

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	81	168

STRUCTURAL GENERAL NOTES:

General:

- A. Workmanship and materials shall conform to the following design specifications:
1. AASHTO LRFD Bridge Design Specifications, 8th Edition, 2017 including all interim revisions.
 2. State of Hawaii, Department of Transportation, Highways Division, Design Criteria for Bridges and Structures, August 8, 2014 as amended by HWY-DB 2.5098, Changes to Design Criteria for Bridges and Structures, January 8, 2018.
 3. AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 1st Edition, 2016 including all interim revisions.
 4. AASHTO Manual for Assessing Safety Hardware, 2nd Edition, 2016.
 5. AASHTO Manual for Bridge Evaluation, 3rd Edition, 2018 including all interim revisions and requirements for emergency vehicle ratings as per FHWA's Memorandum, Load Rating for the FAST Act's Emergency Vehicles, November 3, 2016 as modified by "Draft Modifications to the "Design Criteria for Bridges and Structures, August 8, 2014" for the Manual for Bridge Evaluation 2nd Edition".
 6. Hawaii Standard Specifications for Road and Bridge Construction (2005 Edition) and Special Provisions.
- B. The contractor shall compare all the contract documents with each other and report in writing to the engineer all inconsistencies and omissions.
- C. The contractor shall take field measurements and verify field conditions and shall compare such field measurements and conditions with the drawings before commencing work. Report in writing to the engineer all inconsistencies and omissions.
- D. The contractor shall be responsible for coordinating the work of all trades.
- E. The contractor shall be responsible for means and methods of construction, workmanship and job safety.
- F. The contractor shall provide temporary shoring and bracing as required for stability of structural members and systems.
- G. Construction loading shall not exceed design live load unless special shoring is provided. Permitted construction loads shall be properly reduced in areas where the structure has not attained full design strength.
- H. The contractor shall be responsible for protection of the adjacent properties, structures, streets and utilities during the construction period. Any damaged or deteriorated property shall be restored to the condition prior to the beginning of work or better at no cost to the State.
- I. Details noted as typical on the structural drawings shall apply in all conditions unless specifically shown or noted otherwise.
- J. Elevations and details of the existing bridges and other miscellaneous structures as shown on these plans are based on as-built drawings. The contractor shall be responsible for verifying all existing elevations and existing structure details and shall notify the engineer in writing of any discrepancies for further action.
- K. Except as noted otherwise, all vertical dimensions are measured plumb.

Design Criteria:

- A. Dead load
- Weight of all components of the structures, appurtenances attached thereto, and earth covers.
 - Unit weight of concrete ----- 160 pcf
 - Compacted earth ----- 120 pcf
 - Future wearing surface ----- 25 psf
 - Future utilities on each bridge railing ----- 150 plf
- B. Live load ----- AASHTO HL-93
- C. Collision load ----- AASHTO TL-3
- D. Seismic
- 0.2-second spectral response coefficient, s_s ----- 0.36
 - 1.0-second spectral response coefficient, s_1 ----- 0.10
 - Peak seismic ground acceleration coefficient, A_s ----- 0.335
 - Site class ----- E
 - Seismic design zone ----- 3
- E. Basic wind speed ----- 140 MPH
- F. Design soil parameters for structures
- Bearing capacity
 - Extreme event limit state ----- 9,000 psf
 - Strength limit state ----- 5,400 psf
 - Service limit state ----- 3,000 psf
 - Passive earth pressure
 - Extreme event limit state ----- 520 pcf
 - Strength limit state ----- 260 pcf
 - Lateral earth pressure
 - Active (level backfill) ----- 36 pcf
 - At-rest (level backfill) ----- 57 pcf
 - Dynamic lateral earth pressure
 - Unrestrained ----- $5.5H^2$ psf
 - Restrained ----- $16.0H^2$ psf
 - Coefficient of Friction
 - Extreme event limit state ----- 0.58
 - Strength limit state ----- 0.46

Foundation:

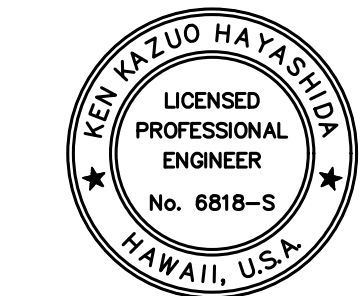
- A. Foundation design is based upon Geotechnical Investigation by Hirata & Associates, Inc., dated July 2, 2020.
- B. Contractor shall provide for de-watering of excavation from either surface water, ground water or seepage. NPDES permit required for discharging into state waters.
- C. Contractor shall provide for design and installation of all cribbing, sheeting, and shoring necessary for personnel safety and to preserve excavations and earth banks, and adjacent structures and property for damage for owner review. Design shall be by a civil engineer specializing in geotechnical engineering and a structural engineer both shall be licensed in the State of Hawaii. Submit stamped drawing and calculations to the Engineer. Shoring shall comply with HIOSH and OSHA regulations. Excavation boundaries and grade elevations for footing shall be accepted by a geotechnical engineer licensed in the State of Hawaii prior to placing the concrete and reinforcing.
- D. Footings shall bear on a 6-inch layer of aggregate base course compacted to a minimum of 95% relative density in accordance with ASTM D1557. Prior to the placement of the aggregate base course, the exposed soils should be scarified to a depth of 6-inches, moisture conditioned to within 2% of optimum moisture and compacted to no less than 90% relative density in accordance with ASTM D1557. Bottom of footing shall be compacted to provide a relatively firm and smooth bearing surface prior to placement of reinforcing steel and concrete. If soft and/or loose materials are encountered at the bottom of excavations, they shall be over-excavated to expose the underlying firm materials. The over-excavated area shall be backfilled with the same aggregate base course or the footing bottom may be extended down to the underlying competent material. Contractor may substitute CLSM for the aggregate base course upon acceptance from the engineer.
- E. Backfill shall be Structural Backfill Material A in accordance with Section 703.20 of the Hawaii Standard Specifications for Road and Bridge construction, 2005 Edition.

Concrete:

- A. Concrete shall be regular weight hard rock concrete and shall have the following minimum 28-day compressive strengths and water to cement ratios:
- | Structural Item | Minimum Compressive Strength f'c (28 days) | Maximum (W/C) |
|--|--|---------------|
| 1. Prestressed planks, Bridge 3 ----- | 7,000 psi | 0.35 |
| 2. Prestressed planks, Bridge 3A ----- | 8,000 psi | 0.35 |
| 3. Deck topping ----- | 4,000 psi | 0.45 |
| 4. Abutment, end walls, caps, columns ----- | 4,000 psi | 0.45 |
| 5. Drilled shafts ----- | 4,500 psi | 0.45 |
| 6. Traffic railing, end posts, approach slabs -- | 4,000 psi | 0.45 |
| 7. CLSM ----- | 300 psi | -- |
| 8. All other concrete ----- | 4,000 psi | 0.45 |
- B. The use of any calcium chloride in any concrete is prohibited.
- C. Concrete delivery tickets shall record all free water in the mix at batching plant, added for consistency by driver, and any additional request by contractor up to the maximum amount allowed by the mix design.
- D. Conduits, pipes, and sleeves passing through a wall not conforming to typical details shall be located and submitted to the structural engineer for approval.
- E. Construction joints may be requested to be relocated by the contractor and submit request to its structural engineer for approval. Submit stamped and signed drawings and calculations to the Engineer for acceptance. Construction joints shall be made and relocated as not to impair the durability, strength of the structure and to minimize shrinkage stresses. All construction joints shall be cleaned, laitance removed and wetted. See typical details for specific requirements.
- F. Unless otherwise noted, chamfer all exposed concrete edges 3/4".
- G. Reinforcing bars, anchor bolts, inserts and other items to be cast in the concrete shall be secured in position prior to placement of concrete.
- H. All inserts, anchor bolts, plates, and other structural items to be cast in the concrete shall be hot-dip galvanized according to ASTM A153 unless otherwise noted.
- I. Non-shrink grout shall be a premixed non-metallic formula, capable of developing a minimum compressive strength of 4,000 psi in 1 day and 7,000 psi in 28 days.
- J. A shrinkage reducing admixture (SRA), Tetraguard AS20 by BASF, Eclipse by W.R. Grace & Co, or an approved equal shall be added to the concrete. The minimum dosage requirement shall be 128 oz per cubic yard of concrete. The concrete shall have a maximum shrinkage strain of 0.00006 at 28 days and 0.000145 at 56 days according to ASTM C512.
- K. A corrosion inhibiting admixture shall be included in the concrete mix for all concrete. The corrosion inhibiting admixture shall contain a minimum of 30% calcium nitrate by mass and shall be added at a dosage rate of 4.0 gallons per cubic yard of concrete or as recommended by the manufacturer. The admixture shall be Masterline CI 30 Calcium Nitrate-Based corrosion inhibitor, DCI S corrosion inhibitor or an approved equal. Addition of corrosion inhibiting admixture shall be as recommended by the manufacturer.
- L. Stay-in-place forms shall not be allowed.

Approved By:

Manager and Chief Engineer, BWS
(For Work Affecting BWS Facilities in
City/State R/W and BWS Easements Only)



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STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION
STRUCTURAL GENERAL NOTES - 1
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A Federal Aid Project No. BR-093-K(20)
Scale: As Noted Date: July 2020
SHEET No. 80.1 OF 168 SHEETS

STRUCTURAL GENERAL NOTES:

Reinforcing Steel:

- A. Deformed and Plain Carbon Steel Bars for Concrete Reinforcement shall meet the requirements of AASHTO M31M/M31-19, Grade 60 (ASTM A615/A615M-16, Grade 60).
- B. Deformed and Plain Carbon Steel Bars for Concrete Reinforcement to be spliced by welding or otherwise welded, such as welded hoops, or for seismic reinforcing shall meet the requirements of AASHTO M31M/M31-19, Grade 60 (ASTM A615/ A615M-16, Grade 60) and meet the requirements of ASTM A706/A706M-16.
- C. The welding of reinforcing steel shall be in accordance with the Structural Welding Code-Reinforcing Steel AWS D1.4.
- D. Epoxy-coated dowels and deformed bars shall conform to ASTM A775, Grade 60 unless otherwise noted.
- E. The contractor shall not damage the epoxy coating on the dowels and deformed bars in any way during shipment, handling, or placement. Damaged epoxy coated dowels and deformed bars shall be replaced at no cost to the State. Repair of epoxy coating as approved by the Engineer shall meet ASTM A775.
- F. Clear concrete cover for reinforcing bars shall be as follows, unless otherwise noted:
- | | |
|--|-----|
| 1. Footing, walls, etc, cast against earth | 3" |
| 2. Exterior concrete in coastal region | 3" |
| 3. Exterior concrete other than above | 2" |
| 4. Bridge Deck | |
| a. Top reinforcement | 2½" |
| b. Bottom reinforcement | 1½" |
- Measured to the closest part of the bars.
- G. At the time concrete is placed, reinforcing shall be free from mud, oil, laitance or other coatings which may adversely affect bond strength.
- H. Minimum clear spacing between parallel bars shall be one and one-half (1½") times the diameter of the larger bar (for non-bundled bars), but in no case shall the clear distance between the bars be less than one and one-half (1½") times the maximum coarse aggregate size.
- I. All dimensions relating to reinforcing bars (e.g. spacing of bars etc.) are to centers of bars unless noted otherwise.
- J. Reinforcing steel shall be spliced only where indicated on plans. Provide lap splice length per typical details and schedule, unless otherwise noted.
- K. Mechanical splice connectors shall develop, in tension, 125 percent of the specified minimum yield strength of reinforcing bars.
- L. Stagger all splices where possible.
- M. Bar bends and hook shall be "standard hooks" in accordance with typical details.
- N. Minimum reinforcement bend diameters shall comply with AASHTO 5.10.2.3.

Structural Steel:

- A. Fabrication and erection of structural steel shall conform to the American Institute of Steel Construction Manual of Steel Construction, Thirteenth Edition.
- B. All structural steel in this section, except for sheet piles and H-piles, shall be hot-dip galvanized after fabrication.
- C. Zinc (Hot-Dip Galvanizing) Coatings for structural iron and steel products made from rolled, pressed and forged shapes, castings, bars and plates including unfabricated and fabricated products shall conform to ASTM A123 unless otherwise noted.
- D. Any damaged galvanized surface shall be repaired as follows:
1. Prepare surface per sspc-spl, solvent cleaning.
 2. Apply two coats of cold applied galvanizing compound containing 95% metallic zinc content by weight in dry film and 52% solids content by volume.
 3. Application rate shall be 1.5 mils dry film thickness per coat.
- E. Structural steel shall conform to ASTM A36 unless otherwise noted.
- F. Stainless steel shall conform to ASTM A240, Type 316L.
- G. Steel wide flange sections shall conform to ASTM A992.
- H. Steel pipes shall conform to ASTM A53, Grade B.
- I. Steel tubes (HSS) shall conform to ASTM A500, Grade B.
- J. Plates and bars shall conform to ASTM A36.
- K. Steel sheet piles shall have a section modulus, moment of inertia, and flexural capacity equal to, or greater than, a PZC18.

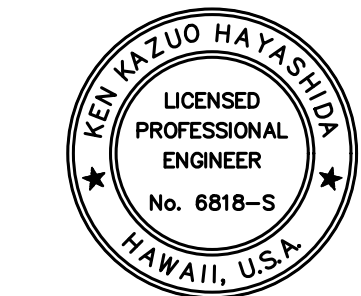
- L. Welds and welding procedures shall conform to the structural welding codes AWS D1.5 and D1.6 of the American Welding Society.
- M. Welding shall be performed by welders prequalified for welding procedures to be used.
- N. Welding electrodes shall be E70XX and E316.
- O. Fasteners:
1. Bolts (Hex or Heavy Hex Bolts) shall conform to ASTM A307, Grade A unless otherwise specified and hot-dip galvanized in accordance with ASTM F2329. Hex Nuts for ASTM A307 hex bolts shall conform to ASTM A563, Hex Grade A and hot-dip galvanized in accordance with ASTM F2329. Heavy Hex Nuts for ASTM A307 heavy hex bolts shall conform to ASTM A563, Heavy Hex Grade DH and hot-dip galvanized in accordance with ASTM F2329. Washers for ASTM A307 bolts shall conform to ASTM F844 and hot-dip galvanized in accordance with ASTM F2329.
 2. High Strength Bolts (Heavy Hex Structural Bolts) shall conform to ASTM F3125, Grade A325, Type 1 unless otherwise specified and hot-dip galvanized in accordance with ASTM F2329. Nuts for ASTM F3125 bolts shall conform to ASTM A563, Grade DH and hot-dip galvanized in accordance with ASTM F2329. Washers for ASTM F3125 bolts shall conform to ASTM F436, Type 1 and hot-dip galvanized in accordance to ASTM F2329.
 3. Threaded Rods shall conform to ASTM A449, Type 1 and hot-dip galvanized in accordance to ASTM F2329. Nuts for ASTM A449 threaded rods shall conform to ASTM A563, Grade DH and hot-dip galvanized in accordance to ASTM F2329. Washers for ASTM A449 threaded rods shall conform to ASTM F436, Type 1 and hot-dip galvanized in accordance to ASTM F2329.
 4. Anchor Bolts shall conform to ASTM F1554, Grade (36, 55, 105) and hot-dip galvanized in accordance to ASTM F2329. Nuts for anchor bolts shall conform to ASTM F1554, Section 6.7.1 and hot-dip galvanized in accordance to ASTM F2329. Washers for anchor bolts shall conform to ASTM F436, Type 1 and hot-dip galvanized in accordance to ASTM F2329.
 5. The material for the 3" x 3" x ¼" or 3½" x 3½" x ¼" square washers shall conform to ASTM A572, Grade 60.
 6. Stainless Steel Bolts shall conform to ASTM A193, Grade B8M or ASTM F593, Alloy Group 2, Condition A or CW unless otherwise specified. Nuts for ASTM stainless steel bolts shall conform to ASTM A194, Grade 8M or ASTM F594, Alloy Group 2, Condition A or CW and shall match the corresponding bolt specification, grade, alloy group, and condition. Washers for stainless steel bolts shall be Type 316 Stainless Steel.
- P. Installation of the high-strength bolts shall be assured by any of the following methods.
1. Turn of nut method
 2. Direct tension indicator
 3. Calibrated wrench
 4. Alternative design bolt
- Q. Thru bolts for guardrail connection shall conform to AASHTO M164 (ASTM F3125, Grade A325, Type 1), unless otherwise noted.
- R. Anchor bolts shall have sufficient length when installed to ensure that the bolt projects at least ⅛" beyond the top of the nut but should not project more than ¼". Anchor bolts shall not be out of plumb more than 1:40 Horizontal: Vertical.
- S. Bolts and high strength bolts shall have sufficient length when installed to ensure that the bolt projects at least ⅛" beyond the nut but should not project more than ¼".
- T. Stainless steel shall not come into contact with carbon steel.
- U. Thrie Beam Sections, W-Beam Sections and Thrie Beam to W-Beam Asymmetric Transition Sections shall conform to AASHTO M180-18.
- V. The Thrie Beam Terminal Connections shall be 10 gauge and conform to AASHTO M180-18 and have a minimum yield strength of 50 ksi and a minimum ultimate strength of 70 ksi.

Miscellaneous Materials:

- A. Preformed Expansion Joint Filler for Concrete (Bituminous Type) shall conform to AASHTO M33-99 (2012), ASTM D994-11 (2016).
- B. 14⅜" x 12" x 5⅛" Composite Recycled Polymer Blockouts shall be Mondo Polymer MGS14SH or MASH (2016) approved equivalent.
- C. 14⅜" x 8" x 5⅛" Composite Recycled Polymer Blockouts shall be Mondo Polymer GB14SH2 or MASH (2016) approved equivalent.

Approved By:

Manager and Chief Engineer, BWS Date
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HIGHWAYS DIVISION

STRUCTURAL

GENERAL NOTES - 2

Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

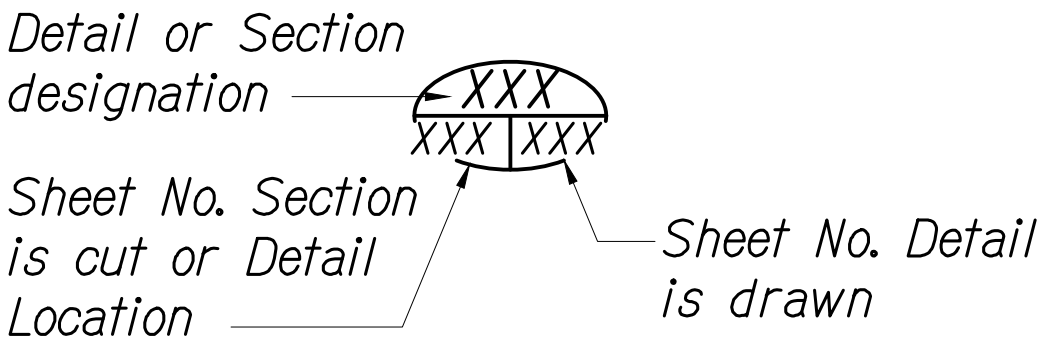
Federal Aid Project No. BR-093-1(20)

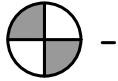
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SHEET No. S02 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	83	168

SYMBOLS AND ABBREVIATIONS:



- (XX) - ϕ Bearing Abutment Seat Line
 - Boring No. ϕ Designation

Abut.	Abutment
AC	Asphaltic Concrete
Adj.	Adjacent
Alt.	Alternate
Appro.	Approximate
Az.	Azimuth

ϕ	Baseline
Bal.	Balance
Bet., Btwn.	Between
B.F.	Both faces
BF.E.	Bottom Footing Elevation
Bl.	Back
Blt.	Bolt
Bm.	Beam
B, Bot., Bott.	Bottom
Br.	Bridge
Brg., Brgs.	Bearing, Bearings
B.V.C.	Beginning of Vertical Curve

ϕ	Center Line
Cant.	Cantilever
C.F.	Cubic Feet
Cip	Cast in Place
C.I.P.	Cast Iron Pipe
C.i., Clr.	Clear
Col.	Column
Conc.	Concrete
Conn.	Connection
Const.	Construction
Cont.	Continuous
CRM	Cement Rubble Masonry
C.Y., Cu. Yd.	Cubic Yard

Det.	Detail
Dia., ϕ	Diameter
Dim.	Dimension
Dwg., Dwgs.	Drawing, Drawings
EA., Ea., ea.	Each
E.F.	Each Face
Elec.	Electrical
El., Elev.	Elevation
Emb.	Embankment
E.P.	Edge of Pavement
Eq.	Equal
Est.	Estimated
E.W.	Each Way
Exc.	Excavation
Exist.	Existing
Exp., (E)	Expansion
Ext.	Exterior

(F)	Fixed
F'c	Specified Strength of Concrete
F'ci	Strength of Concrete at Time of Initial Prestress
F.F.	Front Face
Fig.	Figure
Fin.	Finish
Fin. Gr.	Finish Grade
Ftg.	Footing

Ga.	Gage, Gauge
Galv.	Galvanized
Gir., G	Girder
G.R.P.	Grouted Rubble Paving
Gr.	Grade
Grd.	Ground

(H)	Hinge
Horiz.	Horizontal
HS	High Strength
Ht.	Height
Hwy.	Highway

I.B.	Inbound
I.F.	Inside Face
In.	Inch
Int.	Interior
Inv.	Invert

Jt.	Joint
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L	Length
LBS., lb., lbs.	Pound, Pounds
L.F., Lin. Ft.	Linear Feet
Lg.	Long
Longit.	Longitudinal
L.S.	Lump Sum
Lt.	Left
Ltg. Std.	Lighting Standard

Max.	Maximum
Mech.	Mechanical
Min.	Minimum
Misc.	Miscellaneous

N	North
N.B.	Northbound
N.F.	Near Face
No., #	Number
N.T.S.	Not to Scale

O.B.	Outbound
o.c.	On Center
O.G.	Outside Girder
Opn'g	Opening
o/s, O/S	Offset

P.B.	Pull Box
P.C.	Point of Curvature
P.C.C	Portland Cement Concrete
Perf.	Perforated
PG-()	Prestressed Girder-(Type)
PL	Plate
P/S	Prestressed Strands
Pvmt.	Pavement

R	Radius
Rdwy	Roadway
Ref.	Reference
Reinf.	Reinforcement
Ret.	Retaining
Req'd	Required
R.F.	Rear Face
Rt.	Right
R/W	Right Of Way

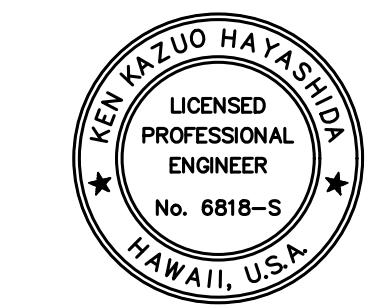
S	South
S.B.	Southbound
Sect.	Section
SF	Square Feet
Shldr.	Shoulder
Sht.	Sheet
Spc.	Space
Spcd.	Spaced
Spcg.	Spacing
Spec.	Specification
Sprd.	Spread
Sta.	Station
Std.	Standard
Stirr.	Stirrup
Str.	Straight
Struct.	Structural
Symm.	Symmetrical

T	Top
Temp.	Temporary
Thk.	Thick, Thickness
T.O.D.	Top Of Deck
Tot.	Total
Transv.	Transverse
Typ.	Typical

Var.	Varies
V.C.	Vertical Curve
Vert.	Vertical

W	West
w/	With
W.W.	Wingwall

BRIDGE LOAD CAPACITY RATING SUMMARY					
	Design Load	Rating Factor	Controlling Member	Controlling Load Effect	Live Load Distribution Factor
Makaha Bridge No. 3	HL-93 Inventory	1.68	Exterior Plank	Tension Stress	0.362
	HL-93 Operating	2.03	Exterior Plank	Tension Stress	0.362
Makaha Bridge No. 3A	HL-93 Inventory	1.45	Exterior Plank	Tension Stress	0.347
	HL-93 Operating	1.73	Exterior Plank	Tension Stress	0.347



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STATE OF HAWAII
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HIGHWAYS DIVISION

SYMBOLS, ABBREVIATIONS,
AND LOAD RATING SUMMARY
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

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MINIMUM SPLICE & EMBEDMENT LENGTHS					
Bar Size	Lap Splice		Embedment		
	Top Bars	Other Bars	Straight		with Standard 90° Hook
			Top Bars	Other Bars	
#3, #4	30"	23"	23"	18"	10"
#5	37"	29"	29"	22"	12"
#6	44"	34"	34"	26"	14"
#7	56"	43"	43"	34"	16"
#8	74"	57"	57"	44"	19"
#9	93"	72"	72"	55"	21"

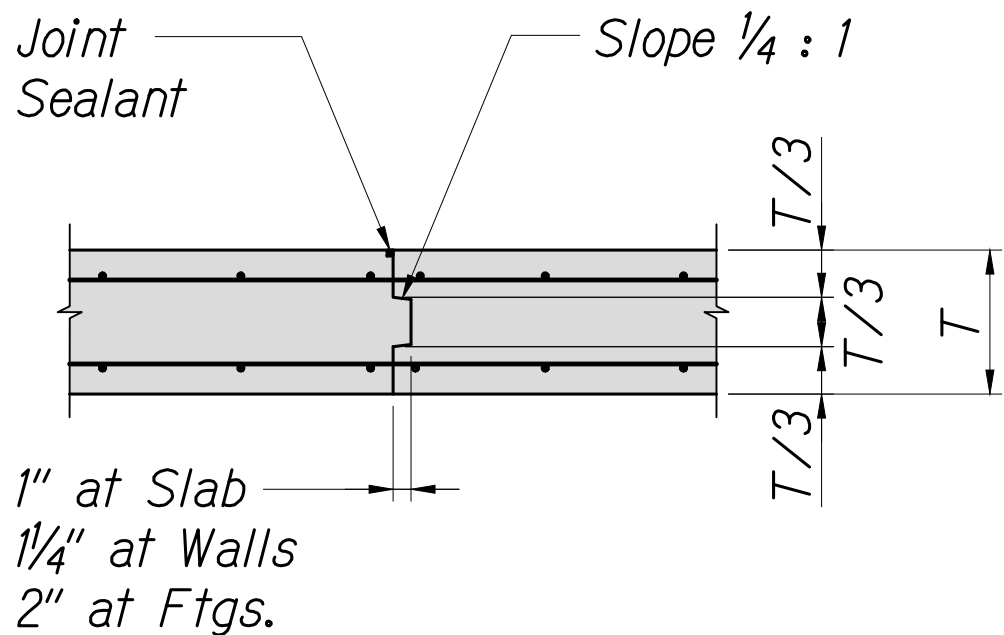
Notes:

- "Top Bars" are horizontal bars with 12" or more of concrete cast below.
- Splice lengths may be reduced by multiplying the tabulated values by 0.765 if the centerline of splice of adjacent bars are staggered 6'-0" o.c. for #9 bars and smaller.
- Embedment lengths for straight bars may be reduced by multiplying the tabulated values by 0.80 if the bars are spaced laterally not less than 6" center-to-center, with not less than 3" clear cover measured in the direction of the spacing.
- Embedment lengths for bars with 90° hook are bars with side cover, normal to plane of hook, of not less than 2½" and cover on bar extension beyond hook not less than 2". Increase embedment length by 43% for bars not meeting these requirements.

TYPICAL REBAR SPLICE AND EMBEDMENT LENGTH SCHEDULE

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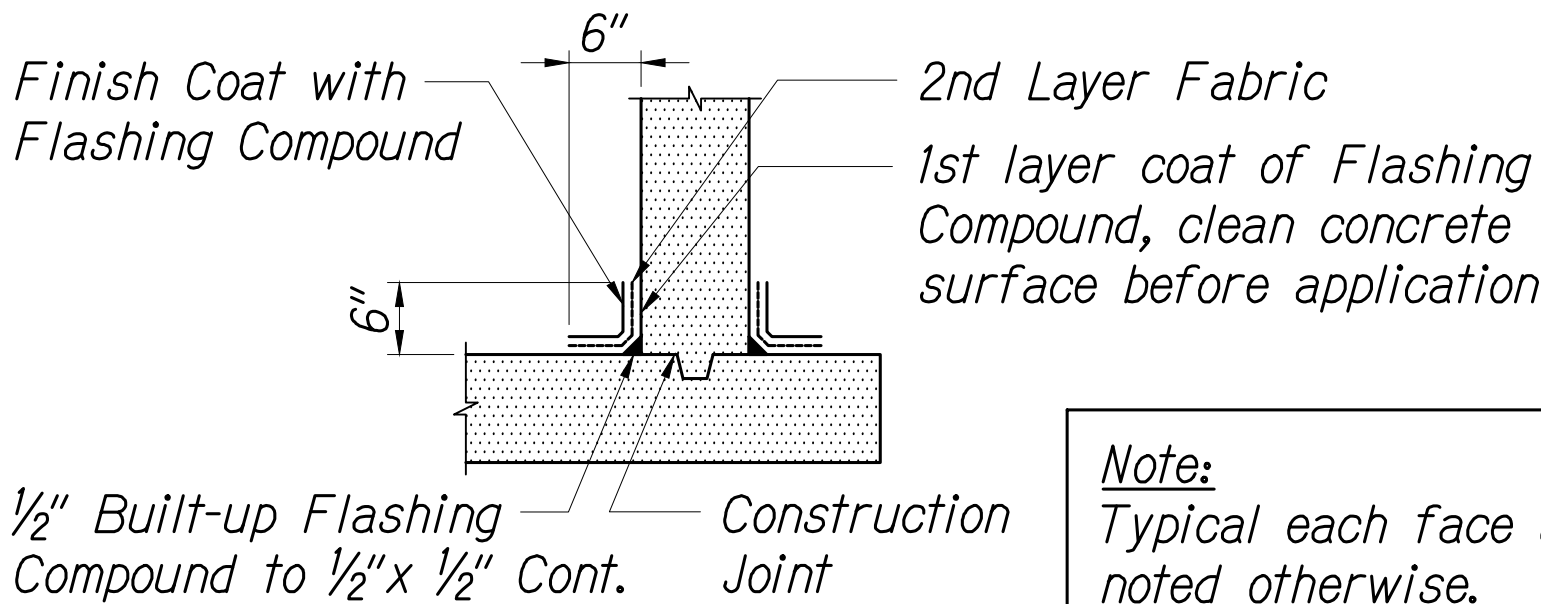
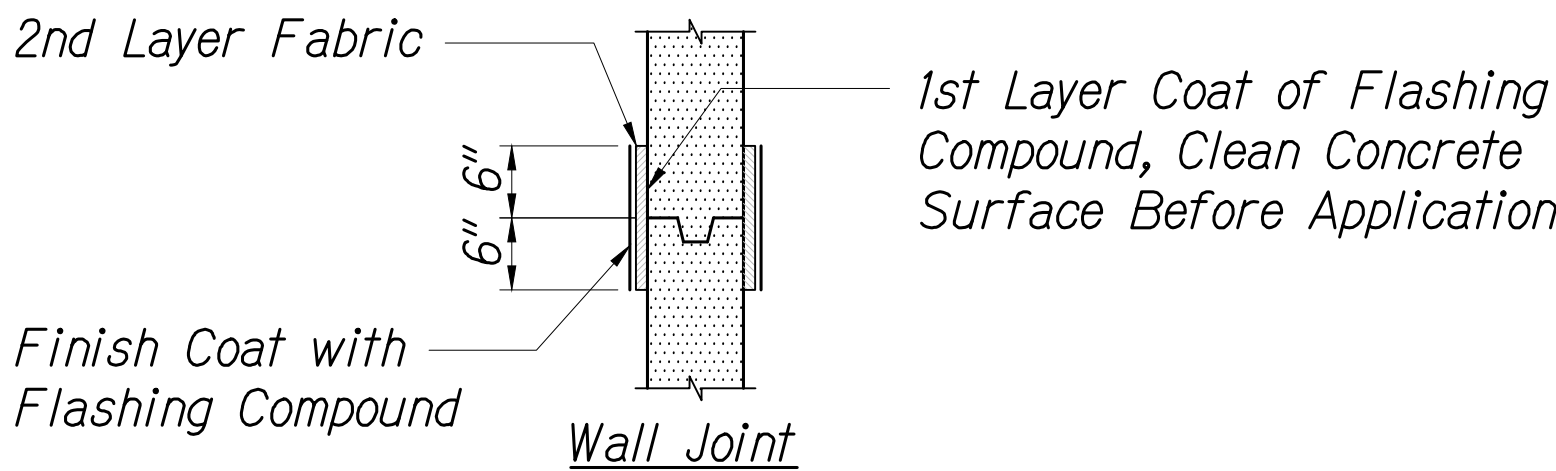
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TYPICAL JOINT DETAILS

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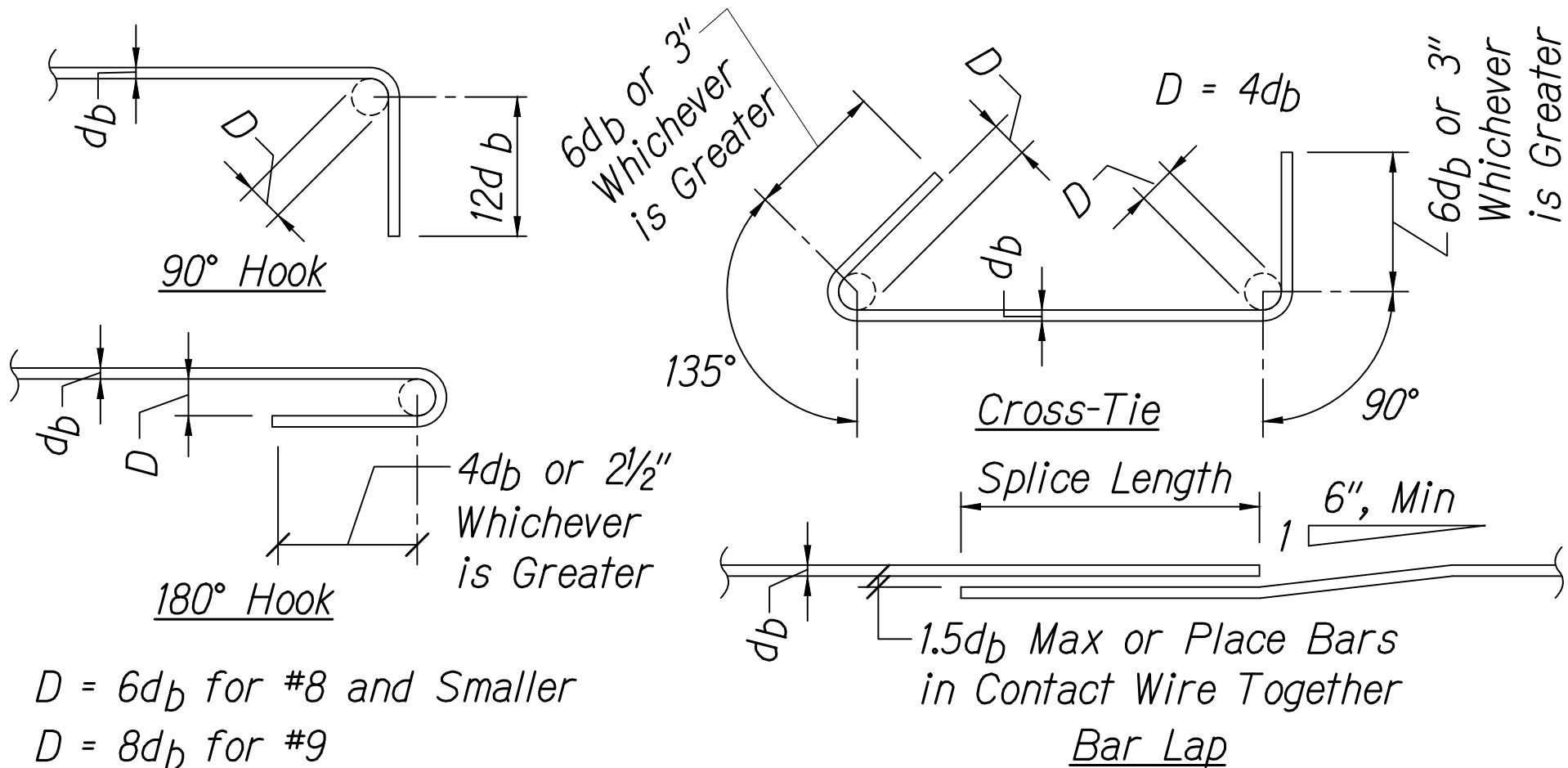
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TYPICAL WATERPROOFING DETAIL

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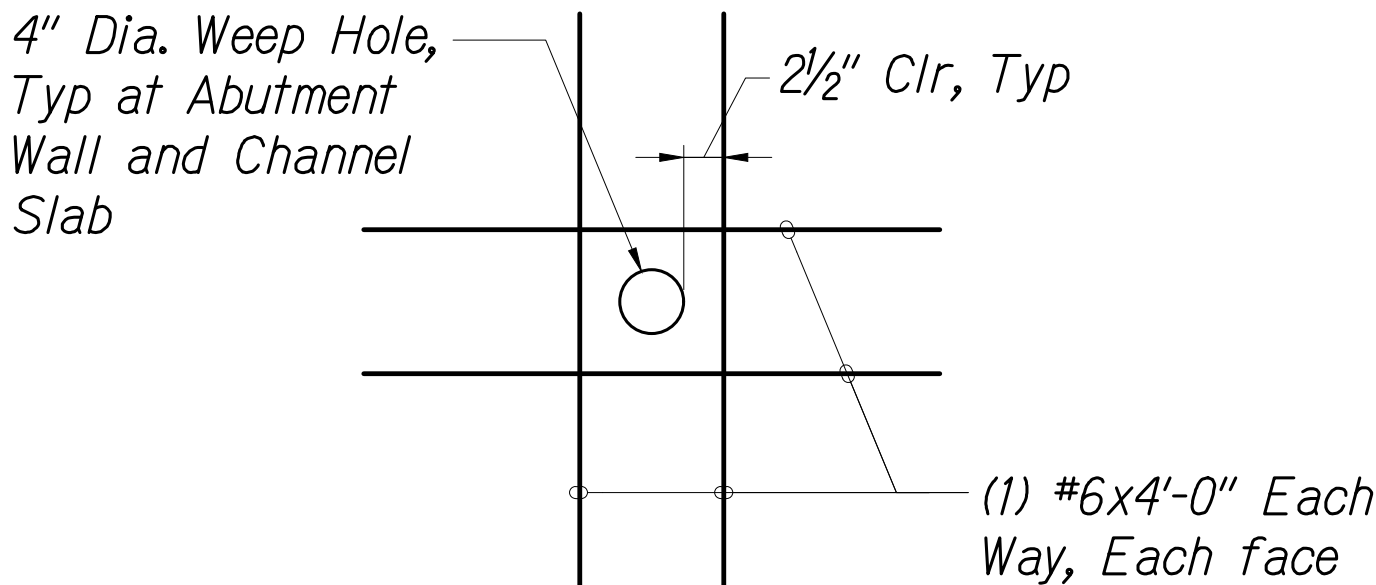
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STANDARD HOOKS AND CROSS-TIE DETAIL

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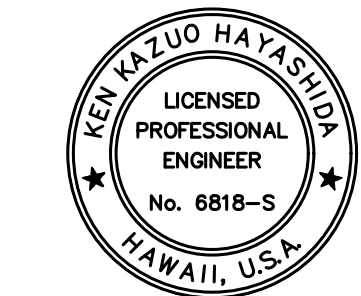
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TYPICAL ADDED REINFORCING AT WEEP HOLES

Not to Scale

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S0.4 S0.4



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TYPICAL DETAILS

Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

Federal Aid Project No. BR-093-1(20)

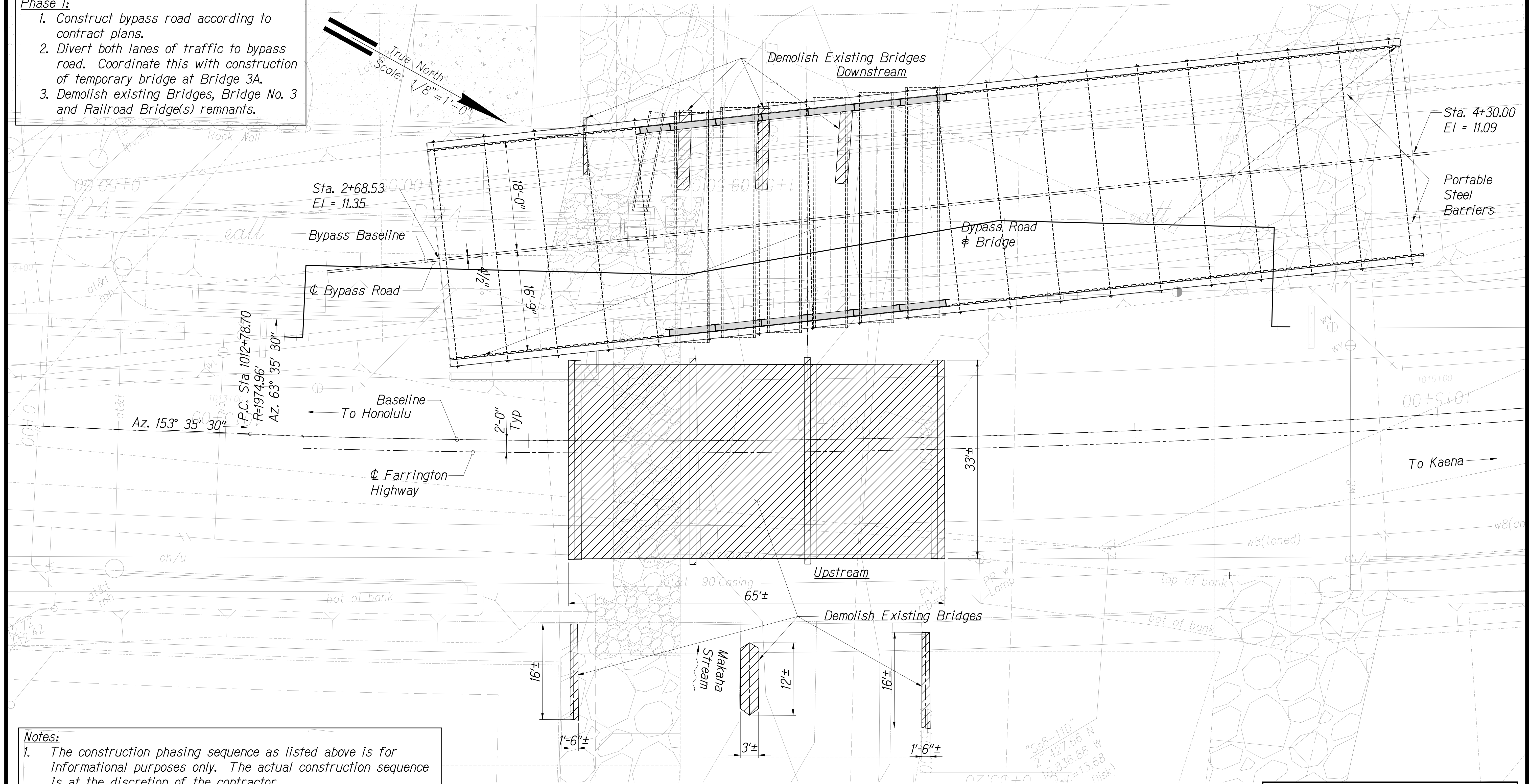
Scale: As Noted Date: July 2020

SHEET No. S0.4 OF 168 SHEETS

CONSTRUCTION PHASING SEQUENCE

Phase 1:

1. Construct bypass road according to contract plans.
2. Divert both lanes of traffic to bypass road. Coordinate this with construction of temporary bridge at Bridge 3A.
3. Demolish existing Bridges, Bridge No. 3 and Railroad Bridge(s) remnants.

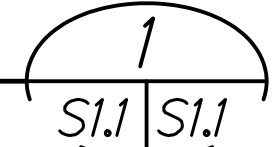


Notes:

1. The construction phasing sequence as listed above is for informational purposes only. The actual construction sequence is at the discretion of the contractor.
2. Contractor shall layout bridge with respect to baseline stations and offset dimensions.
3. Bridge deck width (out to out) is 47'-0" along length of bridge.
4. Edge of bridge decks follow the curve of the road.
5. Bridge railing is follows the curve of the road.
6. Contractor shall install Precast Planks and pour Concrete Topping prior to backfilling abutments.
7. See Sheet S21 for bypass road plan.
8. See Civil Drawings for Baseline details.

BRIDGE NO. 3 LAYOUT PLAN - PHASE 1

Scale: 1/8" = 1'-0"



EXPIRATION DATE OF THE LICENSE 4/30/2022
THIS WORK WAS PREPARED BY
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3
LAYOUT PLAN PHASE 1

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S1.1 OF 168 SHEETS

CONSTRUCTION PHASING SEQUENCE

Phase 2:

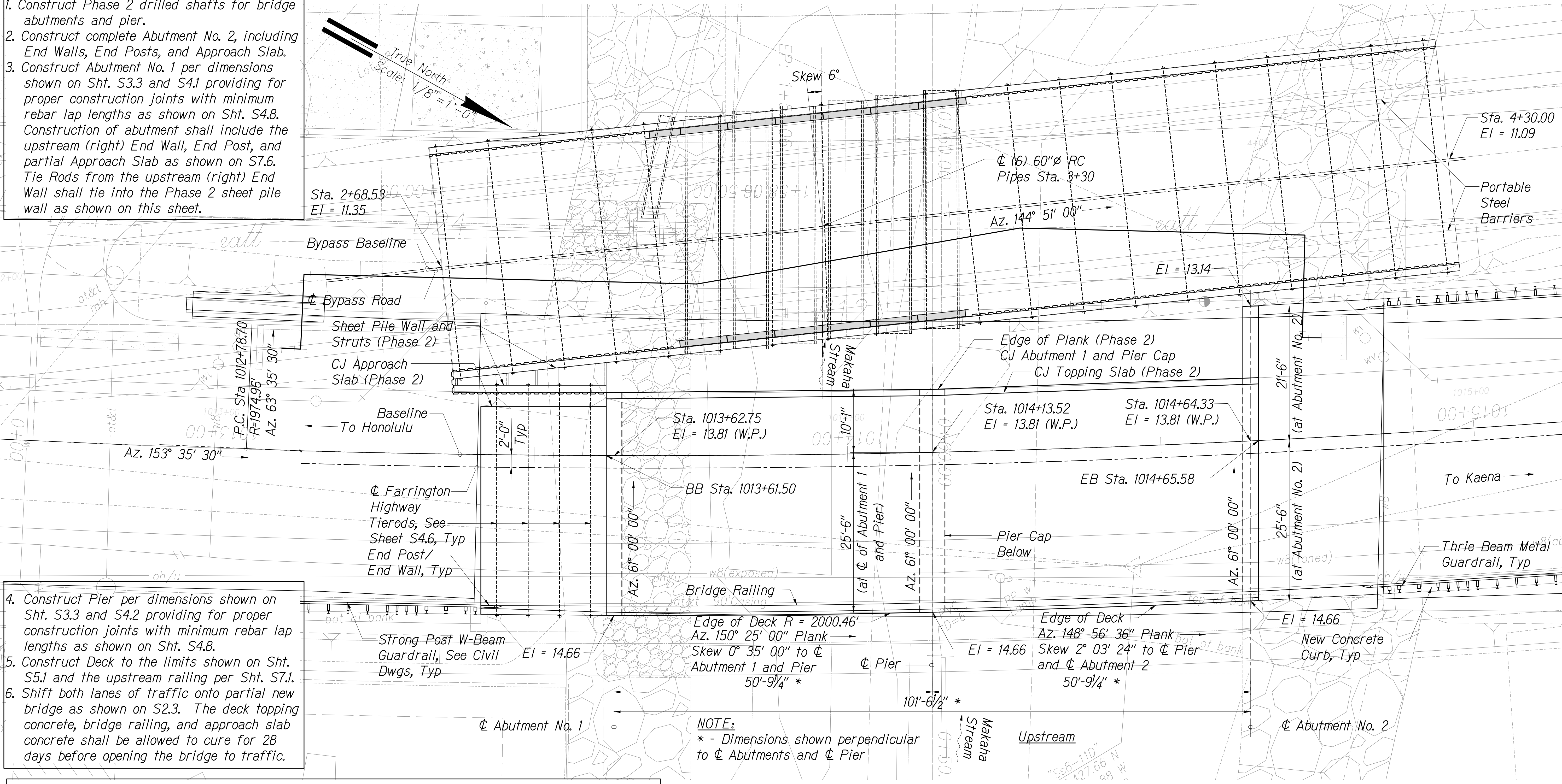
1. Construct Phase 2 drilled shafts for bridge abutments and pier.
2. Construct complete Abutment No. 2, including End Walls, End Posts, and Approach Slab.
3. Construct Abutment No. 1 per dimensions shown on Sht. S3.3 and S4.1 providing for proper construction joints with minimum rebar lap lengths as shown on Sht. S4.8. Construction of abutment shall include the upstream (right) End Wall, End Post, and partial Approach Slab as shown on S7.6. Tie Rods from the upstream (right) End Wall shall tie into the Phase 2 sheet pile wall as shown on this sheet.

4. Construct Pier per dimensions shown on Sht. S3.3 and S4.2 providing for proper construction joints with minimum rebar lap lengths as shown on Sht. S4.8.
5. Construct Deck to the limits shown on Sht. S5.1 and the upstream railing per Sht. S7.1.
6. Shift both lanes of traffic onto partial new bridge as shown on S2.3. The deck topping concrete, bridge railing, and approach slab concrete shall be allowed to cure for 28 days before opening the bridge to traffic.

Notes:

1. The construction phasing sequence as listed above is for informational purposes only. The actual construction sequence is at the discretion of the Contractor.
2. Contractor shall layout bridge with respect to baseline stations and offset dimensions.
3. Bridge deck width (out to out) is 47'-0" along length of bridge.
4. Edge of bridge decks are parallel with precast planks and are not following the curve of the road.
5. Bridge railing is following the curve of the road.
6. Contractor shall install Precast Planks and pour Concrete Topping prior to backfilling abutments.
7. See Sheet S2.1 for bypass road plan.
8. See Civil Drawings for Baseline details.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	87	168

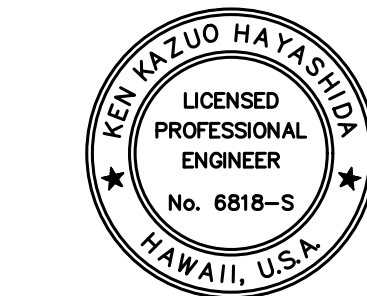


NOTE:
 * - Dimensions shown perpendicular to ϕ Abutments and ϕ Pier

BRIDGE NO. 3 LAYOUT PLAN - PHASE 2

Scale: 1/8" = 1'-0"

1
 S1.2 S1.2



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 HIGHWAYS DIVISION

BRIDGE NO. 3
LAYOUT PLAN PHASE 2

Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A
 Federal Aid Project No. BR-093-1(20)

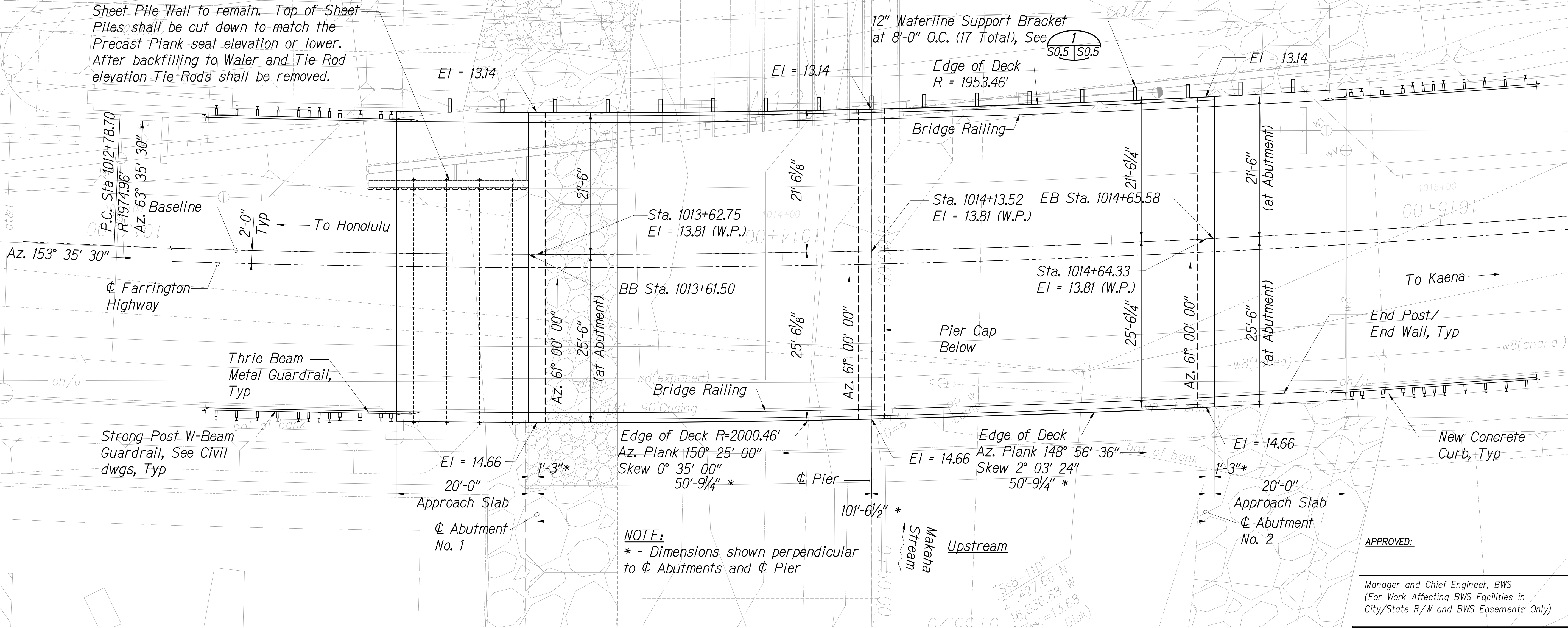
Scale: As Noted Date: July 2020

SHEET No. S1.2 OF 168 SHEETS

CONSTRUCTION PHASING SEQUENCE

Phase 3:

1. Demolish the bypass road. Remove all steel sheeting and soldier piles on bypass road.
2. Steel sheeting that is tied to Abutment No. 1 shall remain and the top shall be cut down to match the Precast Plank seat elevation or lower.
3. Abutment No. 1 Tie Rods at the sheet pile wall shall be removed after backfilling to the Waler and Tie Rod elevation.
4. Complete the construction of Bridge No. 3



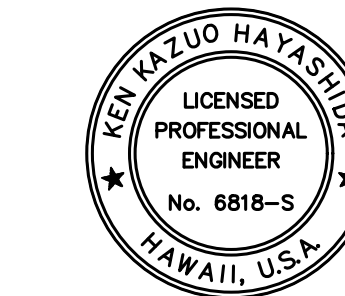
Notes:

1. Contractor shall layout bridge with respect to baseline stations and offset dimensions.
2. Bridge deck width (out to out) is 47'-0" along length of bridge.
3. Edge of bridge decks are parallel with precast planks and are not following the curve of the road.
4. Bridge railing follows the curve of the road.
5. Contractor shall install Precast Planks and pour Concrete Topping prior to backfilling abutments.

BRIDGE NO. 3 LAYOUT PLAN - PHASE 3

Scale: 1/8" = 1'-0"

$\frac{1}{S1.3 | S1.3}$



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HIGHWAYS DIVISION

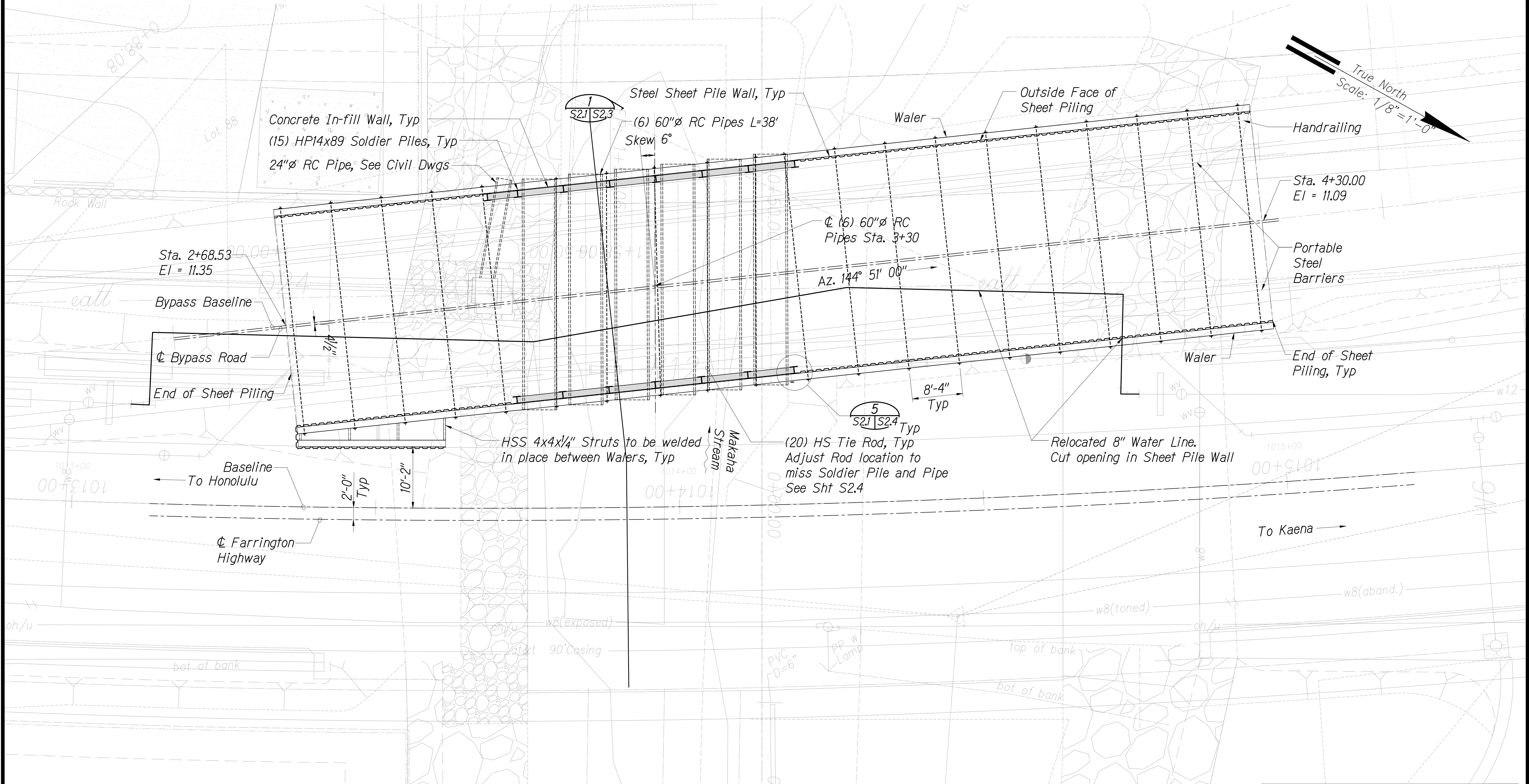
BRIDGE NO. 3
LAYOUT PLAN PHASE 3

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S1.3 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	89	168



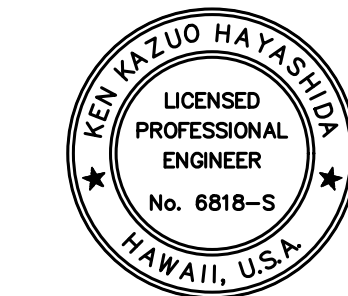
Notes:

1. HS Tie Rods are to be installed perpendicular to the face of the sheet piling, except at pipes.
2. Refer to Civil Drawings for baseline of bypass road.

