020-0927.RLBR.Culv 4.80.Sta. 253-17.00\Pirate Ind Lead 4.80_csxz.dgn

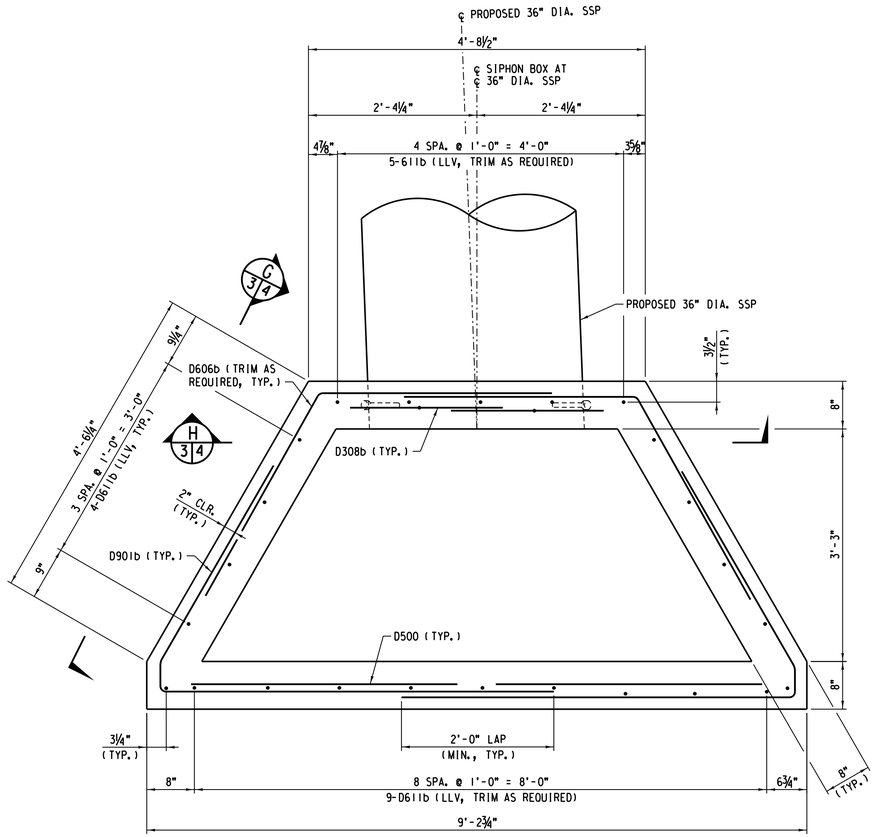
PLOTTED: 7/11/2023 8:38:53 AM

DESIGN SHEET



REINFORCING PLAN AT APRON

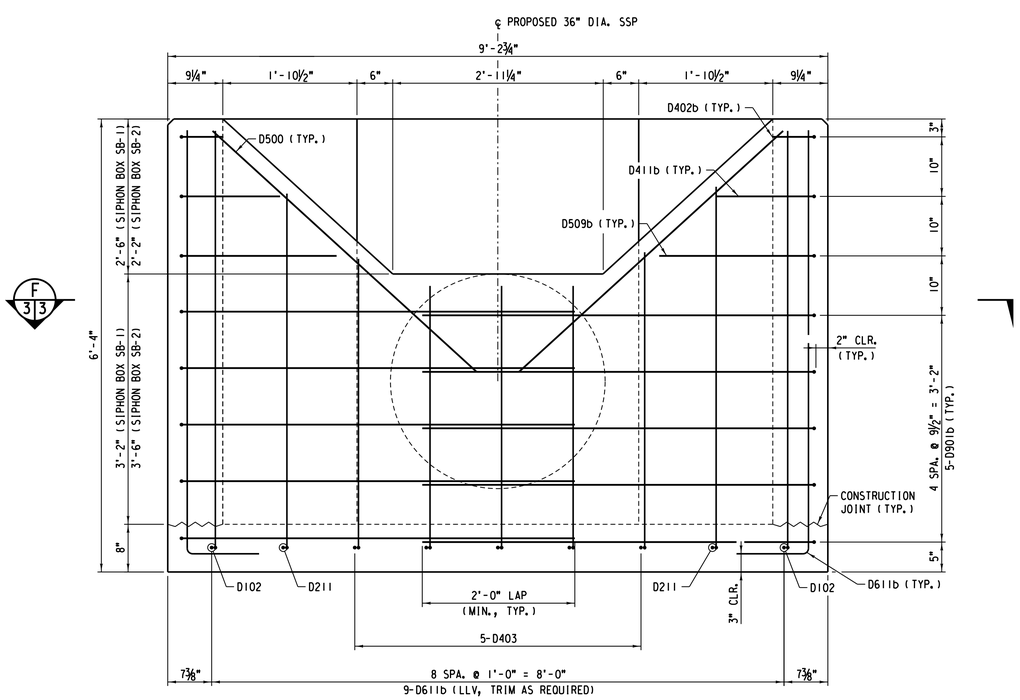
SCALE: 1"=1'-0"



SECTION F (3|3)

SCALE: 1"=1'-0"

SIPHON BOX SB-2 SHOWN,
SIPHON BOX SB-1 SIMILAR



VIEW E (3|3)

SCALE: 1"=1'-0"

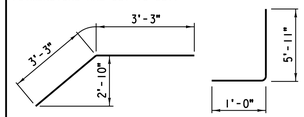
REINFORCING SCHEDULE

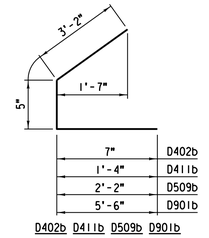
(QUANTITY PER SIPHON BOX)

TOTAL	MARK	SIZE	LENGTH	SHAPE
2	D102	#5	1'-2"	—
2	D211	#5	2'-11"	—
4	D308b	#5	3'-8"	⌒
2	D402b	#5	4'-2"	⌐
5	D403	#5	4'-3"	—
2	D411b	#5	4'-11"	⌐
2	D500	#5	5'-0"	—
1	D509	#5	5'-9"	—
2	D509b	#5	5'-9"	⌐
16	D606b	#5	6'-6"	⌐
1	D611	#5	6'-11"	—
24	D611b	#5	6'-11"	⌐
1	D801	#5	8'-1"	—
10	D901b	#5	9'-1"	⌐

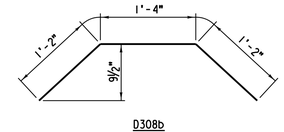
BENDING DIAGRAM

(DIMENSIONS ARE OUT TO OUT)





D402b D411b D509b D901b



D308b

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 = 490 LB.

