FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	113	213

STRUCTURAL GENERAL NOTES:

1. General:
   - A. Workmanship and materials shall conform to the AASHTO LRFD Bridge Design Specification, 4th Edition, 2007 including its subsequent interim specifications, and the Hawaii Standard Specifications for Bridge and Road Construction, 2005 as modified by the State of Hawaii Department of Transportation.
   - B. The Contractor shall compare the Civil, Electrical and Structural drawings with each other and report in writing to the Engineer, inconsistencies or 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 the work. Report in writing to the Engineer all inconsistencies or omissions.
   - D. The Contractor shall be responsible for methods of construction, workmanship and job safety. The Contractor shall provide temporary shoring and bracing as required for stability of structural members and systems.
   - E. Details noted as typical on structural drawings shall apply in all conditions unless specifically shown or noted otherwise.
   - F. The Contractor shall be responsible for coordinating the work of all trades
   - G. The Contractor shall be responsible for protection of the adjacent properties, structures, streets, and utilities during the construction period. Any damage or deteriorated property shall be restored to the same or better condition at no cost to the State.

2. Design Criteria:
   - A. Dead Load
     Weight of all components of the structures, appurtenances attached thereto, and earth covers.
     Future wearing surface (curb to curb) ——— 25 psf
     Future utilities on each side of the bridge ——— 150 plf
   - B. Live Load
     AASHTO HL-93 Loading
   - C. Seismic
     Seismic design is in accordance with the AASHTO Guide Specifications for LRFD Seismic Bridge Design, 1st Edition, 2009 as modified by the State of Hawaii Department of Transportation.
     0.2-second spectral response acceleration coefficient, Ss = 0.54
     1.0-second spectral response acceleration coefficient, S_1 = 0.16
     Horizontal peak ground acceleration coefficient, PGA = 0.28
     Site class ——— = C
     Seismic design catagory, SDC ——— = B
   - D. Basic Wind Speed ——— = 105 MPH
   - E. Bridge Railing ——— in accordance with AASHTO TL-4 design factors
   - F. Soil Properties - Kauaula Stream Bridge
     1. Bearing pressure
        a. Extreme event limit state ——— = 15,000 psf
        b. Strength limit state ——— = 6,750 psf
     2. Passive earth pressure
        a. Extreme event limit state ——— = 400 pcf
        b. Strength limit state ——— = 200 pcf
     3. Coefficient of friction
        a. Extreme event limit state ——— = 0.58
        b. Strength limit state ——— = 0.46
     4. Static lateral earth pressure
        a. Active earth pressure ——— = 37 pcf
        b. At-rest earth pressure ——— = 57 pcf
     5. Dynamic lateral earth pressure
        a. Walls free to translate up to 2 to 3 inches ——— = 4.5 H^2 PLF
        b. Wall movement less than 0.5 inches ——— = 17.0 H^2 PLF
        where : H = Height of wall in feet

2. Design Criteria: (cont.)
   - G. Soil Properties - AG crossing and culvert structures
     1. Bearing pressure
        a. Extreme event limit state ——— = 12,000 psf
        b. Strength limit state ——— = 6,000 psf
     See Note 2.F for all other soil properties.

3. Foundation:
   - A. Foundation design is based upon geotechnical investigations by Hirata and Associates dated October 27, 2009.
   - 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.
   - D. Excavation boundaries and grade elevations for footing shall be approved by the Engineer prior to placing the concrete and reinforcing.
   - E. Backfill behind the abutment and retaining structures shall be Type A Structure Backfill. Backfill shall be placed in uniform lifts of no more 8 inches in loose thickness and uniformly compacted to at least 95 percent relative compaction.

4. Concrete:
   - A. Concrete shall be regular weight concrete and shall have the following minimum 28-day compressive strengths:
     a. Prestressed Girders ——— 7000 psi
     b. Deck slab, beams, abutment walls, and wing walls ——— 4000 psi
     c. Abutment footings ——— 4000 psi
     d. Traffic railing and end posts ——— 4000 psi
     e. Approach slabs ——— 4000 psi
     f. All other concrete ——— Class "A"
     All concrete shall have maximum w/c ratio of 0.45 except for Class "A" which shall be as specified in the standard specifications.
   - B. Tetraguard AS20 shrinkage reducing admixture, Eclipse Plus shrinkage reducing admixture, or an approved equal, shall be included in the concrete mix for the concrete deck slab and bridge railing. The required dosage shall be 96 ounces per cubic yard of concrete or as recommended by the manufacturer. Addition of shrinkage reducing admixture shall be as recommended by the manufacturer.
   - C. 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 Rheocrete CNI 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.
   - D. All inserts, anchor bolts, plates, etc. embedded in concrete shall be hot-dip galvanized unless otherwise noted.
   - E. Conduits, pipes, and sleeves passing through a wall not conforming to typical details shall be located and submitted to the Engineer for approval.
   - F. Construction joints may be relocated by the Contractor and submitted to the Engineer for approval. Construction joints shall be made and relocated as not to impair the 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.
   - G. Non-shrink grouts shall be a premixed compound consisting of non-staining non-metallic aggregate, cement, water reducing and plasticizing agents capable of developing minimum compressive strength of 4,000 psi in 3 days and 7,000 psi in 28 days.

4. Concrete: (cont.)
   - H. Unless otherwise noted, chamfer all concrete edges 3/4".
   - I. Concrete delivery tickets shall record all free water in the mix: at batching by plant, for consistency by driver, and any additional request by Contractor if permitted by the mix design.
   - J. Reinforcing bars, anchor bolts, inserts and other items to be cast in the concrete shall be secured in position prior to placement of concrete.

5. Reinforcing Steel:
   - A. Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60.
   - B. Pre-stress strands shall be uncoated seven wire low-relaxation strand conforming to ASTM A416 Grade 270, or AASHTO M203 Grade 270.
   - C. Clear concrete coverage for reinforcing bars shall be as follows, unless otherwise noted:
     a. Footing, Grade Beams, ETC.
        Cast against earth ——— 3"
     b. Footing, Grade Beams, ETC.
        Formed and exposed to earth ——— 2"
     c. Wall faces exposed to earth
        or weather ——— 2"
     d. Deck slabs
        i. Top bars ——— 2 1/2"
        ii. Bottom bars ——— 1 1/2"
   - D. Stainless steel reinforcing bars shall be Type 316 grade conforming to ASTM A955 grade 60.
   - E. Thru bolts for guardrail connection shall conform to AASHTO M164 (ASTM A325), unless otherwise noted.
   - F. Splices:
     a. Reinforcing steel shall be spliced only where indicated on plans. Provide lap splice length per typical details and schedule, Sht S1.2 unless otherwise noted.
   - G. Bar bends and hook shall be "standard hooks" in accordance with Typical Details Sht S1.2.

6. Precast Arch Culverts:
   - A. Precast concrete in arches shall be regular weight concrete and shall have a minimum 28-day compressive strength of 4000 psi.
   - B. Precast arch fabricator shall be responsible for design of arches, headwalls, and arch to headwall connections.
   - C. Arches and headwalls shall be designed using the design criteria as shown in Notes 2.B and 2.G. A soil unit weight of 135 pcf shall be used.
   - D. Arch and headwall plans and calculations shall be stamped and signed by a licensed structural engineer in the State of Hawaii.
   - E. Precast arch fabricator shall provide engineer with footing reactions and calculations for arch and headwall designs.
   - F. Precast arch fabricator shall be responsible for design and installation of fence post sleeves in headwalls.
   - G. Setting precast headwalls, grouting, sealing joints, and backfilling of precast system shall conform to the specifications by the precast arch fabricator.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRUCTURAL GENERAL NOTES

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.0 OF 54 SHEETS

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HAWAII	HAW.	NH-030-1(38)	2010	114	213

7. Structural Steel:
   - A. Fabrication and erection of structural steel shall conform to the AASHTO LRFD Bridge Construction Specifications, Third Edition, including its subsequent interim specifications.
   - B. Structural steel shall conform to ASTM A36, unless otherwise noted.
   - C. Steel wide flange sections shall conform to ASTM A992.
   - D. Steel pipes shall conform to ASTM A53, Grade B.
   - E. Steel tubes shall conform to ASTM A500, Grade B.
   - F. Bolts shall conform to ASTM A307, Grade A, unless otherwise noted.
   - G. Welds and welding procedures shall conform to the structural welding code AWS D1.1 of the American Welding Society.
   - H. Welding shall be performed by welders that are prequalified for applicable welding procedures.
   - I. Welding electrodes shall be E70XX.
   - J. All steel shall be hot-dip galvanized after fabrication.
8. Metal Pedestrian Railing:
   - A. The metal pedestrian railings shall be hot dip galvanized after fabrication and shop painted according to Paint Schedule, this sheet.
   - B. The metal railing posts shall be field welded to embedded plate in the top of concrete railing as shown on Sht. S16.0.
   - C. After welding is complete, remove all weld slag, splatter, damaged galvanizing material, and all other welding by-products from the surface of the railing posts and embedded plates.
   - D. Prepare surface of steel per SSPC-SP1.
   - E. Rust scale shall be cleaned per SSPC-SP3.
   - F. Apply (2) coats of cold applied, galvanizing compound containing 95% metallic zinc content by weight in dry film and 52% solids content by volume.
   - G. The coating shall be well stirred before use so that it is completely homogeneous during application.
   - H. Minimum dry film build is 3 mils, using manufacturer's recoat time directions.
   - I. The coating shall be applied at sufficient wet film thickness to achieve a minimum dry film.
   - J. Apply paint system according to paint schedule, this sheet.

ABBREVIATIONS

Bot	Bottom	Galv	Galvanized
Btwn	Between	Horiz	Horizontal
℄	Centerline	HSB	High Strength Bolt
CJ	Construction Joint	I.D.	Inside Diameter
Clr	Clear	Max	Maximum
Conc	Concrete	Mech	Mechanical
Cont	Continuous	Min	Minimum
Dbl	Double	Misc	Miscellaneous
Dia	Diameter	No. or #	Number
Dwg	Drawing	N.T.S.	Not to Scale
Ea	Each	O.C.	On center
E.F.	Each Face	O.D.	Outside Diameter
Elev	Elevation	Opng	Opening
Eq	Equal	Opp	Opposite
E.W.	Each Way	PL or ℄	Plate
Exist or (E)	Existing	Prefab	Prefabricated
Ext	Exterior	Ref	Reference
Fin	Finish	Reinf	Reinforced or Reinforcing
Ft	Foot or Feet	Sp	Spaces or Spacing
Ftg	Footing		

Painting Notes:
1. Contractor shall shop coat all members. Field coating shall consist of touch up only.
2. The touch up paint shall consist of the following:
   - a. prepare surface per SSPC-SP1, solvent cleaning.
   - b. apply first and second coat according to paint schedule
3. Color for top coat shall be an earthtone light brown or green, as proposed by the contractor and approved by the Engineer. Intermediate coat shall have contrasting light color. Finish for top coat shall not be gloss or high gloss.
4. Multiple coats may be required to obtain minimum dry film thickness (DFT).
5. All hot-dip galvanized coating that is damaged shall be repaired. The repairs shall consist of the following:
   - a. Prepare surface per SSPC-SP1, solvent cleaning.
   - b. Apply (2) coats of cold applied, galvanizing compound containing 95% metallic zinc content by weight in dry film and 52% solids content by volume.
   - c. Application rate shall be 1.5 mils dry film thickness per coat.
   - d. Rust scale shall be cleaned per SSPC-SP3.
   - e. The coating shall be applied at sufficient wet film thickness to achieve a minimum dry film.
   - f. The coating shall be well stirred before use so that it is completely homogeneous during application.
   - g. Minimum dry film build is 3 mils, using manufacturer's recoat time directions.
   - h. Apply paint system according to paint schedule.
6. Cost of painting is incidental to metal railings.

PAINT SCHEDULE

SPECIAL COATING SCHEDULE FOR ZINC COATED METAL BRIDGE RAILING

	OPTION 1	OPTION 2	OPTION 3	OPTION 4
PREPARATION:	Carboline thinner #2 or surface cleaner #3, per SSPC-SP1, Apply Rustbond Penetrating Sealer.	Solvent clean per SSPC-1, and as recommended by the manufacturer	Solvent clean per SSPC-SP1, and as recommended by the manufacturer	Solvent clean per SSPC- SP1. Apply Galvanized Zinc Treatment (Acid Etching)
1ST COAT:	Carboline Carboguard 890 epoxy DFT 5 mil (min) WFT 7 mil (min)	Tnemec High-Build Epoxoline II Series N69 DFT 5 mil (min) WFT 7 mil (min)	Sherwin Williams Tile Clad High Solids B62 Series DFT 4 mil (min) WFT 7 mil (min)	Ameron Amercoat 385 epoxy DFT 5 mil (min) WFT 8 mil (min)
RECOATING TIME:	8 HRS (min) 2 Days (max)	10 HRS (min) 2 Days (max)	8 HRS (min) 14 Days (max)	8 HRS (min) 2 Days (max)
TOP COAT:	Carboline Carbothane 133HB Alyphatic polyurethane DFT 5 mil (min) WFT 7 mil (max)	Tnemec Endura-Shield Series 75 DFT 4 mil (min) WFT 7 mil (min)	Sherwin Williams Corothane II B65 W200 Series/B60V2 DFT 4 mil (min) WFT 7 mil (min)	Ameron Amercoat 450 SA Polyurethane DFT 4 mil WFT 7 mil
TOP COAT COLOR:	Medium Shade Green, submit color chips for approval.			

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HIGHWAYS DIVISION

STRUCTURAL GENERAL NOTES

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.1 OF 54 SHEETS

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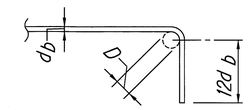
MINIMUM SPLICE & EMBEDMENT LENGTHS

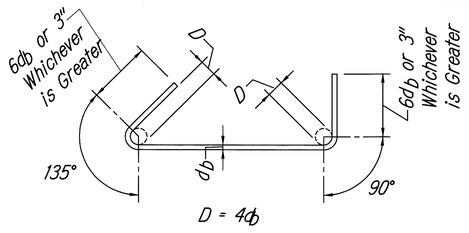
BAR SIZE	CONCRETE STRENGTH = 4,000 PSI				
	LAP SPLICE		EMBEDMENT		
			STRAIGHT		
	OTHER BARS	TOP BAR	OTHER BARS	TOP BAR	WITH STANDARD 90° HOOK
#3, #4	21"	29"	12"	17"	7"
#5	26"	36"	15"	21"	9"
#6	31"	43"	18"	26"	10"
#7	39"	54"	23"	32"	12"
#8	51"	71"	30"	42"	14"
#9	64"	90"	38"	53"	15"
#10	81"	114"	48"	67"	17"
#11	100"	140"	59"	82"	19"

Notes:
1. "Top Bars" are horizontal bars with 12" or more of concrete cast below.
2. 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 bar and smaller and 9'-0" o.c. for #10 bar and larger.
3. 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.
4. 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 1
Not to Scale S1.2 | S1.2

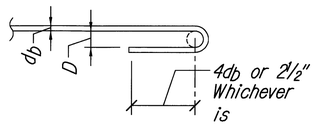


90° Hook

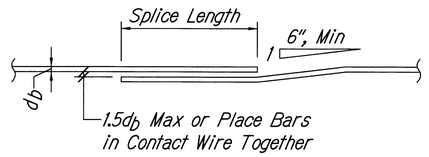


D = 4db

Cross-Tie



180° Hook

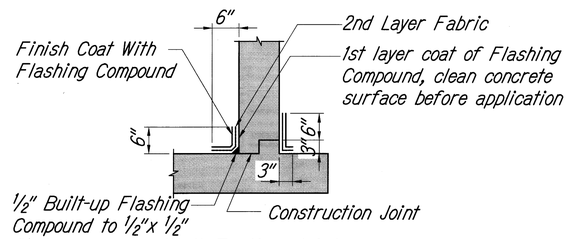


Bar Lap

D = 6db for #8 and Smaller
D = 8db for #9 to #11

STANDARD HOOKS AND CROSS-TIE DETAIL 2
Not to Scale S1.2 | S1.2

Wall Joint



Wall Footing Joint

Note: Typical each face unless noted otherwise

TYPICAL WATERPROOFING DETAIL 3
Not to Scale S1.2 | S1.2

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TYPICAL DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.2 OF 54 SHEETS

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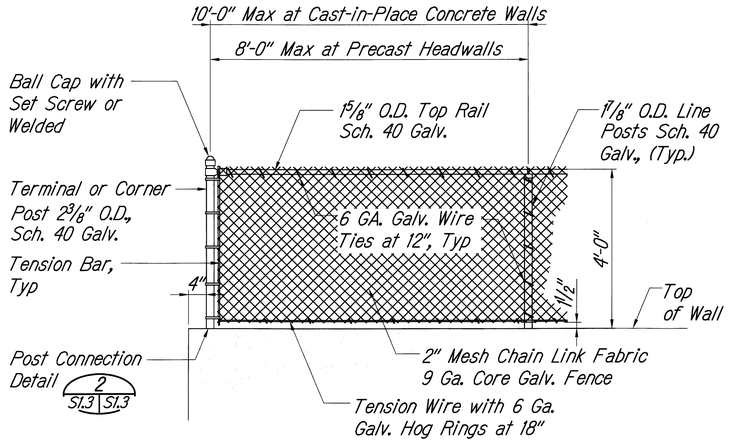
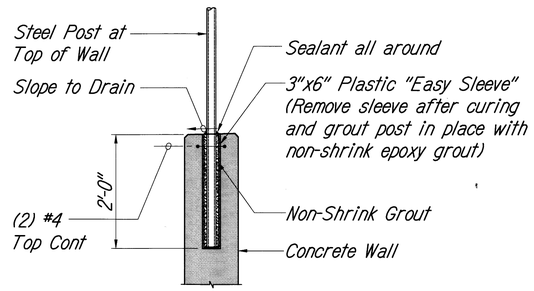
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	116	213

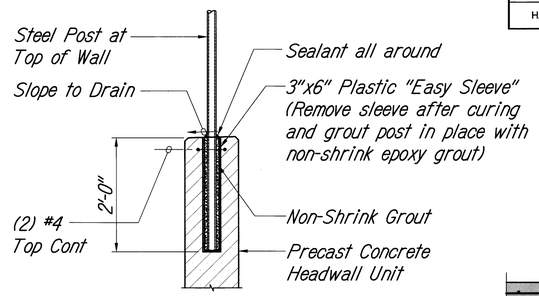


CHAINLINK FENCE DETAIL 1 — S1.3 | S1.3

Not to Scale



at Cast-in-Place Concrete Wall

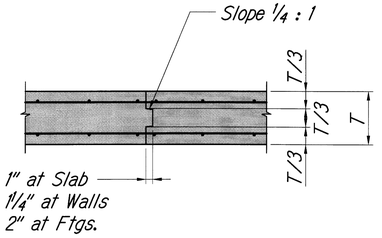


at Precast Concrete Headwall

Note:
Payment for sleeves, sealant and grout (including installation) to be made incidental to the cost of the railing.

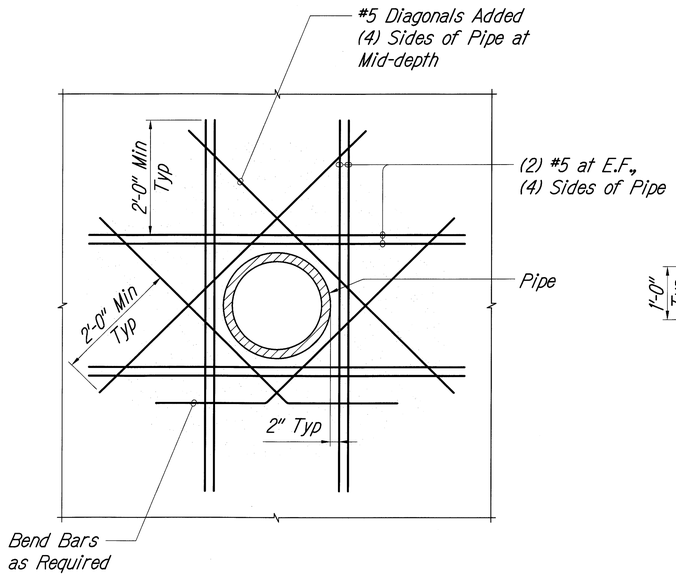
TYPICAL POST EMBEDMENT DETAILS 2 — S1.3 | S1.3

Not to Scale



TYPICAL CONSTR. JOINT DETAIL 3 — S1.3 | S1.3

Not to Scale



ADDED REBARS AT PIPE PENETRATIONS 4 — S1.3 | S1.3

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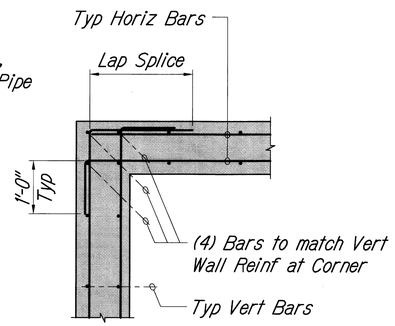
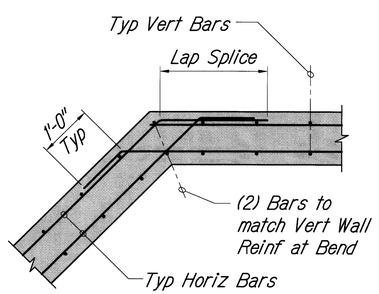
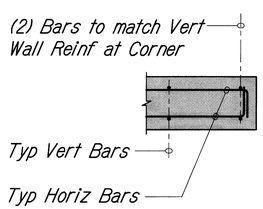


At Corner



At Bend



At End

TYPICAL WALL HORIZONTAL REINFORCEMENT DETAILS 5 — S1.3 | S1.3

Not to Scale

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TYPICAL DETAILS

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Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.3 OF 54 SHEETS

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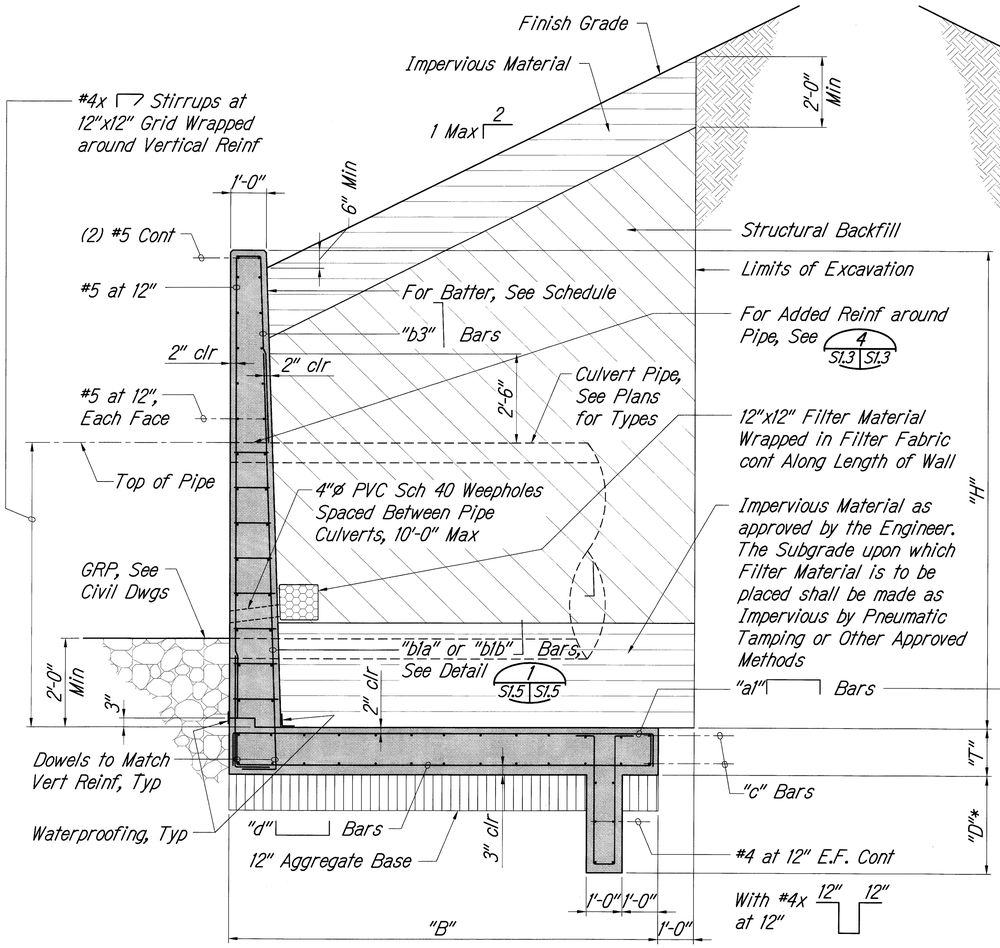
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	117	213

Headwall Schedule for Culverts 6, 8 and 10

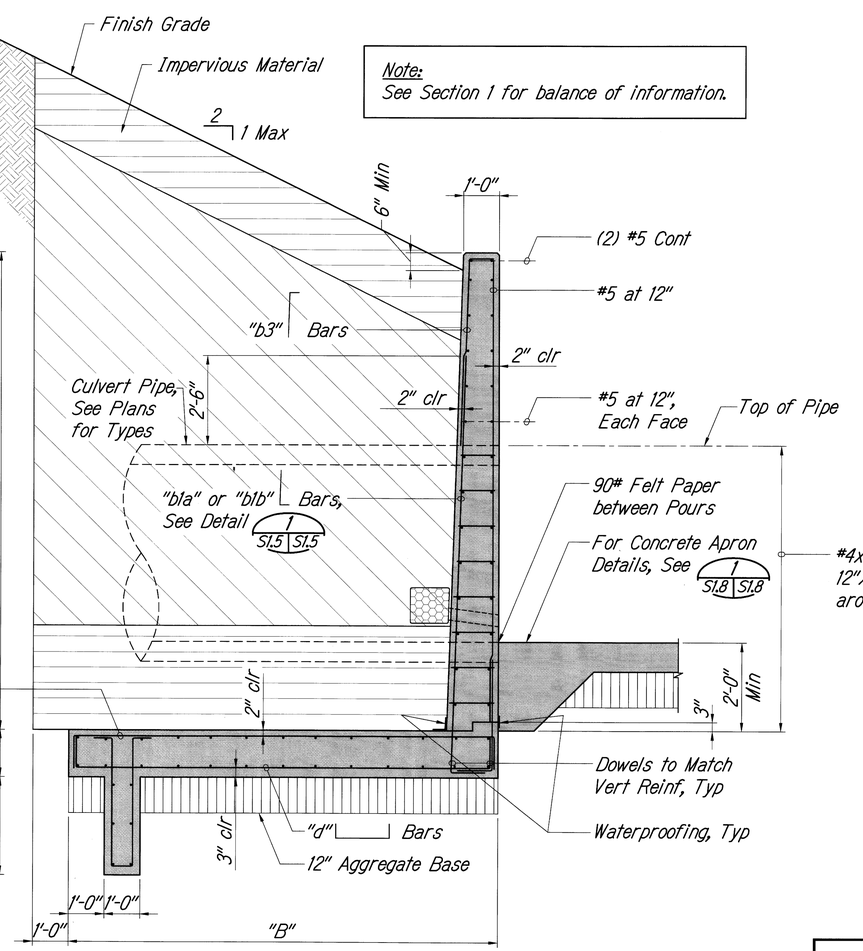
	Dimensions							Reinforcing						
Wall Type	Wall Height "H"	"B"	"T"	"D"*	"L1"	"L2"	Batter	"a1" Bars	"a2" Bars	"b1a" Bars	"b1b" Bars	"b3" Bars	"c" Bars	"d" Bars
Type H1-3	12'-0" < "H" ≤ 14'-0"	12'-0"	1'-4"	2'-6"	-	-	1½ : 12	#7 at 4"	-	#8 at 4"	#8 at 8"	#5 at 8"	#4 at 12"	#6 at 12"
Type H1-2	10'-0" < "H" ≤ 12'-0"	10'-0"	1'-4"	2'-0"	-	-	1½ : 12	#7 at 8"	-	#7 at 4"	#7 at 8"	#5 at 8"	#4 at 12"	#6 at 12"
Type H1-1	"H" < 10'-0"	8'-6"	1'-4"	1'-0"	-	-	1½ : 12	#6 at 8"	-	#6 at 4"	#6 at 8"	#5 at 8"	#4 at 12"	#5 at 12"

* - If bottom of retaining wall footing is on basalt, shear key is not required.



