

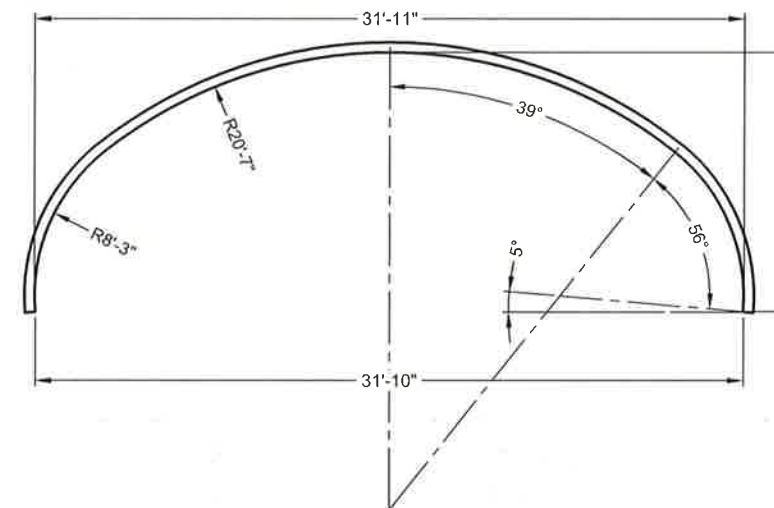
GENERAL NOTES:

1. THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE GALVANIZED STEEL DEEP CORRUGATED ARCH STRUCTURE (BRIDGECOR®) AS DETAILED IN THE PLANS. ANY INSTALLATION INFORMATION PROVIDED HEREIN SHALL BE REVIEWED AND APPROVED BY THE ENGINEER. CHANGES AND DISCREPANCIES MUST BE FORWARDED TO THE MANUFACTURER TO BE INCORPORATED IN A REVISED DRAWING SET.
2. THE ENGINEER SHALL VERIFY THAT THE PROPOSED STRUCTURE IS APPROPRIATE FOR THE SITE CONDITIONS AND THE DESIGN PARAMETERS ARE CONSISTENT WITH THE PROJECT REQUIREMENTS. ALL ASPECTS OF THE STRUCTURE DESIGN AND SITE LAYOUT NOT EXPLICITLY INCLUDED IN THESE DRAWINGS SHALL BE PROVIDED OR COORDINATED BY THE ENGINEER. THIS MAY INCLUDE BUT IS NOT LIMITED TO: FOUNDATIONS, BACKFILL, END TREATMENTS, HYDRAULIC ANALYSIS AND SCOUR ANALYSIS AS REQUIRED.
3. CONTECH PRODUCT DRAWINGS MAY NOT BE USED, REPRODUCED, COPIED, OR ISSUED TO A THIRD PARTY WITHOUT THE PRIOR WRITTEN PERMISSION OF CONTECH ENGINEERED SOLUTIONS.
4. ALL DIMENSIONS ARE TO THE INSIDE CREST OF THE CORRUGATION PROFILE UNLESS NOTED OTHERWISE AND ARE SUBJECT TO MANUFACTURING TOLERANCES.
5. THE STRUCTURE GEOMETRY, DESIGN, AND MATERIALS AS SHOWN IN THESE DRAWINGS ONLY APPLY FOR BRIDGECOR®, DESIGNED AND FABRICATED BY CONTECH ENGINEERED SOLUTIONS (CONTECH). ALTERNATIVE SYSTEMS SHALL BE FULLY DESIGNED AND APPROVED PRIOR TO BIDDING, WITH SEALED DRAWINGS AND CALCULATIONS PROVIDED TO DEMONSTRATE COMPLIANCE WITH THE SAME GEOMETRY, DESIGN, AND MATERIAL REQUIREMENTS AS SHOWN HEREIN.
6. CIRCUMFERENTIAL PLATE LENGTHS ARE IN TERMS OF S = 16 INCHES.
7. FOR WATER CONVEYANCE APPLICATIONS THE STRUCTURE MUST MEET HYDRAULIC REQUIREMENTS OF THE SITE AS DETERMINED BY THE ENGINEER. SHEET PILING, INLET AND OUTLET APRONS, CUTOFF WALLS, RIP RAP, AND/OR OTHER MEASURES SHALL BE INSTALLED AS NECESSARY TO PREVENT LOSS OF ENGINEERED BACKFILL AND/OR FOUNDATION SOILS DUE TO SCOUR. THE EXTENT, SIZE, AND LOCATION OF SCOUR PROTECTION SHALL BE DETERMINED BY THE ENGINEER.
8. PERIMETER DRAINAGE, SURFACE DRAINAGE, AND GRADING AROUND THE STRUCTURE SHALL BE DESIGNED, SPECIFIED, SUPPLIED, AND INSTALLED BY OTHERS.

DESIGN PARAMETERS

1. DESIGN BY CONTECH ENGINEERED SOLUTIONS IS BASED ON THE FOLLOWING DESIGN CRITERIA:
 VEHICLE LIVE LOAD: HL-93
 MINIMUM COVER: 4.0'
 MAXIMUM COVER: 6.6'
 DESIGN UNIT WEIGHT OF ENGINEERED BACKFILL = 120 LBS/FT³.
2. ENGINEERED BACKFILL MATERIAL SHALL COMPLY WITH THE ENGINEERED BACKFILL MATERIAL REQUIREMENTS SHOWN IN THESE DRAWINGS.
3. DESIGN COVER AND LATERAL EXTENT OF ENGINEERED BACKFILL ZONE SHALL BE AS SHOWN IN THESE DRAWINGS AND REQUIRED BY THE DESIGN STANDARDS REFERENCED IN THESE NOTES.
4. REFERENCE AASHTO LRFD SECTION 12.6.1 FOR SEISMIC DESIGN CONSIDERATIONS.
5. STRUCTURE DESIGN BASED ON SITE SOIL INFORMATION PROVIDED IN CONTRACT DOCUMENTS. IF UNEXPECTED SITE SOIL CONDITIONS ARE ENCOUNTERED, CONTECH MUST BE NOTIFIED TO DETERMINE IF DESIGN CHANGES ARE NEEDED.
6. TEMPORARY CONSTRUCTION VEHICLE LOADING HEAVIER THAN THE DESIGN VEHICLE LIVE LOAD SHALL NOT BE PERMITTED TO CROSS OVER THE STRUCTURE WITHOUT THE APPROVAL OF CONTECH. IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY CONTECH OF THE SIZE, TYPE AND WEIGHT OF ANY CONSTRUCTION VEHICLES INTENDED TO CROSS OVER THE STRUCTURE.

BRIDGECOR TWO RADIUS ARCH ARROYA CROSSING TIMBER RIDGE COLORADO SPRINGS, CO



Provide standard signature blocks if this will be a standalone set.

PLATE MAKE UP: 1 @ 13 S, 1 @ 12 S, 1 @ 8 S

NOTES:

- 1) MEASUREMENTS ARE TO THE INSIDE CRESTS OF THE CORRUGATIONS.
- 2) DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
- 3) CIRCUMFERENTIAL PLATE LENGTHS ARE IN TERMS OF S = 16 INCHES.

BRIDGECOR TWO RADIUS ARCH
INSIDE END AREA = 295.4 ft²
TOTAL S = 33

STRUCTURE CROSS-SECTION



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CONTECH CONTRACT DRAWING

BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 1 OF 7		

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1. DESIGN AND MANUFACTURING STANDARDS

- 1.1 ALL STANDARDS REFER TO THE CURRENT ASTM/AASHTO EDITION UNLESS OTHERWISE NOTED
 - 1.2 AASHTO M111 - STANDARD SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS
 - 1.3 AASHTO M232 - STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE
 - 1.4 AASHTO M 167 - STANDARD SPECIFICATION FOR CORRUGATED STEEL STRUCTURAL PLATE, ZINC COATED, FOR FIELD-BOLTED PIPE, PIPE-ARCHES AND ARCHES
 - 1.5 AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS - SECTION 12
 - 1.6 AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS - SECTION 26
 - 1.7 ASTM A761 - STANDARD SPECIFICATION FOR CORRUGATED STEEL STRUCTURAL PLATE, ZINC COATED, FOR FIELD-BOLTED PIPE, PIPE-ARCHES AND ARCHES
 - 1.8 ASTM A796 - STANDARD PRACTICE FOR STRUCTURAL DESIGN OF CORRUGATED STEEL PIPE, PIPE-ARCHES, AND ARCHES FOR STORM AND SANITARY SEWERS AND OTHER BURIED APPLICATIONS
 - 1.9 ASTM A807 - STANDARD PRACTICE FOR INSTALLING CORRUGATED STEEL STRUCTURAL PLATE PIPE FOR SEWERS AND OTHER APPLICATIONS
 - 1.10 ASTM A449 - STANDARD SPECIFICATION FOR HEX CAP SCREWS, BOLTS AND STUDS, HEAT TREATED, 120/105/90 KSI MINIMUM TENSILE STRENGTH, GENERAL USE
 - 1.11 ASTM A123 - STANDARD SPECIFICATION FOR ZINC (HOT DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS
 - 1.12 ASTM A153 - STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE
- 2. DEFINITIONS**
- 2.1 ENGINEER - IN THESE NOTES THE WORD "ENGINEER" SHALL MEAN THE ENGINEER OF RECORD OR OWNER'S DESIGNATED ENGINEERING REPRESENTATIVE.
 - 2.2 MANUFACTURER - IN THESE NOTES THE WORD "MANUFACTURER" SHALL MEAN THE MANUFACTURER OF THE DEEP CORRUGATED ARCH PLATES, CONTECH ENGINEERED SOLUTIONS @ PHONE 800/338-1122.
 - 2.3 CONTRACTOR - IN THESE NOTES THE WORD "CONTRACTOR" SHALL MEAN THE FIRM OR CORPORATION UNDERTAKING THE EXECUTION OF ANY INSTALLATION WORK UNDER THE TERMS OF THESE SPECIFICATIONS.
- 3. BRIDGECOR® STRUCTURE ASSEMBLY**
- 3.1 ASSEMBLY OF THE BRIDGECOR® STRUCTURE SHALL BE IN ACCORDANCE WITH SECTION 26 OF AASHTO LRFD CONSTRUCTION SPECIFICATIONS (LATEST EDITION, WITH INTERIMS) AND ANY SUPPLEMENTAL RECOMMENDATIONS PROVIDED BY THE MANUFACTURER.
 - 3.2 ALL PLATES SHALL BE UNLOADED AND HANDLED WITH REASONABLE CARE. PLATES SHALL NOT BE ROLLED OR DRAGGED OVER GRAVEL ROCK AND SHALL BE PREVENTED FROM STRIKING ROCK OR OTHER HARD OBJECTS DURING PLACEMENT IN TRENCH OR ON BEDDING.

GALVANIZED COATINGS THAT HAVE BEEN COMPROMISED SHALL BE RESTORED WITH A MINIMUM OF TWO COATS OF COLD GALVANIZING COMPOUND (SPRAY OR PAINT) IN ACCORDANCE WITH ASTM A761, SECTION 7 OR OTHER MEASURES AS DESCRIBED IN ASTM A780.
 - 3.3 FOR STRUCTURES SET ON FOOTINGS, PLATE ASSEMBLY CAN BEGIN AFTER PLACEMENT OF STRUCTURE FOOTINGS HAS BEEN APPROVED BY THE ENGINEER. VERIFICATION OF PROPER SPACING, ALIGNMENT, AND ORIENTATION OF THE FOUNDATIONS IS STRONGLY RECOMMENDED PRIOR TO BEGINNING PLATE ASSEMBLY. ANY MODIFICATIONS TO THE FOUNDATIONS SHALL BE MADE PRIOR TO BEGINNING PLATE ASSEMBLY.

BEDDING PREPARATION FOR ROUND AND ELLIPTICAL SHAPES SHOULD BE APPROVED BY THE ENGINEER PRIOR TO ASSEMBLY. THE BED SHOULD BE CONSTRUCTED TO UNIFORM LINE AND GRADE. IT SHOULD BE FREE OF ROCK FORMATIONS, PROTRUDING STONES, FROZEN LUMPS, ROOTS AND OTHER FOREIGN MATTER.
 - 3.4 THE SPAN AND RISE OF THE STRUCTURE SHOULD BE CHECKED FREQUENTLY DURING THE EARLY STAGES OF ASSEMBLY TO VERIFY THAT ASSEMBLY TOLERANCES ARE BEING ACHIEVED AND TO ALLOW FOR ADJUSTMENTS TO PROCEDURES, IF NECESSARY, BEFORE ASSEMBLY IS COMPLETE.
 - 3.5 CUT PLATES FOR SKEWED OR BEVELED ENDS SHOULD BE ATTACHED AFTER THE MAIN BARREL OF A STRUCTURE HAS BEEN ASSEMBLED. WHEN CAST-IN-PLACE CONCRETE COLLARS OR HEADWALLS ARE TO BE CONSTRUCTED, THE CONTRACTOR MUST ALLOW FOR FORMWORK TO BE ERECTED ON THE END OF THE STRUCTURE. FORMING AGAINST A SKEWED CORRUGATION PROFILE IS COMPLEX AND SHOULD BE ACCOUNTED FOR BY THE FORMING CONTRACTOR WHEN PLANNING PROCEDURES AND METHODS FOR FORMWORK CONSTRUCTION. IN SOME CASES, FIELD TRIMMING OF THE STRUCTURE MAY BE NECESSARY. SPECIAL

- BRACING AND/OR SCAFFOLDING (DESIGN BY OTHERS) IS REQUIRED TO SUPPORT SKEWED ENDS UNTIL ADEQUATE COMPRESSIVE STRENGTH IS ACHIEVED AS REQUIRED BY THE COLLAR/HEADWALL DESIGNER.
 - 3.6 NUTS SHALL BE PLACED WITH THE ROUNDED FACE IN CONTACT WITH THE PLATES UNLESS NOTED OTHERWISE. NUTS CAN BE ON EITHER THE INSIDE OR OUTSIDE OF THE STRUCTURE TO FACILITATE ASSEMBLY.
 - 3.7 RECOMMENDED TORQUE RANGE ON THE BOLTS IS 150 TO 300 FT-LBS FOR 3/4" DIAMETER BOLTS AND 200-350 FT-LBS FOR 7/8" DIAMETER BOLTS.
 - 3.8 INSIDE SPAN AND RISE OF THE ASSEMBLED STRUCTURE AFTER BOLTING SHALL BE WITHIN 2% (OR 5 INCHES, WHICHEVER IS LESS) OF THE PLAN DIMENSIONS. THE TOLERANCE ON STRUCTURE LENGTH IS ± 1/2" PER 10 FT OF STRUCTURE LENGTH
- 4. ENGINEERED BACKFILL ENVELOPE**
- 4.1 ENGINEERED BACKFILL MATERIAL SHALL BE PLACED WITHIN THE ENGINEERED BACKFILL ENVELOPE TO THE MINIMUM WIDTH AND WITHIN THE COVER LIMITS SHOWN ON THESE DRAWINGS. THE ENGINEERED BACKFILL ENVELOPE SHALL NOT BE ALTERED WITHOUT WRITTEN APPROVAL FROM CONTECH.
 - 4.2 IN-SITU SOILS BELOW AND ADJACENT TO THE ENGINEERED BACKFILL ENVELOPE SHALL PROVIDE A FIRM SURFACE AGAINST WHICH TO COMPACT THE ENGINEERED BACKFILL MATERIAL. THE GEOTECHNICAL ENGINEER SHALL EVALUATE THE IN-SITU SOILS AND DETERMINE THE TYPE AND DEGREE OF ANY SOIL IMPROVEMENTS REQUIRED. THESE MAY INCLUDE BENCHING OR SLOPING OF THE SIDE SOILS. BACKFILL PLACEMENT MAY NOT BEGIN UNTIL THE GEOTECHNICAL ENGINEER HAS APPROVED THE IN-SITU SOILS AND ANY REQUIRED IMPROVEMENTS.
 - 4.3 A DRAINED CONDITION WAS ASSUMED FOR THE ENGINEERED BACKFILL ENVELOPE. DESIGN AND SUPPLY OF A SUBSURFACE DRAINAGE SYSTEM (IF NEEDED) SHALL BE PROVIDED BY OTHERS.
 - 4.4 IF REQUIRED BY THE GEOTECHNICAL ENGINEER, A GEOTEXTILE OR GRADED SOIL FILTER MAY BE USED BETWEEN THE ENGINEERED BACKFILL AND IN-SITU SOIL TO PREVENT MIGRATION OF FINES AND POSSIBLE INTERNAL EROSION OF THE SOIL.
- 5. ENGINEERED BACKFILL MATERIAL REQUIREMENTS**
- 5.1 THE DESIGN OF BRIDGECOR® STRUCTURES RELIES ON COMPACTED SOIL PROPERTIES PROVIDED BY THE ENGINEERED BACKFILL MATERIALS. THE CORRECT SELECTION AND PLACEMENT OF COMPACTED ENGINEERED BACKFILL MATERIAL IS CRITICAL TO THE PERFORMANCE OF BRIDGECOR® STRUCTURES.
 - 5.2 THE ENGINEERED BACKFILL MATERIAL SHALL NOT BE ADVERSELY AFFECTED BY WETTING, DRYING, SATURATION, FREEZE/THAW, VIBRATIONS, OR FLOWING WATER.
 - 5.3 BACKFILL MATERIALS SHALL CONFORM TO PROPERTIES REFERENCED IN THE PROJECT SPECIFICATIONS OR THE PROPERTIES DESCRIBED HEREIN, WHICHEVER IS MORE STRINGENT.
 - 5.4 BACKFILL MATERIAL SHOULD CONSIST OF A WELL-GRADED, ANGULAR GRANULAR SOIL WITH A MAXIMUM PARTICLE SIZE OF 3 INCHES, OPEN GRADED OR GAP GRADED MATERIALS ARE NOT PREFERRED. THE BACKFILL MATERIAL SHOULD BE FREE OF FROZEN LUMPS, FOREIGN MATERIAL OR ORGANIC DECOMPOSABLE MATERIALS. FINE BEACH SANDS, WINDBLOWN SANDS, AND STREAM DEPOSITED SANDS ALL OF WHICH EXHIBIT FINE, ROUNDED PARTICLES AND TYPICALLY ARE CLASSIFIED BY AASHTO M 145 AS A-3 MATERIALS ARE NOT ALLOWED. WHEN USING A-2 MATERIALS, MOISTURE CONTENT MUST BE BETWEEN -3% AND +2% OPTIMUM AS DEFINED BY AASHTO T 180.
 - 5.5 GRAIN SIZE DISTRIBUTION (GRADATION) OF THE ENGINEERED BACKFILL MATERIAL SHALL SATISFY: C_u GREATER THAN OR EQUAL TO 3 AND C_c BETWEEN 0.7 AND 3, WHERE C_u = COEFFICIENT OF UNIFORMITY = D_{60}/D_{10} AND C_c = COEFFICIENT OF CURVATURE = $(D_{30})^2/(D_{60}D_{10})$. D_{XX} IS THE PARTICLE SIZE CORRESPONDING TO XX% FINER ON THE CUMULATIVE PARTICLE SIZE DISTRIBUTION CURVE (ASTM D2487).