BRIDGE NO. 3 - BYPASS ROAD PLAN

Scale: 1/8" = 1'-0"

1
S2.1 S2.1



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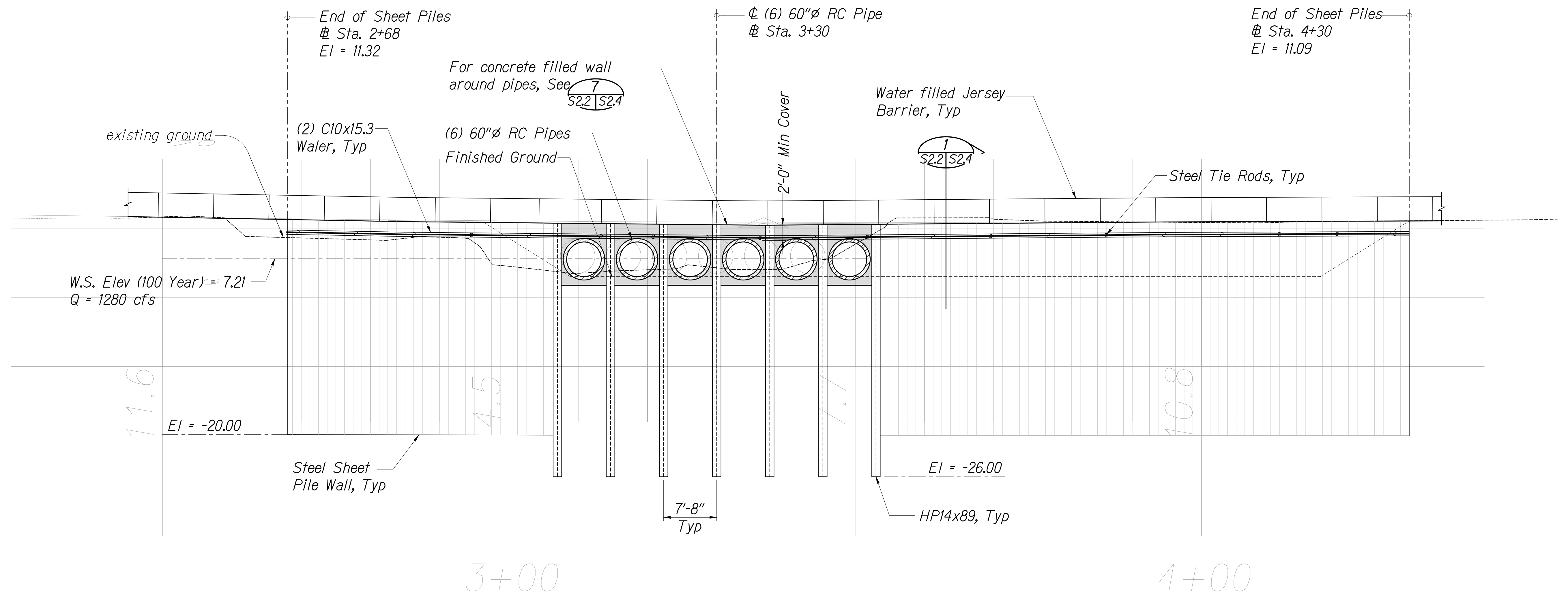
BRIDGE NO. 3
BYPASS ROAD PLAN

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

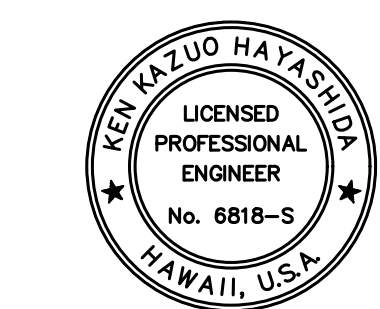
SHEET No. S2.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	90	168



Note:
1. All baseline stations refer to bypass road baseline.
2. Refer to civil dwgs for culvert pipe invert elevations.

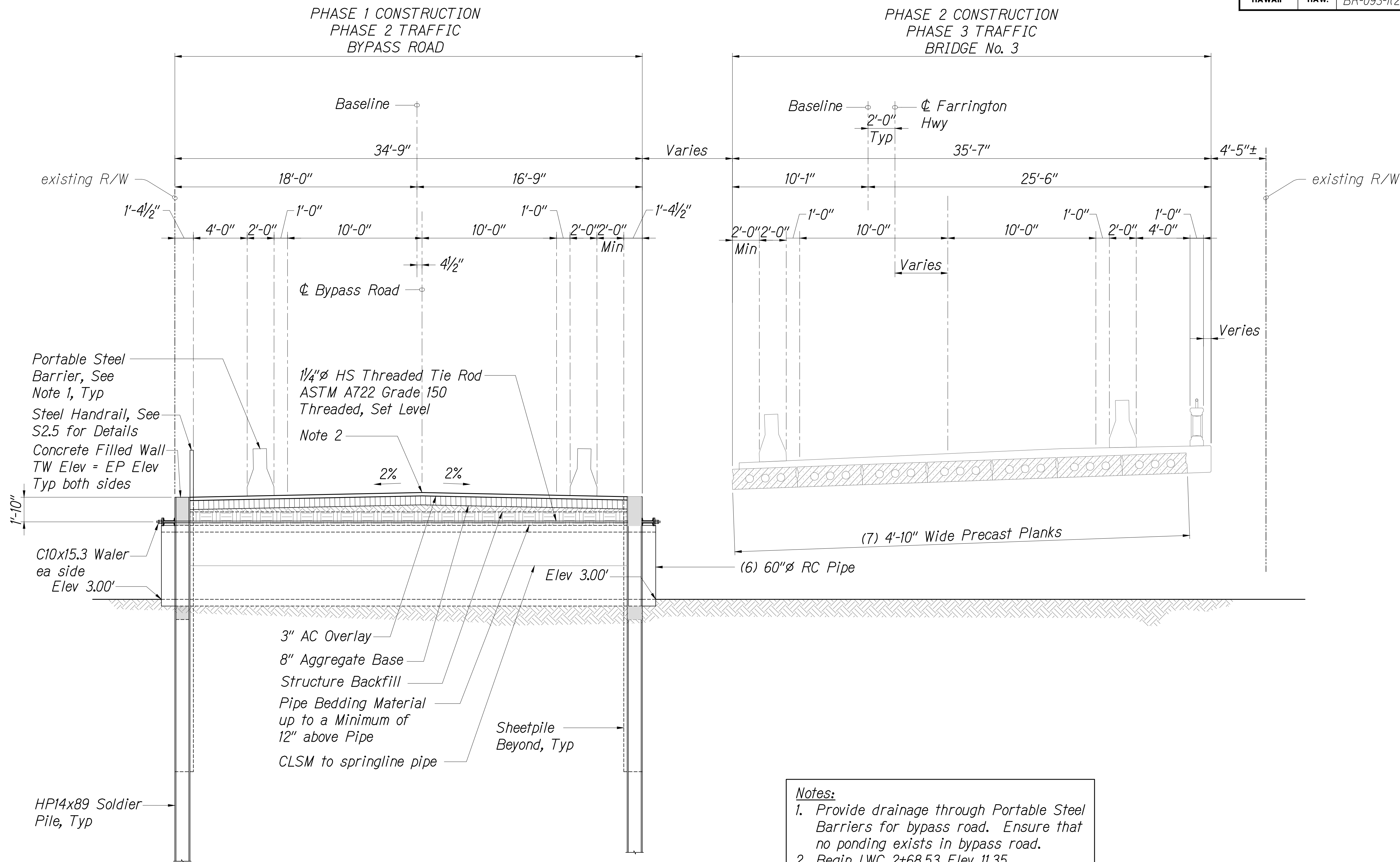
BRIDGE NO. 3 - BYPASS ROAD ELEVATION
Scale: 1/8" = 1'-0"
S2.2 | S2.2



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BRIDGE NO. 3
BYPASS ROAD ELEVATION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)
Scale: As Noted Date: July 2020
SHEET No. S2.2 OF 168 SHEETS

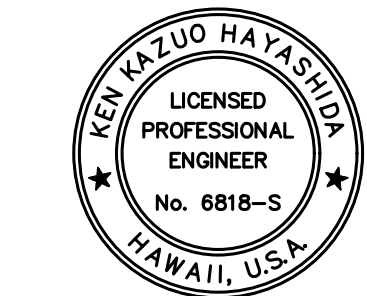
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	91	168



- Notes:**
1. Provide drainage through Portable Steel Barriers for bypass road. Ensure that no ponding exists in bypass road.
 2. Begin LWC 2+68.53 Elev 11.35
Low Point 3+57.50 Elev 10.82
End LWC 4+30.00 Elev 11.09

BRIDGE NO. 3 - BYPASS ROAD CROSS SECTION
Scale: 1/4" = 1'-0"

1
S2.1 S2.3



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HIGHWAYS DIVISION

BRIDGE NO. 3

BYPASS ROAD CROSS SECTION

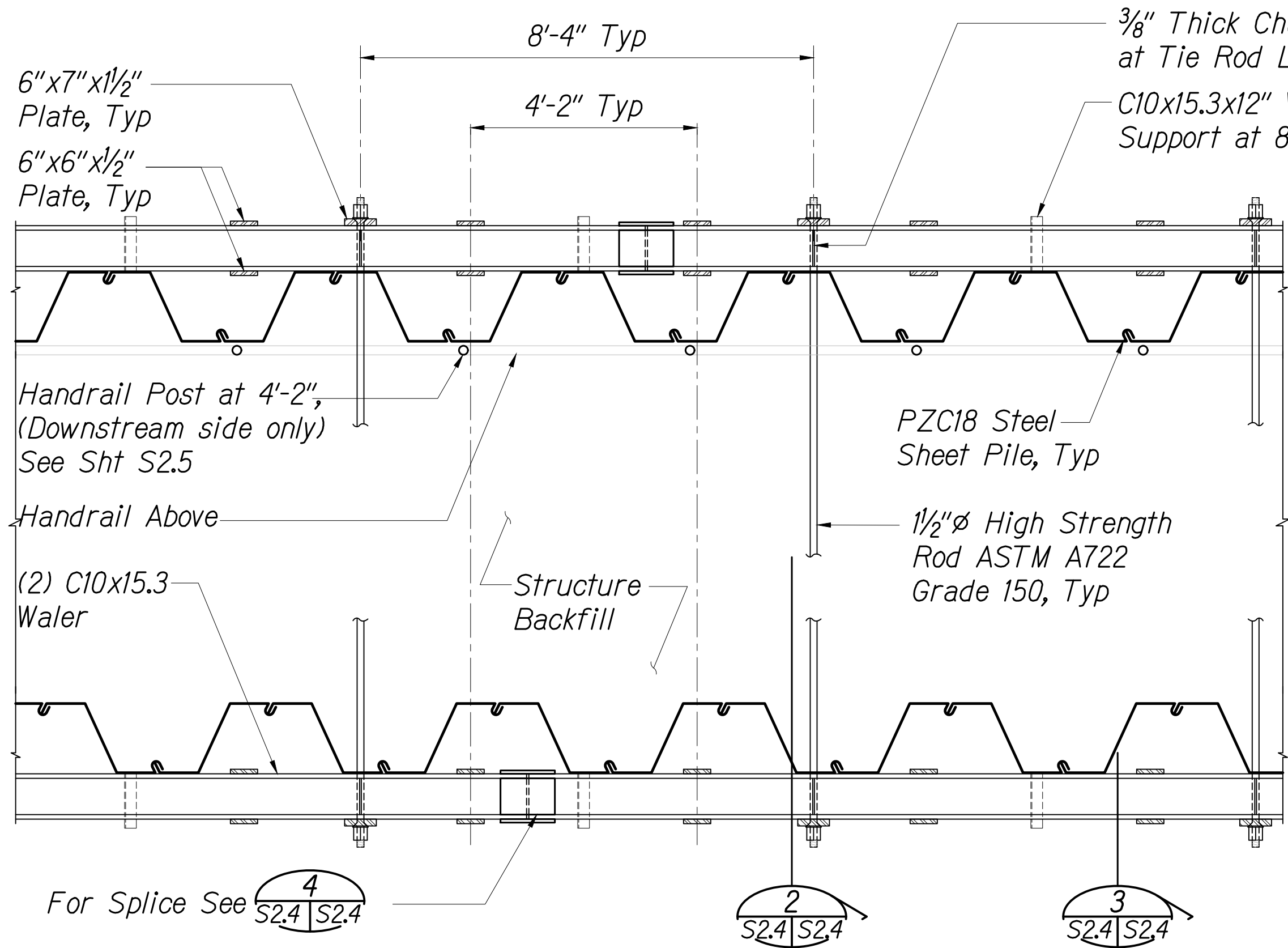
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

SHEET No. S2.3 OF 168 SHEETS

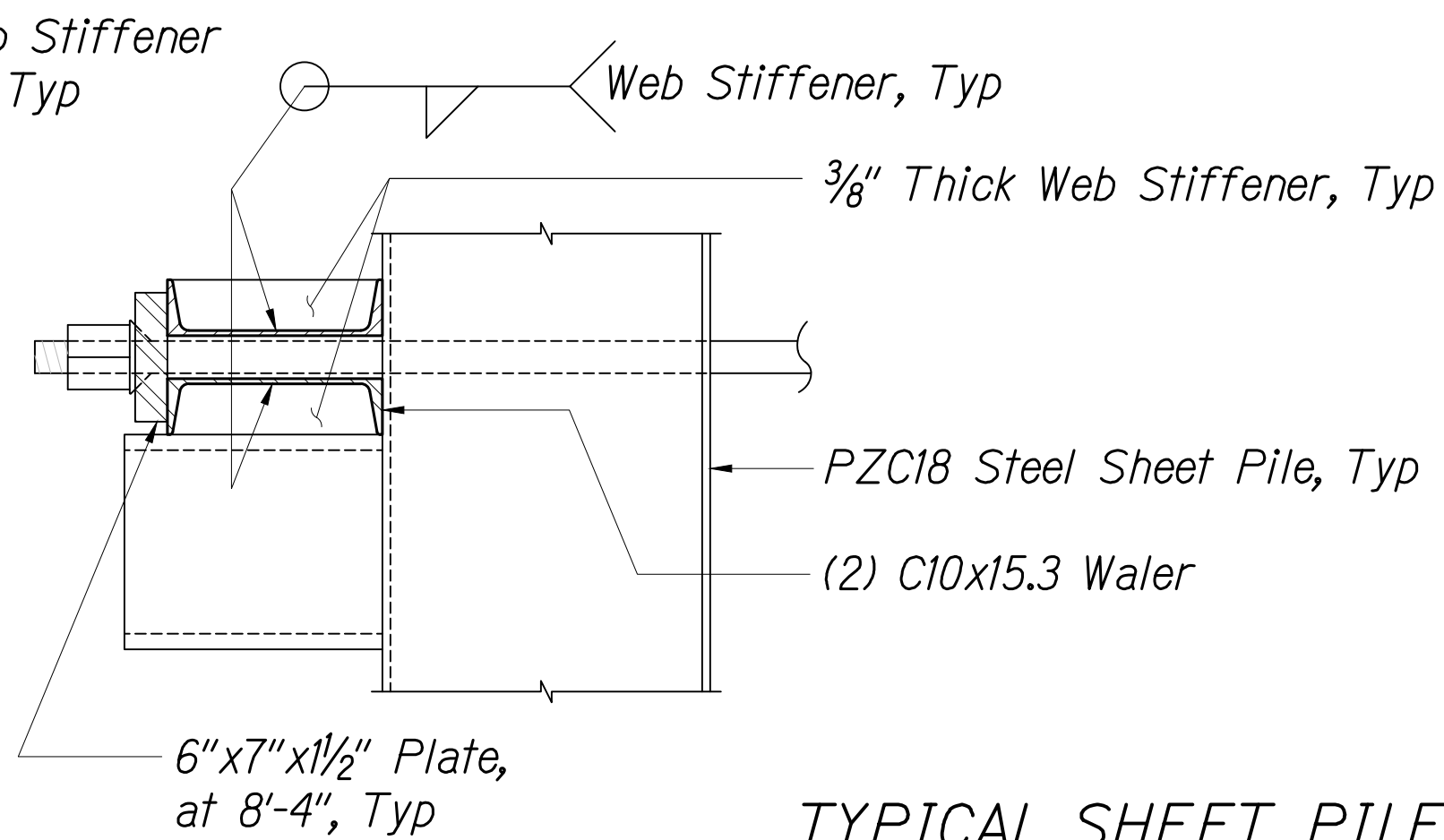
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	92	168



TYPICAL SHEET PILE WALL PLAN

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

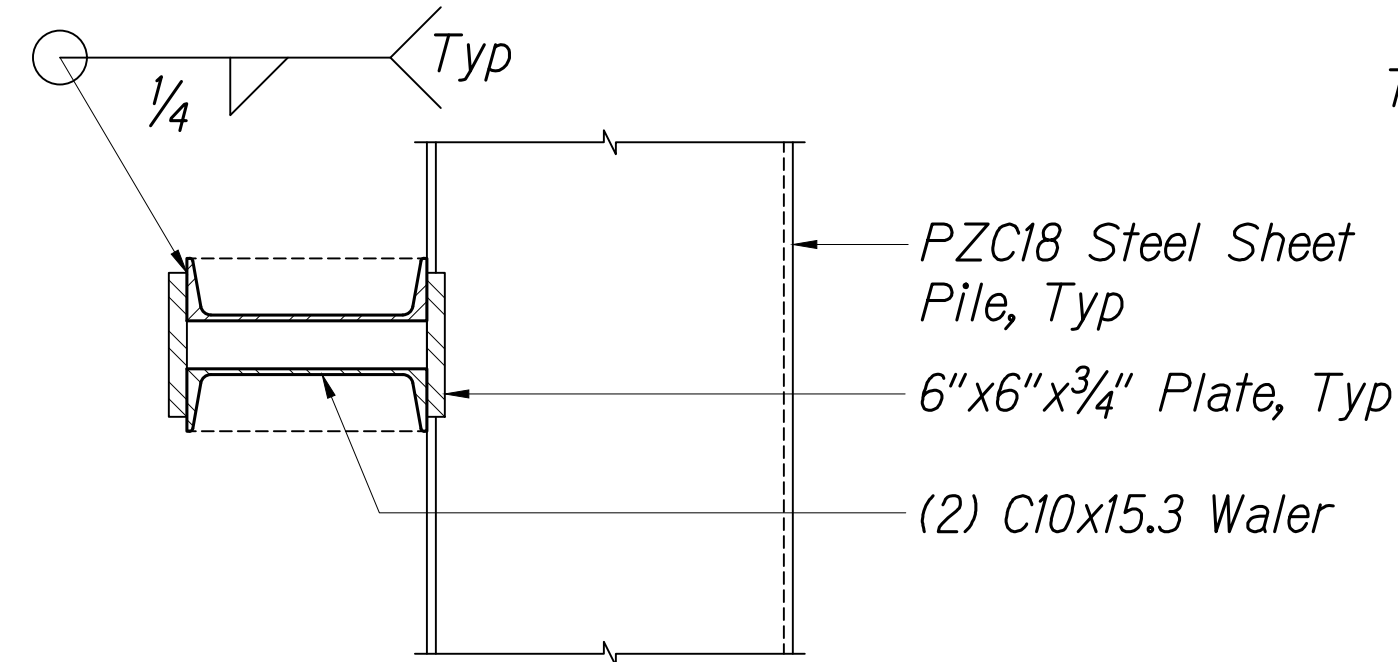
1 S2.2 S2.4



TYPICAL SHEET PILE WALL SECTION

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

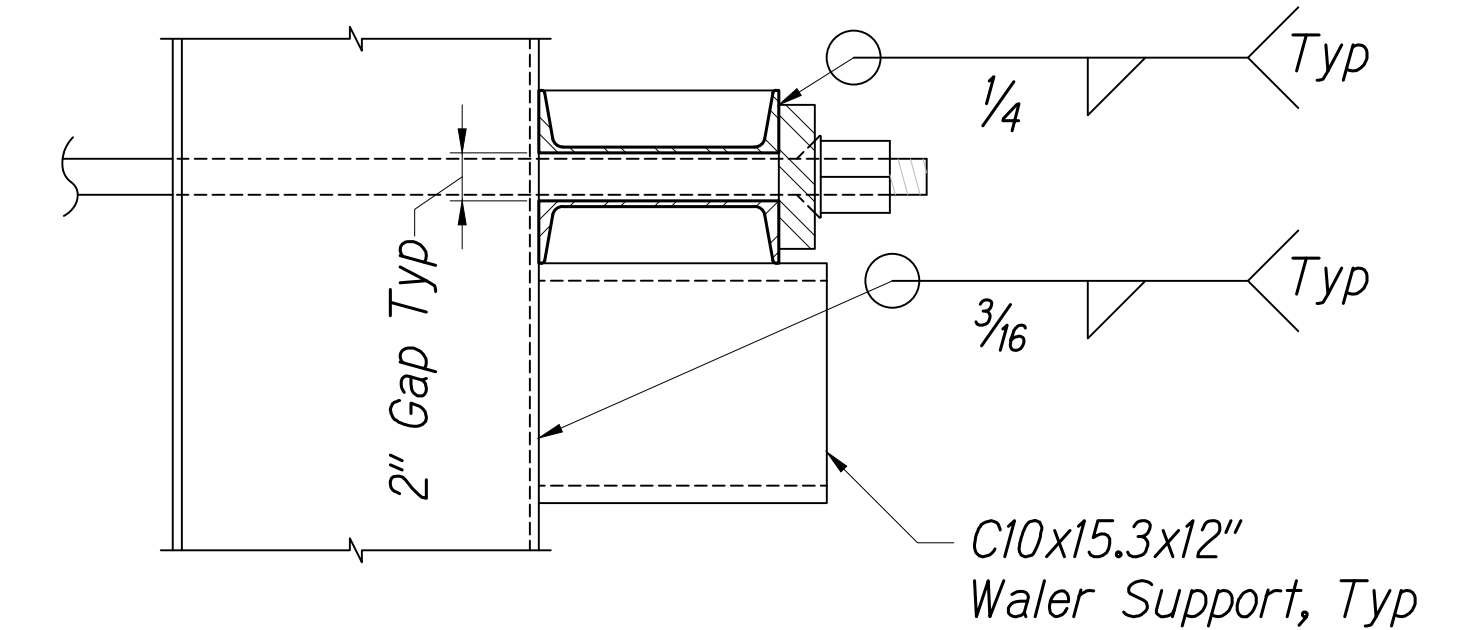
2 S2.4 S2.4



SECTION

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

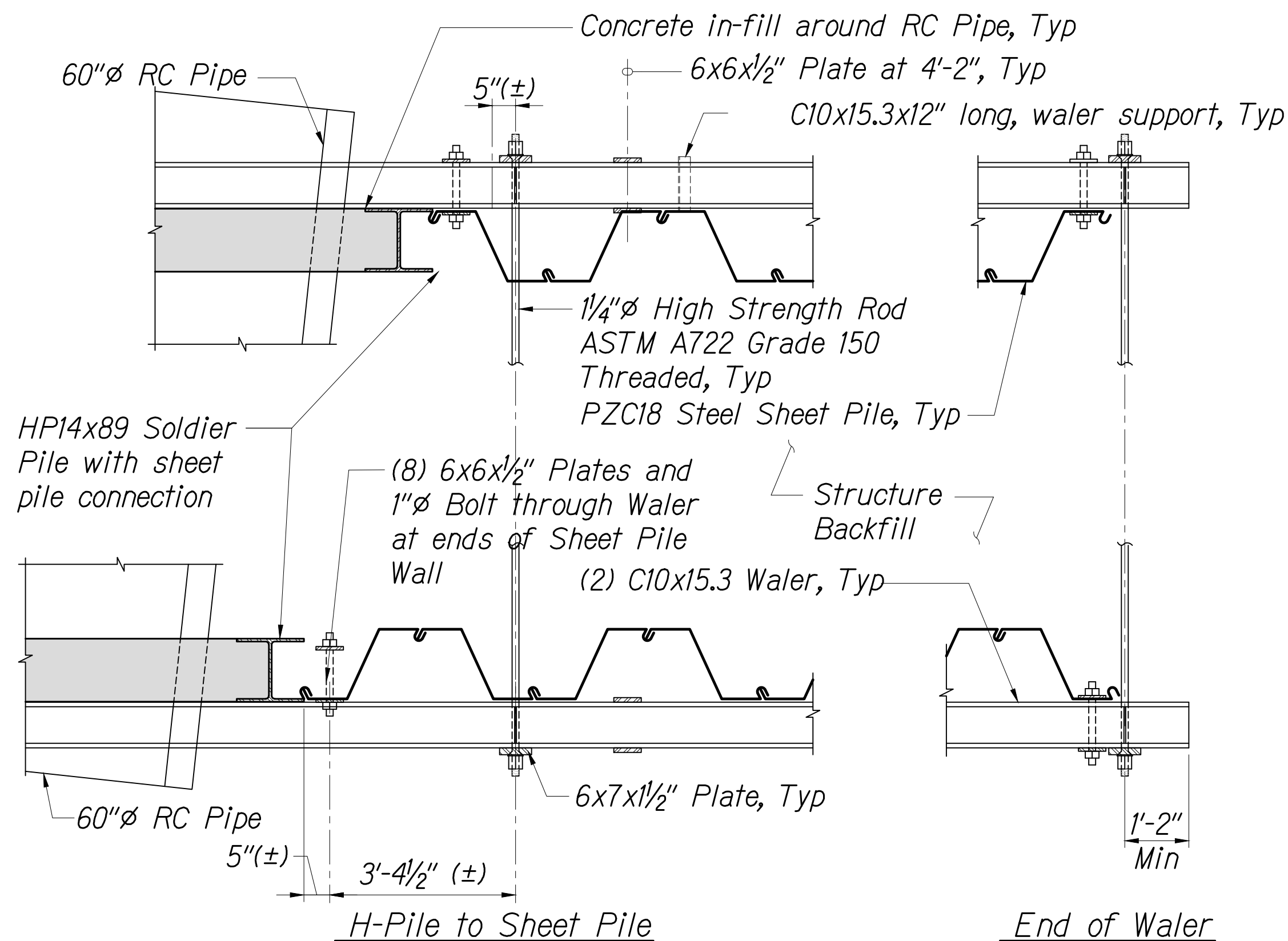
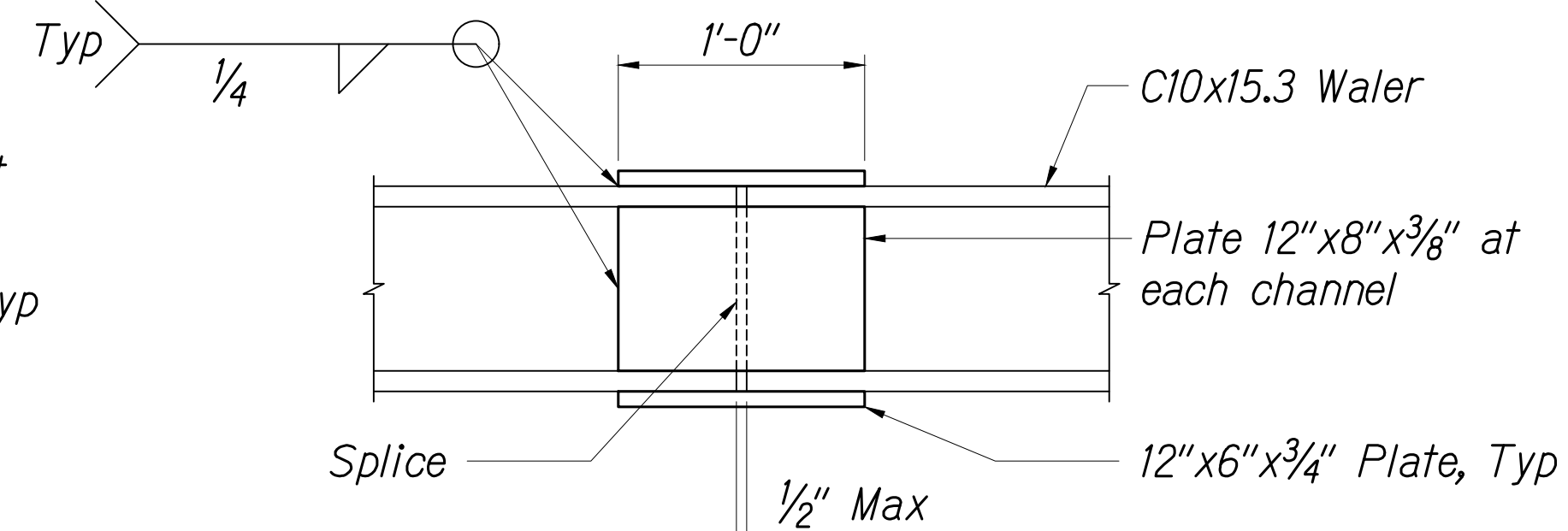
3 S2.4 S2.4



SECTION

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

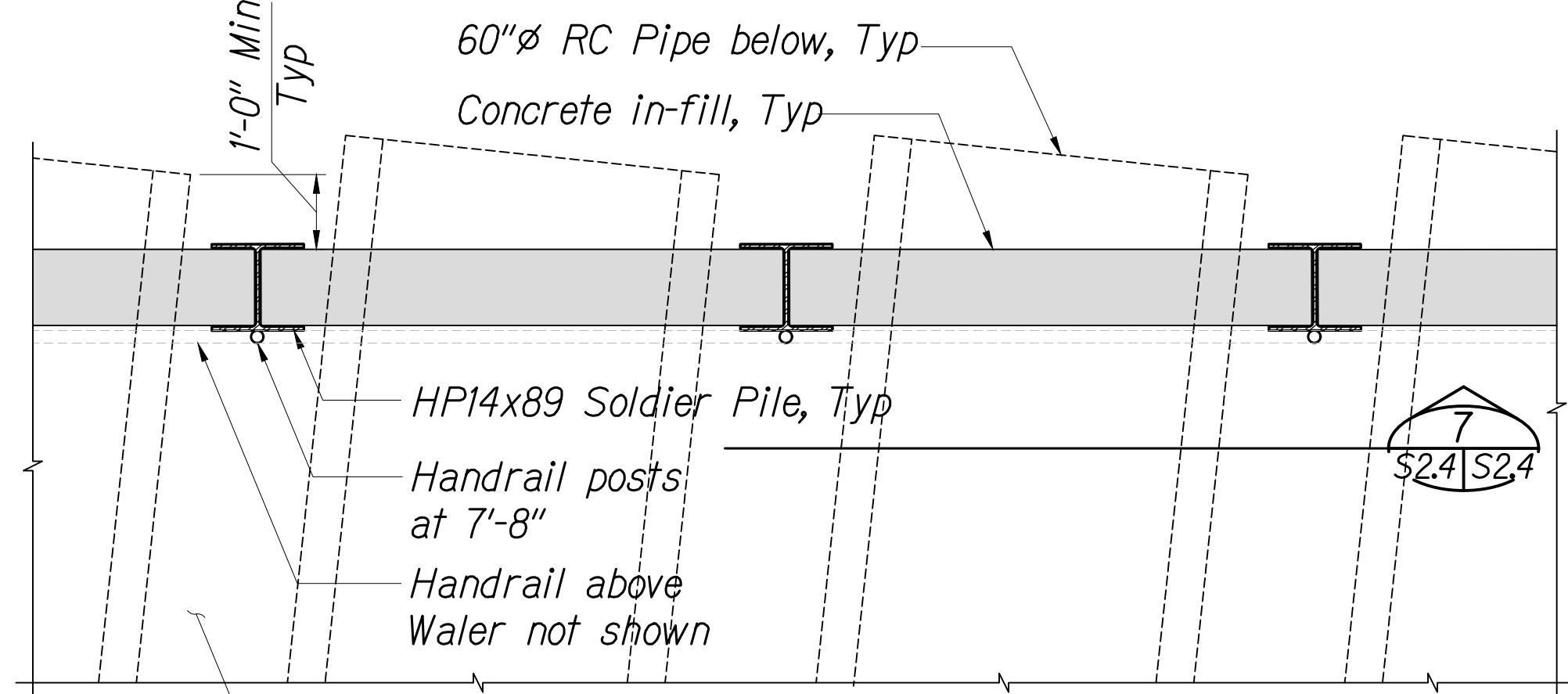
4 S2.4 S2.4



DETAIL

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

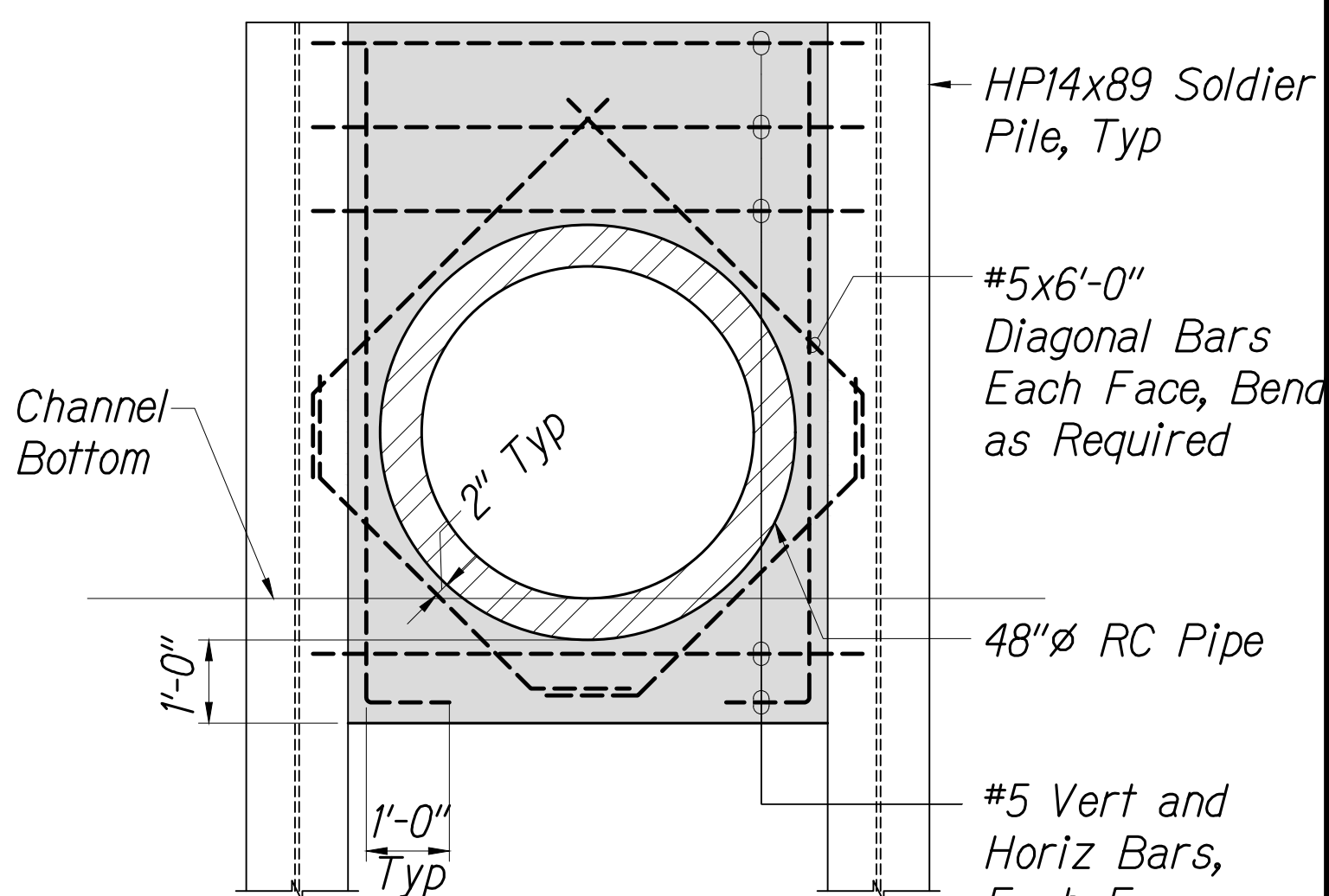
5 S2.1 S2.4



TYPICAL H-PILE AND CONCRETE WALL PLAN

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

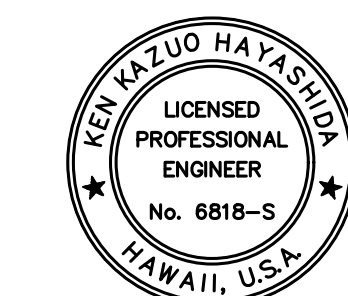
6 S2.4 S2.4



SECTION

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

7 S2.2, S2.4 S2.4



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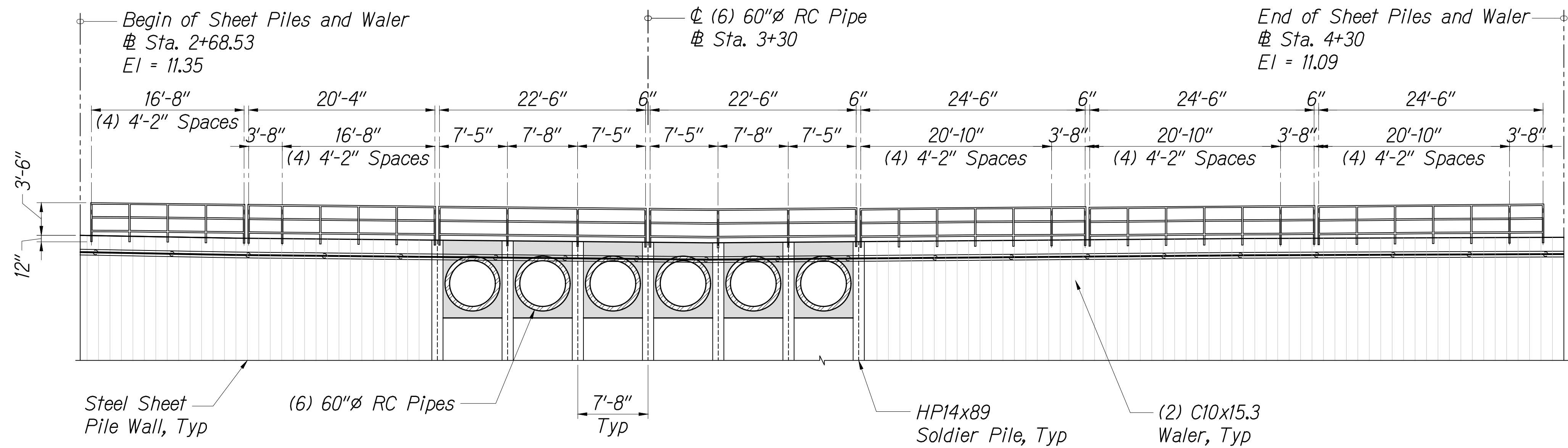
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3 - BYPASS ROAD
WALL SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

SHEET No. S2.4 OF 168 SHEETS

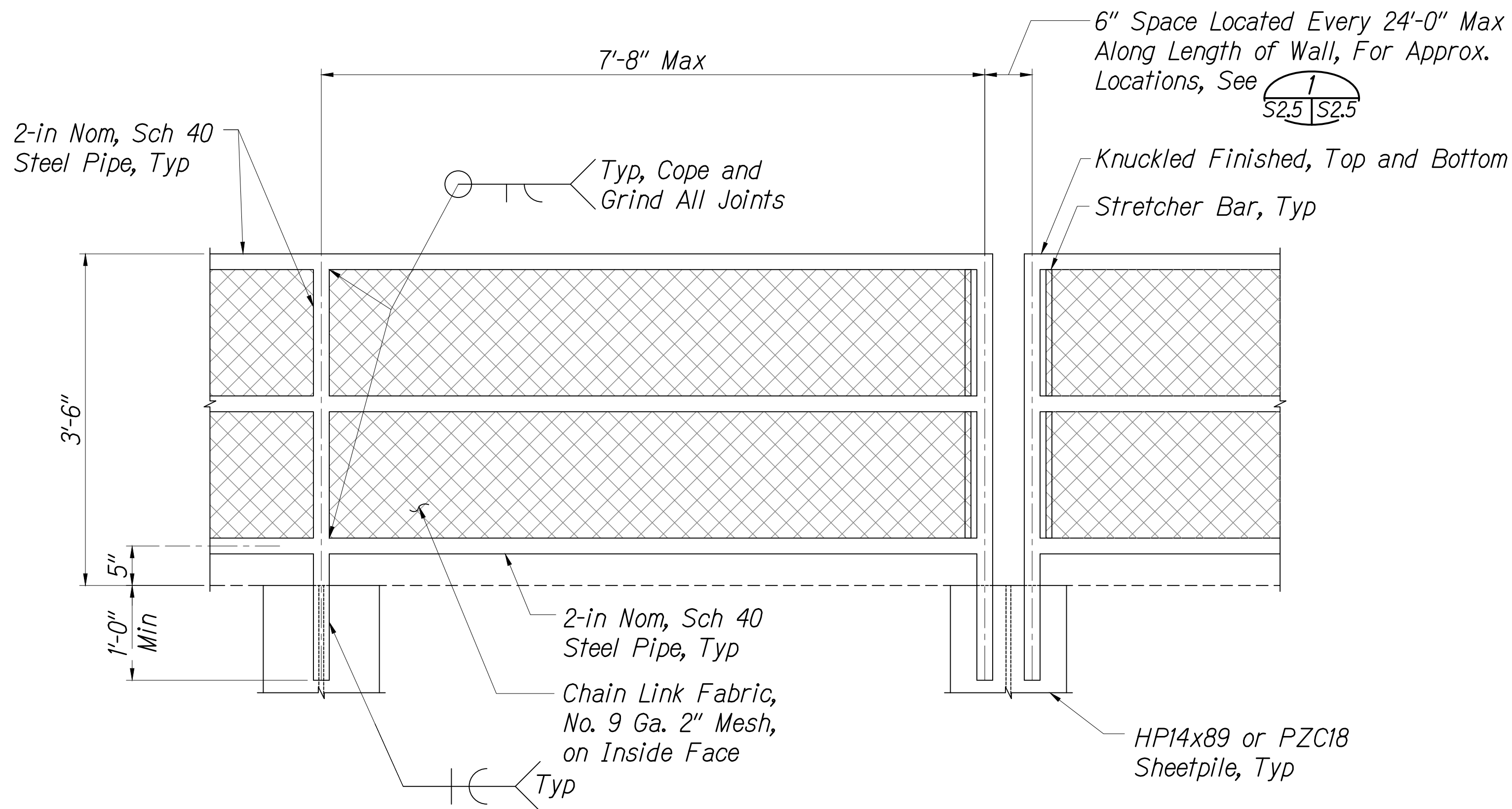
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	93	168



BRIDGE NO. 3 - BYPASS ROAD HAND RAILING ELEVATION

Scale : 1/8" = 1'-0"

1
S2.5 | S2.5

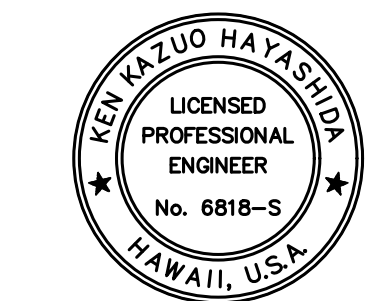


TYPICAL HANDRAILING DETAIL

Not to Scale

2
S2.5 | S2.5

- Notes:
- Hand railing to be Hot-Dip Galvanized.
 - All hot-dip galvanized Coating that is damaged during shipping and installation shall be repaired. The repairs shall consist of the following:
 - Prepare surface per SSPC-SP1, solvent cleaning.
 - Apply (2) coats of cold applied, galvanizing compound containing 95% metallic zinc content by weight in dry film and 52% solids content by volume.
 - Application rate shall be 1.5 mils dry film thickness per coat.
 - Fabric shall be continuous and fastened to end posts by stretcher tension bars and tension bands spaced approximately 15" apart.
 - Wire fastenings shall be No. 9 guage galvanized tie wire.
 - Line post wire fastenings shall be spaced at 14" apart.
 - Horizontal rail wire fastenings shall be spaced 18" apart.



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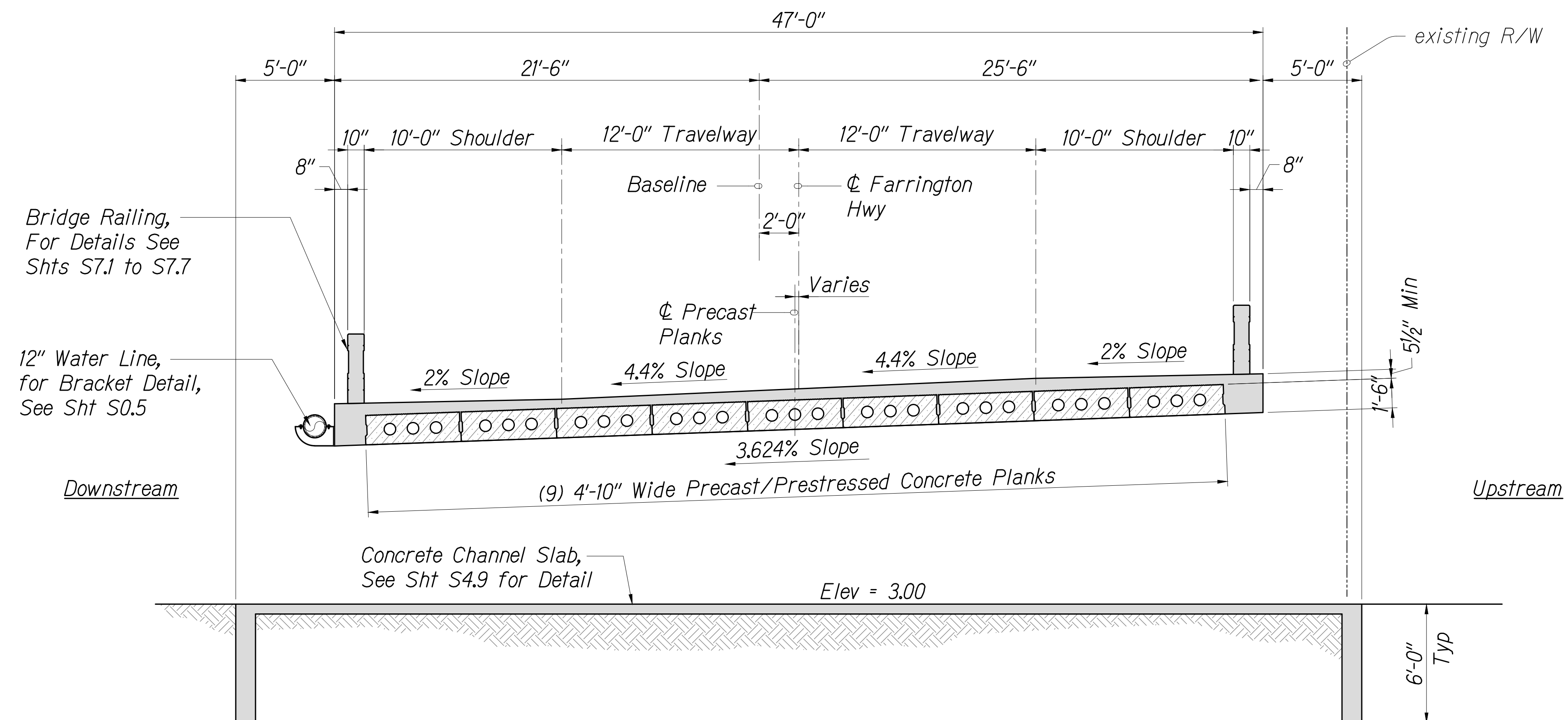
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RAILING ELEVATION AND DETAILS
ABUTMENT SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

SHEET No. S2.5 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	95	168



APPROVED:

Manager and Chief Engineer, BWS
(For Work Affecting BWS Facilities in
City/State R/W and BWS Easements Only)

Date



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
BRIDGE NO. 3
TYPICAL CROSS SECTION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

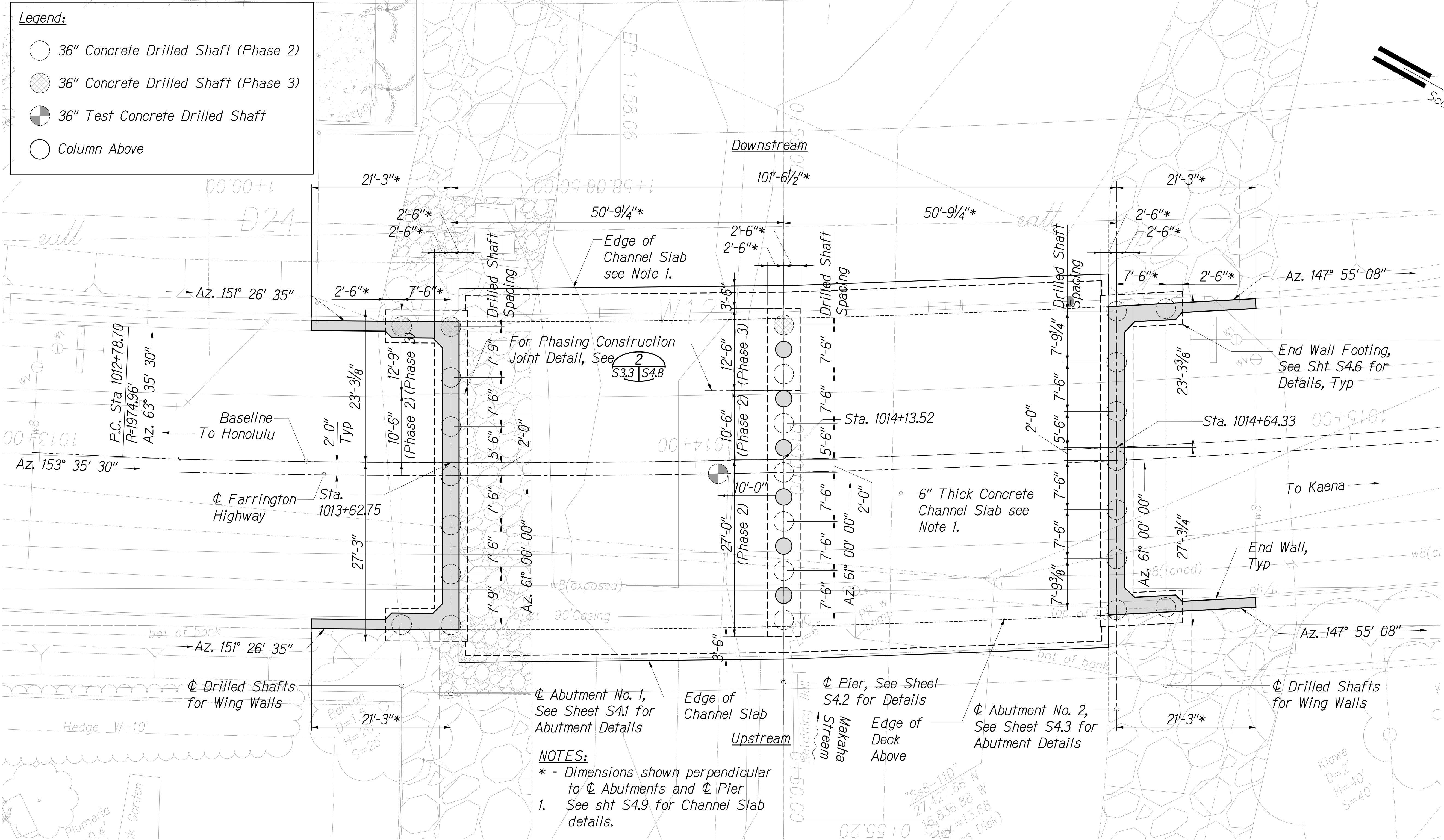
SHEET No. S3.2 OF 168 SHEETS

BRIDGE NO. 3 - TYPICAL CROSS SECTION

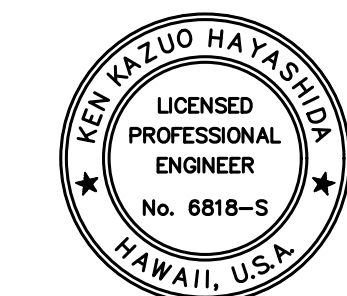
Scale: 1/4" = 1'-0"

1
S3.2 | S3.2

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	96	168



BRIDGE NO. 3 - FOUNDATION LAYOUT PLAN
Scale: 1/8" = 1'-0"



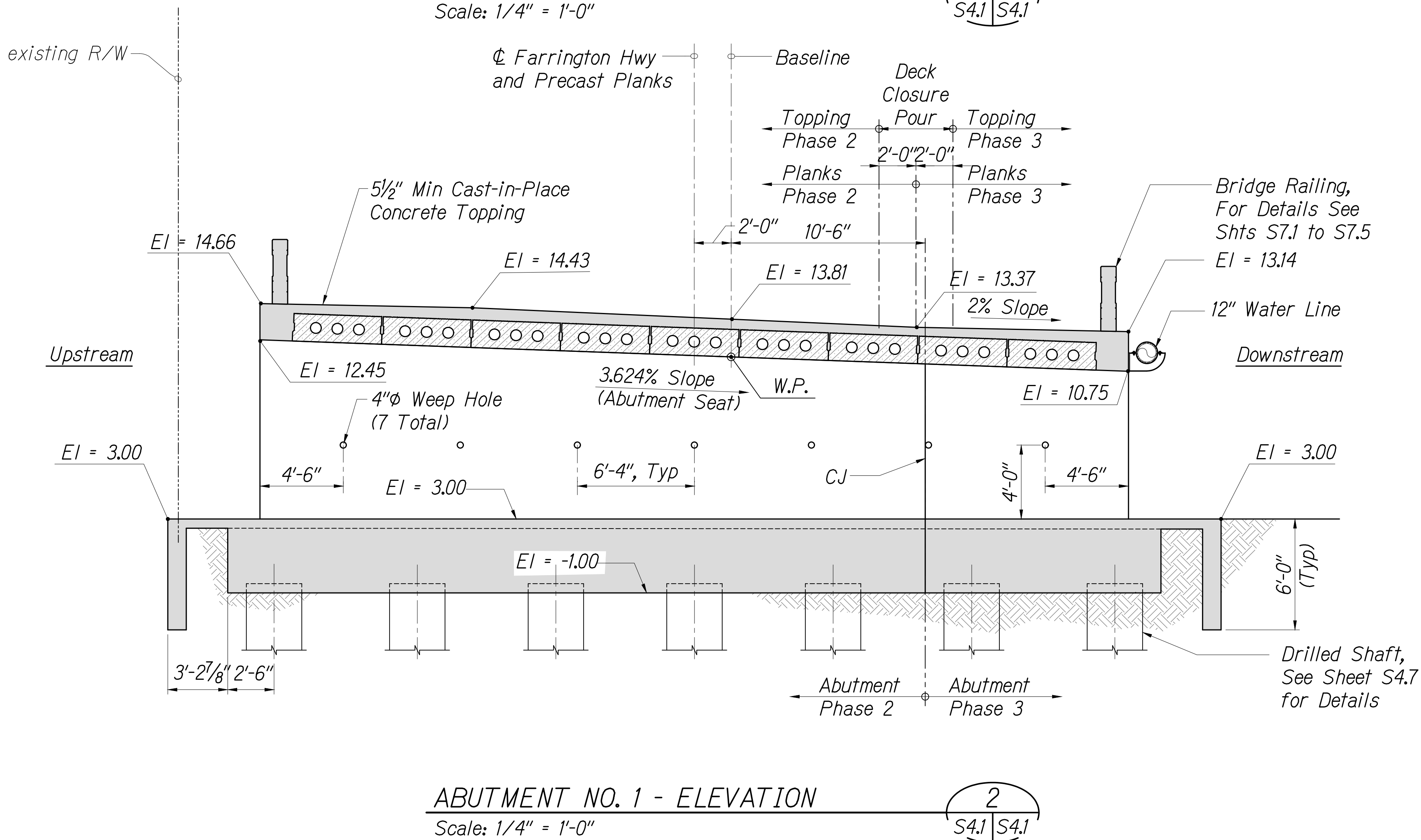
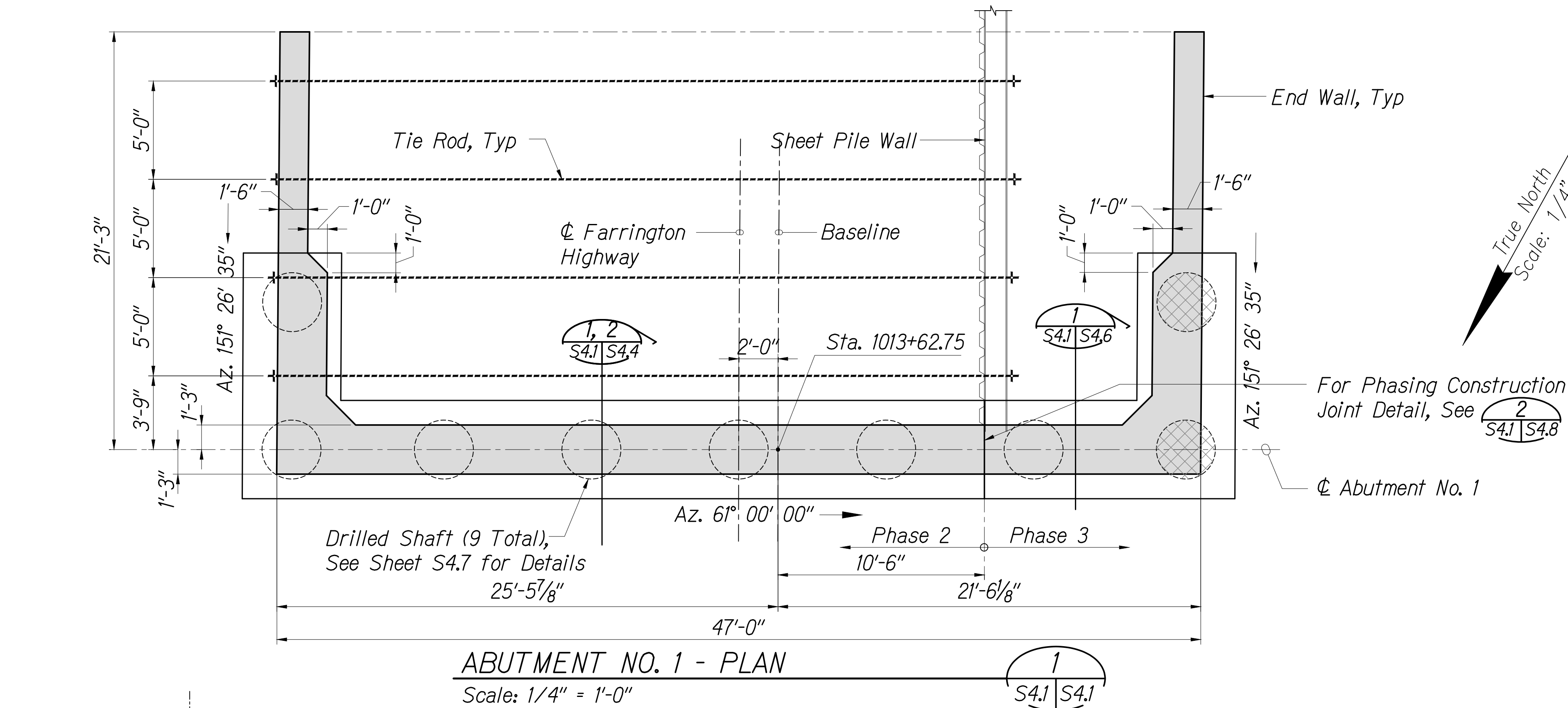
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3
FOUNDATION LAYOUT PLAN
Farrington Hwy - Replacement of Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

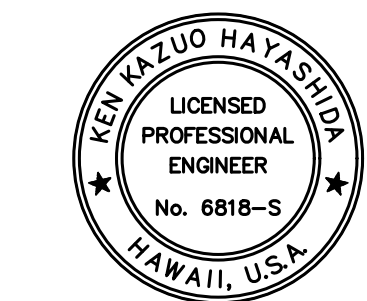
Scale: As Noted Date: July 2020

SHEET No. S3.3 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	97	168



- Notes:**
- For typical added reinforcing at weep holes, See S0.4/S0.4
 - Top of deck elevation and abutment seat elevation shown are at the center line of abutment. Abutment seat elevation shown is at the bottom of Plank. Elevation may vary depending on camber. Contractor is responsible to set elevation of abutment seat.