HEADWALL OUTLET SECTION FOR CULVERTS 6, 8, AND 10 (1)

Scale: 1/2" = 1'-0" S6.0, S8.0, S10.0 | S1.4



HEADWALL INLET SECTION FOR CULVERTS 6, 8, AND 10 (2)

Scale: 1/2" = 1'-0" S6.0, S8.0, S10.0 | S1.4

Note:
See Section 1 for balance of information.

KEIH KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 8818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HEADWALL SECTIONS

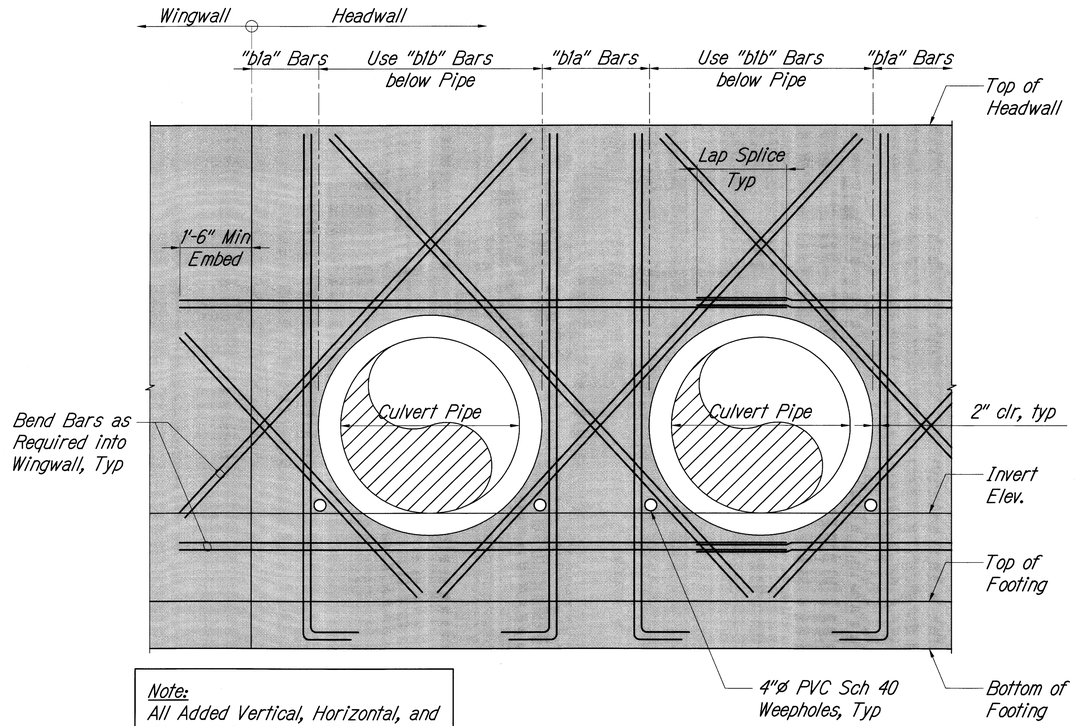
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.4 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S1.4.dwg, 24, 12/16/2009 3:07:20 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	118	213



Note:
All Added Vertical, Horizontal, and Diagonal Reinforcing Bars shown shall be (2) #6 Bars at each face.

ADDED REINFORCEMENT AT HEADWALL PIPE PENETRATION DETAIL

1 / S1.5 | S1.5

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

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6816-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HEADWALL DETAIL

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.5 OF 54 SHEETS

P:\Drafting\2009.12.17_1917 bridge culvert\1917_S1-5.dwg, 24, 12/16/2009 3:07:21 PM, tamanaha, 1:1

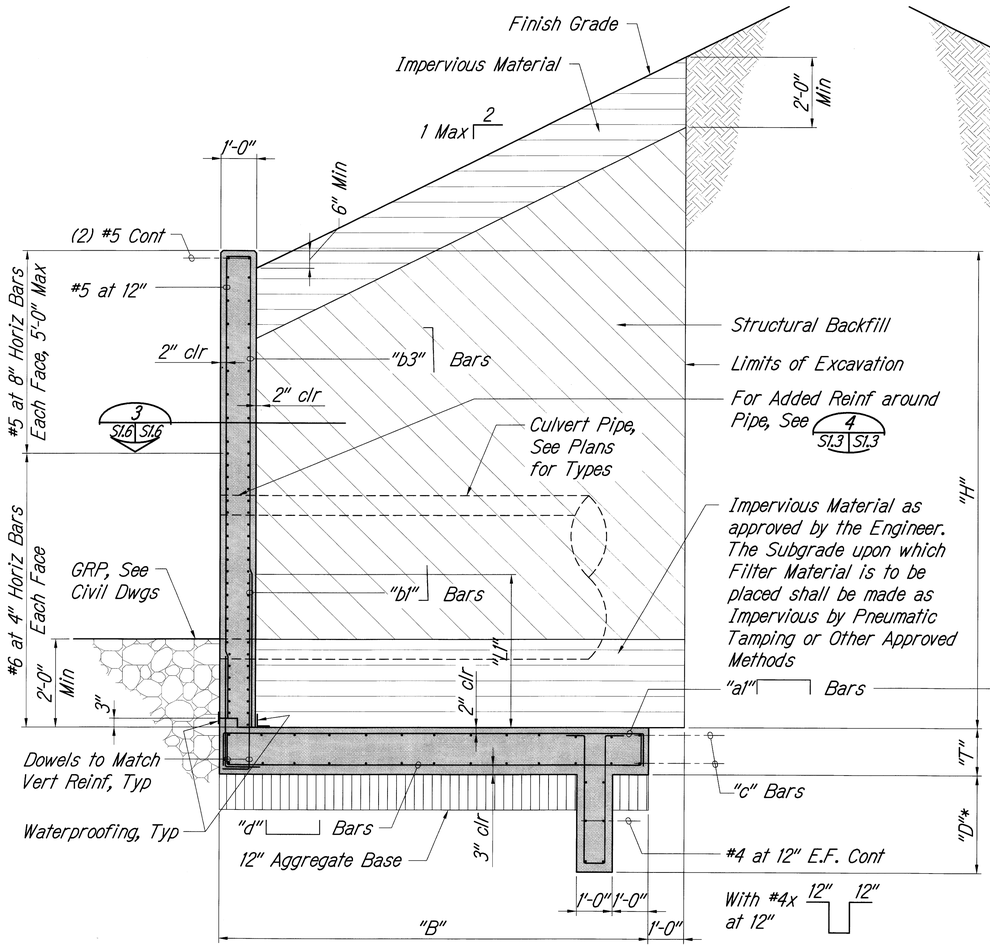
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	119	213

Headwall Schedule for Culverts 7 and 9

	Dimensions							Reinforcing						
Wall Type	Wall Height "H"	"B"	"T"	"D"*	"L1"	"L2"	Batter	"a1" Bars	"a2" Bars	"b1" Bars	"b2" Bars	"b3" Bars	"c" Bars	"d" Bars
Type H2-4	10'-0" < "H" ≤ 12'-6"	10'-0"	1'-4"	2'-0"	5'-0"	-	-	#6 at 4"	-	#6 at 4"	-	#5 at 12"	#4 at 12"	#6 at 12"
Type H2-3	8'-0" < "H" ≤ 10'-0"	8'-6"	1'-4"	1'-0"	4'-0"	-	-	#6 at 8"	-	#5 at 4"	-	#5 at 12"	#4 at 12"	#5 at 12"
Type H2-2	6'-0" < "H" ≤ 8'-0"	7'-0"	1'-0"	1'-0"	4'-0"	-	-	#5 at 8"	-	#5 at 8"	-	#5 at 12"	#4 at 12"	#5 at 12"
Type H2-1	"H" ≤ 6'-0"	5'-0"	1'-0"	-	4'-0"	-	-	#5 at 12"	-	#5 at 12"	-	#5 at 12"	#4 at 12"	#5 at 12"

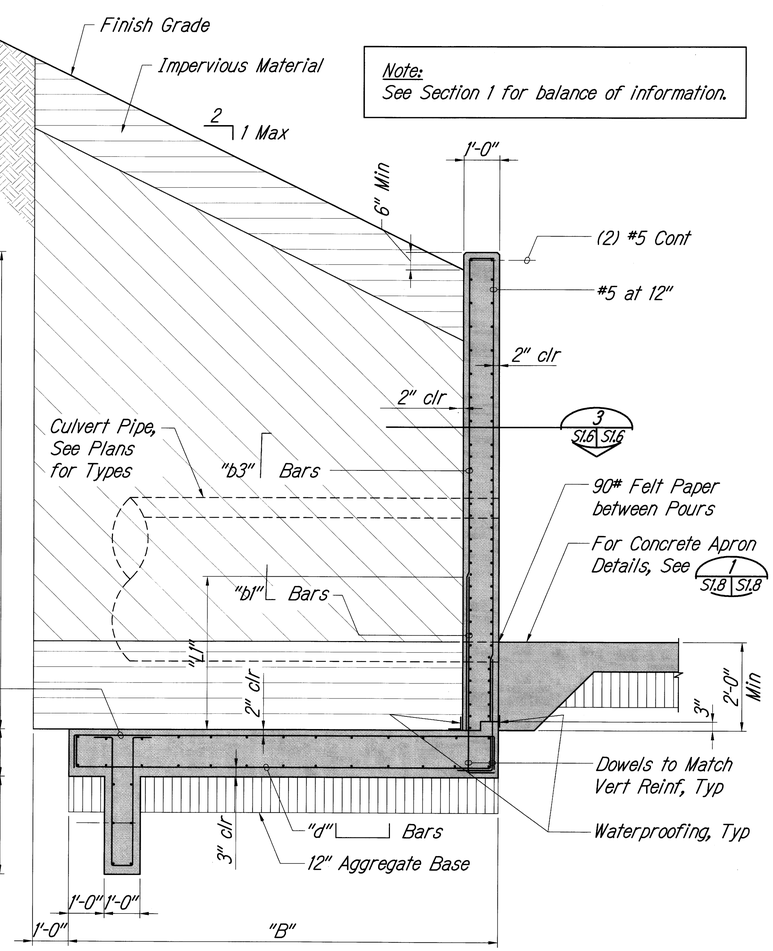
* - If bottom of retaining wall footing is on basalt, shear key is not required.

Note:
"b1" and "b3" Bars are lap spliced.



HEADWALL OUTLET SECTION FOR CULVERTS 7 AND 9 — 1 — S7.0, S9.0, S1.6

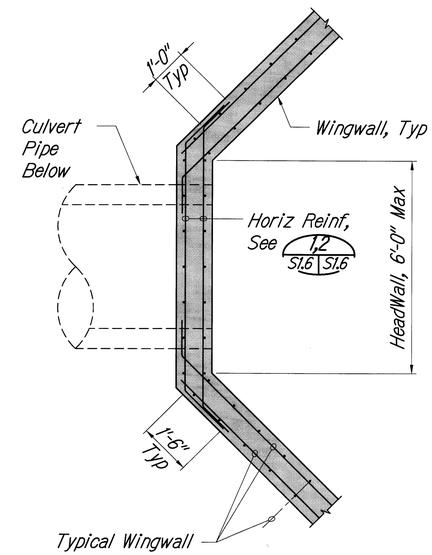
Scale: 1/2" = 1'-0"



HEADWALL INLET SECTION FOR CULVERTS 7 AND 9 — 2 — S7.0, S9.0, S1.6

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

Note:
See Section 1 for balance of information.



SECTION — 3 — S1.6 S1.6

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

KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 8818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

HEADWALL SECTIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S1.6 OF 54 SHEETS

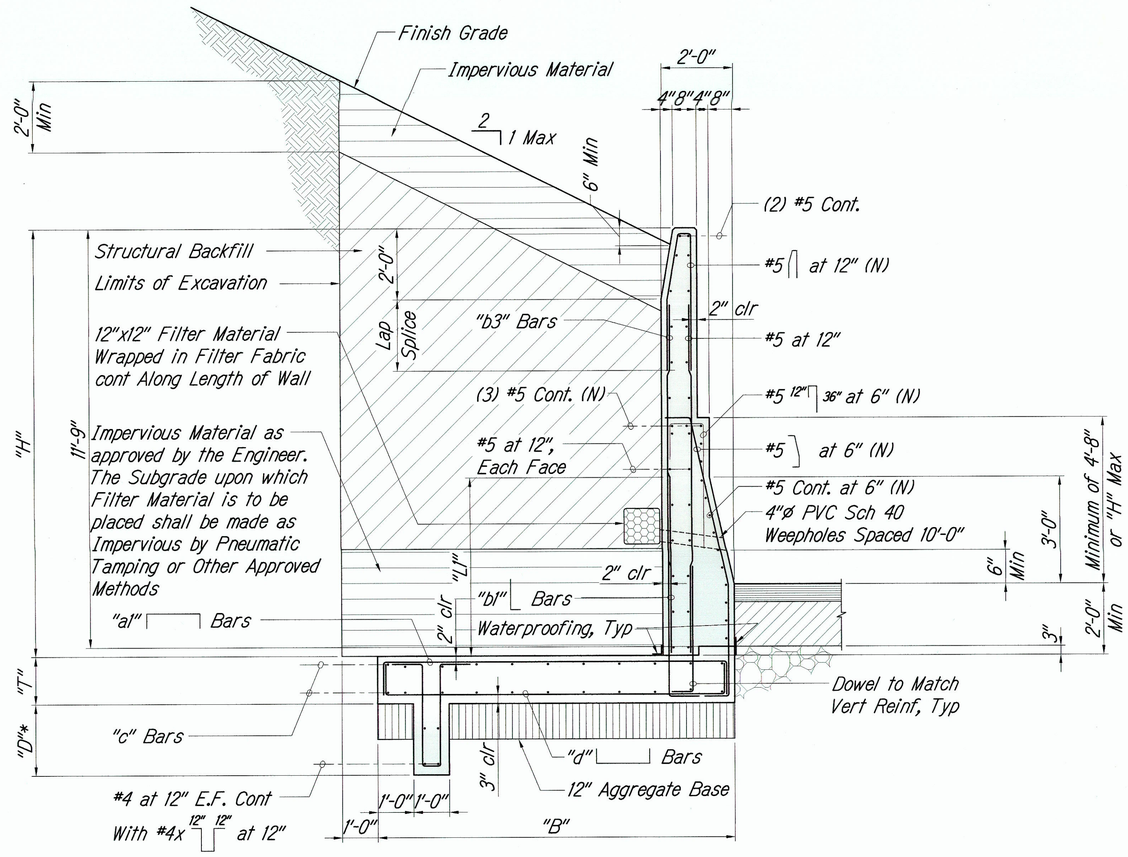
P:\Drafting\2008-12-17_1917 bridge culvert\1917_S1-6.dwg, 24, 12/16/2009 3:07:22 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 120	213

Wingwall and Retaining Wall Schedule										
	Dimensions					Reinforcing				
Wall Type	Wall Height "H"	"B"	"T"	"D"*	"L1"	"a1" Bars	"b1" Bars	"b3" Bars	"c" Bars	"d" Bars
Type W-4	10'-0" < "H" ≤ 12'-0"	10'-0"	1'-4"	2'-0"	5'-0"	#6 at 4"	#6 at 4"	#5 at 12"	#4 at 12"	#6 at 12"
Type W-3	8'-0" < "H" ≤ 10'-0"	8'-6"	1'-4"	1'-0"	4'-0"	#5 at 4"	#5 at 4"	#5 at 12"	#4 at 12"	#5 at 12"
Type W-2	6'-0" < "H" ≤ 8'-0"	7'-0"	1'-0"	1'-0"	4'-0"	#5 at 8"	#5 at 8"	#5 at 12"	#4 at 12"	#5 at 12"
Type W-1	"H" ≤ 6'-0"	5'-0"	1'-0"	-	4'-0"	#5 at 12"	#5 at 12"	#5 at 12"	#4 at 12"	#5 at 12"

* - If bottom of retaining wall footing is on basalt, shear key is not required.

Note:
1. "b1" and "b3" Bars are lap spliced.



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

1 S1.7 | S1.7

05/22/12	Revised Retaining Wall Profile
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WINGWALL AND RETAINING WALL SECTION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.
EXPIRATION DATE OF THIS PAGE 4/30/2014
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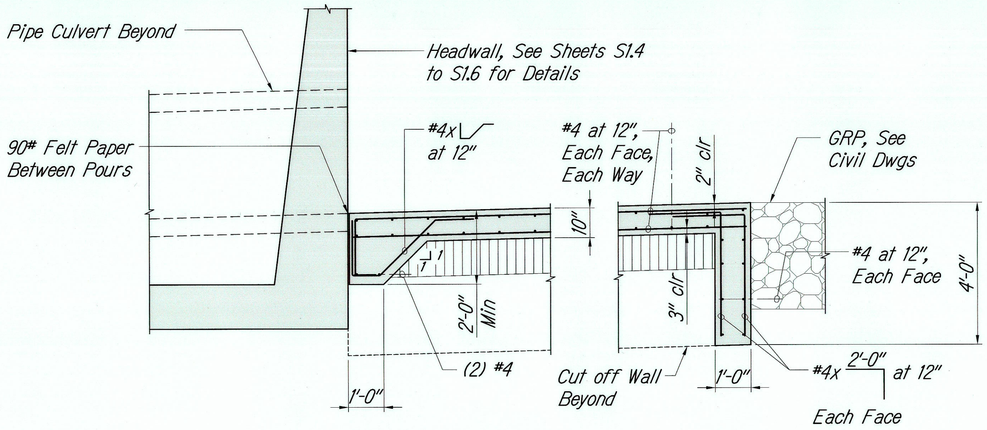
SHEET No. S1.7 OF 54 SHEETS

"AS-BUILT"

C.O. 120

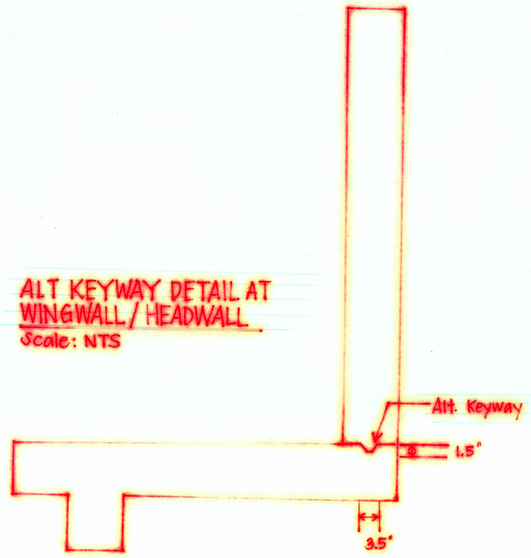
P:\1901_1950\1917 Lahaina Bypass, Phase 1B1\Drawings\Structural\AutoCAD_format\2012-05-16_1917 CHANGE\1917_S1-7.dwg, 5/22/2012 2:09:24 PM, Adobe PDF

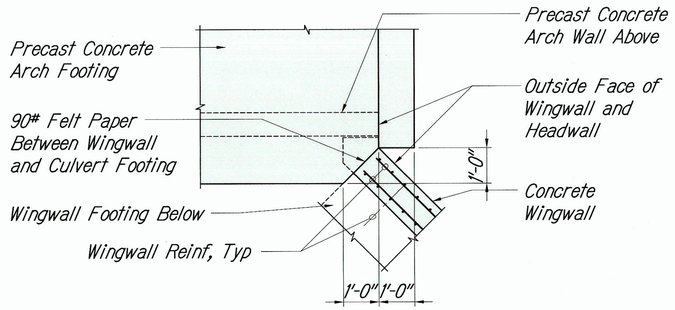
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	121	213



CONCRETE APRON DETAIL — 1 (S1.8 | S1.8)

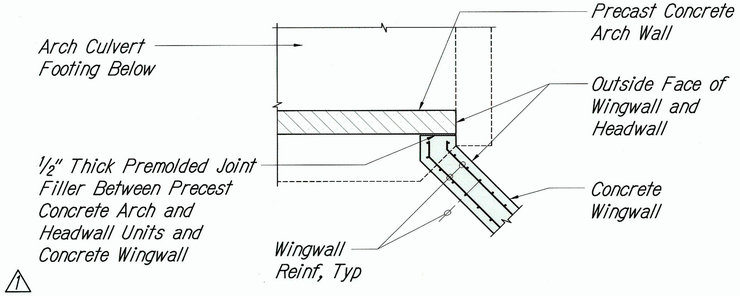
Scale: 1/2" = 1'-0"





SECTION AT ARCH CULVERT FOOTING — 2 (S1.8 | S1.8)

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



SECTION AT ARCH CULVERT WALL — 3 (S1.8 | S1.8)

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

1/18/10	⚠ Revised Joint Detail
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONCRETE APRON DETAIL

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA — LICENSED PROFESSIONAL ENGINEER — No. 8348-S — HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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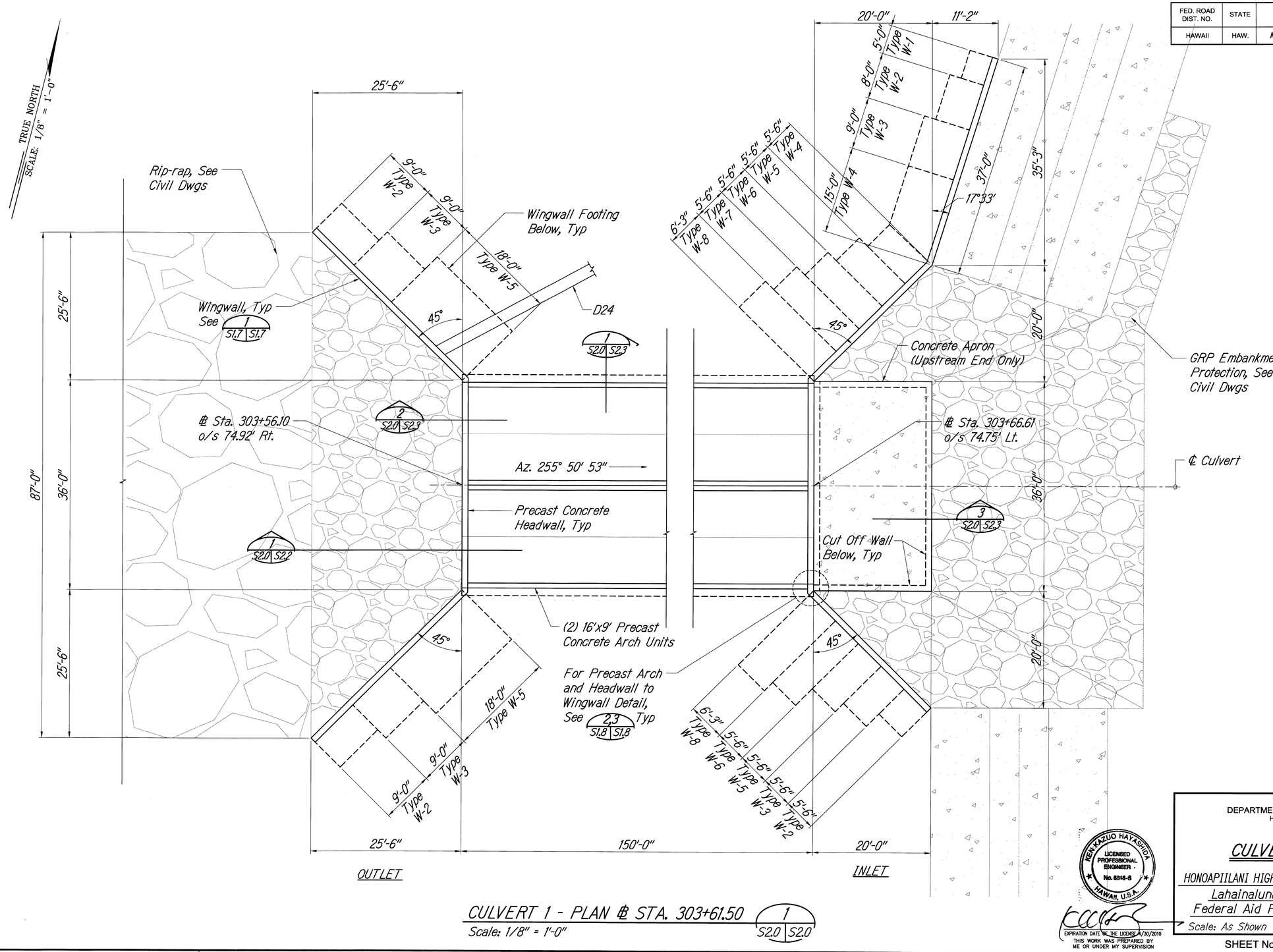
SHEET No. S1.8 OF 54 SHEETS