 C_u REQUIREMENTS ARE WAIVED FOR CRUSHER RUN SCREENED AGGREGATES. C_c REQUIREMENTS ARE WAIVED FOR BACKFILL MATERIAL CONTAINING MORE THAN 60% GRAVEL (> #4 SIEVE).
 - 5.6 ABRASION LOSS SHALL NOT EXCEED 45% AS DETERMINED BY THE LOS ANGELES ABRASION TEST (ASTM C131).
 - 5.7 HUMIC (DECAYING) ORGANIC MATTER SHALL NOT EXCEED 1.0% (DRY WEIGHT BASIS).
 - 5.8 ELECTROCHEMICAL REQUIREMENTS FOR SOIL AND WATER IN CONTACT WITH BOTH THE INSIDE AND OUTSIDE OF THE BRIDGECOR® STRUCTURE ARE AS FOLLOWS, PER THE NCSPA DESIGN MANUAL:
 - PH = 6 TO 10
 - RESISTIVITY = 2,000 to 10,000 OHM-CM
 - WATER HARDNESS > 50 PPM $CaCO_3$
 - 5.9 IF THE ELECTROCHEMICAL PROPERTIES OF THE BACKFILL OR WATER FALL OUTSIDE OF THE RECOMMENDED RANGE, A SECONDARY PROTECTION SYSTEM MAY BE NEEDED TO ACHIEVE THE DESIGN SERVICE LIFE. SECONDARY PROTECTION SYSTEMS (IF REQUIRED) SHALL BE DESIGNED AND PROVIDED BY OTHERS.
 - 5.10 THE SELECTION AND EVALUATION OF PROPOSED ENGINEERED BACKFILL MATERIAL

- IS THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL PROVIDE CONTECH WITH DOCUMENTATION FROM A QUALIFIED GEOTECHNICAL ENGINEER THAT THE PROPOSED ENGINEERED BACKFILL MATERIAL MEETS OR EXCEEDS THE REQUIREMENTS.
- 6. ENGINEERED BACKFILL PLACEMENT PROCEDURE**
- 6.1 A CONTECH REPRESENTATIVE WILL CONDUCT A PRECONSTRUCTION CONFERENCE PRIOR TO COMMENCEMENT OF WORK TO REVIEW AND DISCUSS THE RECOMMENDED PROCEDURES FOR BACKFILLING, AND STRUCTURE SHAPE MEASUREMENTS. ANY CONTRACTOR WITH RESPONSIBILITY FOR BACKFILLING OR CONSTRUCTION OF END TREATMENTS MUST BE REPRESENTED AT THIS MEETING. IT IS RECOMMENDED THAT THE ENGINEER AND ANY THIRD PARTY INVOLVED IN COMPACTION TESTING OR OTHER QUALITY CONTROL MEASURES ALSO ATTEND.
 - 6.2 ANY IMPROVEMENT OF THE SUBGRADE AND EMBANKMENT SOILS REQUIRED BY THE GEOTECHNICAL ENGINEER SHALL BE COMPLETED AND APPROVED PRIOR TO BEGINNING PLACEMENT OF ENGINEERED BACKFILL MATERIAL.
 - 6.3 THE ENGINEERED BACKFILL MATERIAL SHALL BE PLACED UNIFORMLY ON BOTH SIDES OF THE STRUCTURE IN LAYERS OF 8 INCHES OR LESS (BEFORE COMPACTION).
 - 6.4 BACKFILL SHALL BE COMPACTED TO THE MINIMUM DENSITY INDICATED IN THESE DRAWINGS. DEPENDING ON THE COMPACTION EQUIPMENT AND ENGINEERED BACKFILL MATERIAL USED, IT MAY BE NECESSARY TO DECREASE THE LIFT THICKNESS AND/OR MOISTURE CONDITION THE LOOSE SOIL TO ACHIEVE THE SPECIFIED MINIMUM LEVEL OF COMPACTION.
 - 6.5 IF THE ENGINEERED BACKFILL MATERIAL DOES NOT PRODUCE A PROCTOR CURVE AND/OR IS NOT CONDUCTIVE TO TRADITIONAL FIELD-TESTING METHODS, QUALITATIVE METHODS OF EVALUATING COMPACTION MAY BE USED. SUCH METHODS SHALL BE EVALUATED AND APPROVED BY THE GEOTECHNICAL ENGINEER AND A COPY OF THE METHOD BE PROVIDED TO THE DESIGNER.
 - 6.6 THE DIFFERENCE IN BACKFILL LEVELS ON THE TWO SIDES OF THE STRUCTURE AT ANY TRANSVERSE SECTION SHALL NOT EXCEED 24 INCHES WITHOUT PRIOR APPROVAL FROM CONTECH.
 - 6.7 CONSTRUCTION EQUIPMENT USED WITHIN 5 FEET LATERALLY OF THE WIDEST PART OF THE STRUCTURE, UP TO THE MINIMUM DESIGN COVER HEIGHT ABOVE THE STRUCTURE, SHALL HAVE A STATIC MASS OF 10 TONS OR LESS. IT MAY BE POSSIBLE TO USE HEAVIER EQUIPMENT IF IT CAN BE DEMONSTRATED THAT THE STRUCTURE SHAPE IS NOT ADVERSELY AFFECTED. ENGINEERED BACKFILL MATERIAL SHALL BE PLACED WITHIN 1 FOOT LATERALLY OF THE WIDEST PART OF THE STRUCTURE SHALL BE COMPACTED USING HAND OPERATED EQUIPMENT UNTIL THE MINIMUM COVER HEIGHT IS REACHED. OVER-COMPACTION OF ENGINEERED BACKFILL IN THIS ZONE SHOULD BE AVOIDED, AS THIS CAN CONTRIBUTE TO EXCESSIVE DEFLECTION OF SOME STRUCTURES. AREAS CLOSEST TO THE STRUCTURE SHALL BE COMPACTED RUNNING PARALLEL TO THE LENGTH OF THE STRUCTURE.
 - 6.8 ONCE THE BACKFILL ELEVATION REACHES APPROXIMATELY ¼ OF THE STRUCTURE RISE (DEPENDING ON THE SHAPE OF THE STRUCTURE AND RELATIVE MOVEMENT DURING THE BACKFILL PROCESS), PLACE AND COMPACT ENGINEERED BACKFILL MATERIAL IN RADIAL LIFTS OVER THE TOP OF THE STRUCTURE USING EQUIPMENT AS DESCRIBED ABOVE. THE FIRST RADIAL LIFT SHOULD BE THICKER AND PROVIDE A MINIMUM 12 INCHES OF COVER BETWEEN THE STRUCTURE AND COMPACTION EQUIPMENT. EQUIPMENT SHOULD RUN PERPENDICULAR TO THE LONGITUDINAL AXIS OF THE STRUCTURE. NO EQUIPMENT SHALL BE ALLOWED OVER THE STRUCTURE THAT WOULD EXCEED THE DESIGN LOAD AT THE MINIMUM DESIGN HEIGHT OF COVER. NO CONSTRUCTION EQUIPMENT SHALL BE ALLOWED TO PARK ON TOP OF A PARTIALLY BACKFILLED STRUCTURE.
 - 6.9 AT NO TIME SHALL THE ENGINEERED BACKFILL MATERIAL BE DUMPED OR PUSHED AGAINST THE STRUCTURE WALL(S) SO AS TO CHANGE THE SHAPE OR ALIGNMENT OF THE STRUCTURE. MATERIAL SHALL NOT BE DUMPED ON TOP OF THE STRUCTURE AT ANY TIME. TRUCKS MAY UNLOAD IN ROUGH LAYERS NO CLOSER THAN 5 FEET FROM THE WIDEST PART OF THE STRUCTURE.
 - 6.10 THE STRUCTURE SHALL BE CHECKED PERIODICALLY DURING BACKFILLING TO ENSURE THE SHAPE OF THE STRUCTURE MEETS DESIGN REQUIREMENTS AND IS CONSISTENT WITH THE ASSEMBLY TOLERANCES AS STATED IN THESE NOTES. IF DEFLECTION OF THE STRUCTURE IS GREATER THAN EXPECTED, BACKFILLING SHALL BE HALTED AND BACKFILL PLACEMENT AND COMPACTION PROCEDURES MODIFIED TO CORRECT THE STRUCTURE SHAPE. IT MAY BE NECESSARY TO REMOVE SOME OF THE BACKFILL TO CORRECT EXCESSIVE DEFLECTION. AFTER COMPLETION OF BACKFILL PLACEMENT, THE FINAL SHAPE OF THE STRUCTURE SHALL BE WITHIN 2% (OR 5 INCHES, WHICHEVER IS LESS) OF THE PLAN DIMENSIONS.
- 7. CONSTRUCTION OBSERVATIONS AND TESTING**
- 7.1 OBSERVATION AND TESTING SHALL BE PERFORMED DURING CONSTRUCTION TO VERIFY COMPLIANCE WITH THESE DRAWINGS, APPLICABLE PROJECT DOCUMENTS, AND STANDARDS REFERENCED IN THESE NOTES.

- 7.2 THE CONTRACTOR IS RESPONSIBLE FOR QUALITY CONTROL PROCEDURES, VERIFICATION MEASUREMENTS, ADEQUATE SUPERVISION, PROGRESS TESTING, EVALUATION OF PROPOSED ENGINEERED BACKFILL MATERIALS, AND/OR OTHER MEASURES AS NEEDED TO ENSURE THAT THE COMPLETED PROJECT COMPLIES WITH THESE DRAWINGS AND NOTES.
- 7.3 THE PROJECT OWNER (OR THEIR DESIGNATED REPRESENTATIVE) IS RESPONSIBLE FOR PROJECT OVERSIGHT AND FINAL ACCEPTANCE OF THE CONSTRUCTED STRUCTURE. THE OWNER MAY ACCEPT THE CONTRACTOR'S QUALITY CONTROL PROGRAM OR ADOPT AN INDEPENDENT QUALITY ASSURANCE PROGRAM TO VERIFY COMPLIANCE.
- 7.4 OBSERVATIONS AND TESTING PRIOR TO STRUCTURE ASSEMBLY & BACKFILL SHALL INCLUDE BUT NOT BE LIMITED TO:
 - EVALUATION OF FOUNDATION SOILS BELOW FOOTINGS AND THE ENGINEERED BACKFILL ENVELOPE
 - VERIFICATION OF PROPER ALIGNMENT, DIMENSIONS, AND PLACEMENT OF FOUNDATIONS
 - VERIFICATION OF PROPER SHAPING, PLACEMENT, AND PREPARATION OF BEDDING SOILS (STRUCTURES WITH INVERTS)
 - VERIFICATION OF PROPER PREPARATION OF EMBANKMENT SOILS ADJACENT TO THE ENGINEERED BACKFILL ENVELOPE
 - EVALUATION AND APPROVAL OF ENGINEERED BACKFILL MATERIALS
 - VERIFICATION OF PROPER PLACEMENT OF GEOTEXTILES (WHEN REQUIRED)
- 7.5 OBSERVATIONS AND TESTING DURING ASSEMBLY & BACKFILLING SHALL INCLUDE BUT NOT BE LIMITED TO:
 - STRUCTURE ALIGNMENT
 - PLATE TIGHTNESS OBSERVATIONS
 - BOLT TORQUE MEASUREMENTS
 - INITIAL STRUCTURE SHAPE MEASUREMENTS (PRIOR TO STARTING BACKFILLING)
 - PERIODIC STRUCTURE SHAPE MEASUREMENTS (DURING BACKFILLING)
 - ENGINEERED BACKFILL MATERIAL SAMPLING AND TESTING
 - OBSERVATIONS OF PROPER FILL PLACEMENT AND COMPACTION PROCEDURES.
- 7.6 CONTECH MAY REQUIRE ADDITIONAL OBSERVATIONS AND/OR TESTING WHICH MAY INCLUDE, BUT NOT BE LIMITED TO, FULL TIME SHAPE MONITORING, ADDITIONAL SOIL TESTING, AND SITE EVALUATIONS DEPENDING ON THE STRUCTURE GEOMETRY, DESIGN, AND/OR OTHER PROJECT SPECIFIC FACTORS.



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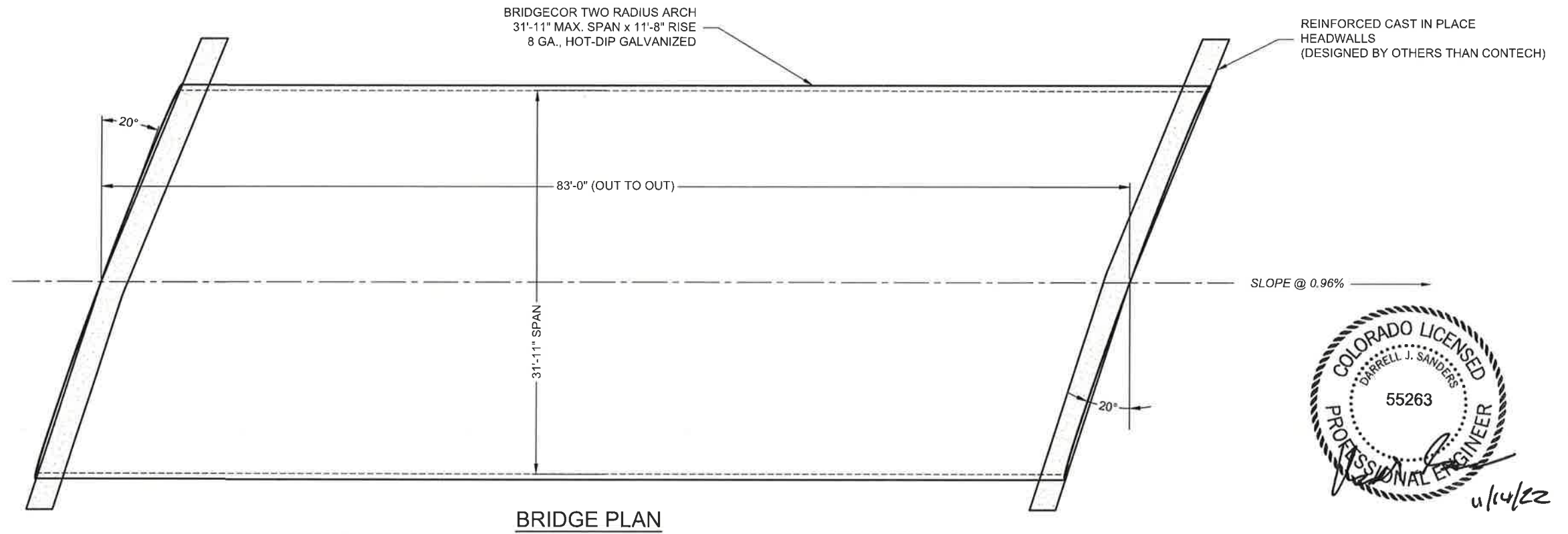
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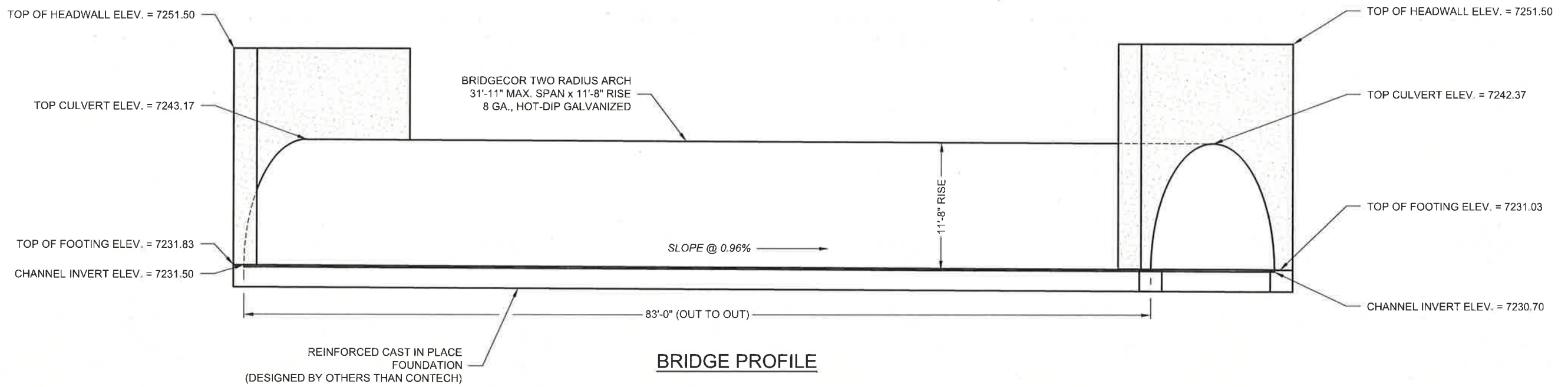
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DRAWING

BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 2 OF 7		



NOTE: STRUCTURE IS SLOPE CORRECTED ON EACH END.



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BridgeCor

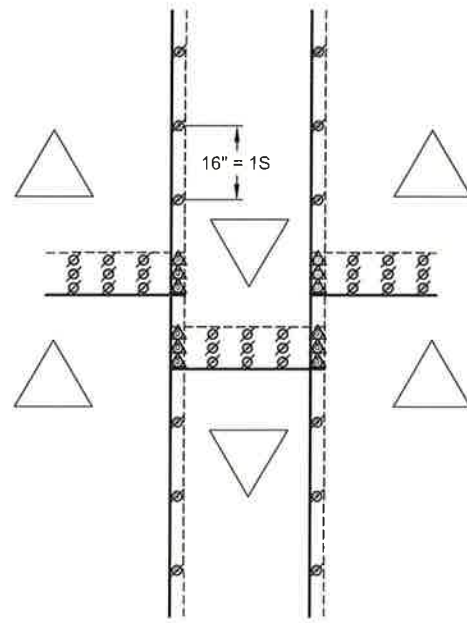
CONTECH
CONTRACT
DRAWING

BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 3 OF 7		

NOTES:

1. ALL COMPONENTS MUST BE ASSEMBLED AS SHOWN. PAY CLOSE ATTENTION TO MARK NUMBERS ON THE COMPONENTS.
2. MANUFACTURING FACILITY: MANSFIELD, TX.
3. REFERENCE FINAL SHEET FOR PLATE LAP DETAIL.