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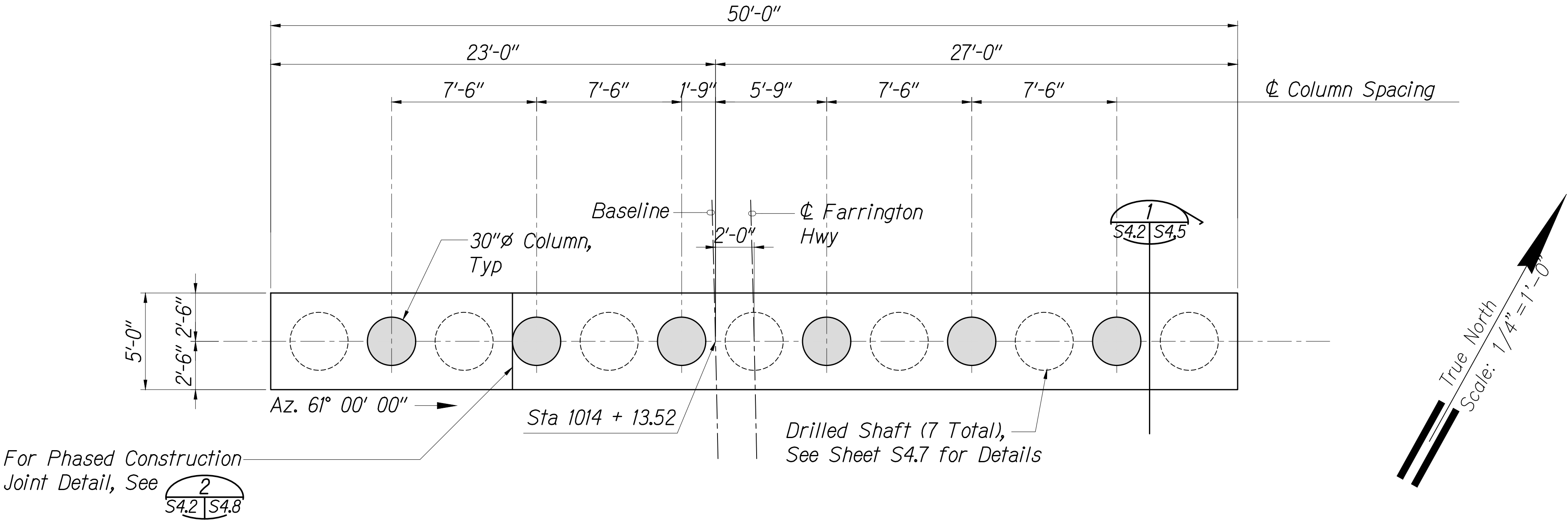
BRIDGE NO. 3 - ABUTMENT NO. 1
PLAN AND ELEVATION

Farrington Hwy - Replacement of Makaha
 Bridge No.3 & Makaha Bridge No. 3A
 Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

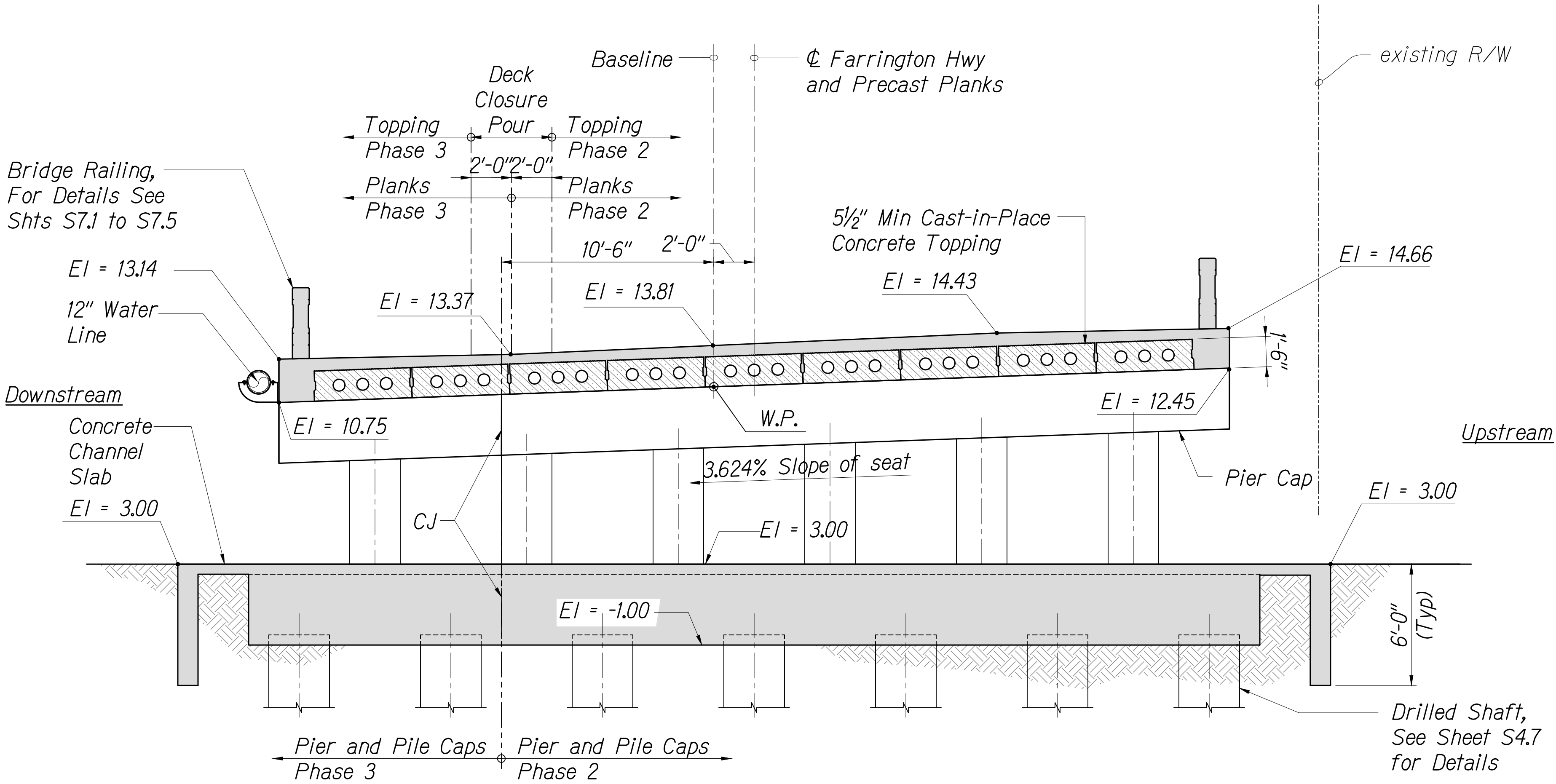
SHEET No. S4.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	98	168



PIER - PLAN

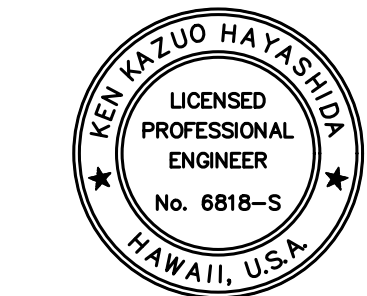
Scale: 1/4" = 1'-0"



PIER - ELEVATION

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

- Notes:
- Top of deck elevation and pier seat elevation shown are at the center line of pier. Pier seat elevation shown is at the bottom of Plank. Elevation may vary depending on camber. Contractor is responsible to set elevation of pier seat.



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HIGHWAYS DIVISION

BRIDGE NO. 3 - PIER

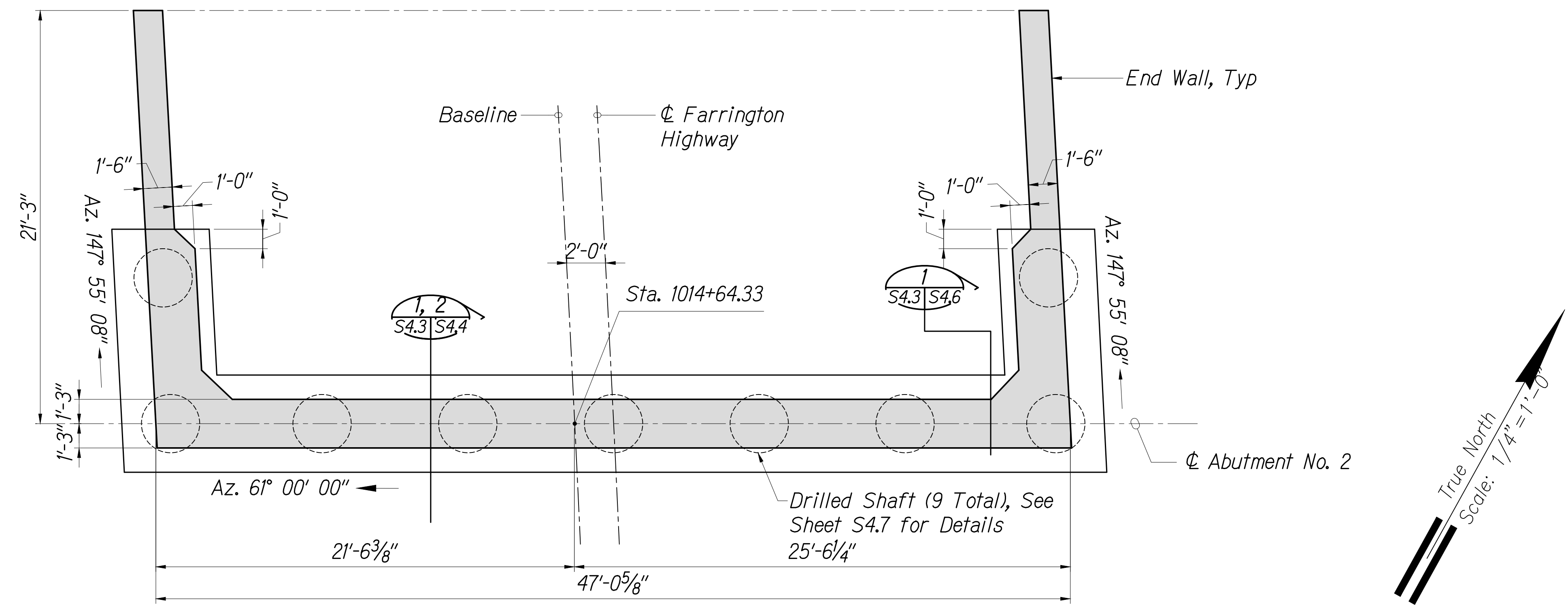
PLAN AND ELEVATION

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

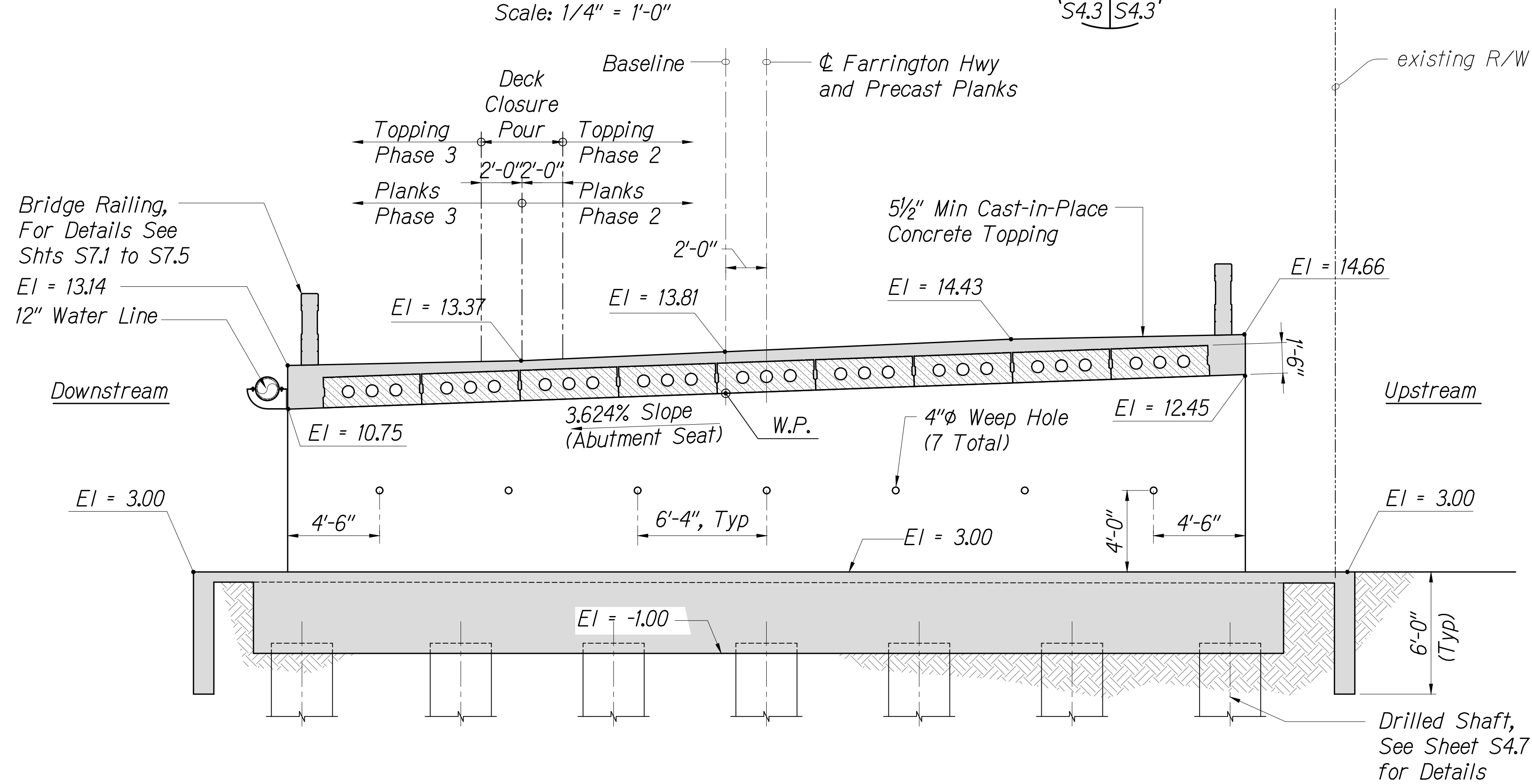
Scale: As Noted Date: July 2020

SHEET No. S4.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	99	168

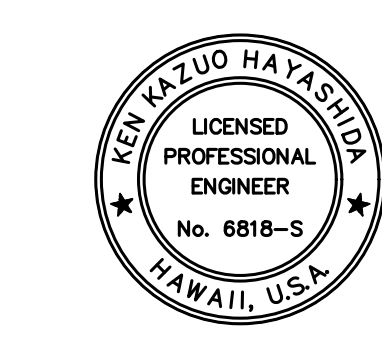


ABUTMENT NO. 2 - PLAN
Scale: 1/4" = 1'-0"



ABUTMENT NO. 2 - ELEVATION
Scale: 1/4" = 1'-0"

- Notes:
- For typical added reinforcing at weep holes, See S0.4 S0.4
 - Top of deck elevation and abutment seat elevation shown are at the center line of abutment. Abutment seat elevation shown is at the bottom of Plank. Elevation may vary depending on camber. Contractor is responsible to set elevation of abutment seat.



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HIGHWAYS DIVISION

BRIDGE NO. 3 - ABUTMENT NO. 2

PLAN AND ELEVATION

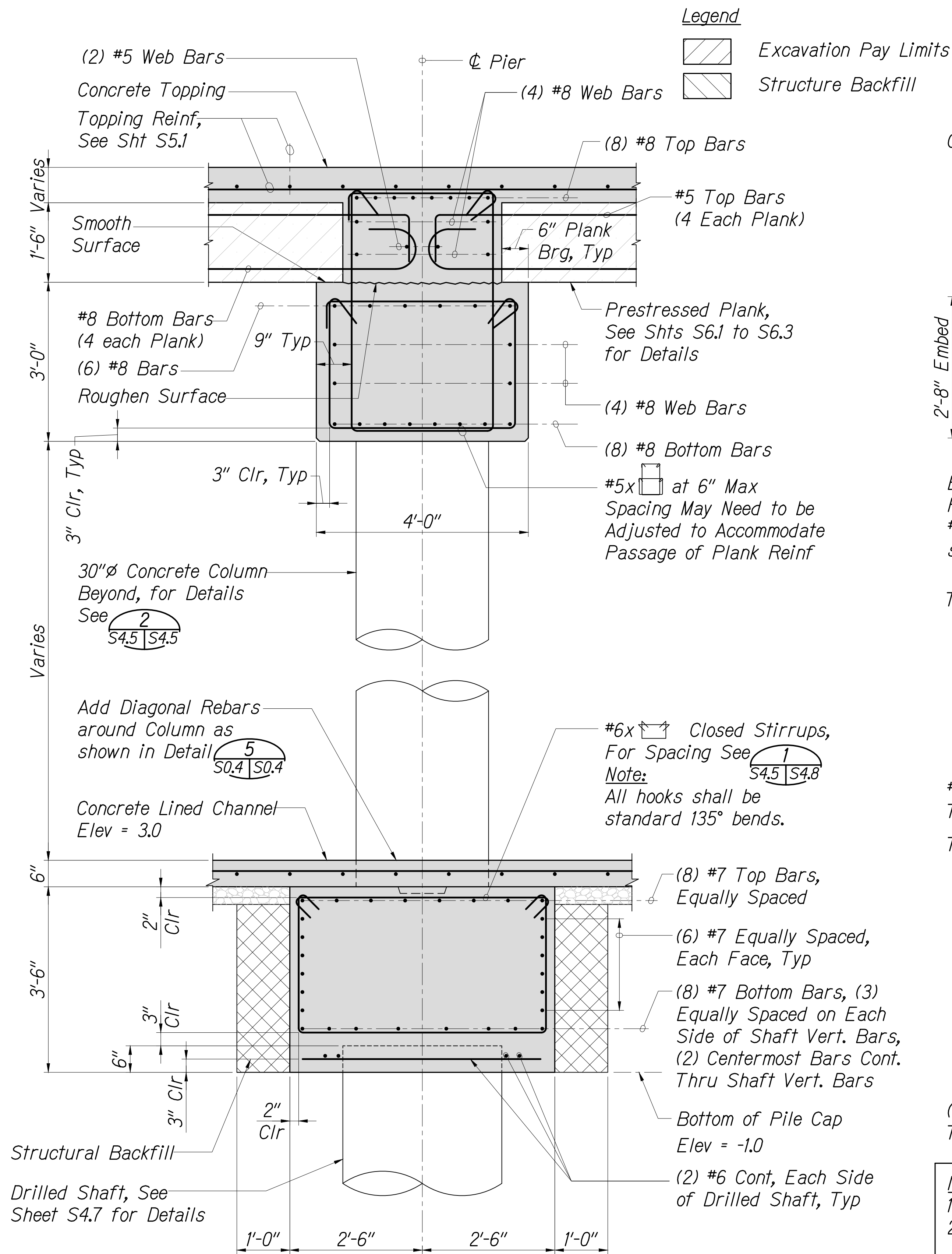
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

Federal Aid Project No. BR-093-1(20)

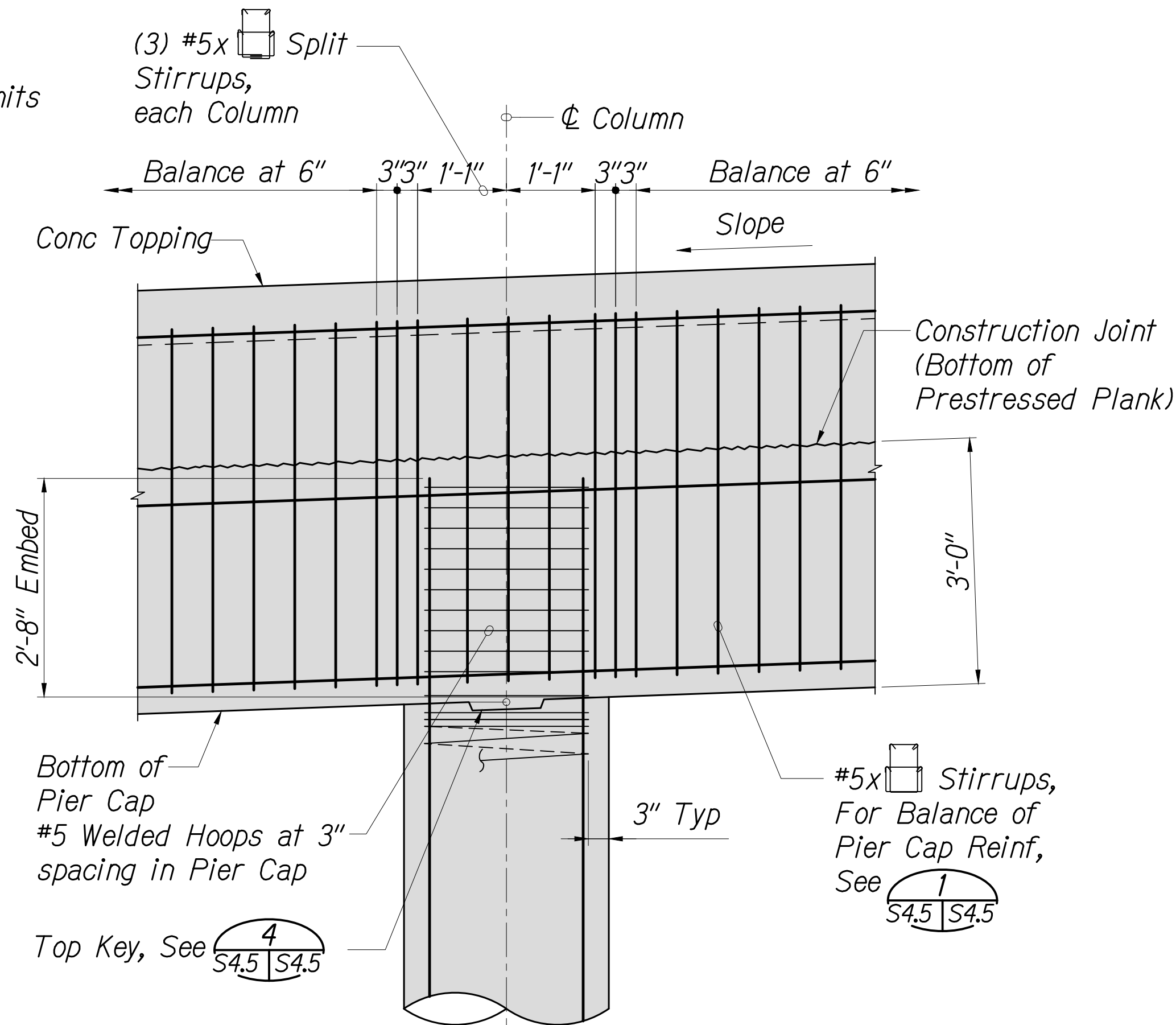
Scale: As Noted

Date: July 2020

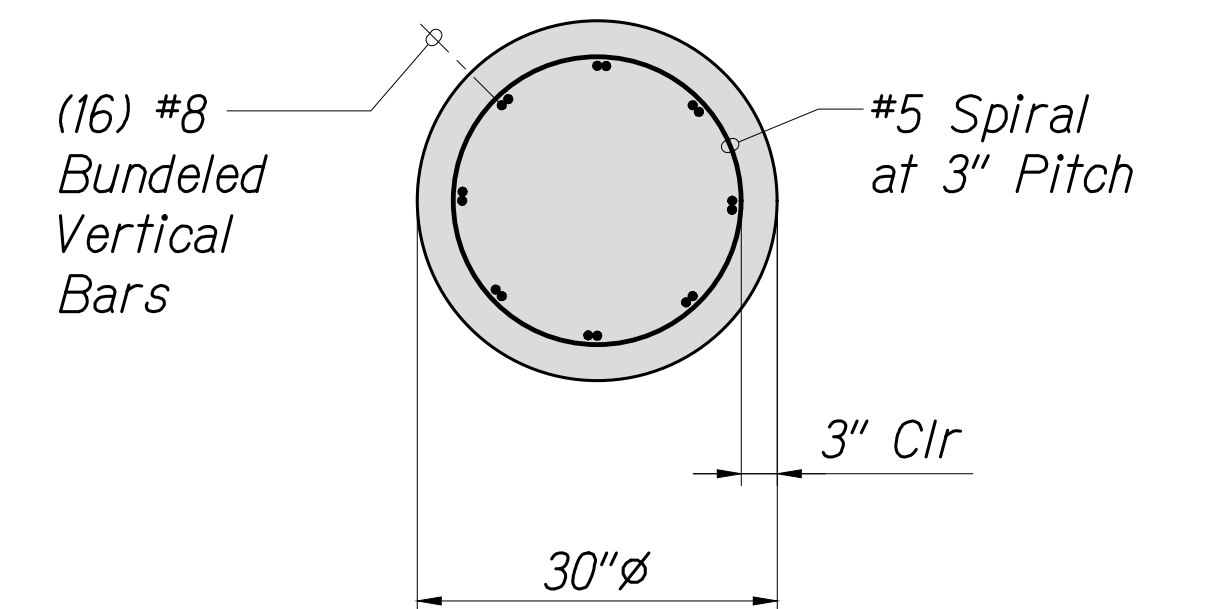
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	101	168



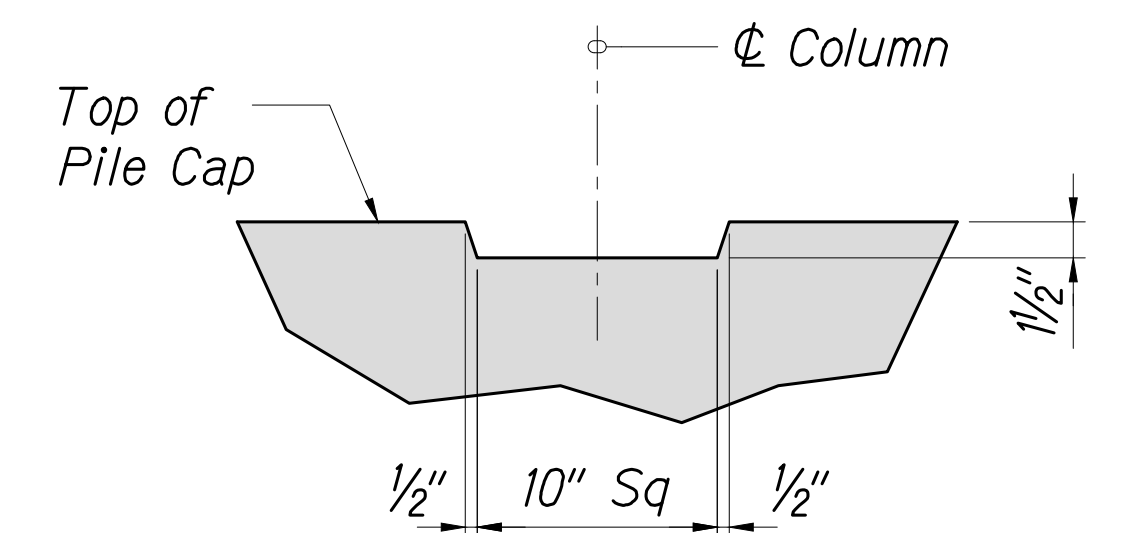
TYPICAL PIER CAP SECTION 1
Scale: 3/4" = 1'-0" S4.2, S4.5 S4.5



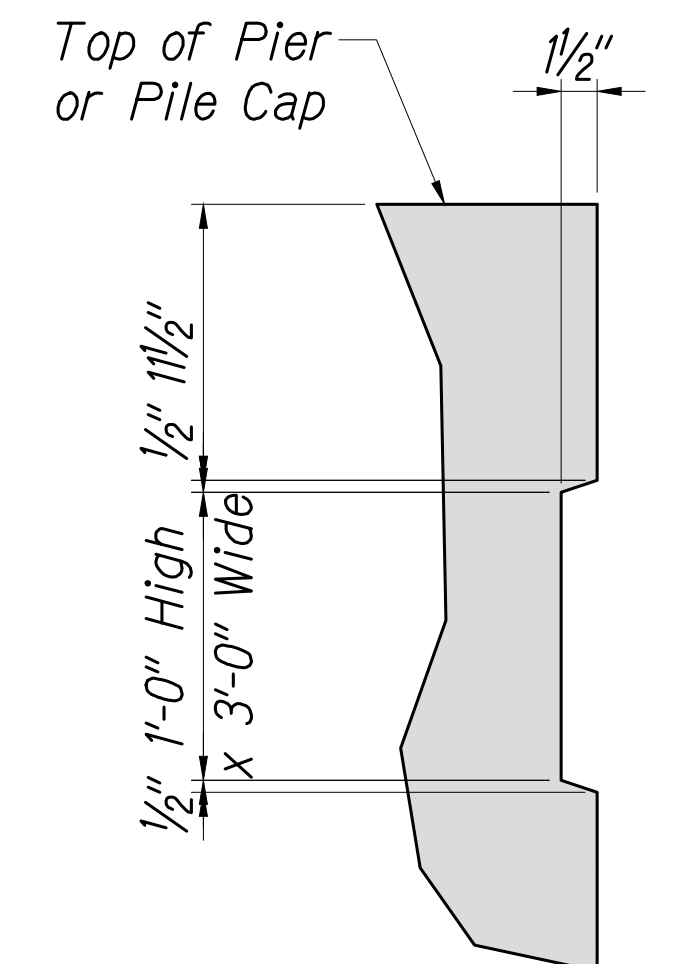
TYPICAL PIER COLUMN ELEVATION 2
Scale: 3/4" = 1'-0" S4.5 S4.5



TYPICAL COLUMN SECTION 3
Scale: 3/4" = 1'-0" S4.5 S4.5

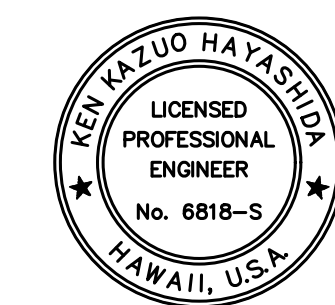


TYPICAL COLUMN TOP AND BASE KEY DETAIL 4
Not to Scale S4.5 S4.5



PIER AND PILE CAP SHEAR KEY DETAIL 5
Not to Scale S4.8 S4.5

- Notes:
- Pile Cap reinf not shown for Clarity.
 - Column vertical bars may be spliced. Centerline of splice shall be at the mid height of the column. The min lap length shall be 4 ft.
 - Welded Hoops shall use complete joint penetration single or double V-groove welds in accordance with AWS D1.4.



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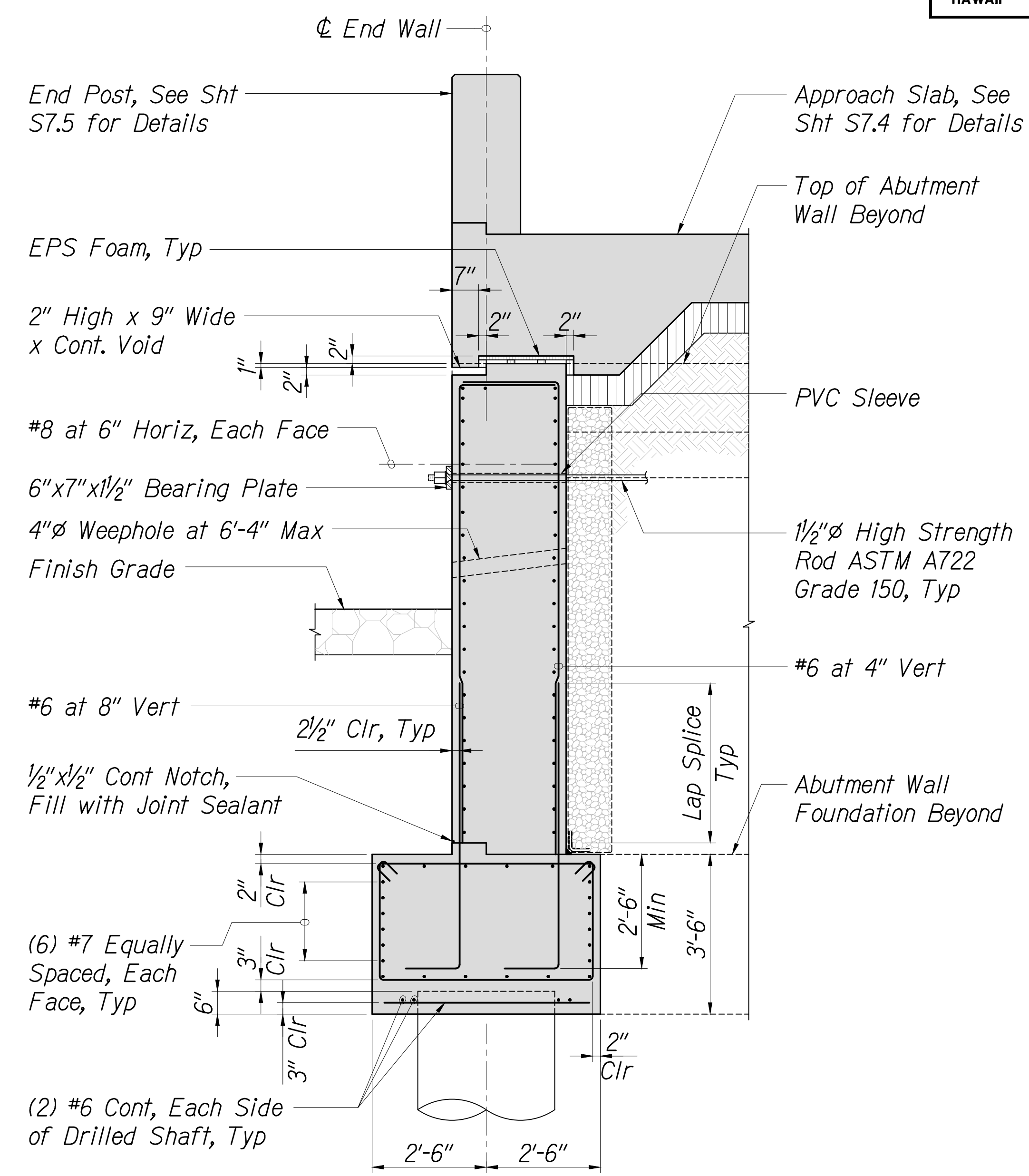
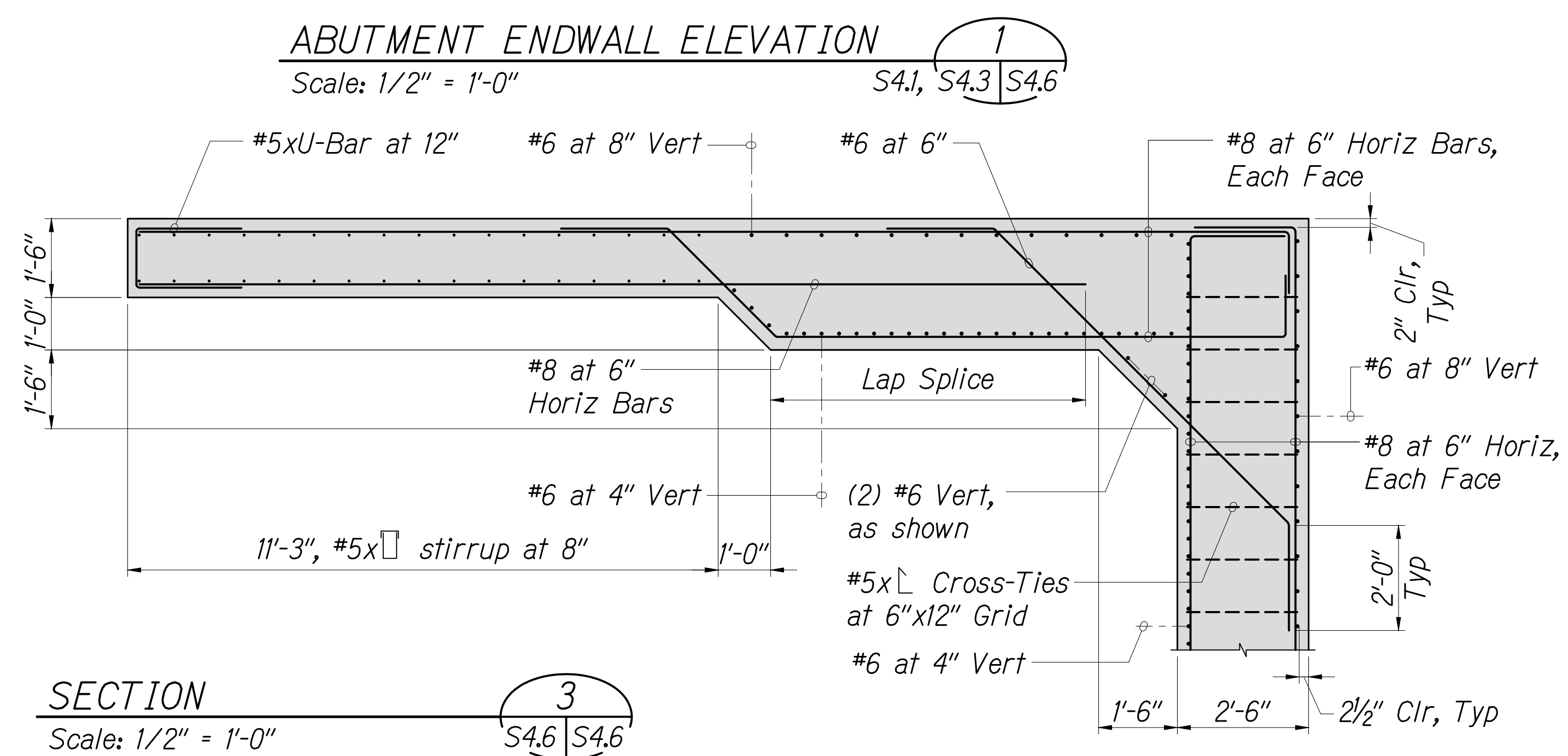
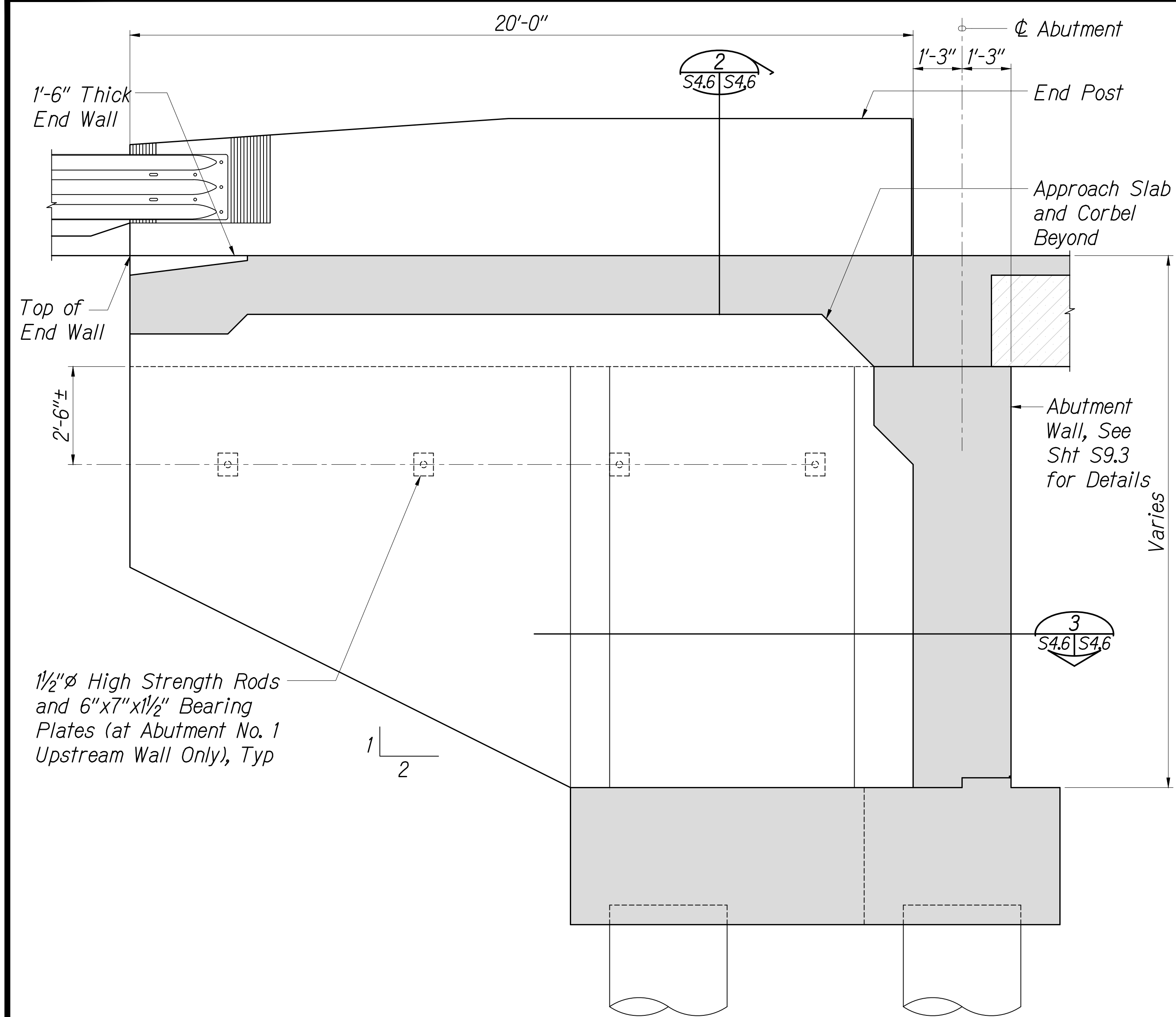
**BRIDGE NO. 3 - PIER
SECTIONS AND DETAILS**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

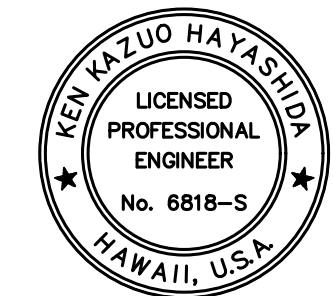
Scale: As Noted Date: July 2020

SHEET No. S4.5 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
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Note:
During phase 3 backfilling, once the top of backfill has reached the tie rod elevation, the tie rods and base plates shall be removed. The PVC sleeves shall be removed or undercut at least 2" and the voids shall be filled with non-shrink grout.



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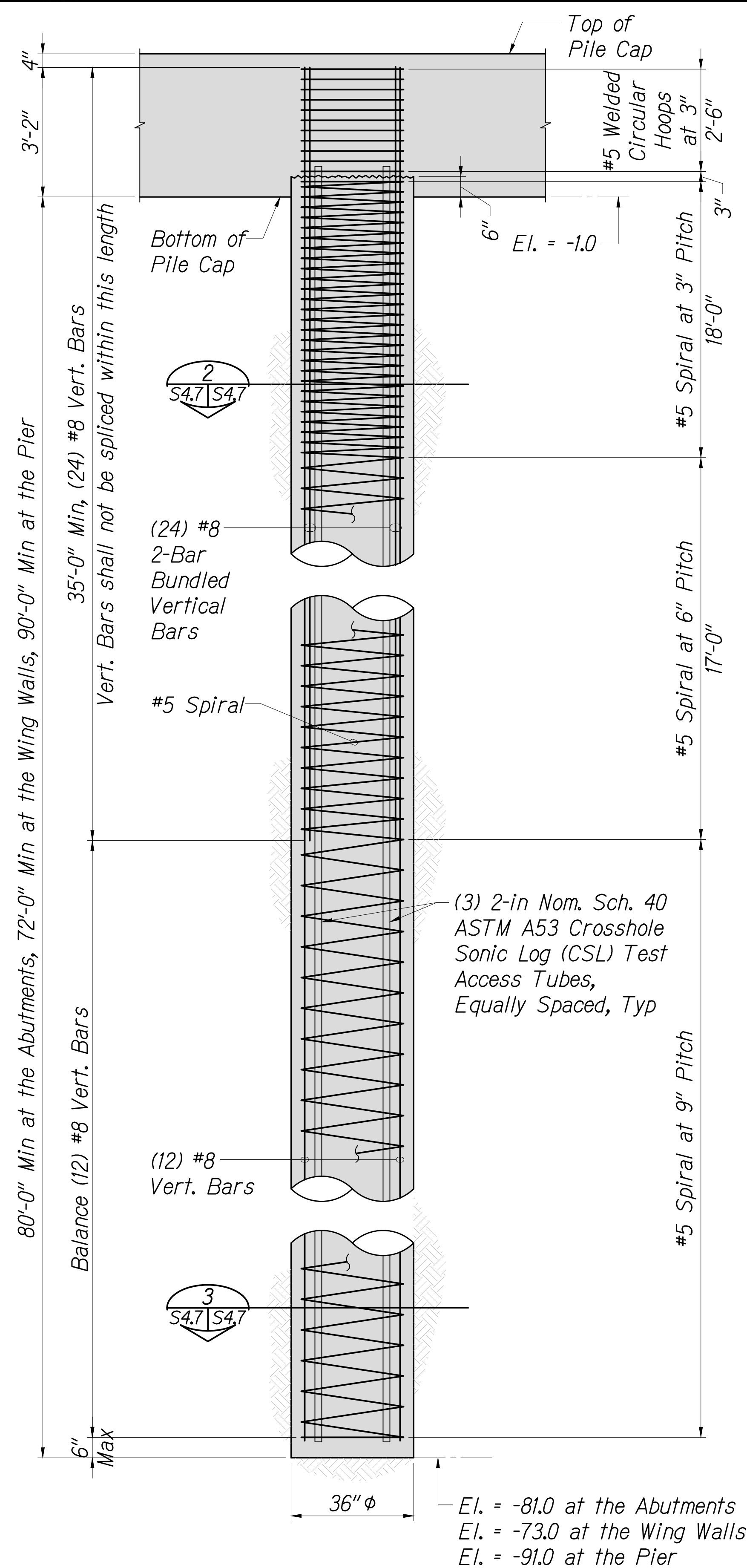
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3
END WALL SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

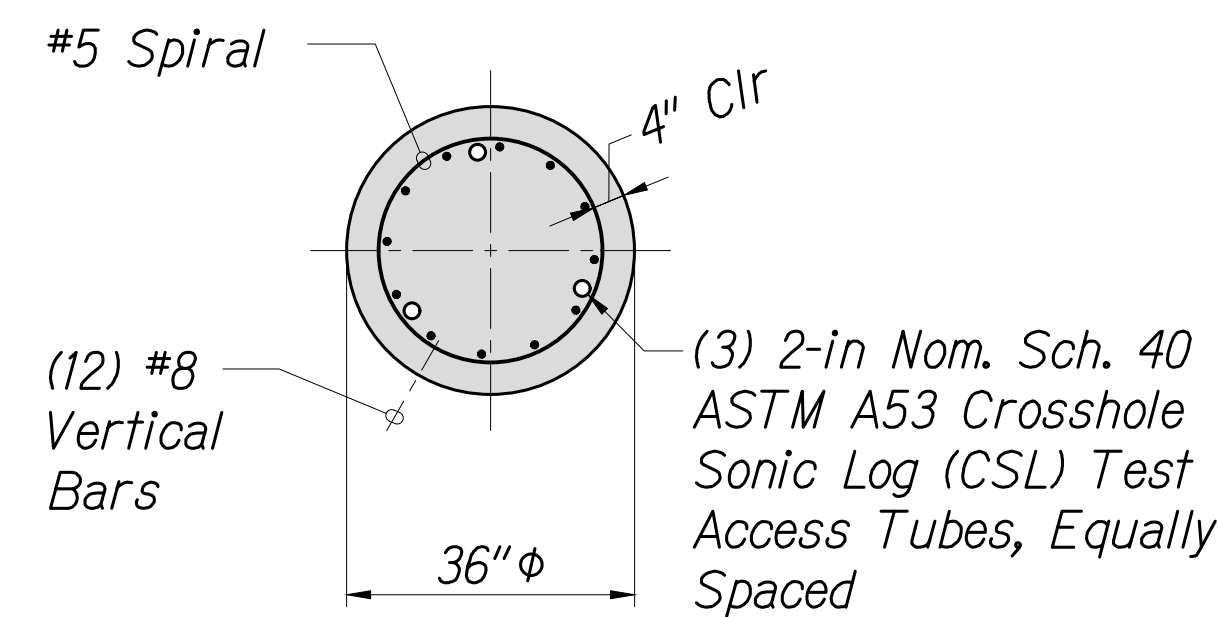
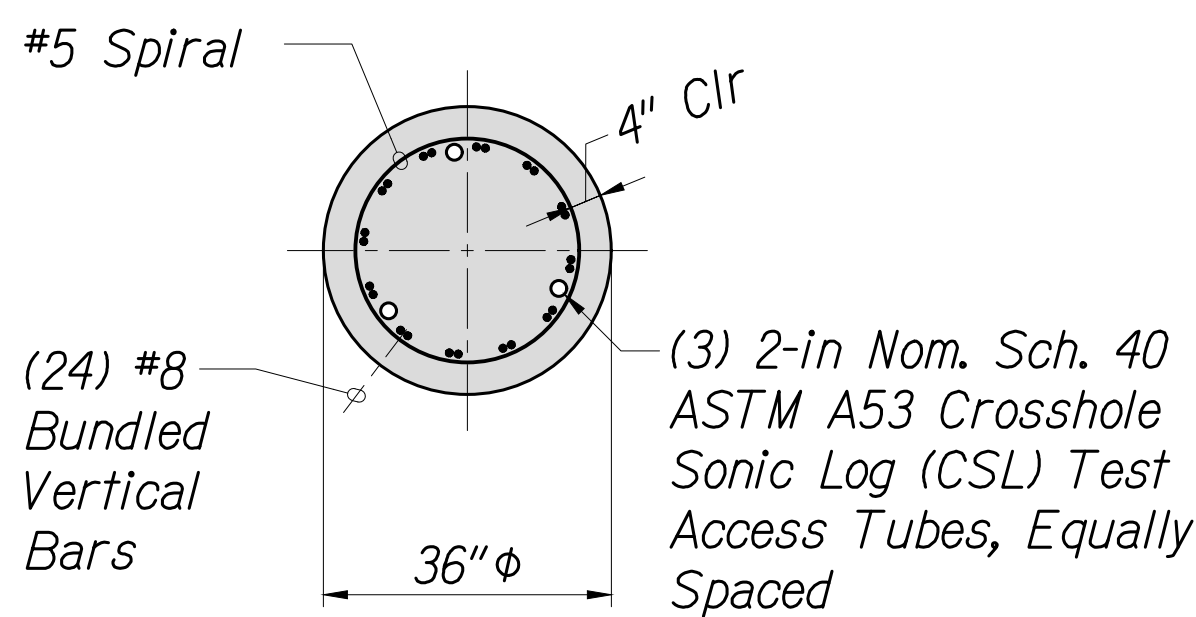
Scale: As Noted
Date: July 2020

SHEET No. S4.6 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	103	168



- Notes:
- Concrete for drilled shafts shall have a minimum 28-day compressive strength of 4,500 psi.
 - Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60 or ASTM A706, Grade 60.
 - Anchorage of spiral reinforcing shall be provided by 1½ extra turns of spiral bar at each end of spiral unit.
 - Spiral reinforcing lap splice shall be 3'-6" minimum.
 - Welded Hoops shall use complete joint penetration single or double V-groove welds in accordance with AWS D1.4.
 - For vertical bar splices and spiral splices, mechanical connectors are allowed in lieu of lapping bars. All mechanical connectors shall be submitted to the engineer for review.
 - Drilled shafts at the pier and abutments shall be constructed with the use of temporary casings to prevent caving. The temporary casing shall extend at least 30 feet of the shaft excavations for the bridge pier and abutments. The inside diameter of temporary casing shall not be less than the specified shaft diameter. The design of the casing, including the material type, strength, and wall thickness shall be the responsibility of the contractor.
 - A minimum 5 foot head of concrete above the bottom of the casing or more to adequately counter hydrostatic pressure shall be maintained during removal of the casing to reduce the potential for "necking" of the drilled shaft.
 - In anticipation of existence of shallow ground water during drilled shaft excavations, concrete placement by tremie methods will be required during construction of the drilled shafts. Ground water shall be controlled to prevent flowing water over excavations.
 - The Contractor shall exercise care in drilling the shaft holes and placing concrete into the holes. A low-shrink concrete mix with high slump (7 to 9-inch range) shall be used to provide close contact between the drilled shafts and the surrounding soils. Concrete shall be placed in a suitable manner to reduce the potential for segregation of the aggregates from the concrete mix.
 - Owner's Geotechnical Engineer shall observe the production of all drilled shafts.
 - Drilled shaft bottom elevations shall be verified by the Geotechnical Engineer prior to installing reinforcing bar cage and placement of concrete.
 - Drilled shafts are designed to be embedded into dense to hard coral formation encountered at depths. Therefore, coring into the dense to hard coral formation will be required.
 - Crosshole Sonic Logging (CSL) shall be conducted in accordance with HDOT specifications. Shafts indicating irregular CSL reading may be subject to additional testing.
 - A test shaft program consisting of drilling a 36 inch diameter test shaft extending to an elevation of about -91.0 feet below MSL is required. A bi-directional axial load test utilizing the Osterberg Load Cell shall be conducted on the test shaft. The test shall be preformed in general accordance with the quick load test method of ASTM D1143. The maximum test load shall be 648 kips. See sheet S3.3 for location of test shaft. The test shaft program shall be observed by the Geotechnical Engineer.