"AS-BUILT"

ADD. 121

P:\Drafting\2010-01-14_1917 bridge culvert - addendum 1\1917_S1.8 ADD 1.dwg, 24, 1/15/2010 11:29:03 AM, tamamaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	122	213



CULVERT 1 - PLAN ℄ STA. 303+61.50 (1 S2.0 S2.0)

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

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 1 - PLAN

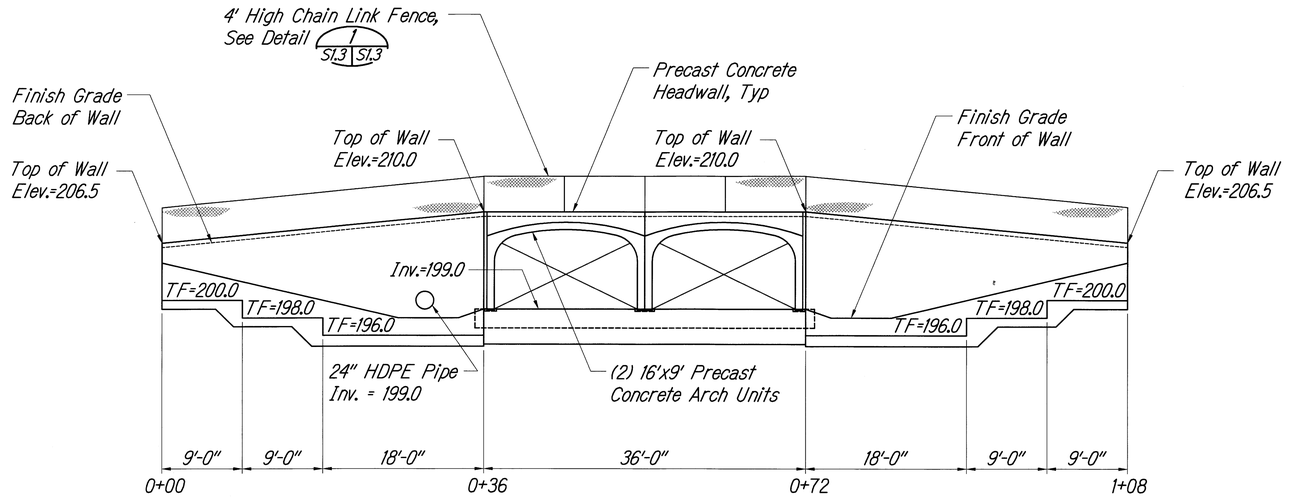
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S2.0 OF 54 SHEETS

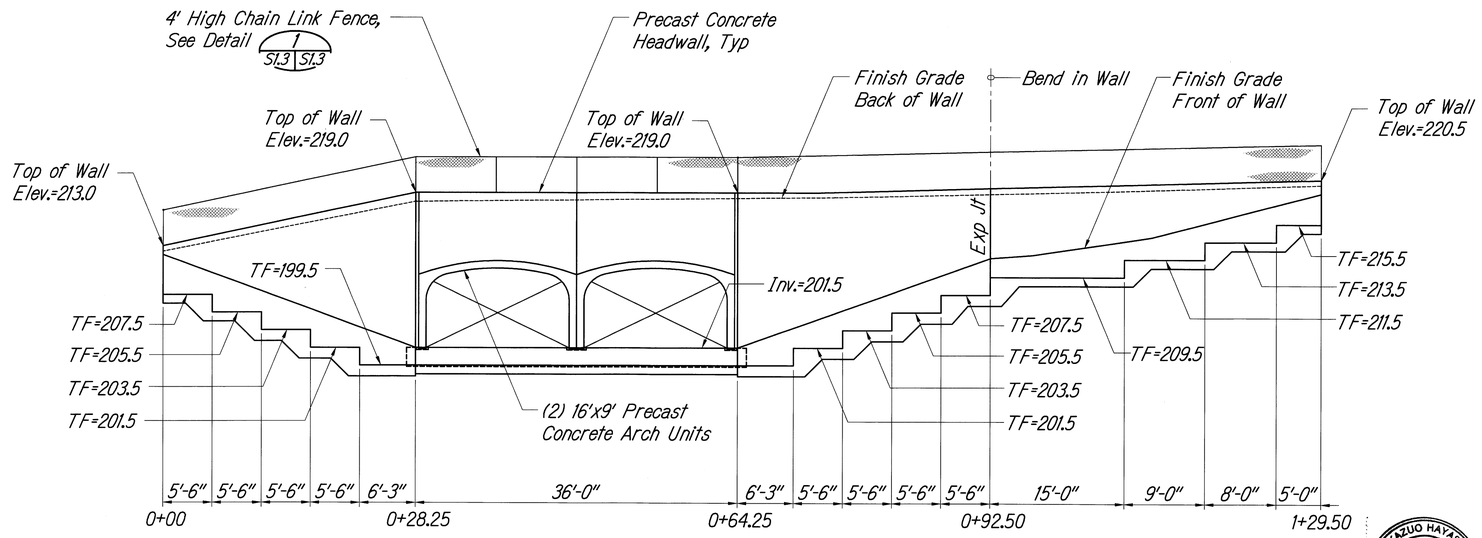
P:\Drafting\2009-12-17_1917 bridge culvert\1917_S2-0.dwg, 98, 12/16/2009 3:07:26 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	123	213



CULVERT 1 - OUTLET ELEVATION @ STA. 303+61.50 (1 / S2.1 S2.1)

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



CULVERT 1 - INLET ELEVATION @ STA. 303+61.50 (2 / S2.1 S2.1)

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

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LICENSED PROFESSIONAL ENGINEER
No. 8818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 1 - ELEVATIONS

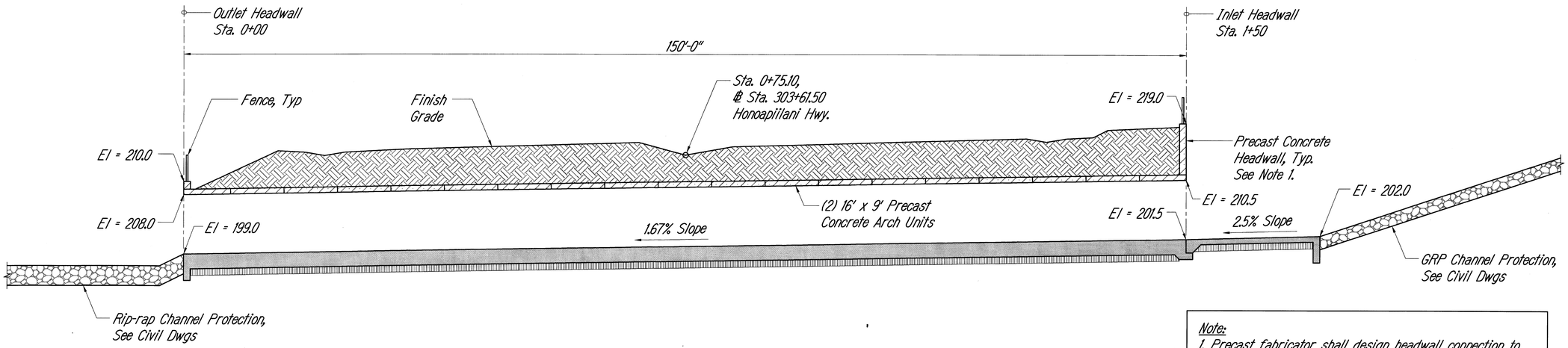
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S2.1 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S2-1.dwg, 96, 12/16/2009 3:07:27 PM, tumanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	124	213



CULVERT 1 - LONGITUDINAL SECTION ALONG CENTERLINE

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

1
S2.0 | S2.2

Note:

1. Precast fabricator shall design headwall connection to precast arch section. Calculations shall be stamped and signed by a structural engineer, licensed in Hawaii. Typical for all precast arch culverts.

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THIS LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 1 -
LONGITUDINAL SECTION

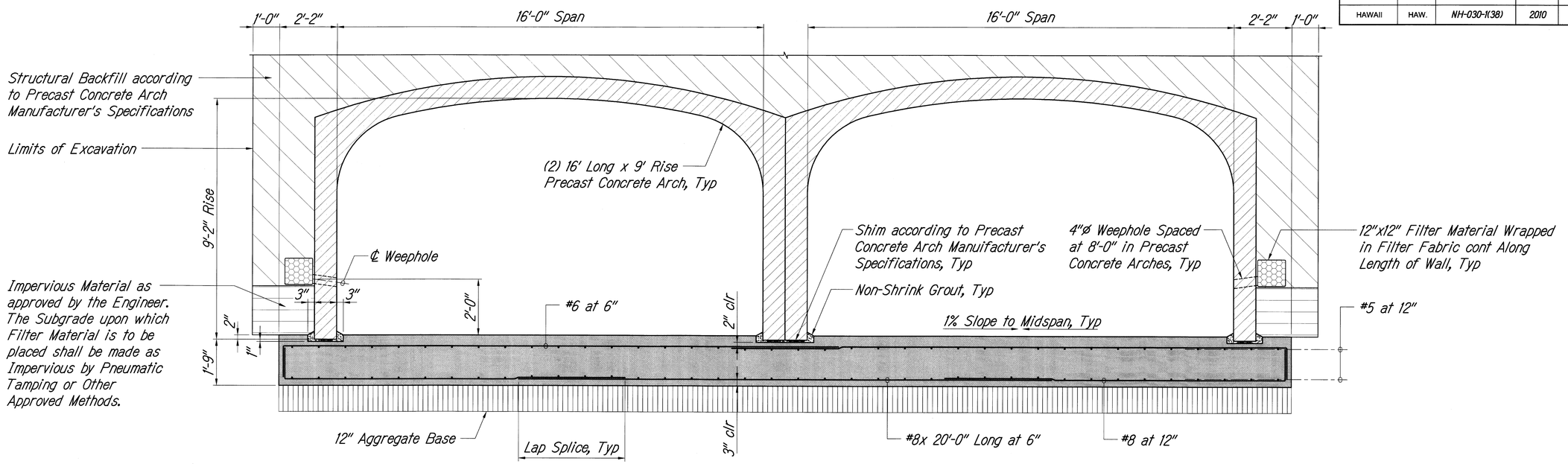
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

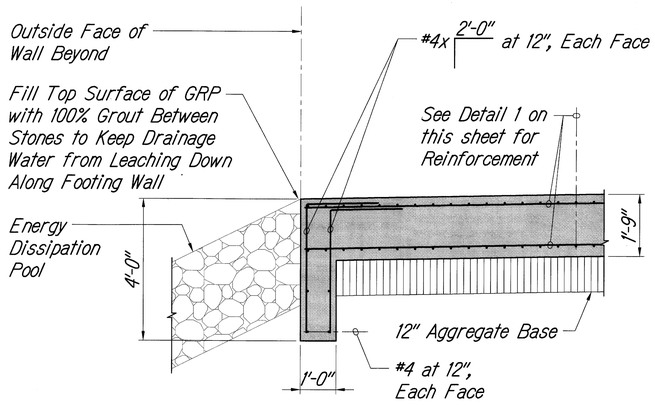
SHEET No. S2.2 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S2.2.dwg, 96, 12/16/2009 3:07:28 PM, tumanaha, 1:1

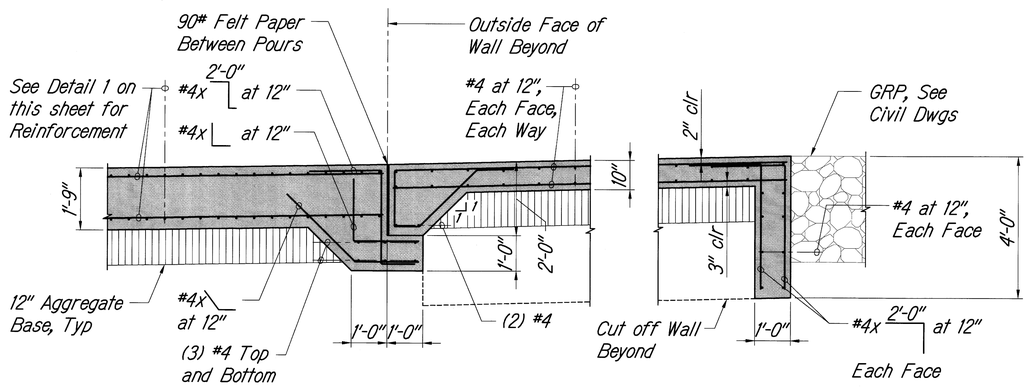
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	125	213



SECTION 1
Scale: 1/2" = 1'-0"
S2.0 | S2.3



SECTION AT OUTLET 2
Scale: 1/2" = 1'-0"
S2.0 | S2.3



SECTION AT INLET 3
Scale: 1/2" = 1'-0"
S2.0 | S2.3

KENT KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 1 - SECTIONS AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

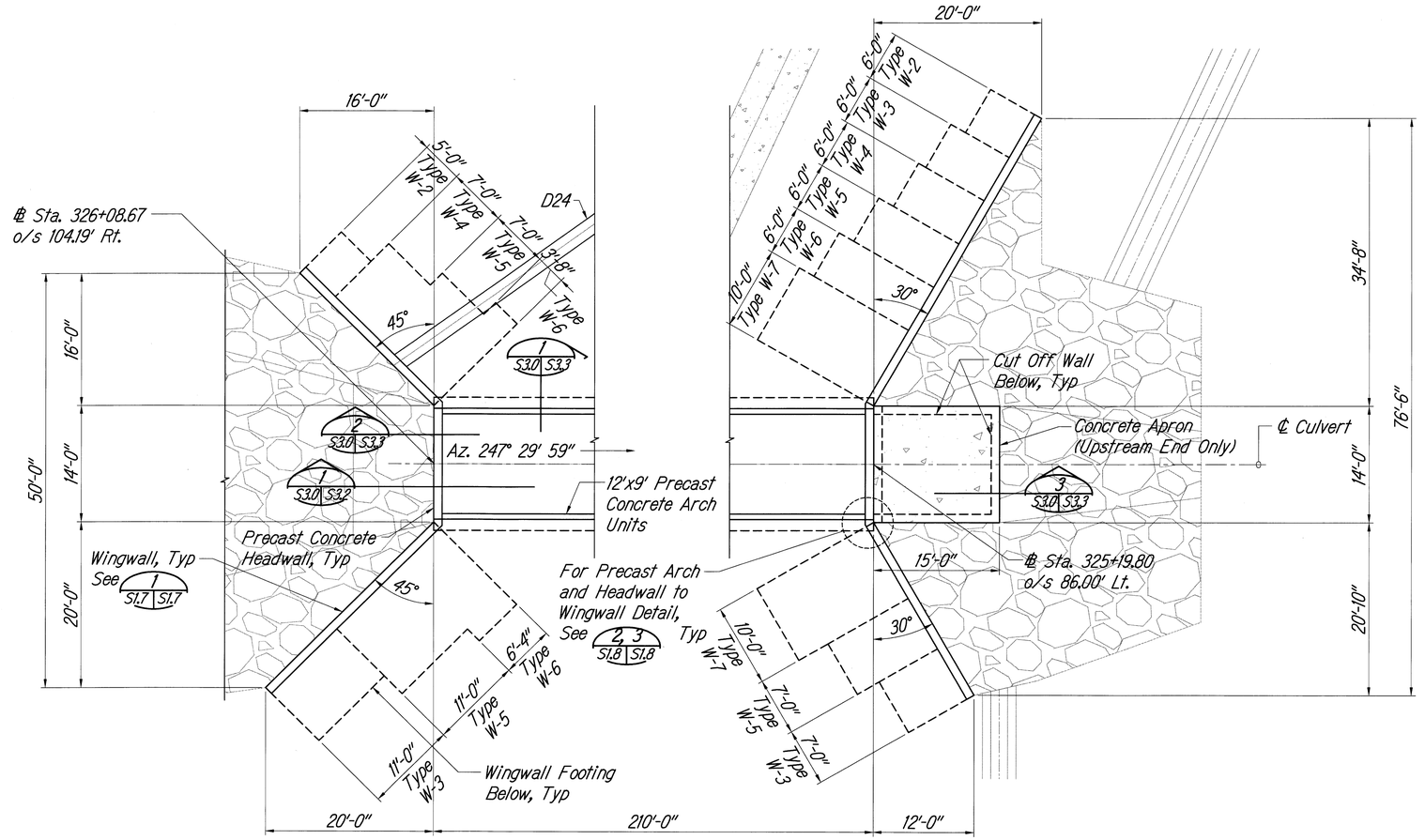
Scale: As Shown Date: November 23, 2009

SHEET No. S2.3 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S2-3.dwg, 24, 12/16/2009 3:07:29 PM, tamashiro, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	126	213

TRUE NORTH
SCALE: 1/8" = 1'-0"



CULVERT 2 - PLAN ℄ STA. 325+60 (1 S3.0 S3.0)
Scale: 1/8" = 1'-0"

KEIN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6816-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 2 - PLAN

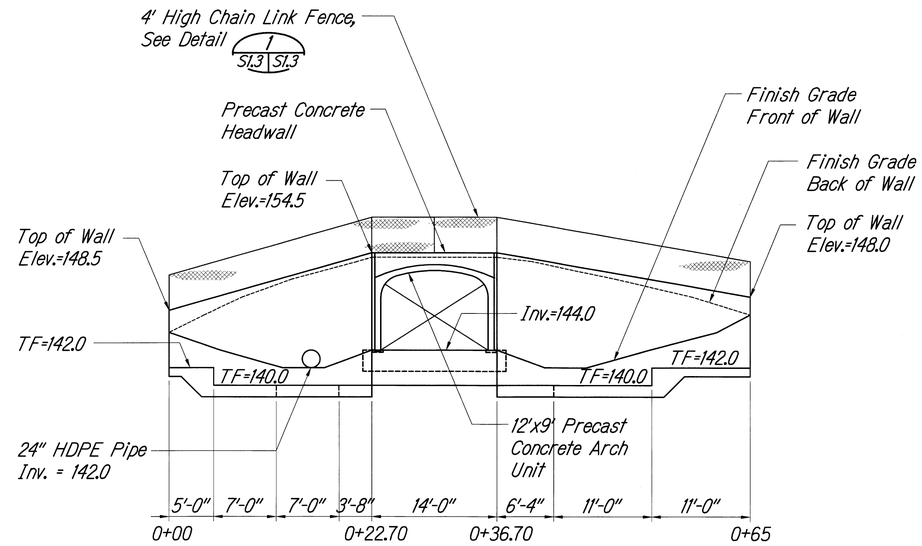
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S3.0 OF 54 SHEETS

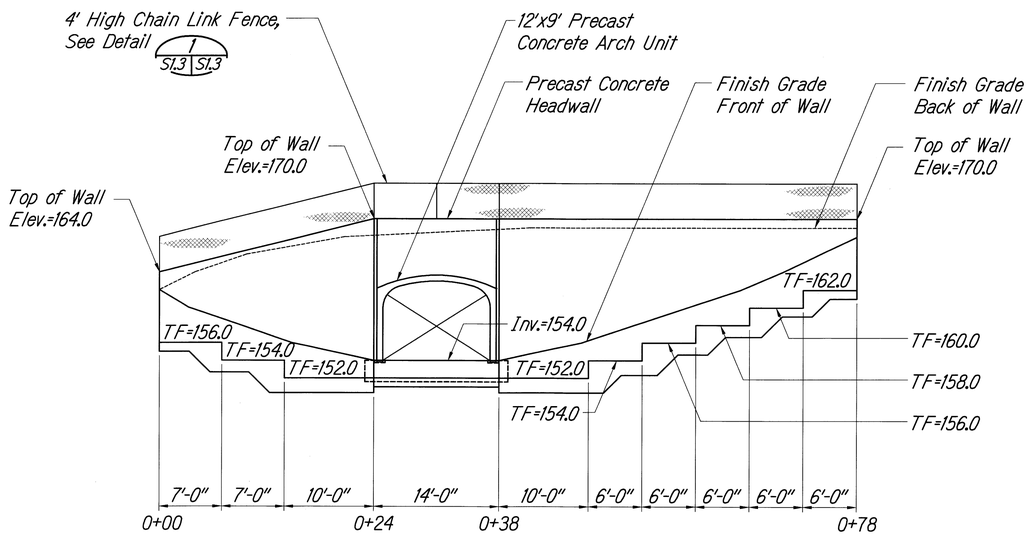
P:\Drafting\2009-12-17_1917 bridge culvert\1917_S3-0.dwg, 96, 12/16/2009 3:07:31 PM, kamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	127	213



CULVERT 2 - OUTLET ELEVATION @ STA. 325+60 (1 S3.1 | S3.1)

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



CULVERT 2 - INLET ELEVATION @ STA. 325+60 (2 S3.1 | S3.1)

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

KENT KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 8818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 2 - ELEVATIONS

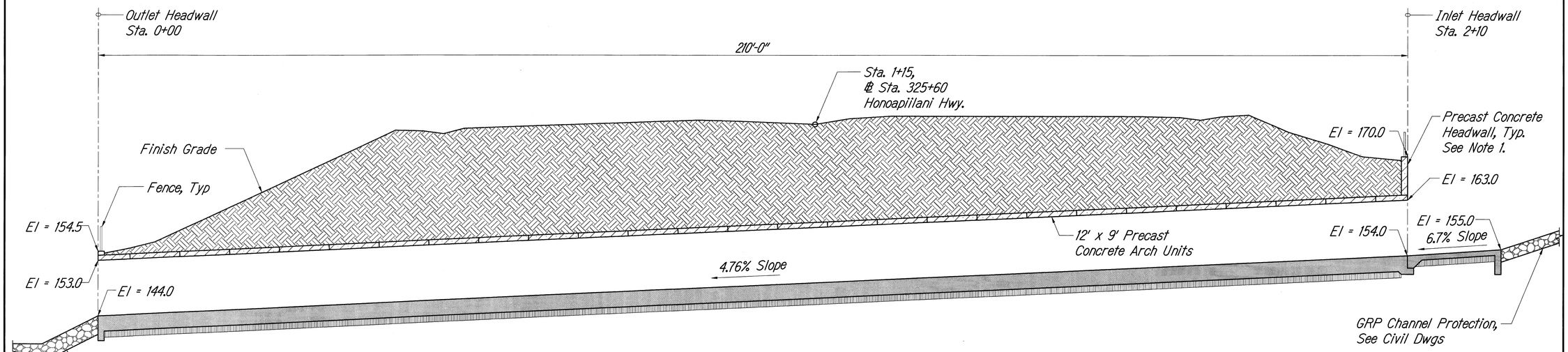
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S3.1 OF 54 SHEETS

P:\Drafting\2008-12-17_1917 bridge culvert\1917_S3-1.dwg, 95, 12/16/2009 3:07:32 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	128	213



CULVERT 2 - LONGITUDINAL SECTION ALONG CENTERLINE

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

1
S3.0 | S3.2

Note:
1. Precast fabricator shall design headwall connection to precast arch section. Calculations shall be stamped and signed by a structural engineer, licensed in Hawaii. Typical for all precast arch culverts.