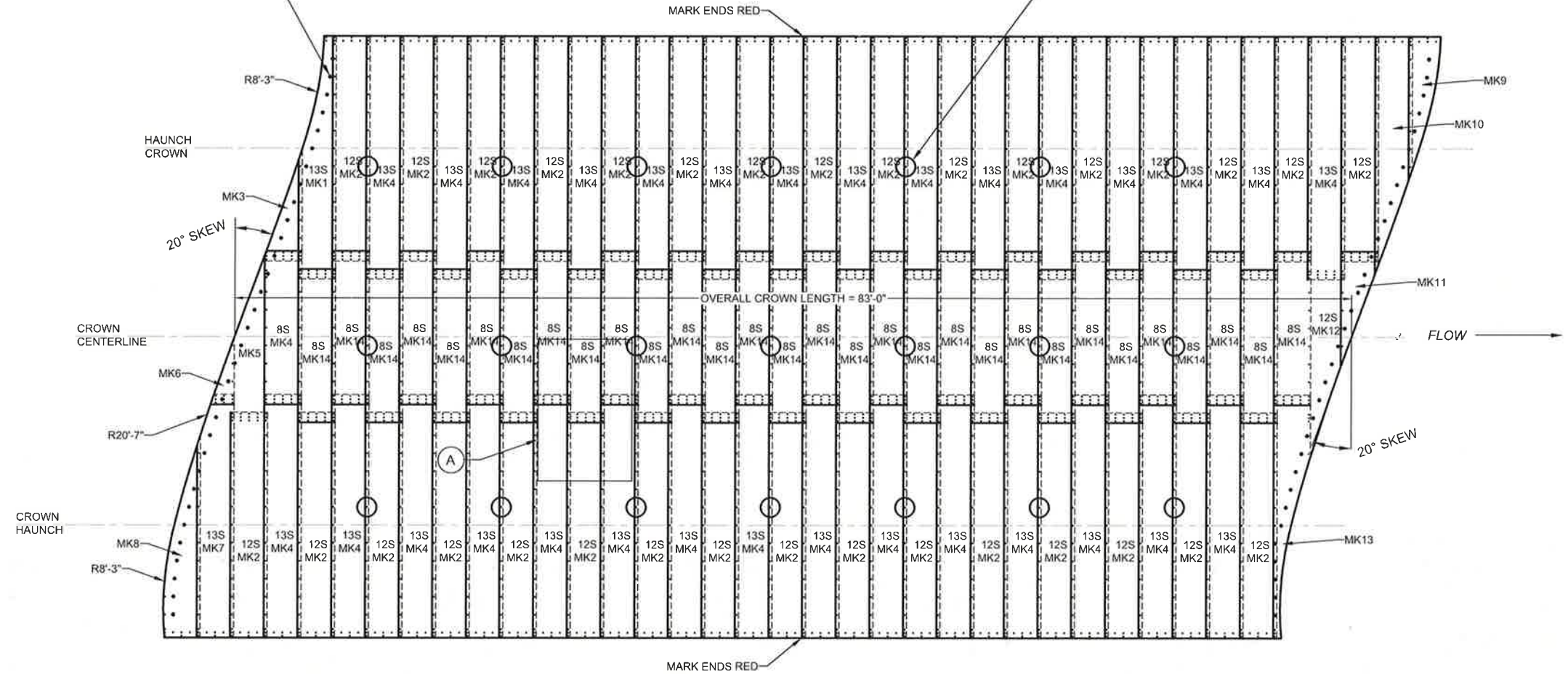
DETAIL A
SCALE: N.T.S.

LEGEND

- ⊗ 2 PLATE LAP SEAMS
- △ 3-PLATE SEAM

ANCHOR BOLTS PLACED 9" FROM PLATE EDGE @ 16" O.C. IN NEAREST CREST OR VALLEY AS SHOWN QTY OF (64x) (32x EACH SIDE)

MOVEMENT CONTROL HOOKS (QTY. OF 21) FOR SHAPE MONITORING PLACED AT EVERY FOURTH SEAM



BRIDGECOR PLATE DETAILS (30" LONG PLATES)

PLATE WIDTH "S"	GAGE	PLATE QTY.	MK #	OVERALL WIDTH (INCHES)	NUMBER OF CIRCUMFERENTIAL BOLT HOLES AT 16" CENTERS	PLATE WEIGHT WITHOUT FASTENERS
8	8	34	3;6;11;14	137	9	284
10	8	1	5	169	11	350
12	8	35	2;8;9;12	201	13	417
13	8	32	1;4;7;13	217	14	450
14	8	1	10	233	15	483

PLATE LAYOUT DRAWING
BRIDGECOR TWO RADIUS ARCH (OUTSIDE VIEW)
31'-11" SPAN x 11'-8" RISE



FOR APPROVAL



CONTECH CONTRACT DRAWING

BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 4 OF 7		

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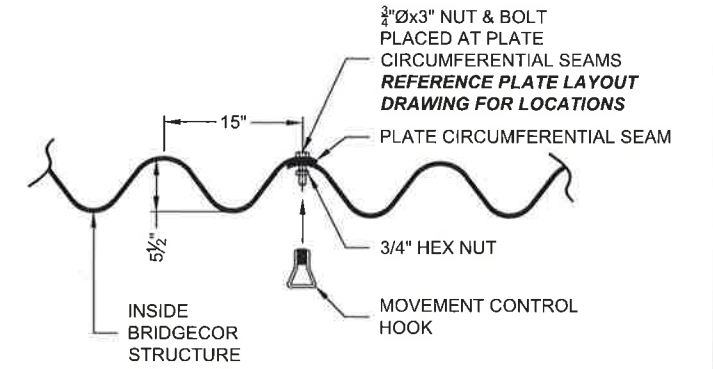
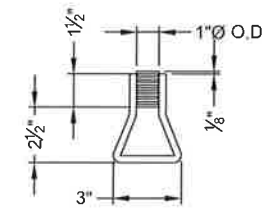
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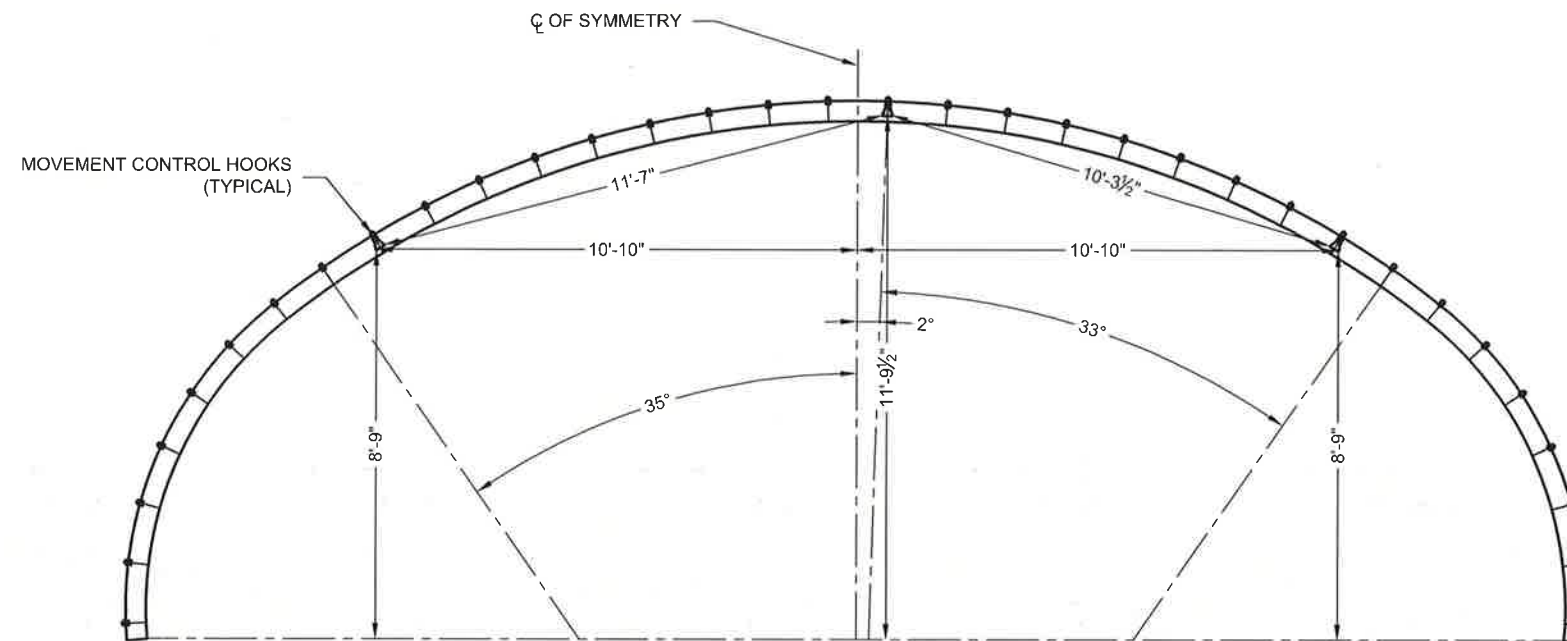
MARK	DATE	REVISION DESCRIPTION	BY

NOTES:

1. REFERENCE PLATE LAYOUT DIAGRAM FOR MOVEMENT CONTROL HOOK LOCATIONS.



MOVEMENT CONTROL HOOK DETAIL



MOVEMENT CONTROL HOOK PLACEMENT DETAIL



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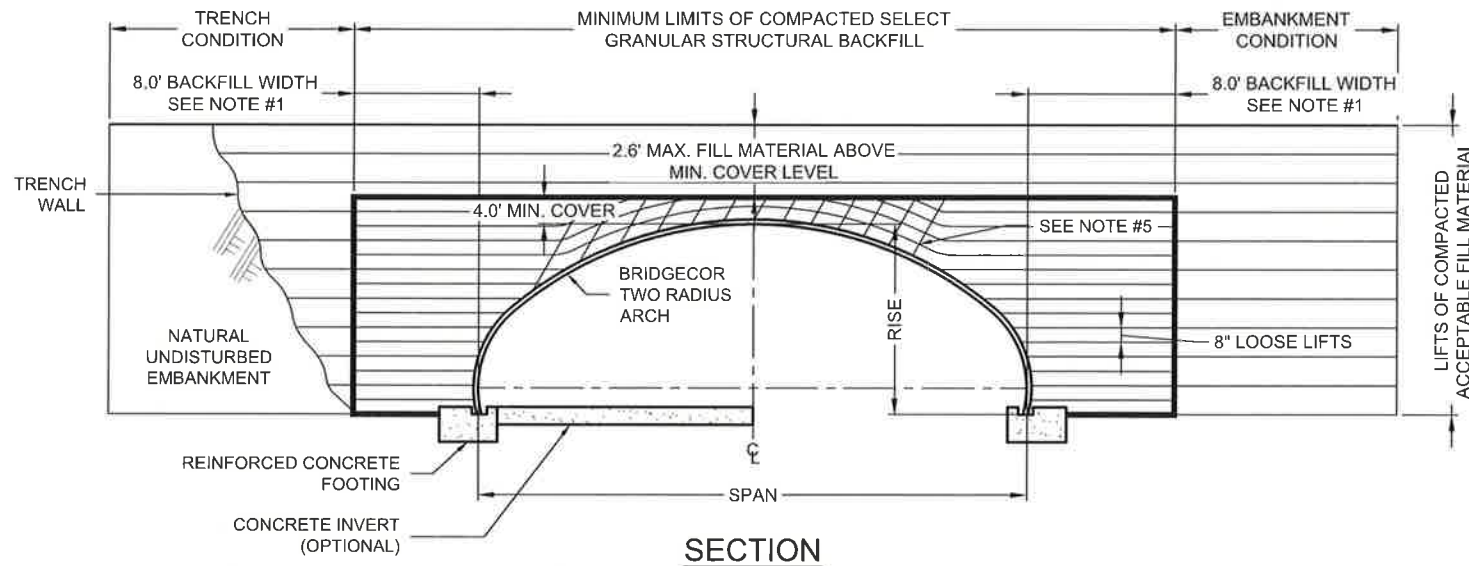
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

BridgeCor
CONTECH
CONTRACT
DRAWING

BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 5		OF 7

I:\MERLIN\PROJECTS\23500\723523\10-BRIDGECOR\DRAWINGS\CONTRACT\PRE\723523-010-BCTRA-CO-NA.DWG 11/3/2022 10:55 AM



-  SELECT GRANULAR STRUCTURAL BACKFILL LIMITS.
-  INITIAL LIFTS OVER THE CROWN OF STRUCTURE AS INDICATED BY SHADED AREA TO BE COMPACTED TO REQUIRED DENSITY WITH HAND OPERATED EQUIPMENT OR WITH LIGHTWEIGHT TRACTOR (D-4 OR LIGHTER) EQUIPMENT.

- NOTES:**
1. MINIMUM SELECT GRANULAR STRUCTURAL BACKFILL WIDTH IS BASED ON AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12 AND/OR THE RESULTS OF THE PROJECT SPECIFIC FINITE ELEMENT ANALYSIS.
 2. ALL SELECT GRANULAR STRUCTURAL BACKFILL TO BE PLACED IN A BALANCED FASHION IN THIN LIFTS (8" LOOSE TYPICALLY) AND COMPACTED TO 90 PERCENT DENSITY PER AASHTO T-180.
 3. MONITORING OF THE TWO RADIUS ARCH STRUCTURE IS REQUIRED DURING THE BACKFILLING PROCESS. THE METHOD, FREQUENCY AND DURATION SHALL BE DETERMINED BASED ON THE SIZE AND SHAPE OF THE STRUCTURE.
 4. PREVENT DISTORTION OF SHAPE AS NECESSARY BY VARYING COMPACTION METHODS AND EQUIPMENT.
 5. PLACE SELECT GRANULAR STRUCTURAL BACKFILL IN RADIAL LIFTS AT APPROXIMATELY 75% OF THE RISE OF THE TWO RADIUS ARCH STRUCTURE.
 6. BECAUSE OF THE FLEXING AND VIBRATION OF THE CROWN PLATES, THE FULL COMPACTION DENSITY LEVELS OFTEN CAN NOT BE ACHIEVED IN THE FIRST SEVERAL INCHES OF FILL OVER THE CROWN.

BASED ON A PROJECT SPECIFIC ANALYSIS GAGE TO BE 8, BACKFILL MATERIAL TO BE A-1, COMPACTED TO 90 % PER AASHTO T-180.

IF OTHER BACKFILL MATERIALS ARE TO BE EVALUATED, CONTACT YOUR LOCAL CONTECH REPRESENTATIVE.

ADDITIONAL SELECT GRANULAR STRUCTURAL BACKFILL NOTES:

SATISFACTORY BACKFILL MATERIAL, PROPER PLACEMENT, AND COMPACTION ARE KEY FACTORS IN OBTAINING MAXIMUM STRENGTH AND STABILITY.

THE BACKFILL MATERIAL SHOULD BE FREE OF ROCKS, FROZEN LUMPS, AND FOREIGN MATERIAL THAT COULD CAUSE HARD SPOTS OR DECOMPOSE TO CREATE VOIDS. BACKFILL MATERIAL SHOULD BE WELL GRADED GRANULAR MATERIAL THAT MEETS THE REQUIREMENTS OF THE PROJECT SPECIFIC ANALYSIS NOTED BELOW. REFERENCE THE STRUCTURAL PLATE BACKFILL GROUP CLASSIFICATION TABLE ON THIS SHEET. RECYCLED CONCRETE/SLAG ARE NOT RECOMMENDED FOR STRUCTURAL BACKFILL MATERIAL. BACKFILL MUST BE PLACED SYMMETRICALLY ON EACH SIDE OF THE STRUCTURE IN 8" LOOSE LIFTS. EACH LIFT IS TO BE COMPACTED TO THE SPECIFIED DENSITY.

A HIGH PERCENTAGE OF SILT OR FINE SAND IN THE NATIVE SOILS SUGGESTS THE NEED FOR A WELL GRADED GRANULAR BACKFILL MATERIAL TO PREVENT SOIL MIGRATION. IF THE PROPOSED BACKFILL IS NOT A WELL GRADED GRANULAR MATERIAL, A NON-WOVEN GEOTEXTILE FILTER FABRIC SHALL BE PLACED BETWEEN THE SELECT BACKFILL AND THE IN SITU MATERIAL.

DURING BACKFILL, ONLY LIGHTWEIGHT TRACKED VEHICLES (D-4 OR LIGHTER) SHOULD BE NEAR THE STRUCTURE AS FILL PROGRESSES ABOVE THE CROWN AND TO THE FINISHED GRADE. THE ENGINEER AND CONTRACTOR ARE CAUTIONED THAT THE MINIMUM COVER MAY NEED TO BE INCREASED TO HANDLE TEMPORARY CONSTRUCTION VEHICLE LOADS (HEAVIER THAN D-4).

STRUCTURAL PLATE BACKFILL GROUP CLASSIFICATION, REFERENCE AASHTO M-145		
GROUP CLASSIFICATION	A-1-a	A-1-b
Sieve Analysis Percent Passing		
No. 10 (2.000 mm)	50 max.	----
No. 40 (0.425 mm)	30 max.	50 max.
No. 200 (0.075 mm)	15 max.	25 max.
Atterberg Limits for Fraction Passing No. 40 (0.425 mm)		
Liquid Limits	----	----
Plasticity Index	6 max.	6 max.
Usual Materials	Stone Fragment, Gravel and Sand	

*Modified from AASHTO M-145.
 Fine beach sands, windblown sands, stream deposited sands, etc., exhibiting fine, rounded particles and typically classified by AASHTO M-145 as A-3 Materials should not be used.

If 95% Compaction per AASHTO T-180 is specified, the backfill material shall be a A-1-a.

Reference the most current version of ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System), for comparable soil groups.

FOR APPROVAL



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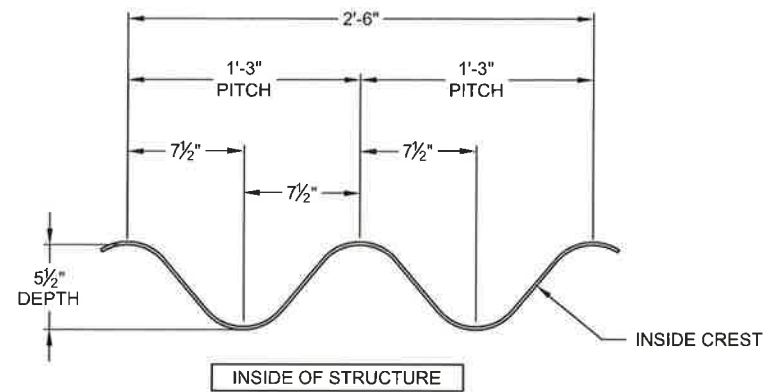
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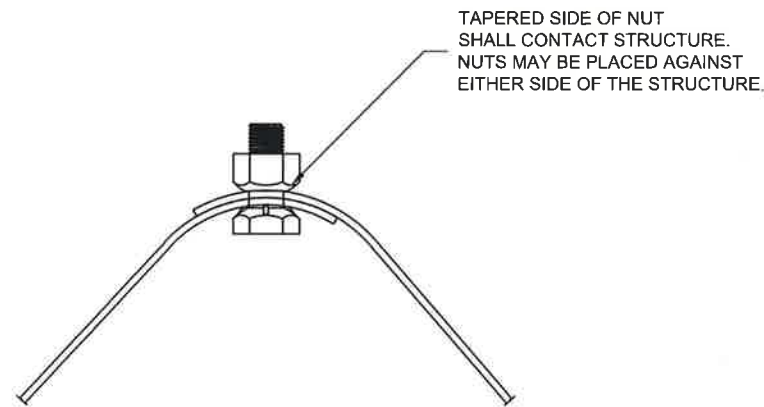
CONTECH
 CONTRACT
 DRAWING