COMPRESSION LOAD CAPACITIES FOR DRILLED SHAFTS			
Location	Shaft Diameter (feet)	Compressive Load Capacity Per Drilled Shaft (kips)	
		Extreme Event Limit State	Strength Limit State
Abutments	3	475	260
Wing Walls	3	-	210
Center Pier	3	540	300

UPLIFT LOAD CAPACITIES FOR DRILLED SHAFTS			
Location	Shaft Diameter (feet)	Uplift Load Capacity Per Drilled Shaft (kips)	
		Extreme Event Limit State	Strength Limit State
Abutments	3	380	170
Wing Walls	3	-	-
Center Pier	3	430	195

TYPICAL DRILLED SHAFT DETAIL 1
Scale: 1/2" = 1'-0"

SECTION 2
Scale: 1/2" = 1'-0"

SECTION 3
Scale: 1/2" = 1'-0"



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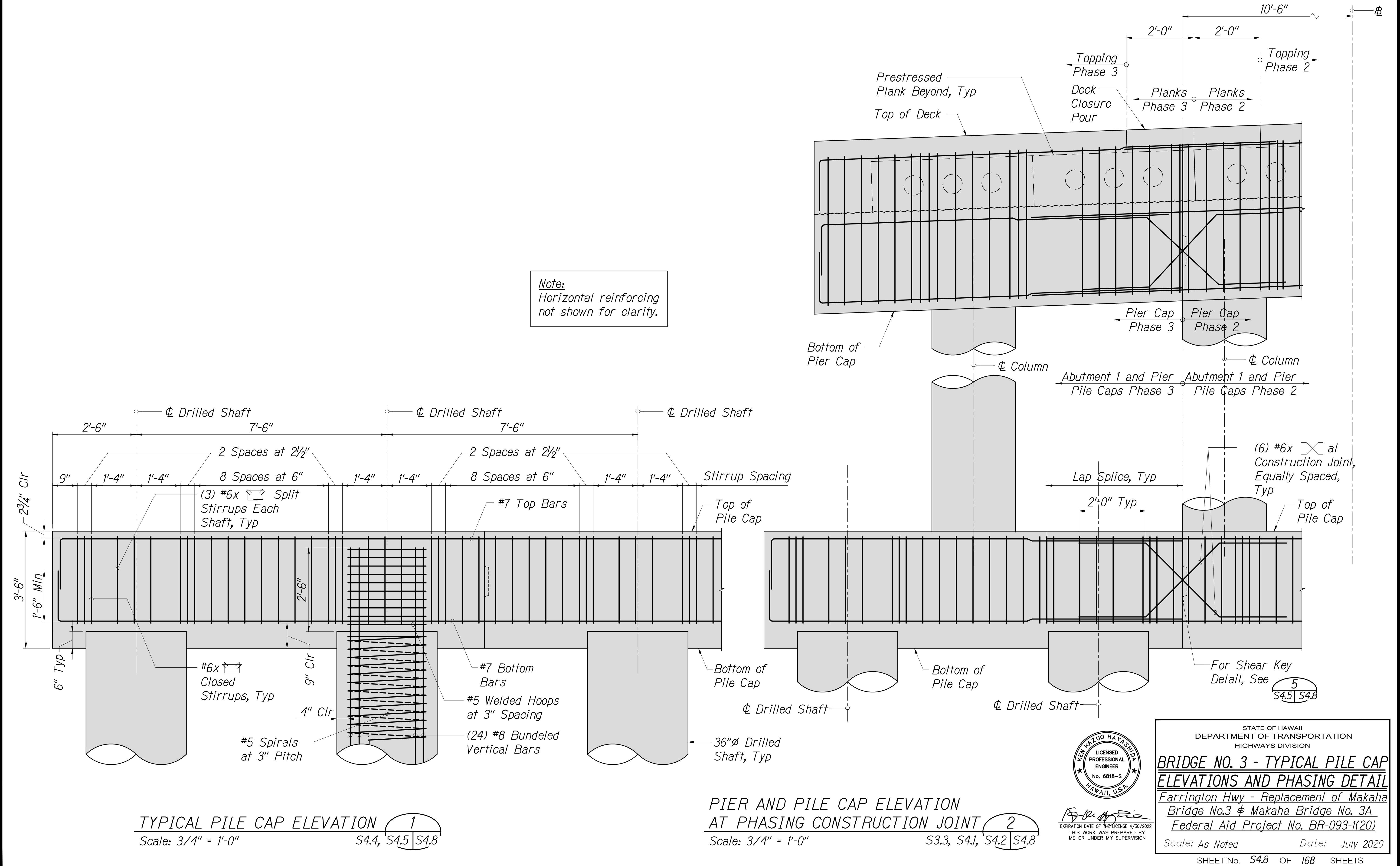
**BRIDGE NO. 3 - TYPICAL
DRILLED SHAFT DETAILS**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

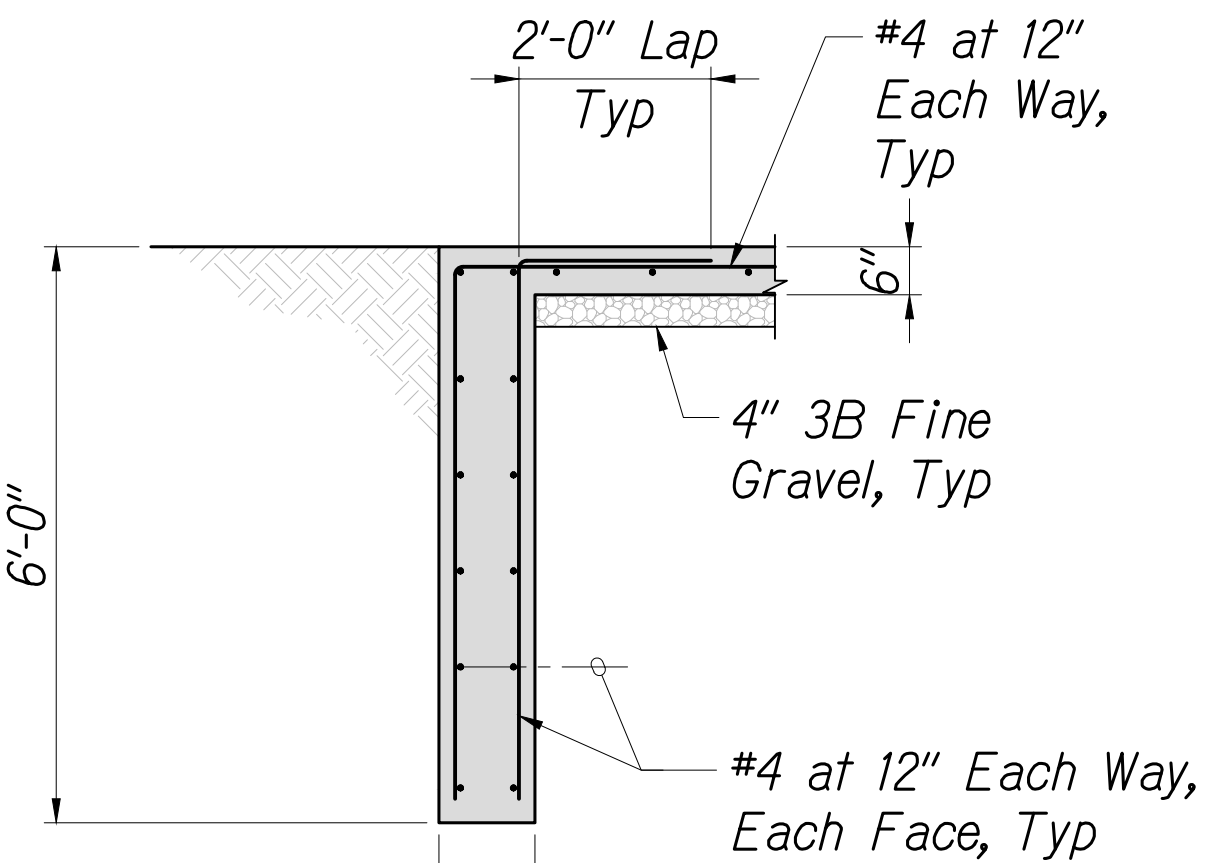
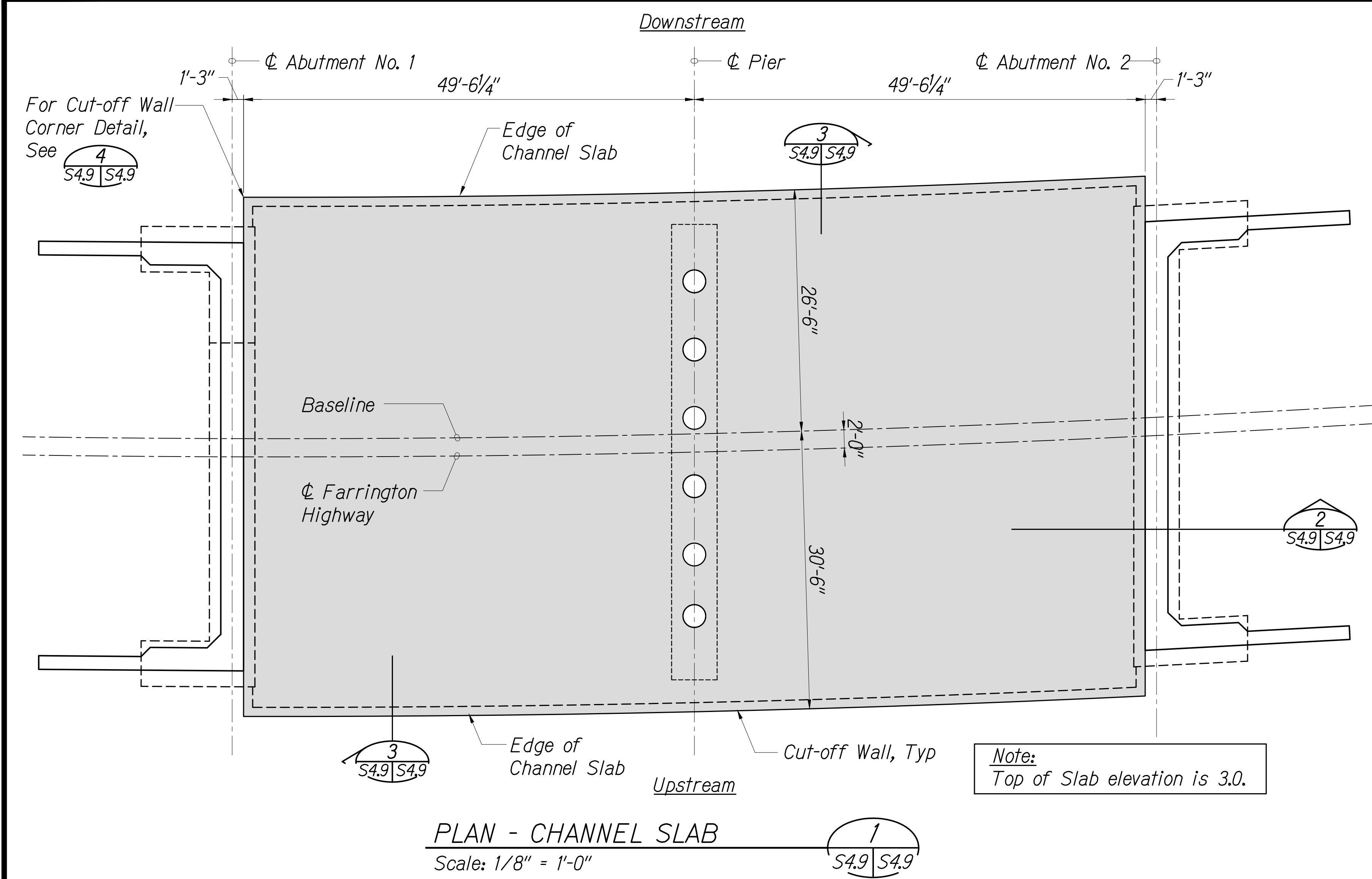
Scale: As Noted Date: July 2020

SHEET No. S4.7 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	104	168

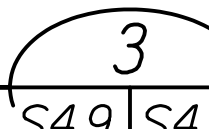


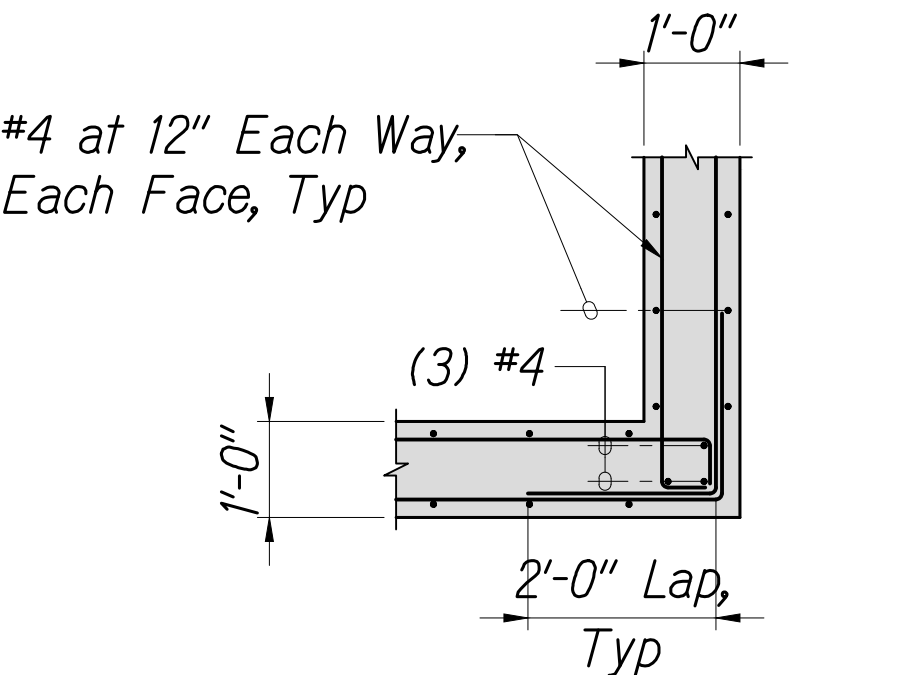
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	105	168



SECTION 3

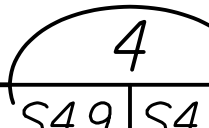
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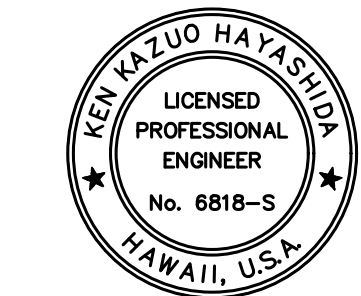
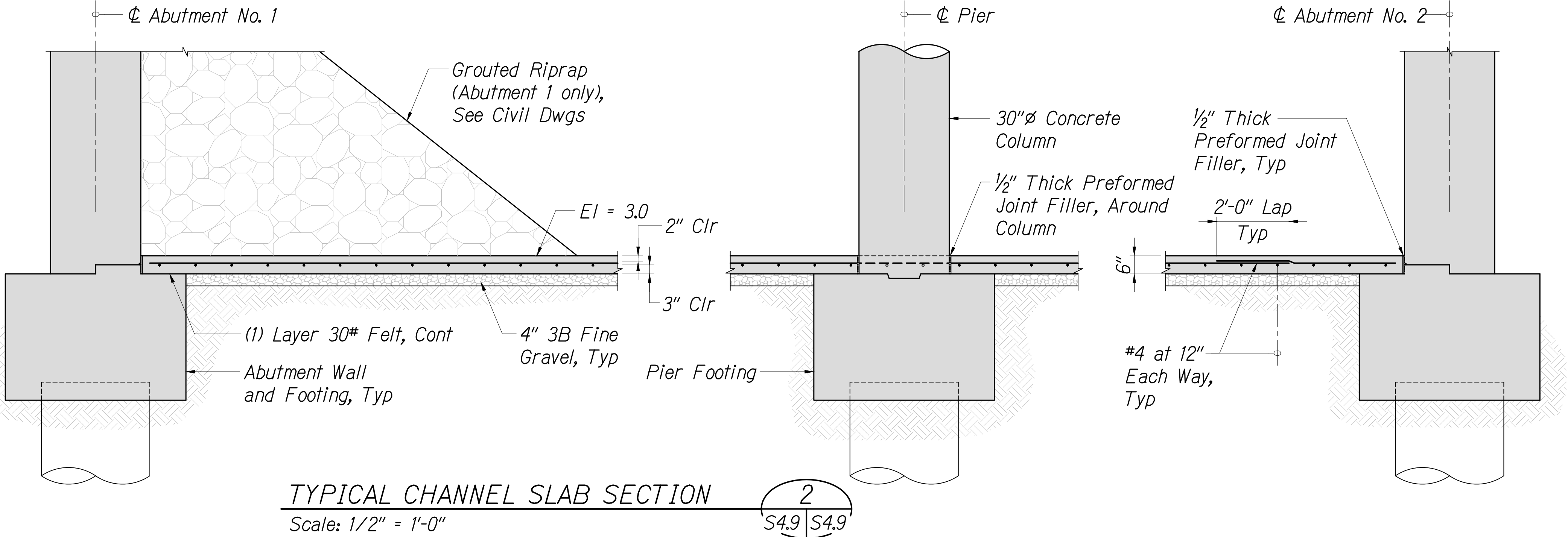




SECTION 4

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





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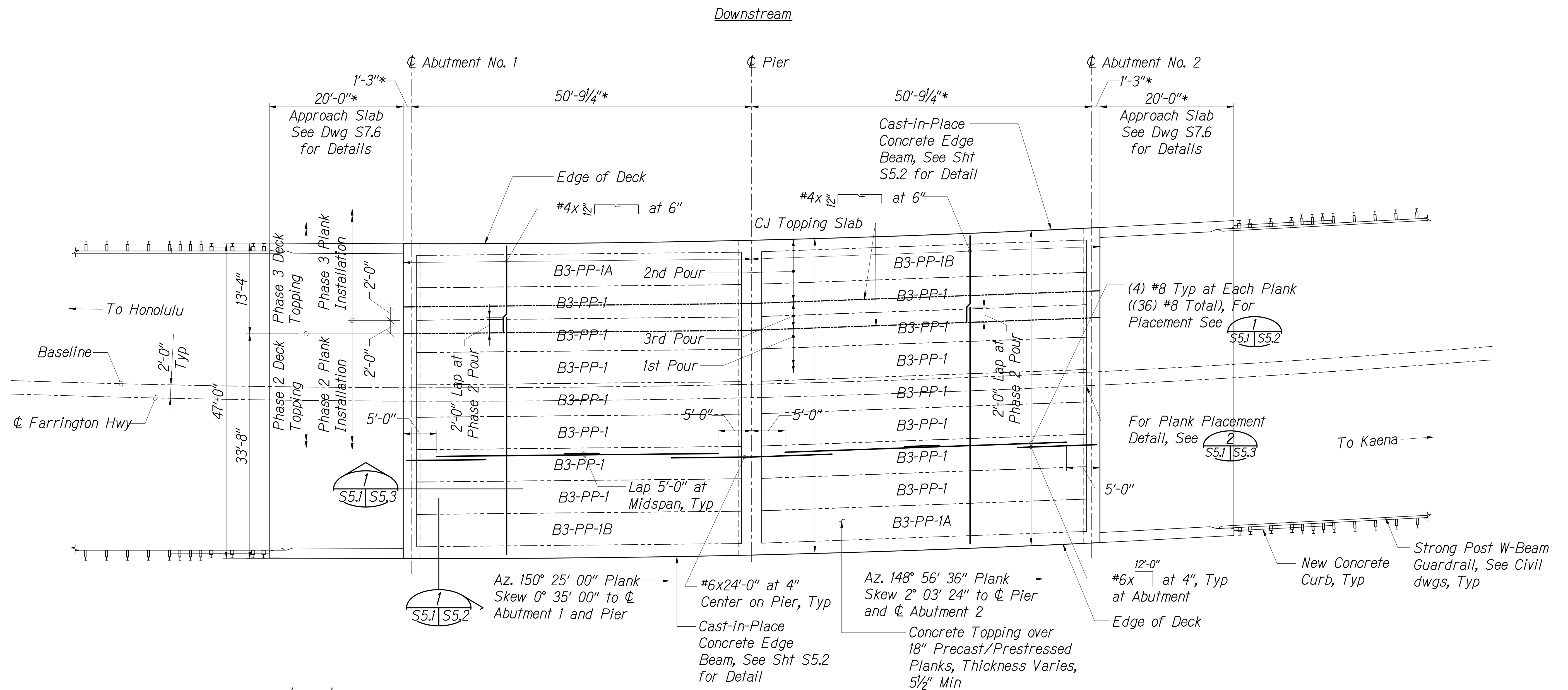
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**BRIDGE NO. 3 - CHANNEL
SLAB PLAN AND SECTIONS**
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S4.9 OF 168 SHEETS

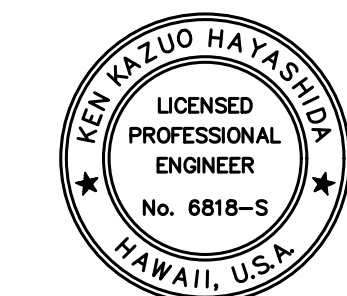
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	106	168



Legend
B3-PP-1 Denotes Precast/Prestressed Plank Type for Bridge 3, See dwgs S6.1 to S6.3 for Details

NOTE:
* - Dimensions shown perpendicular to ϕ Abutments and ϕ Pier

BRIDGE NO. 3 - DECK FRAMING PLAN
Scale : 1/8" = 1'-0"



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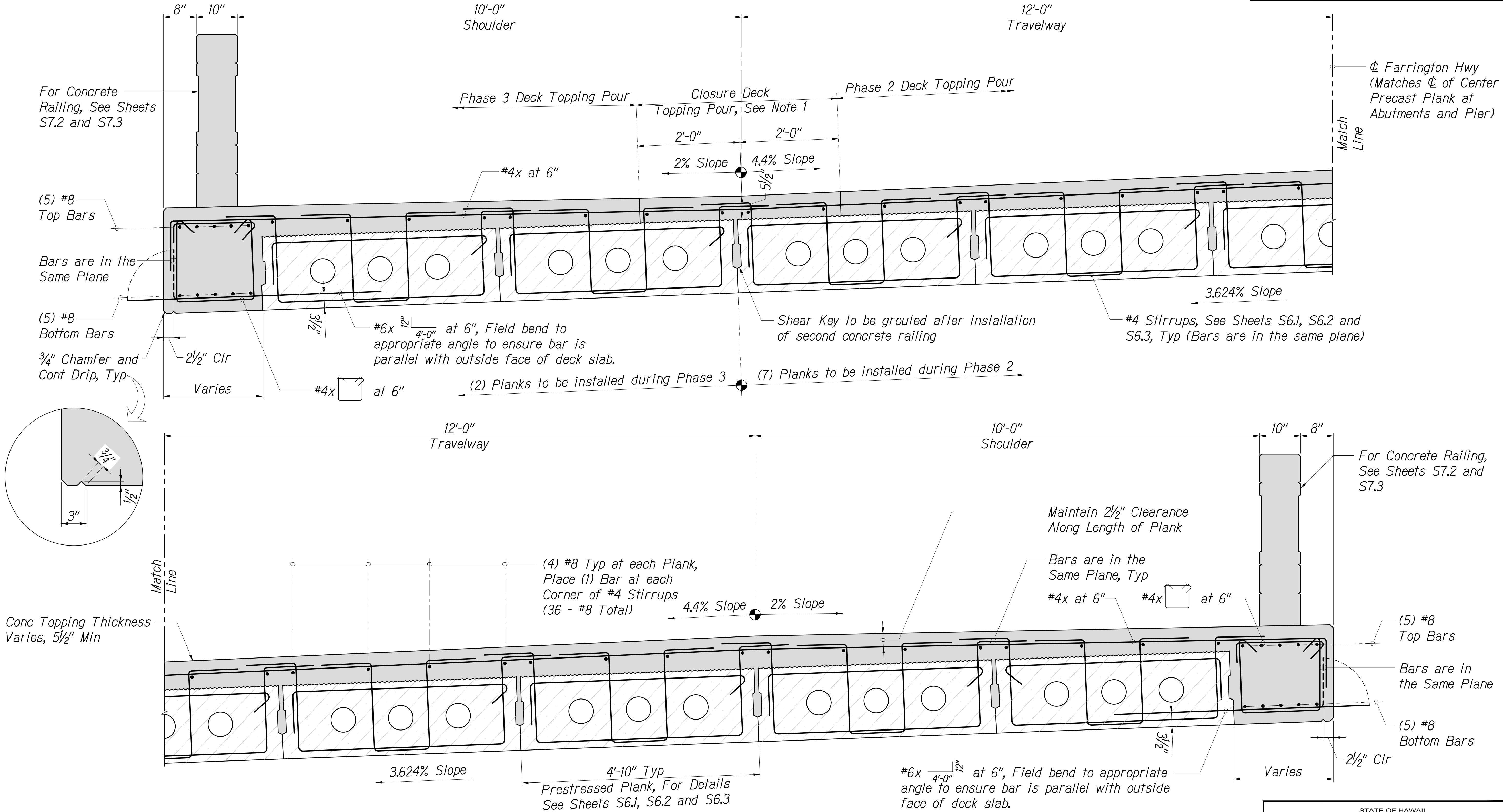
**BRIDGE NO. 3 -
DECK FRAMING PLAN**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

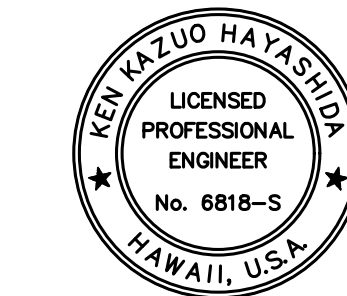
SHEET No. S5.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	107	168



BRIDGE NO. 3 - DECK SECTION
Scale: 1" = 1'-0"

1
S5.1 S5.2



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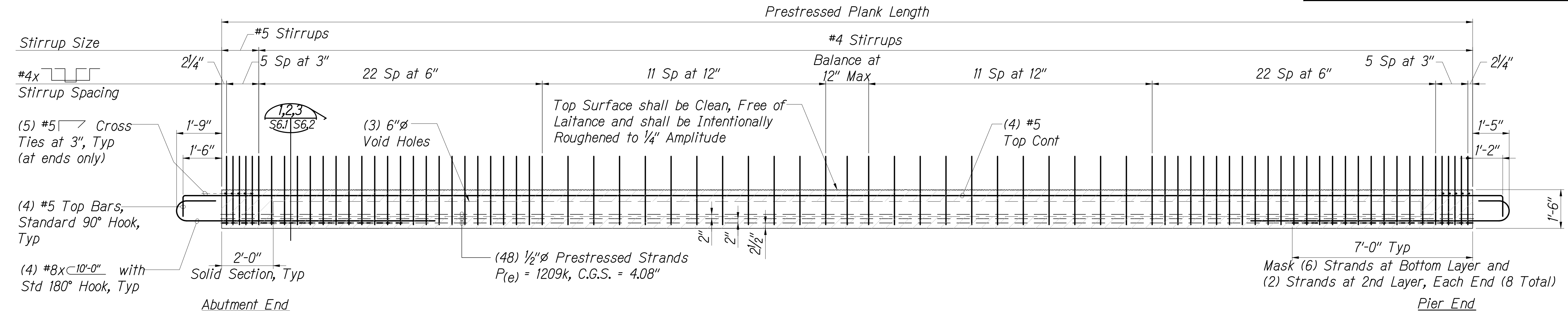
BRIDGE NO. 3
DECK SECTION

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

Scale: As Noted Date: July 2020

SHEET No. S5.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	109	168

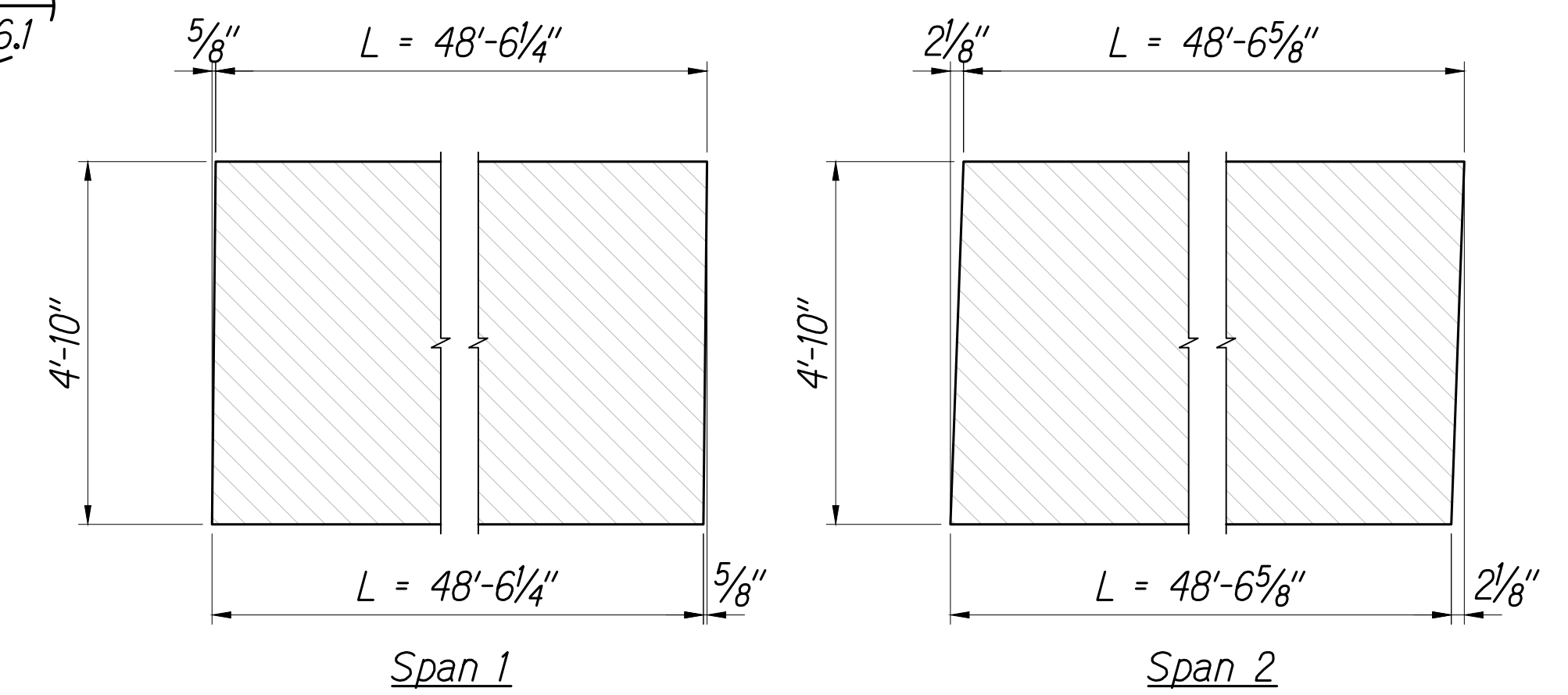
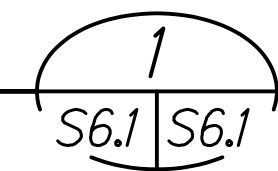


TYPICAL PRESTRESSED PLANK (INTERIOR/EXTERIOR) ELEVATION

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

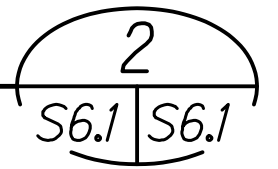
PRESTRESSED PLANK NOTES:

1. Concrete 28 day compressive strength, $f'c = 7,000$ psi. Concrete compressive strength at time of prestressing release, $fci = 5,500$ psi.
2. All strands shall be 1/2" diameter, 7-wire low relaxation strands conforming to AASHTO M203 (ASTM A416), Grade 270.
3. Initial tensioning stress (before any losses) shall be 202.50 ksi.
4. Non-prestressed (mild) reinforcing steel shall be deformed bars conforming to ASTM A615 Grade 60.
5. Strand pattern shall be symmetrical about the longitudinal center line of the plank.
6. Strand release sequence shall not to induce any lateral deflection of the plank.
7. Contractor shall submit shop drawings indicating proposed strand pattern, releasing sequence, reinforcing details and hold down device details to the Engineer prior to fabrication.
8. Contractor shall submit structural calculations for prestressed concrete beams stamped by a structural engineer licensed in the State of Hawaii to the Engineer for approval prior to fabrication.
9. During curing, care shall be taken to avoid any lateral deflection to the plank due to improper orientation.
10. Excessive damage or honeycombing may be grounds for rejection.
11. Lifting devices shall be placed as close as possible to the centerline of bearings of the plank. Details and locations of lifting devices shall be submitted to the Engineer for record. Such a submittal does not relieve the Contractor of their responsibilities if the beam is damaged due to failure of the lifting device.
12. $P(e)$ = effective prestressing force after all losses (kips)
13. Stirrups shall be placed parallel to the plank skew.
14. See Prestressed Plank Plan for plank length.

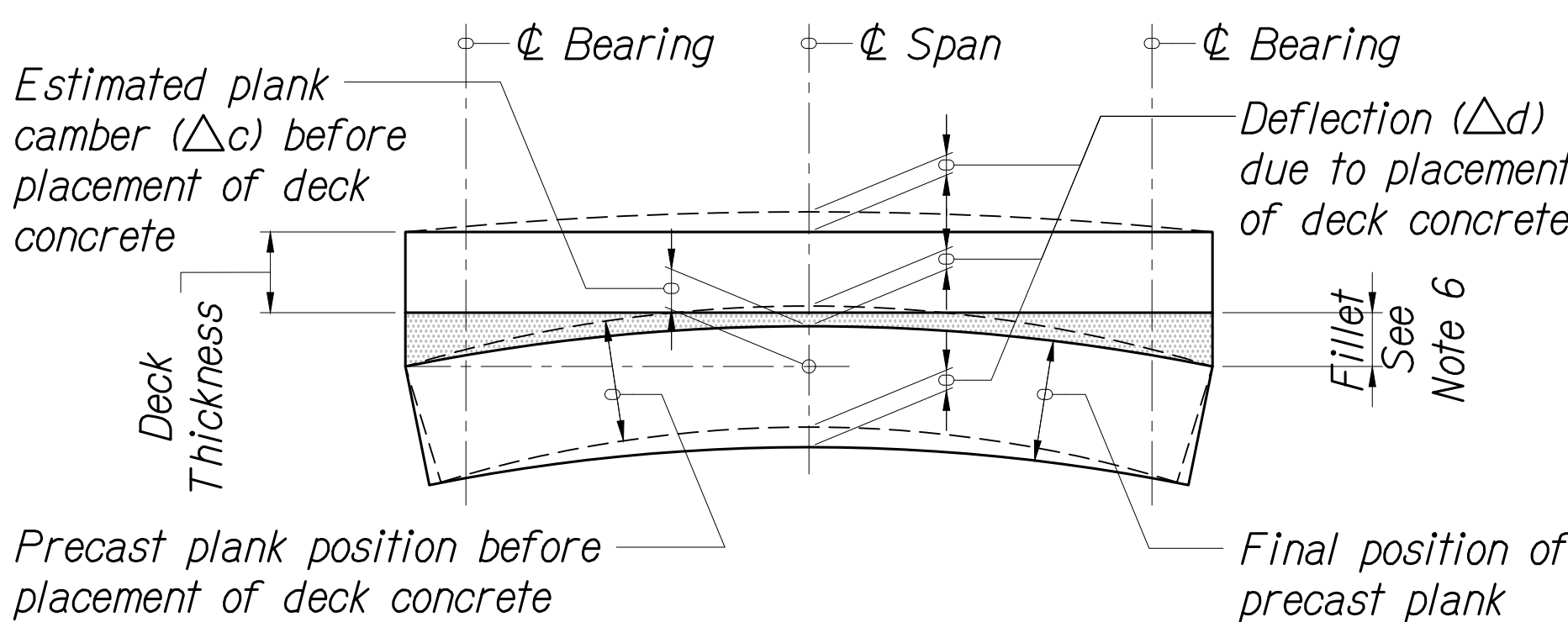


TYPICAL PRESTRESSED PLANK PLAN

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



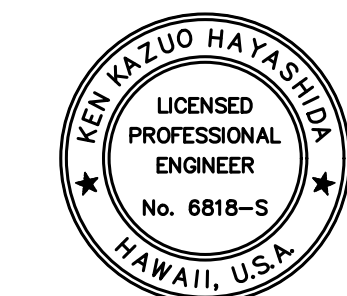
	Calculated Camber Δ_c
Immediately After Release of Prestress	1.56"
At Erection	2.75"
ΔD	-0.77"



PRESTRESSED PLANK CAMBER DIAGRAM

CAMBER DIAGRAM NOTES:

1. The calculated camber, Δ_c , includes the effects of the initial prestress force, the weight of the precast plank after removal from the bed, and time-dependant properties of concrete (compressive strength, modulus of elasticity, creep strain, and shrinkage strain) were included in the analysis. The time-dependant modulus of elasticity of concrete was multiplied by 0.85 to account for the effect of the type of aggregate.
2. The type of aggregate to be used in all of the planks shall be obtained from a single supplier and quarry site.
3. The contractor shall control and measure the actual camber of each plank immediately after the release of prestress and just before erection in the field. Actual camber immediately after release shall not vary from the calculated values by +0.50". The actual camber just before erection in the field shall not exceed +1.00". If the camber limits are exceeded for any plank, the engineer shall be notified immediately to evaluate camber and provide recommendation. Prescribed recommendations shall be at no additional cost to the Owner.
4. Dead load deflection, Δd , is due to the weight of the concrete deck.
5. Set the deck forms and camber the deck machine screed rails to offset the dead load deflection due to deck placement.
6. Plank seat elevations were calculated using dead load deflections of the deck so that top of precast plank will be a minimum of 1" below bottom of deck at any point in the span, allowing for precast precast depth and slab camber tolerance.



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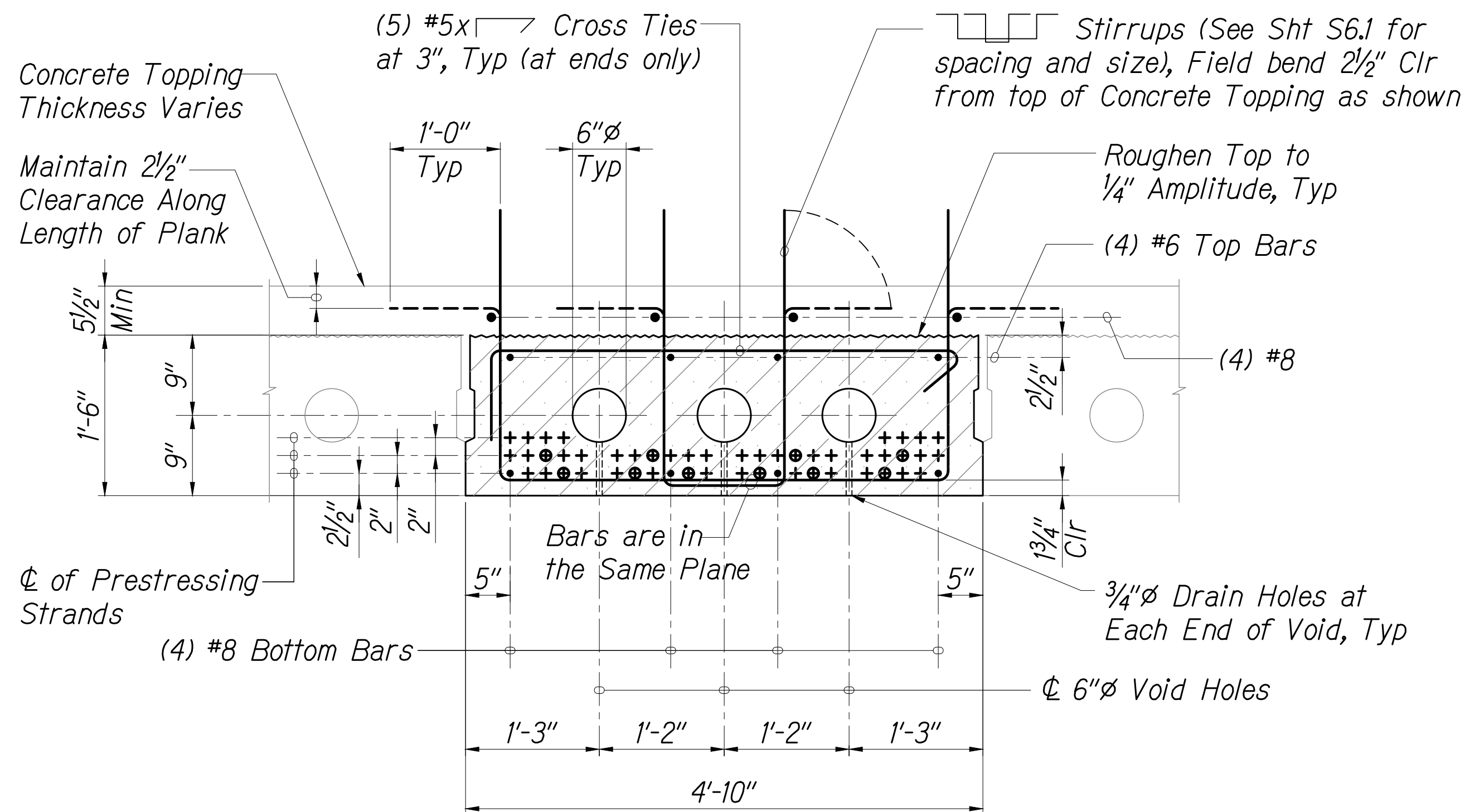
BRIDGE NO. 3 - PRESTRESSED
PLANK LONG. SECTIONS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

Scale: As Noted Date: July 2020

SHEET No. S6.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	110	168



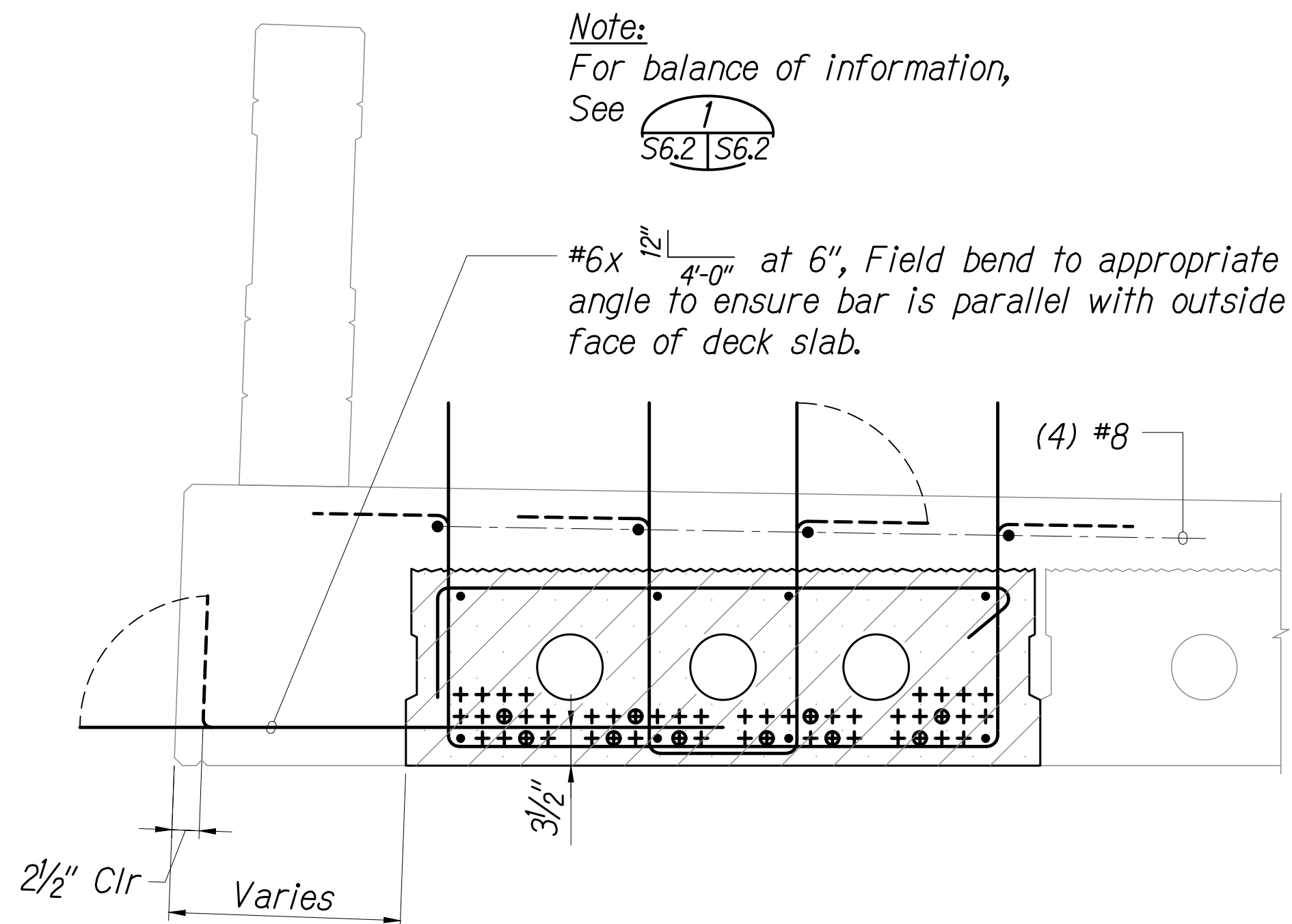
Legend

- + 1/2"∅ Strands
- ⊕ 1/2"∅ Strands Masked 7'-0" at Each End
- Deformed Rebar

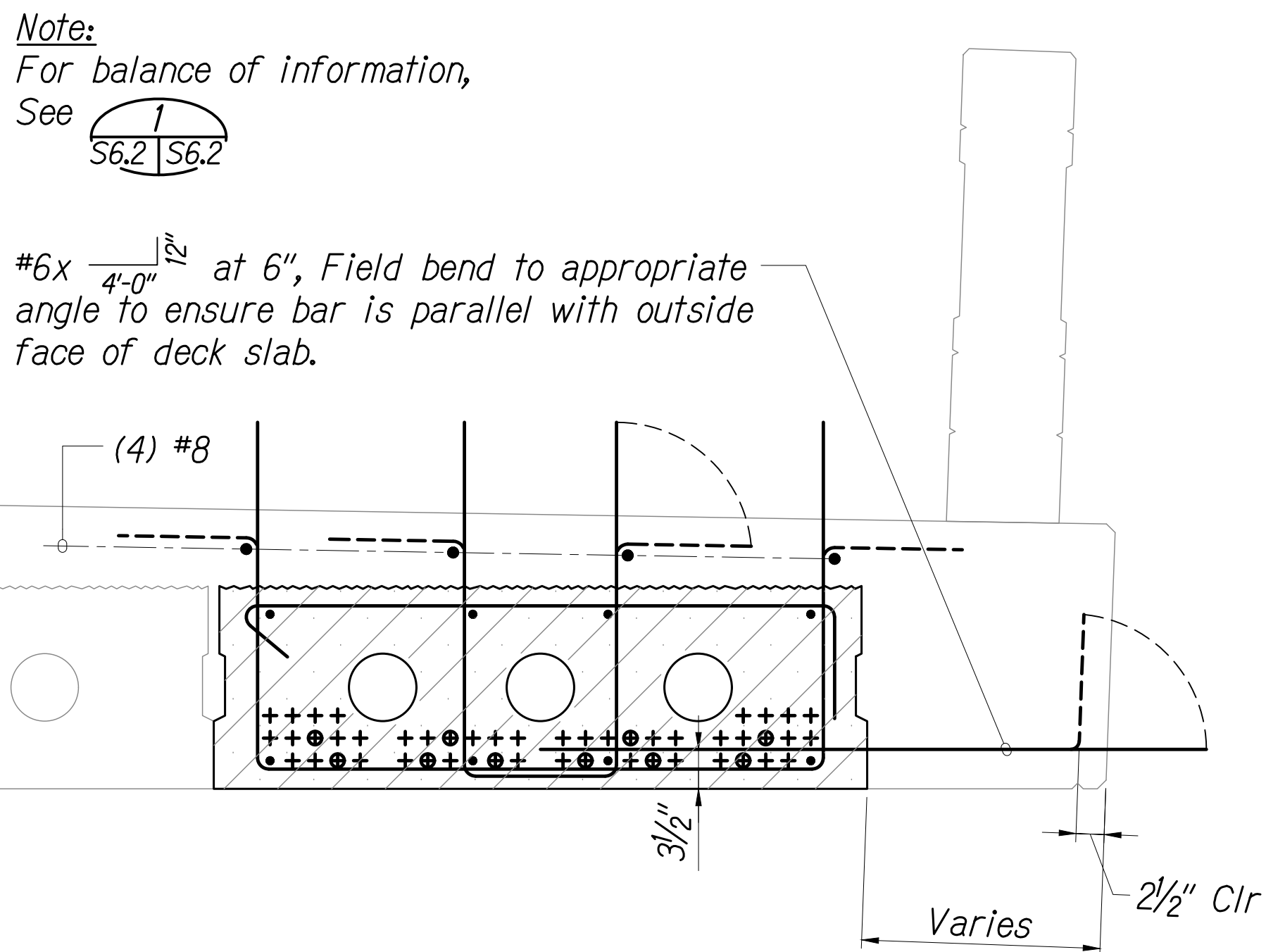
Notes:

- Total No. of Prestressing Strands = 48 Each Plank.
- Minimum spacing of Prestressing Strands shall be 2" o.c.
- Bend at appropriate angle to ensure bar is parallel with outside face of deck slab.

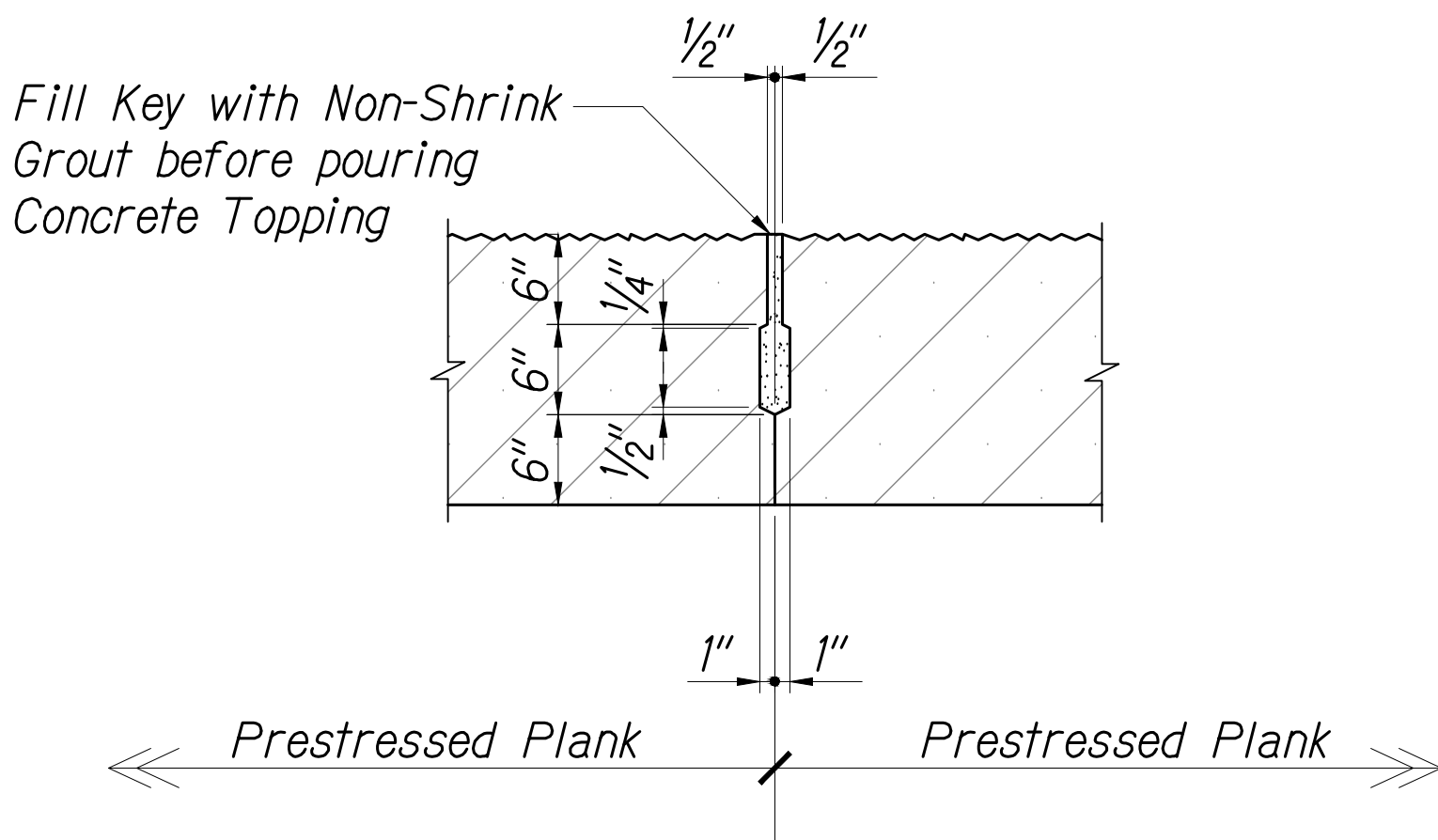
SECTION - PRESTRESSED PLANK B3-PP-1
Scale: 1" = 1'-0"



SECTION - PRESTRESSED PLANKS
B3-PP-1A AND B3-PP-1B (DOWNSTREAM SIDE)
Scale: 1" = 1'-0"



SECTION - PRESTRESSED PLANKS
B3-PP-1A AND B3-PP-1B (UPSTREAM SIDE)
Scale: 1" = 1'-0"



Note:
Non-Shrink Grout shall attain a minimum compressive strength of 7,000 psi prior to pouring concrete topping.