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

CONCRETE PLACEMENT QUANTITIES

(PER SIPHON BOX SB-1)

ITEM	UNIT	QTY.
BOTTOM SLAB	CU. YD.	0.9
WALLS	CU. YD.	2.9

CONCRETE PLACEMENT QUANTITIES

(PER SIPHON BOX SB-2)

ITEM	UNIT	QTY.
BOTTOM SLAB	CU. YD.	0.9
WALLS	CU. YD.	2.8

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 04/05/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123250

LATITUDE: 33.28820°N LONGITUDE: 111.60458°W

DSN/CHK BY:	JAS/MJH
DRAWN/CHK BY:	FAM/JAS
UPRR ENGINEER:	ADS
SHT NO.:	S3 of S4

UNION PACIFIC RAILROAD

Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 4.80, PIRATE IND LEAD

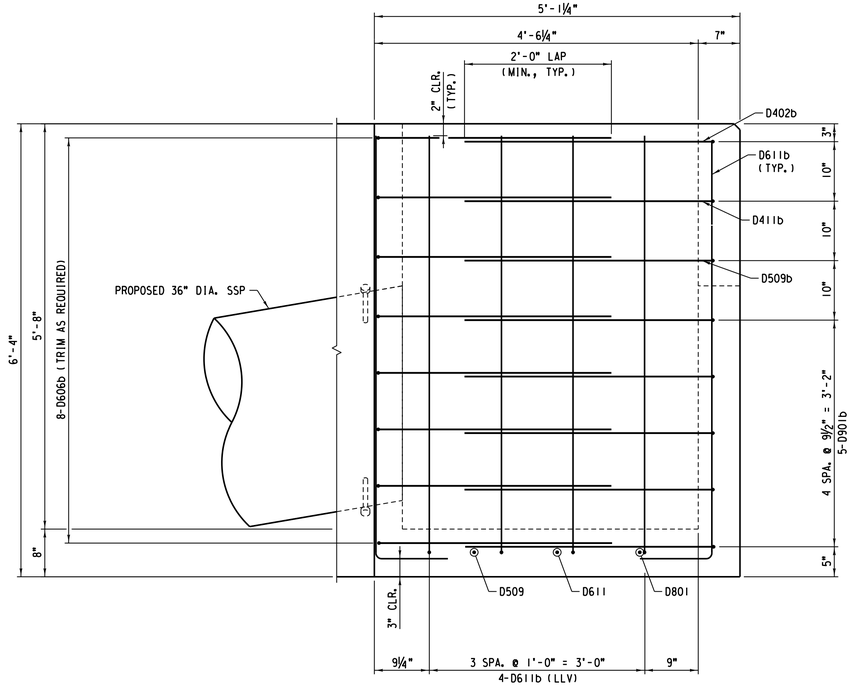
FURNISH & INSTALL
1-36" DIA. SSP x 134' AND SIPHON BOXES

SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)

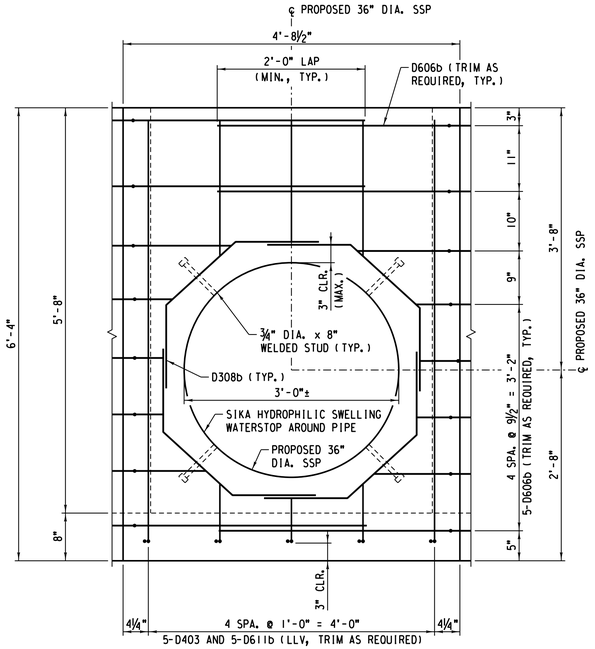
FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\050\1000\020\0927.40-Design\Microstation\020-0927-RLBR Culv 4.80 Sta. 253+17.00 Pirate Ind Lead 4.80_csx.dgn

PLOTTED: 7/11/2023 8:38:54 AM

DESIGN SHEET



VIEW G
SCALE: 1"=1'-0" 3|4



SECTION H
SCALE: 1"=1'-0" 3|4

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 04/05/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123250

LATITUDE: 33.28820°N LONGITUDE: 111.60458°W

DSN/CHK BY:	JAS/MJH
DRAWN/CHK BY:	FAM/JAS
UPRR ENGINEER:	ADS
SHT NO.:	S4 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 4.80, PIRATE IND LEAD

FURNISH & INSTALL
1-36" DIA. SSP x 134' AND SIPHON BOXES

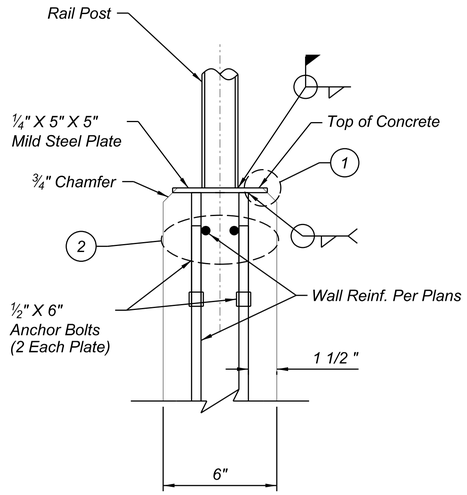
SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.aol.oaconsulting.com\fnts-na1\projects\2020\0501-1000\020-0927\40-Design\Microstation\020-0927_RLBRA.Culv 4.80_Sta. 253+17.00_Pirate Ind Lead_4.80_caz.dgn

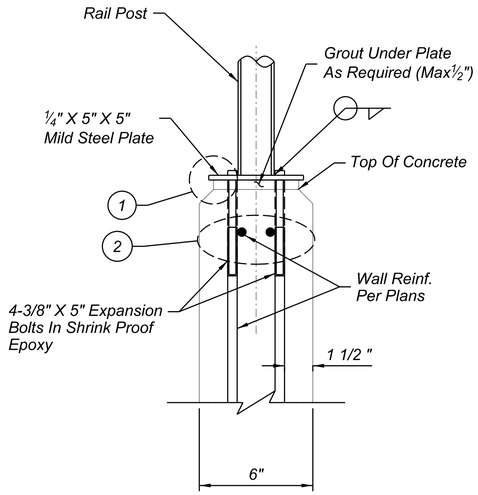
PLOTTED: 7/11/2023 8:38:54 AM

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	X	XXX	XX	

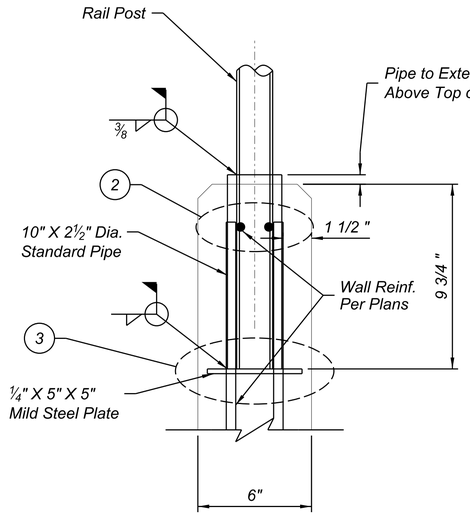
MAG DETAIL 145 EXISTING ISSUES



TYPE 1- (6" Wall)
Scale: 1"=0'-4"



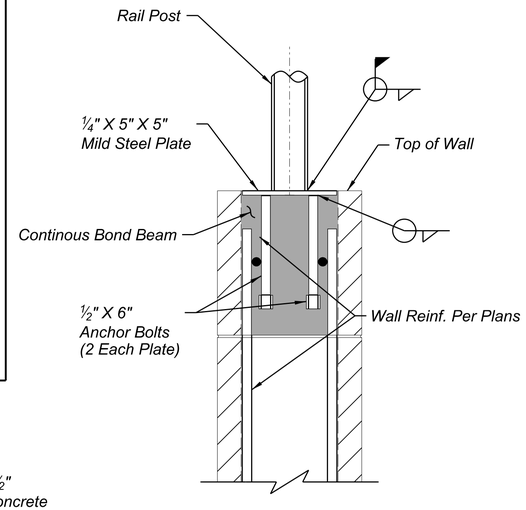
TYPE 2- (6" Wall)
Scale: 1"=0'-4"