BRIDGECOR TWO RADIUS ARCH
 31'-11" MAX. SPAN X 11'-8" RISE
 ARROYA CROSSING TIMBER RIDGE
 COLORADO SPRINGS, CO

PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 6 OF 7		



BRIDGECOR CORRUGATION PROFILE



TYPICAL BOLTING DETAIL

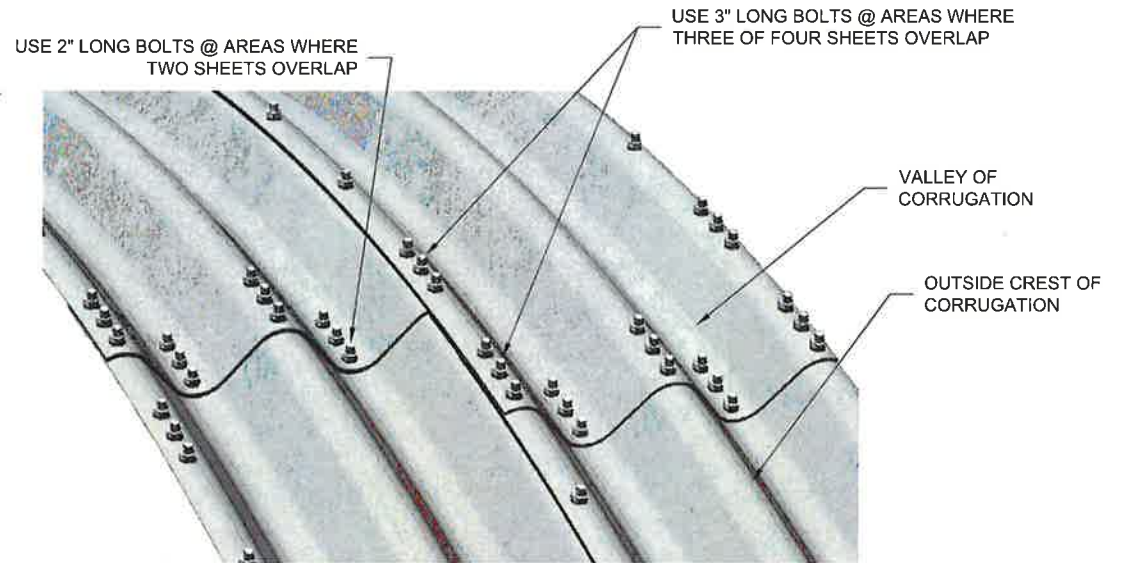
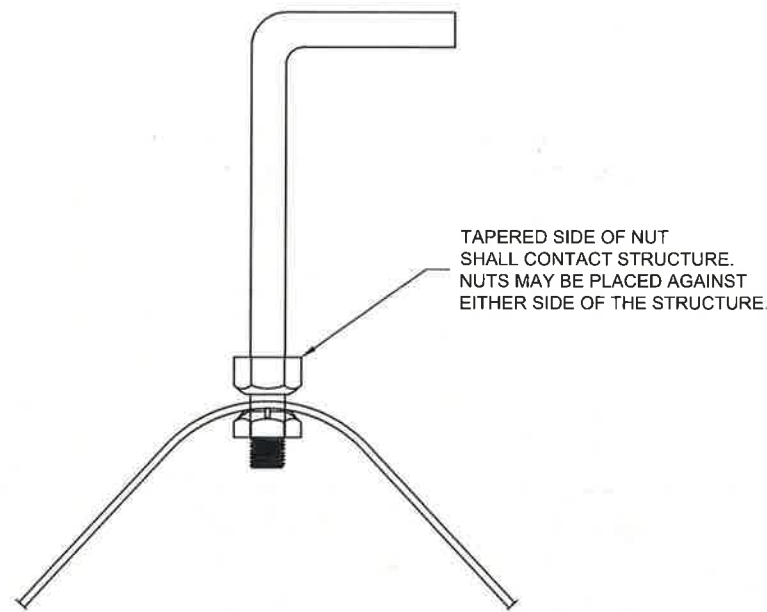


PLATE LAP DETAIL



ANCHOR BOLT BOLTING DETAILS

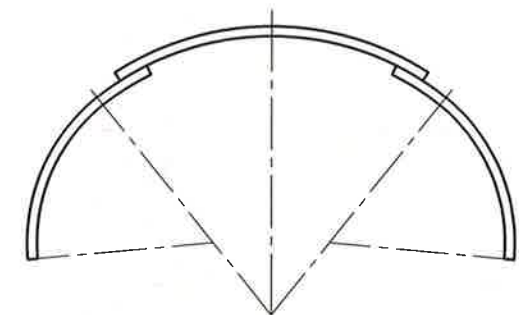
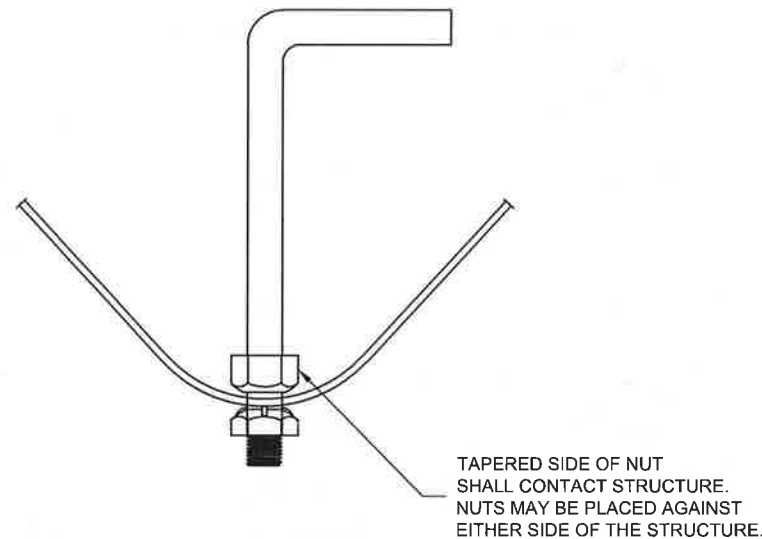


PLATE LAPPING DETAIL (LOOKING DOWNSTREAM)



FOR APPROVAL

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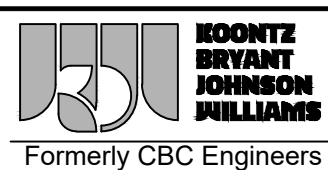
BRIDGECOR TWO RADIUS ARCH
31'-11" MAX. SPAN X 11'-8" RISE
ARROYA CROSSING TIMBER RIDGE
COLORADO SPRINGS, CO

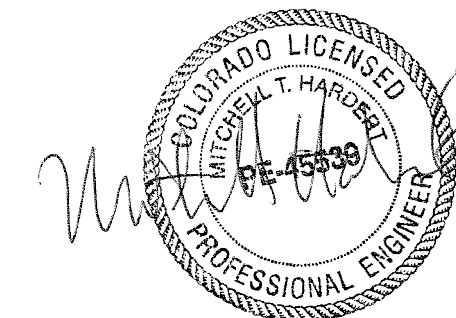
PROJECT No.: 723523	SEQ. No.: 010	DATE: 11/3/2022
DESIGNED: XXX	DRAWN: SCC	
CHECKED: EDE	APPROVED: XXX	
SHEET NO.: 7 OF 7		

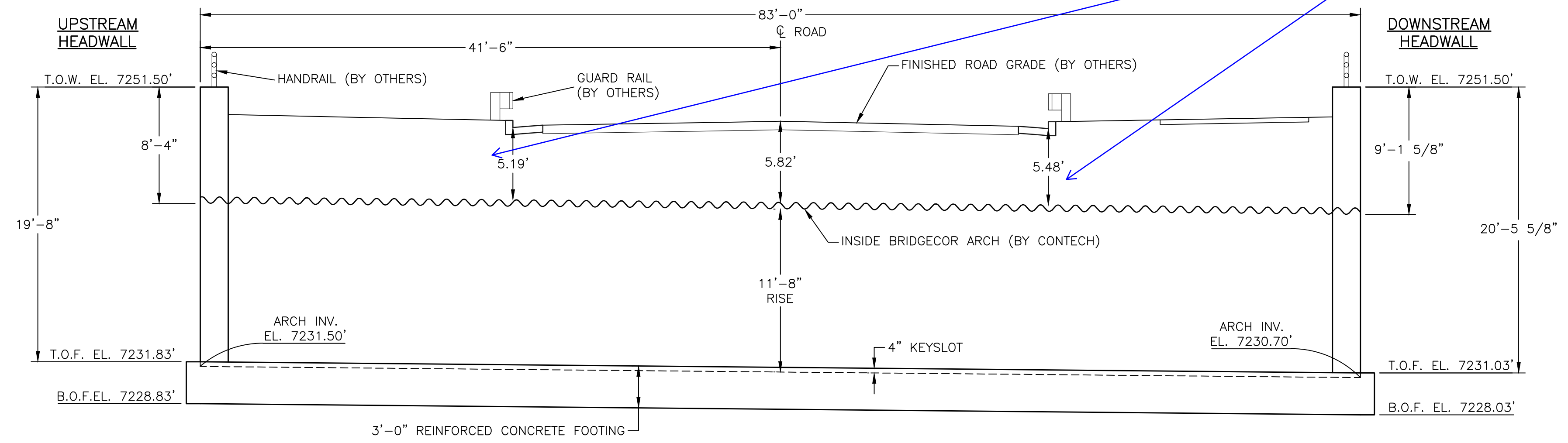
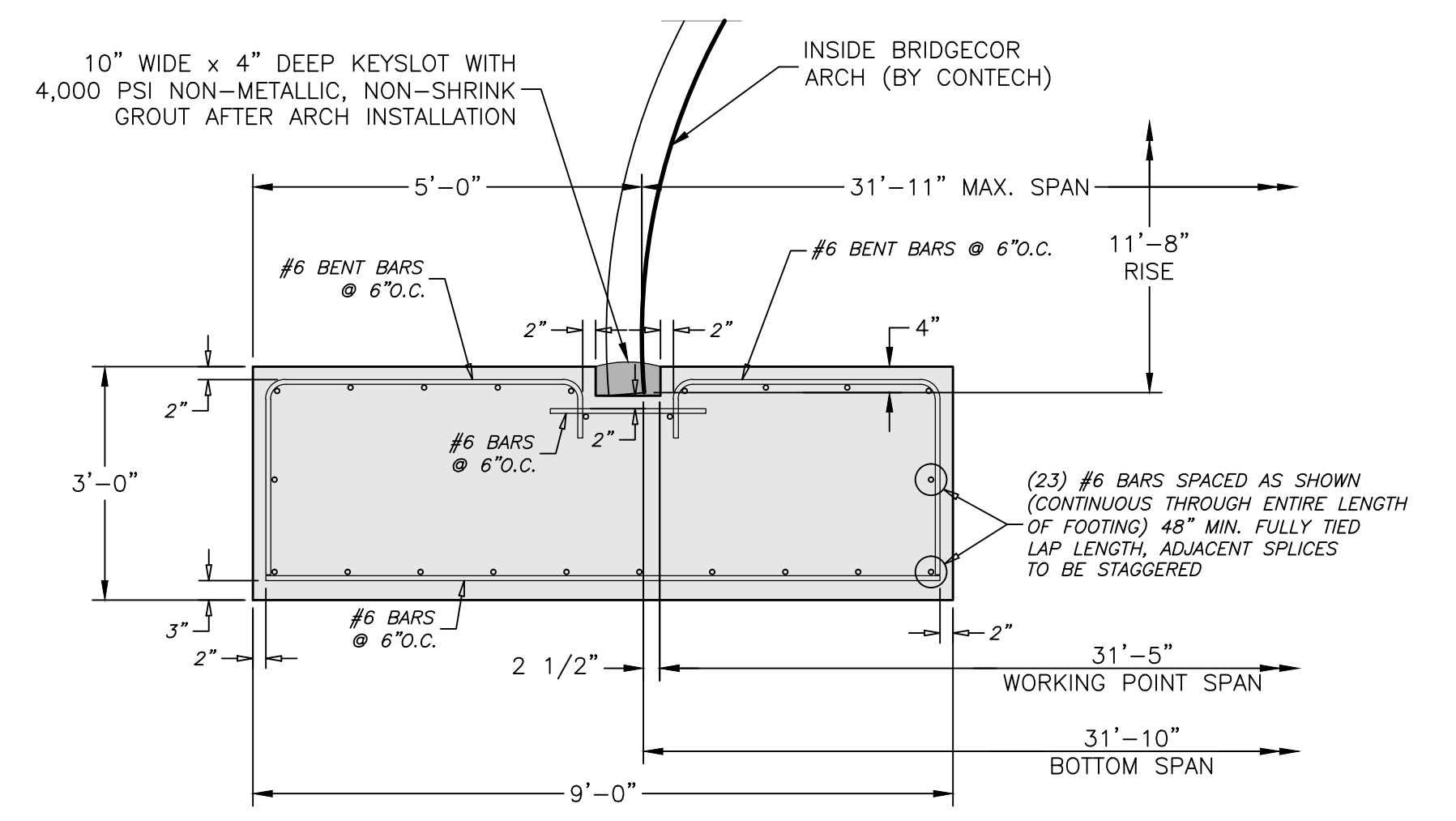
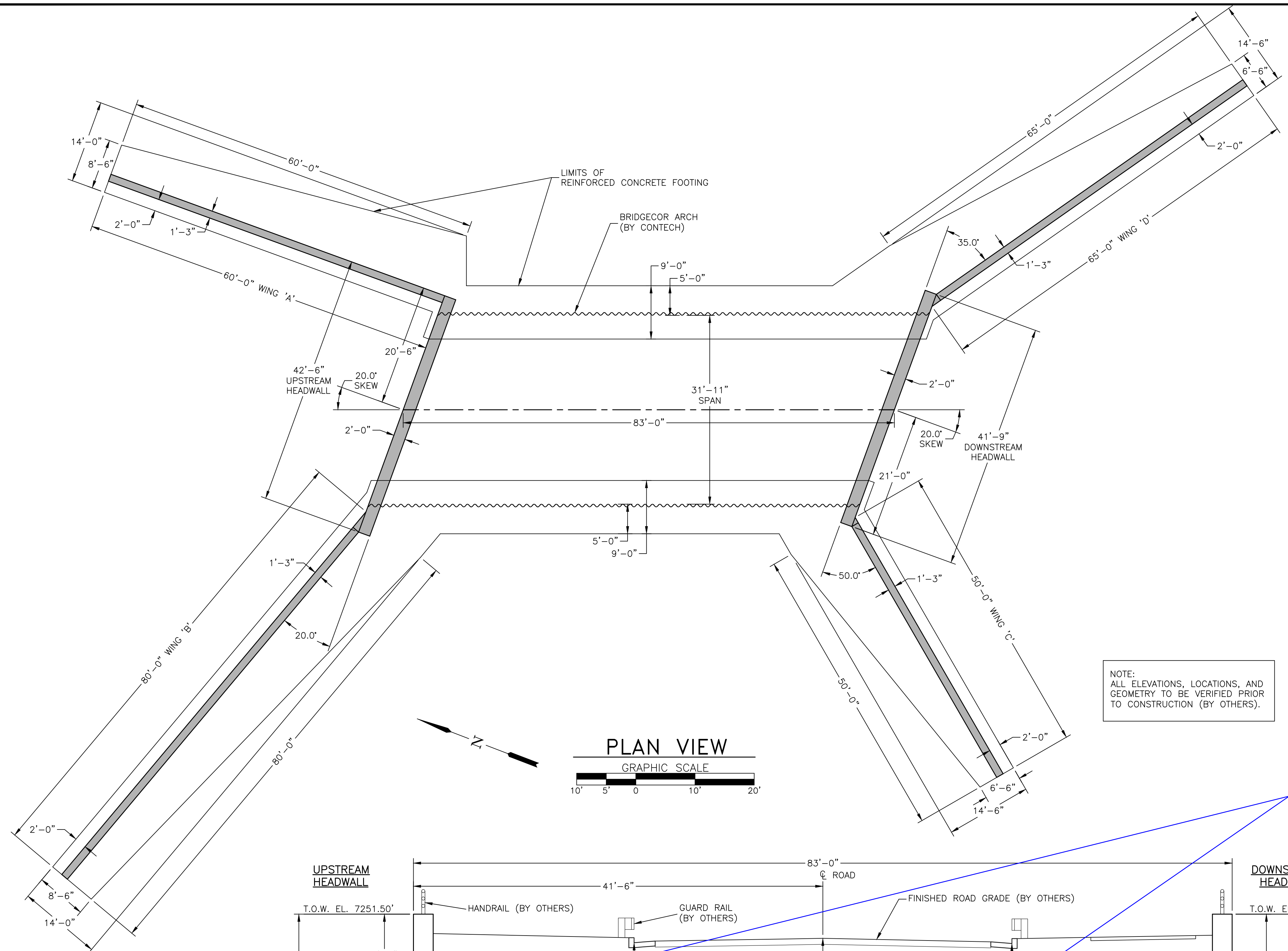
CONTECH ENGINEERED SOLUTIONS, LLC

Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado

INDEX	
1.	TITLE SHEET / INDEX
2.	PLAN, PROFILE, & FOOTING SECTIONS
3.	END ELEVATION VIEWS
4.	UPSTREAM HEADWALL DETAILS
5.	DOWNSTREAM HEADWALL DETAILS
6.	TYPICAL WINGWALL DETAILS
7.	SPECIFICATIONS

			
TITLE SHEET / INDEX			
Drawn By	Date	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado	
D.J.H.	11/9/22		
Approved By	Date	Project No.	Rev.
		KB.J.W.-25353	-
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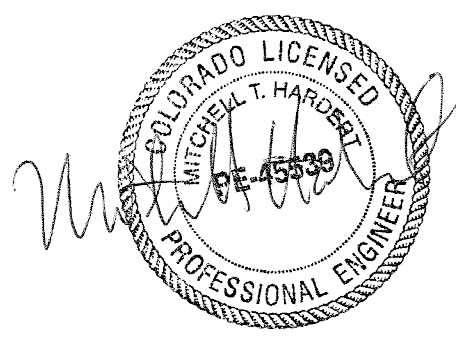




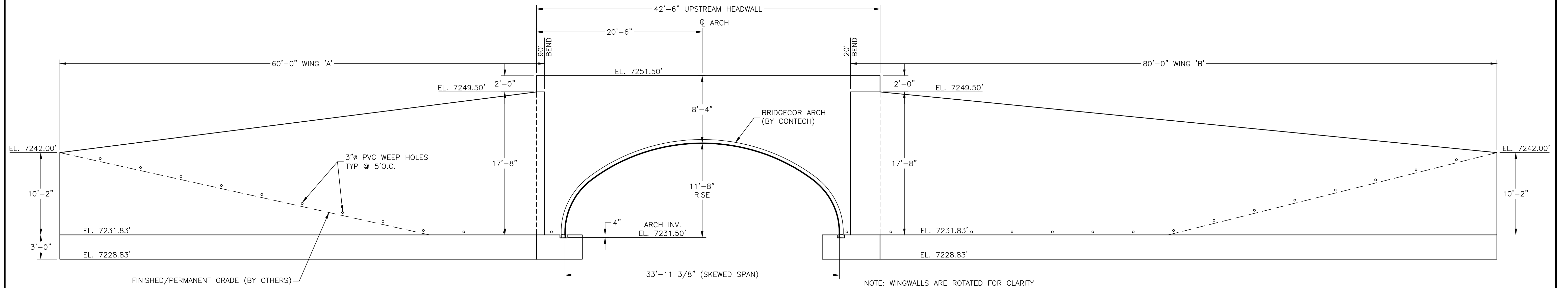
- NOTES:
- 1.) CONCRETE SHALL BE $f'c = 4,000$ psi.
 - 2.) ALL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60.
 - 3.) FOOTING IS DESIGNED FOR A 4,000 psf ALLOWABLE BEARING CAPACITY. THIS VALUE MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
 - 4.) SCOUR IS NOT ADDRESSED HEREIN AND IS THE RESPONSIBILITY OF OTHERS THAN KBJW.