TYPICAL PLANK KEY DETAIL
Scale: 1" = 1'-0"



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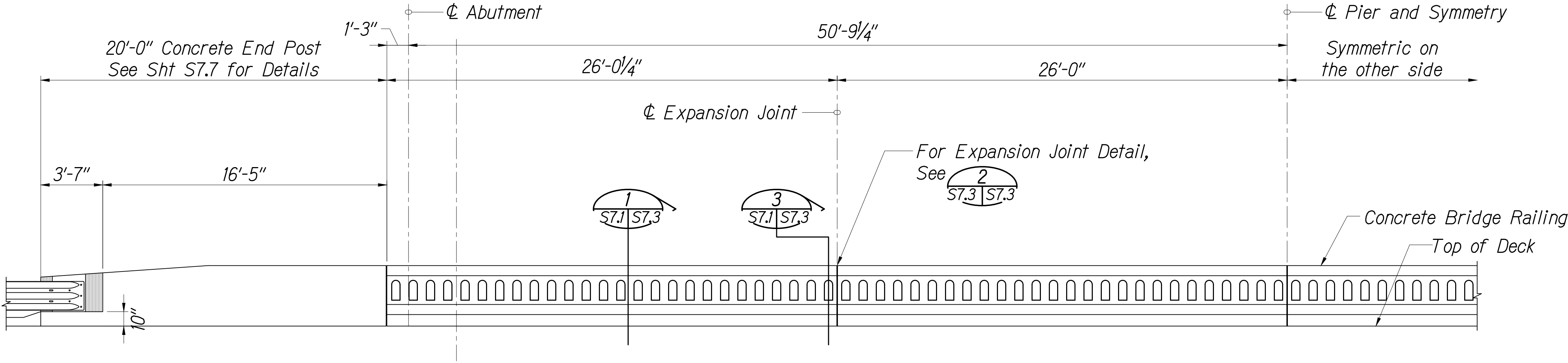
STATE OF HAWAII
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HIGHWAYS DIVISION

**BRIDGE NO. 3 - PRESTRESSED
PLANK SECTIONS AND DETAILS**
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

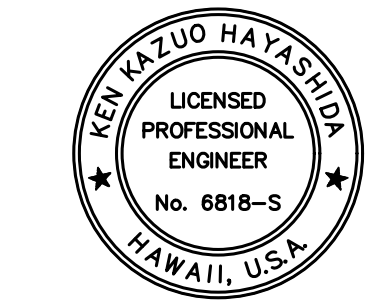
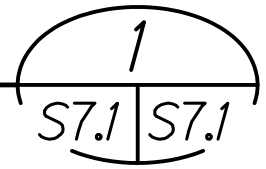
Scale: As Noted Date: July 2020

SHEET No. S6.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	111	168



BRIDGE NO. 3 - RAILING ELEVATION
Scale: 1/4" = 1'-0"



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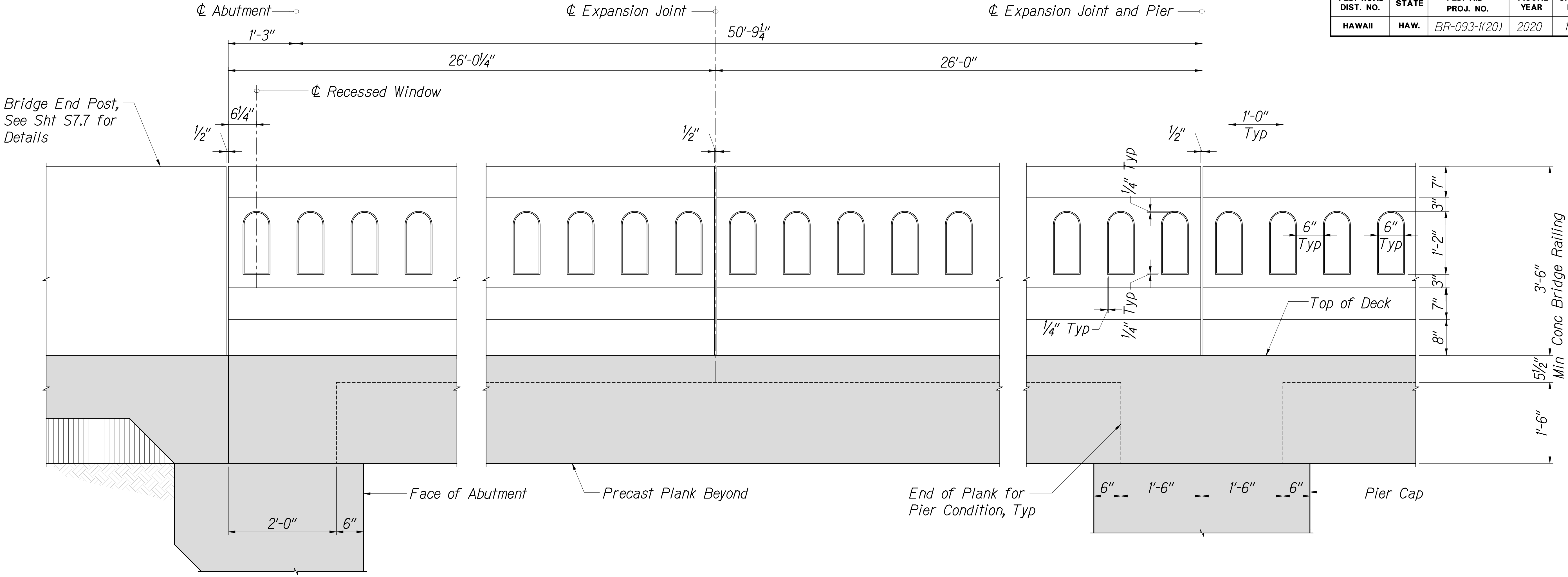
BRIDGE NO. 3
RAILING ELEVATIONS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S7.1 OF 168 SHEETS

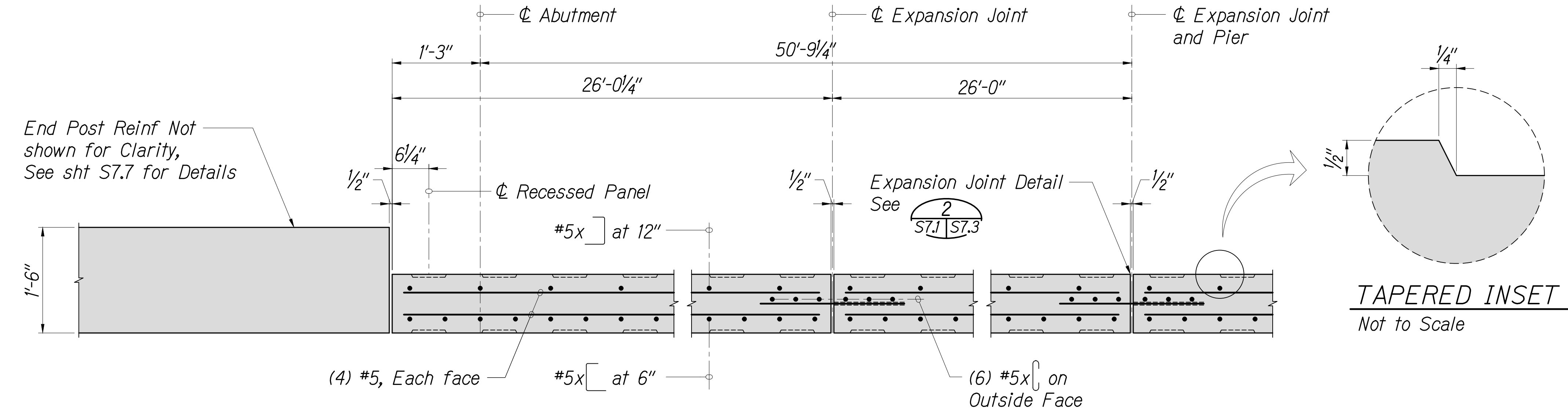
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	112	168



PARTIAL RAILING ELEVATION SHOWING DIMENSIONS

Scale: 1" = 1'-0"

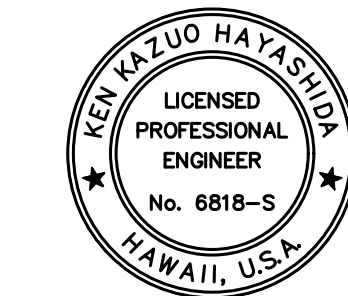
1
S7.2 | S7.2



PARTIAL RAILING PLAN VIEW - SECTION

Scale: 1" = 1'-0"

2
S7.2 | S7.2



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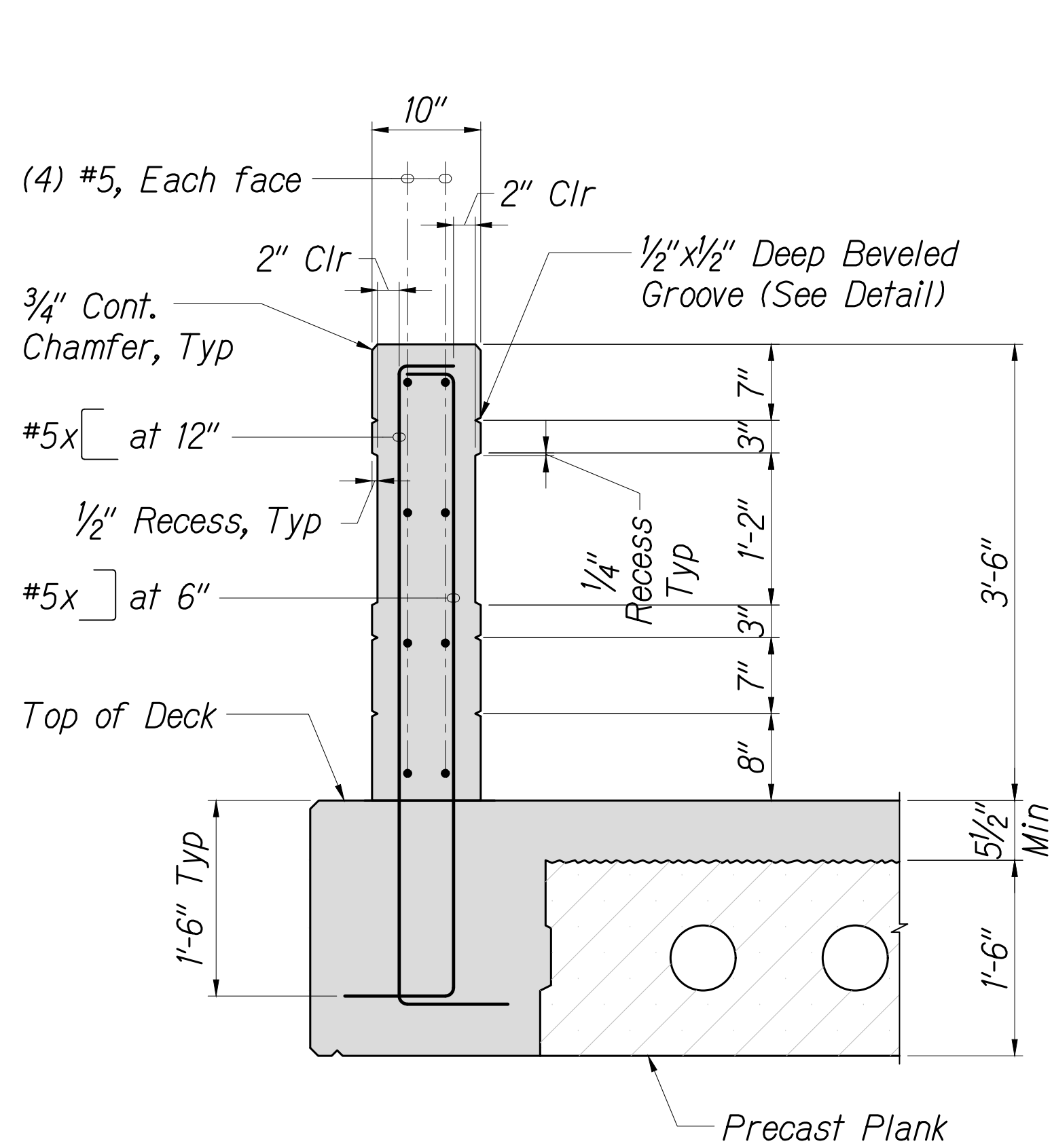
BRIDGE NO. 3 - PARTIAL
RAILING ELEVATION AND PLAN

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S7.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	113	168

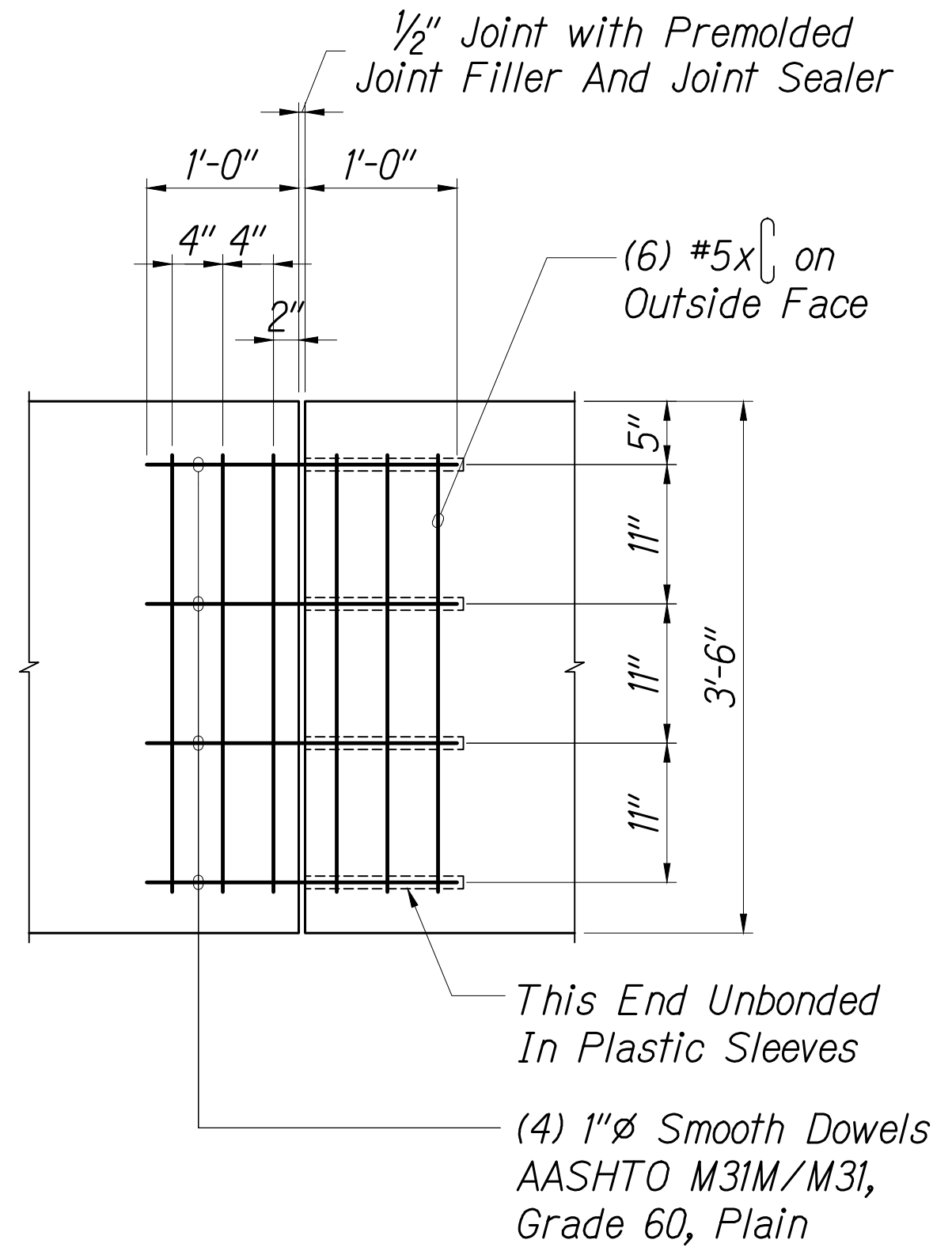


TYPICAL SECTION

Scale: 1" = 1'-0"

1

S7.1 S7.3



EXPANSION JOINT DETAIL

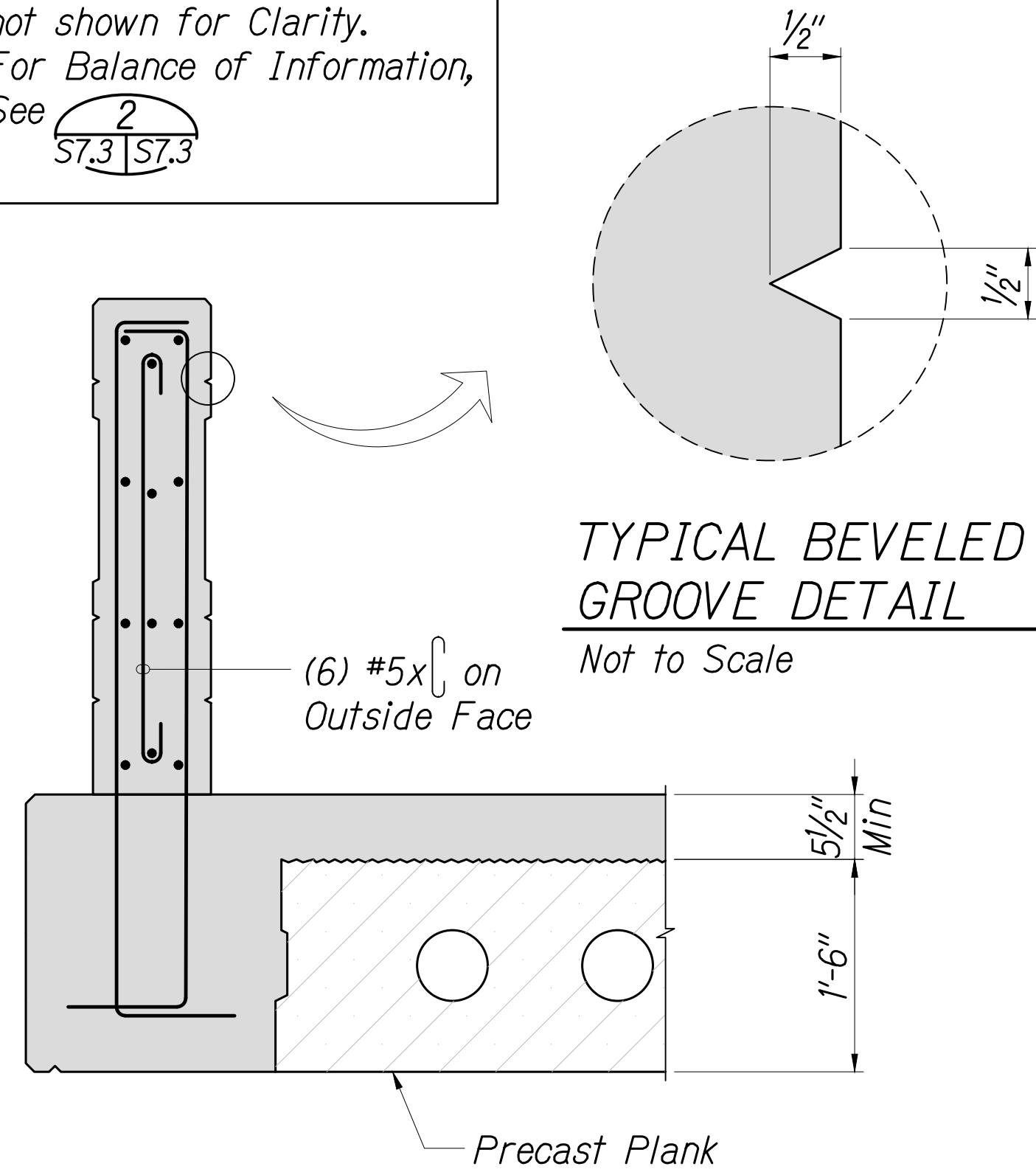
Scale: 1" = 1'-0"

2

S7.3 S7.3

Notes:

- Concrete Topping and Precast Plank reinforcing not shown for Clarity.
- For Balance of Information, See S7.3 S7.3

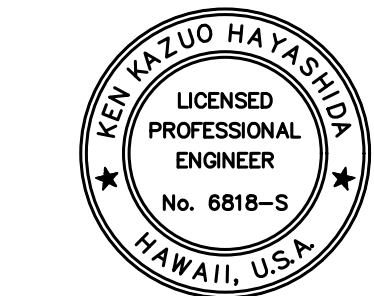


SECTION AT EXPANSION JOINT

Scale: 1" = 1'-0"

3

S7.1 S7.3



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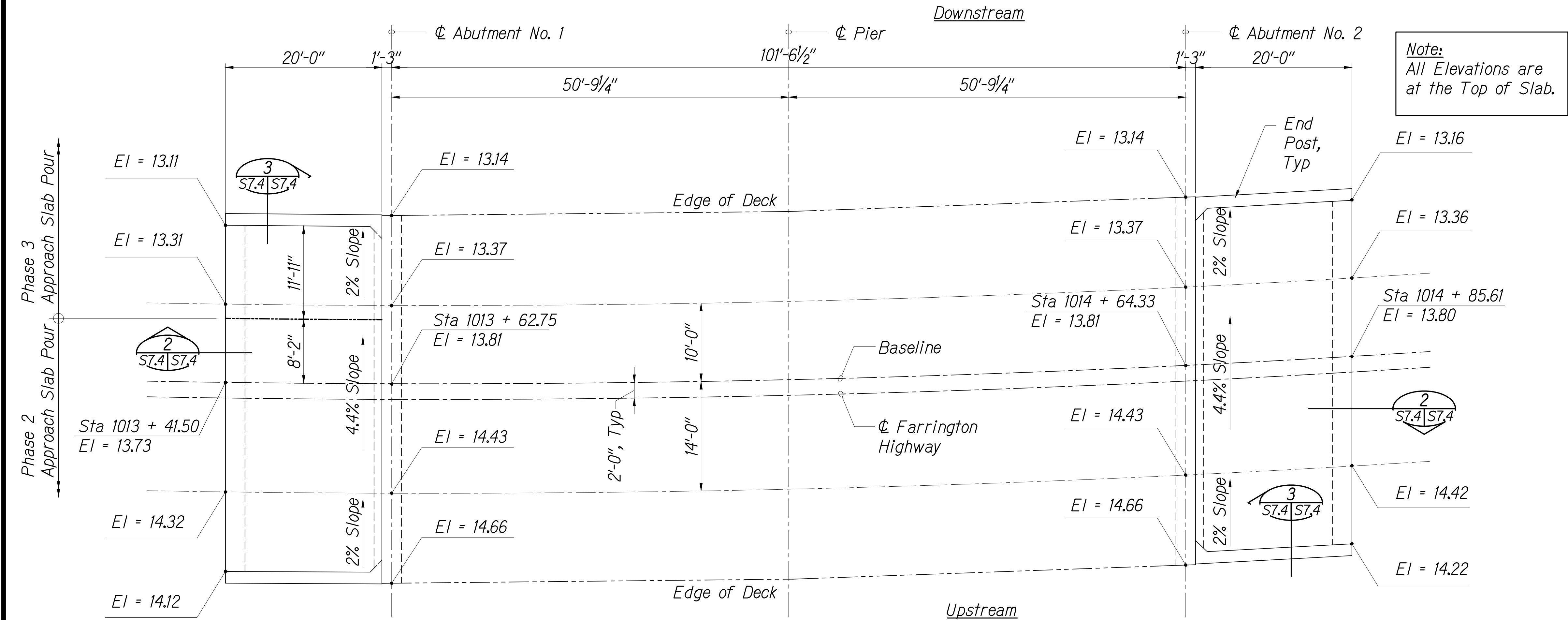
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3 - RAILING
SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

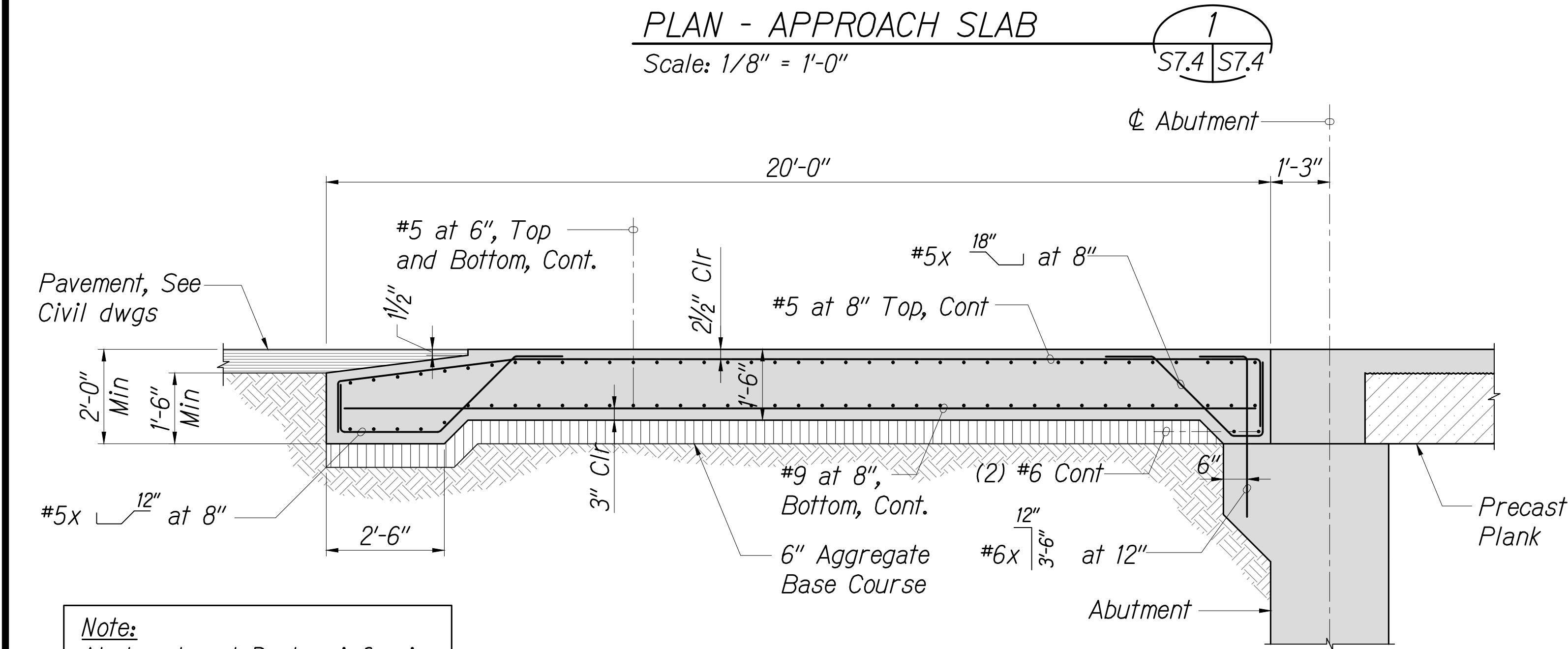
Scale: As Noted Date: July 2020

SHEET No. S7.3 OF 168 SHEETS

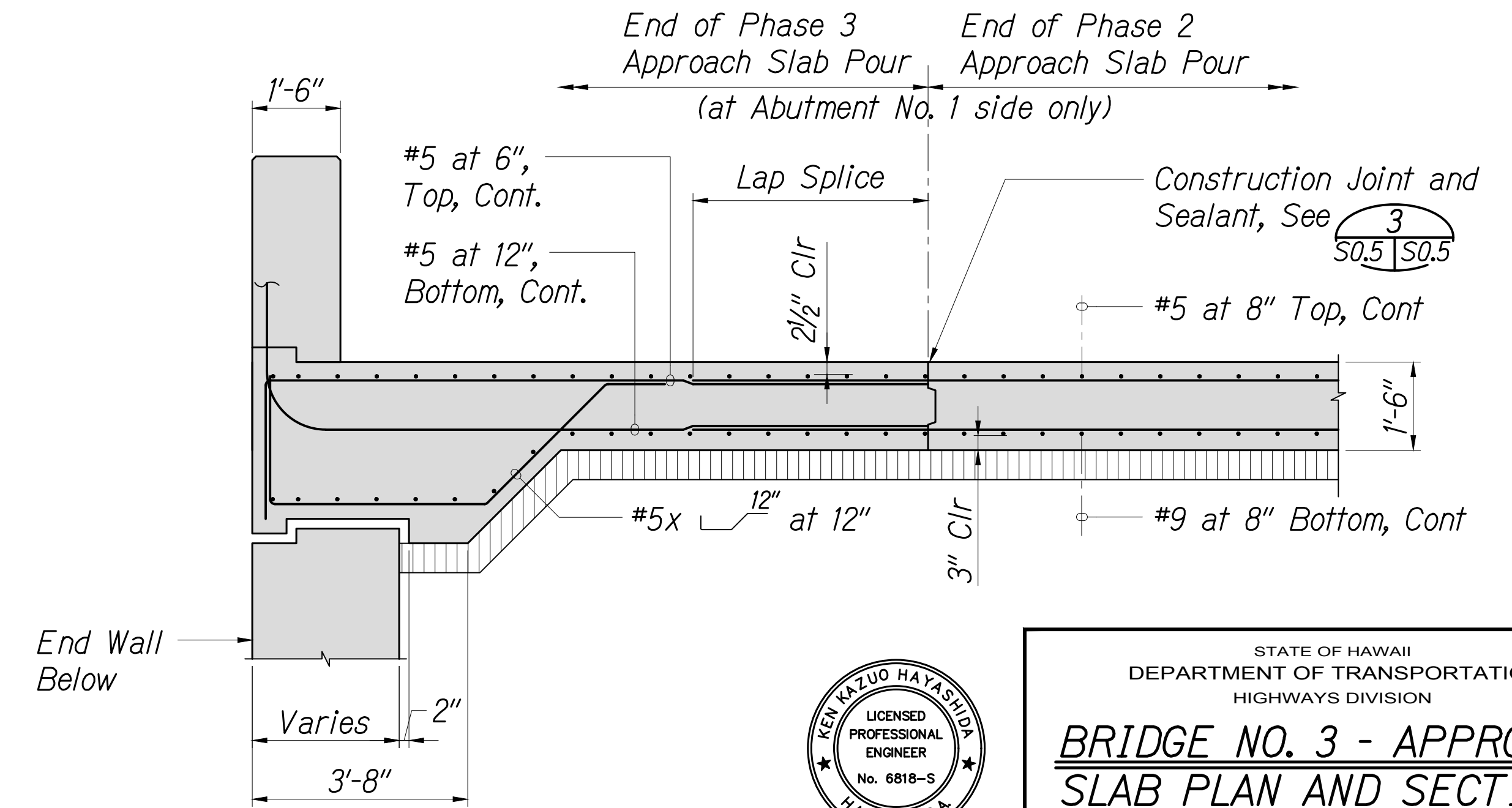
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	114	168



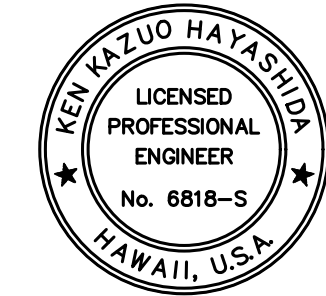
PLAN - APPROACH SLAB
Scale: 1/8" = 1'-0"



TYPICAL APPROACH SLAB SECTION
Scale: 1/2" = 1'-0"



SECTION
Scale: 1/2" = 1'-0"



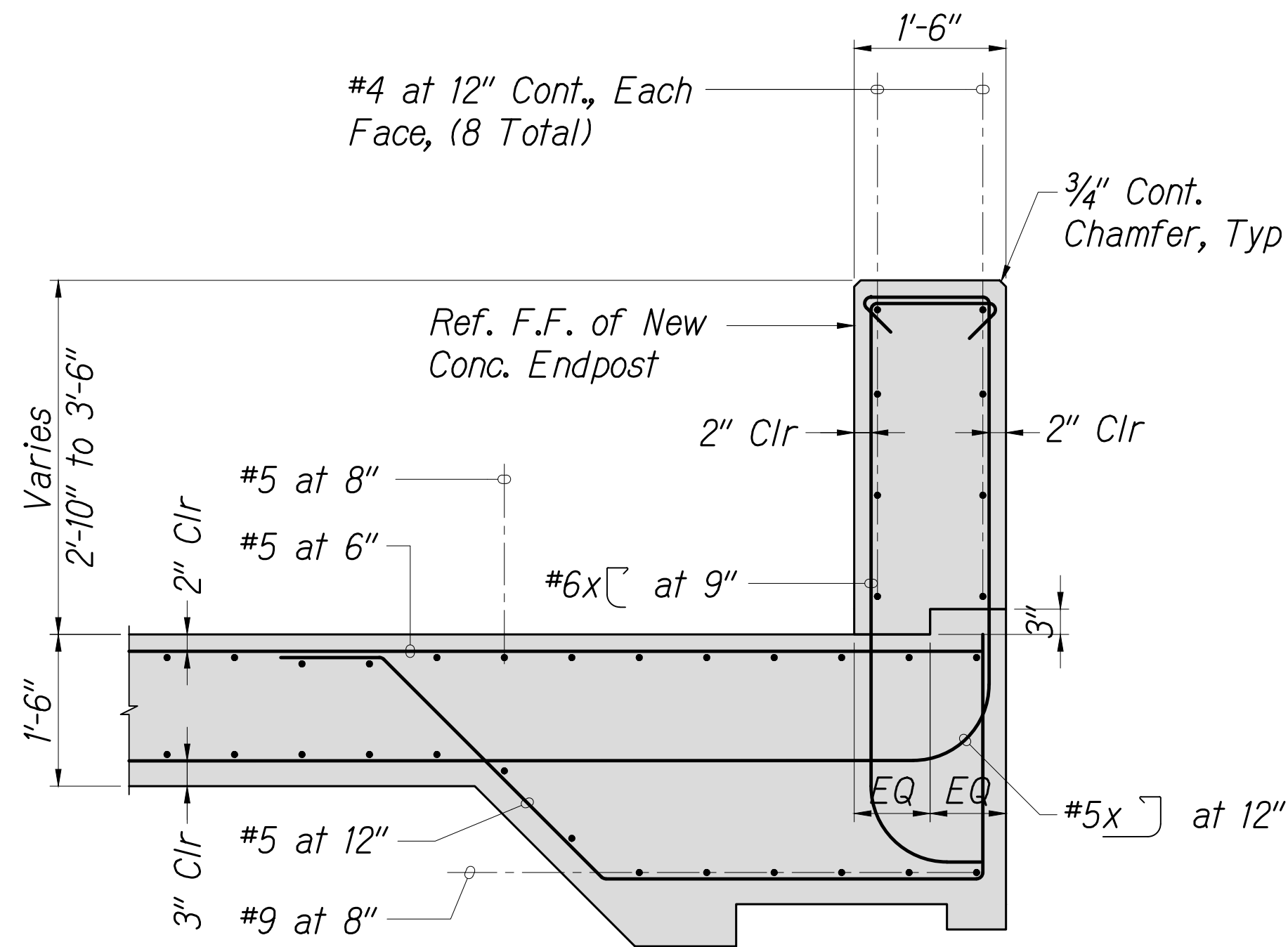
STATE OF HAWAII
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HIGHWAYS DIVISION

**BRIDGE NO. 3 - APPROACH
SLAB PLAN AND SECTIONS**

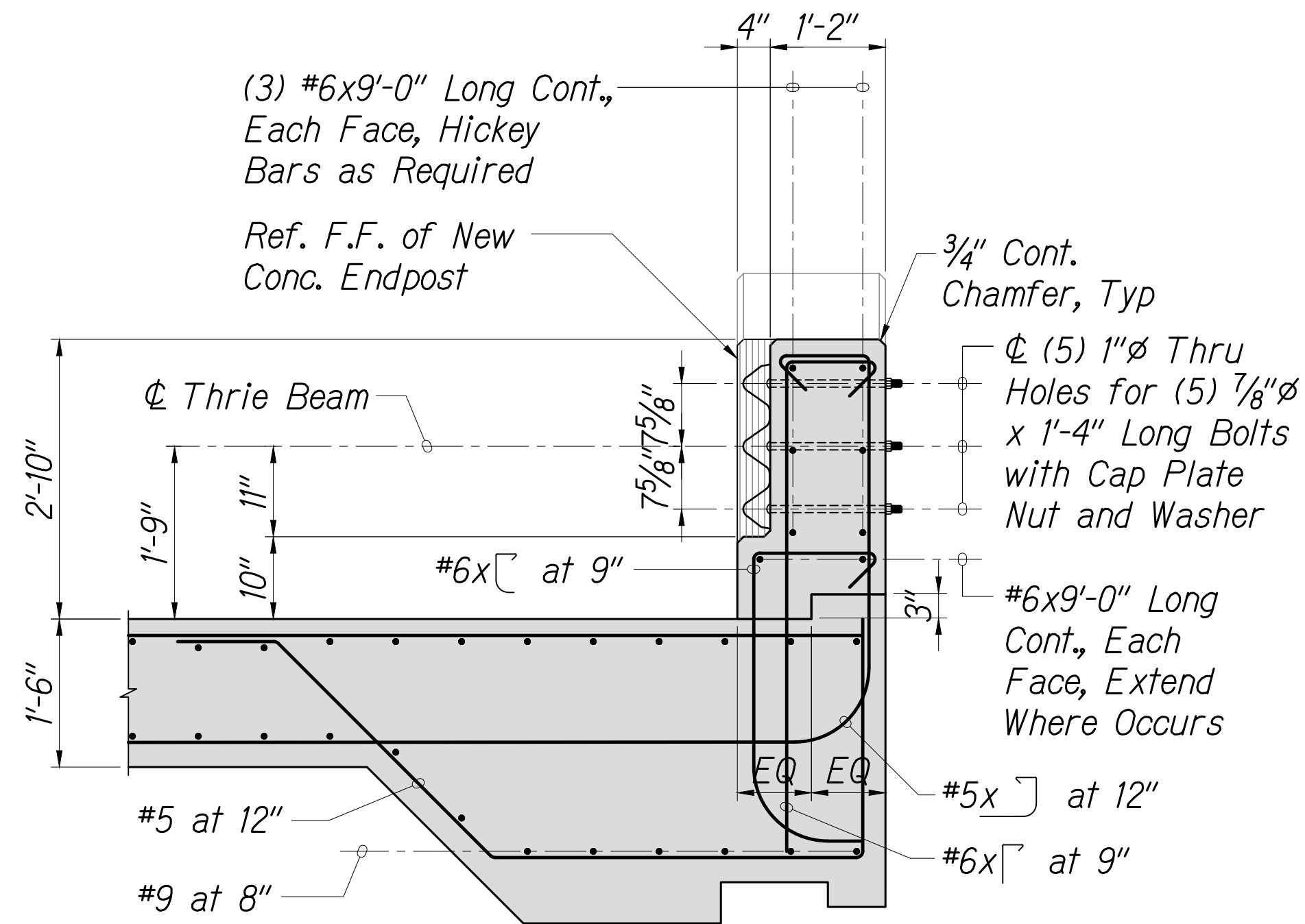
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

Scale: As Noted Date: July 2020

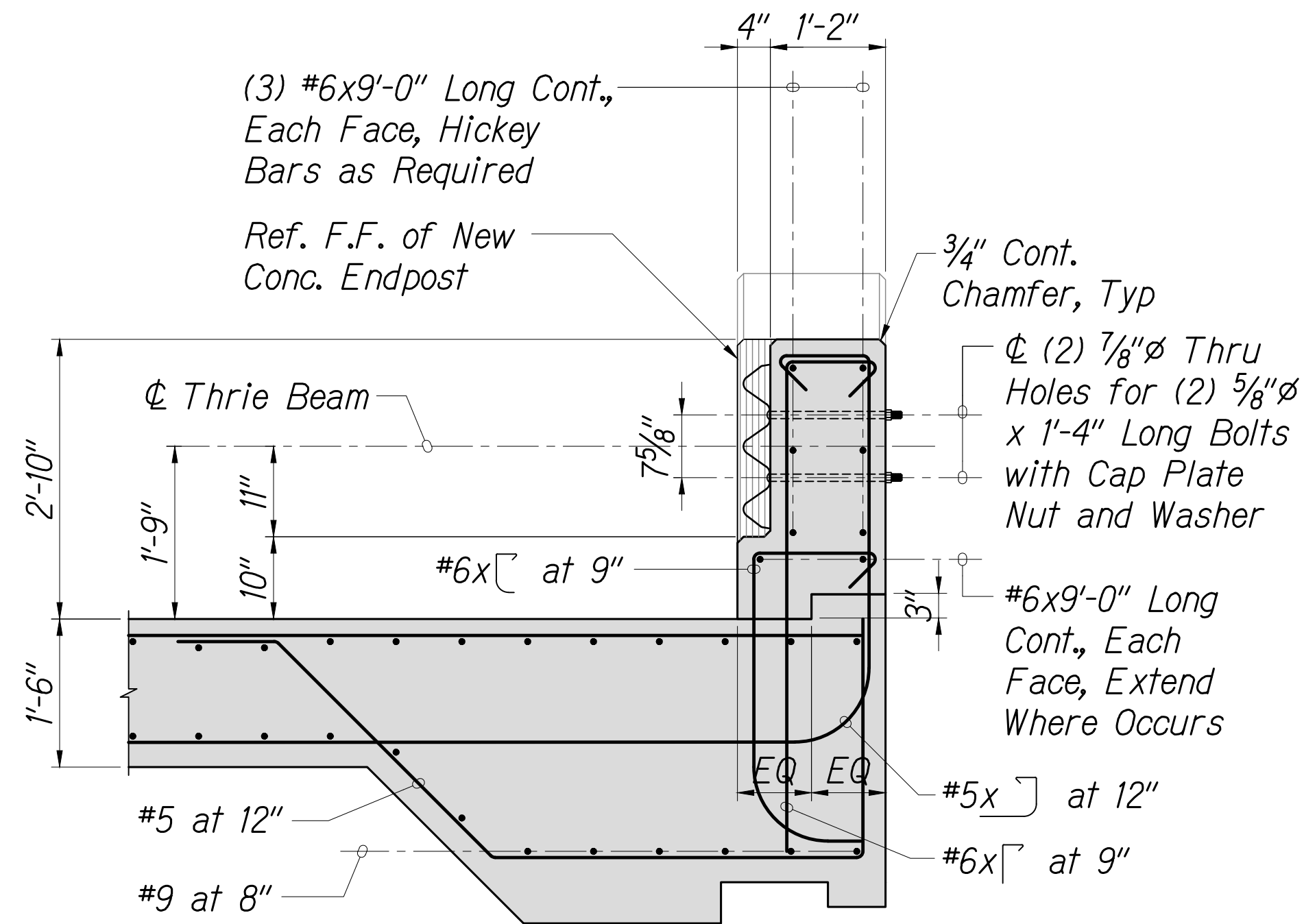
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	116	168



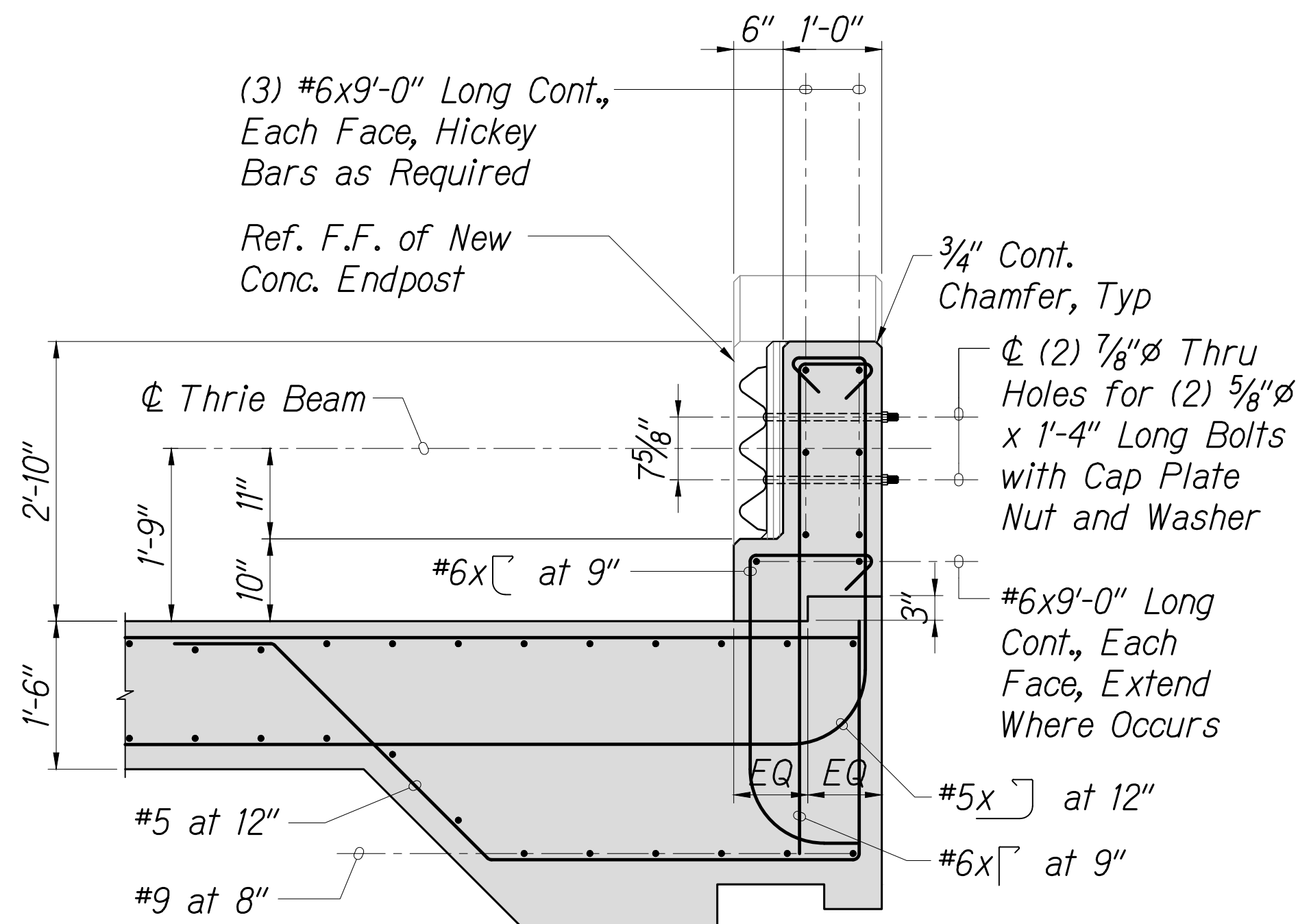
SECTION 1
Scale: 3/4" = 1'-0"



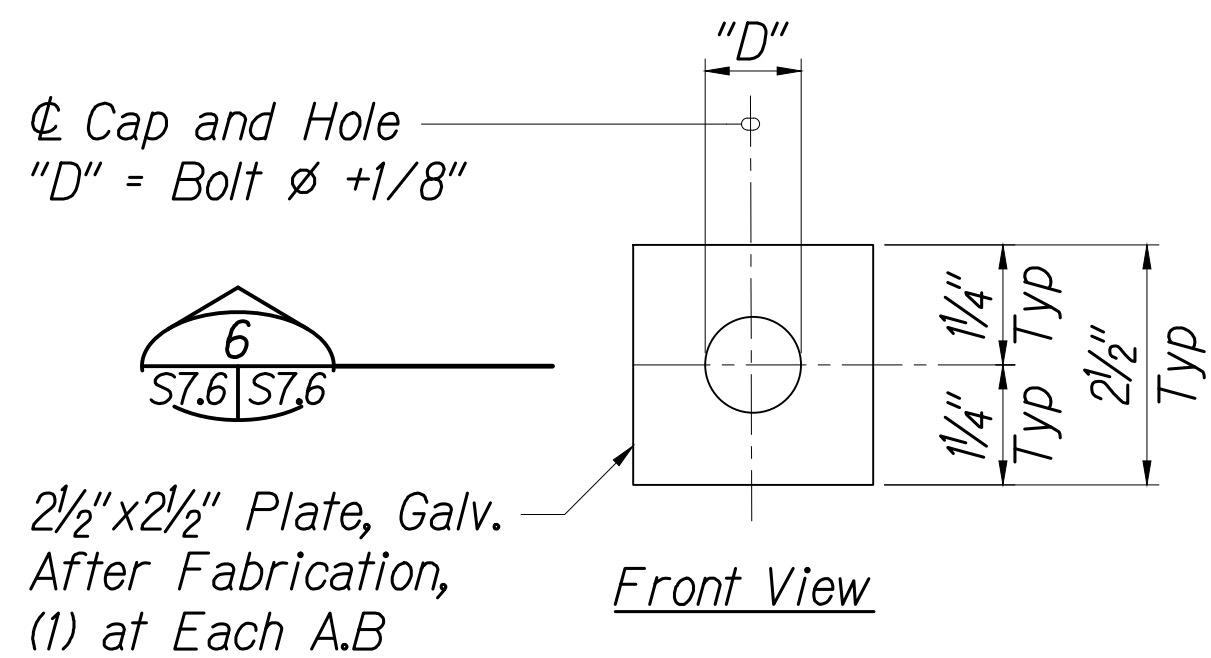
SECTION 2
Scale: 3/4" = 1'-0"



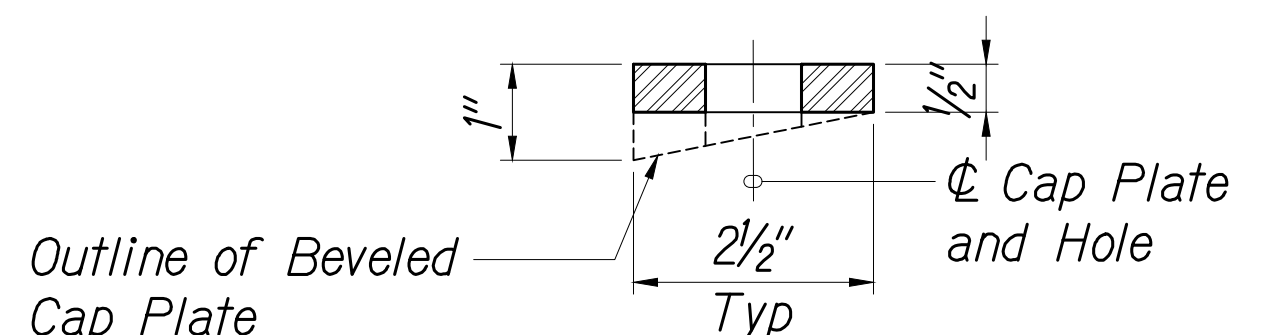
SECTION 3
Scale: 3/4" = 1'-0"



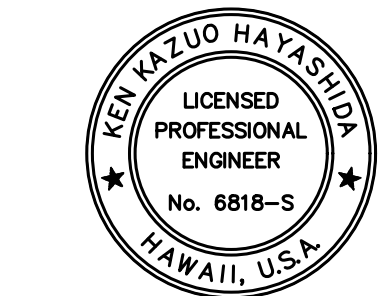
SECTION 4
Scale: 3/4" = 1'-0"



CAP (BEARING) PLATE DETAIL 5
Scale: 6" = 1'-0"



SECTION 6
Scale: 6" = 1'-0"



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BRIDGE NO. 3 - END POST

SECTIONS AND DETAILS

Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

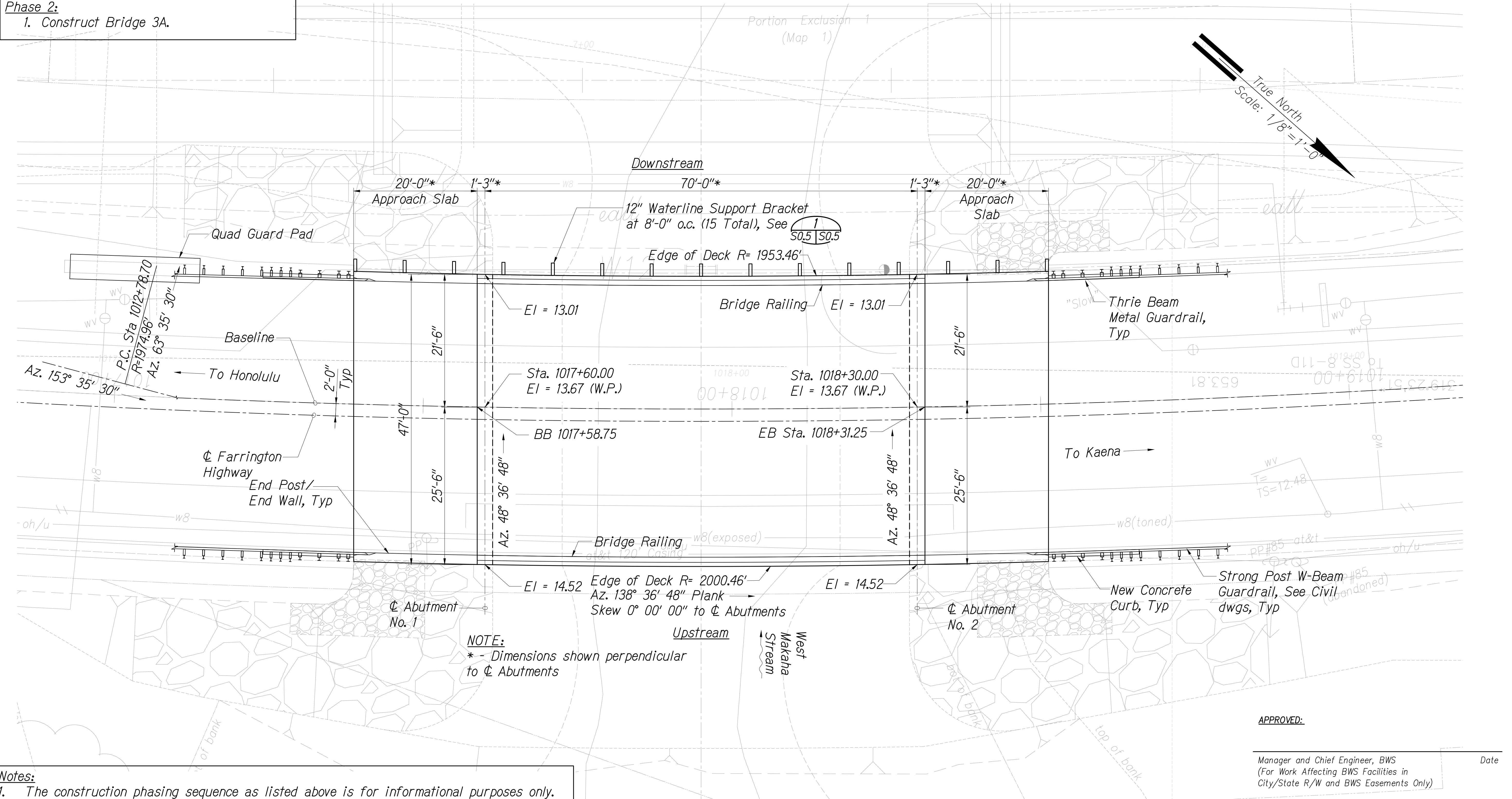
Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

CONSTRUCTION PHASING SEQUENCE

Phase 2:
1. Construct Bridge 3A.

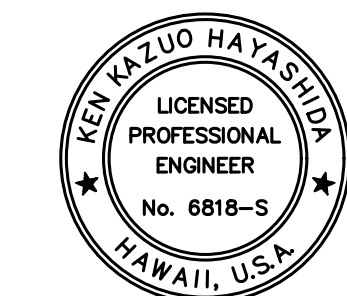
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-K(20)	2020	119	168



- Notes:
- The construction phasing sequence as listed above is for informational purposes only. The actual construction sequence is at the discretion of the contractor.
 - Contractor shall layout bridge with respect to baseline stations and offset dimensions.
 - Bridge deck width (out to out) is 47'-0" along length of bridge.
 - Edge of bridge decks follows the curve of the road.
 - Bridge railing follows the curve of the road.
 - Contractor shall install Precast Planks and pour Concrete Topping prior to backfilling abutments.
 - See Sheet S13.1 for bypass road plan.
 - See Civil Drawings for Baseline details.