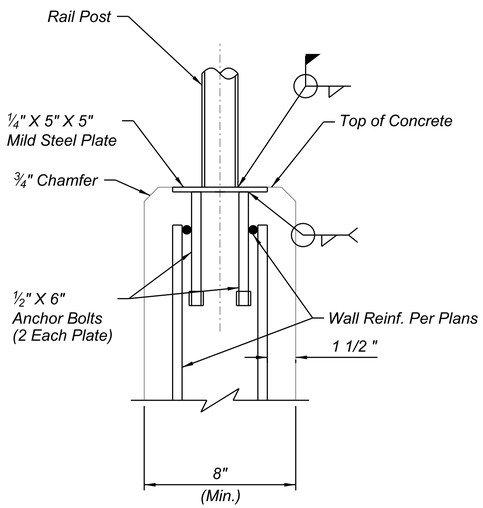
TYPE 3- (6" Wall)
Scale: 1"=0'-4"

STRUCTURAL PROBLEMS

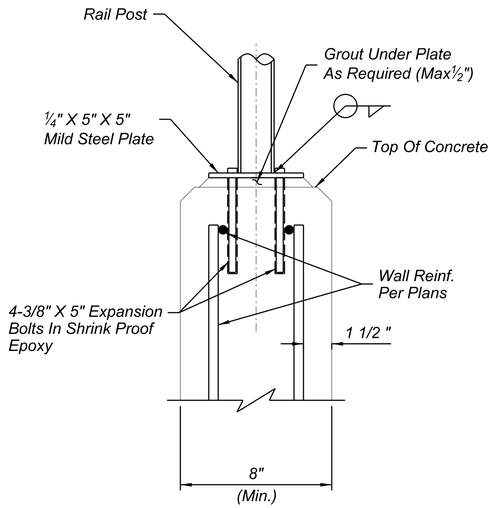
1. STEEL PLATE CORNER EXPOSED
2. CONFLICTS WITH NOTE 6. "THE EMBEDMENT FOR ANCHOR TYPES 1,2, & 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE".
3. LESS THAN MINIMUM REQUIRED CONCRETE COVER.



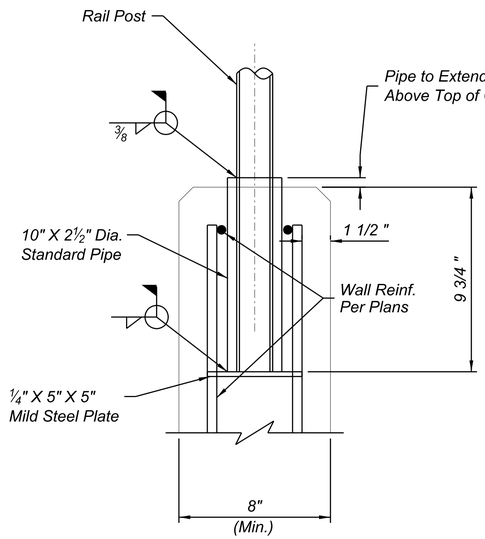
TYPE 5- (8" CMU Wall)
Scale: 1"=0'-4"



TYPE 1- (8" Wall)
Scale: 1"=0'-4"



TYPE 2- (8" Wall)
Scale: 1"=0'-4"



TYPE 3- (8" Wall)
Scale: 1"=0'-4"

MAG DETAIL 145 PROPOSED

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

MAG DETAIL 145

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	A.N. ENGINEER	XX/XX/XX
	DRAWN	A. TECHNICIAN	XX/XX/XX
	CHECKED	A.N. ENGINEER	XX/XX/XX

XXX

SHEET XXX OF XX

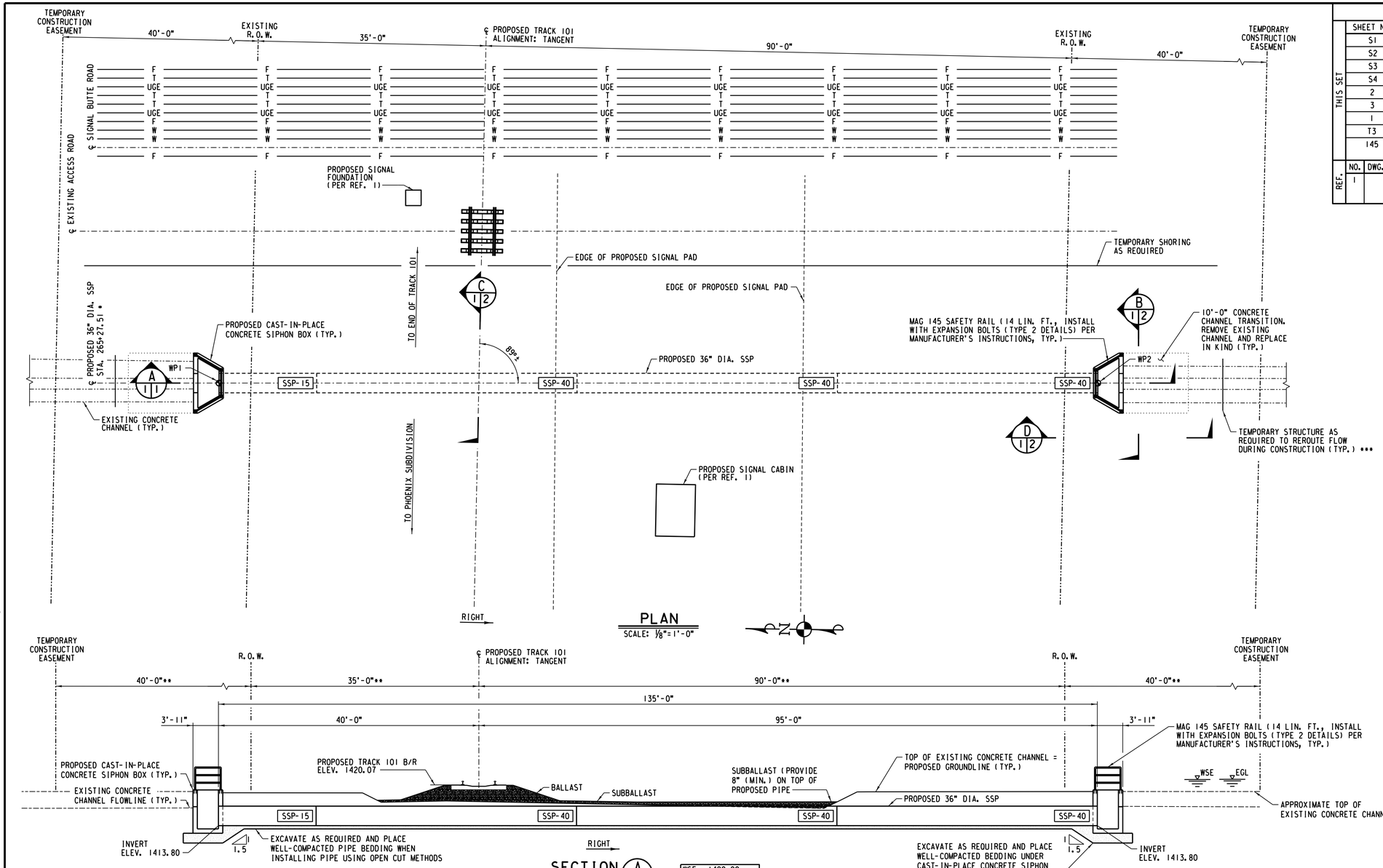
TRACS NO.