Show utility crossings

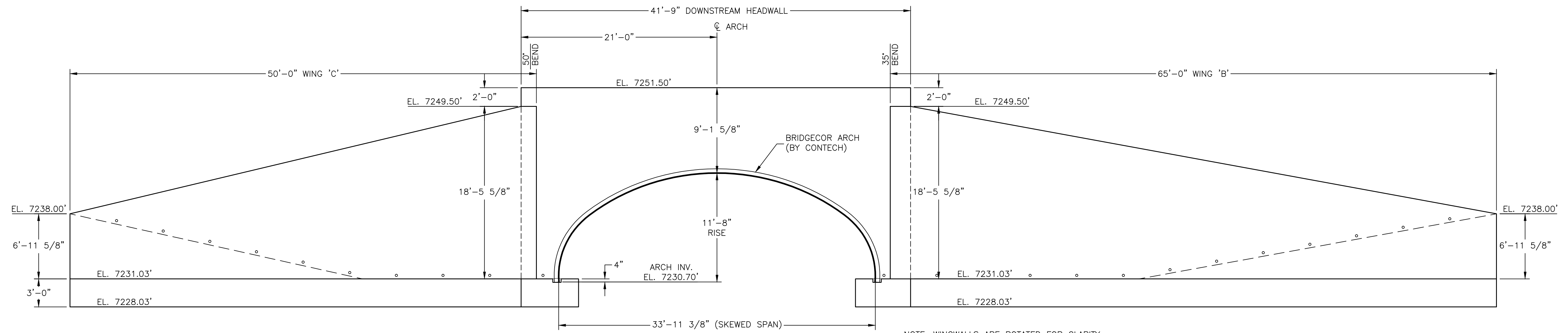
on sandstone per SSI



		PLAN, PROFILE & FOOTING SECTION	
		Drawn By: DJH Date: 11/9/22	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado
Approved By: [Signature] Date:	Project No.: KBJW-25353	Rev.: -	Sheet: 2 OF 7
Scale: GRAPHIC	Project No.: KBJW-25353	Rev.: -	Sheet: 2 OF 7



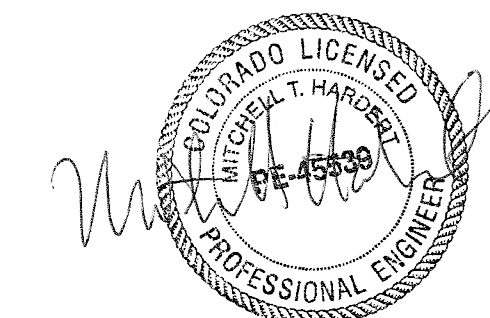
UPSTREAM END ELEVATION VIEW

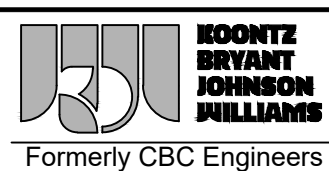


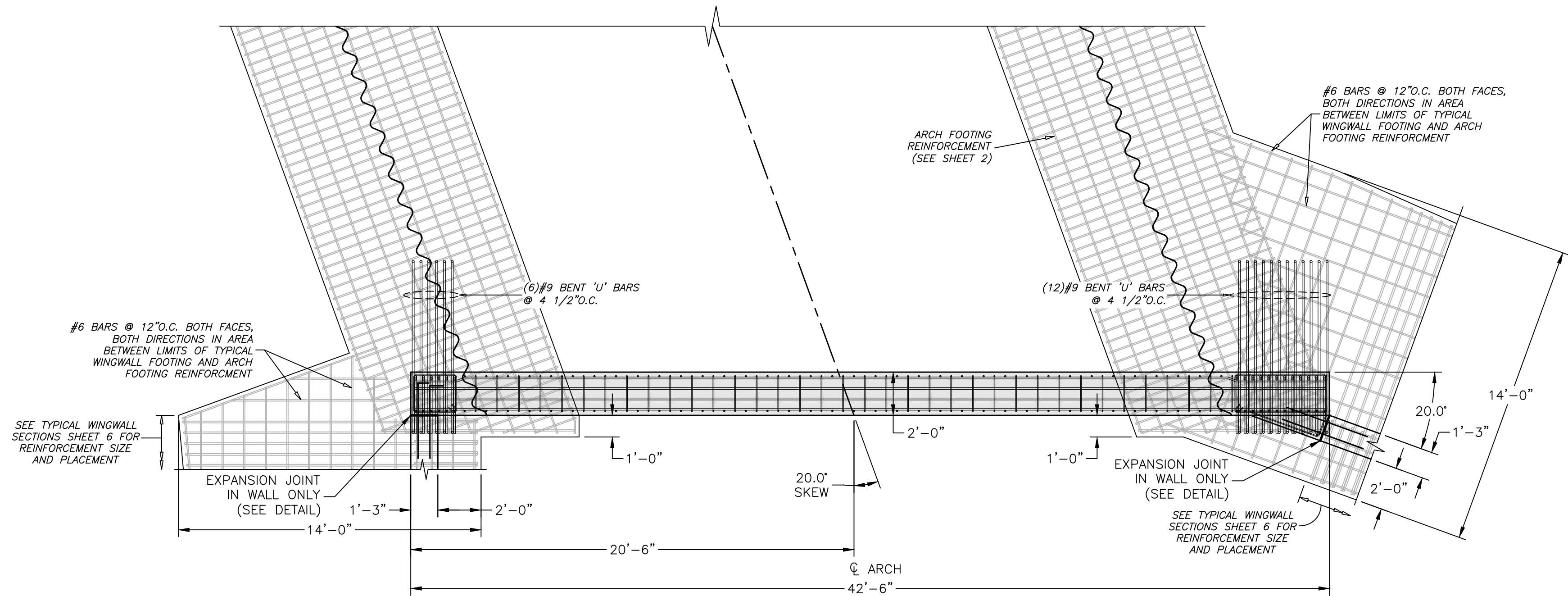
DOWNSTREAM END ELEVATION VIEW



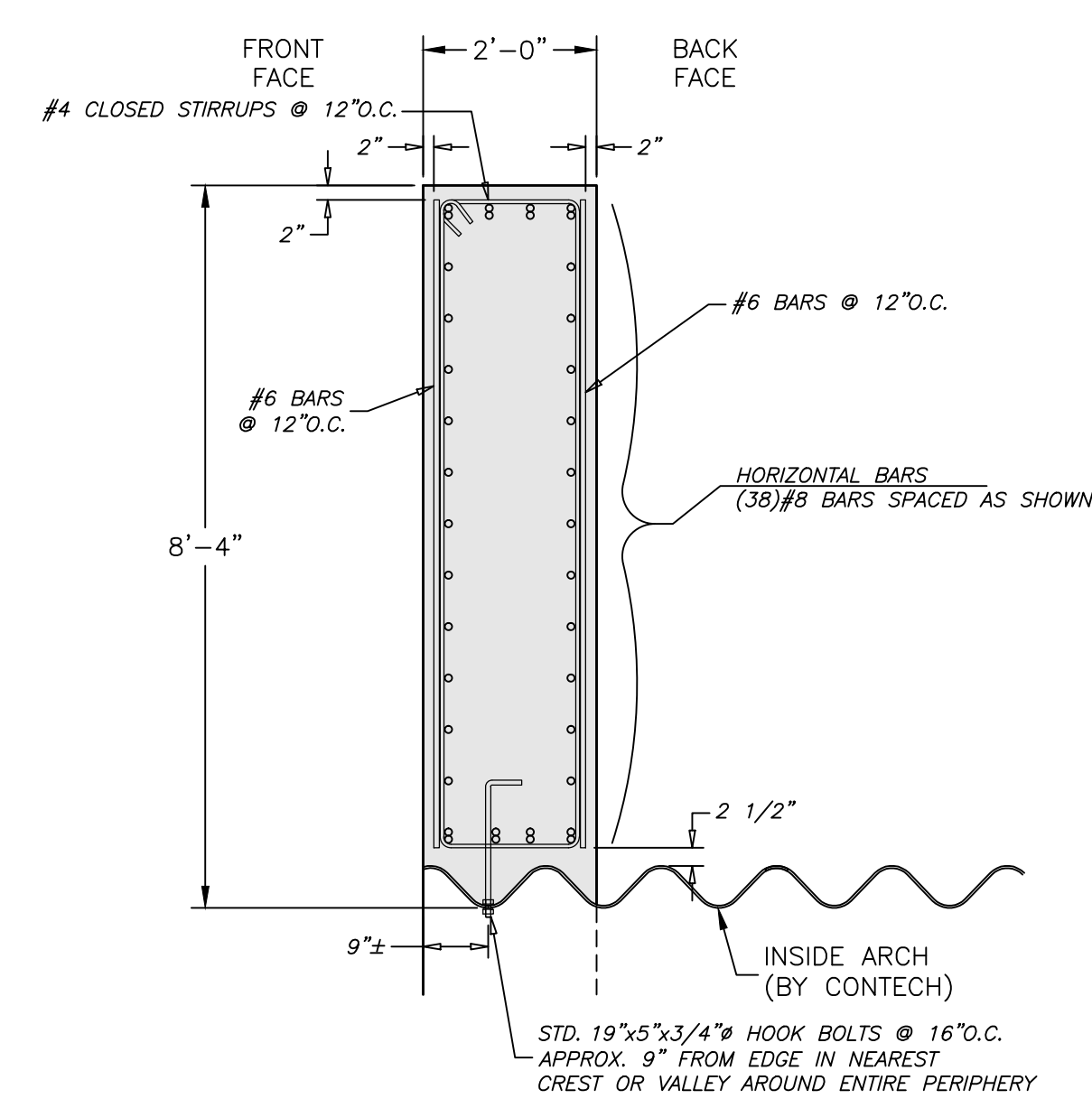
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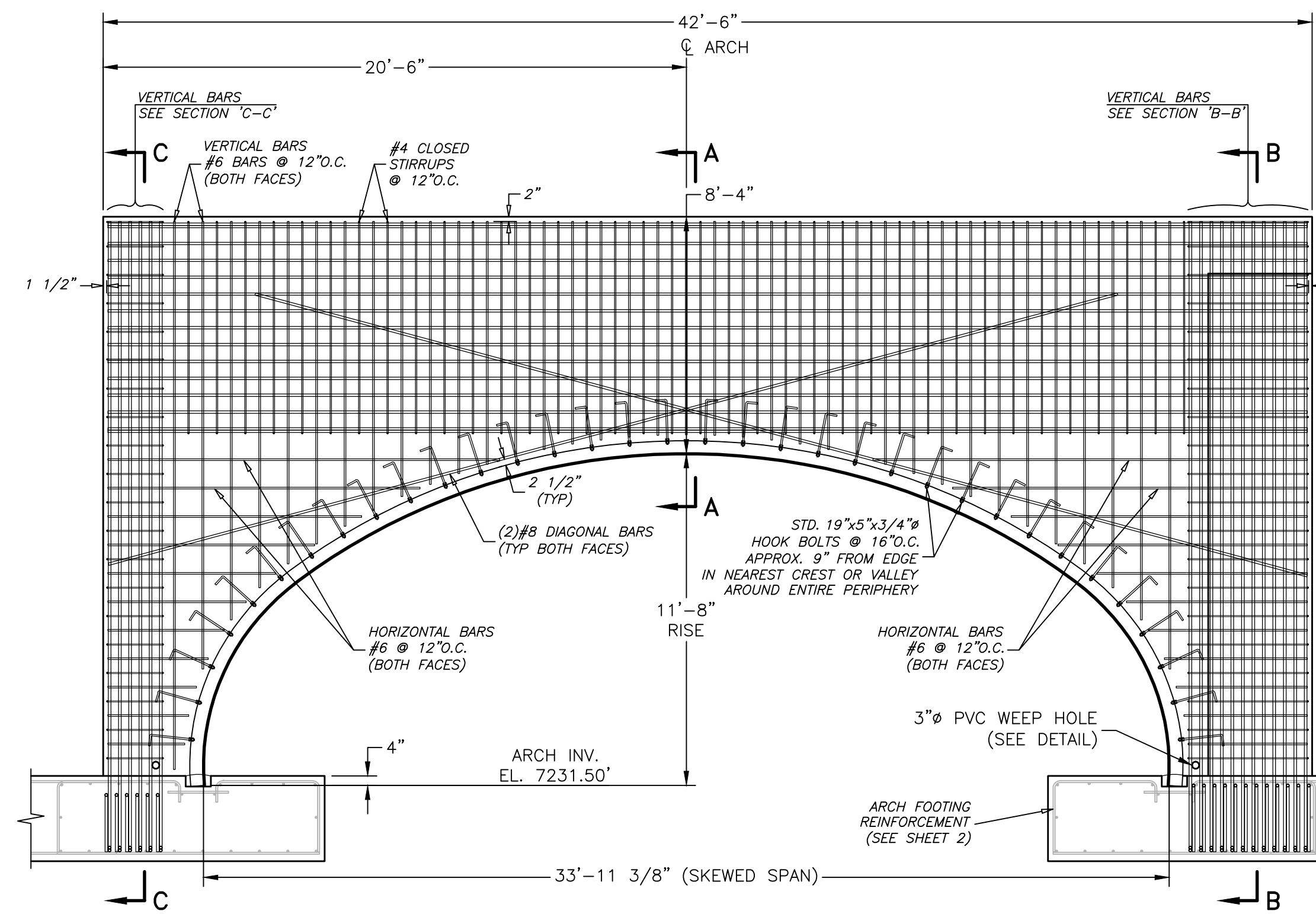
 KBJW Formerly CBC Engineers					
END ELEVATION VIEWS					
Drawn By	DJH	Date	11/9/22	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado	
Approved By		Date		Project No.	KBW-25353
Scale	GRAPHIC	Rev.	-	Sheet	3 OF 7



PLAN VIEW

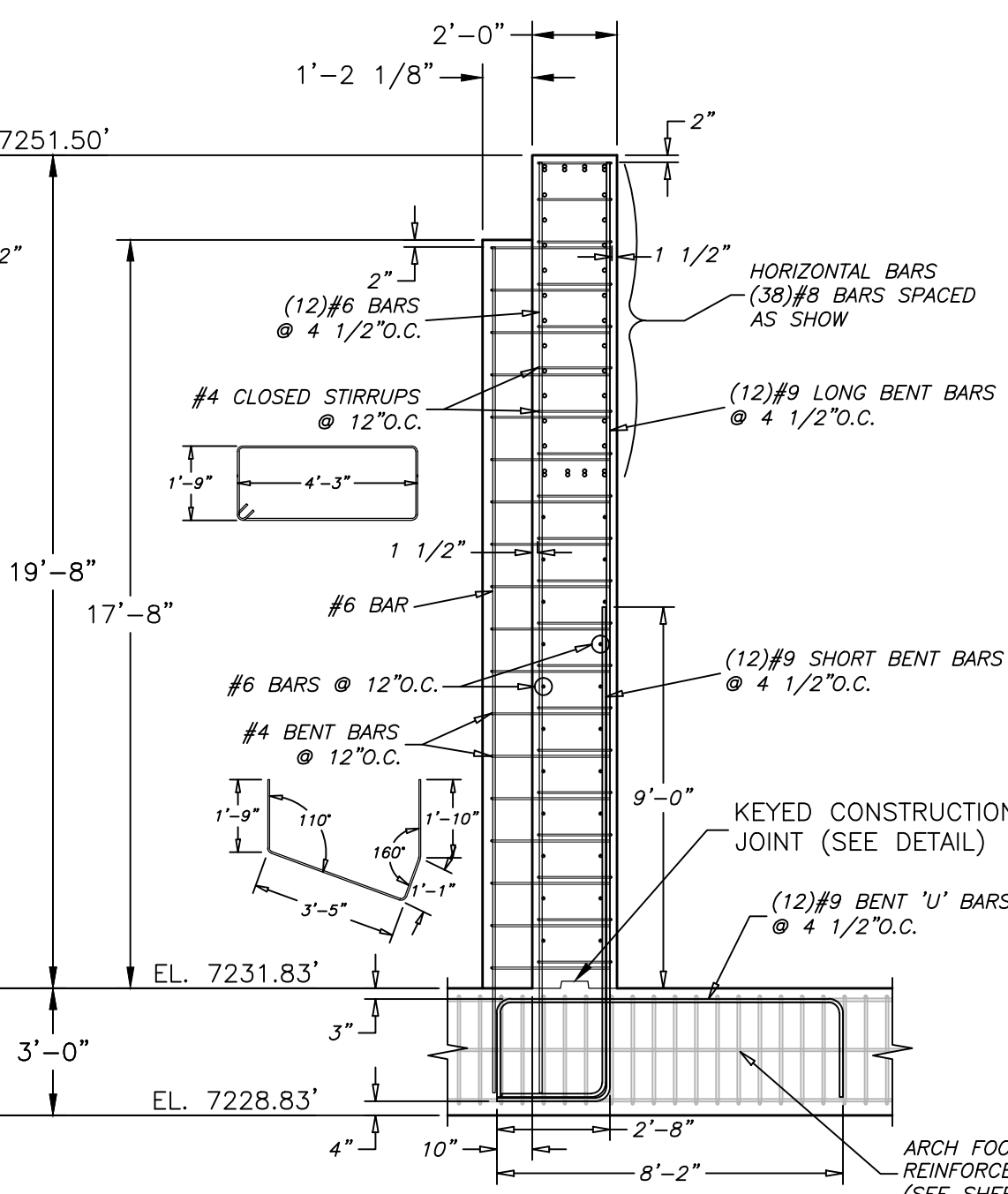


SECTION 'A-A'