BRIDGE NO. 3A - LAYOUT PLAN - PHASE 2
Scale: 1/8" = 1'-0"

1
S8.2 | S8.2



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APPROVED:

Manager and Chief Engineer, BWS
(For Work Affecting BWS Facilities in
City/State R/W and BWS Easements Only)

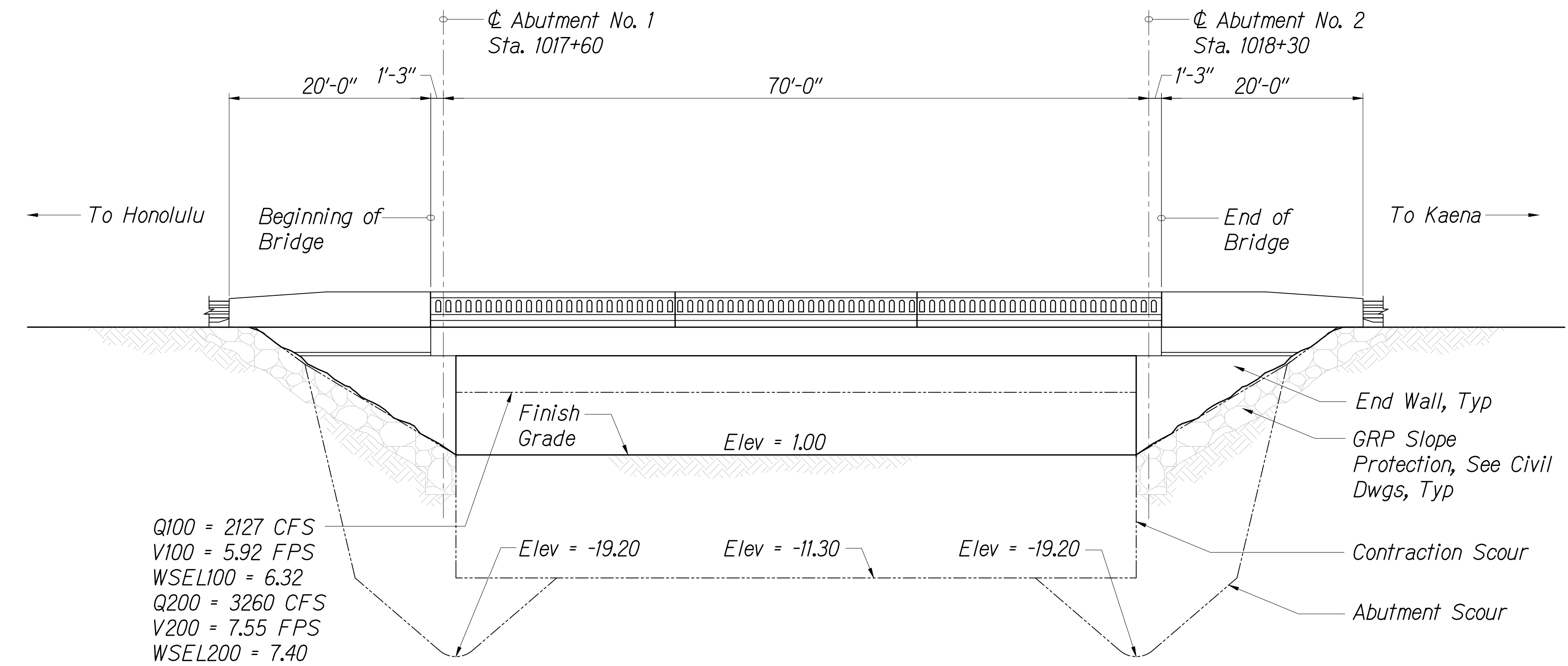
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A
LAYOUT PLAN - PHASE 2
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-K(20)

Scale: As Noted Date: July 2020

SHEET No. S8.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	120	168

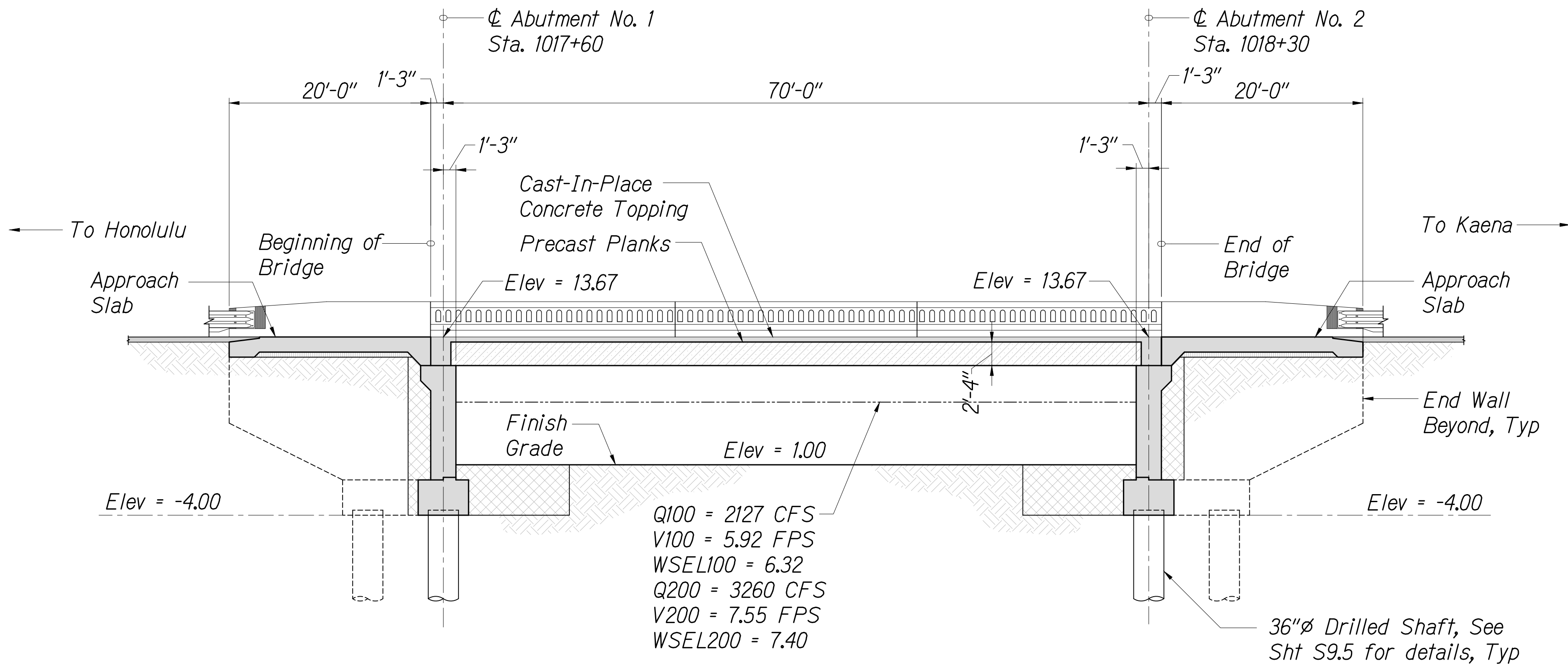


BRIDGE NO. 3A - LONGITUDINAL ELEVATION

Scale: 1/8" = 1'-0"

2

S8.3 | S8.3



BRIDGE NO. 3A - LONGITUDINAL SECTION ALONG BASELINE

Scale: 1/8" = 1'-0"

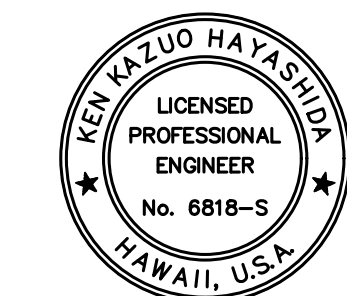
1

S8.3 | S8.3

APPROVED:

Manager and Chief Engineer, BWS
(For Work Affecting BWS Facilities in
City/State R/W and BWS Easements Only)

Date



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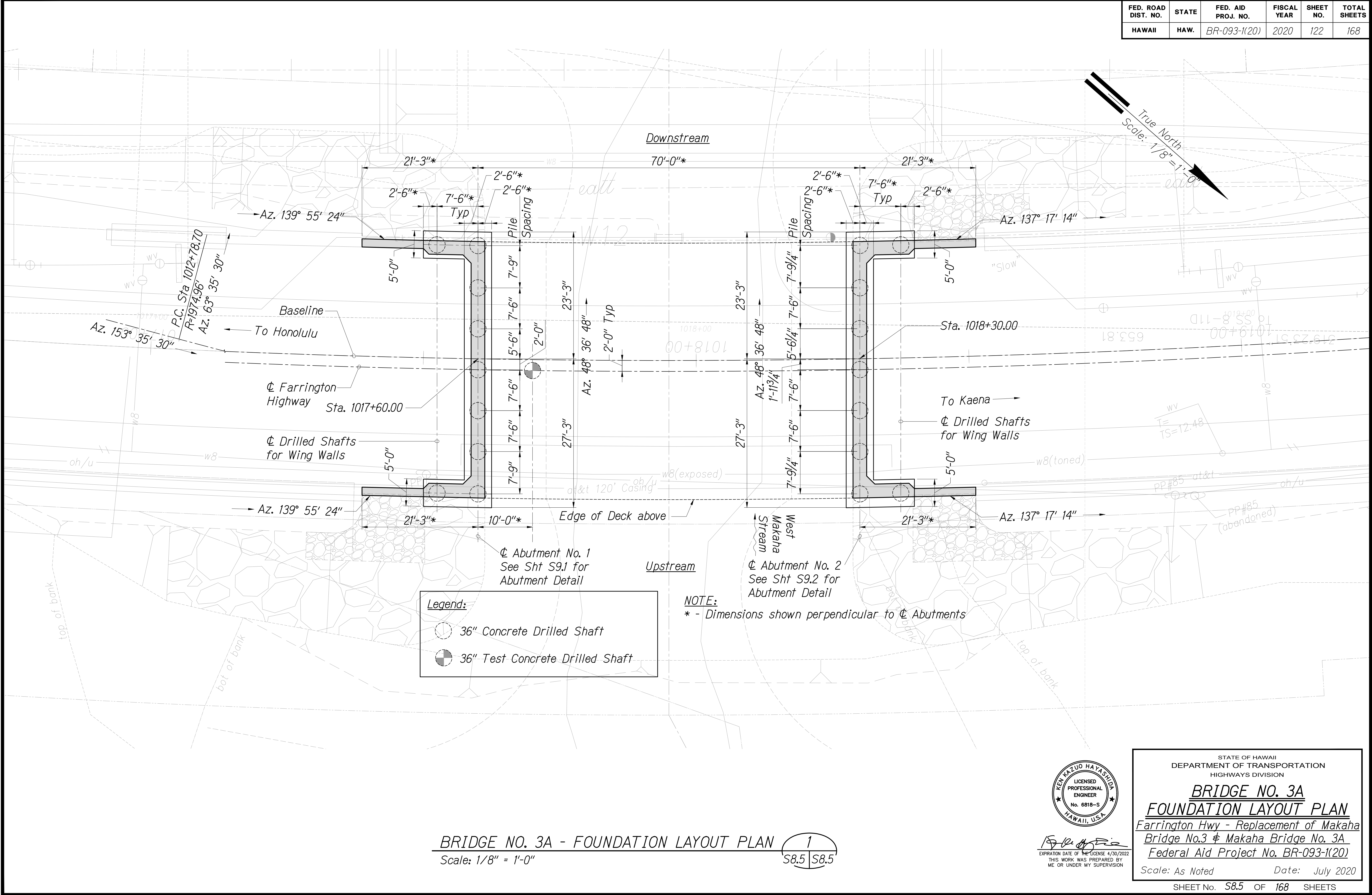
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - LONGITUDINAL
ELEVATION AND SECTION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

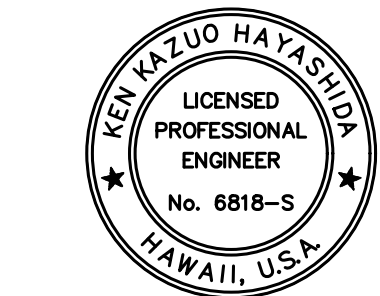
Scale: As Noted
Date: July 2020

SHEET No. S8.3 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	122	168



BRIDGE NO. 3A - FOUNDATION LAYOUT PLAN 1
Scale: 1/8" = 1'-0" S8.5 S8.5



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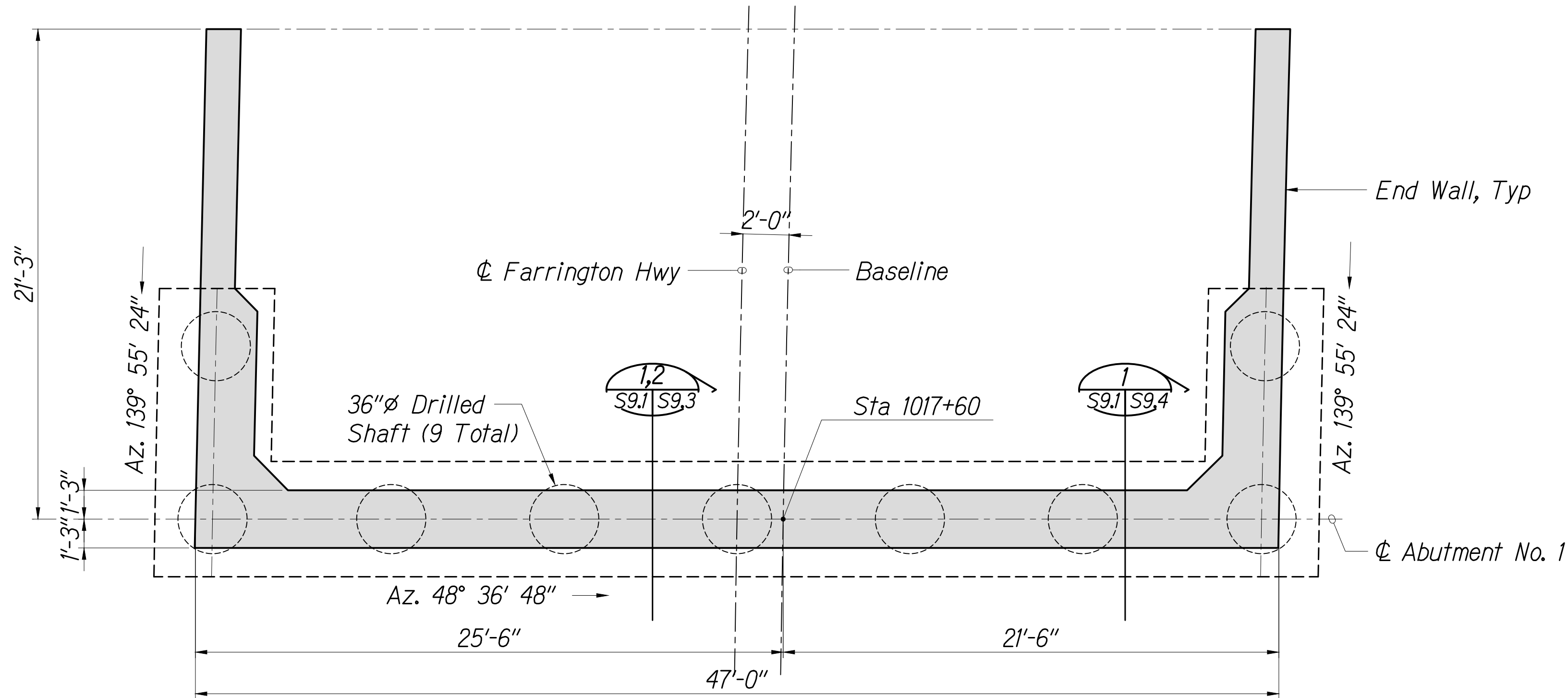
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A
FOUNDATION LAYOUT PLAN
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S8.5 OF 168 SHEETS

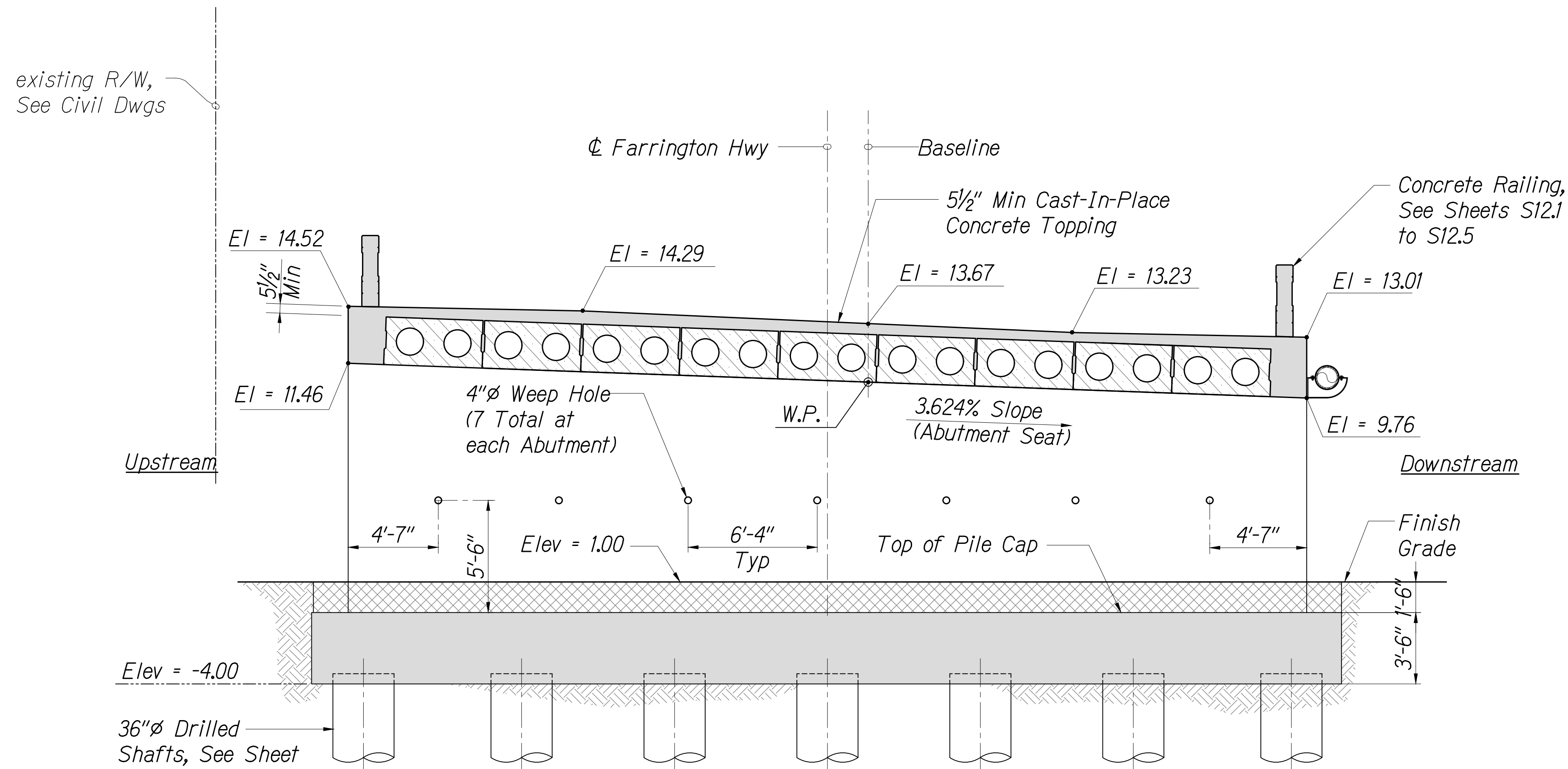
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	123	168



ABUTMENT NO. 1 - FOUNDATION PLAN

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

1
S9.1 S9.1

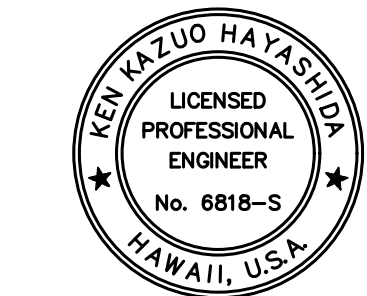


ABUTMENT NO. 1 - ELEVATION

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

2
S9.1 S9.1

- Notes:
- For typical added reinforcing at weep holes, See S0.4 S0.4
 - Top of deck elevation and abutment seat elevation shown are at the center line of abutment. Abutment seat elevation shown is at the bottom of Plank. Elevation may vary depending on camber. Contractor is responsible to set elevation of abutment seat.



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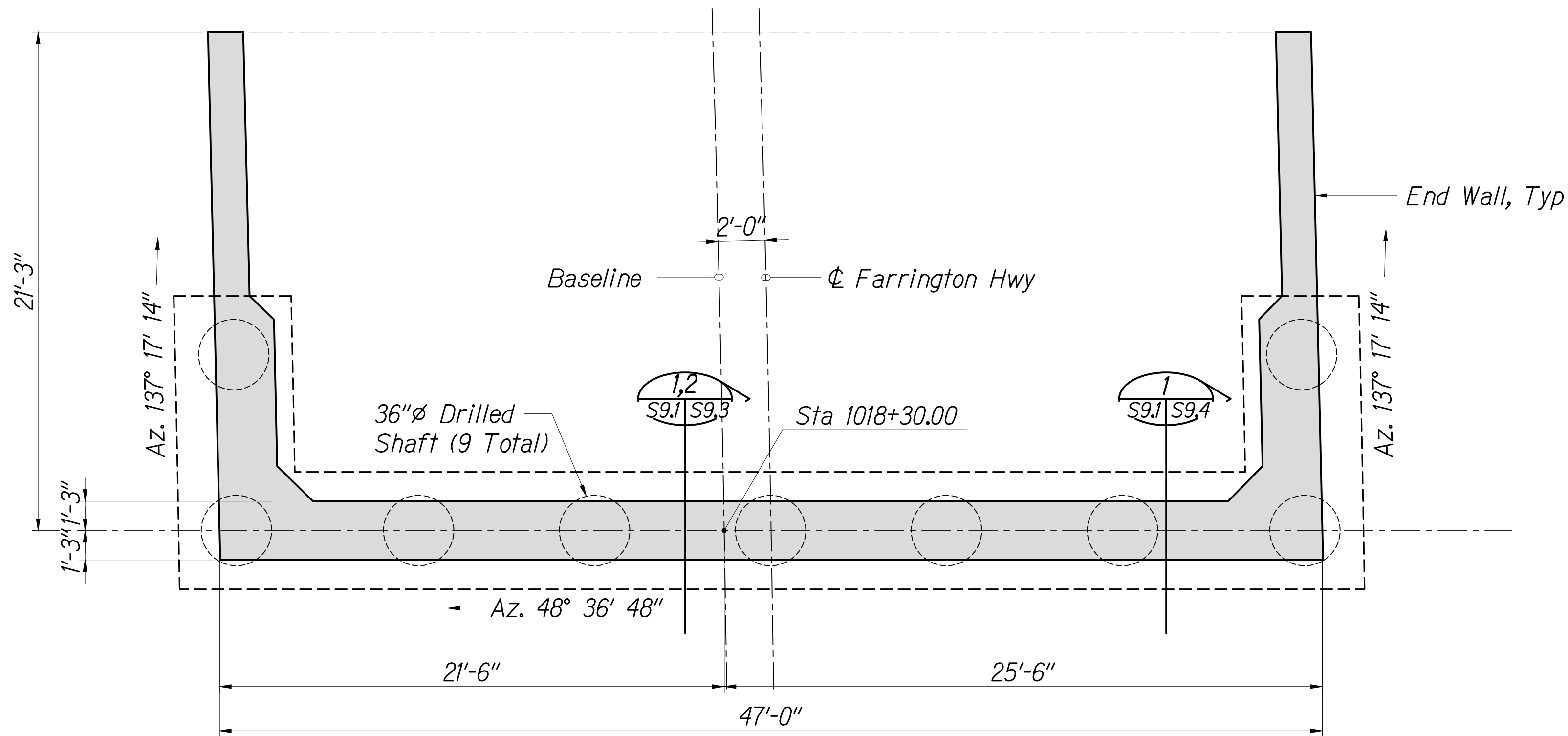
STATE OF HAWAII
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HIGHWAYS DIVISION

BRIDGE NO. 3A - ABUTMENT NO. 1
PLAN AND ELEVATION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

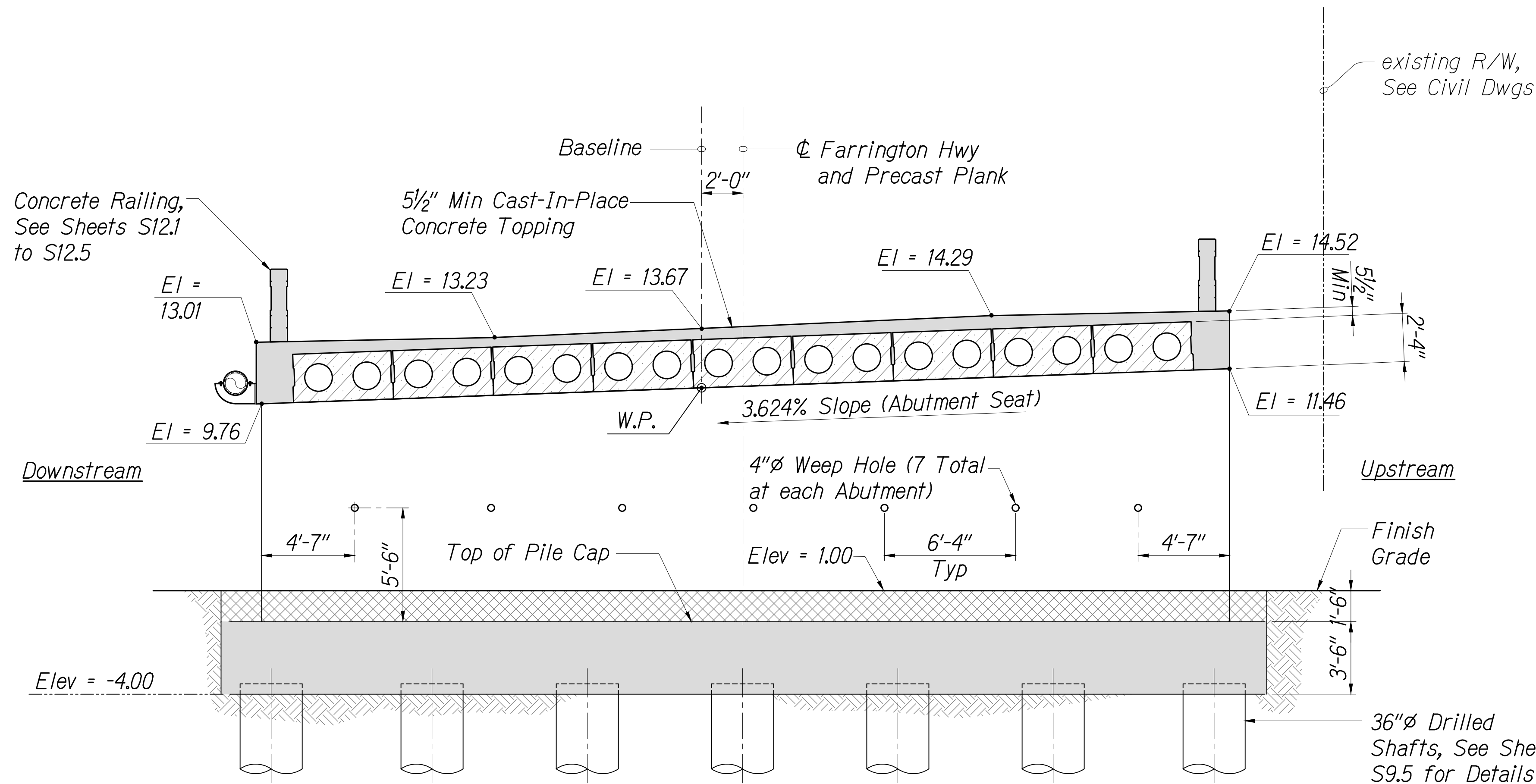
Scale: As Noted Date: July 2020

SHEET No. S9.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	124	168

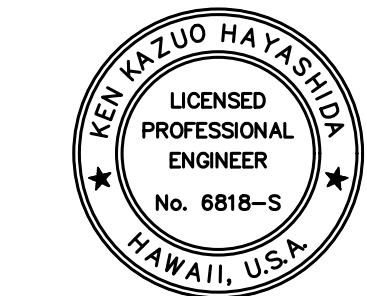


ABUTMENT NO. 2 - FOUNDATION PLAN
 Scale: 1/4" = 1'-0"



ABUTMENT NO. 2 - ELEVATION
 Scale: 1/4" = 1'-0"

- Notes:
- For typical added reinforcing at weep holes, See S0.4 S0.4
 - Top of deck elevation and abutment seat elevation shown are at the center line of abutment. Abutment seat elevation shown is at the bottom of Plank. Elevation may vary depending on camber. Contractor is responsible to set elevation of abutment seat.



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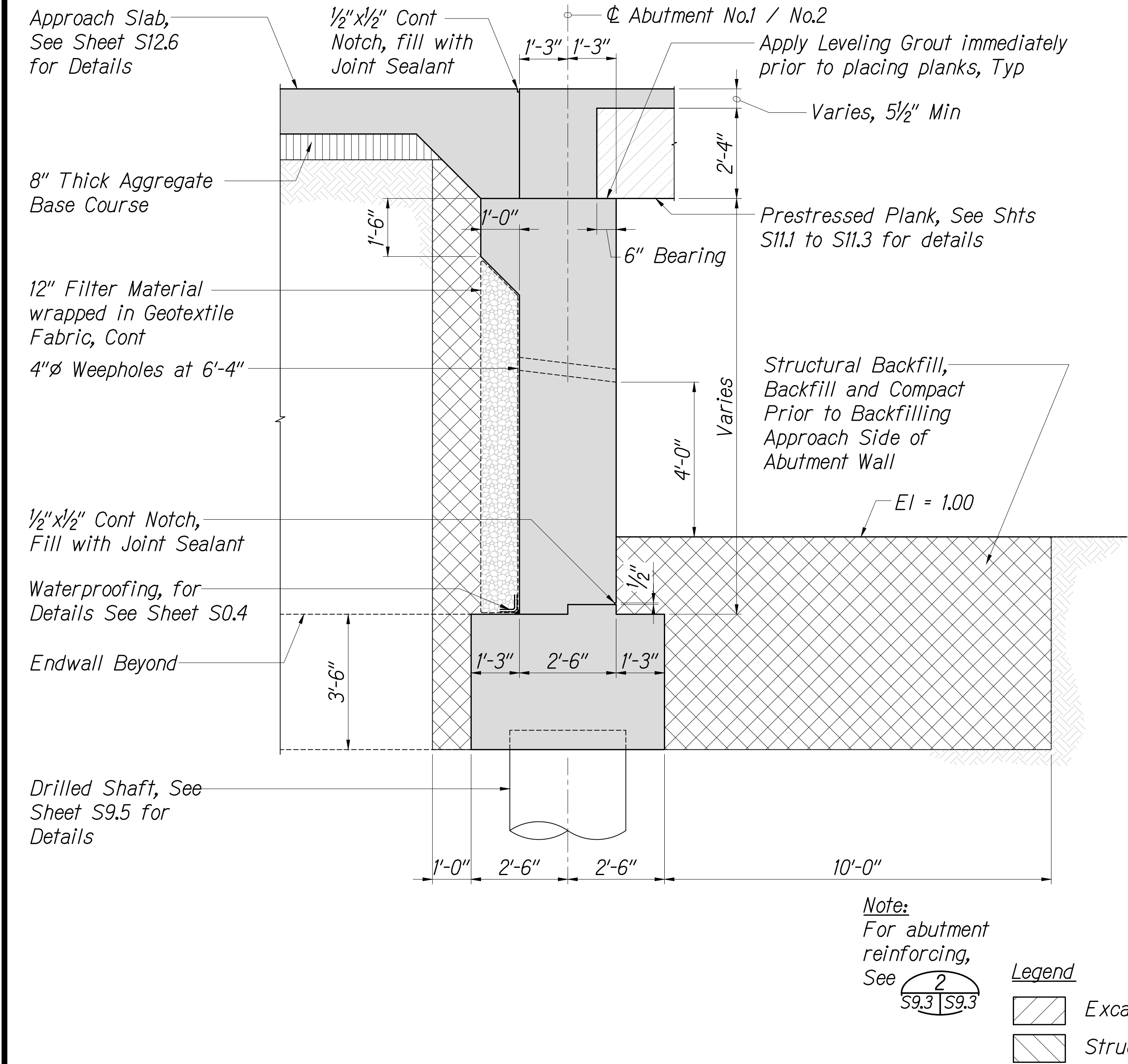
STATE OF HAWAII
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HIGHWAYS DIVISION

BRIDGE NO. 3A - ABUTMENT NO. 2
PLAN AND ELEVATION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

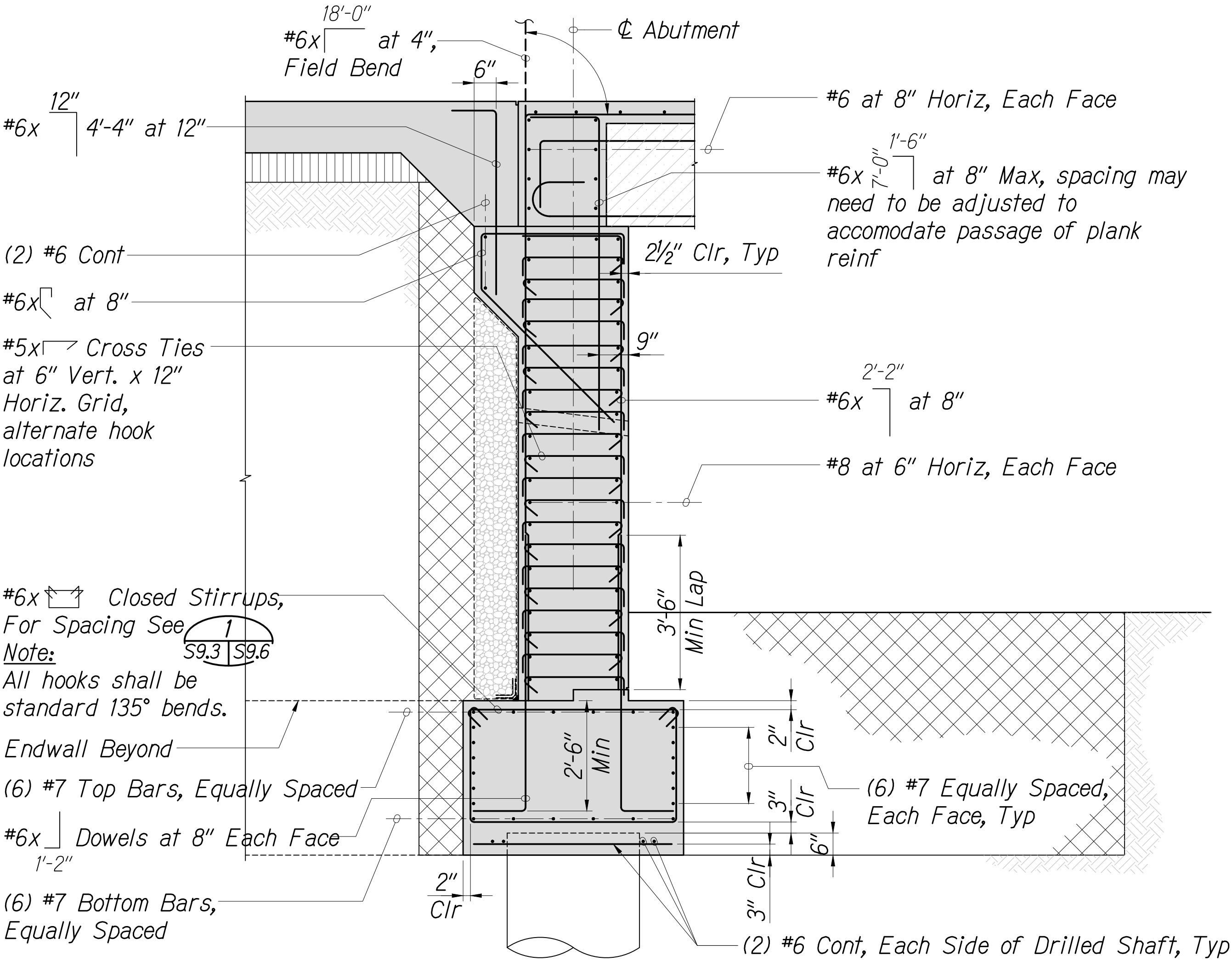
Scale: As Noted
Date: July 2020

SHEET No. S9.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	125	168

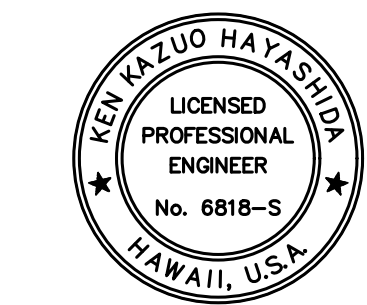


ABUTMENT NO. 1 SECTION SHOWING DIMENSIONS 1
 Scale: 1/2" = 1'-0" S9.1, S9.2, S9.3 | S9.3



- Notes:
- Splices in the abutment horiz reinf shall be staggered and splices in the two layers shall not occur at the same location.
 - For dimensions, see 1
S9.3 | S9.3
 - See Foundation Note F on Sht S0.1 for backfill material requirements.
 - Backfilling behind the abutments shall not be allowed until after the deck topping has been poured atop the prestressed planks and and has attained the minimum 28-day compressive strength.

ABUTMENT NO. 1 SECTION SHOWING REINFORCEMENT 2
 Scale: 1/2" = 1'-0" S9.1, S9.2, S9.3 | S9.3



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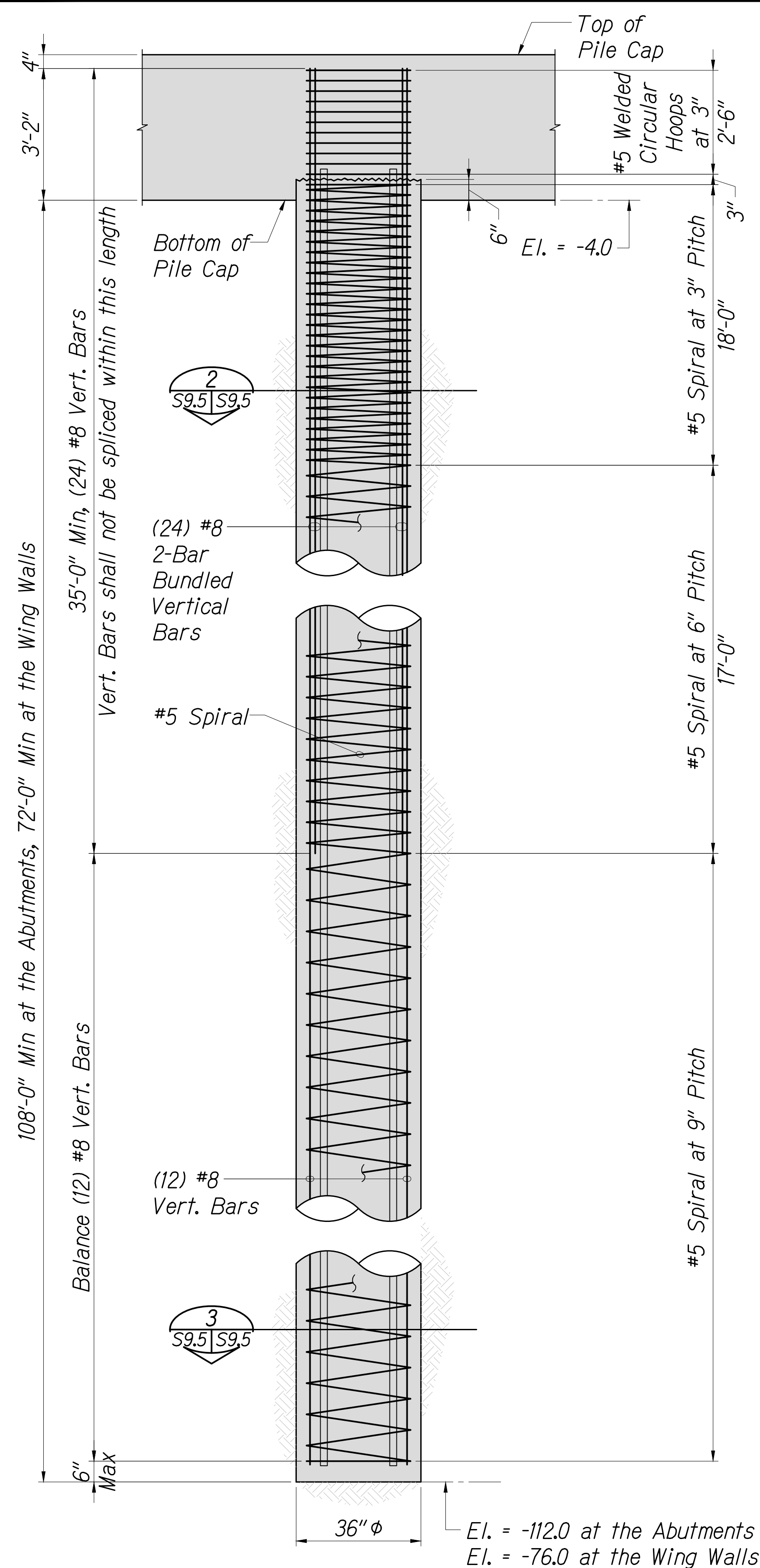
BRIDGE NO. 3A
ABUTMENT SECTIONS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

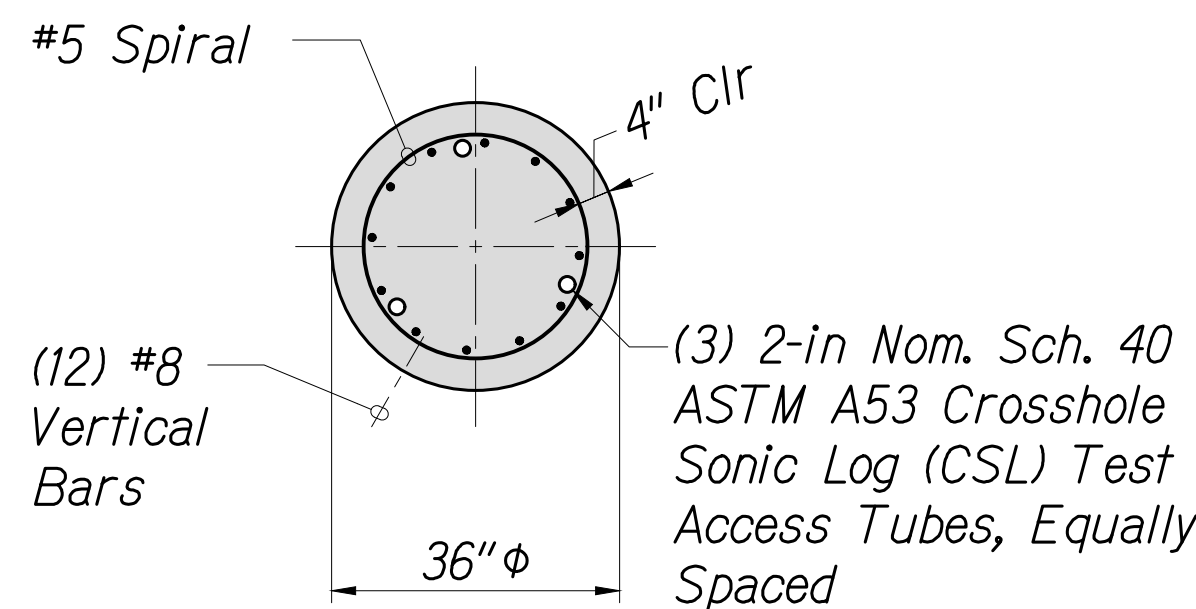
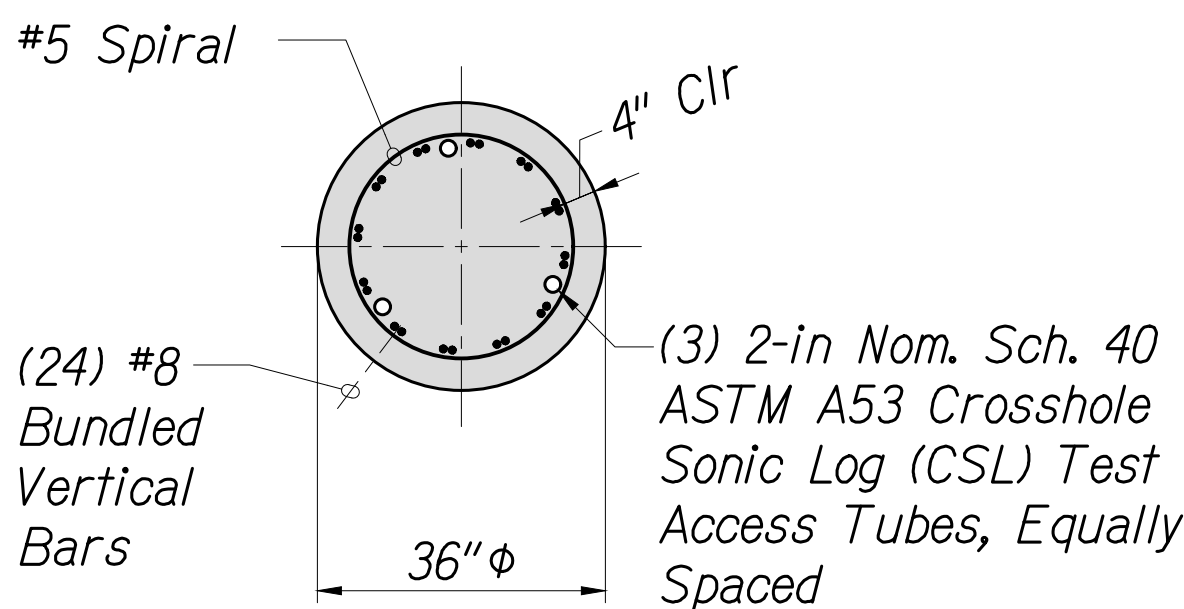
Scale: As Noted
Date: July 2020

SHEET No. S9.3 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	127	168



- Notes:
- Concrete for drilled shafts shall have a minimum 28-day compressive strength of 4,500 psi.
 - Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60 or ASTM A706, Grade 60.
 - Anchorage of spiral reinforcing shall be provided by 1½ extra turns of spiral bar at each end of spiral unit.
 - Spiral reinforcing lap splice shall be 3'-6" minimum.
 - Welded Hoops shall use complete joint penetration single or double V-groove welds in accordance with AWS D1.4.
 - For vertical bar splices and spiral splices, mechanical connectors are allowed in lieu of lapping bars. All mechanical connectors shall be submitted to the engineer for review.
 - Drilled shafts at the abutments shall be constructed with the use of temporary casings to prevent caving. The temporary casing shall extend at least 30 feet of the shaft excavations for the bridge abutments. The inside diameter of temporary casing shall not be less than the specified shaft diameter. The design of the casing, including the material type, strength, and wall thickness shall be the responsibility of the contractor.
 - A minimum 5 foot head of concrete above the bottom of the casing or more to adequately counter hydrostatic pressure shall be maintained during removal of the casing to reduce the potential for "necking" of the drilled shaft.
 - In anticipation of existence of shallow ground water during drilled shaft excavations, concrete placement by tremie methods will be required during construction of the drilled shafts. Ground water shall be controlled to prevent flowing water over excavations.
 - The Contractor shall exercise care in drilling the shaft holes and placing concrete into the holes. A low-shrink concrete mix with high slump (7 to 9-inch range) shall be used to provide close contact between the drilled shafts and the surrounding soils. Concrete shall be placed in a suitable manner to reduce the potential for segregation of the aggregates from the concrete mix.
 - Owner's Geotechnical Engineer shall observe the production of all drilled shafts.
 - Drilled shaft bottom elevations shall be verified by the Geotechnical Engineer prior to installing reinforcing bar cage and placement of concrete.
 - Drilled shafts are designed to be embedded into dense to hard coral formation encountered at depths. Therefore, coring into the dense to hard coral formation will be required.
 - Crosshole Sonic Logging (CSL) shall be conducted in accordance with HDOT specifications. Shafts indicating irregular CSL reading may be subject to additional testing.
 - A test shaft program consisting of drilling a 36 inch diameter test shaft extending to an elevation of about -112.0 feet below MSL is required. A bi-directional axial load test utilizing the Osterberg Load Cell shall be conducted on the test shaft. The test shall be preformed in general accordance with the quick load test method of ASTM D1143. The maximum test load shall be 792 kips. See sheet S8.5 for location of test shaft. The test shaft program shall be observed by the Geotechnical Engineer.



STATE OF HAWAII
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**BRIDGE NO. 3A - TYPICAL
DRILLED SHAFT DETAILS**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S9.5 OF 168 SHEETS

COMPRESSION LOAD CAPACITIES FOR DRILLED SHAFTS			
Location	Shaft Diameter (feet)	Compressive Load Capacity Per Drilled Shaft (kips)	
		Extreme Event Limit State	Strength Limit State
Abutments	3	660	330
Wing Walls	3	-	210

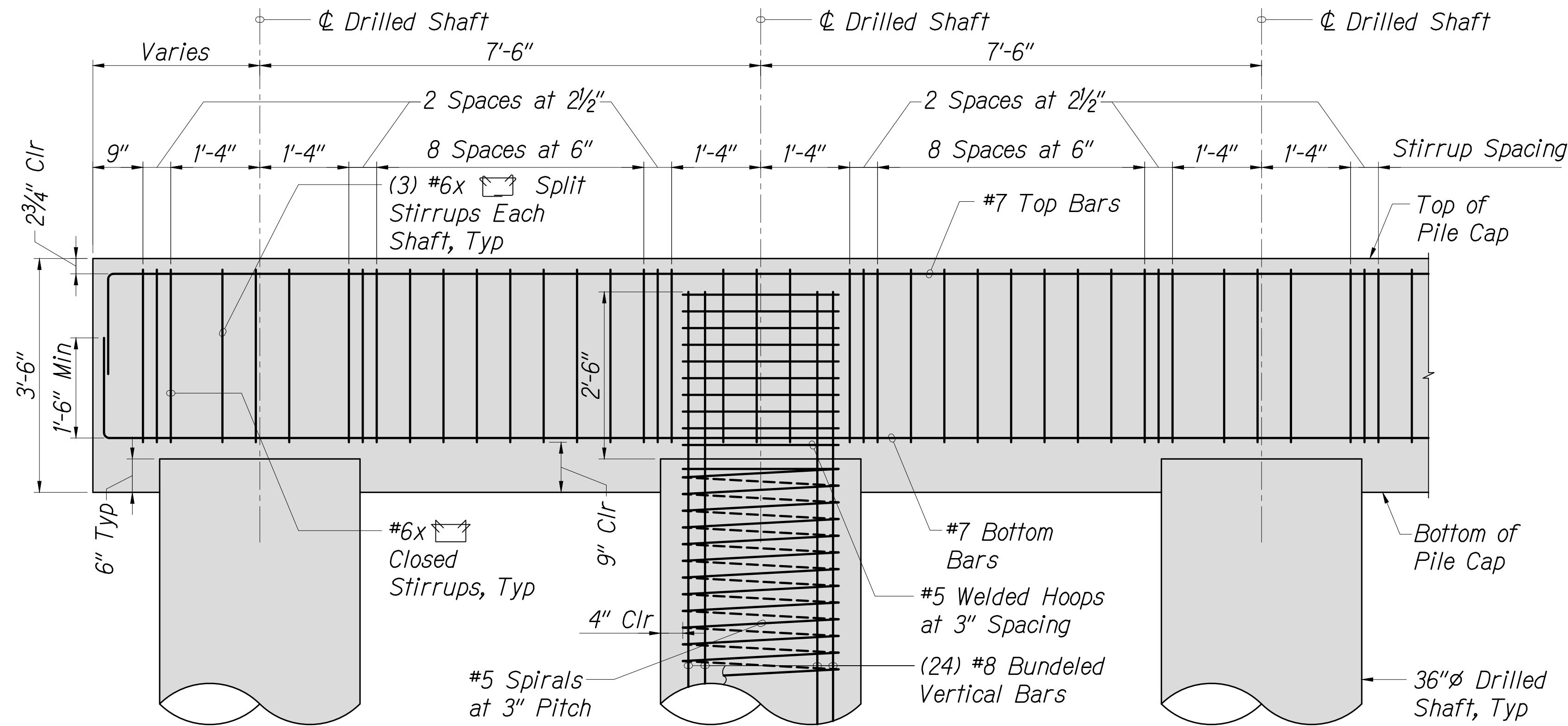
UPLIFT LOAD CAPACITIES FOR DRILLED SHAFTS			
Location	Shaft Diameter (feet)	Uplift Load Capacity Per Drilled Shaft (kips)	
		Extreme Event Limit State	Strength Limit State
Abutments	3	520	210
Wing Walls	3	-	-

TYPICAL DRILLED SHAFT DETAIL
Scale: 1/2" = 1'-0"

SECTION 1
Scale: 1/2" = 1'-0"

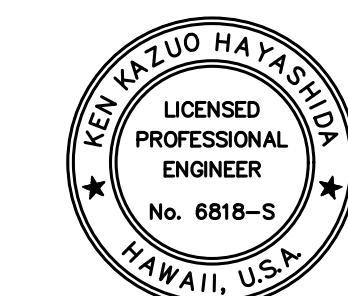
SECTION 2
Scale: 1/2" = 1'-0"

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	128	168



TYPICAL PILE CAP ELEVATION
Scale: 3/4" = 1'-0"

1
S9.3 | S9.6



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HIGHWAYS DIVISION

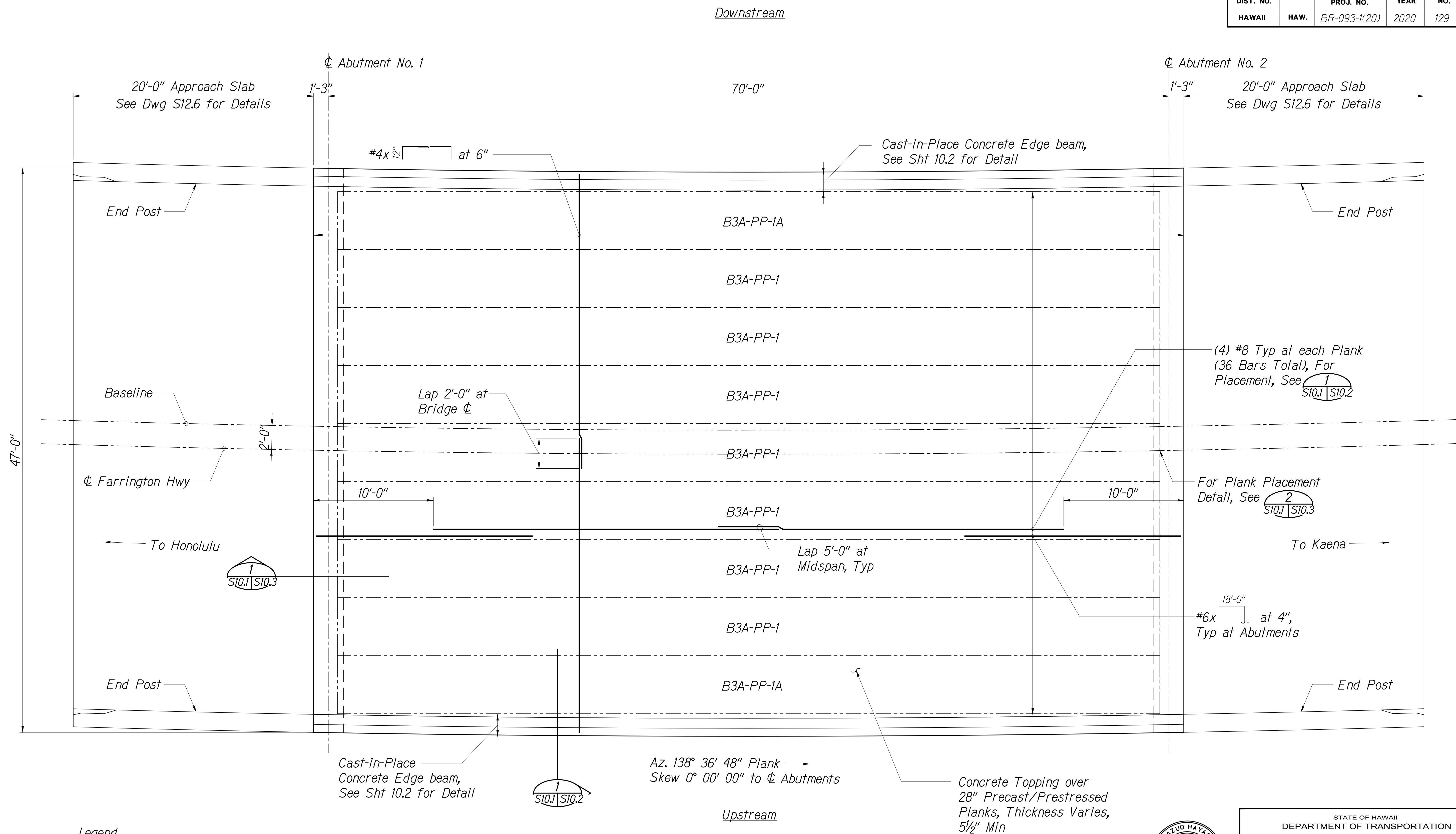
**BRIDGE NO. 3A - TYPICAL
PILE CAP ELEVATION**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S9.6 OF 168 SHEETS

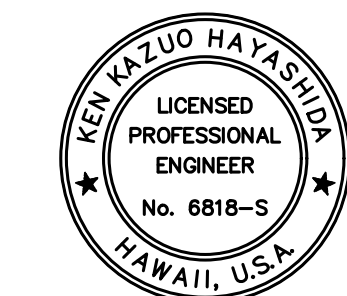
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	129	168



Legend
B3A-PP-1 Denotes Precast/Prestressed Plank Type
for Bridge 3A, See dwgs S11.1 to S11.3 for Details

Note:
Bridge Railing not Shown for Clarity.