Contact Arizona 811 Two Working Days Before You Dig
ARIZONA811 BLUE STAKE, INC.
Call 811 or Click Arizona811.com

8:16:49 AM 3/8/2018

F:\Safety Rail\SD_Safety Rail Details.dgn

DESIGN SHEET



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

RIGHT

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

WSE = 1420.90
EGL = 1420.93
VEL = 1.41 fps

MATERIAL NOTE:
CEMENT SHALL BE TYPE II OR TYPE III PORTLAND CEMENT IN ACCORDANCE WITH ASTM C150 SPECIFICATIONS.

BILL OF MATERIAL

REQ'D.	UNIT	DESCRIPTION	STORE ITEM NO.	ORDERED BY
3	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 40' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)	510-3010	CONSTRUCTOR
1	EA	CULVERT, SMOOTH STEEL PIPE 36" DIA. X 3/8" WALL X 15' LONG, ASTM A139, GR. B OR ASTM A252, GR. 3 (PER STD PLAN NO. 680010)		
28	LIN. FT.	MARICOPA ASSOCIATION OF GOVERNMENTS (MAG) 145 SAFETY RAIL (TWO LOCATIONS, WITH EXPANSION BOLTS (TYPE 2 DETAILS) AND ALL OTHER ASSOCIATED HARDWARE) OR APPROVED ALTERNATE		
8	EA	3/4" DIA. x 8" WELDED STUD (PER DETAILS, SHEET NO. S2)		
45	CU. YD.	PIPE BEDDING (PER STD. DWG. 680000 SHT. 3)		
2	LOT	REINFORCING STEEL FOR CONCRETE SIPHON BOX (PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND SCHEDULE, SHEET NO. S3)		
10	CU. YD.	4000 PSI CONCRETE FOR CONCRETE SIPHON BOX PER NOTES, STD. DWG. 531100, SHT. NO. T3 AND DETAILS, SHEET NOS. S3-S4)		
20	LIN. FT.	SIKA HYDROTITE WATERSTOP, PROFILE CJ-0725-3K, OR APPROVED ALTERNATE		
1	LOT	EPOGRIP MULTIPURPOSE STRUCTURAL BONDING AND GROUTING EPOXY ADHESIVE OR APPROVED ALTERNATE		
1	EA.	CULVERT MARKER SIGNS, MOUNTING POST AND MOUNTING HARDWARE (PER STD. DWG. 0502, 0507 AND 0599)	P00-2616	
2	LOT	CONCRETE CHANNEL TRANSITION MATERIAL		
1	LOT	FILL MATERIAL (PER STD. DWG. 680000 SHT. 3 AND REF. 1)		
1	LOT	TEMPORARY FORMWORK MATERIAL		
1	LOT	TEMPORARY SHORING		
1	LOT	TEMPORARY STRUCTURE TO REROUTE FLOW		

CLSM MAY BE SUBSTITUTED FOR FILL MATERIAL.
BULK QUANTITIES ARE ESTIMATED.

DESIGN NOTES

LAYOUT

1. Stationing: Per Ref. 1.
2. Elevation Datum: Per Ref. 1.
3. Temporary Benchmarks:
   TBM 1 (Olsson CP 4): Elev. 1390.42, NAVD 1988, established by 1/2" rebar located in ground West of proposed Culvert No. 5.02, 9,606.96' left of existing Phoenix Sub. Main Track centerline, Sta. 1588+58.48.
   TBM 2 (Olsson CP 5): Elev. 1391.63, NAVD 1988, established by 1/2" rebar located in ground West of proposed Culvert No. 5.02, 9,311.99' left of existing Phoenix Sub. Main Track centerline, Sta. 1590+90.31.
4. Profile: Proposed Track 101 per Ref. 1.
5. Alignment: Tangent.
6. Information used to prepare this drawing in addition to reference drawings:
   Hydrologic & Hydraulic Evaluation prepared by Olsson, dated September 2022.

DESIGN

1. The proposed cast-in-place concrete siphon box has been designed in accordance with the AREMA Manual for Railway Engineering, Chapter 8: Concrete Structures and Foundations The proposed cast-in-place concrete siphon box has been designed for lateral earth pressure and a construction surcharge of 250 psf.
2. The SSP has been designed for Cooper E80 Live Load with impact and cover depth ranging from 1'-6" to 18'-0" and HS-20 loading with cover depth ranging from 0'-8" to 18'-0".

POSTCONSTRUCTION COMPLIANCE

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

SIGNED

In Charge of Construction — Date

DRAWING SCHEDULE

	SHEET NO.	PLAN NO.	DESCRIPTION	TYPE
THIS SET	S1	123251	GENERAL ARRANGEMENT	DESIGN
	S2	123251	TYPICAL SECTIONS AND CONSTRUCTION DETAILS	DESIGN
	S3	123251	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)	DESIGN
	S4	123251	CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)	DESIGN
	2	680000	DETAILS FOR ROUND STEEL PIPE CULVERTS	STANDARD
	3	680000	GENERAL NOTES FOR ROUND STEEL PIPE CULVERTS	STANDARD
	1	680010	CONSTRUCTION NOTES AND TABLE FOR SMOOTH STEEL PIPE CULVERTS	STANDARD
	T3	531100	PIECE FABRICATION NOTES	STANDARD
	145	-	SAFETY RAIL	MAG STANDARD

REF.	NO.	DWG. NO.	SHEET NO.	REV. NO.	DESCRIPTION	TYPE
	1	-	P033 OF 037 T012 OF 012 X101 OF 143	-	MESA, ARIZONA, PHOENIX SUBDIVISION, MP 934.78 TO MP 937.83, CONSTRUCT INDUSTRIAL LEAD TRACK, 100% PLANS, ISSUED FOR BID, DATED MARCH 6, 2023	DESIGN

***NOTES:**
1. FLOW SHALL BE REROUTED TEMPORARILY AS REQUIRED FOR CONSTRUCTION. CONSTRUCTOR IS RESPONSIBLE FOR ANY TEMPORARY STRUCTURES REQUIRED AND SHALL SUBMIT PLANS AND CALCULATIONS TO UPRR FOR APPROVAL AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION.
2. AFTER CONSTRUCTION, CONSTRUCTOR SHALL REROUTE FLOW BACK TO ORIGINAL ALIGNMENT AND RESTORE AREA TO ORIGINAL CONDITION OR BETTER.

WORK POINT TABLE

WORK POINT	NORTHING	EASTING
WP1	832684.80	796695.62
WP2	832549.80	796696.94

F = FIBER OPTIC LINE
T = TELEPHONE LINE
UGE = UNDERGROUND ELECTRIC LINE
W = WATER LINE

NOTES:
1. * = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.
2. ** = MEASURED PERPENDICULAR TO PROPOSED TRACK 101.
3. CONSTRUCTOR TO FIELD VERIFY ALL STATIONS ELEVATIONS AND DIMENSIONS PRIOR TO CONSTRUCTION. IF CONFLICTS OR INCONSISTENCIES ARE ANTICIPATED, NOTIFY UPRR.
4. LOCATION OF UTILITIES IS APPROXIMATE. UTILITIES SHALL BE VERIFIED PRIOR TO CONSTRUCTION. NOTIFY ARIZONA 811, 1-800-782-5348, AT LEAST 48 HOURS PRIOR TO CONSTRUCTION.