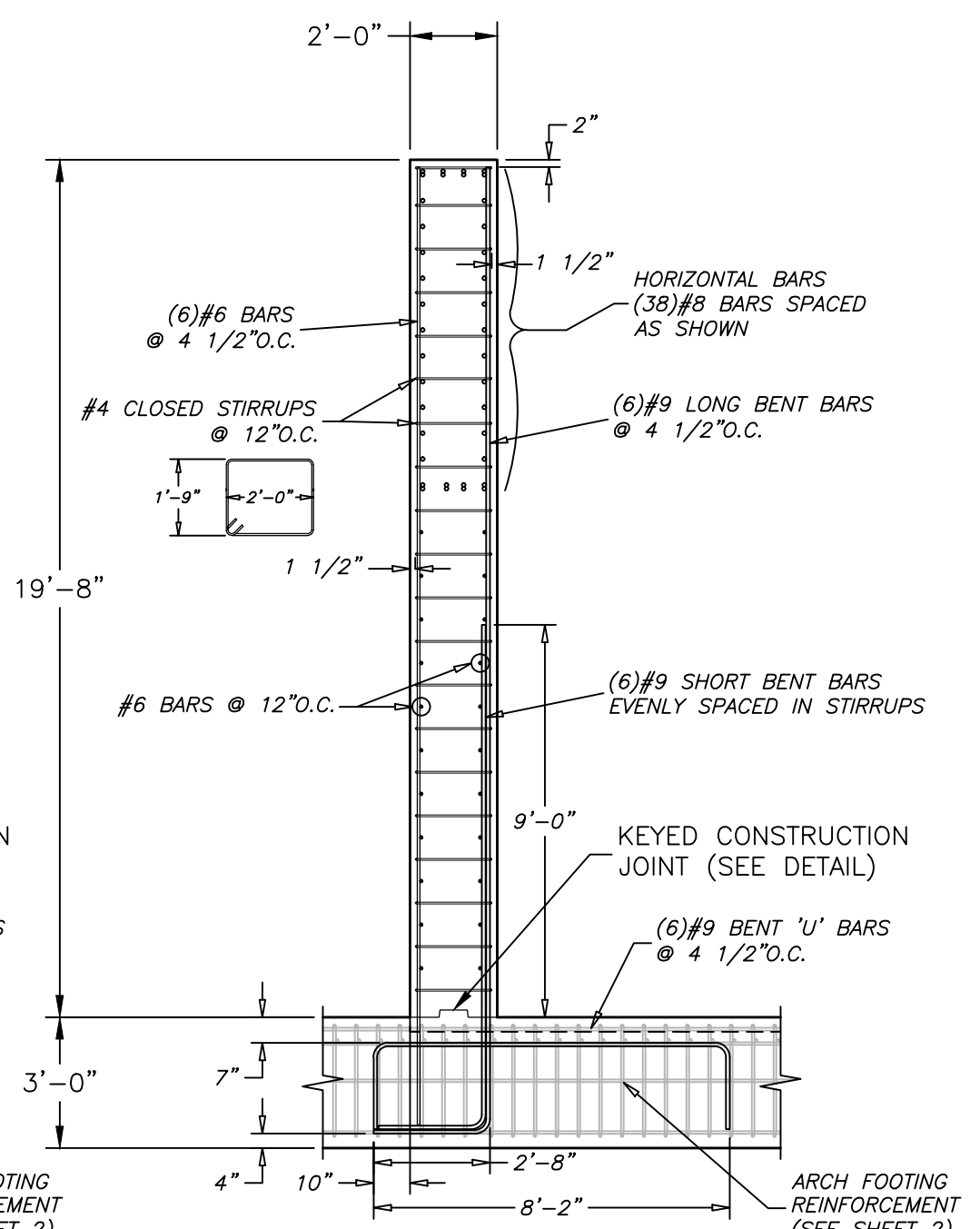


ELEVATION VIEW

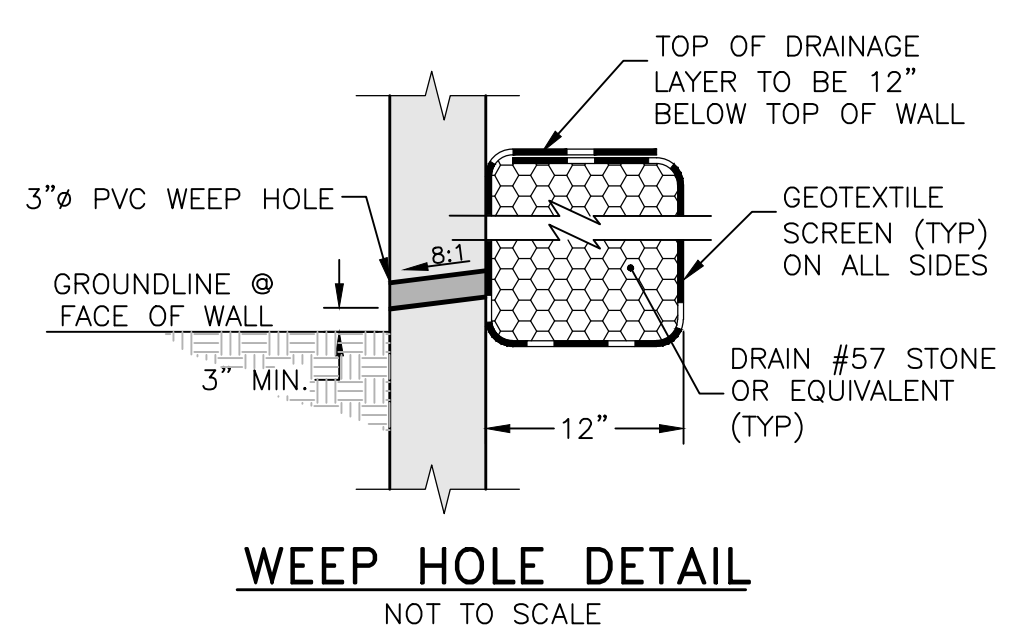
UPSTREAM HEADWALL DETAILS



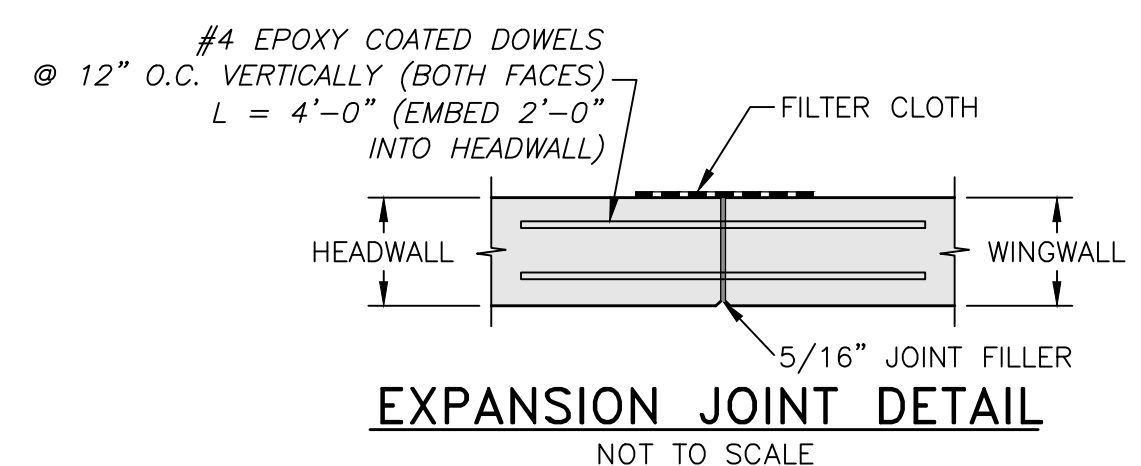
SECTION 'B-B'



SECTION 'C-C'

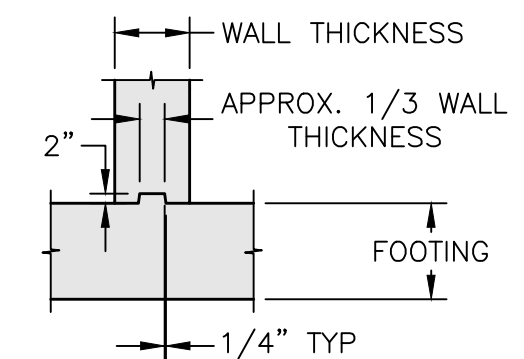


WEEP HOLE DETAIL



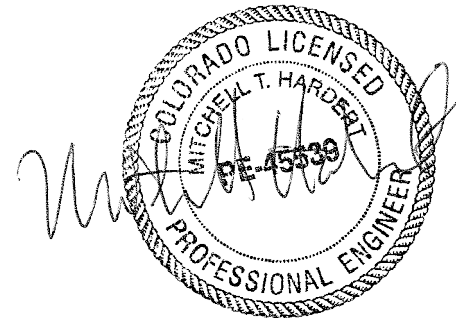
EXPANSION JOINT DETAIL

NOTES FOR EXPANSION JOINT:
A FILTER CLOTH THREE FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE APPLIED TO ALL TRANSVERSE JOINTS IN THE FOOTING AND WALLS. THE MATERIAL SHALL BE CENTERED ON THE JOINT AND THE EDGES SEALED WITH A MASTIC OR WITH TWO SIDED TAPE. THE FILTER CLOTH SHALL BE A GEOTEXTILE MEETING THE APPROVAL OF THE ENGINEER.

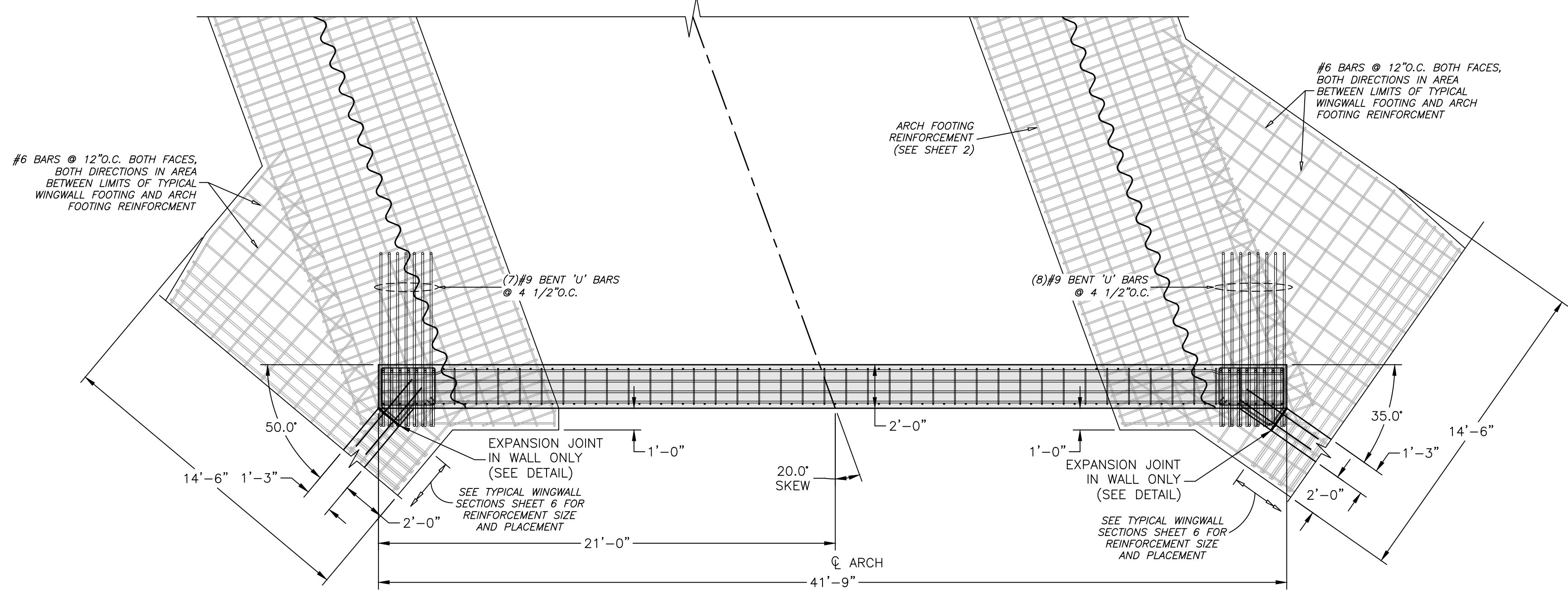


KEYED CONSTRUCTION JOINT DETAIL

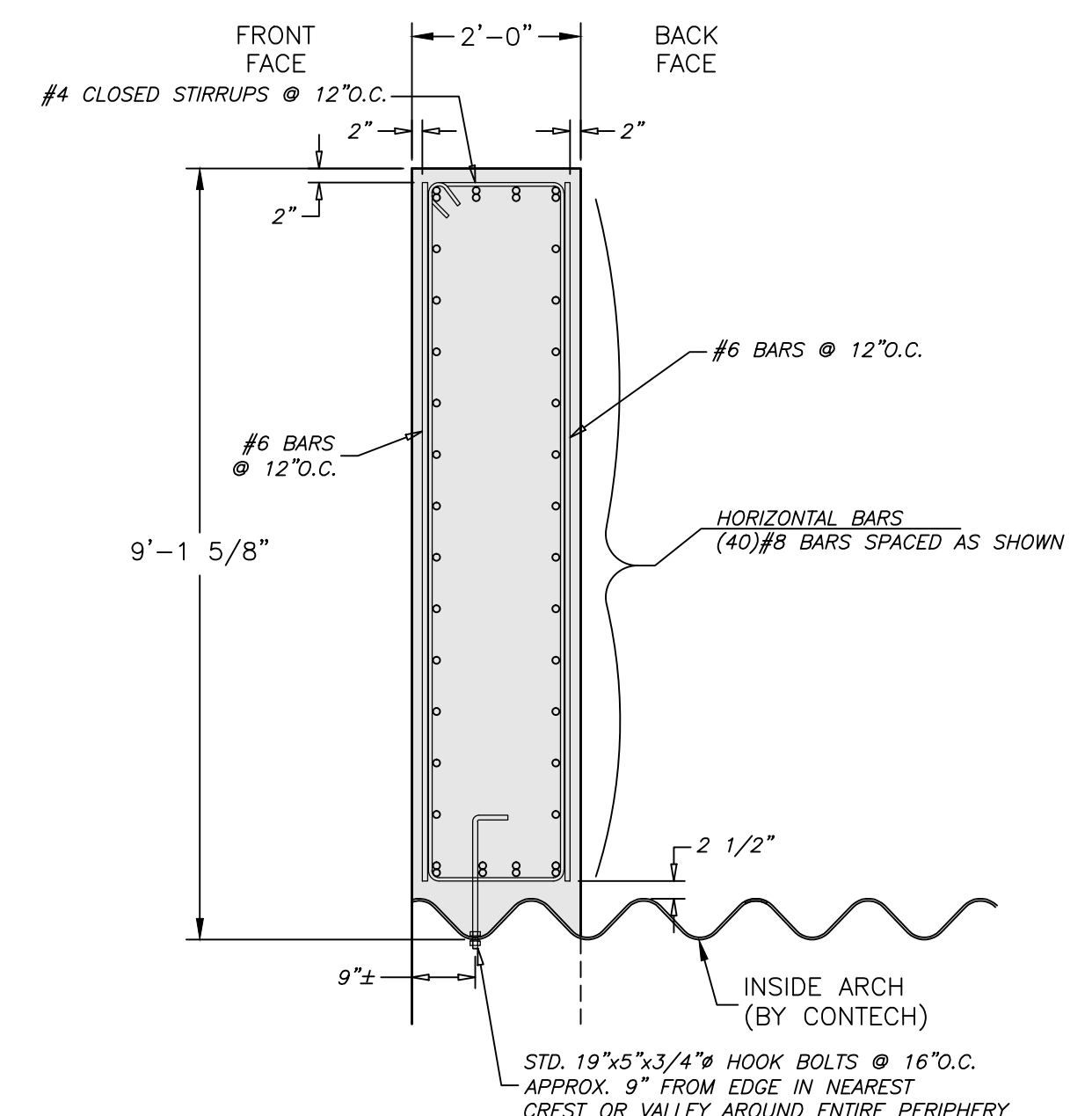
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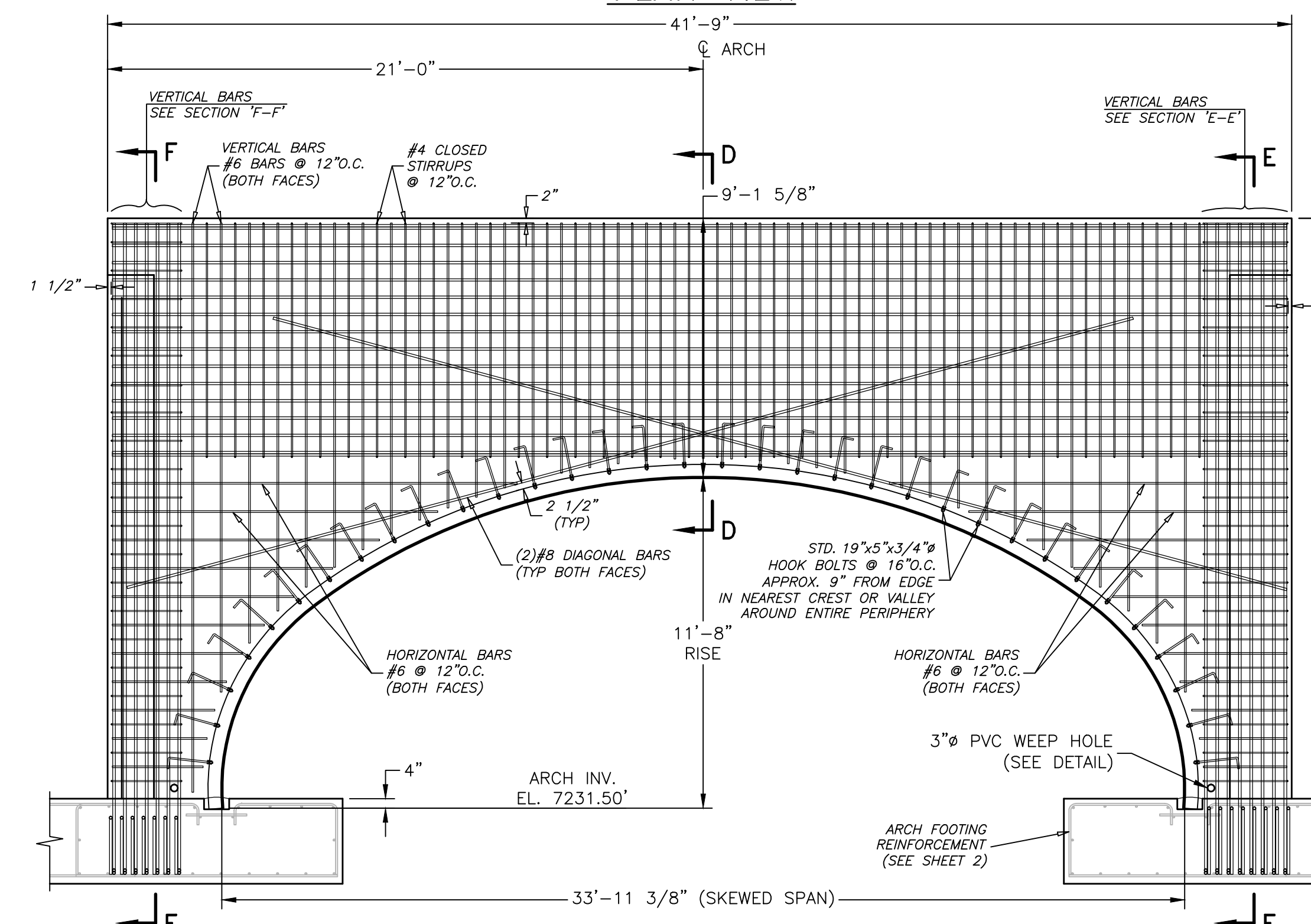
UPSTREAM HEADWALL DETAILS			
Drawn By DJH	Date 11/9/22	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado	
Approved By 	Date 	Scale GRAPHIC	Project No. KBW-25353
		Rev. 	Sheet 4 OF 7