BRIDGE NO. 3A - DECK FRAMING PLAN
Scale: 1/4" = 1'-0"



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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

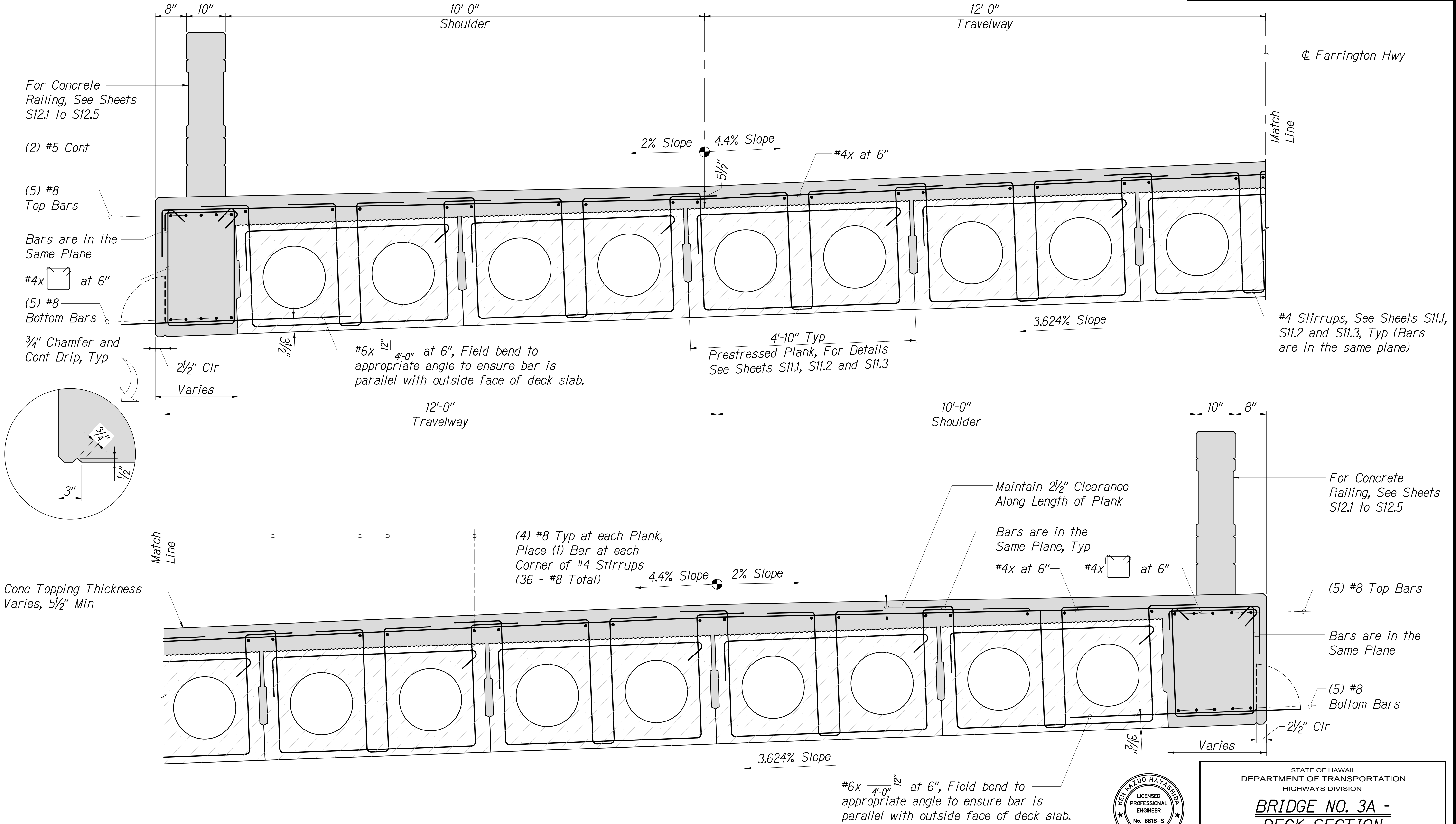
BRIDGE NO. 3A
DECK FRAMING PLAN

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

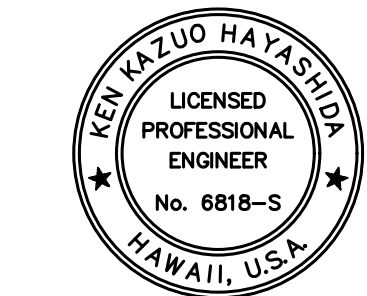
SHEET No. S10.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	130	168



BRIDGE NO. 3A - DECK SECTION
Scale: 1" = 1'-0"

1
S10.1 S10.2



EXPIRATION DATE OF THE LICENSE 4/30/2022
THIS WORK WAS PREPARED BY
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

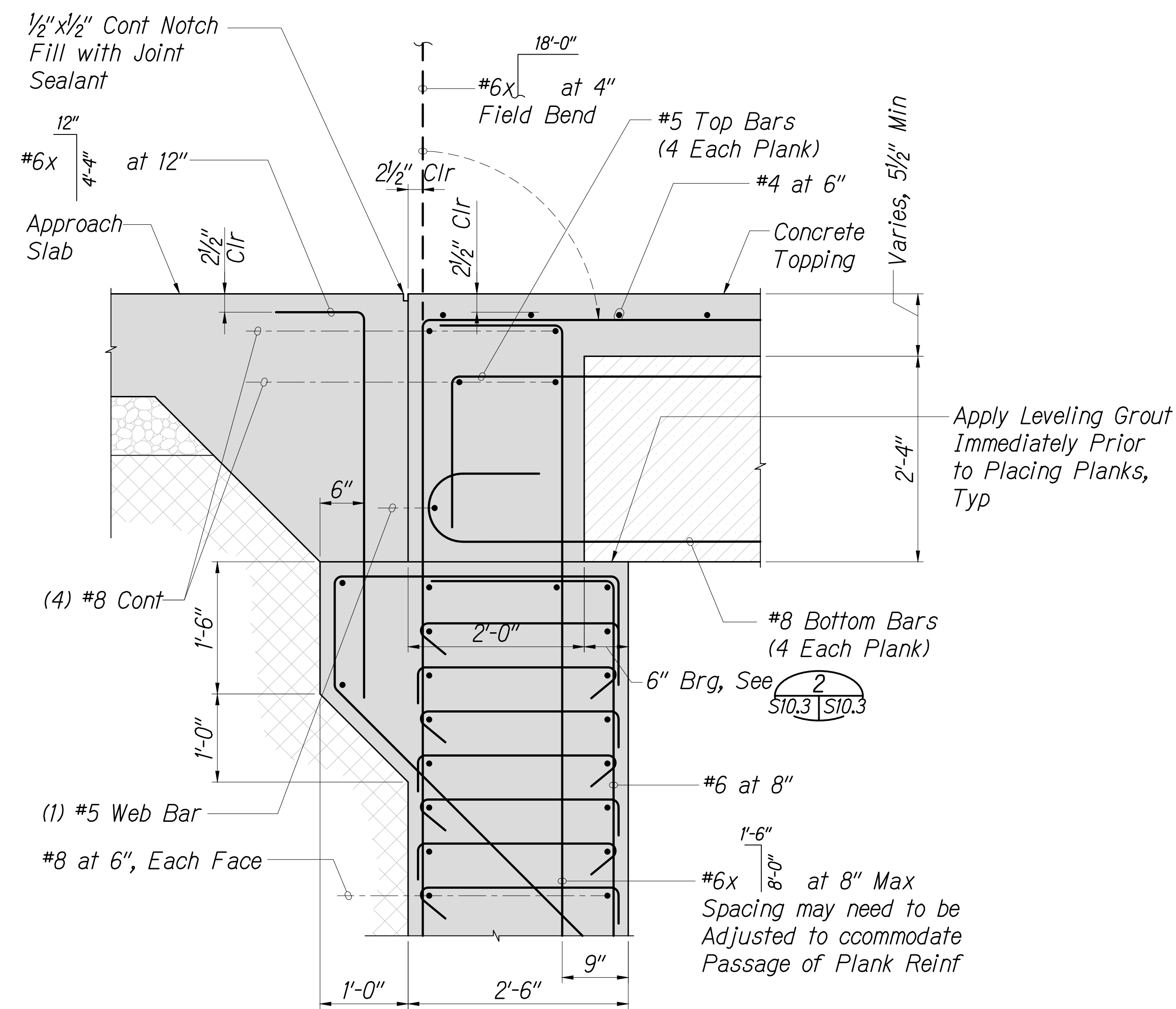
BRIDGE NO. 3A -
DECK SECTION

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

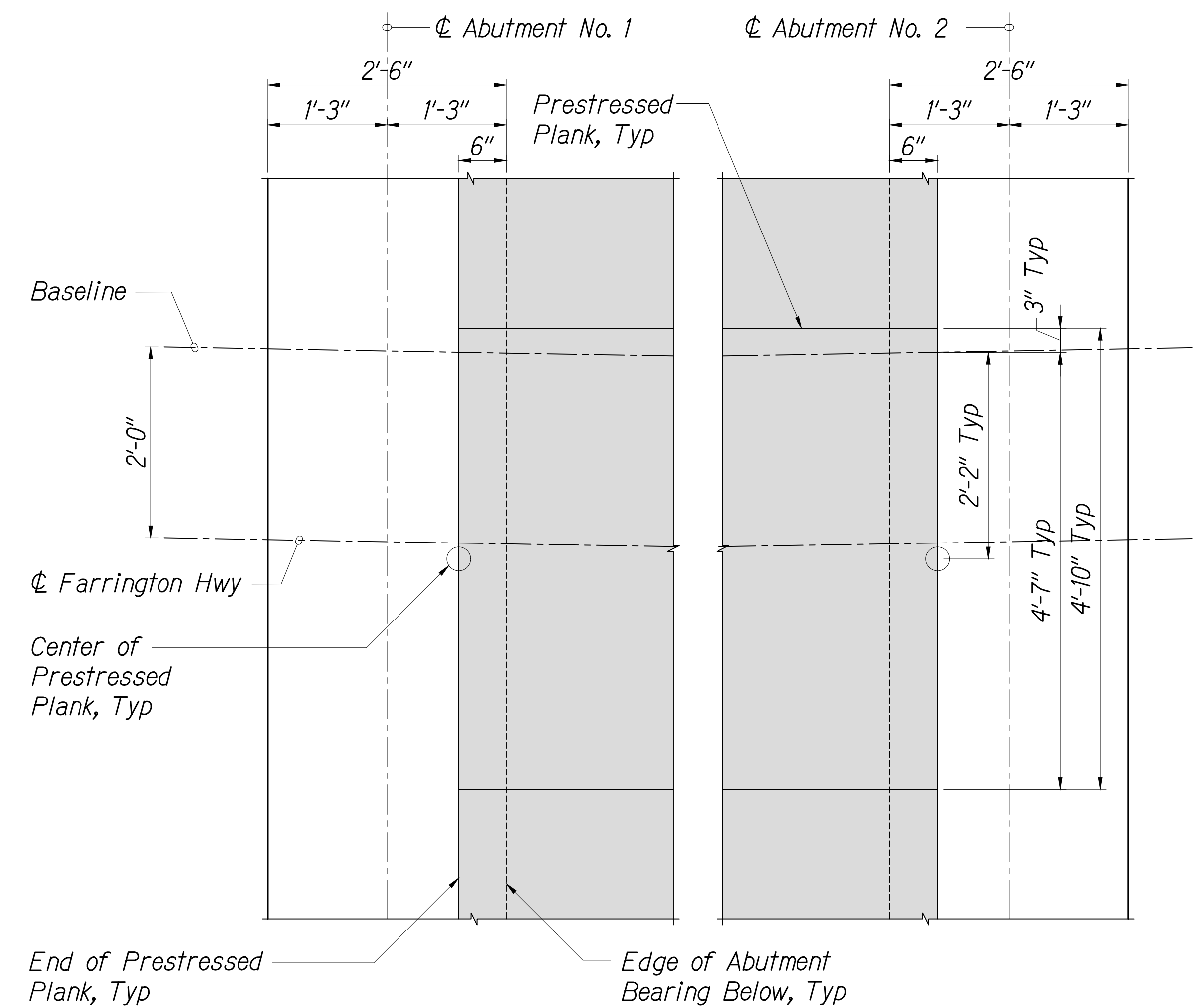
Scale: As Noted Date: July 2020

SHEET No. S10.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	131	168



SECTION 1
Scale: 1" = 1'-0"



PLANK PLACEMENT DETAIL 2
Scale: 1" = 1'-0"



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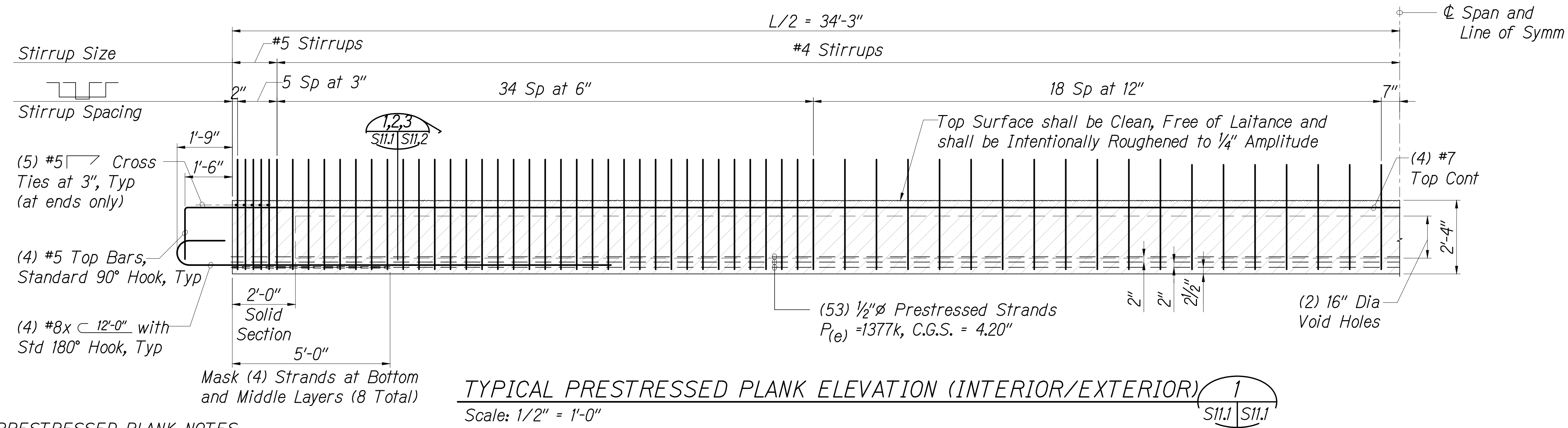
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - DECK
SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S10.3 OF 168 SHEETS

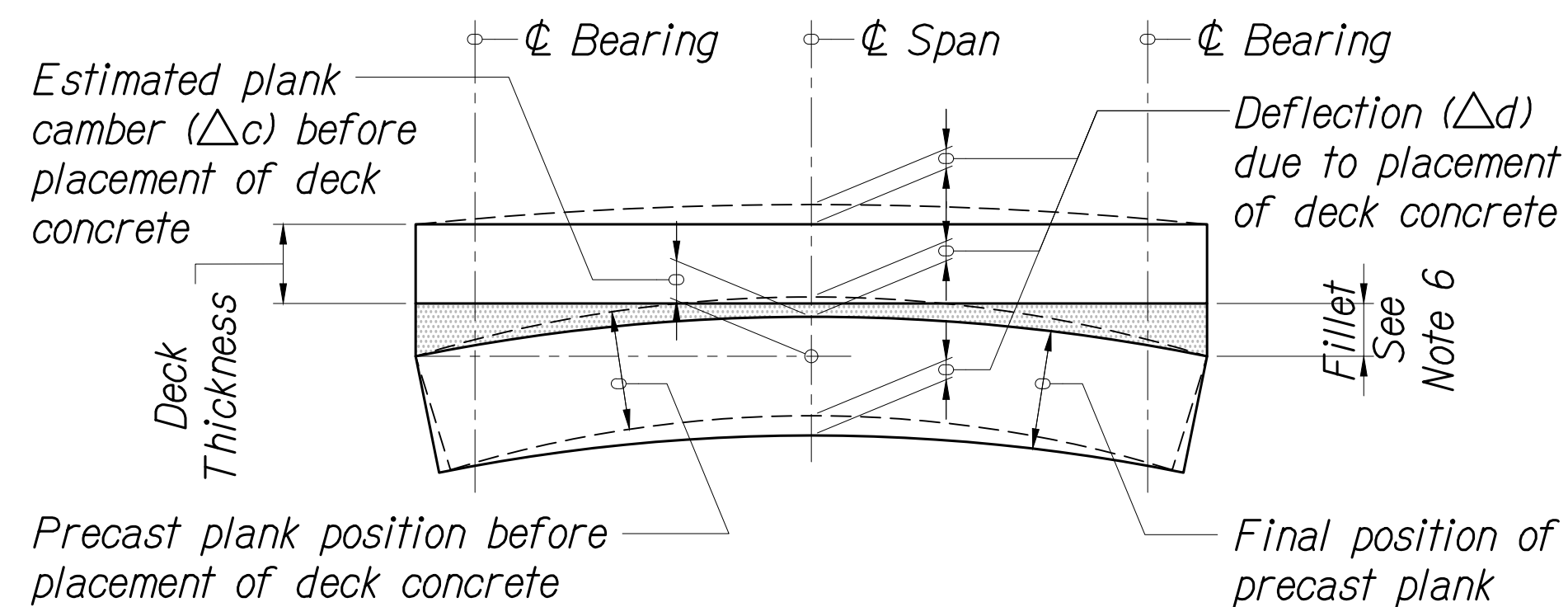
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	132	168



PRESTRESSED PLANK NOTES:

- Concrete 28 day compressive strength, $f'_c = 8,000$ psi. Concrete compressive strength at time of prestressing release, $f_{ci} = 6,000$ psi.
- All strands shall be $1/2$ " diameter, 7-wire low relaxation strands conforming to AASHTO M203 (ASTM A416), Grade 270.
- Initial tensioning stress (before any losses) shall be 202.50 ksi.
- Non-prestressed (mild) reinforcing steel shall be deformed bars conforming to ASTM A615 Grade 60.
- Strand pattern shall be symmetrical about the longitudinal center line of the plank.
- Strand release sequence shall not to induce any lateral deflection of the plank.
- Contractor shall submit shop drawings indicating proposed strand pattern, releasing sequence, reinforcing details and hold down device details to the Engineer prior to fabrication.
- Contractor shall submit structural calculations for prestressed concrete beams stamped by a structural engineer licensed in the State of Hawaii to the Engineer for approval prior to fabrication.
- During curing, care shall be taken to avoid any lateral deflection to the plank due to improper orientation.
- Excessive damage or honeycombing may be grounds for rejection.
- Lifting devices shall be placed as close as possible to the centerline of bearings of the plank. Details and locations of lifting devices shall be submitted to the Engineer for record. Such a submittal does not relieve the Contractor of their responsibilities if the beam is damaged due to failure of the lifting device.
- $P(e)$ = effective prestressing force after all losses (kips)
- Stirrups shall be placed parallel to the plank skew.
- $L = 68'-6"$ (prestressed plank length)

	Calculated Camber Δ_c
Immediately After Release of Prestress	1.67"
At Erection	2.92"
ΔD	-0.75"



PRESTRESSED PLANK CAMBER DIAGRAM

CAMBER DIAGRAM NOTES:

- The calculated camber, Δ_c , includes the effects of the initial prestress force, the weight of the precast plank after removal from the bed, and time-dependant properties of concrete (compressive strength, modulus of elasticity, creep strain, and shrinkage strain) were included in the analysis. The time-dependant modulus of elasticity of concrete was multiplied by 0.85 to account for the effect of the type of aggregate.
- The type of aggregate to be used in all of the planks shall be obtained from a single supplier and quarry site.
- The contractor shall control and measure the actual camber of each plank immediately after the release of prestress and just before erection in the field. Actual camber immediately after release shall not vary from the calculated values by ± 0.50 ". The actual camber just before erection in the field shall not exceed ± 1.00 ". If the camber limits are exceeded for any plank, the engineer shall be notified immediately to evaluate camber and provide recommendation. Prescribed recommendations shall be at no additional cost to the Owner.
- Dead load deflection, Δ_d , is due to the weight of the concrete deck.
- Set the deck forms and camber the deck machine screed rails to offset the dead load deflection due to deck placement.
- Plank seat elevations were calculated using dead load deflections of the deck so that top of precast plank will be a minimum of 1" below bottom of deck at any point in the span, allowing for precast precast depth and slab camber tolerance.



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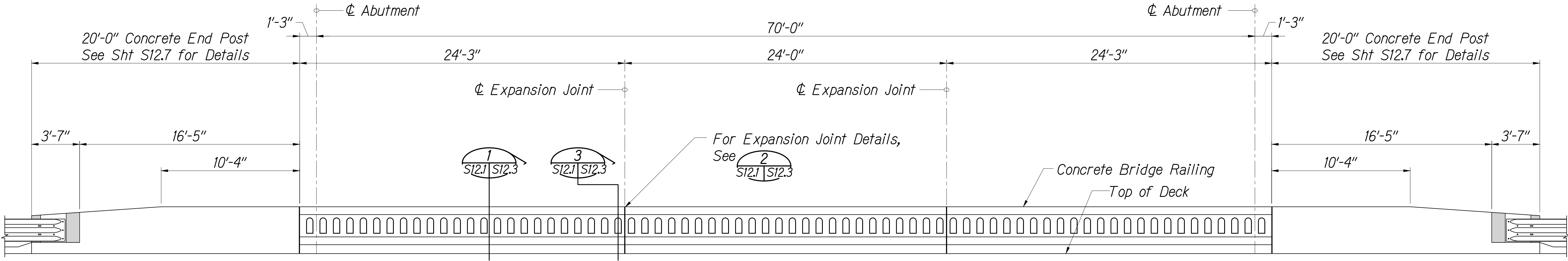
**BRIDGE NO. 3A - TYPICAL PRESTRESSED
PLANK LONGITUDINAL SECTIONS**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

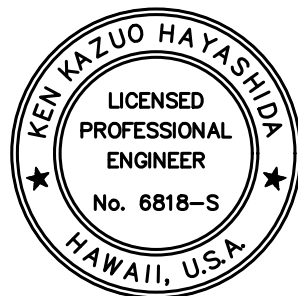
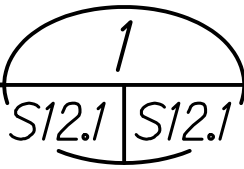
SHEET No. S11.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	134	168



BRIDGE NO. 3A - RAILING ELEVATION

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



EXPIRATION DATE OF THE LICENSE 4/30/2022
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HIGHWAYS DIVISION

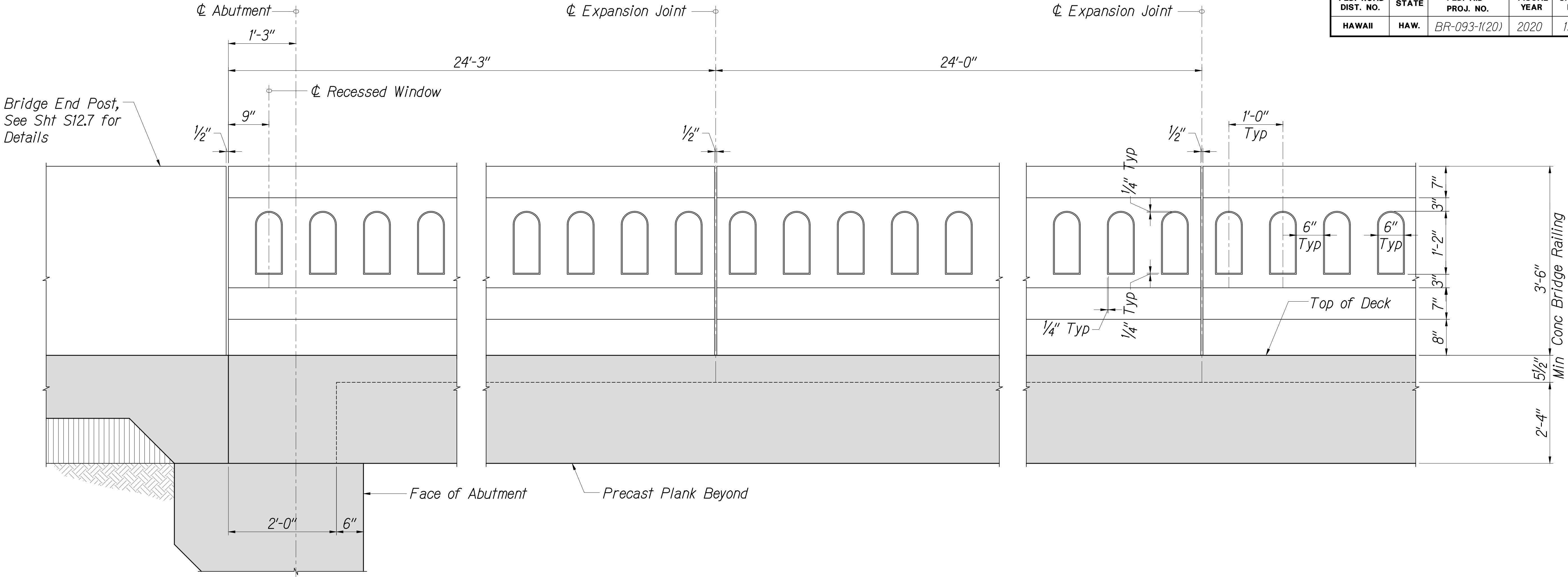
BRIDGE NO. 3A
RAILING ELEVATIONS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

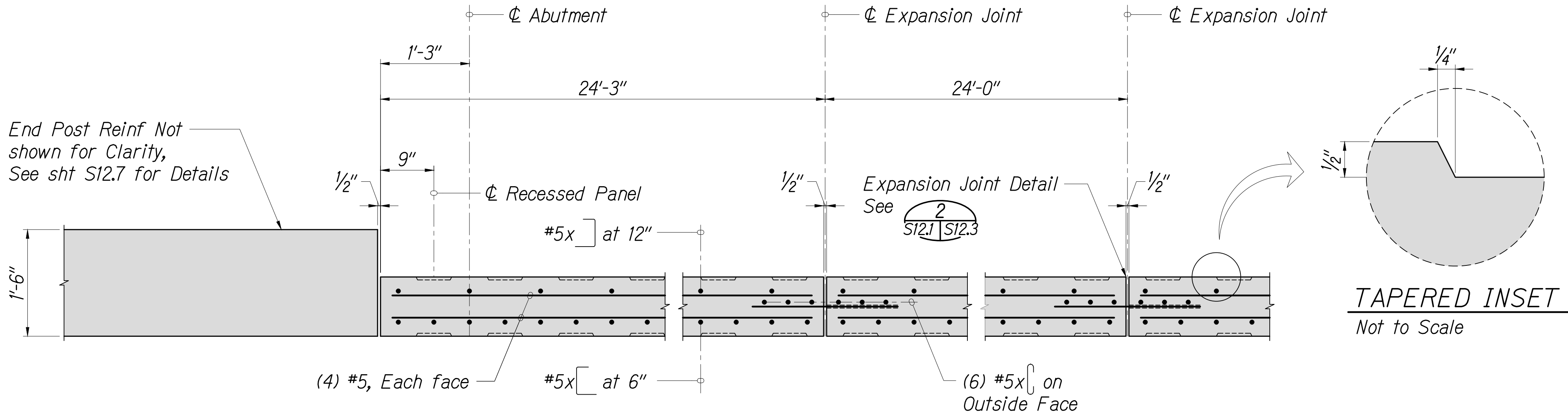
SHEET No. S12.1 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	135	168



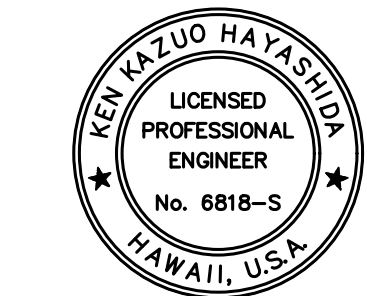
PARTIAL RAILING ELEVATION SHOWING DIMENSIONS
Scale: 1" = 1'-0"

1
S12.2 | S12.2



PARTIAL RAILING PLAN VIEW - SECTION
Scale: 1" = 1'-0"

2
S12.2 | S12.2



EXPIRATION DATE OF THE LICENSE 4/30/2022
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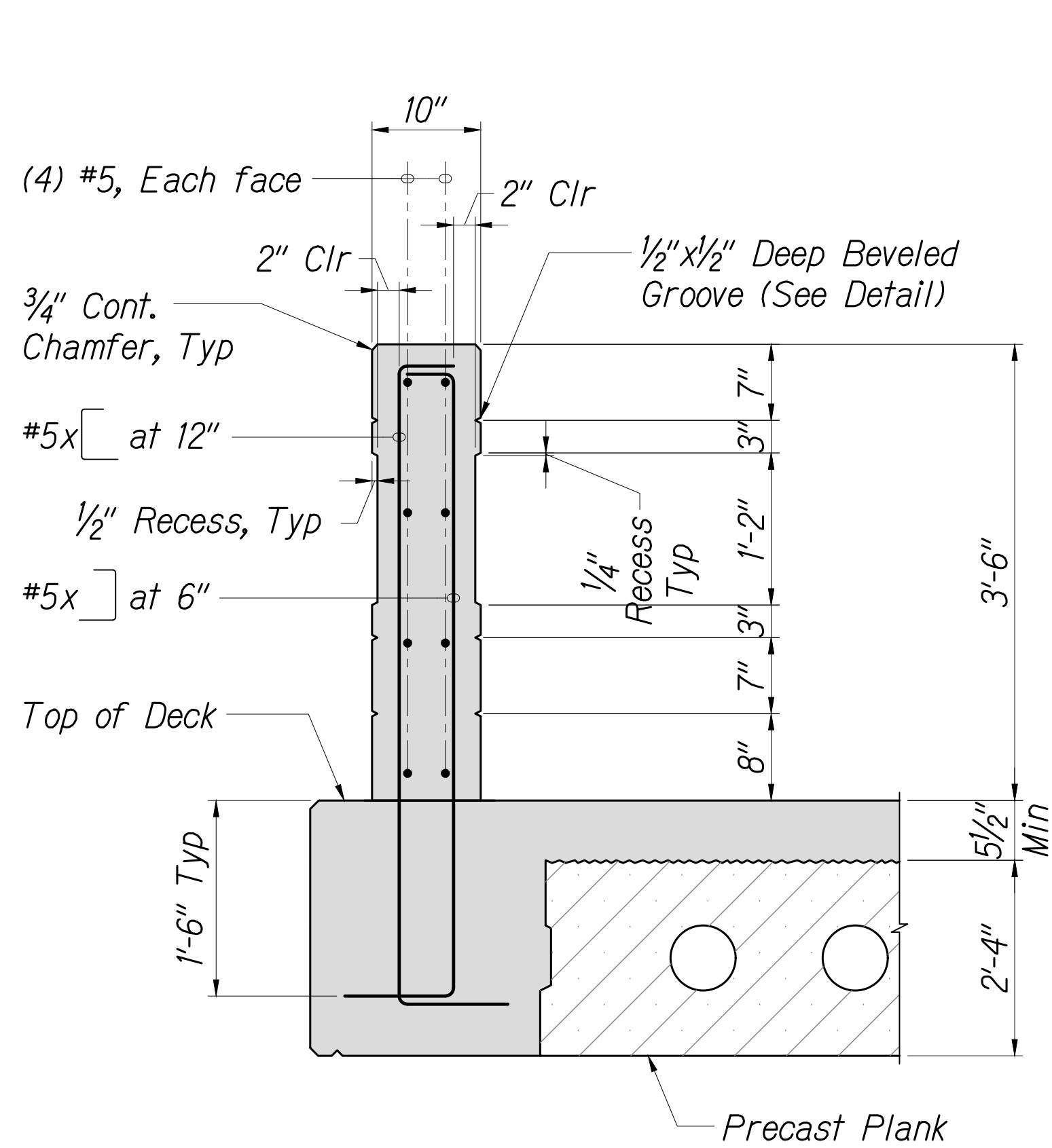
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**BRIDGE NO. 3A - PARTIAL
RAILING ELEVATION AND PLAN**
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S12.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	136	168

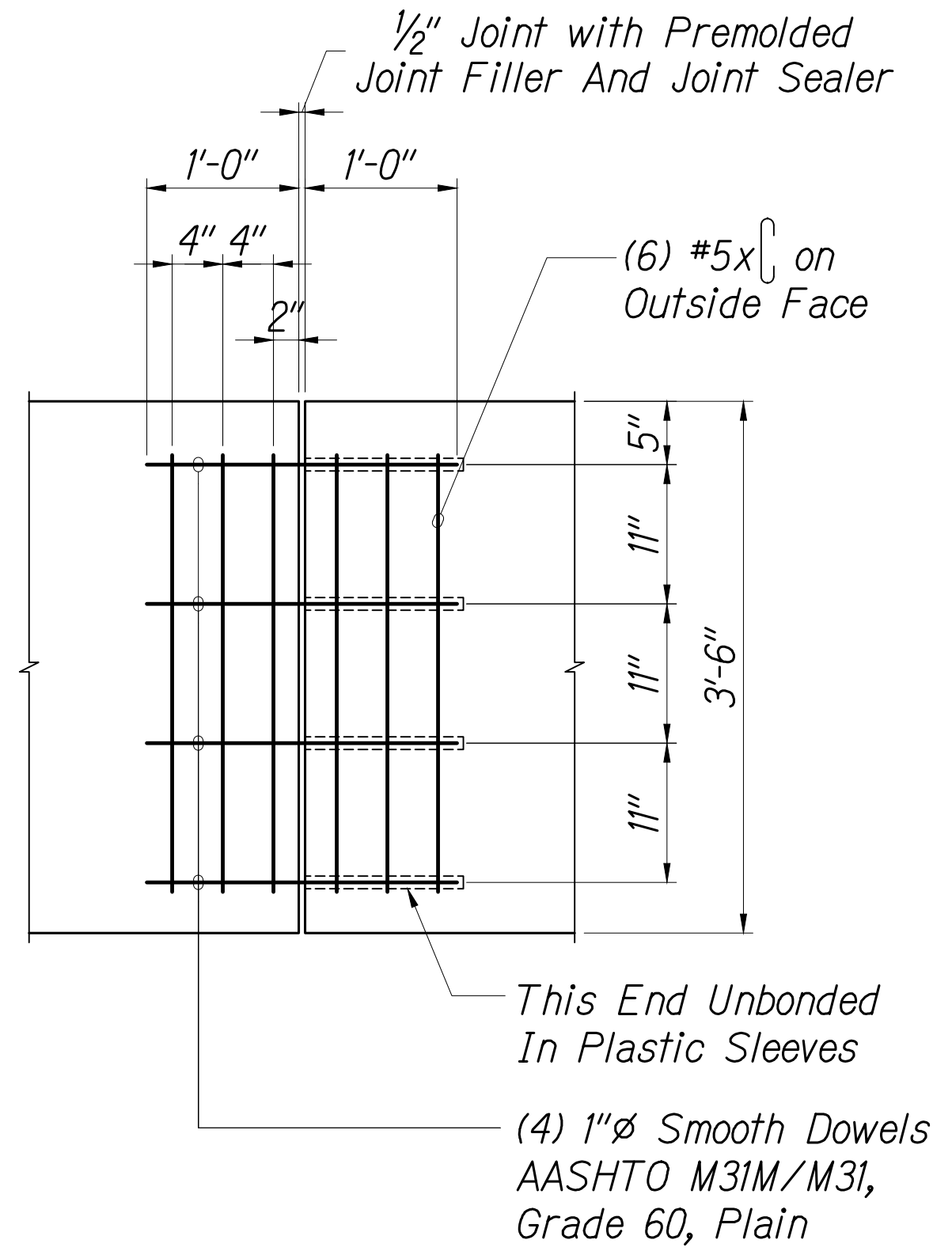


TYPICAL SECTION

Scale: 1" = 1'-0"

1

S12.1 S12.3



EXPANSION JOINT DETAIL

Scale: 1" = 1'-0"

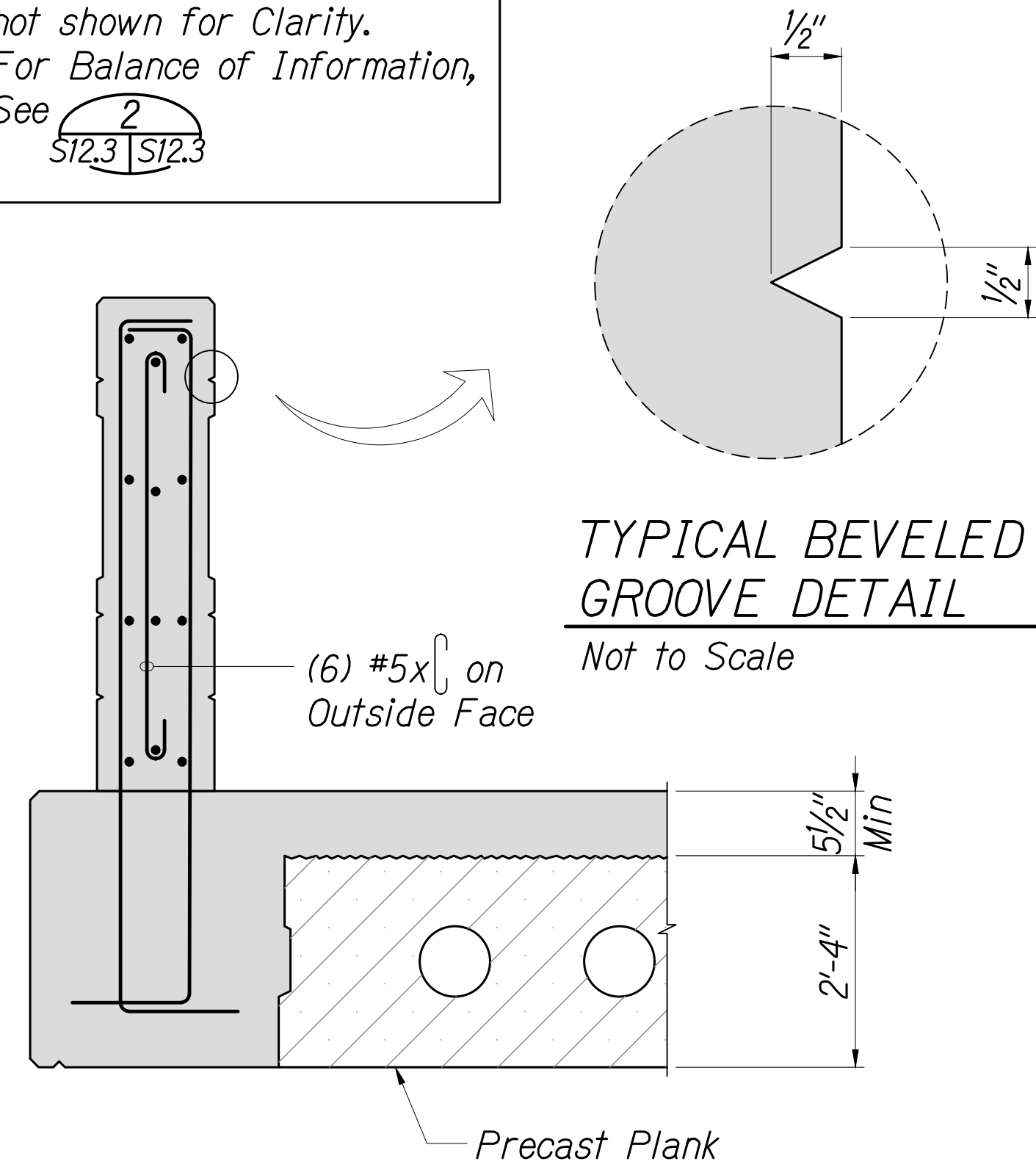
2

S12.3 S12.3

Notes:

1. Concrete Topping and Precast Plank reinforcing not shown for Clarity.

2. For Balance of Information, See S12.3 S12.3

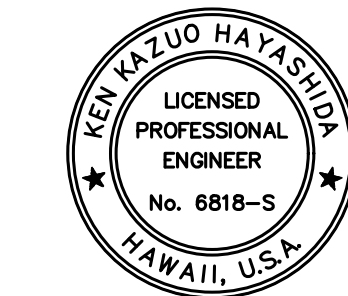


SECTION AT EXPANSION JOINT

Scale: 1" = 1'-0"

3

S12.1 S12.3



EXPIRATION DATE OF THE LICENSE 4/30/2022

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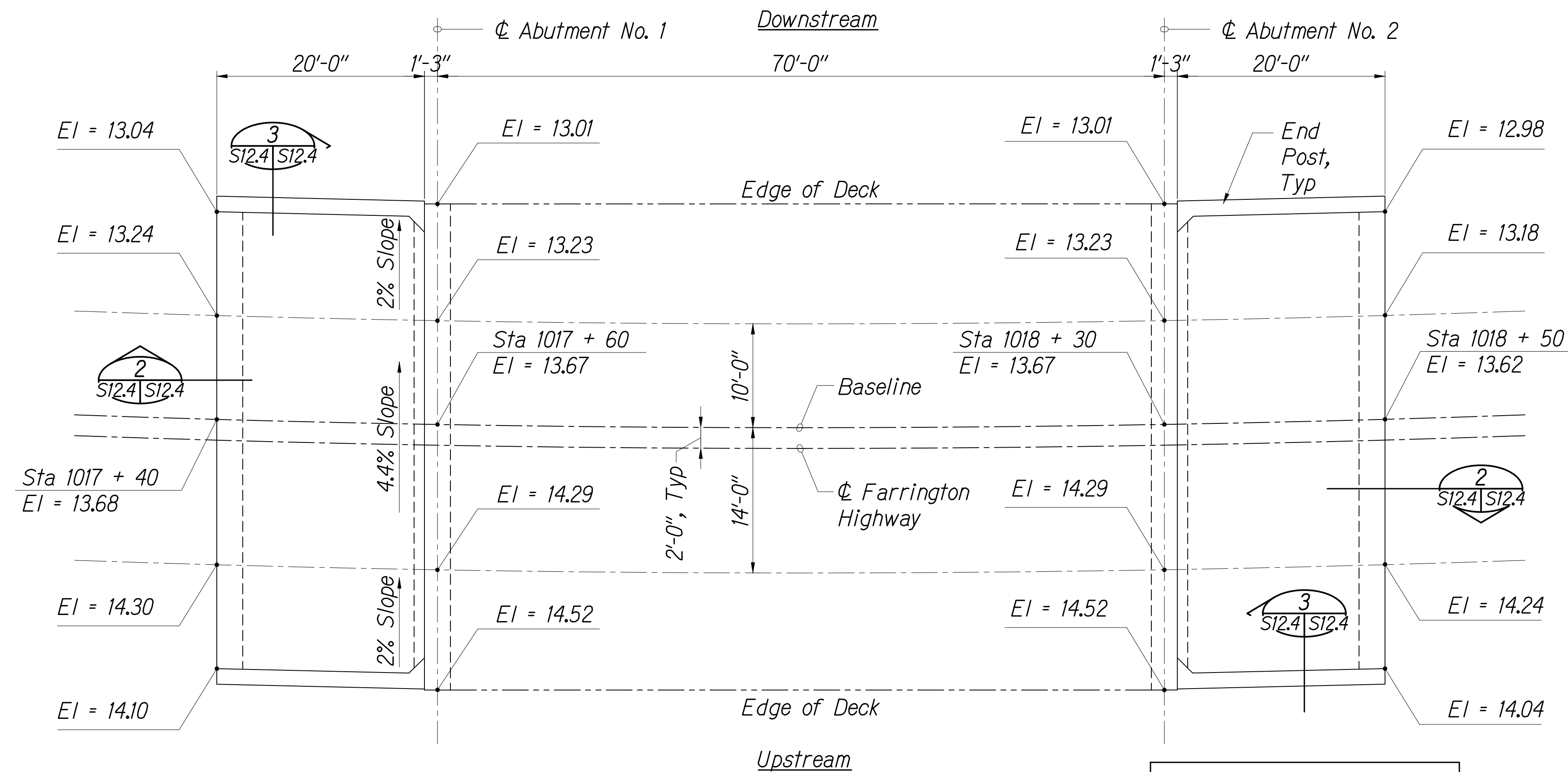
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - RAILING
SECTIONS AND DETAILS
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

SHEET No. S12.3 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	137	168

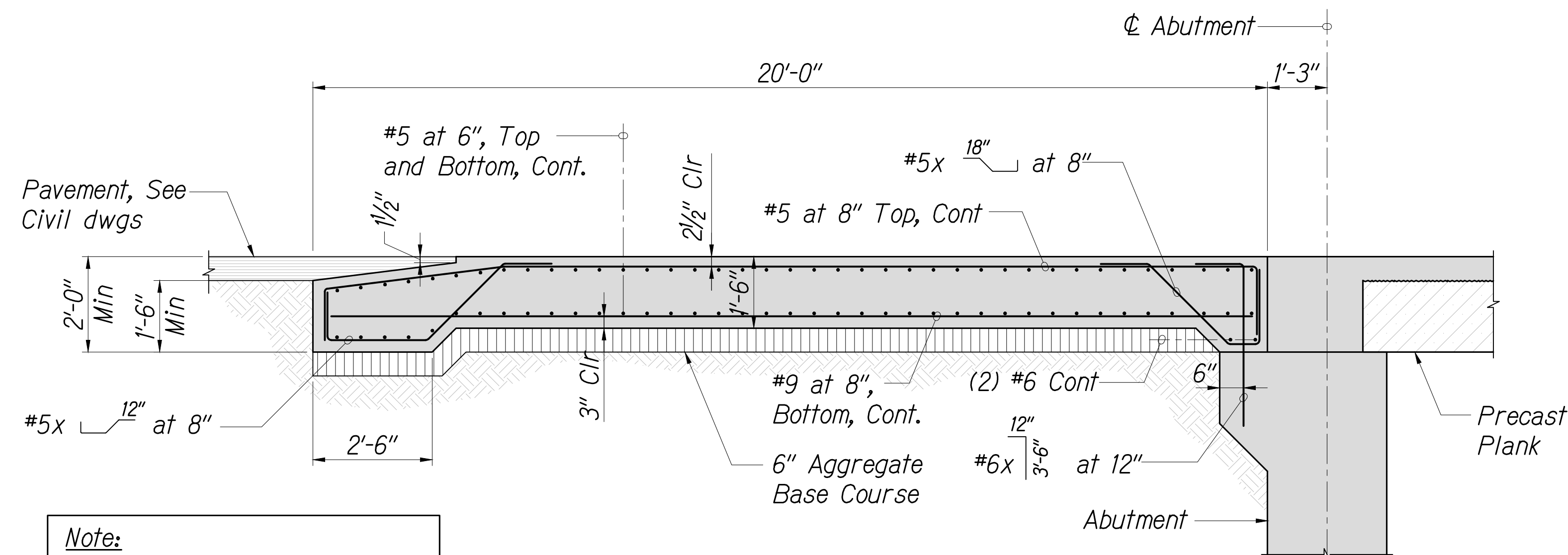


PLAN - APPROACH SLAB

Scale: 1/8" = 1'-0"

1
S12.4 S12.4

Note:
All Elevations are at the
Top of Slab.

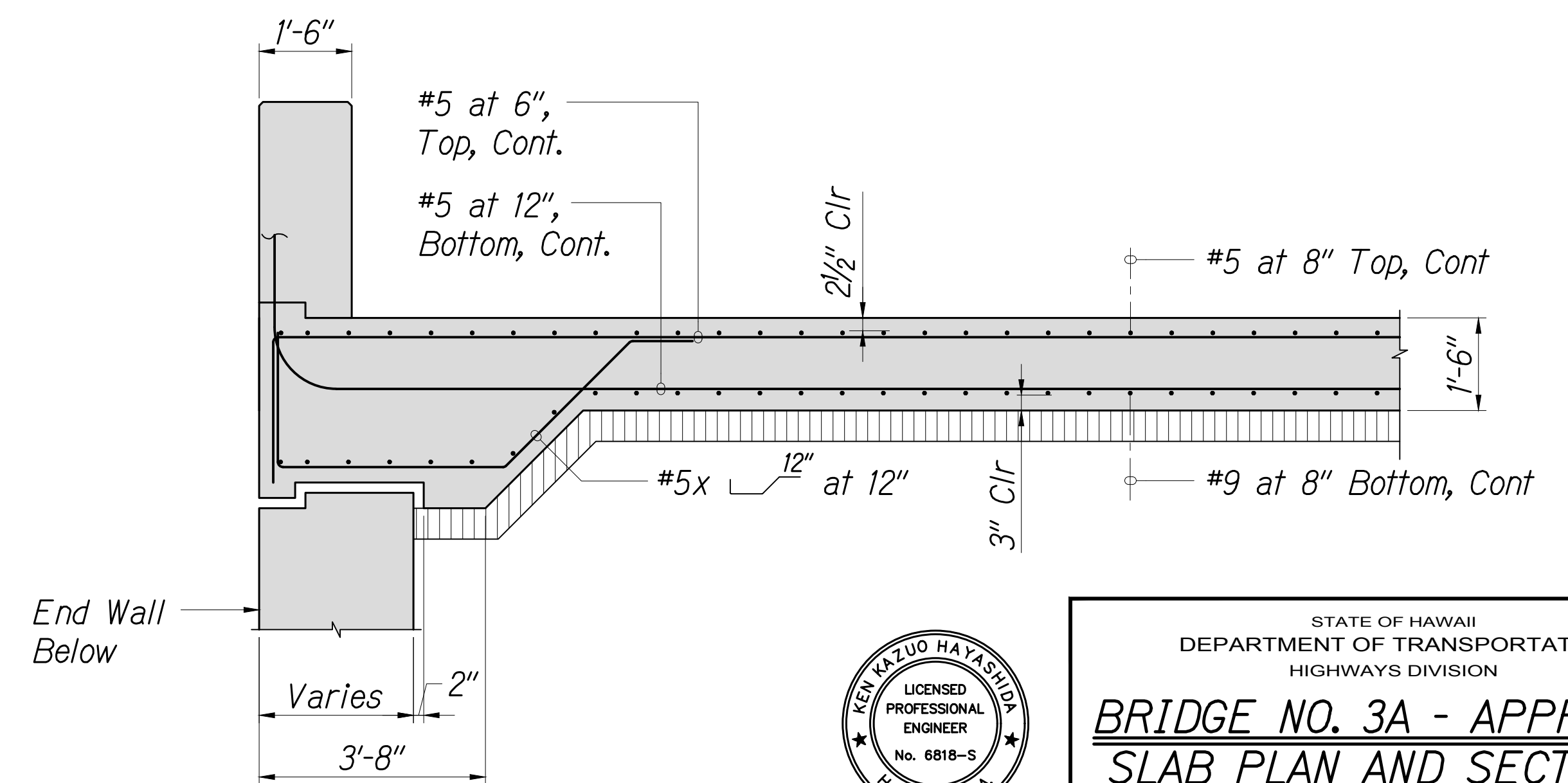


Note:
Abutment and Deck reinforcing
not shown for Clarity.

TYPICAL APPROACH SLAB SECTION

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

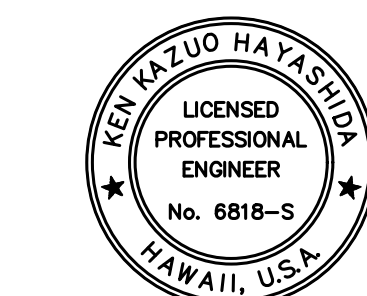
2
S12.4 S12.4



SECTION

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

3
S12.4 S12.4



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HIGHWAYS DIVISION

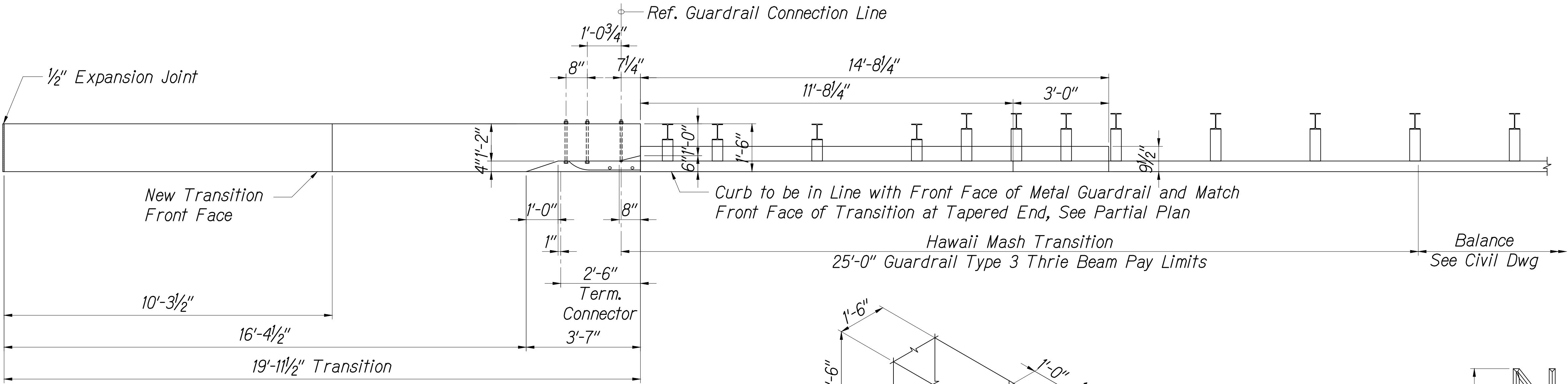
**BRIDGE NO. 3A - APPROACH
SLAB PLAN AND SECTIONS**

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

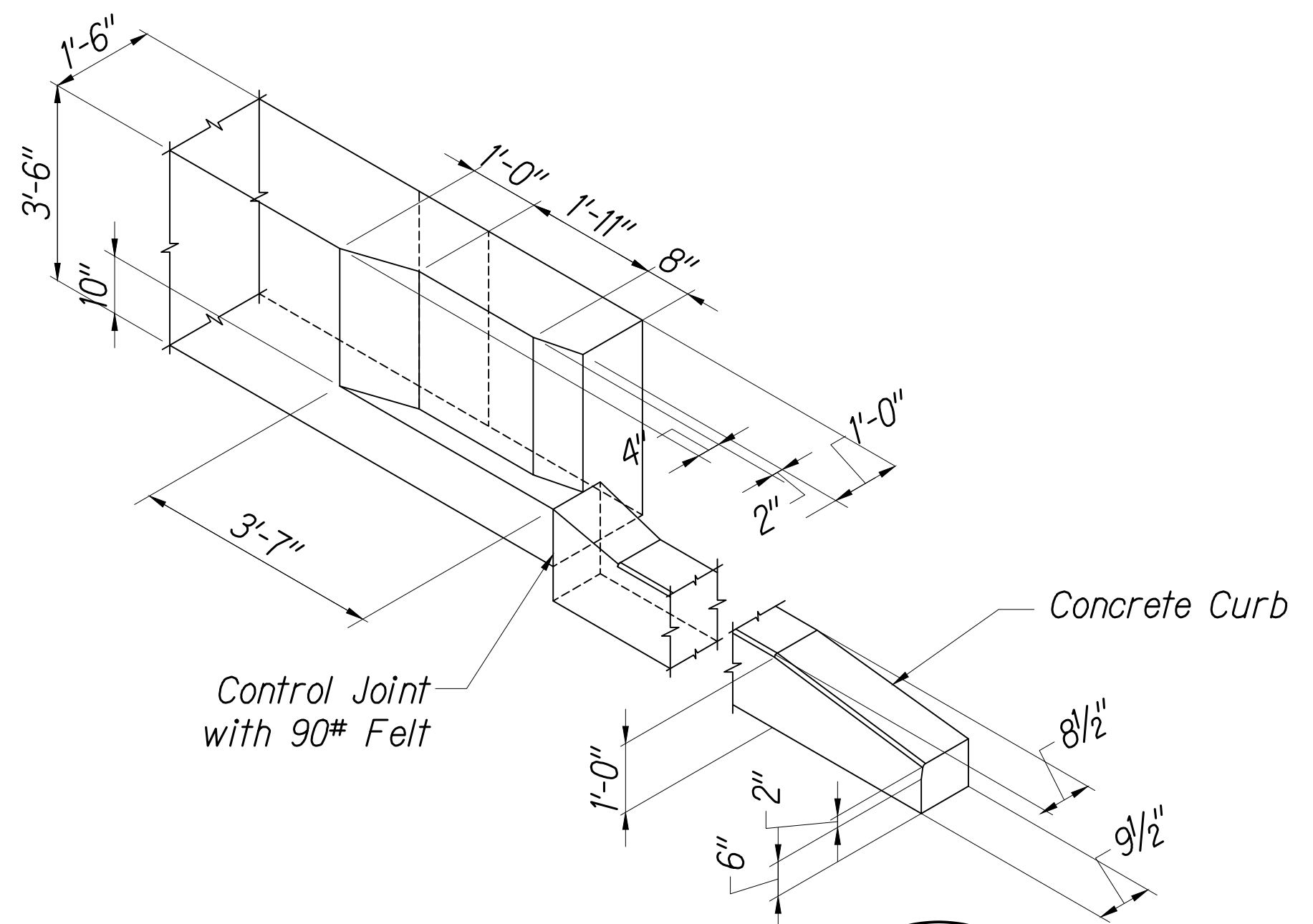
Scale: As Noted Date: July 2020

SHEET No. S12.4 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	138	168



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

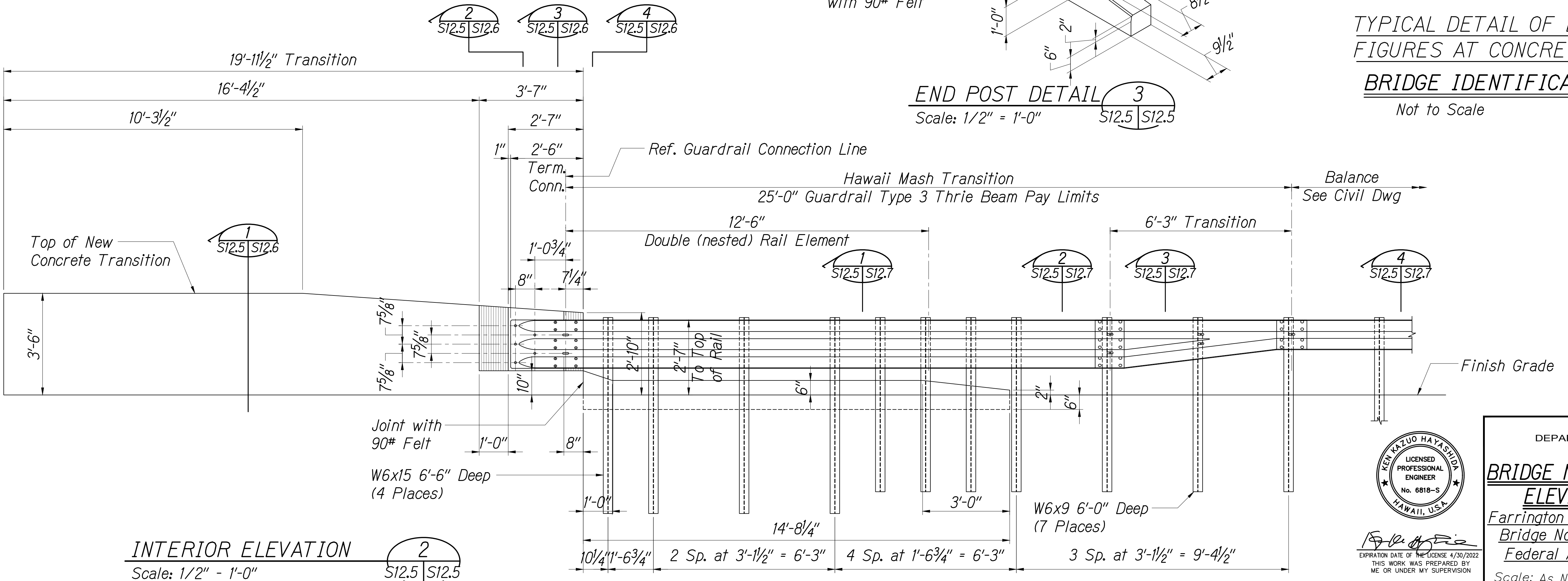


END POST DETAIL
Scale: 1/2" = 1'-0"

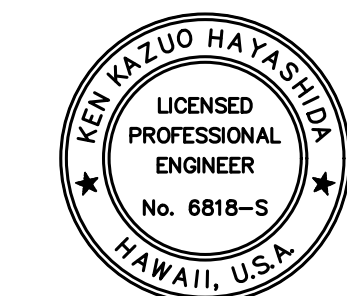
NAME DATE
Use Correct Name of Bridge Year Built
Depressed "V" letters 3/8" deep

- Notes:
1. Unless otherwise directed by the engineer, the bridge name and date shall be placed at the "trailing" end post on each side of the roadway.
 2. Exact details and spacing of letter and figures and location shall be as directed by the engineer. gothic letters and figures approximating dimensions shown will be acceptable if approved by the engineer.