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

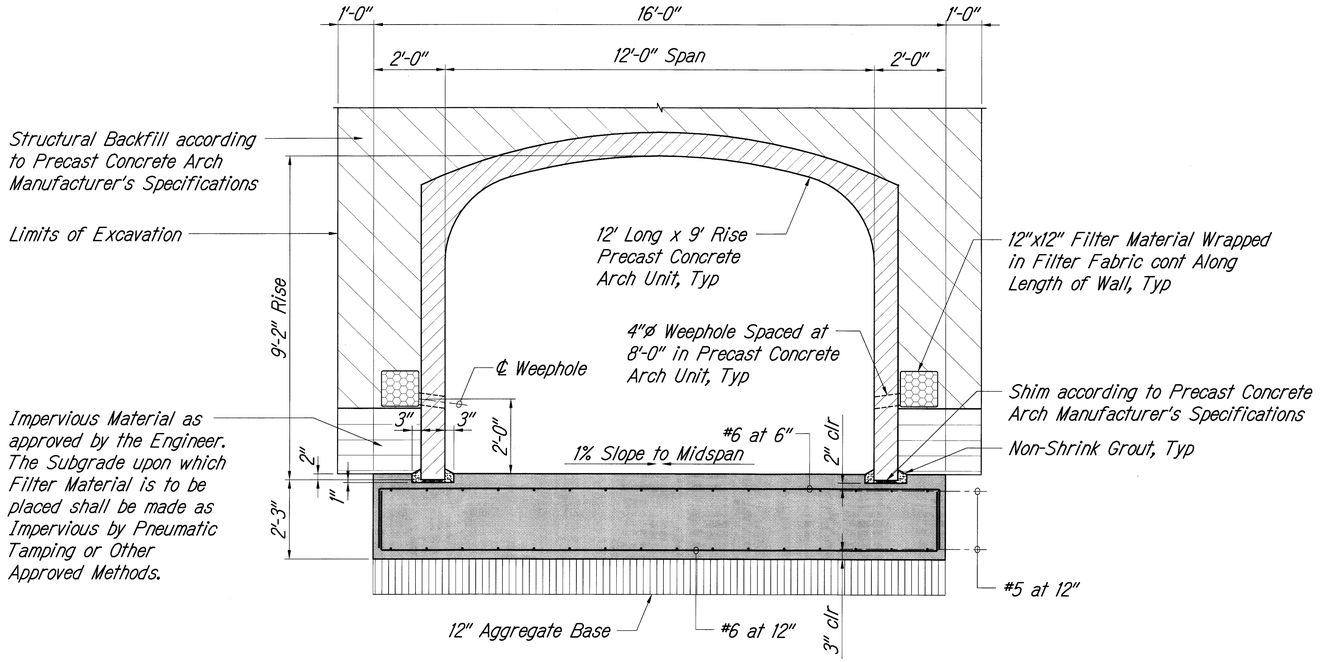
CULVERT 2 -
LONGITUDINAL SECTION
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

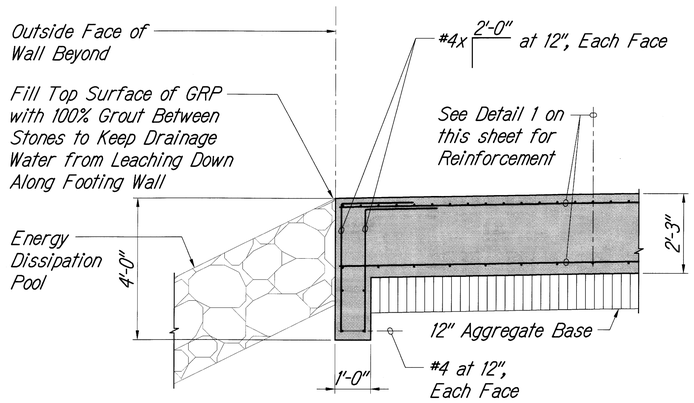
SHEET No. S3.2 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S3.2.dwg, 96, 12/16/2009 3:07:33 PM, tumanaha, 1:1

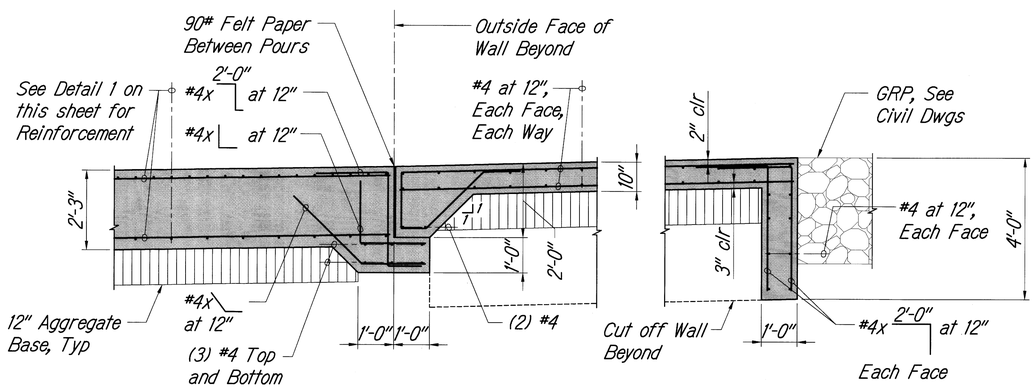
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	129	213



SECTION 1
Scale: 1/2" = 1'-0"
S3.0 | S3.3



SECTION AT OUTLET 2
Scale: 1/2" = 1'-0"
S3.0 | S3.3



SECTION AT INLET 3
Scale: 1/2" = 1'-0"
S3.0 | S3.3

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 8816-S
HAWAII, U.S.A.
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 2 - SECTIONS AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

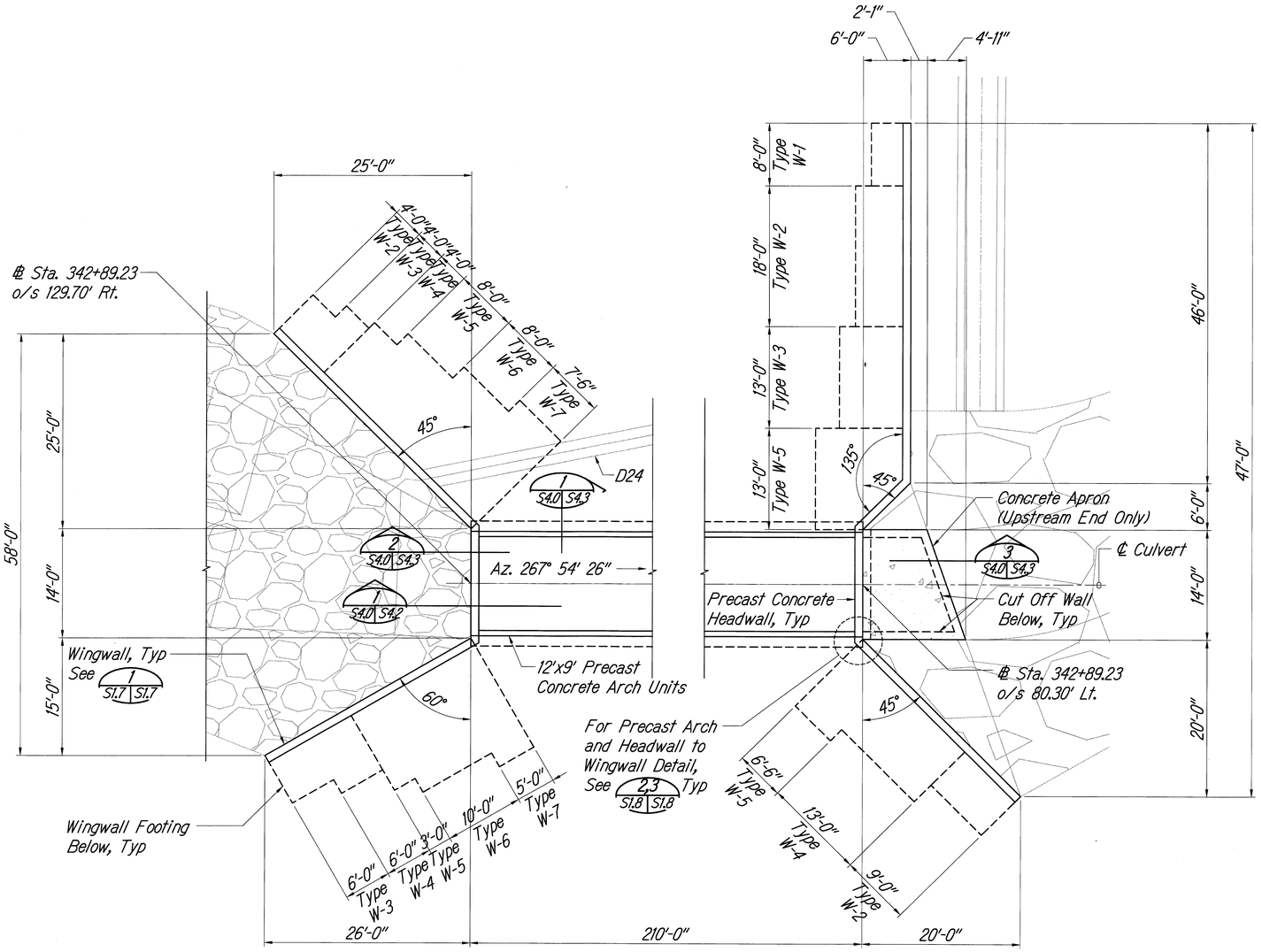
Scale: As Shown Date: November 23, 2009

SHEET No. S3.3 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S3-3.dwg, 24, 12/16/2009 3:07:34 PM, tumanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	130	213

TRUE NORTH
SCALE: 1/8" = 1'-0"



CULVERT 3 - PLAN ℄ STA. 342+89.2
Scale: 1/8" = 1'-0"

1
S4.0 S4.0

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 3 - PLAN

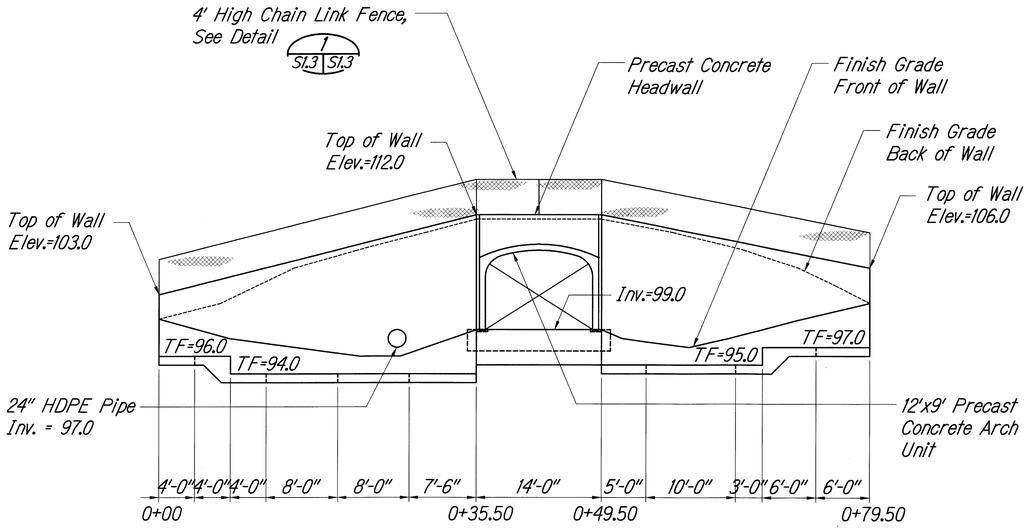
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S4.0 OF 54 SHEETS

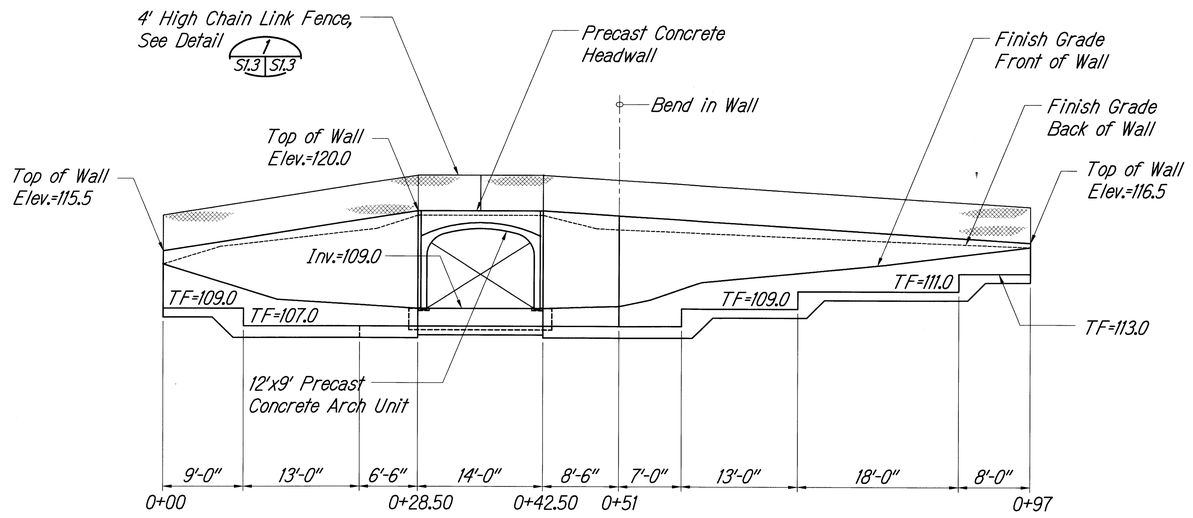
P:\Drafting\2009-12-17_1917 bridge culvert\1917_S4.0.dwg, 86, 12/16/2009 3:07:36 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	131	213



CULVERT 3 - OUTLET ELEVATION @ STA. 342+89 (1 / S4.1 | S4.1)

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



CULVERT 3 - INLET ELEVATION @ STA. 342+89.23 (2 / S4.1 | S4.1)

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

NEIL KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6618-E HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 3 - ELEVATIONS

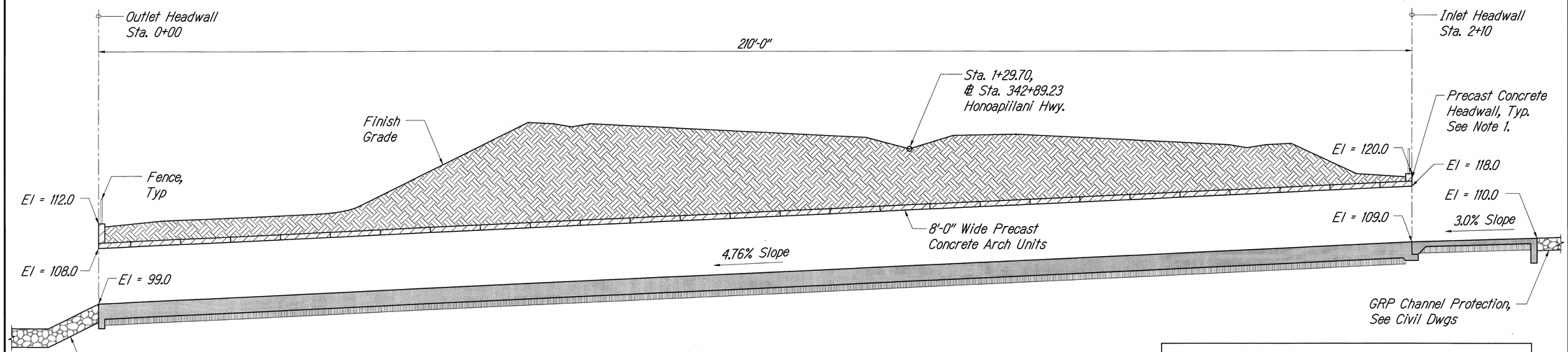
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S4.1 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S4-1.dwg, 96, 12/16/2009 3:07:37 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	132	213



CULVERT 3 - LONGITUDINAL SECTION ALONG CENTERLINE

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

1
S4.0 | S4.2

Note:
1. Precast fabricator shall design headwall connection to precast arch section. Calculations shall be stamped and signed by a structural engineer, licensed in Hawaii. Typical for all precast arch culverts.

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
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HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

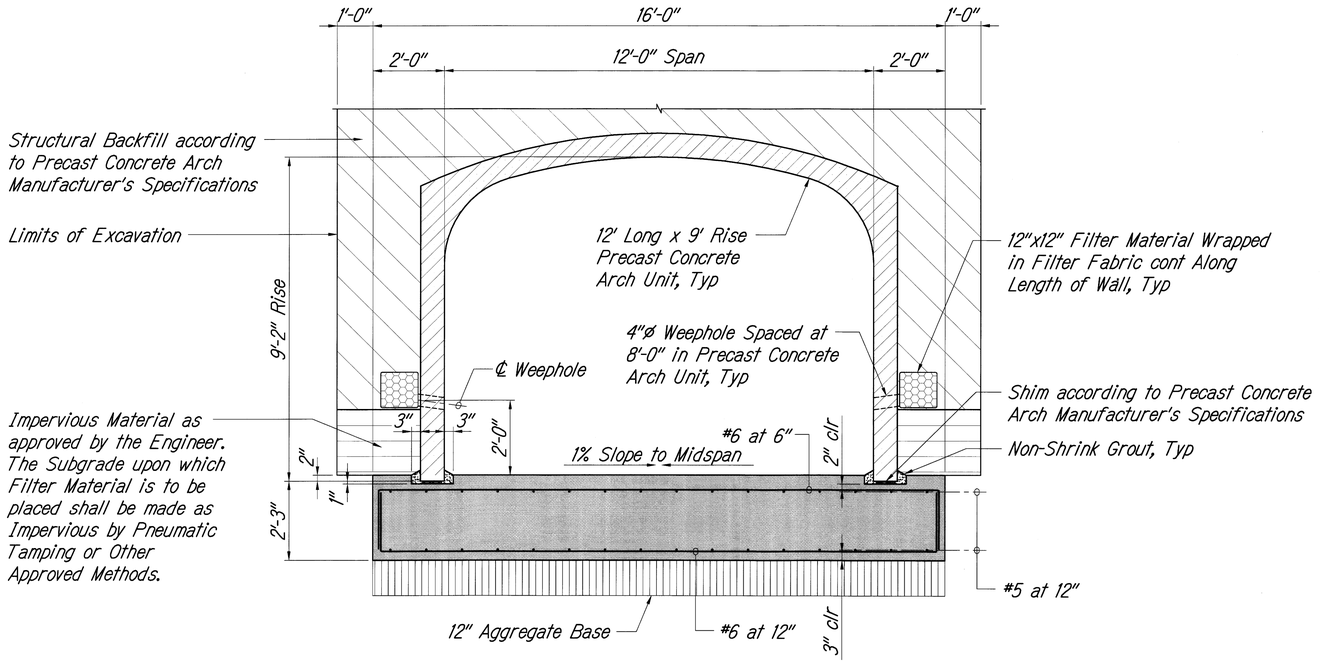
CULVERT 3 -
LONGITUDINAL SECTION
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

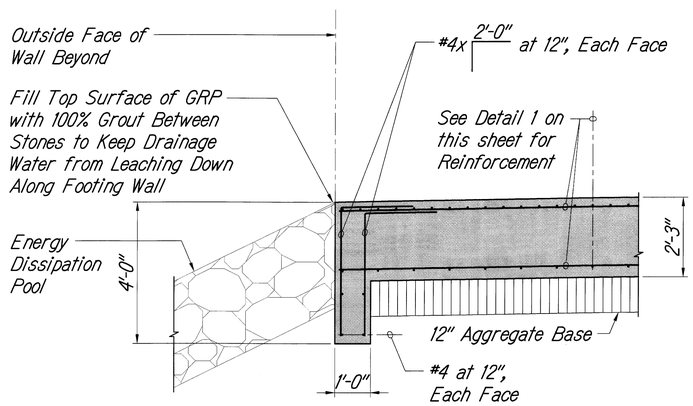
SHEET No. S4.2 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S4.2.dwg, 86, 12/16/2009 3:07:38 PM, tamanaha, 1:1

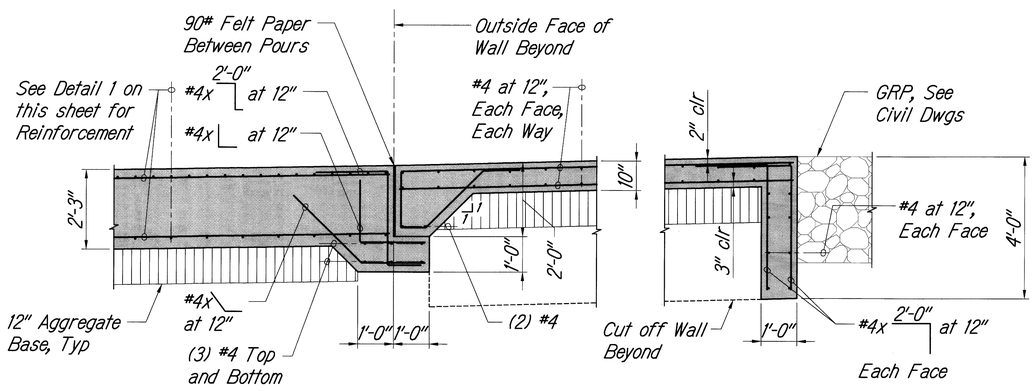
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	133	213



SECTION 1
Scale: 1/2" = 1'-0"
S4.0 | S4.3



SECTION AT OUTLET 2
Scale: 1/2" = 1'-0"
S4.0 | S4.3



SECTION AT INLET 3
Scale: 1/2" = 1'-0"
S4.0 | S4.3

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
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EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 3 - SECTIONS AND DETAILS

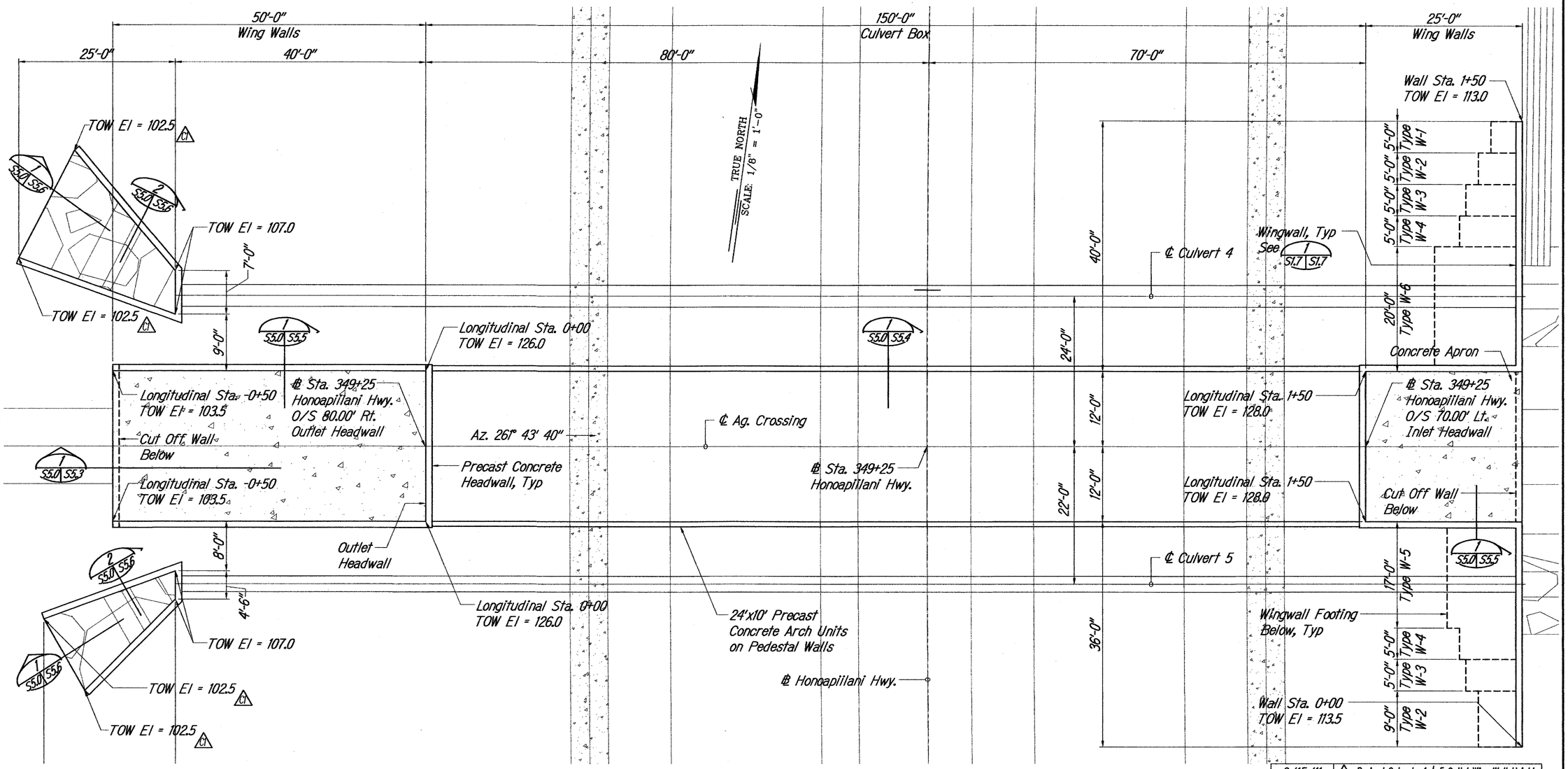
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S4.3 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S4-3.dwg, 24, 12/16/2009 3:07:39 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 134	213



AG. CROSSING - LAYOUT PLAN

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

S5.0 | S5.0

DATE	REVISION
6/15/11	C1 Revised Culverts 4 & 5 Outlet Wing Wall Heights

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

AG. CROSSING - LAYOUT PLAN

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

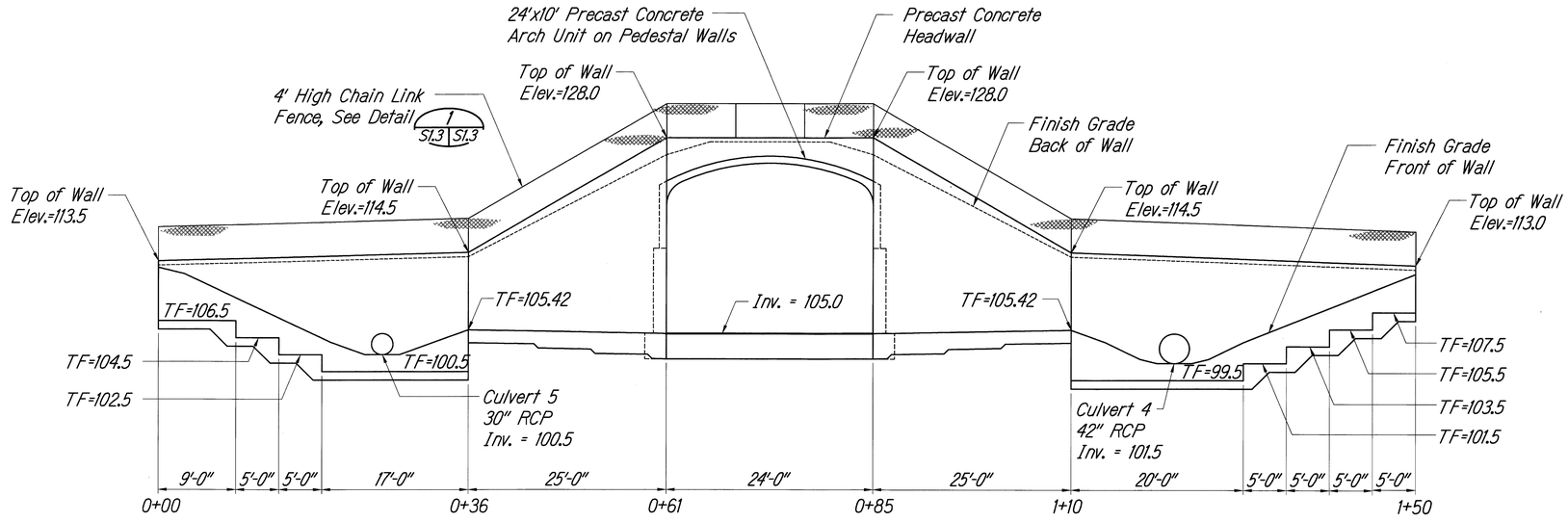
EXPIRATION DATE OF THE LICENSE 4/30/2012
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET No. S5.0 OF 54 SHEETS