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

SECTION DESIGNATION

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA, U.S.A.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER — 04/03/2023 DATE

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123251

LATITUDE: 33.28816°N LONGITUDE: 111.60062°W

DSN/CHK BY:	JAS/MJH
DRAWN/CHK BY:	FAM/JAS
UPRR ENGINEER:	ADS
SHT NO.:	S1 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 5.02, PIRATE IND LEAD

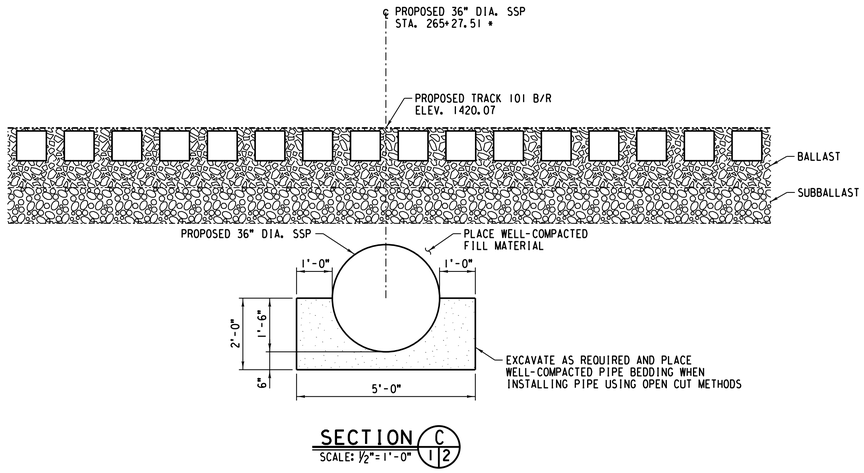
FURNISH & INSTALL
1-36" DIA. SSP x 135' AND SIPHON BOXES

SHEET TITLE: GENERAL ARRANGEMENT

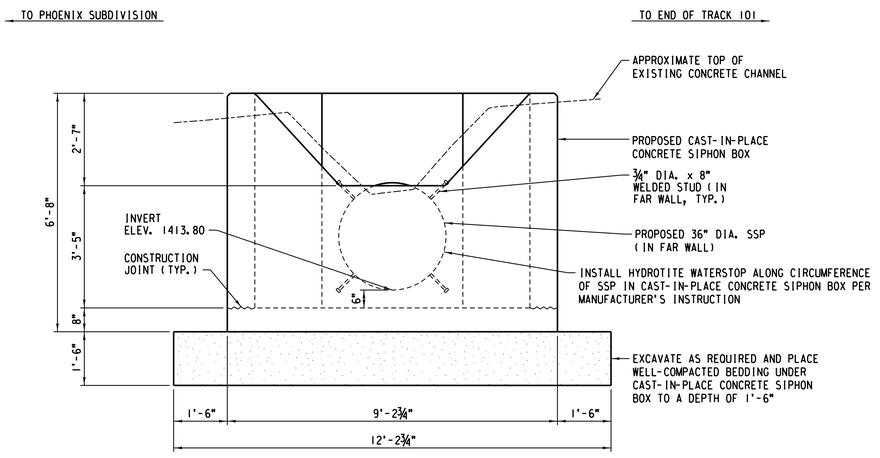
FILE NAME: \\oa.ad.oaconsulting.com\fnts-na\projects\2020\0503-10000\020-0927.40 Design\Microstation\020-0927.PLER.Culv 5.02.Sta. 265+27.00\Pirate Ind Lead_5.02.cad.dgn

PLOTTED: 7/7/2023 12:53:28 PM

DESIGN SHEET

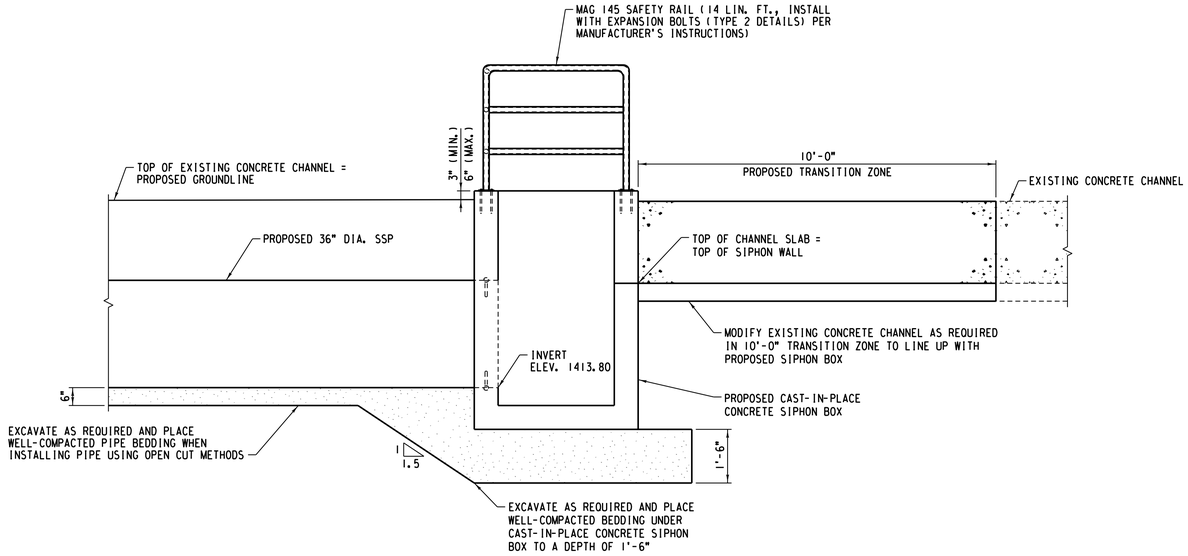


SECTION C
SCALE: ½"=1'-0" 1 | 2



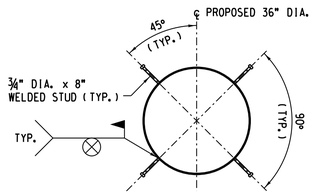
NOTES:
1. PROPOSED MAG 145 SAFETY RAIL NOT SHOWN FOR CLARITY.
2. CONSTRUCTOR SHALL COORDINATE TEMPORARY OPEN CUT AND/OR SHORING WITH UPRR AND ARIZONA STATE LAND DEPARTMENT PRIOR TO CONSTRUCTION.

SECTION B
SCALE: ½"=1'-0" 1 | 2
SOUTH SIPHON BOX SHOWN,
NORTH SIPHON BOX SIMILAR



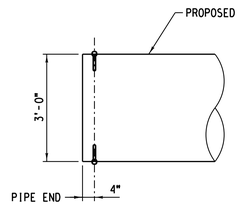
SECTION D
SCALE: ½"=1'-0" 1 | 2
SOUTH SIPHON BOX SHOWN,
NORTH SIPHON BOX SIMILAR

NOTE:
CONSTRUCTOR SHALL SUBMIT PLANS FOR PROPOSED CONCRETE CHANNEL TRANSITION ZONE TO UPRR FOR APPROVAL PRIOR TO CONSTRUCTION.



NOTES:
1. INSTALL STUDS AFTER PIPE IS IN PLACE.
2. STUDS SHALL BE C1015, C1017 OR C1020 COLD DRAWN STEEL WHICH CONFORMS TO ASTM A108 SPECIFICATIONS.