PLAN VIEW

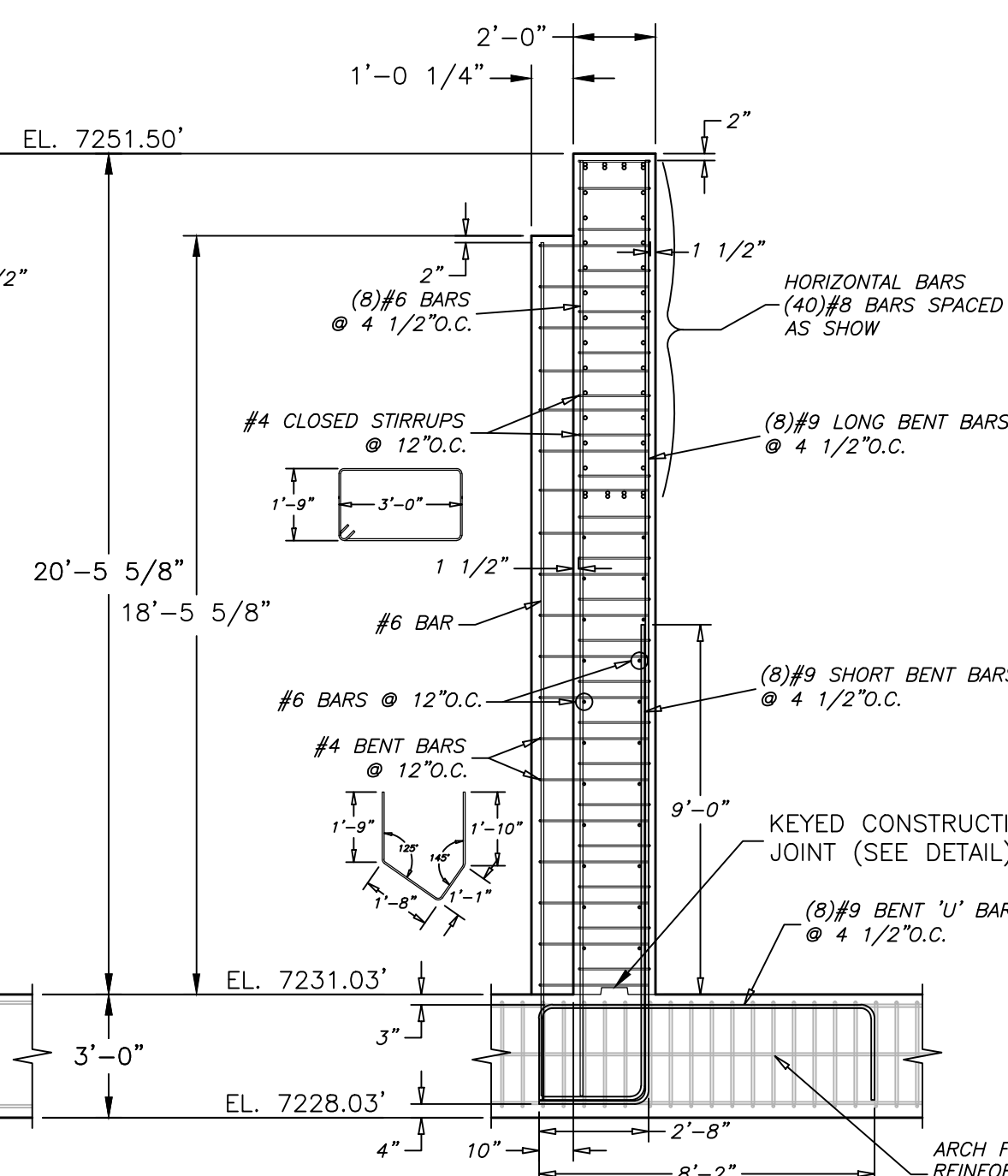


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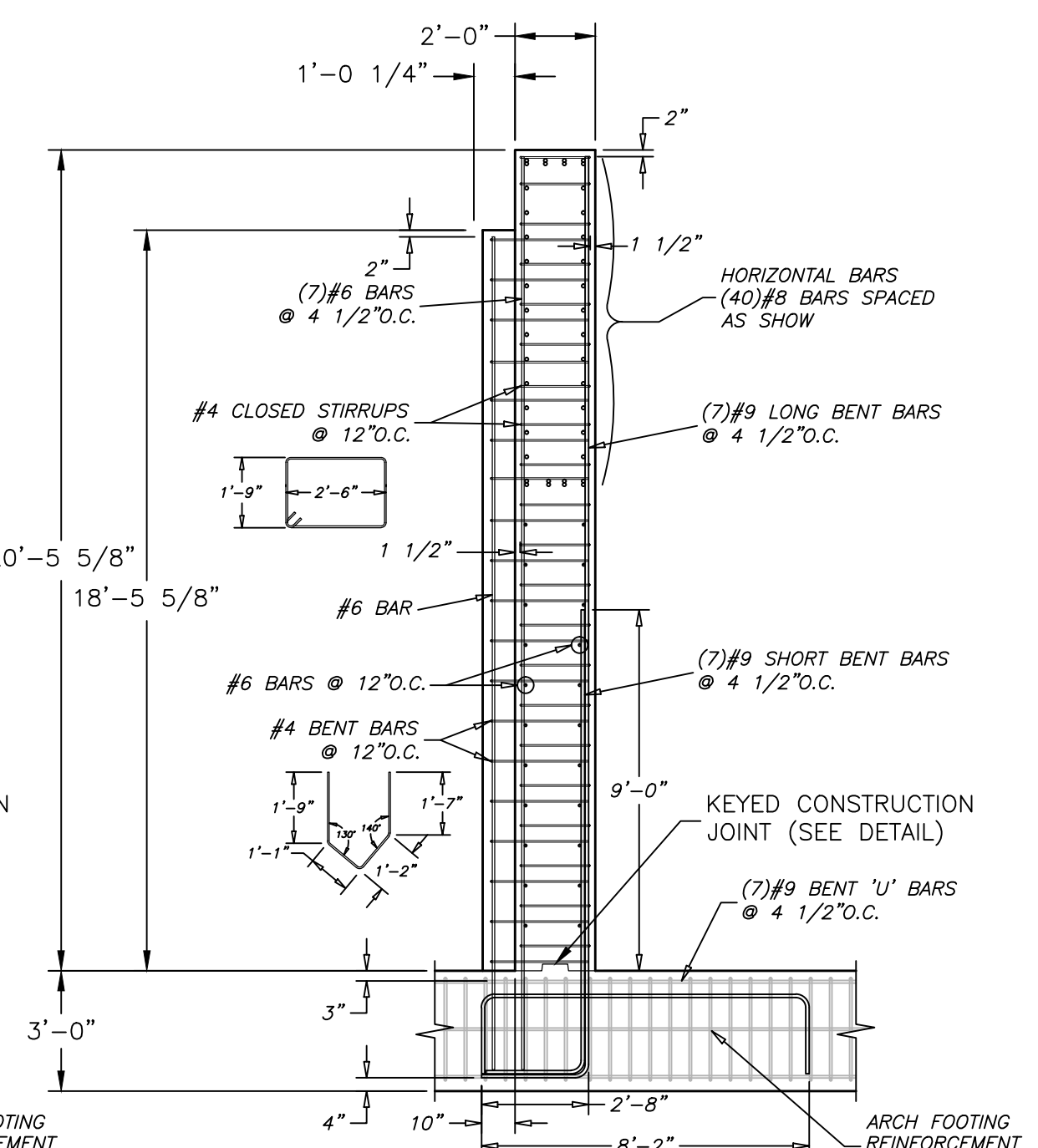


ELEVATION VIEW

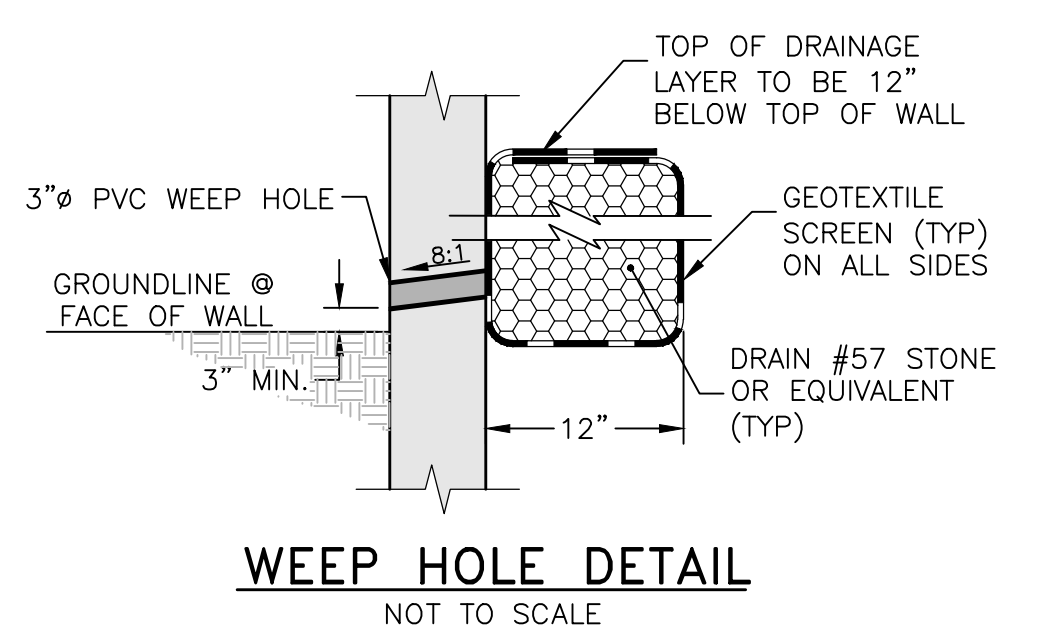
DOWNSTREAM HEADWALL DETAILS



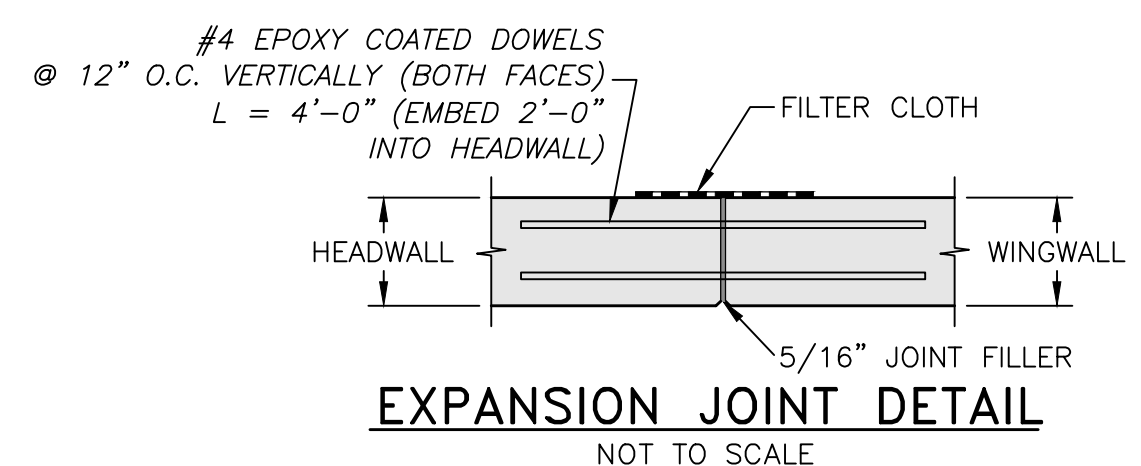
SECTION 'E-E'



SECTION 'F-F'



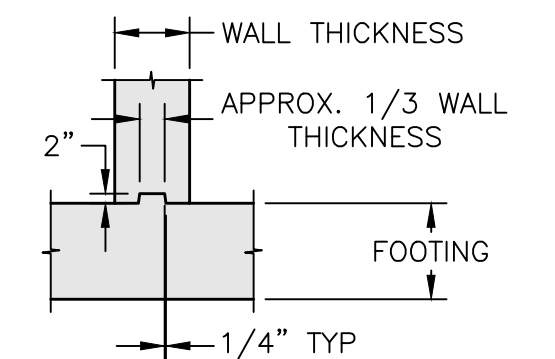
WEEP HOLE DETAIL



EXPANSION JOINT DETAIL

NOT TO SCALE

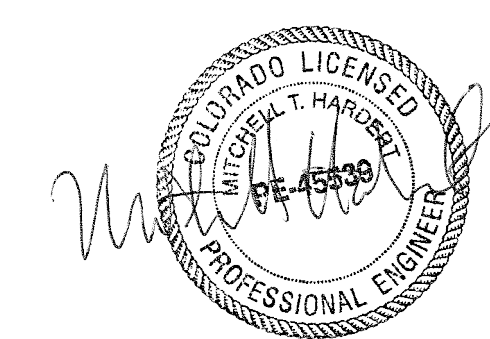
NOTES FOR EXPANSION JOINT:
A FILTER CLOTH THREE FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE APPLIED TO ALL TRANSVERSE JOINTS IN THE FOOTING AND WALLS. THE MATERIAL SHALL BE CENTERED ON THE JOINT AND THE EDGES SEALED WITH A MASTIC OR WITH TWO SIDED TAPE. THE FILTER CLOTH SHALL BE A GEOTEXTILE MEETING THE APPROVAL OF THE ENGINEER.



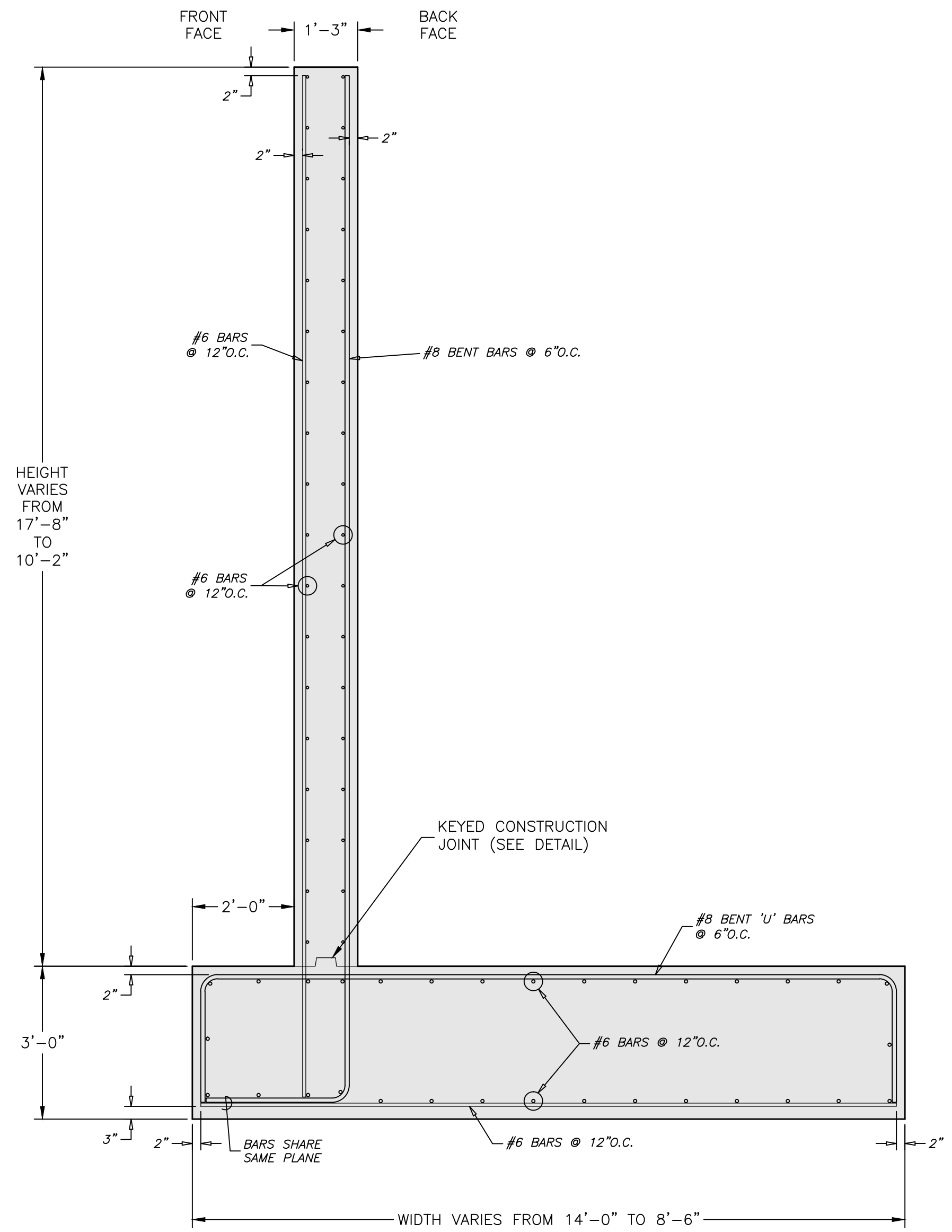
KEYED CONSTRUCTION JOINT DETAIL

NOT TO SCALE

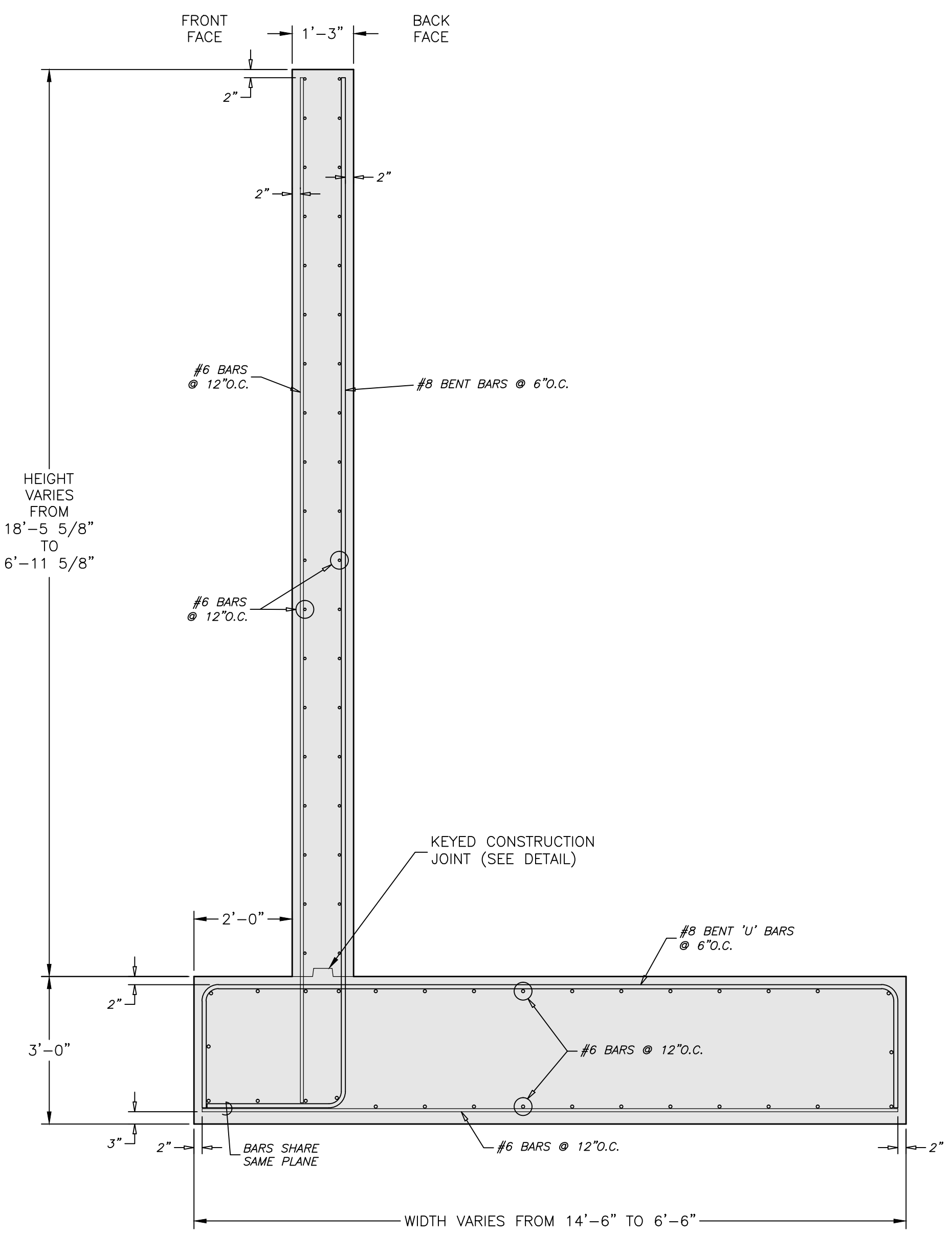
- NOTES:**
- 1.) CONCRETE SHALL BE f'c = 4,000 psi.
 - 2.) ALL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60.
 - 3.) FOOTING IS DESIGNED FOR A 4,000 psf ALLOWABLE BEARING CAPACITY. THIS VALUE MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
 - 4.) SCOUR IS NOT ADDRESSED HEREIN AND IS THE RESPONSIBILITY OF OTHERS THAN KBJW.