C.O.134

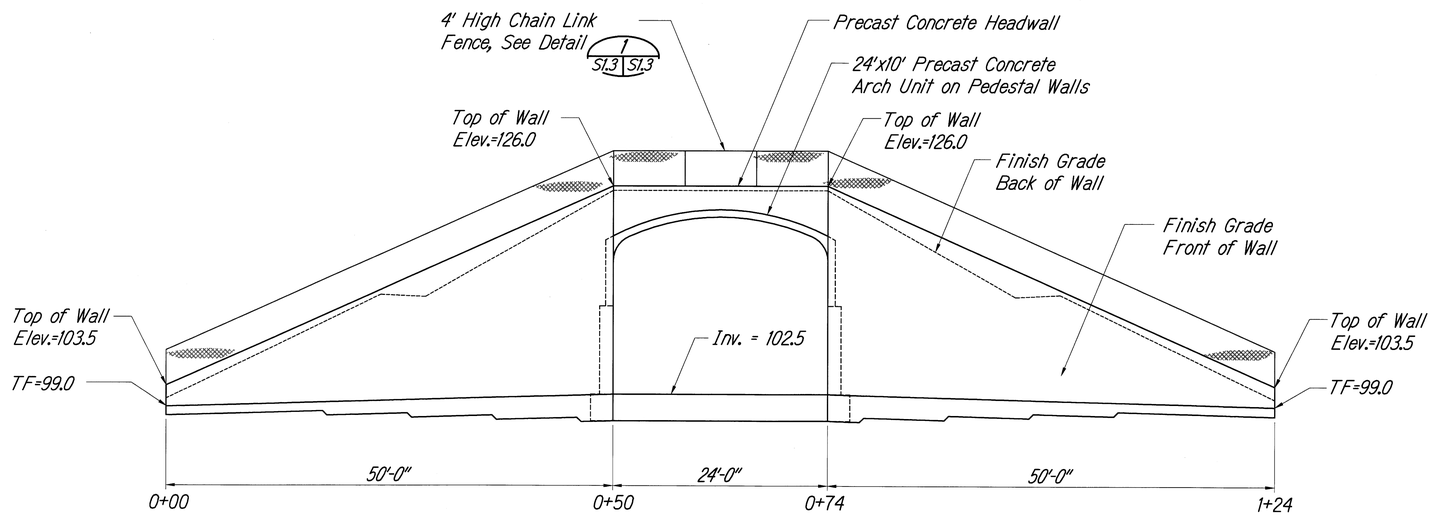
H:\planning\2011-06-22_191_CHANGE ORDER\191_S5-0 CO.dwg, 6/22/2011 4:26:50 PM, tamanaha

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	135	213



AG. CROSSING - INLET ELEVATION BASELINE STATION 349+25 (1 / S5.1 | S5.1)

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



AG. CROSSING - OUTLET ELEVATION BASELINE STATION 349+25 (2 / S5.1 | S5.1)

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

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6616-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

AG. CROSSING - INLET AND OUTLET ELEVATIONS

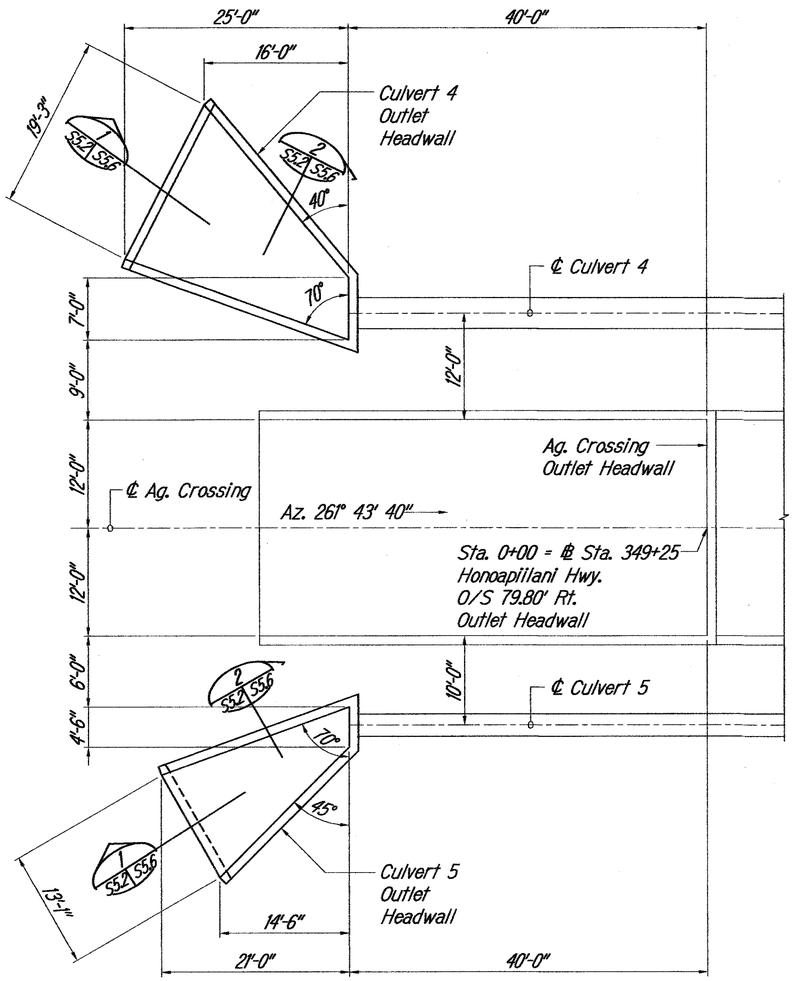
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S5.1 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S5-1.dwg, 96, 12/16/2009 3:07:42 PM, tamanaha, 1:1

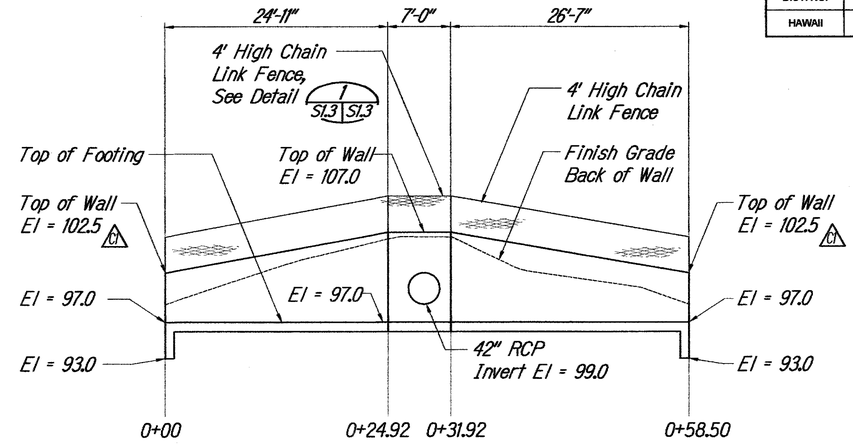
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 136	213



CULVERTS 4 AND 5 - OUTLET PLAN

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

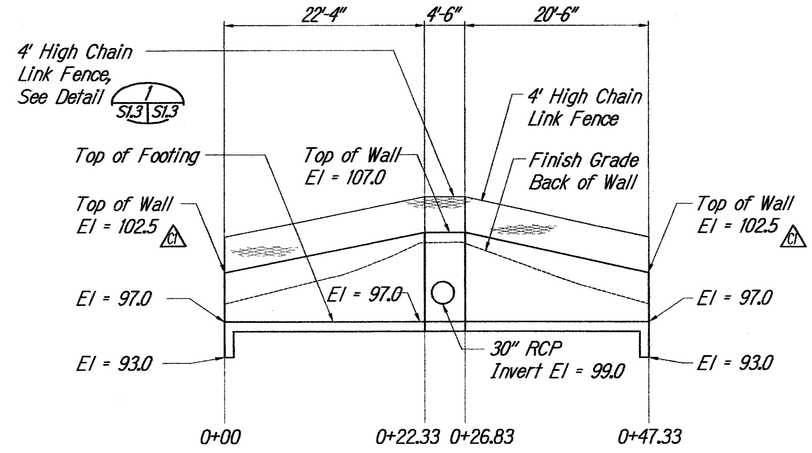
1 S5.2 | S5.2



CULVERT 4 - OUTLET ELEVATION BASELINE STATION 349+04.5

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

2 S5.2 | S5.2



CULVERT 5 - OUTLET ELEVATION BASELINE STATION 349+43.5

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

3 S5.2 | S5.2

DATE	REVISION
6/15/11	C1 Revised Culverts 4 & 5 Outlet Wing Wall Heights

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 4 AND 5 - PLAN AND ELEVATIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.

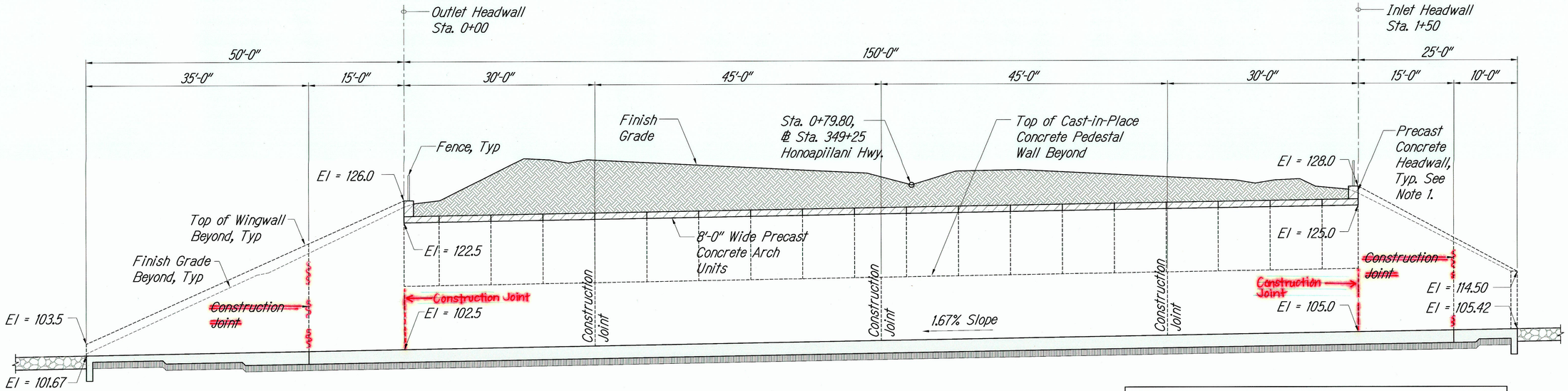
EXPIRATION DATE OF THE LICENSE: 4/30/2012
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET No. S5.2 OF 54 SHEETS

C.O.136

P:\plotting\2011-06-22_191 / CHANGE ORDER\191 / _35-C CO.dwg, 6/22/2011 4:27:20 PM, tamanaha

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	137	213



⚠ AG. CROSSING - LONGITUDINAL SECTION ALONG CENTERLINE (1 / S5.0 | S5.3)

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

Note:

1. Precast fabricator shall design headwall connection to precast arch section. Calculations shall be stamped and signed by a structural engineer, licensed in Hawaii. Typical for all precast arch culverts.

DATE	REVISION
1/18/10	⚠ Revised AG. Crossing

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

AG. CROSSING - LONGITUDINAL SECTION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 8818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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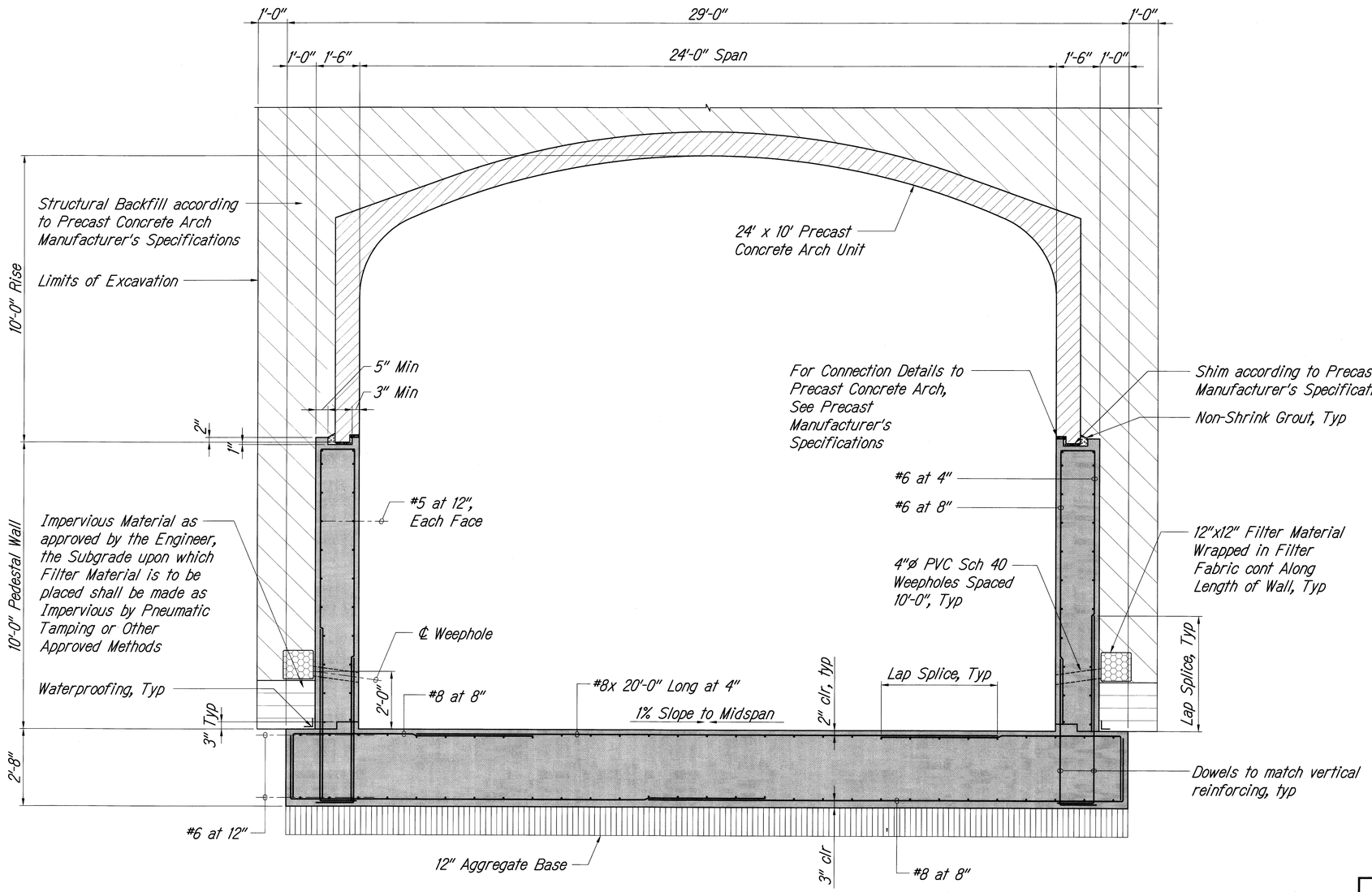
SHEET No. S5.3 OF 54 SHEETS

"AS-BUILT"

ADD. 137

P:\Drafting\2010-01-14_1917 bridge culvert - addendum 1\1917_S5-3 ADD 1.dwg, 96, 1/15/2010 11:29:05 AM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	138	213



SECTION 1
Scale: 1/2" = 1'-0" S5.0 | S5.4

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

AG. CROSSING - SECTION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

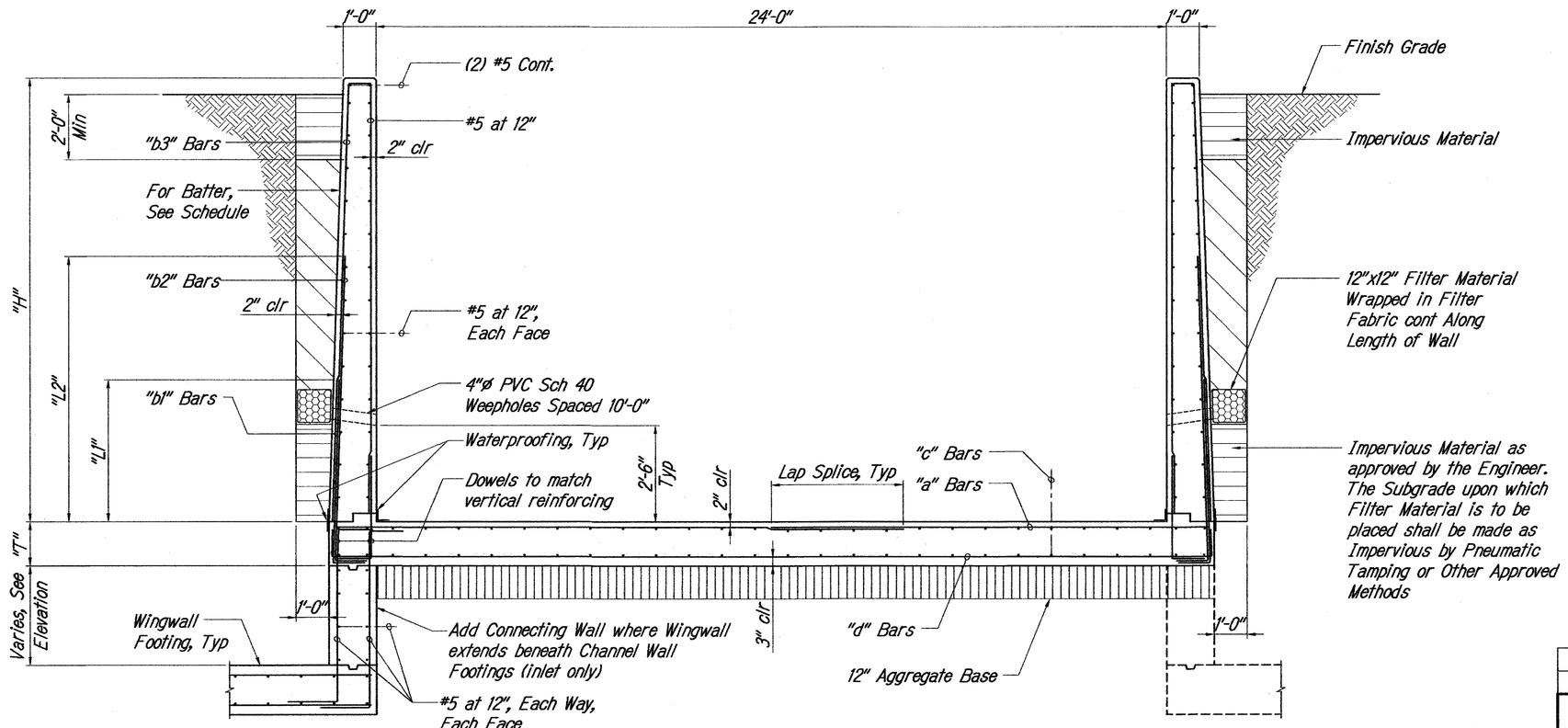
Scale: As Shown Date: November 23, 2009

SHEET No. S5.4 OF 54 SHEETS

P:\Drafting\2008-12-17_1917 bridge culvert\1917_S5-4.dwg, 24, 12/16/2009 3:07:46 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 139	213

Ag. Crossing Channel Wall Schedule											
Wall Height "H"	Dimensions				Reinforcing						
	"T"	"L1"	"L2"	Batter	"a" Bars	"b1" Bars	"b2" Bars	"b3" Bars	"c" Bars	"d" Bars	
22'-0" < "H" ≤ 24'-0"	2'-8"	7'-0"	17'-0"	3/4 : 12	#6 at 12"	#8 at 8"	#8 at 8"	#5 at 8"	#6 at 12"	#8 at 4"	C1
20'-0" < "H" ≤ 22'-0"	2'-8"	7'-0"	15'-0"	3/4 : 12	#6 at 12"	#8 at 8"	#8 at 8"	#5 at 8"	#5 at 12"	#8 at 4"	C1
18'-0" < "H" ≤ 20'-0"	2'-4"	6'-0"	13'-0"	3/4 : 12	#6 at 12"	#7 at 8"	#7 at 8"	#5 at 8"	#5 at 12"	#7 at 4"	C1
16'-0" < "H" ≤ 18'-0"	2'-0"	5'-0"	11'-0"	3/4 : 12	#6 at 12"	#6 at 8"	#6 at 8"	#5 at 8"	#5 at 12"	#7 at 4"	
14'-0" < "H" ≤ 16'-0"	2'-0"	5'-0"	9'-0"	3/4 : 12	#6 at 12"	#6 at 8"	#6 at 8"	#5 at 8"	#5 at 12"	#6 at 4"	
12'-0" < "H" ≤ 14'-0"	1'-8"	4'-0"	7'-0"	3/4 : 12	#6 at 12"	#5 at 8"	#5 at 8"	#5 at 8"	#5 at 12"	#6 at 4"	
10'-0" < "H" ≤ 12'-0"	1'-4"	4'-0"	-	-	#5 at 12"	#5 at 4"	-	#5 at 12"	#4 at 12"	#6 at 4"	
8'-0" < "H" ≤ 10'-0"	1'-4"	4'-0"	-	-	#5 at 12"	#5 at 8"	-	#5 at 12"	#4 at 12"	#6 at 8"	
6'-0" < "H" ≤ 8'-0"	1'-0"	4'-0"	-	-	#5 at 12"	#5 at 12"	-	#5 at 12"	#4 at 12"	#6 at 8"	
"H" ≤ 6'-0"	1'-0"	4'-0"	-	-	#5 at 12"	#5 at 12"	-	#5 at 12"	#4 at 12"	#5 at 8"	



SECTION 1 / S5.0 | S5.5
Scale: 1/2" = 1'-0"

6/15/11	C1 Revised Channel Wall Reinforcement
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

AG. CROSSING - CHANNEL WALL SECTION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THIS LICENSE 4/30/2012
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

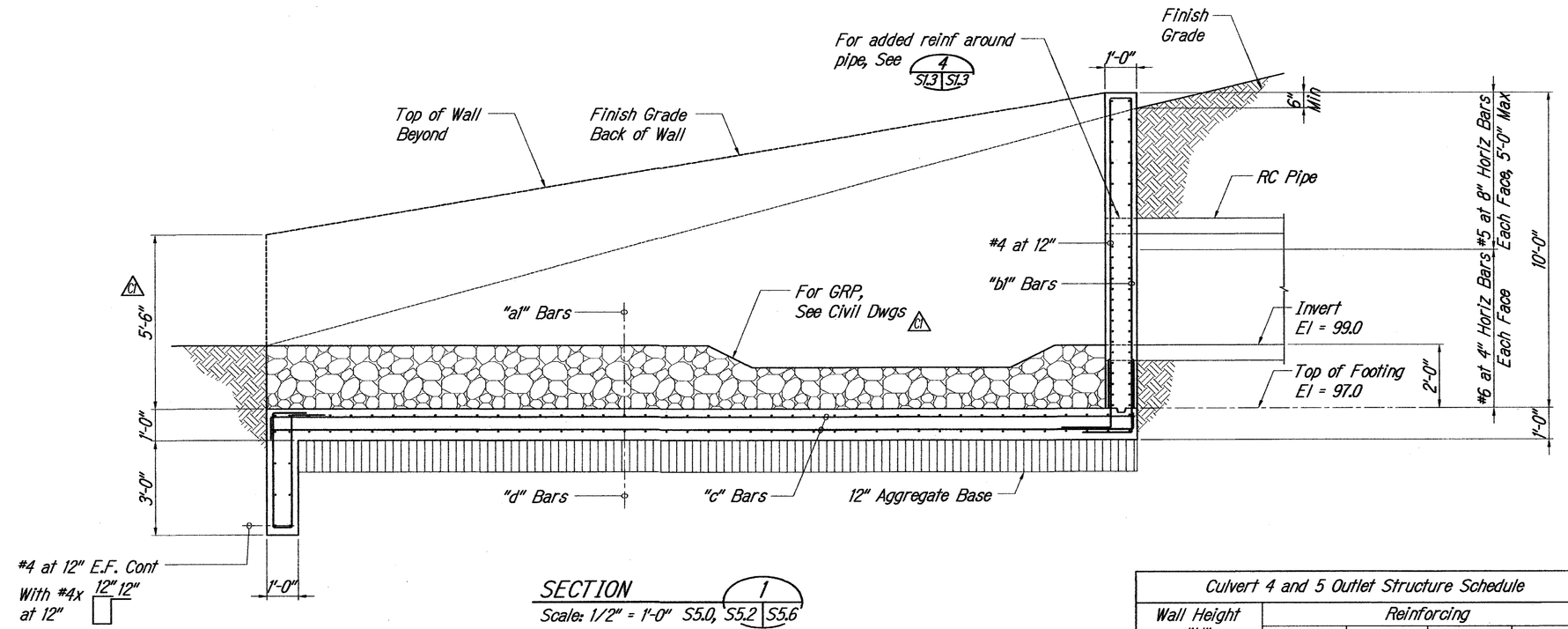
Scale: As Shown Date: November 23, 2009

SHEET No. S5.5 OF 54 SHEETS

C.O.139

P:\Drafting\2011-06-22_1917 CHANGE ORDER\1917_S5-5 CO.dwg, 6/22/2011 4:27:45 PM, tamarisha