ANCHOR LOCATION DETAIL
SCALE: ½"=1'-0"



NOTE:
* = STATIONING IS TAKEN AT CENTERLINE OF PROPOSED TRACK 101.

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL — STATUS — 07/05/2023 DATE

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kyle Stubs — CONSULTANT ENGINEER — 04/03/2023 DATE

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-06-2023 ARIZONA, U.S.A.

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123251

LATITUDE: 33.28816°N LONGITUDE: 111.60062°W

UNION PACIFIC

DSN/CHK BY: JAS/MJH	UNION PACIFIC RAILROAD
DRAWN/CHK BY: FAM/JAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 5.02, PIRATE IND LEAD
SHT NO.: S2 of S4	FURNISH & INSTALL 1-36" DIA. SSP x 135' AND SIPHON BOXES
	SHEET TITLE: TYPICAL SECTIONS AND CONSTRUCTION DETAILS

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2020\050\1000\020\0927\40\Design\Microstation\020-0927-RLBR-Culv 5.02-Sta. 265-27.00-Pirate Ind Lead-5.02_csz.dgn

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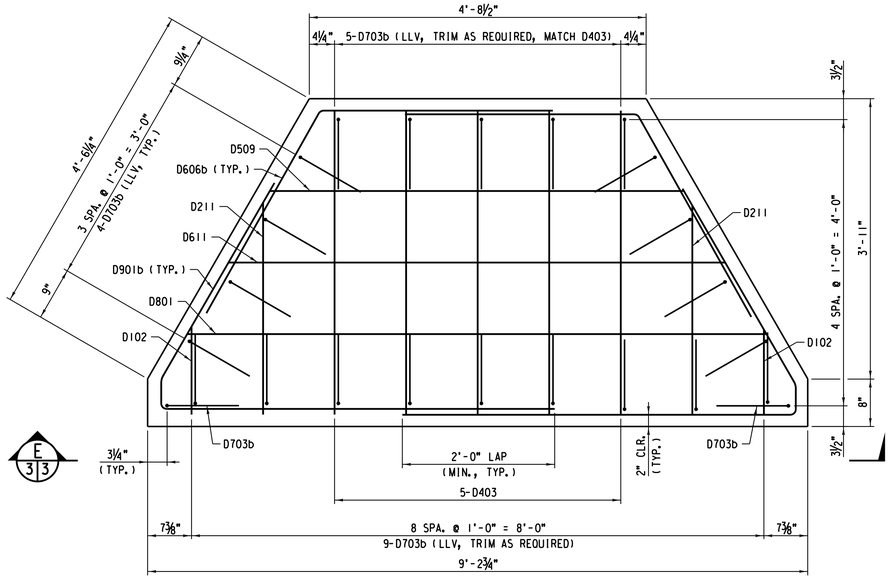
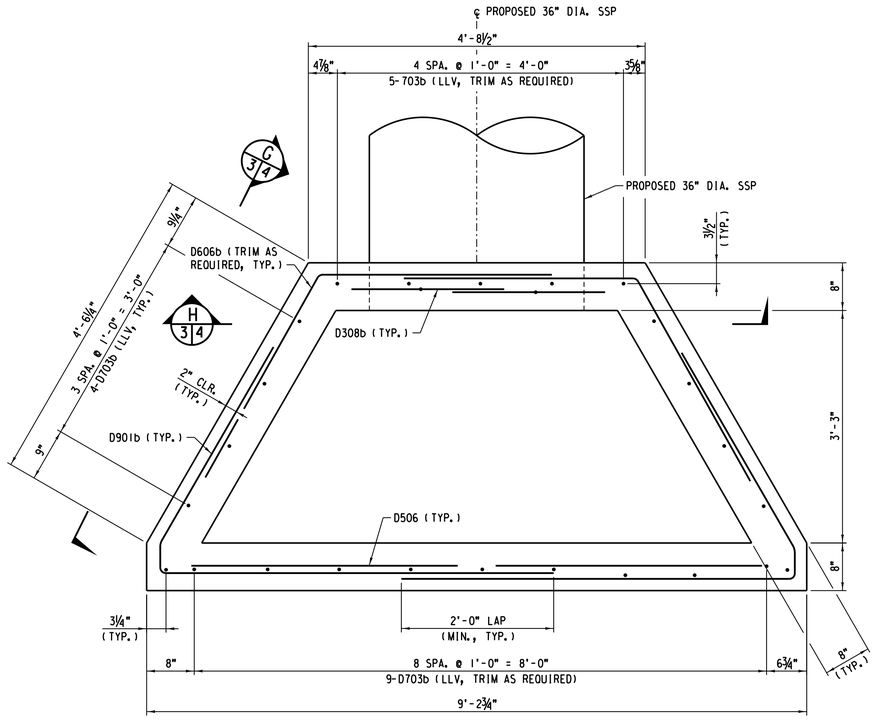
DESIGN SHEET



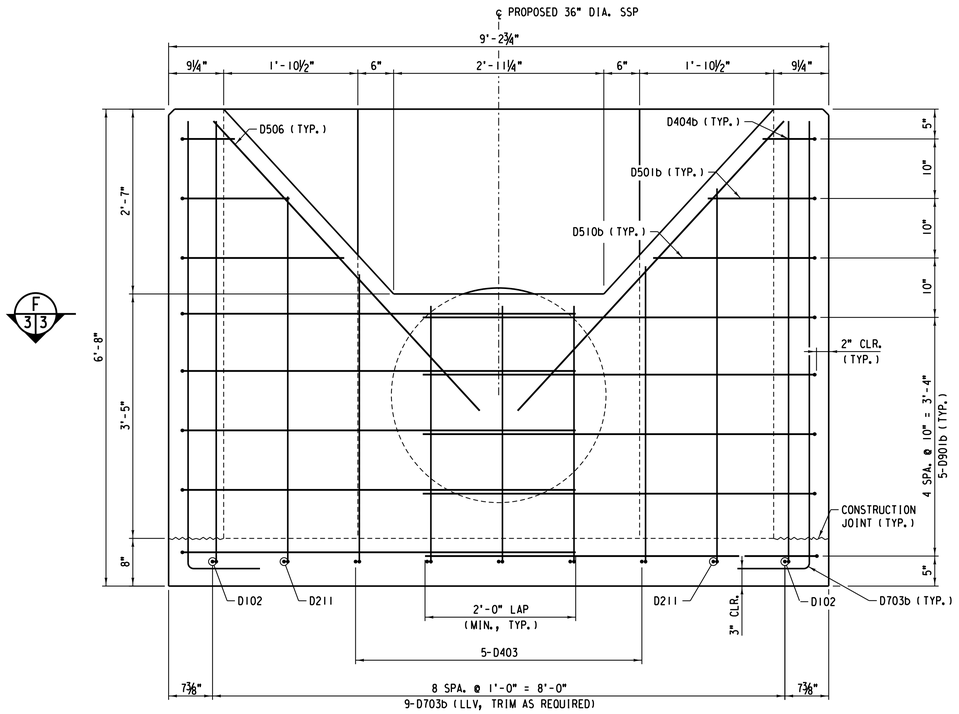
REINFORCING PLAN AT APRON

SCALE: 1"=1'-0"



SECTION F

SCALE: 1"=1'-0" (F 3 3)



VIEW E

SCALE: 1"=1'-0" (E 3 3)

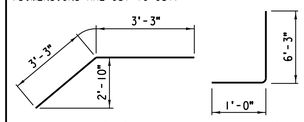
REINFORCING SCHEDULE

(QUANTITY PER SIPHON BOX)