TYPICAL DETAIL OF LETTERS AND FIGURES AT CONCRETE END POST
BRIDGE IDENTIFICATION DETAIL
Not to Scale



INTERIOR ELEVATION
Scale: 1/2" = 1'-0"



EXPIRATION DATE OF THE LICENSE 4/30/2022
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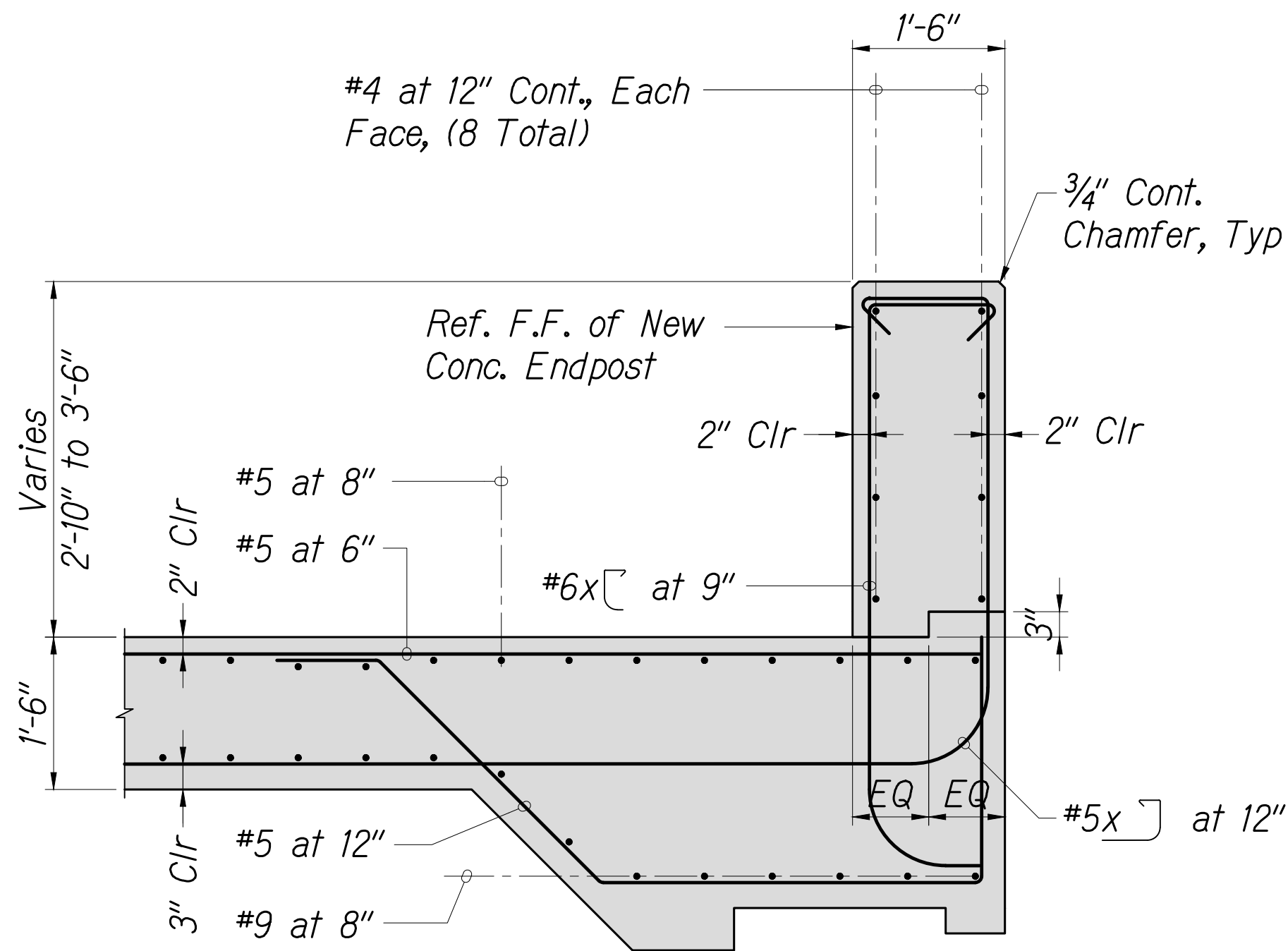
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - END POST PLAN
ELEVATION AND DETAILS
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

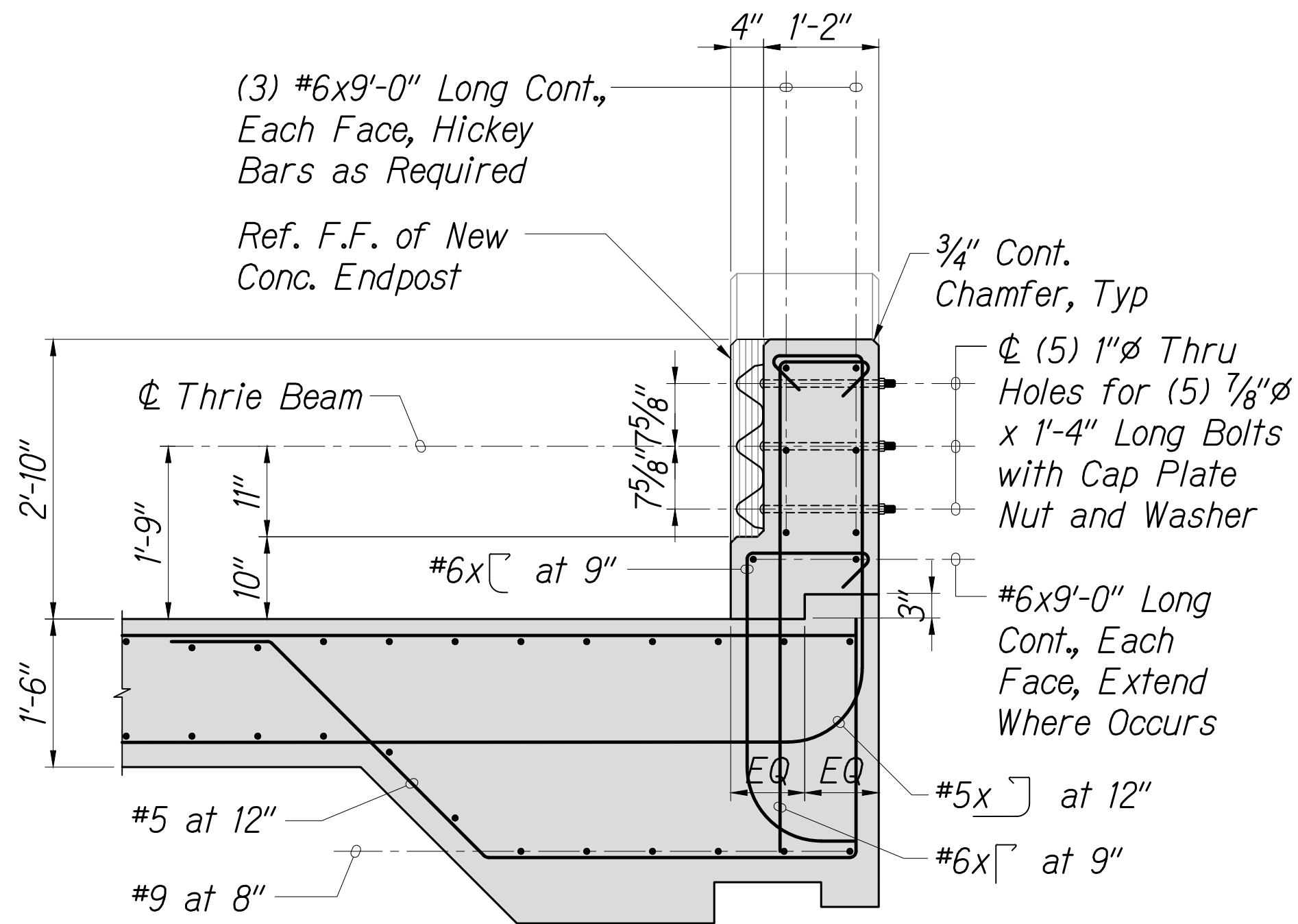
Scale: As Noted Date: July 2020

SHEET No. S12.5 OF 168 SHEETS

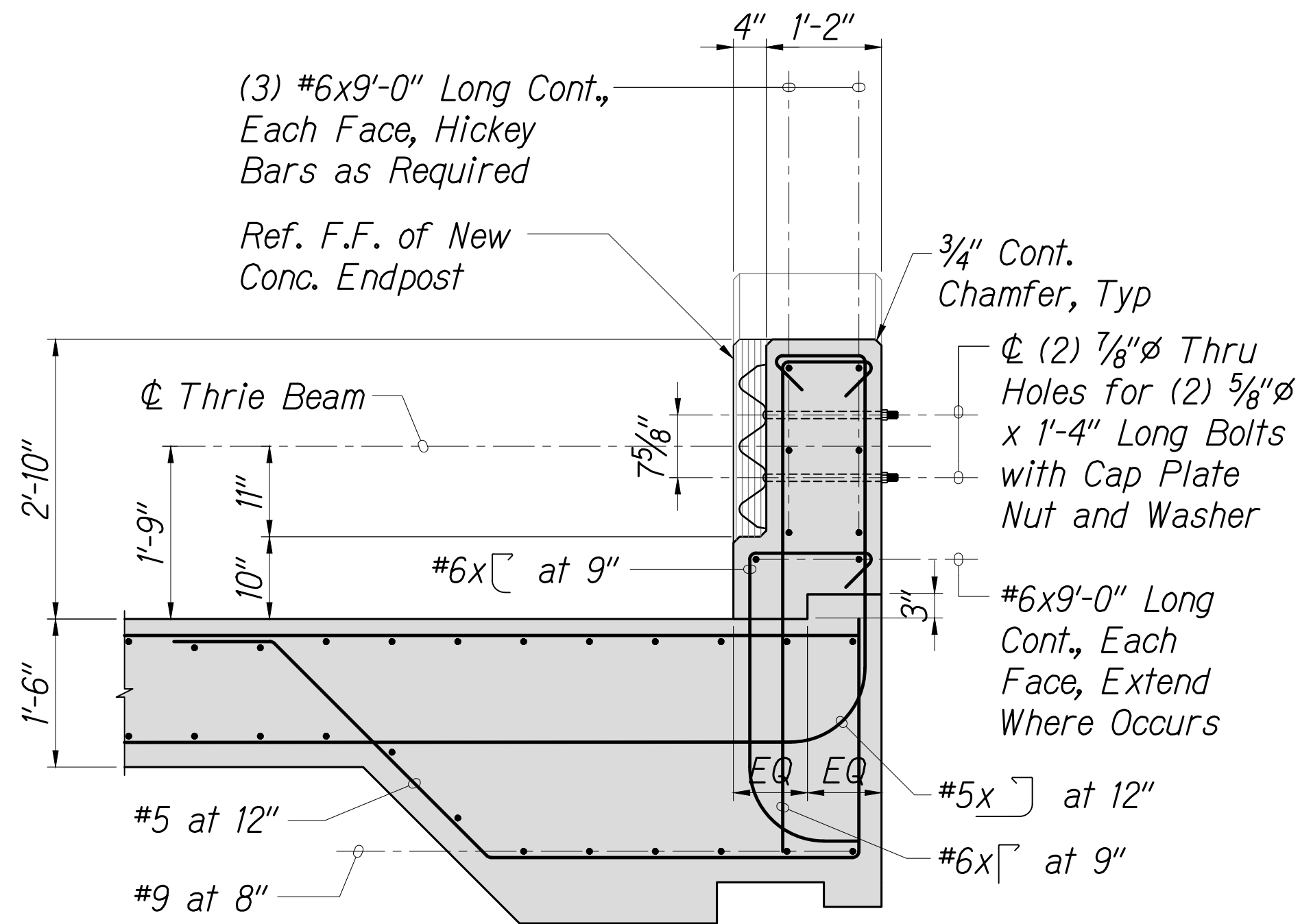
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	139	168



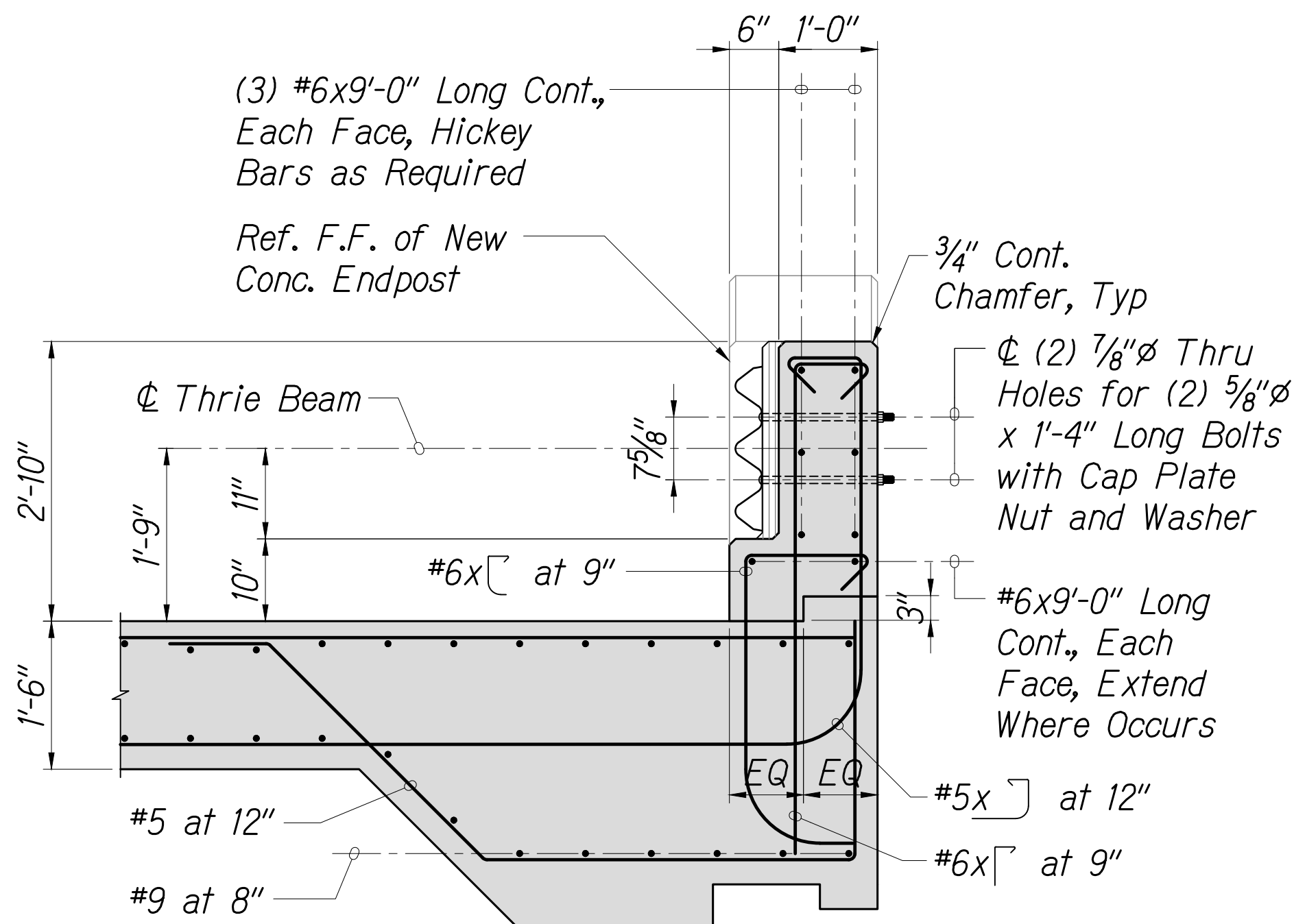
SECTION 1
Scale: 3/4" = 1'-0"



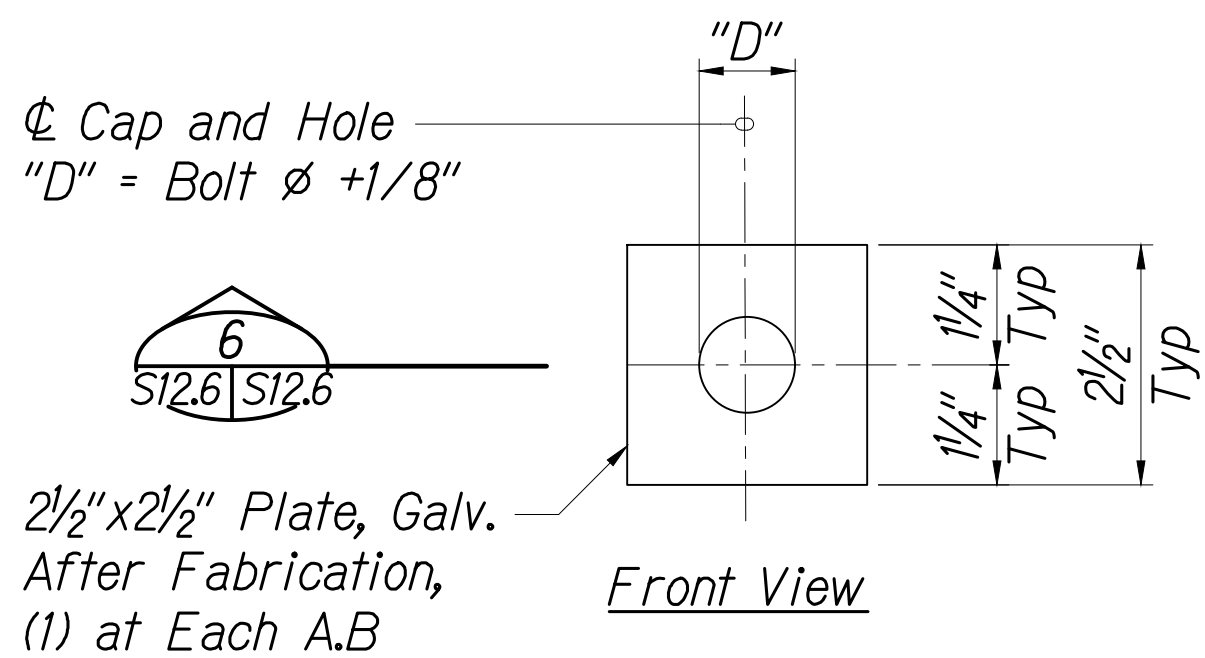
SECTION 2
Scale: 3/4" = 1'-0"



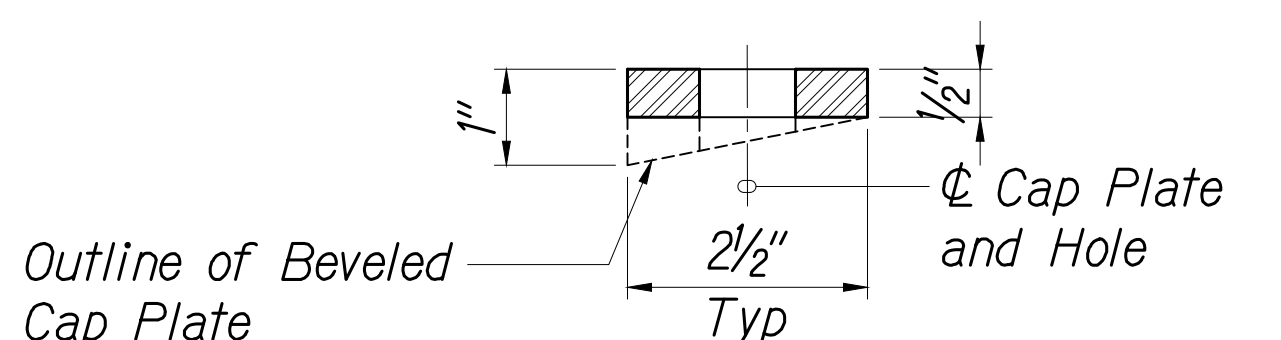
SECTION 3
Scale: 3/4" = 1'-0"



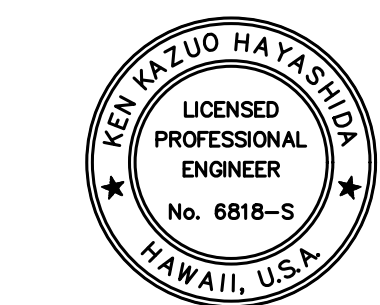
SECTION 4
Scale: 3/4" = 1'-0"



CAP (BEARING) PLATE DETAIL 5
Scale: 6" = 1'-0"



SECTION 6
Scale: 6" = 1'-0"



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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - END POST

SECTIONS AND DETAILS

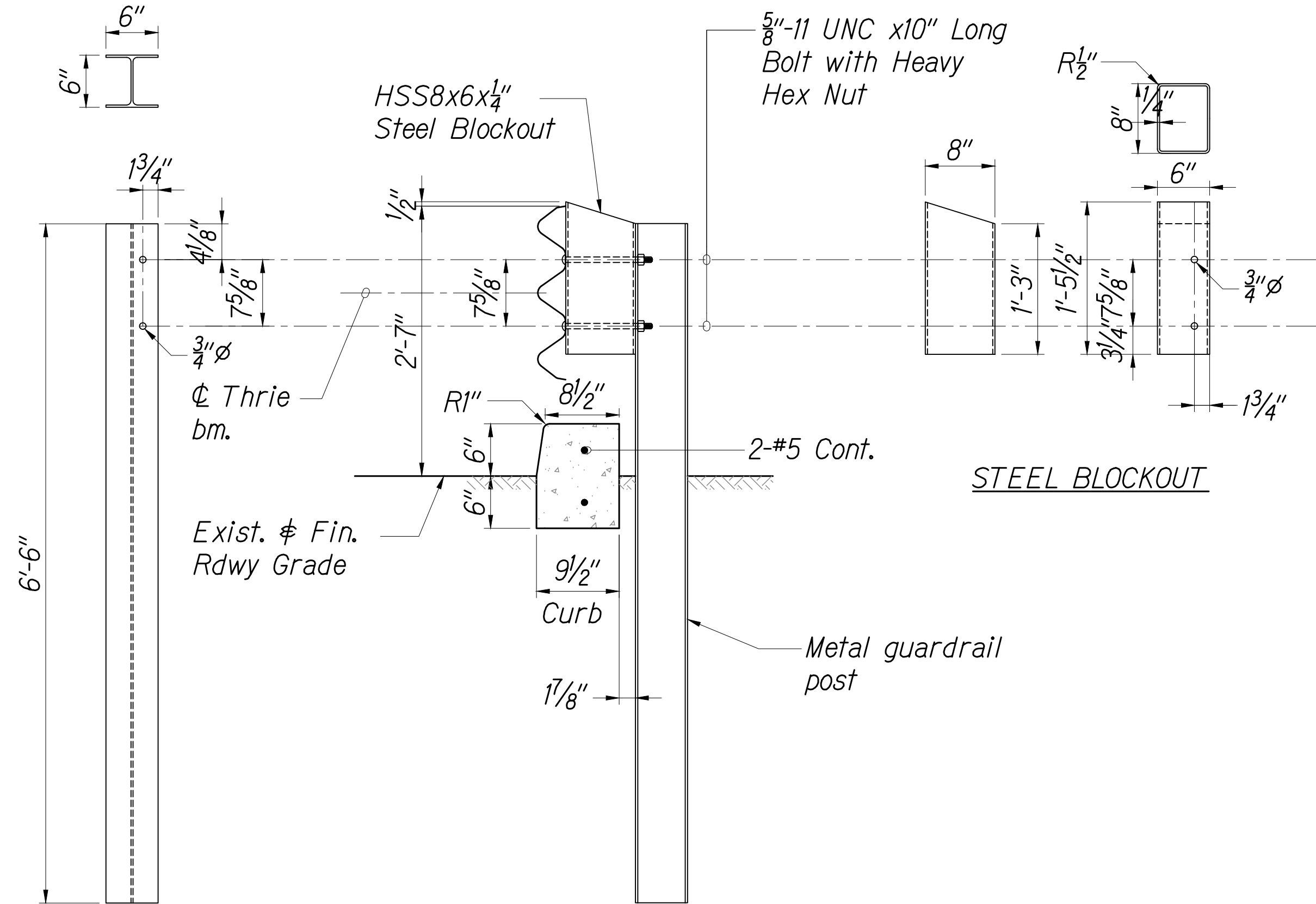
Farrington Hwy - Replacement of Makaha Bridge No.3 & Makaha Bridge No. 3A

Federal Aid Project No. BR-093-1(20)

Scale: As Noted
Date: July 2020

SHEET No. S12.6 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	140	168

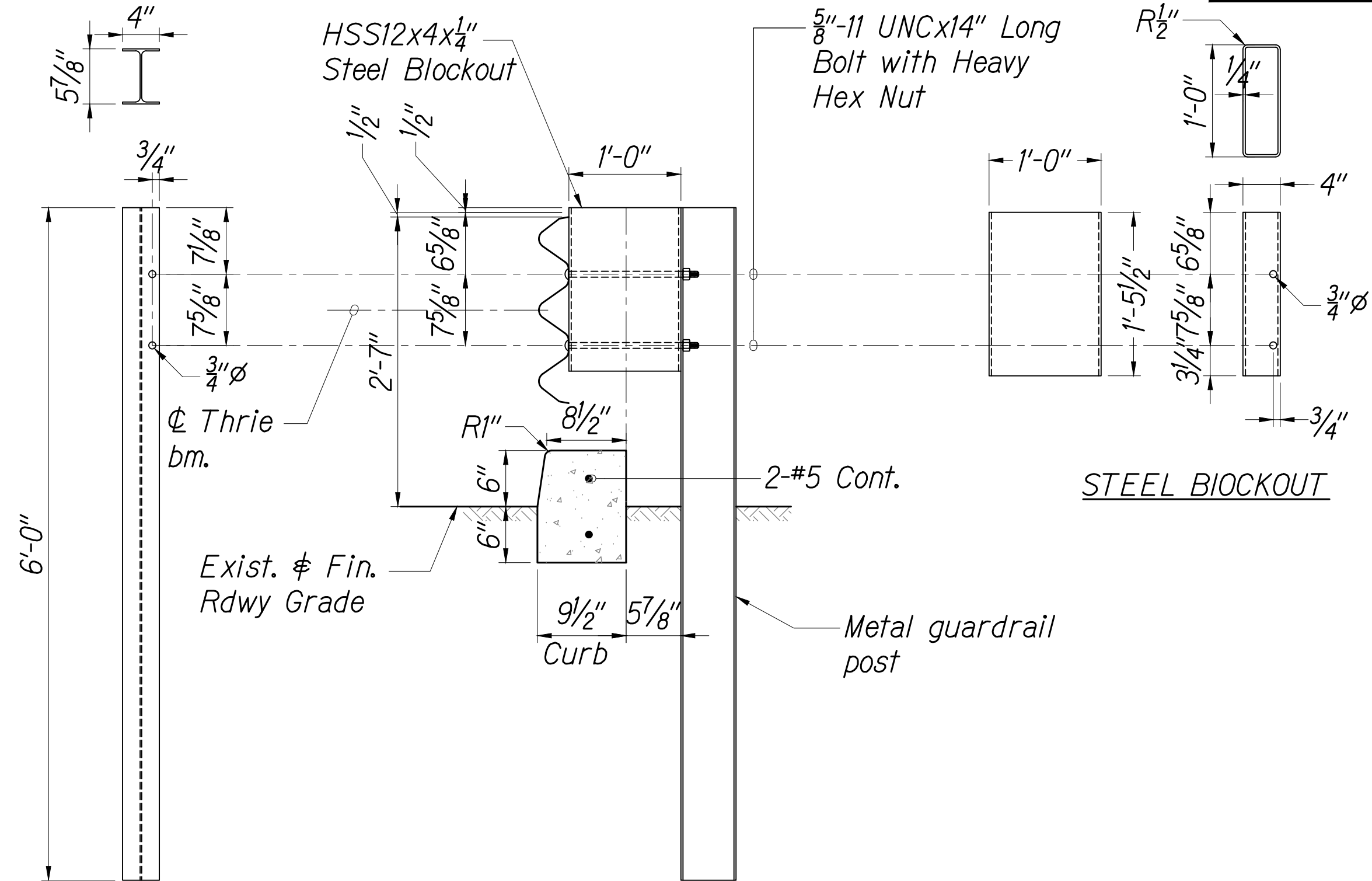


W6x15 POST

SECTION

Scale: 1" = 1'-0"

1
S12.5 S12.7

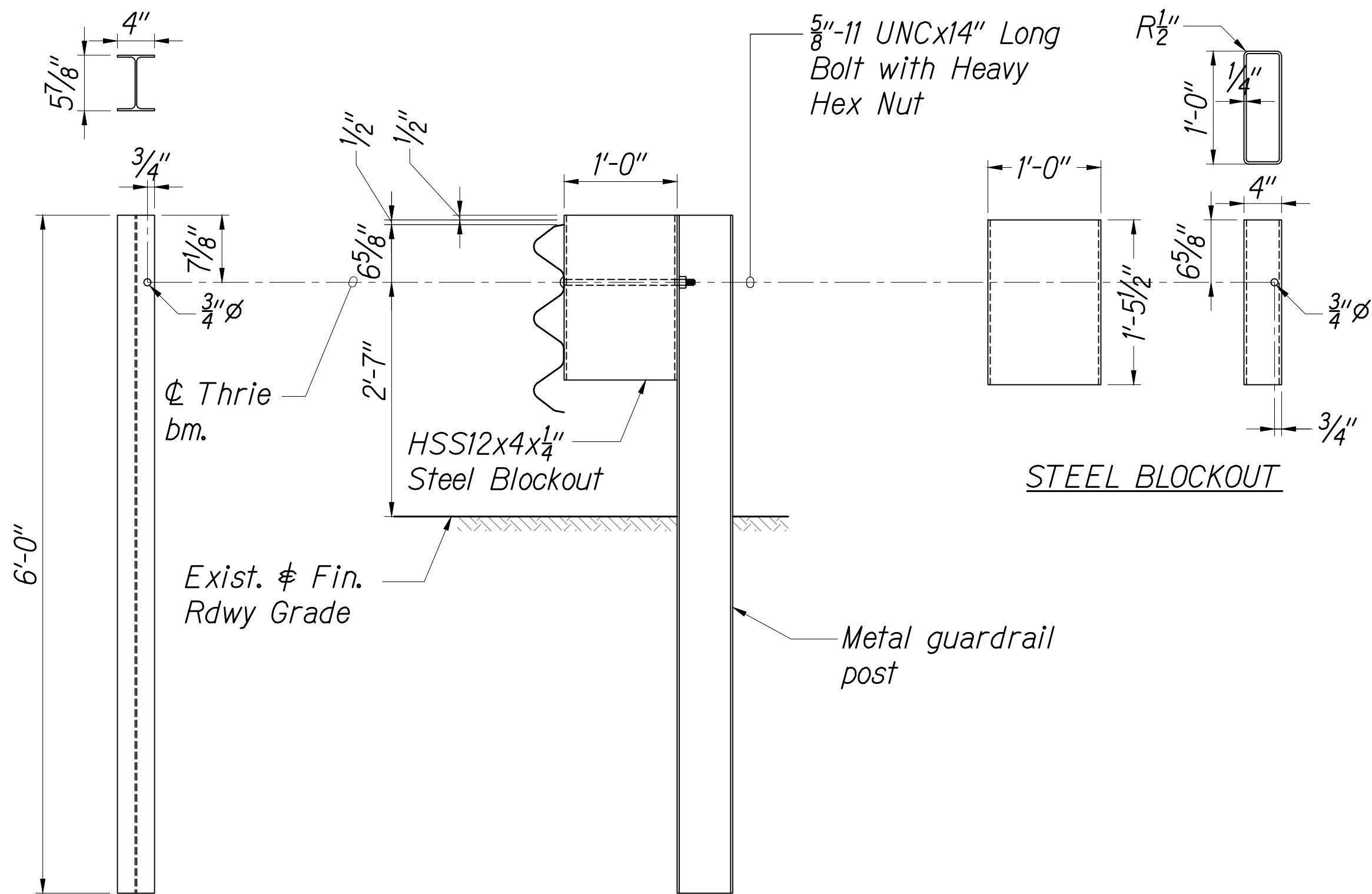


W6x9 POST

SECTION

Scale: 1" = 1'-0"

2
S12.5 S12.7

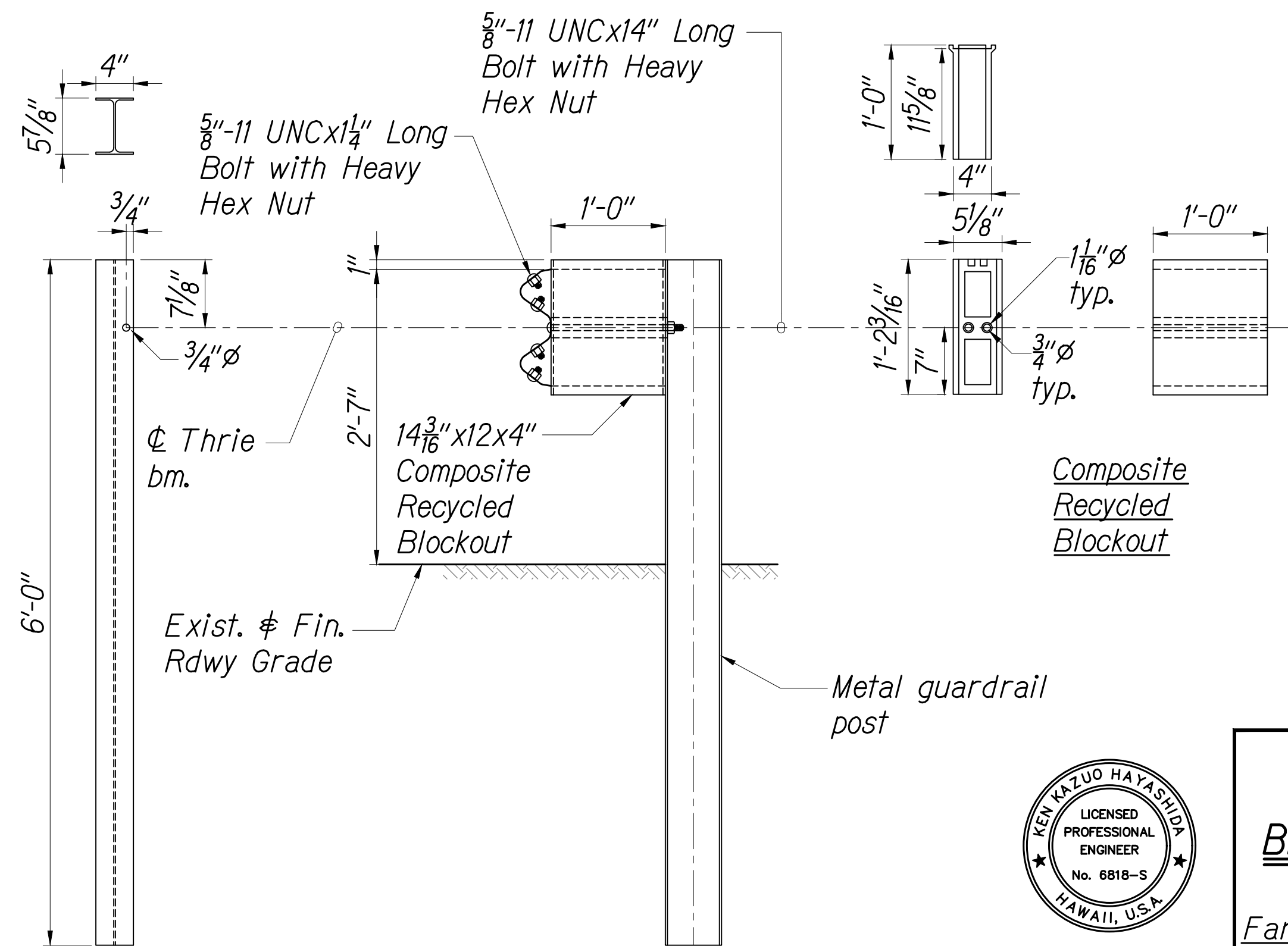


W6x9 POST

SECTION

Scale: 1" = 1'-0"

3
S12.5 S12.7

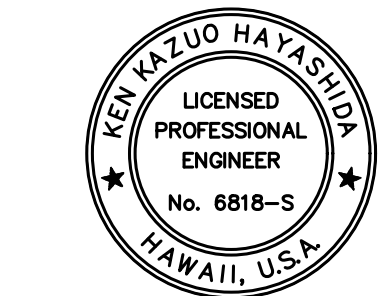


W6x9 POST

SECTION

Scale: 1" = 1'-0"

4
S12.5 S12.7



EXPIRATION DATE OF THE LICENSE 4/30/2022
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

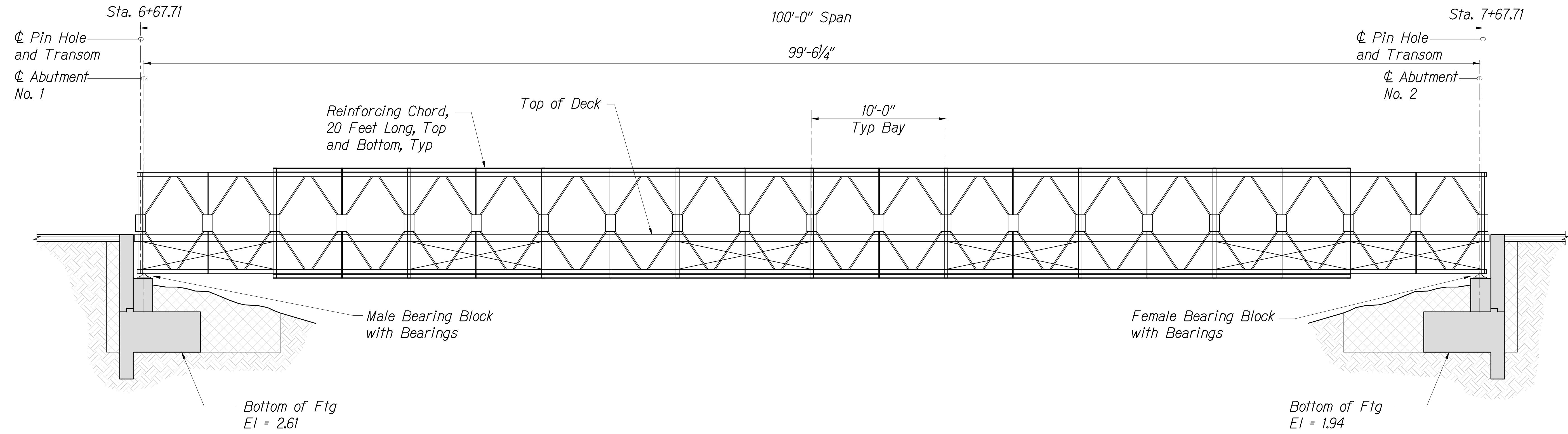
BRIDGE NO. 3A - THRIE BEAM
SECTIONS AND DETAILS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S12.7 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	142	168

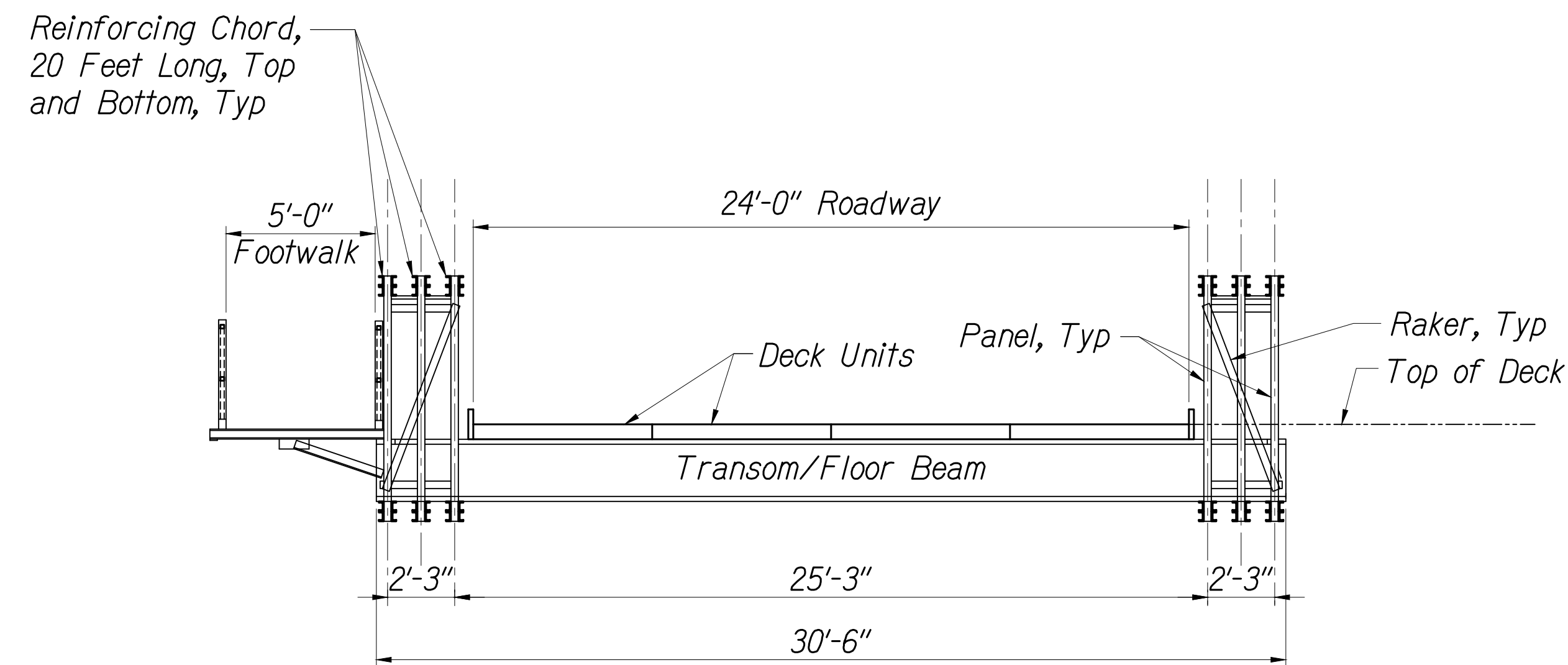


BRIDGE NO. 3A - BYPASS ROAD ELEVATION

Scale 1/4" = 1'-0"

1

S13.2 S13.2

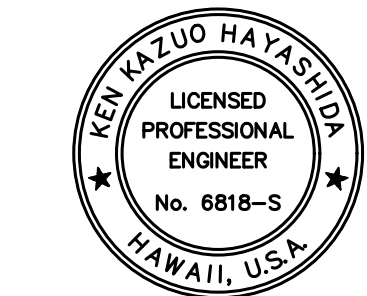


BRIDGE NO. 3A - BYPASS ROAD CROSS SECTION

Scale 1/4" = 1'-0"

2

S13.2 S13.2



EXPIRATION DATE OF THE LICENSE 4/30/2022
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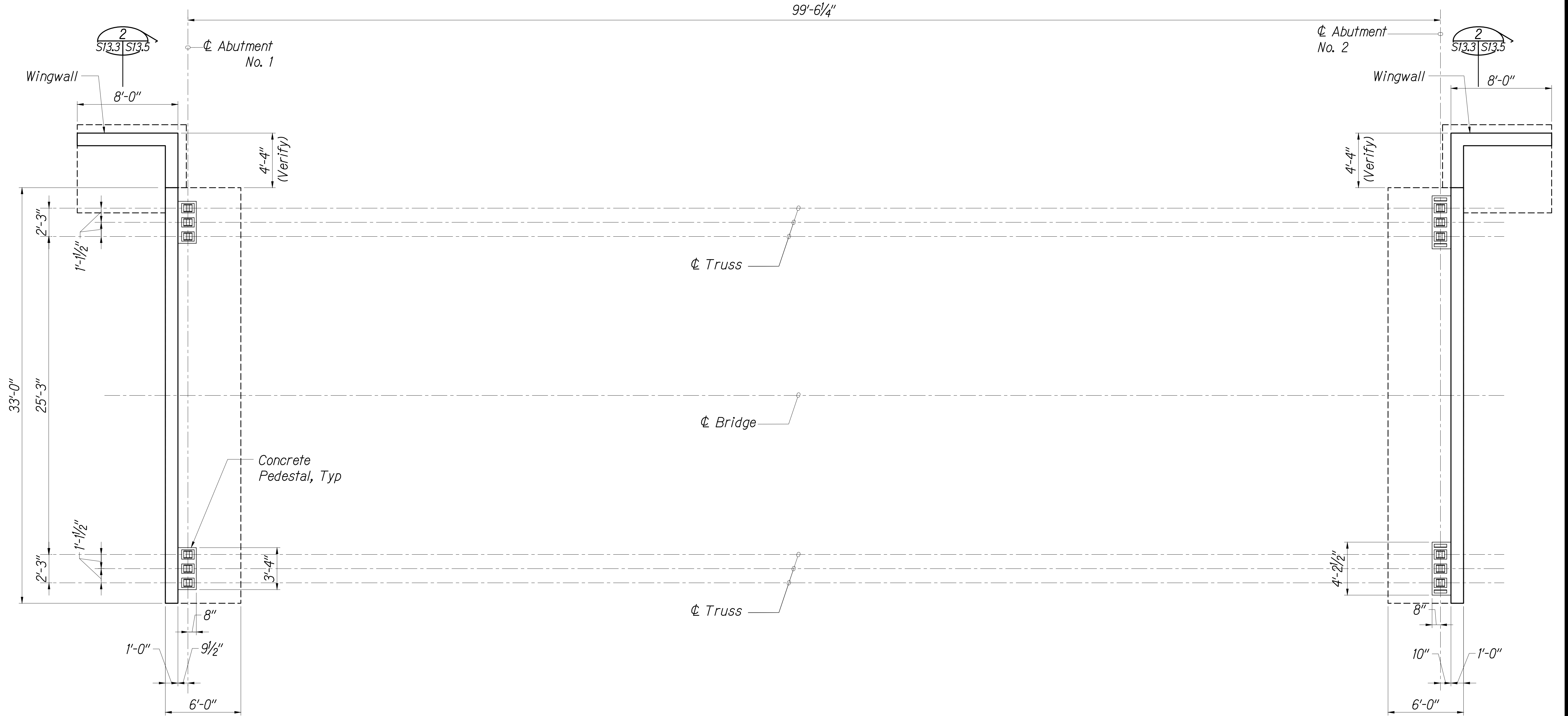
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - BYPASS ROAD
ELEVATION AND SECTION
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

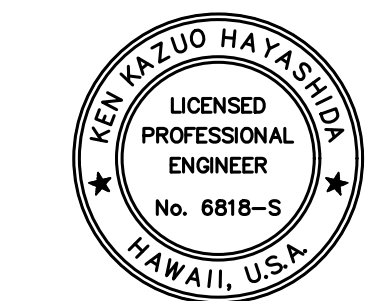
Scale: As Noted
Date: July 2020

SHEET No. S13.2 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	143	168



BRIDGE NO. 3A - BYPASS ROAD FOUNDATION LAYOUT PLAN
Scale: 1/4" = 1'-0"



EXPIRATION DATE OF THE LICENSE 4/30/2022
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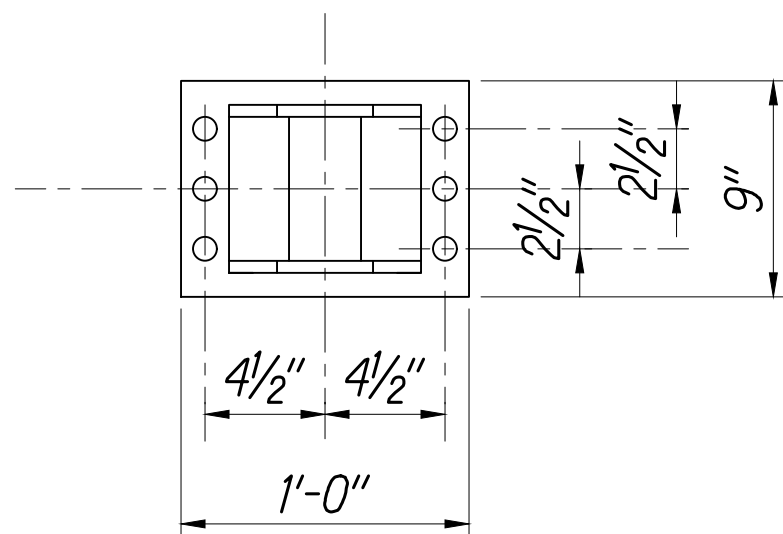
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - BYPASS ROAD
FOUNDATION LAYOUT PLAN
Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

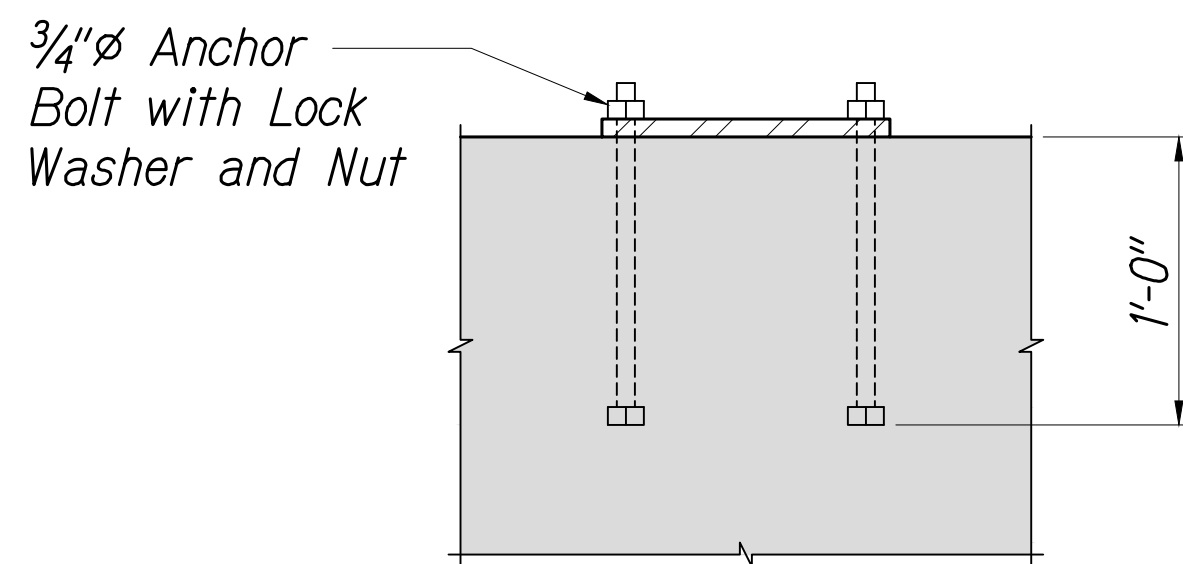
Scale: As Noted Date: July 2020

SHEET No. S13.3 OF 168 SHEETS

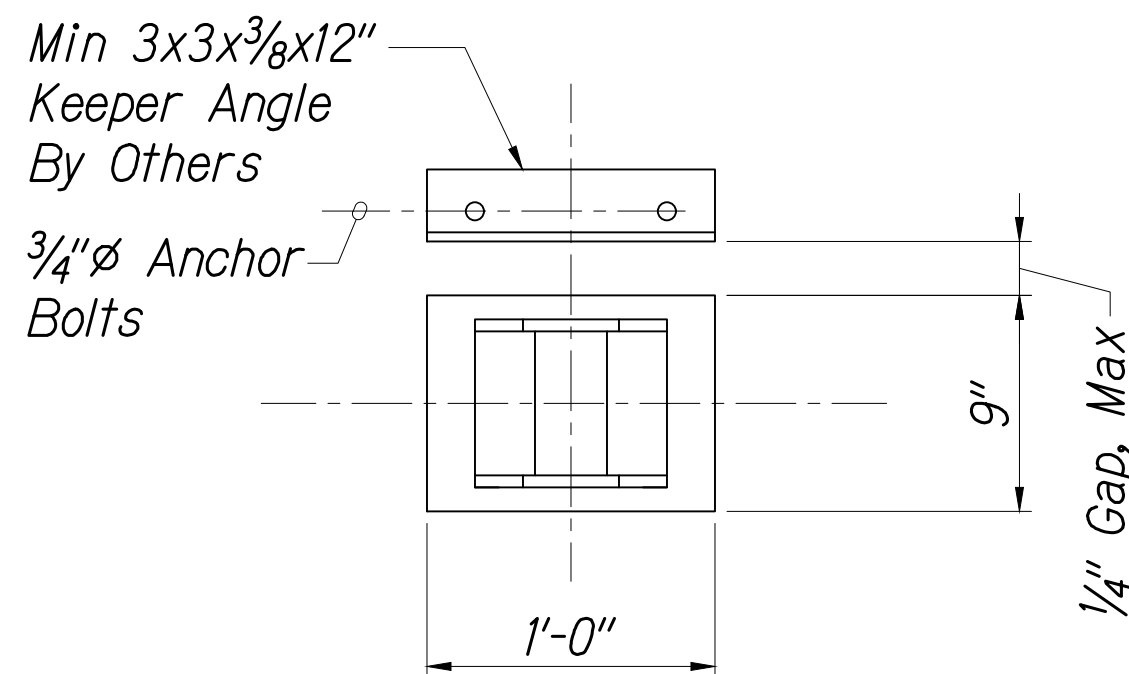
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	144	168



FIXED END BEARING DETAIL 1
Not to Scale S13.4 S13.4



FIXED END BEARING DETAIL 2
Not to Scale S13.4 S13.4



EXPANSION END BEARING DETAIL 3
Not to Scale S13.4 S13.4



Ken Kazuo Hayashida
EXPIRATION DATE OF THE LICENSE 4/30/2022
THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - BYPASS ROAD

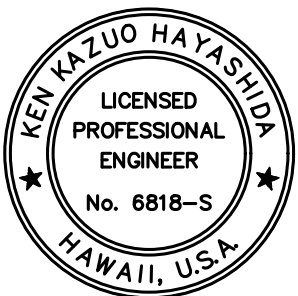
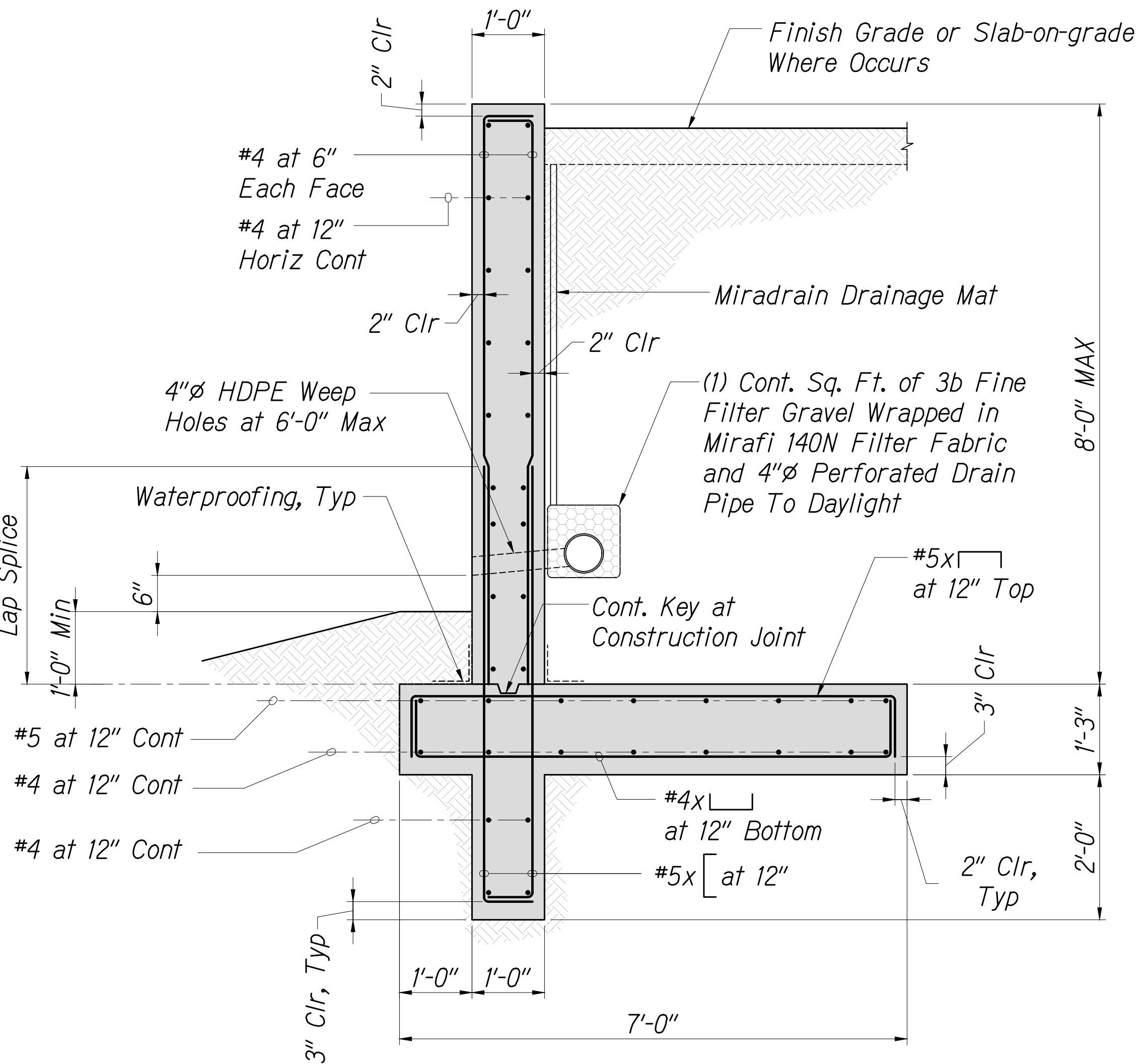
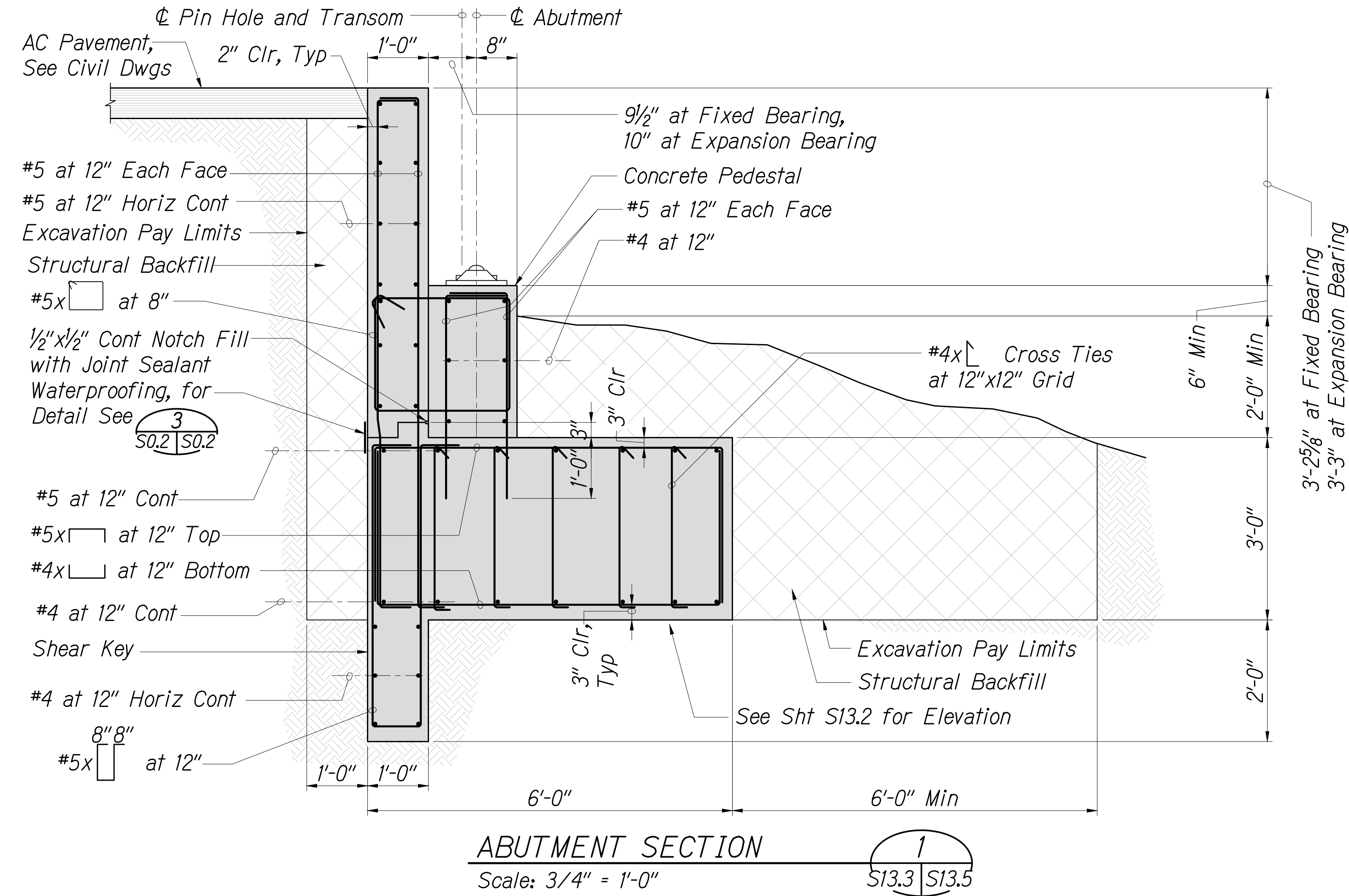
BEARING DETAILS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S13.4 OF 168 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	BR-093-1(20)	2020	145	168



EXPIRATION DATE OF THE LICENSE 4/30/2022
THIS WORK WAS PREPARED BY
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE NO. 3A - BYPASS ROAD
FOUNDATION DETAILS

Farrington Hwy - Replacement of Makaha
Bridge No.3 & Makaha Bridge No. 3A
Federal Aid Project No. BR-093-1(20)

Scale: As Noted Date: July 2020

SHEET No. S13.5 OF 168 SHEETS