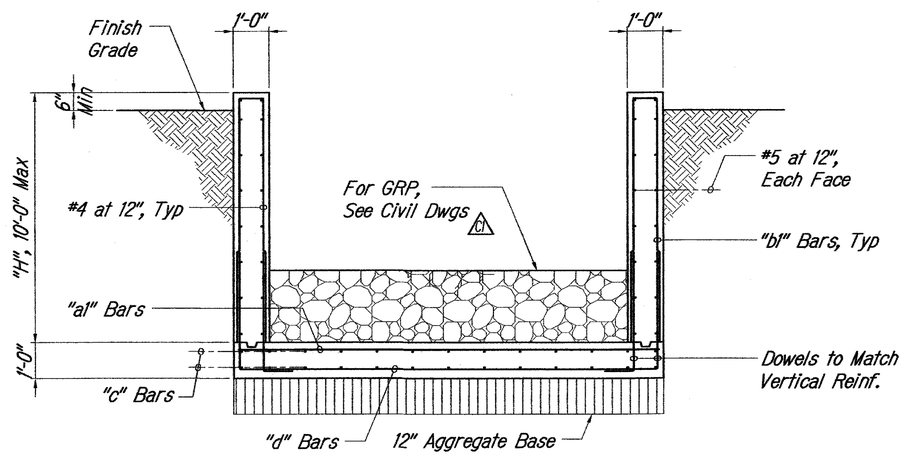
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 140	213



SECTION 1
Scale: 1/2" = 1'-0" S5.0, S5.2 S5.6

Note:
For Headwall Reinforcement Detailing, See 3 S1.6 S1.6

Culvert 4 and 5 Outlet Structure Schedule				
Wall Height "H"	Reinforcing			
	"a1" Bars	"b1" Bars	"c" Bars	"d" Bars
≤ 10'-0"	#4 at 12"	#6 at 8"	#4 at 12"	#6 at 8"
≤ 8'-0"	#4 at 12"	#5 at 8"	#4 at 12"	#5 at 8"
≤ 6'-0"	#4 at 12"	#4 at 8"	#4 at 12"	#4 at 8"



SECTION 2
Scale: 1/2" = 1'-0" S5.0, S5.2 S5.6

DATE	REVISION
6/15/11	C1 Revised Culverts 4 & 5 Outlet Protection & Wing Wall Heights

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 4 AND 5 - SECTIONS AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2012
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET No. S5.6 OF 54 SHEETS

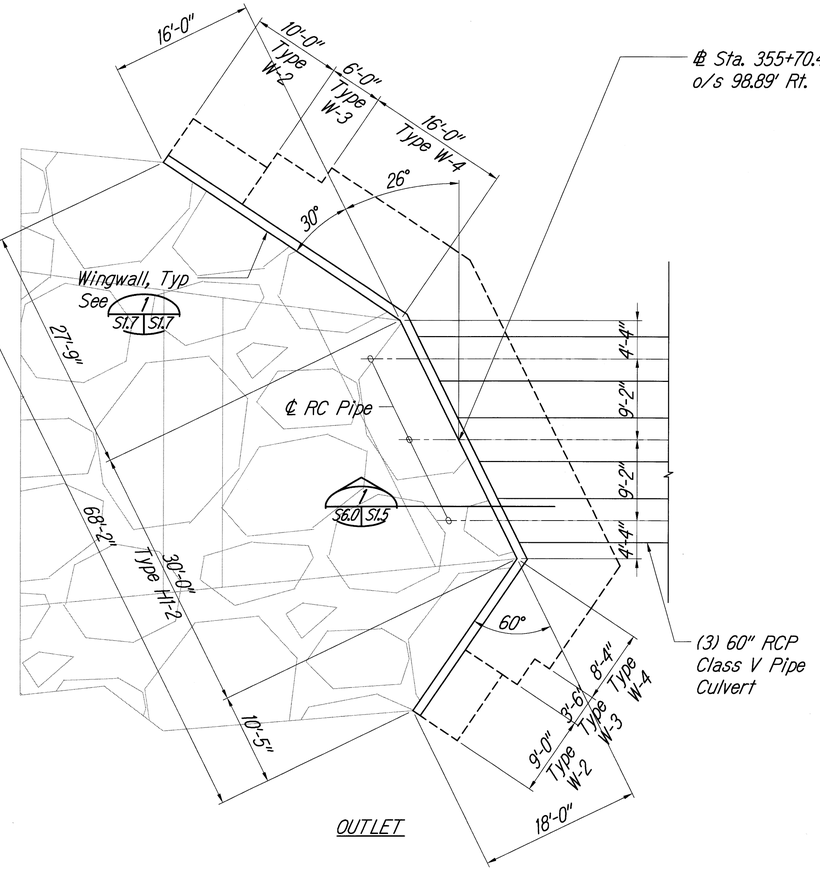
C.O.140

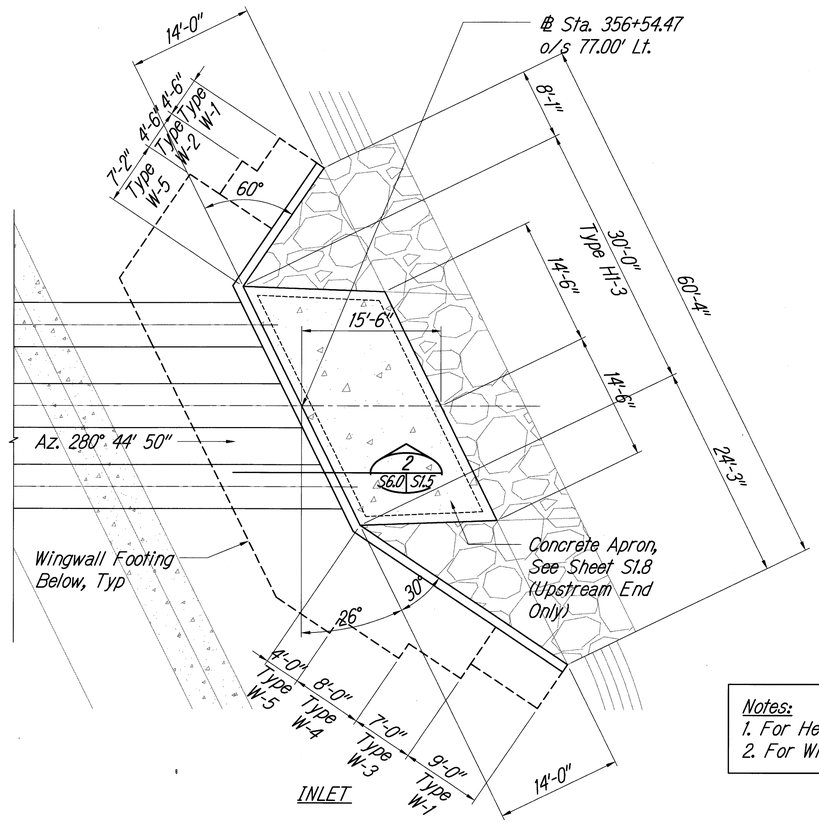
P:\Detailing\2011-06-24_191\CHANGE ORDER\191_S5-6 CO.dwg, 6/22/2011 4:28:12 PM, tamanaha

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	141	213

TRUE NORTH

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





Notes:
1. For Headwall Details, See Sheet S1.4.
2. For Wingwall Details, See Sheet S1.7.

CULVERT 6 - PLAN ℄ STA 356+17 (1 | S6.0 | S6.0)
Scale: 1/8" = 1'-0"

KEIH KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6816-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 6 - PLAN

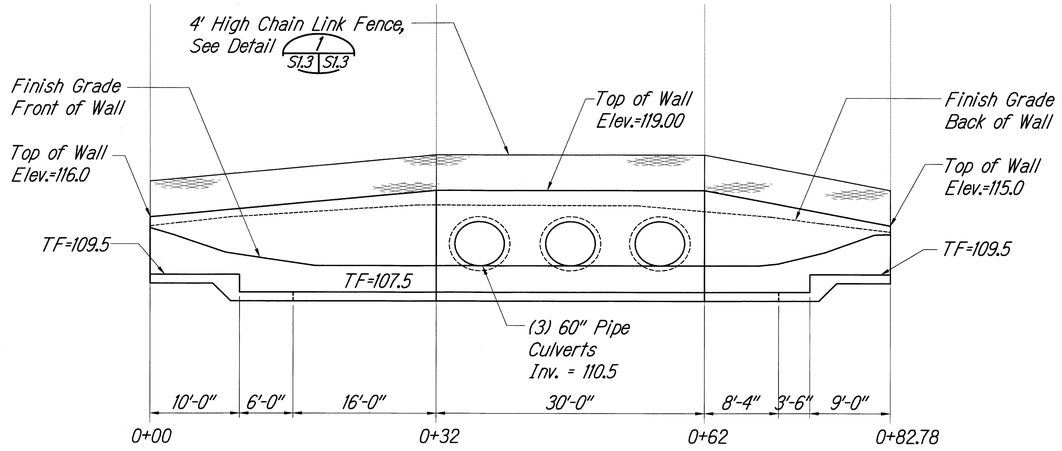
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S6.0 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S6-0.dwg, S6, 12/16/2009 3:07:50 PM, tumunaha, 1:1

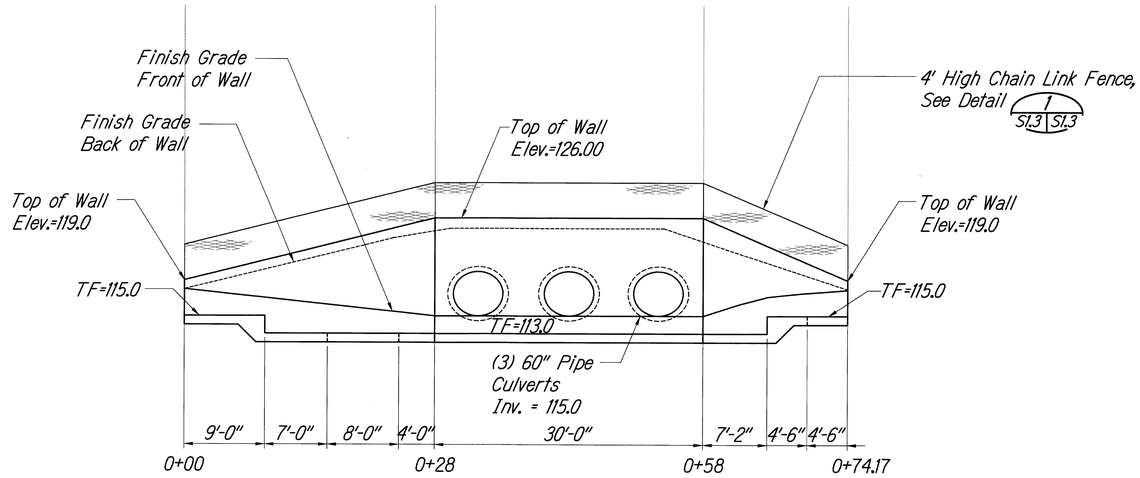
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	142	213



CULVERT 6 - OUTLET ELEVATION @ STA. 356+17 (1 / S6.1 | S6.1)

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

Notes:
1. For Headwall Details, See Sheet S1.4.
2. For Wingwall Details, See Sheet S1.7.



CULVERT 6 - INLET ELEVATION @ STA. 356+17 (2 / S6.1 | S6.1)

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

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 8818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 6 - ELEVATIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S6.1 OF 54 SHEETS

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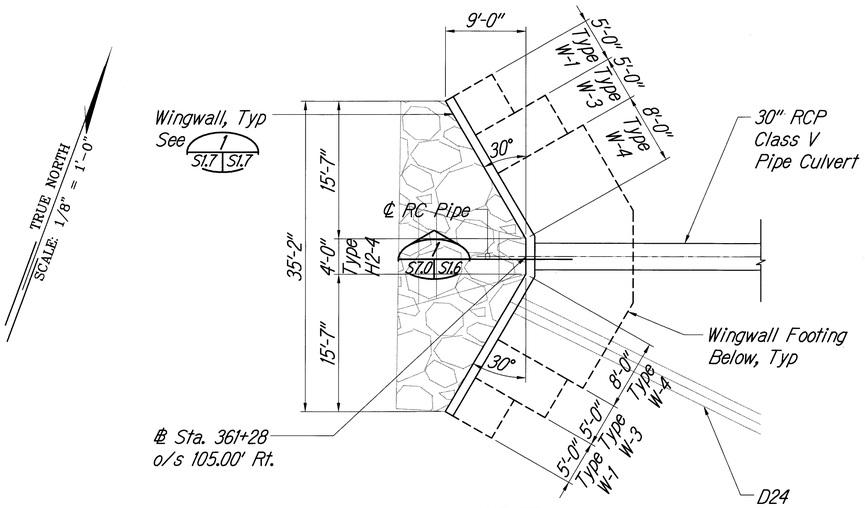
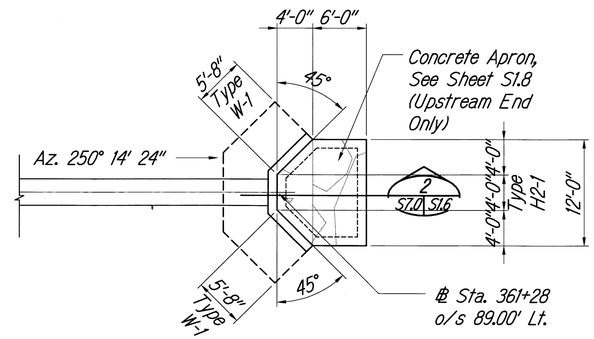
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	143	213



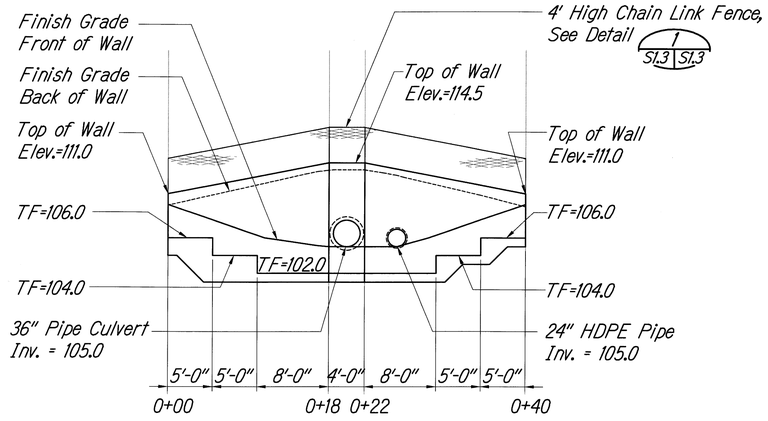


CULVERT 7 - PLAN ℄ STA. 361+28

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

1 S7.0 | S7.0

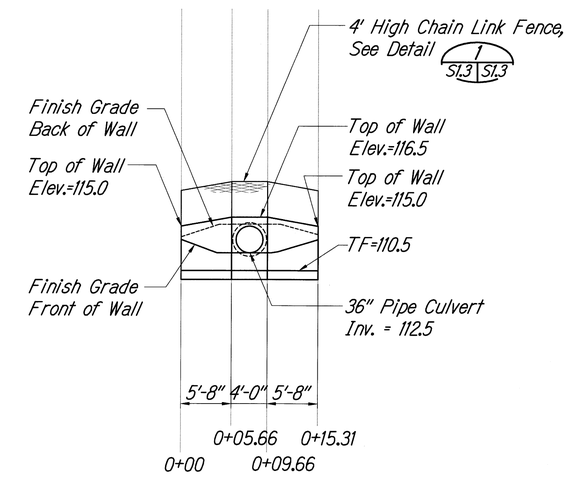
Notes:
1. For Headwall Details, See Sheet S1.6.
2. For Wingwall Details, See Sheet S1.7.



CULVERT 7 - OUTLET ELEVATION ℄ STA. 361+28

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

2 S7.0 | S7.0



CULVERT 7 - INLET ELEVATION ℄ STA. 361+28

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

3 S7.0 | S7.0

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 7 - PLAN AND ELEVATIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S7.0 OF 54 SHEETS

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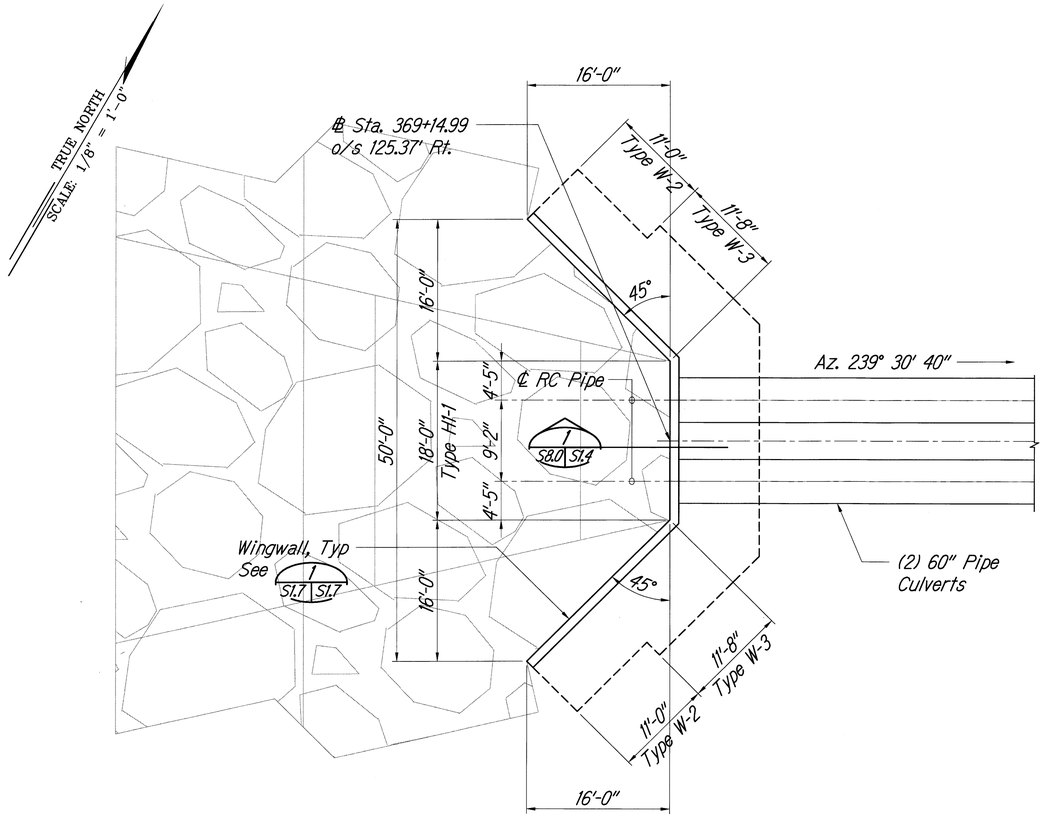
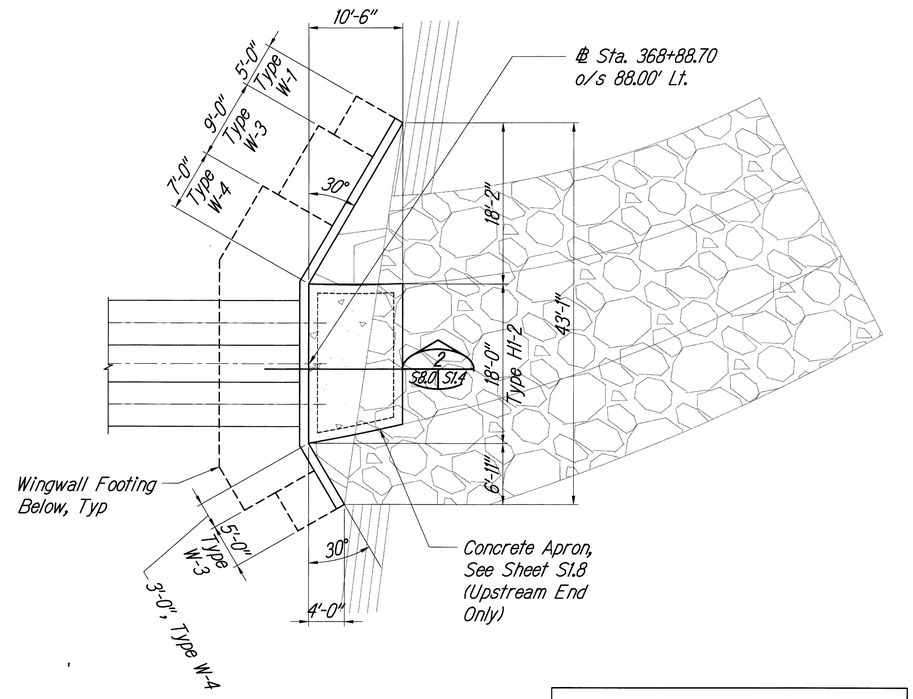
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	144	213



OUTLET



INLET

Notes:
1. For Headwall Details, See Sheet S1.4.
2. For Wingwall Details, See Sheet S1.7.

CULVERT 8 - PLAN ℄ STA. 369+00 (1 / S8.0 | S8.0)
Scale: 1/8" = 1'-0"

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6518-S
HAWAII, U.S.A.

EXPIRATION DATE OF THIS LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 8 - PLAN

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S8.0 OF 54 SHEETS

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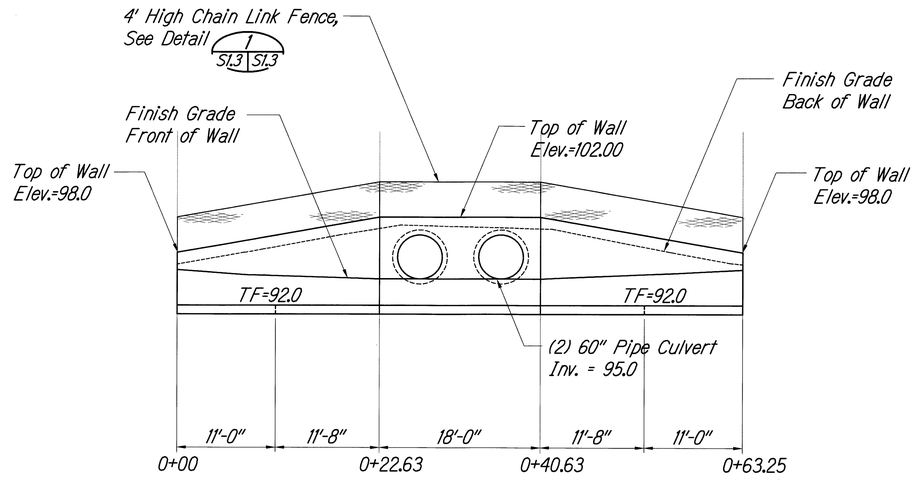
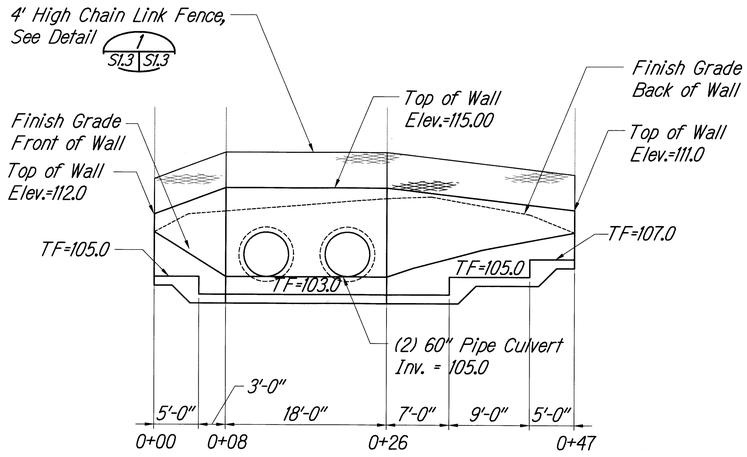
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	145	213



CULVERT 8 - OUTLET ELEVATION @ STA. 369+00 (1 / S8.1 S8.1)

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

Notes:
1. For Headwall Details, See Sheet S1.4.
2. For Wingwall Details, See Sheet S1.7.



CULVERT 8 - INLET ELEVATION @ STA. 369+00 (2 / S8.1 S8.1)

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

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6616-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 8 - ELEVATIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S8.1 OF 54 SHEETS

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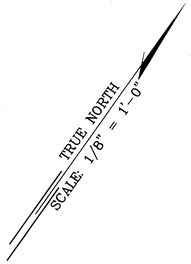
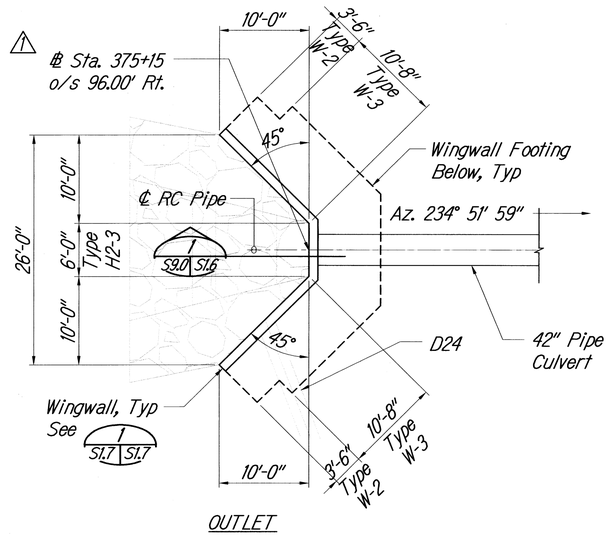
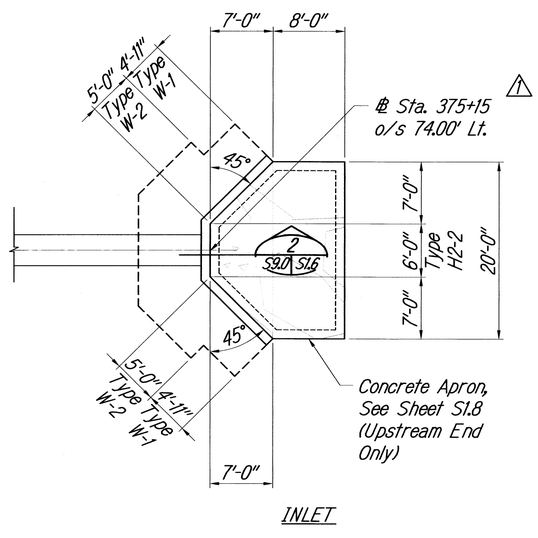
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	146	213





OUTLET



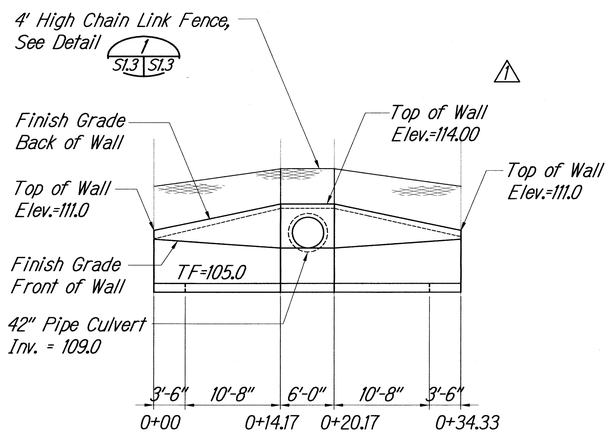
INLET

CULVERT 9 - PLAN ℄ STA. 375+15

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

1 S9.0 S9.0

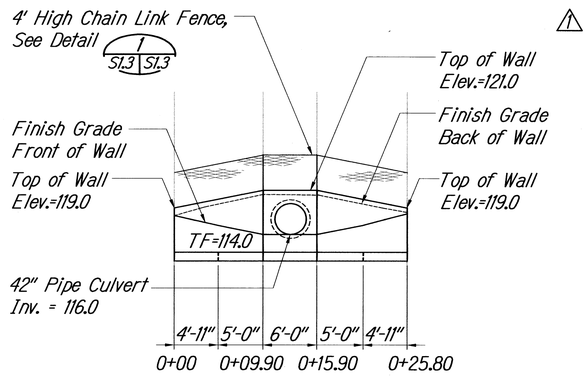
Notes:
1. For Headwall Details, See Sheet S1.6.
2. For Wingwall Details, See Sheet S1.7.