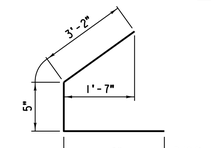
TOTAL	MARK	SIZE	LENGTH	SHAPE
2	D102	#5	1'-2"	—
2	D211	#5	2'-11"	—
4	D308b	#5	3'-8"	⌒
5	D403	#5	4'-3"	—
2	D404b	#5	4'-4"	⌐
2	D501b	#5	5'-1"	⌐
2	D506	#5	5'-6"	—
1	D509	#5	5'-9"	—
2	D510b	#5	5'-10"	⌐
16	D606b	#5	6'-6"	⌐
1	D611	#5	6'-11"	—
24	D703b	#5	7'-3"	⌐
1	D801	#5	8'-1"	—
10	D901b	#5	9'-1"	⌐

BENDING DIAGRAM

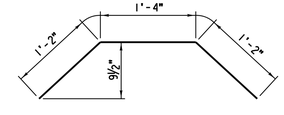
(DIMENSIONS ARE OUT TO OUT)



D606b D703b



D404b D501b D510b D901b



D308b

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 = 500 LB.

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

CONCRETE PLACEMENT QUANTITIES

(PER SIPHON BOX)

ITEM	UNIT	QTY.
BOTTOM SLAB	CU. YD.	0.9
WALLS	CU. YD.	2.9

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

Registered Professional Engineer (Civil) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
Kylie Stubs — CONSULTANT ENGINEER — 04/03/2023 (DATE)

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123251

LATITUDE: 33.28816°N LONGITUDE: 111.60062°W

UNION PACIFIC

DSN/CHK BY:	JAS/MJH
DRAWN/CHK BY:	FAM/JAS
UPRR ENGINEER:	ADS
SHT NO.:	S3 of S4

UNION PACIFIC RAILROAD
Office of Director Structures Design

LOCATION & DESCRIPTION: CULVERT 5.02, PIRATE IND LEAD

FURNISH & INSTALL
1-36" DIA. SSP x 135' AND SIPHON BOXES

SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 1 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-mail\projects\23201\0501-10000\020-0927\40-Design\Microstation\020-0927_RLBR.Culv 5.02.Sta. 265+27.00\Pirate Ind Lead.5.02.cax.dgn

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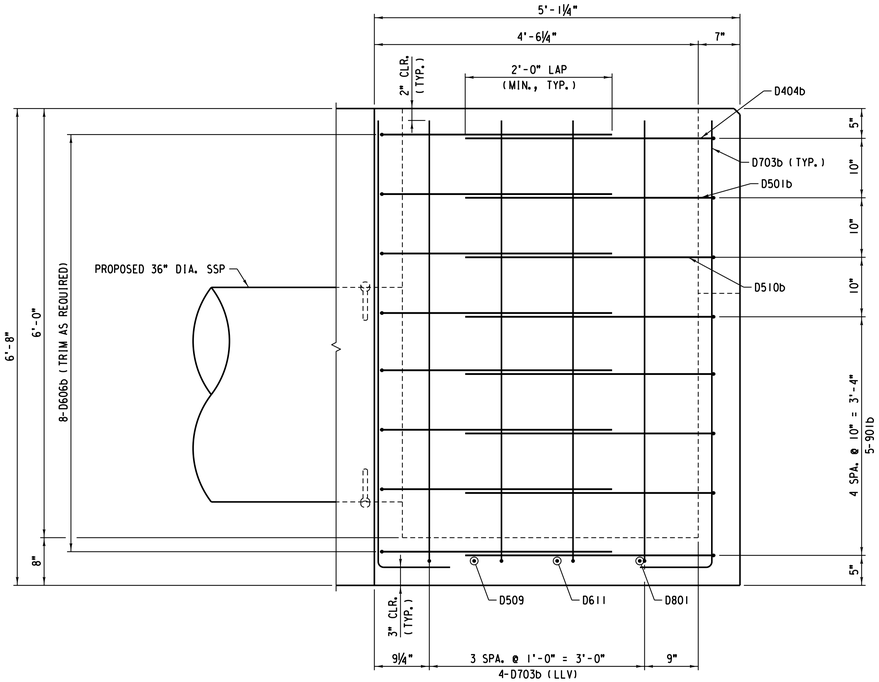
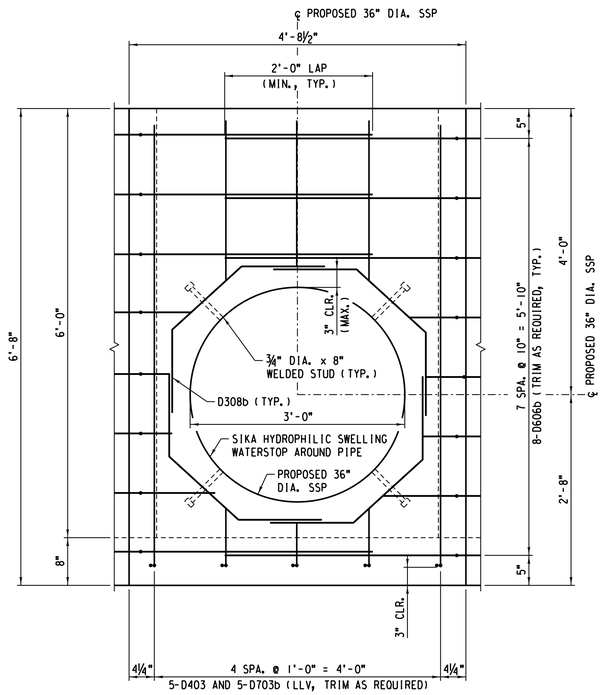
DESIGN SHEET



VIEW G (3|4)
SCALE: 1"=1'-0"



SECTION H (3|4)
SCALE: 1"=1'-0"

NOTES:
1. CONSTRUCTOR SHALL MINIMALLY ADJUST REINFORCING LOCATIONS AS REQUIRED TO ACCOMMODATE INSTALLATION OF SAFETY RAIL EXPANSION ANCHORS.
2. LLV = LONG LEG VERTICAL

NO.	DATE	REVISIONS
	/ /	
	/ /	

COMPLETION STATUS:
FINAL (STATUS) 07/05/2023 (DATE)

olsson

APPROVED FOR UNION PACIFIC RAILROAD BY:
CONSULTANT ENGINEER 04/03/2023 DATE

Registered Professional Engineer (Cert) CERTIFICATE NO. 75691 MARK J. HANIGAN Date Signed 07-05-2023 ARIZONA U.S.A.