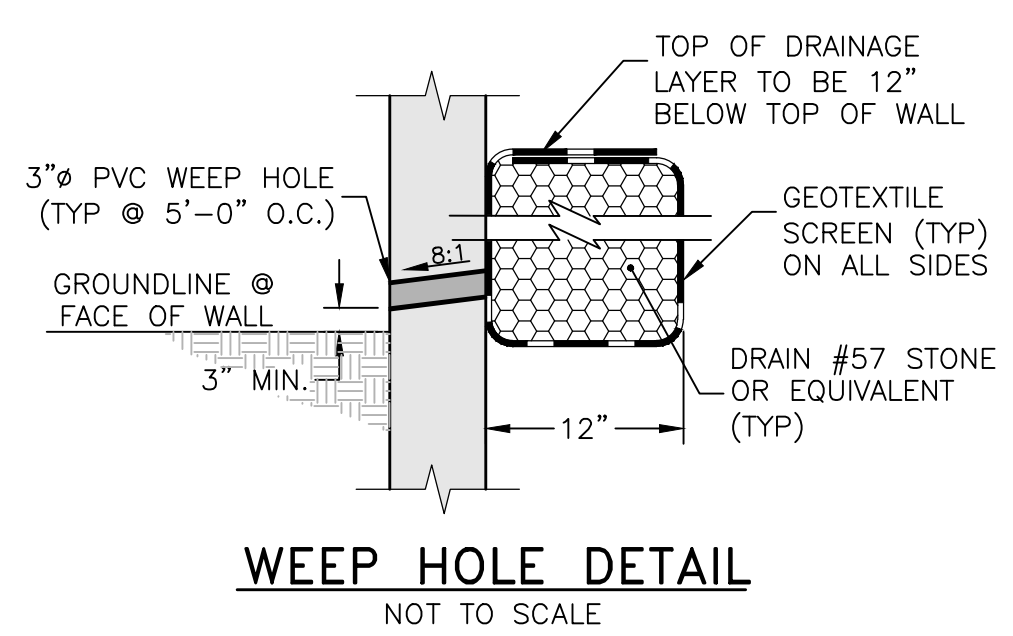
		DOWNSTREAM HEADWALL DETAILS	
Drawn By: DJH	Date: 11/9/22	Rev.	Sheet: 5 OF 7
Approved By:	Date:	Scale: GRAPHIC	Project No. KBJW-25353



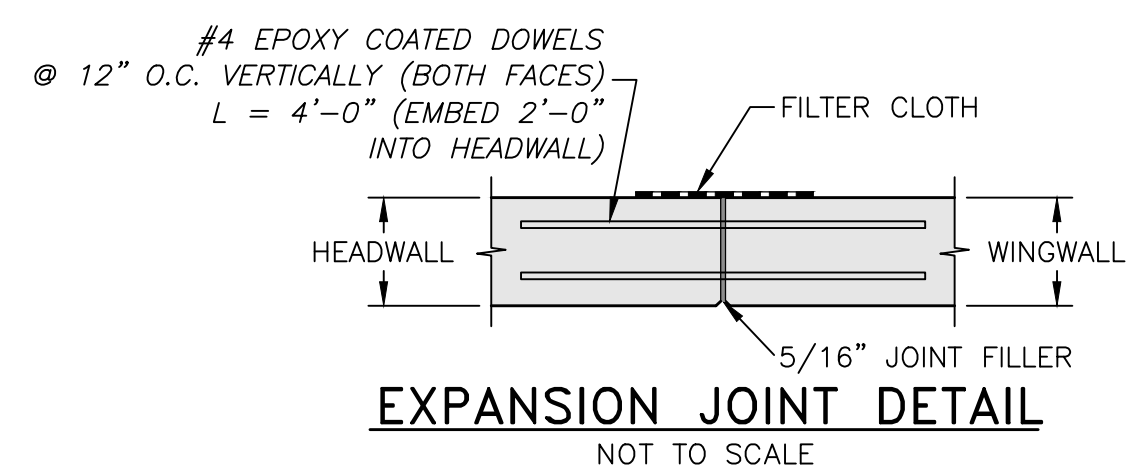
**TYPICAL SECTION
UPSTREAM WINGWALLS 'A' AND 'B'**



**TYPICAL SECTION
DOWNSTREAM WINGWALLS 'C' AND 'D'**

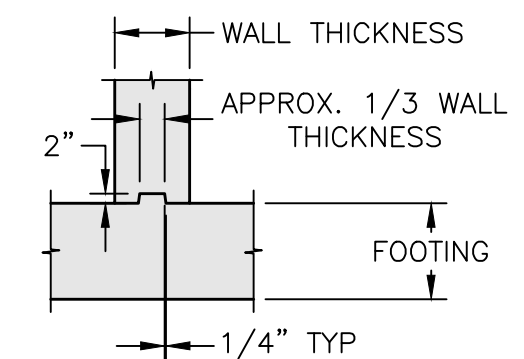


**WEEP HOLE DETAIL
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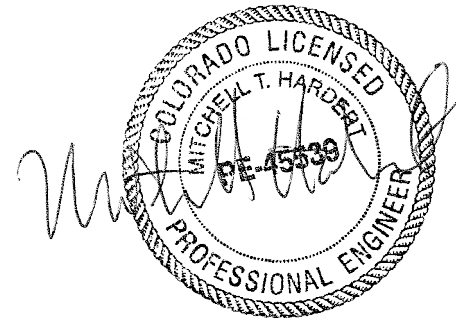
**EXPANSION JOINT DETAIL
NOT TO SCALE**

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A FILTER CLOTH THREE FEET IN WIDTH AND DOUBLE THICKNESS SHALL BE APPLIED TO ALL TRANSVERSE JOINTS IN THE FOOTING AND WALLS. THE MATERIAL SHALL BE CENTERED ON THE JOINT AND THE EDGES SEALED WITH A MASTIC OR WITH TWO SIDED TAPE. THE FILTER CLOTH SHALL BE A GEOTEXTILE MEETING THE APPROVAL OF THE ENGINEER.



**KEYED CONSTRUCTION
JOINT DETAIL
NOT TO SCALE**

- NOTES:**
- 1.) CONCRETE SHALL BE $f'c = 4,000$ psi.
 - 2.) ALL REINFORCEMENT SHALL BE ASTM A-615, GRADE 60.
 - 3.) FOOTING IS DESIGNED FOR A 4,000 psf ALLOWABLE BEARING CAPACITY. THIS VALUE MUST BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
 - 4.) SCOUR IS NOT ADDRESSED HEREIN AND IS THE RESPONSIBILITY OF OTHERS THAN KBWJ.



		TYPICAL WINGWALL DETAILS	
Drawn By DJH	Date 11/9/22	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado	
Approved By 	Date 	Scale GRAPHIC	Project No. KBWJ-25353
Rev. 	Sheet 6 OF 7		

I – GENERAL

1.0 STANDARDS AND DEFINITIONS

1.1 STANDARDS - All standards refer to latest edition unless otherwise noted.

- 1.1.1 ASTM D-698-70 (Method C) "Standard Test Methods for Moisture, Density Relations of Soils and Soil Aggregate Mixtures Using 5.5-lb (2.5 kg.) Rammer and 12-inch (305-mm) Drop".
- 1.1.2 ASTM D-2922 "Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear methods (Shallow Depth)".
- 1.1.3 ASTM D-1556 "Standard Test Method for Density of Soil in place by the Sand-Cone Method".
- 1.1.4 ASTM D-1557 "Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort."
- 1.1.5 All construction and materials shall be in accordance with the latest AASHTO LRFD Bridge Design Specifications and DOT requirements.

1.2 DEFINITIONS

- 1.2.1 Owner - In these specifications the word "Owner" shall mean El Paso County, Colorado
- 1.2.2 Engineer - In these specifications the word "Engineer" shall mean the Owner designated engineer.
- 1.2.3 Design Engineer - In these specifications the words "Design Engineer" shall mean KBJW, Inc.
- 1.2.4 Contractor - In these specifications the word "Contractor" shall mean the firm or corporation undertaking the execution of any work under the terms of these specifications.
- 1.2.5 Approved - In these specifications the word "approved" shall refer to the approval of the Engineer or his designated representative.
- 1.2.6 As Directed - In these specifications the words "as directed" shall refer to the directions to the Contractor from the Owner or his designated representative.

2.0 GENERAL CONDITIONS

- 2.1 The Contractor shall furnish all labor, material and equipment and perform all work and services except those set out and furnished by the Owner, necessary to complete in a satisfactory manner the site preparation, excavation, filling, compaction, grading, footing construction, endwall construction as shown on the plans and as described therein.

This work shall consist of all mobilization clearing and grading, grubbing, stripping, removal of existing material unless otherwise stated, preparation of the land to be filled, filling of the land, spreading and compaction of the fill, and all subsidiary work necessary to complete the grading of the cut and fill areas to conform with the lines, grades, slopes, and specifications.

This work is to be accomplished under the observation of the Owner or his designated representative.

- 2.2 Prior to bidding the work, the Contractor shall examine, investigate and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site, including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such additional investigation as he may deem necessary for the planning and proper execution of the work.

If conditions other than those indicated are discovered by the Contractor, the Owner should be notified immediately. The material which the Contractor believes to be a changed condition should not be disturbed so that the owner can investigate the condition.

- 2.3 The construction shall be performed under the direction of an experienced engineer who is familiar with the design plan.

II – BRIDGECOR FOOTINGS

1.0 EXCAVATION FOR FOOTINGS

- 1.1 Footing excavation shall consist of the removal of all material, of whatever nature, necessary for the construction of foundations.
- 1.2 It shall be the responsibility of the Contractor to identify and relocate all existing utilities which conflict with the proposed footing locations shown on the plan. The Contractor must call the appropriate utility company at least 48 hours before any excavation to request exact field location of utilities, and coordinate removal and installation of all utilities with the respective utility company.
- 1.3 The side of all excavations shall be cut to prevent sliding or caving of the material above the footings.
- 1.4 Excavated material shall be disposed in accordance with the plan established by the Engineer.
- 1.5 The footings are designed for a net allowable bearing capacity of 4,000 psf on sandstone bedrock in accordance with the recommendations by Entech Engineering, Inc. A friction factor of 0.45 has also been utilized. These shall be verified in the field before construction. The evaluation and design of any required foundation improvement to achieve the recommended bearing capacity and friction factor, and to protect against frost and scour and settlement, is the responsibility of others than KBJW. All recommendations in the project geotechnical report shall be followed during construction.
- 1.6 Care must be exercised to ensure that heavy equipment is not operated adjacent to the footings. Heavy equipment shall not be allowed any closer than 5 feet to the footings.

2.0 CONCRETE FOOTING DIMENSIONS

- 2.1 The footings shall be reinforced in accordance with the construction drawings.

III – HEADWALLS AND WINGWALLS

- 1.0 The headwalls and wingwalls shall consist of reinforced concrete conforming to Chapter IV of these specifications, and AASHTO LRFD Bridge Design Specifications having a minimum compression strength of 4,000 psi.
- 2.0 Reinforcing steel shall conform to ASTM A-615, Grade 60, having minimum yield strength of 60,000 psi.
- 3.0 The headwalls shall be anchored to the BridgeCor arch in the manner shown on the plans and shall be formed and poured in accordance with the plan dimensions.
- 4.0 Round weep holes spaced not over 5 feet on center shall be placed in the walls above finished grade as shown on the construction drawings. A granular envelope, consisting of #57 stone (clean ¾" aggregate) or equivalent, shall be placed behind each weep hole for a distance of approximately 1 foot from all edges of the weep hole. A free-draining geotextile screen shall be placed between the weep hole and the stone to prevent erosion of the stone.
- 5.0 The select backfill behind the headwalls must be a well-graded, angular, durable granular material conforming to the select backfill specifications for the BridgeCor arch placed and compacted to achieve a minimum internal friction angle of 36 degrees and a maximum unit weight of 120 pcf. The material must be placed in strict conformance with the project specifications, the manufacturer's requirements, and industry standards. The select backfill behind the wingwalls must be a well-graded, angular, durable granular material placed and compacted to achieve a minimum internal friction angle of 36 degrees and a maximum unit weight of 120 pcf. These values to be field verified.
- 6.0 All Federal, State, and Local regulations shall be strictly adhered to relative to excavation side-slope geometry and any required excavation shoring.

IV – CONCRETE FOR FOOTINGS AND ENDWALLS

1.0 CODES AND STANDARDS

- 1.1 Reinforced concrete shall conform to the requirements of Colorado DOT Standards and Section V of the AASHTO LRFD Bridge Design Specifications having a minimum compressive strength of 4,000 psi.

2.0 STANDARDS FOR MATERIALS

- 2.1 Portland Cement - Conforming to ASTM Specification C-150, Type II.
- 2.2 Water - The water shall be drinkable, clean free from injurious amounts of oils, acids, alkalis, organic materials, or deleterious substances.
- 2.3 Aggregates - Fine and coarse aggregates shall conform to current ASTM Specification C-33 "Specification for Concrete Aggregates" except that local aggregates which have been shown by tests and by actual service to produce satisfactory qualities may be used when approved by the Engineer.
- 2.4 Submittals - Test data and/or certifications to the Owner shall be furnished upon request.

3.0 PROPORTIONING OF CONCRETE

3.1 COMPOSITION

- 3.1.1 The concrete shall be composed of cement, fine aggregate, coarse aggregate and water.
- 3.1.2 The concrete shall be homogeneous, readily placeable and uniformly workable and shall be proportioned in accordance with ACI-211.1.
- 3.1.3 Proportions shall be established on the basis of field experience with the materials to be employed. The amount of water used shall not exceed the maximum 0.45 water/cement ratio, and shall be reduced as necessary to produce concrete of the specified consistency at the time of placement.
- 3.1.4 An air-entraining admixture, conforming to the requirements of ASTM C260, shall be used in all concrete furnished under this contract. The quantity of admixture shall be such as to produce an air content in the freshly mixed concrete of 6 percent plus or minus 1 percent as determined in accordance with ASTM C231 or C173.

- 3.2 Qualities Required - As indicated in the table below:

TABLE IV-1
QUALITIES REQUIRED

ITEM	QUALITY REQUIRED
AASHTO Class	A
Type of Cement	II
Compressive Strength f_c @ 28 days	4,000 psi
Slump, inches	2 - 4 in.

- 3.3 Maximum Size of Coarse Aggregates - Maximum size of coarse aggregates shall not be larger than 19 mm (¾ inches).
- 3.4 Rate of Hardening of Concrete - Concrete mix shall be adjusted to produce the required rate of hardening for varied climatic conditions:

Under 40°F Ambient Temperature – All work to be in accordance with the recommendations of ACI-306R "Cold Weather Concreting."

4.0 MIXING AND PLACING

- 4.1 Equipment - Ready Mix Concrete shall be used and shall conform to the "Specifications for Ready-Mix Concrete," ASTM C-94. Approval is required prior to using job mixed concrete.
- 4.2 Preparation - All work shall be in accordance with ACI-304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete." All construction debris and extraneous matter shall be removed from within the forms. Concrete shall be placed on clean surfaces, free from water. Concrete that has to be dropped four (4) feet or more shall be placed through a tremie.
- 4.3 All concrete shall be consolidated by internal mechanical vibration immediately after placement. Vibrators shall be of a size appropriate for the work, capable of transmitting vibration to concrete at frequencies of not less than 4,500 impulses per minute.

5.0 FORM WORK

- 5.1 Forms shall be of wood, steel or other approved material and shall be set and held true to the dimensions, lines and grades of the structure prior to and during the placement of concrete.
- 5.2 Forms shall not be removed until the concrete has sufficient strength to prevent concrete damage and/or drainage.

6.0 CURING

- 6.1 Fresh concrete shall be protected from rains, flowing water and mechanical injury for a period of seven (7) days. Loads shall not be placed on the concrete until it has reached its design strength.

7.0 REINFORCING STEEL

7.1 MATERIAL

- 7.1.1 All reinforcing bars shall be deformed bars (ASTM-A615) Grade 60.

7.2 BENDING AND SPLICING

- 7.2.1 Bar reinforcement shall be cut and bent to the shapes shown on the plans. Fabrication tolerances shall be in accordance with ACI 315. All bars shall be bent cold, unless otherwise permitted.
- 7.2.2 All reinforcement shall be furnished in the full lengths indicated on the plans unless otherwise permitted. Except for splices shown on the plans and splices for No. 5 or smaller bars, splicing of bars will not be permitted without written approval. Splices shall be staggered as far as possible.
- 7.2.3 In lapped splices, the bars shall be placed and wired in such a manner as to maintain the minimum distance to the surface of the concrete shown on the plans.
- 7.2.4 Substitution of different size bars will be permitted only when authorized by the engineer. The substituted bars shall have an area equivalent to the design area, or larger.

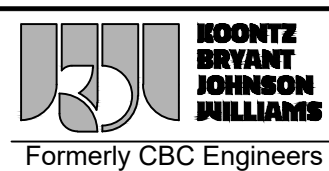
7.3 PLACING AND FASTENING

- 7.3.1 Steel reinforcement shall be accurately placed as shown on the plans and firmly held in position during the placing and setting of concrete. Bars shall be tied at all intersections around the perimeter of each mat and at not less than 2-foot centers or at every intersection, whichever is greater, elsewhere. Welding of cross bars (tack welding) will not be permitted for assembly of reinforcement.
- 7.3.2 Reinforcing steel shall be supported in its proper position by use of mortar blocks, wire bar supports, supplementary bars or other approved devices. Such devices shall be of such height and placed at sufficiently frequent intervals so as to maintain the distance between the reinforcing and the formed surface or the top surface within 1/4 inch of that indicated on the plans.

V - FILTER FABRIC (GEOTEXTILE SCREEN)

- 1.0 Filter fabric shall be placed at all locations shown on the construction drawings, and as necessary between all dissimilar materials to prevent soil migration and to maintain a soil-tight system.
- 2.0 Filter fabric cloth shall conform to Contech specification for C60-NW or equivalent and shall meet the following ASTM tests:
 - 2.1 ASTM D4751 - Apparent opening size equal to #70 U.S. Standard Sieve Size.
 - 2.2 ASTM D4632 (Grab Tensile Test) - Minimum Strength = 160 pounds.
 - 2.3 ASTM D4632 (Grab Elongation) - 30-70%.
 - 2.4 ASTM D4533 (Trapezoidal Tear) - Minimum Strength = 60 pounds.
 - 2.5 ASTM D4355 (Stabilized for Heat and Ultra-Violet Degradation) - 70% strength retained.
- 3.0 The minimum fabric coefficient of permeability (ASTM D4491) shall be 0.24 cm/sec.
- 4.0 The fabric shall be non-woven with a minimum thickness (ASTM D5199) of 60 mils.
- 5.0 Fabric shall not be placed over sharp or angular rocks that could tear or puncture it.
- 6.0 Care should be exercised to prevent any puncturing or rupture of the filter fabric. Should such rupture occur, the damaged area should be covered with a patch of filter fabric using an overlap minimum of one (1) foot.



 Formerly CBC Engineers			
SPECIFICATIONS			
Drawn By D J H	Date 11/9/22	CONTECH ENGINEERED SOLUTIONS, LLC Design of Spread Footing Foundations, Concrete Headwalls and Wingwalls for a BridgeCor Arch (723523); Arroya Lane, El Paso County, Colorado	
Approved By	Date	Project No. KBJW-25353	Rev. -
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