CULVERT 9 - OUTLET ELEVATION ℄ STA. 375+15

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

2 S9.0 S9.0



CULVERT 9 - INLET ELEVATION ℄ STA. 375+15

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

3 S9.0 S9.0

KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 8348-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

DATE	REVISION
1/18/10	⚠1 Revised Culvert 9

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 9 - PLAN AND ELEVATIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

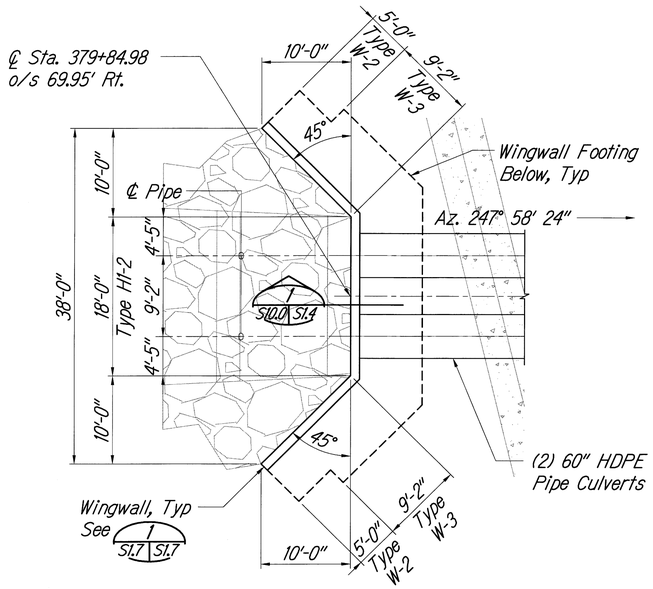
SHEET No. S9.0 OF 54 SHEETS

ADD. 146

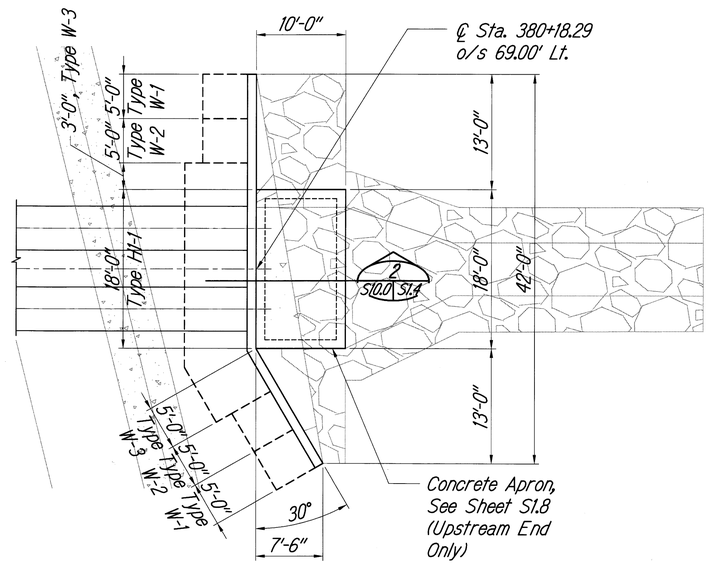
P:\Drafting\2010-01-14_1917 bridge culvert - addendum 1\1917_S9-0 ADD 1.dwg, 86, 1/15/2010 11:29:09 AM, tamashita, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	147	213

TRUE NORTH
SCALE: 1/8" = 1'-0"



OUTLET



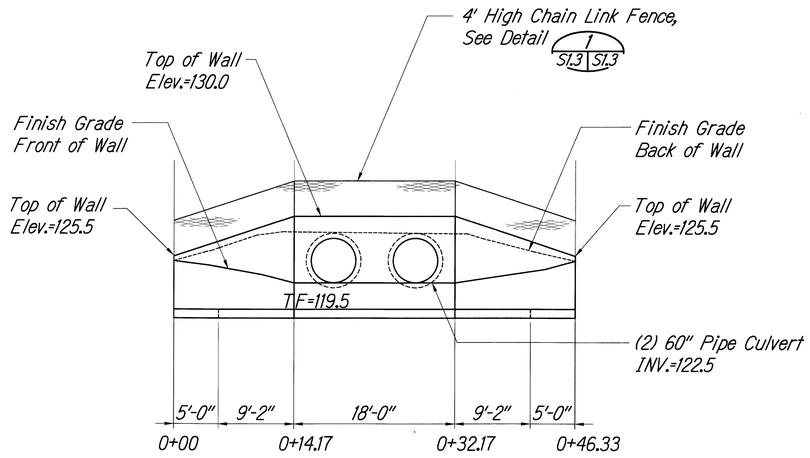
INLET

CULVERT 10 - PLAN ℄ STA. 380+02

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

1 S10.0 S10.0

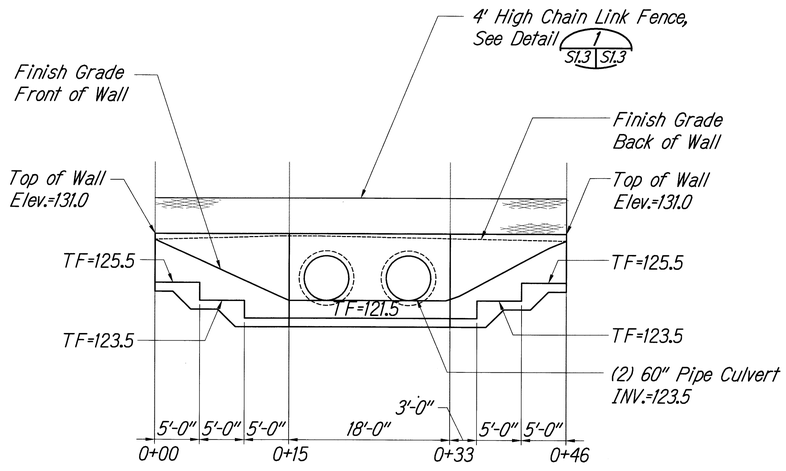
Notes:
1. For Headwall Details, See Sheet S1.4.
2. For Wingwall Details, See Sheet S1.7.



CULVERT 10 - OUTLET ELEVATION ℄ STA. 380+02

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

2 S10.0 S10.0



CULVERT 10 - INLET ELEVATION ℄ STA. 380+02

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

3 S10.0 S10.0

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6816-8
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CULVERT 10 -
PLAN AND ELEVATIONS
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S10.0 OF 54 SHEETS

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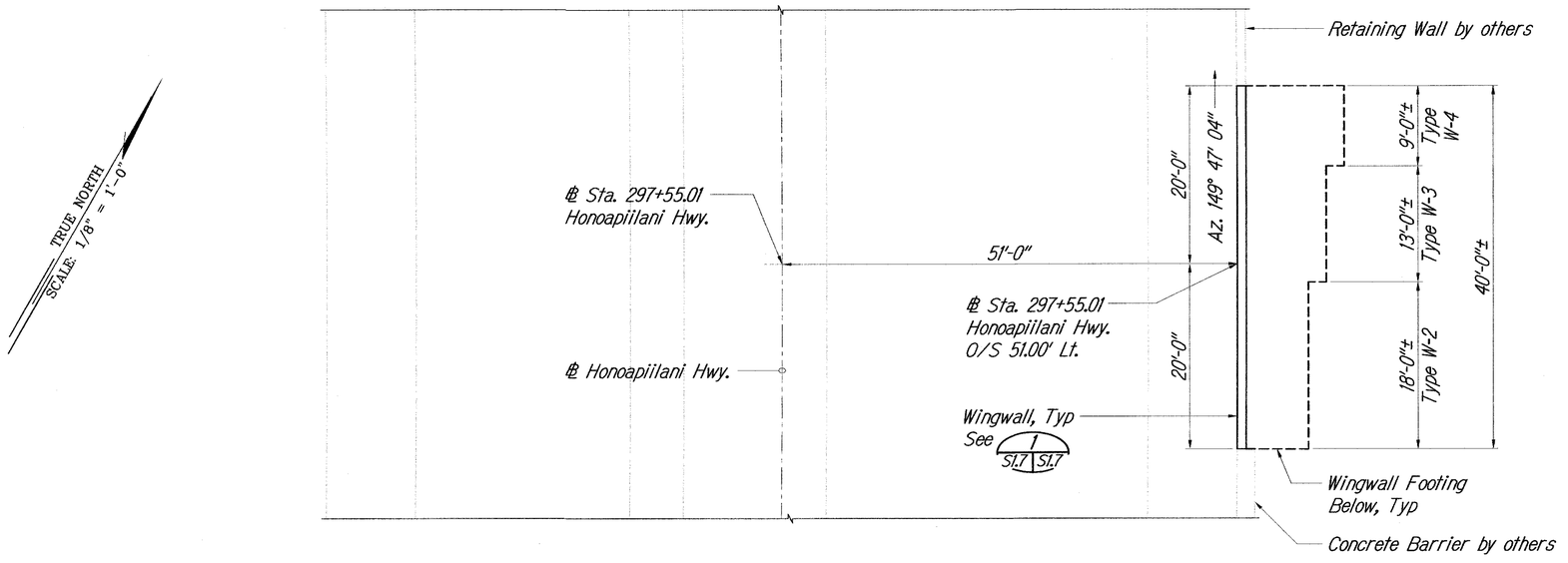
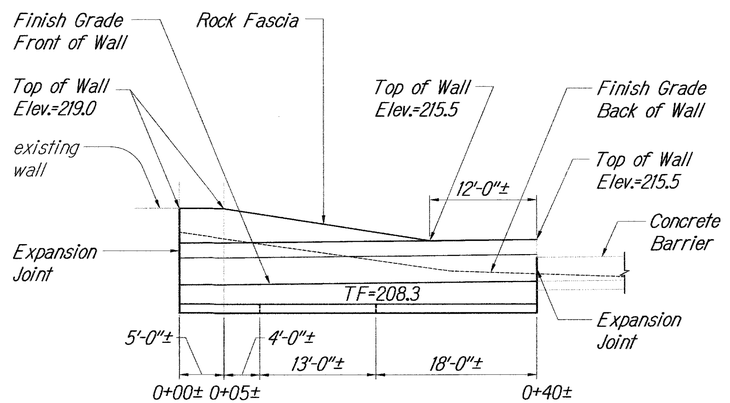
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	C.O. 148	213



RETAINING WALL PLAN ℄ STA. 297+35.01

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

1 (△1) S11.0 | S11.0



RETAINING WALL ELEVATION ℄ STA. 297+35.01

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

2 (△1) S11.0 | S11.0

05/22/12	△1 Revised Retaining Wall Profile
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RETAINING WALL PLAN AND ELEVATION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

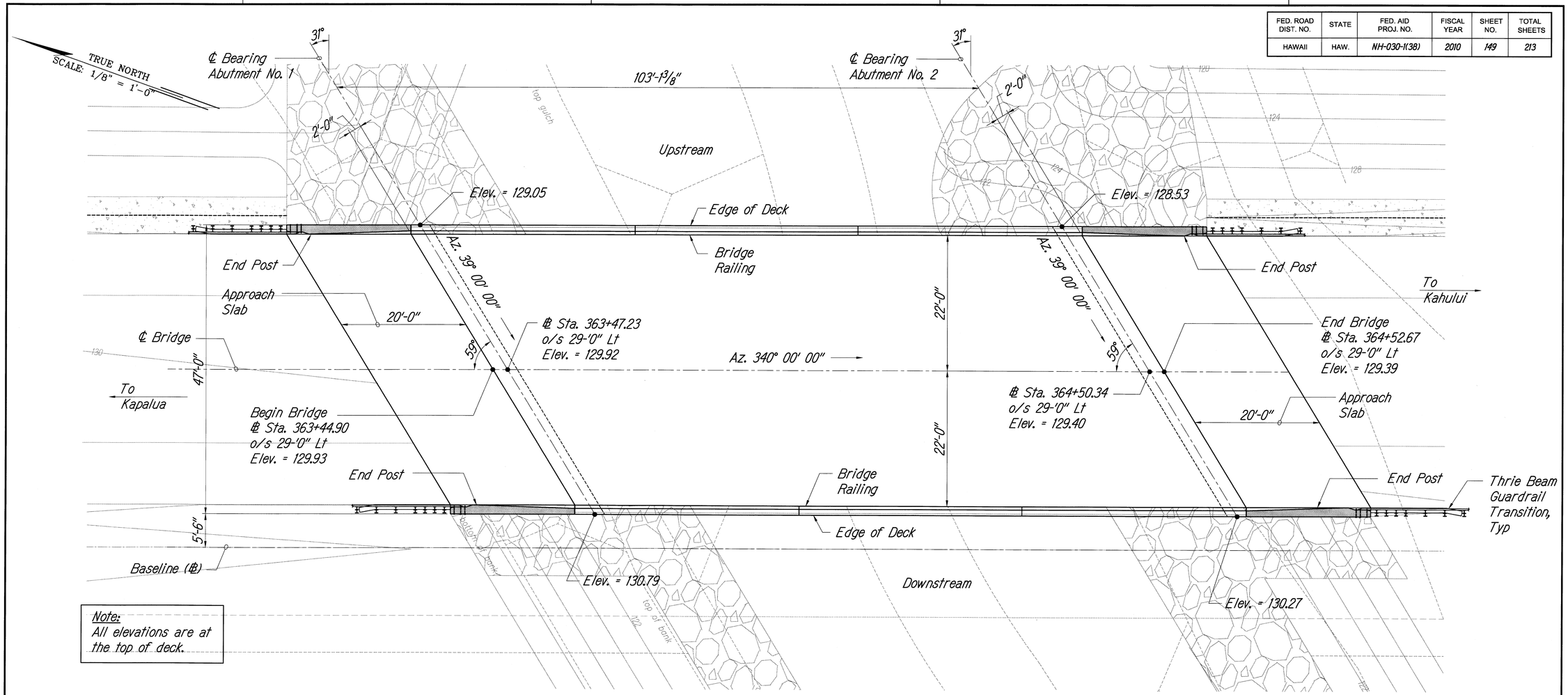
KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2012
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET No. S11.0 OF 54 SHEETS

C.O. 148

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	149	213



Note:
All elevations are at the top of deck.

BRIDGE LAYOUT PLAN
Scale: 1/8" = 1'-0"

1
S12.0 | S12.0

NEIL KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

KAUAULA STREAM BRIDGE
BRIDGE LAYOUT PLAN

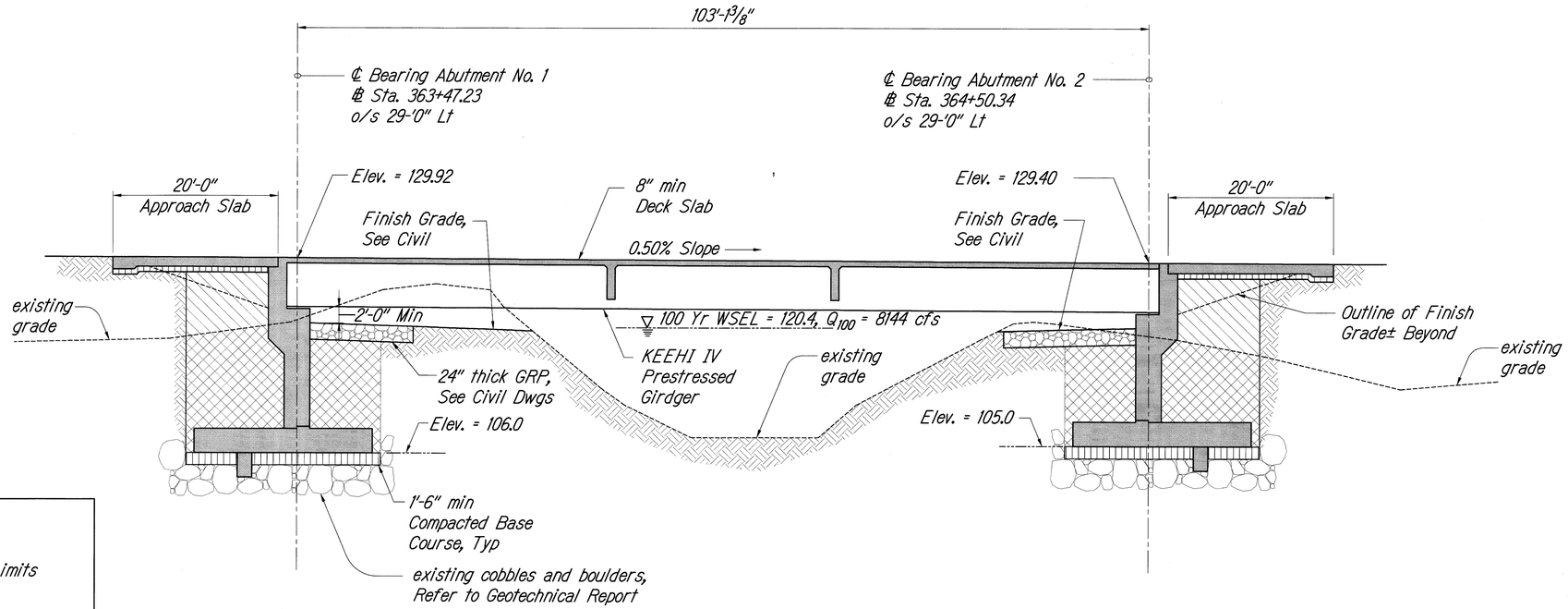
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S12.0 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S12-0.dwg, 96, 12/16/2009 3:08:04 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	150	213



Legend:

Backfill Pay Limits

Excavation Pay Limits

LONGITUDINAL SECTION ALONG CENTERLINE OF BRIDGE

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

1
S12.0 | S12.1

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

KAUAULA STREAM BRIDGE
BRIDGE LONGITUDINAL SECTION
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S12.1 OF 54 SHEETS

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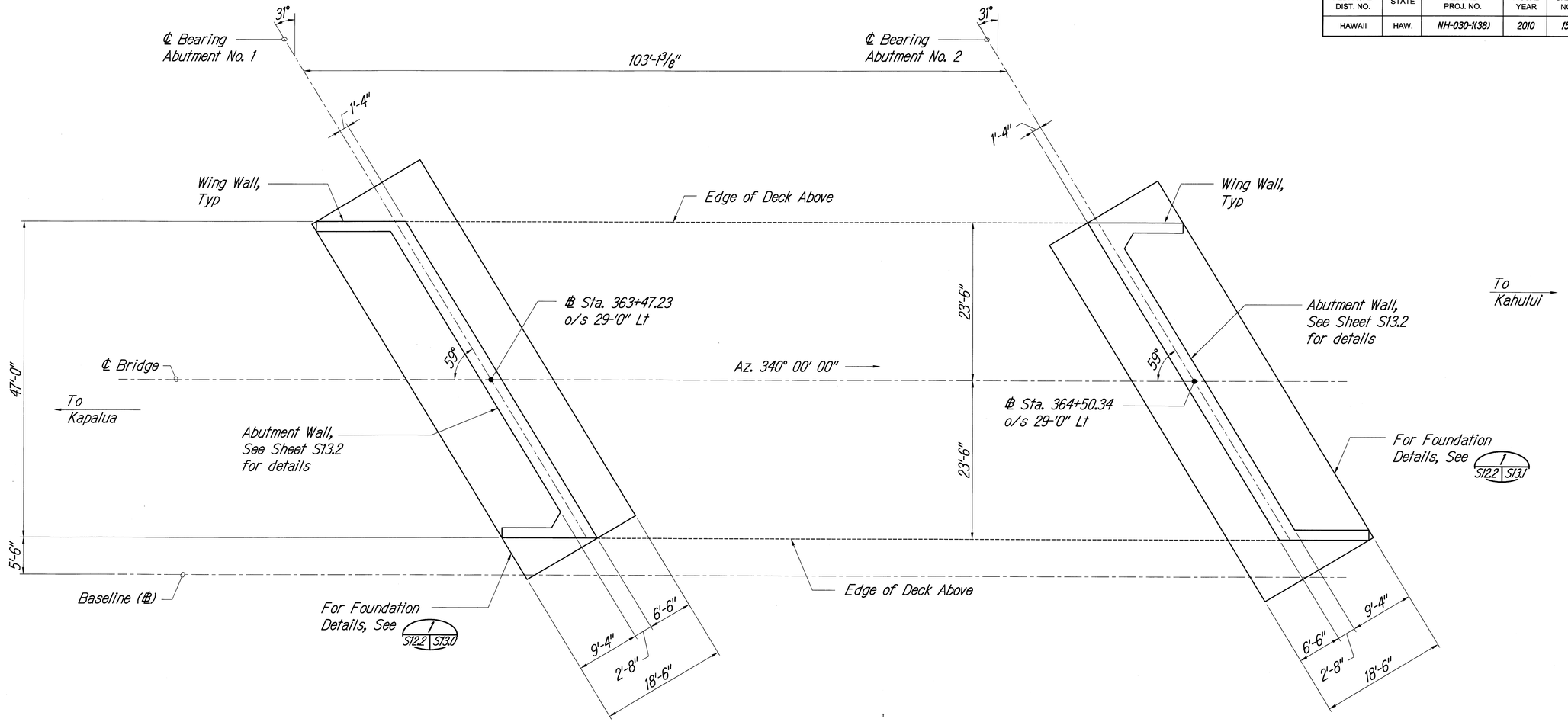
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	151	213



FOUNDATION LAYOUT PLAN (1 / S12.2 | S12.2)

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

KENT KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

KAUAULA STREAM BRIDGE
FOUNDATION LAYOUT PLAN

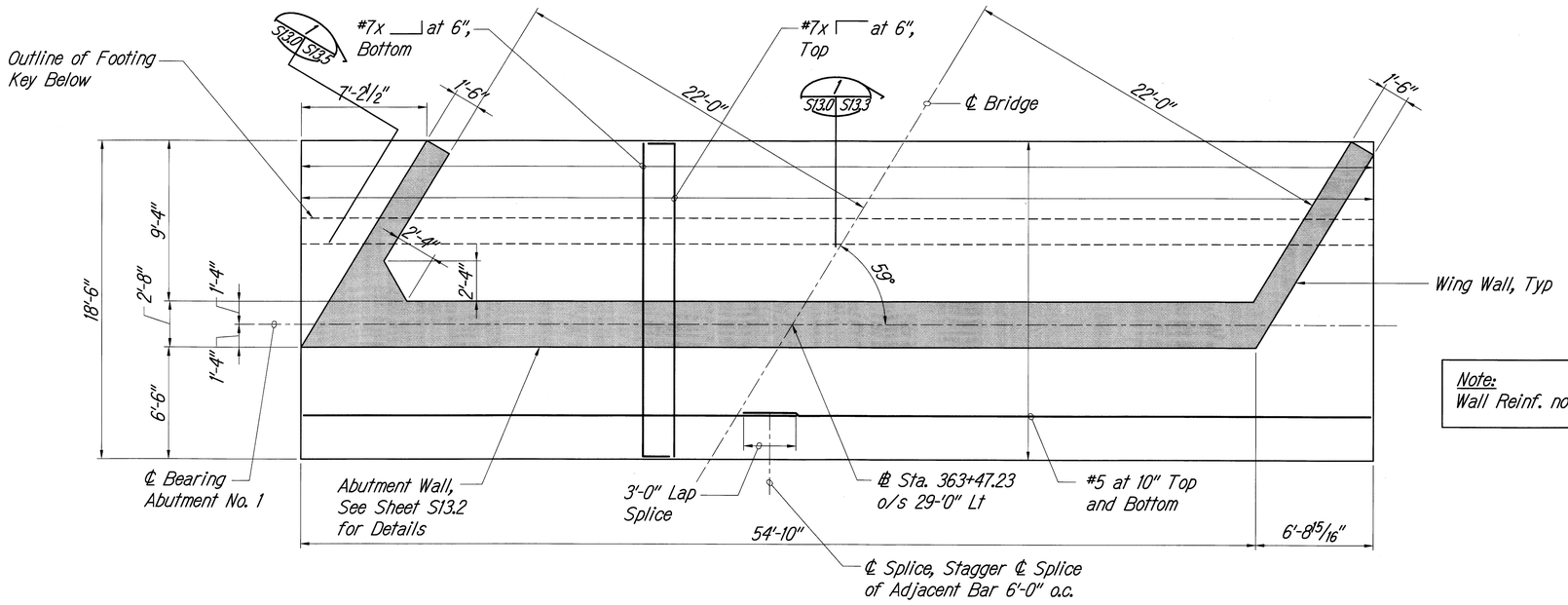
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S12.2 OF 54 SHEETS

P:\Drafting\2009\12-17_1917 bridge culvert\1917_S12-2.dwg, 96, 12/16/2009 3:08:07 PM, tamnaiha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	152	213

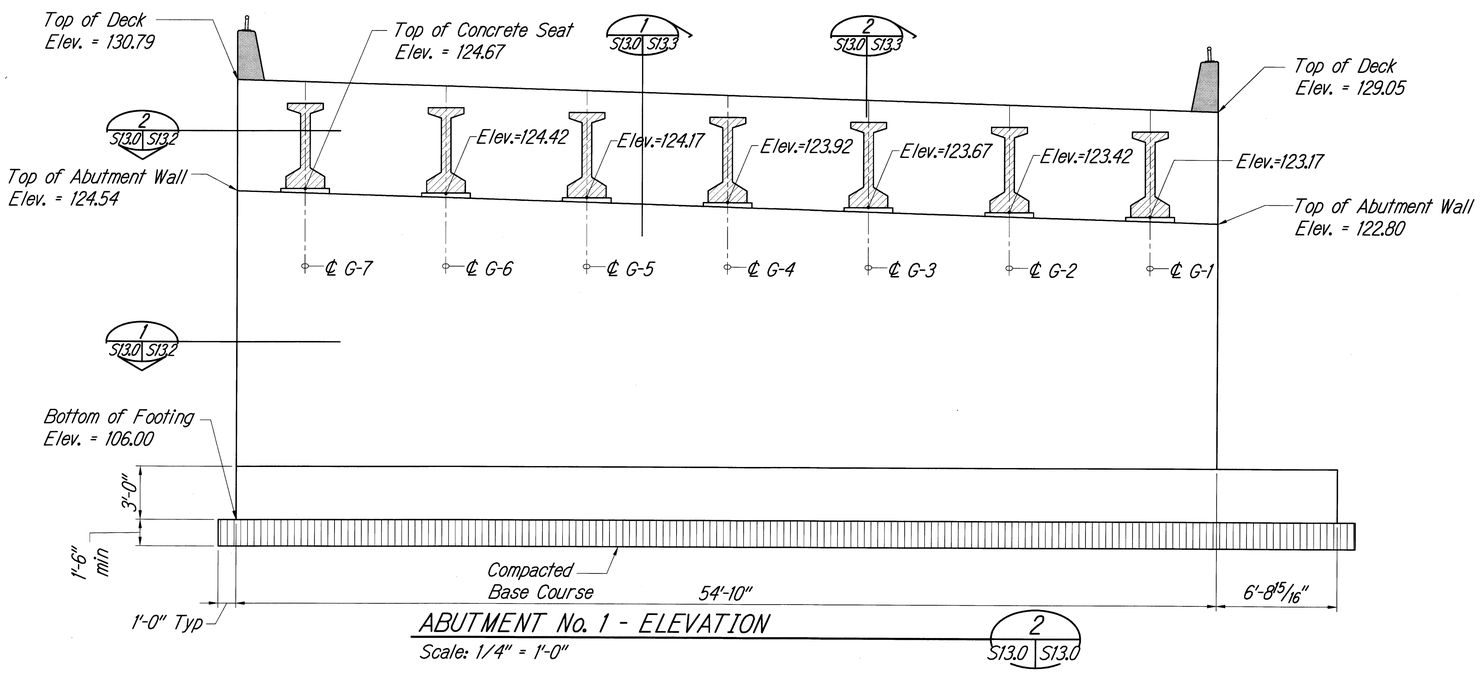


ABUTMENT No. 1 - FOUNDATION PLAN

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

S12.2, S13.0 | S13.0

Note:
Wall Reinf. not shown for clarity.