PROJECT ID:	WORK ORDER:	C E NUMBER:
115884	54975	123251

LATITUDE: 33.28816°N LONGITUDE: 111.60062°W

DSN/CHK BY: JAS/MJH	**UNION PACIFIC RAILROAD**
DRAWN/CHK BY: FAM/JAS	Office of Director Structures Design
UPRR ENGINEER: ADS	LOCATION & DESCRIPTION: CULVERT 5.02, PIRATE IND LEAD
SHT NO.: S4 of S4	FURNISH & INSTALL 1-36" DIA. SSP x 135' AND SIPHON BOXES
	SHEET TITLE: CAST-IN-PLACE CONCRETE SIPHON BOX DETAILS (SHEET 2 OF 2)

FILE NAME: \\oa.ad.oaconsulting.com\fnts-na1\projects\2220\050\1000\020\0927.40\Design\Microstation\020-0927-RLBR Culv 5.02 Sta. 265+27.00 Pirate Ind Lead 5.02_cas.dgn

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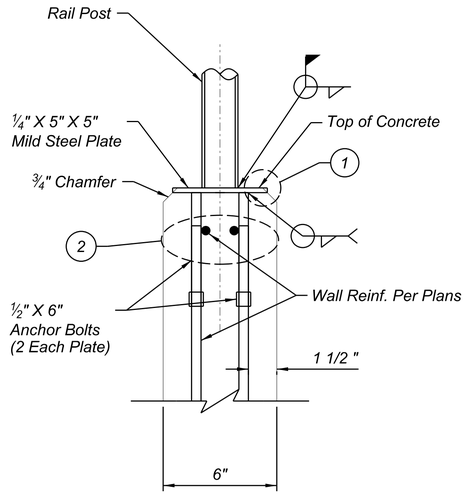
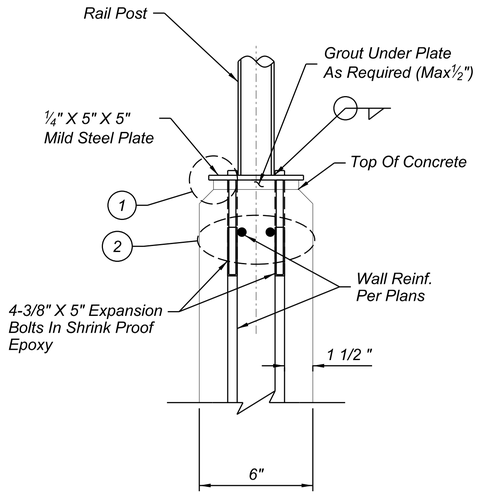
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	X	XXX	XX	

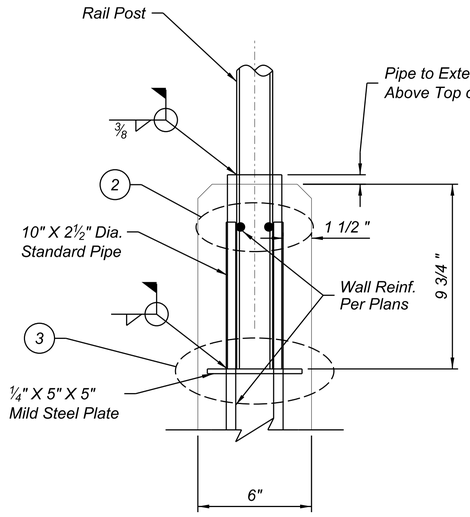
MAG DETAIL 145 EXISTING ISSUES



TYPE 1- (6" Wall)
Scale: 1"=0'-4"



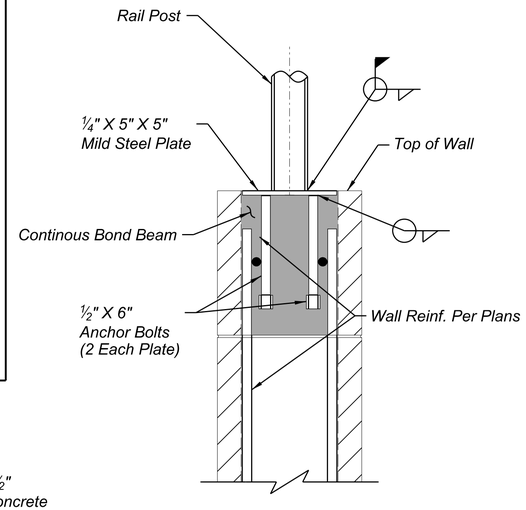
TYPE 2- (6" Wall)
Scale: 1"=0'-4"



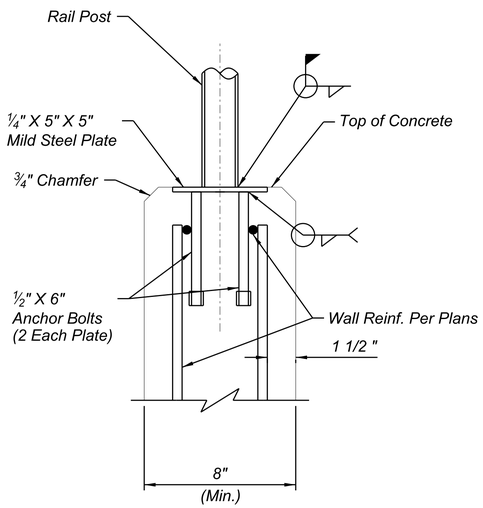
TYPE 3- (6" Wall)
Scale: 1"=0'-4"

STRUCTURAL PROBLEMS

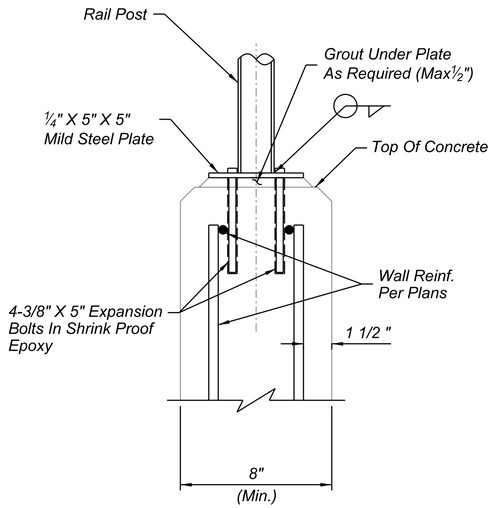
1. STEEL PLATE CORNER EXPOSED
2. CONFLICTS WITH NOTE 6. "THE EMBEDMENT FOR ANCHOR TYPES 1,2, & 3 SHALL BE LOCATED INSIDE THE WALL REINFORCEMENT CAGE".
3. LESS THAN MINIMUM REQUIRED CONCRETE COVER.



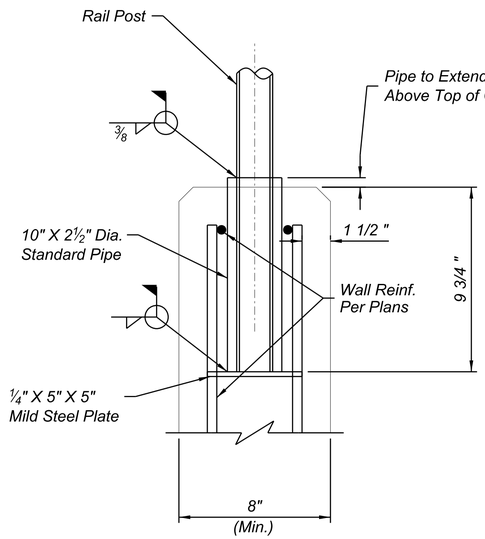
TYPE 5- (8" CMU Wall)
Scale: 1"=0'-4"



TYPE 1- (8" Wall)
Scale: 1"=0'-4"



TYPE 2- (8" Wall)
Scale: 1"=0'-4"



TYPE 3- (8" Wall)
Scale: 1"=0'-4"

MAG DETAIL 145 PROPOSED

NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

MAG DETAIL 145

		BY	DATE
PRELIMINARY NOT FOR CONSTRUCTION	DESIGNED	A.N. ENGINEER	XX/XX/XX
	DRAWN	A. TECHNICIAN	XX/XX/XX
	CHECKED	A.N. ENGINEER	XX/XX/XX

XXX

SHEET XXX OF XX

TRACS NO.

Contact Arizona 811 Two Working Days Before You Dig
ARIZONA811 BLUE STAKE, INC.
Call 811 or Click Arizona811.com

8:16:49 AM 3/8/2018

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