ABUTMENT No. 1 - ELEVATION

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

S13.0 | S13.0

Note:
Top of Deck, Top of Abutment Wall and Top of Concrete Seat Elevations are at the ℄ Bearing

REN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
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HAWAII, U.S.A.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUT. NO. 1 FOUNDATION PLAN AND ELEVATION

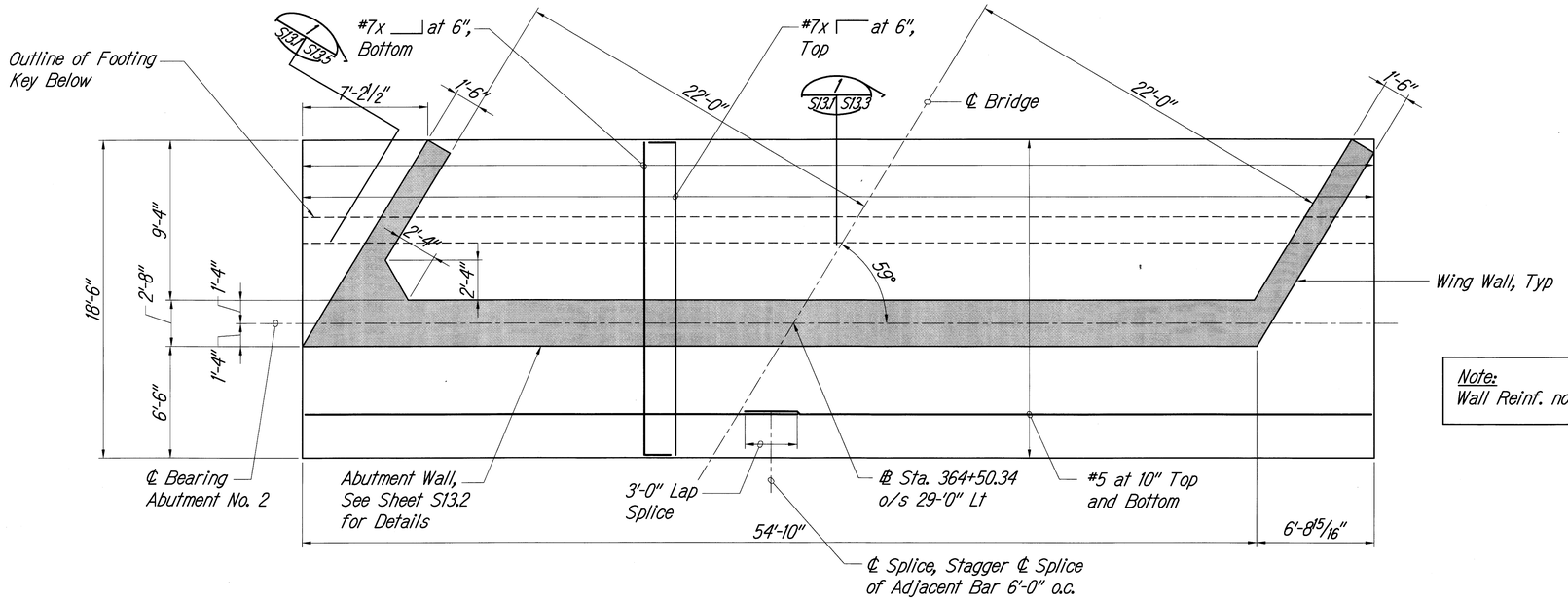
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S13.0 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S13-0.dwg, 48, 12/16/2009 3:08:08 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	153	213

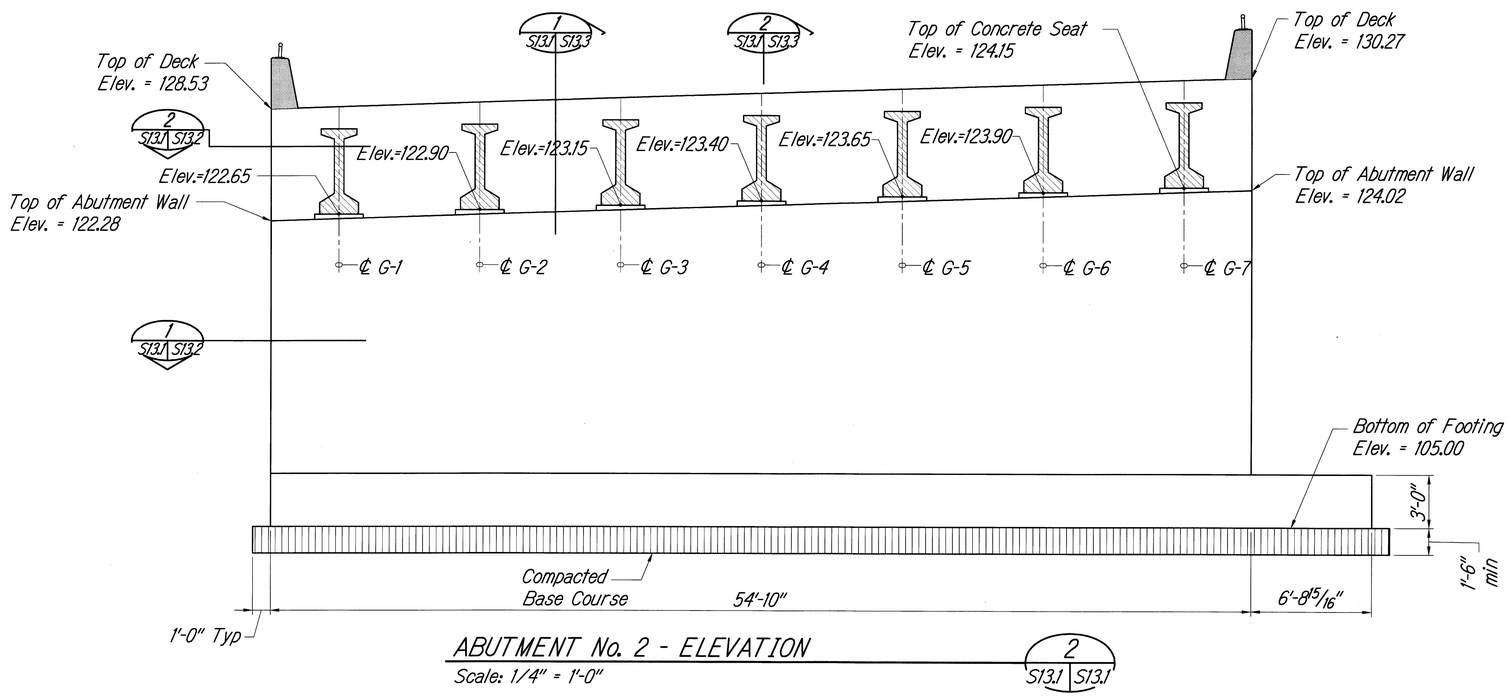


Note:
Wall Reinf. not shown for clarity.

ABUTMENT No. 2 - FOUNDATION PLAN

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

S12.2, S13.1 | S13.1



Note:
Top of Deck, Top of Abutment Wall and Top of Concrete Seat Elevations are at the ℄ Bearing

ABUTMENT No. 2 - ELEVATION

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

S13.1 | S13.1

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6616-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUT. NO. 2 FOUNDATION PLAN AND ELEVATION

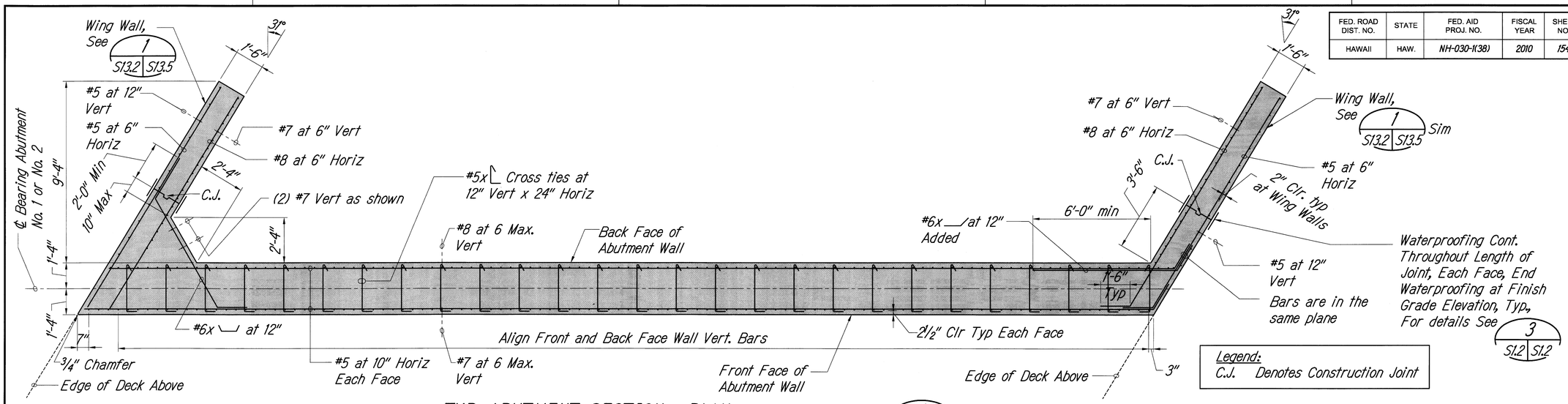
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S13.1 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S13-1.dwg, 48, 12/16/2009 3:08:09 PM, tamanaha, 1:1

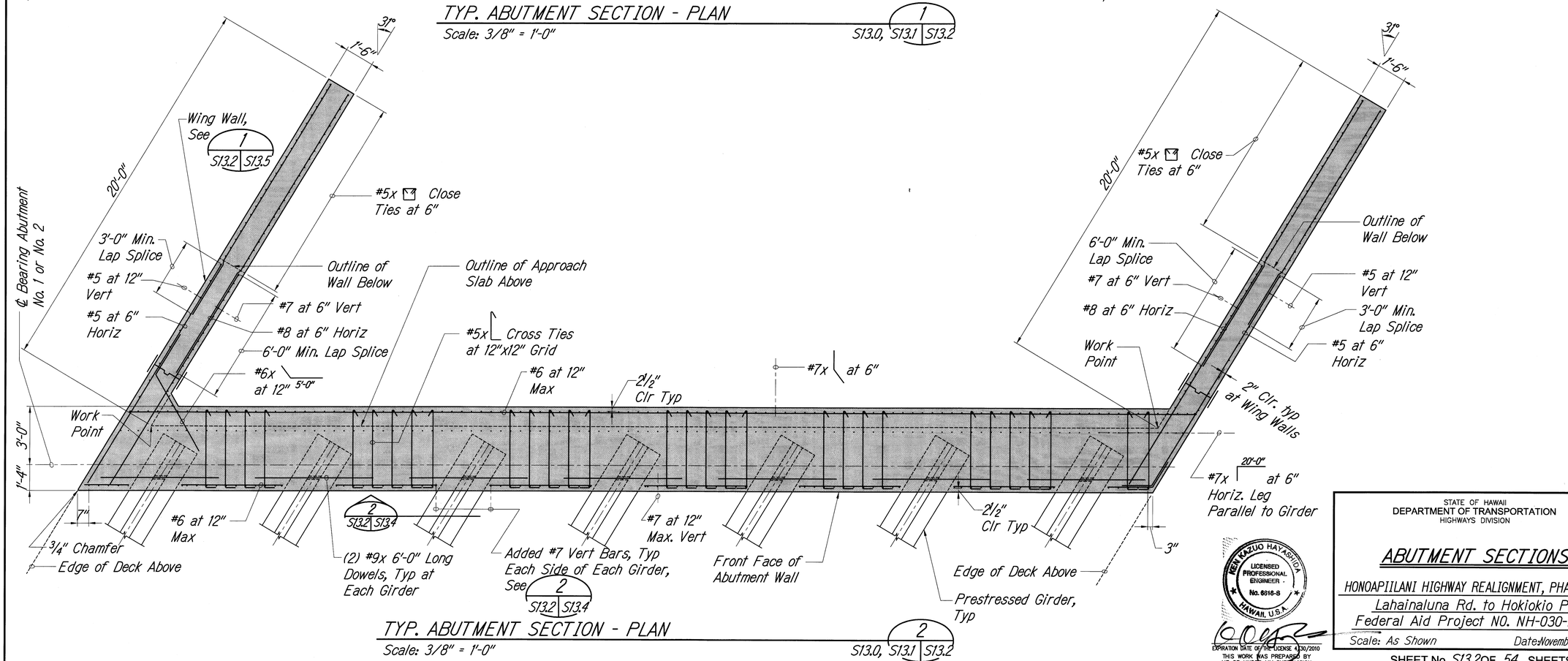
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	154	213



TYP. ABUTMENT SECTION - PLAN

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

1 S13.0, S13.1 S13.2



TYP. ABUTMENT SECTION - PLAN

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

2 S13.0, S13.1 S13.2

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUTMENT SECTIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S13.2 OF 54 SHEETS

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-8
HAWAII, U.S.A.

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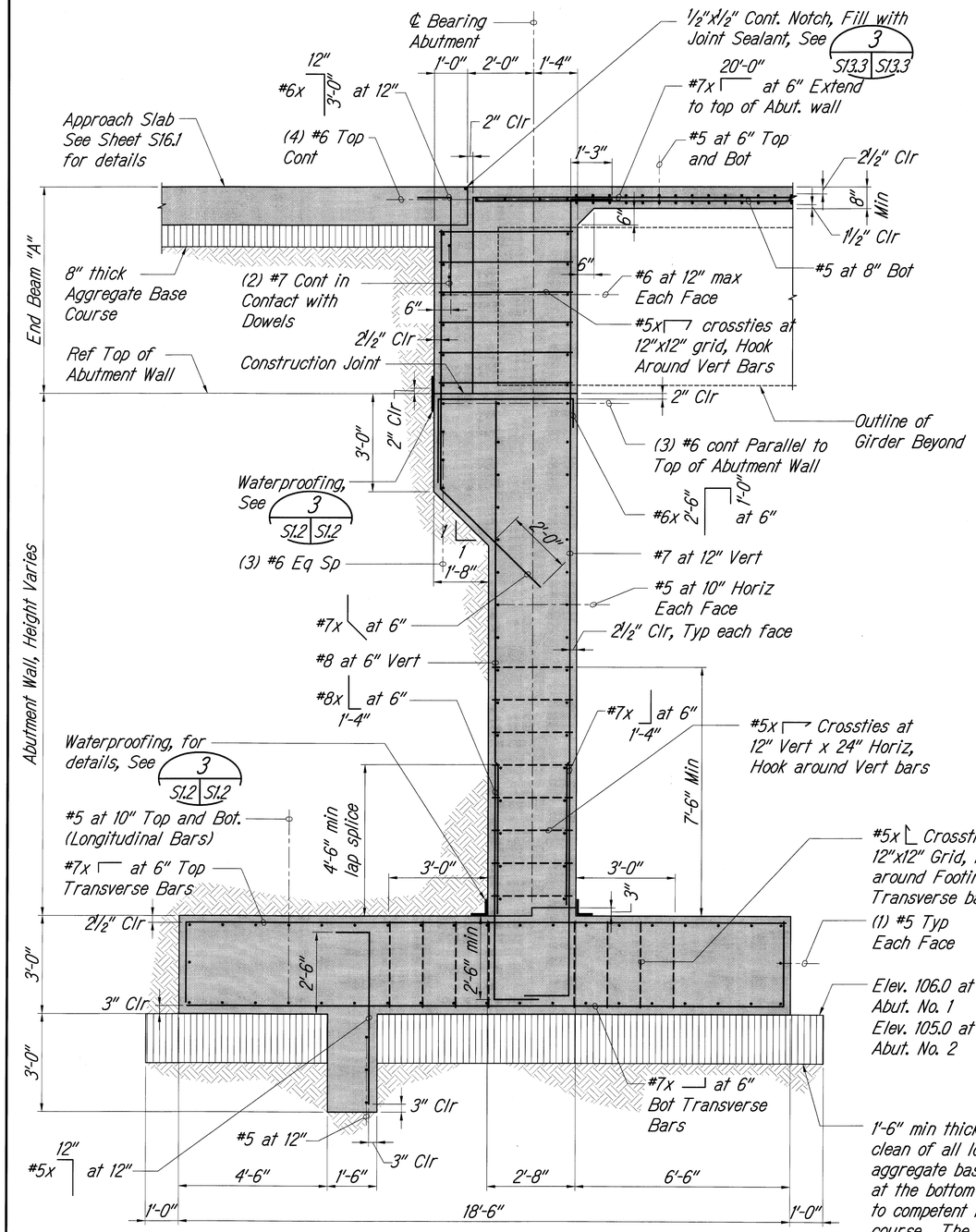
P:\Drafting\2009\12-17_1917 bridge culvert\1917_S13-2.dwg, 32, 12/16/2009 3:08:10 PM, tomaraha, 1:1

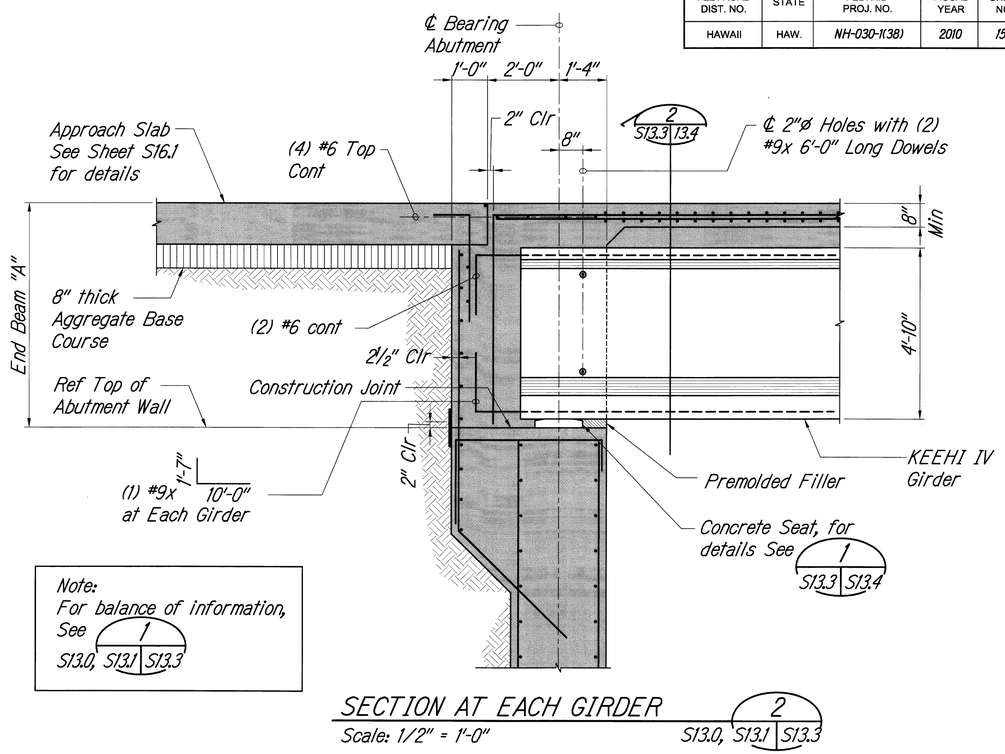
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	155	213



TYP. ABUTMENT SECTION

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

S13.0, S13.1 | S13.3



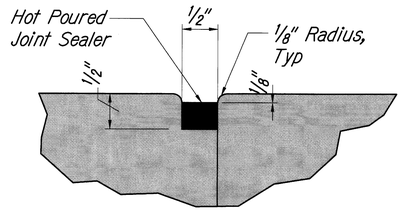
Note:
For balance of information, See 1 S13.0, S13.1 | S13.3

SECTION AT EACH GIRDER

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

2 S13.0, S13.1 | S13.3

Note:
See Sheet S12.1 for excavation backfill and finish grade.



JOINT DETAIL

Not To Scale

3 S13.3 | S13.3

1'-6" min thick Base Course, Footing subgrade shall be clean of all loose material prior to placement of the aggregate base course layer. Loose and soft soil exposed at the bottom of footing excavation shall be removed down to competent material and replaced with aggregate base course. The replacement base course as well as the 18-inch aggregate base course layer shall be compacted in 8-inch loose lifts to a minimum 95 percent compaction as determined by AASHTO T-180 (ASTM D 1557).

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUTMENT SECTIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S13.3 OF 54 SHEETS

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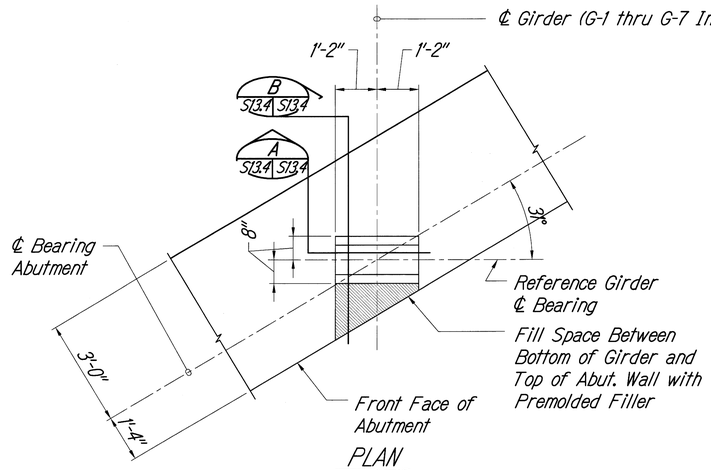
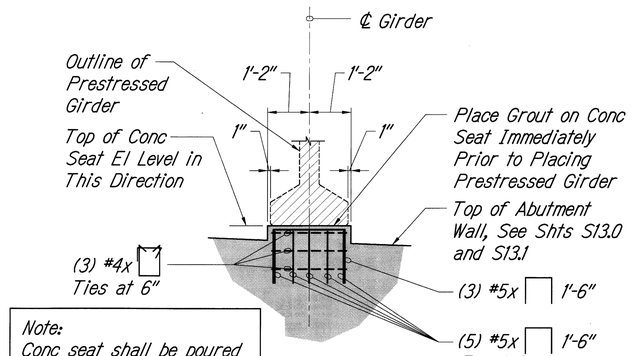
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	156	213

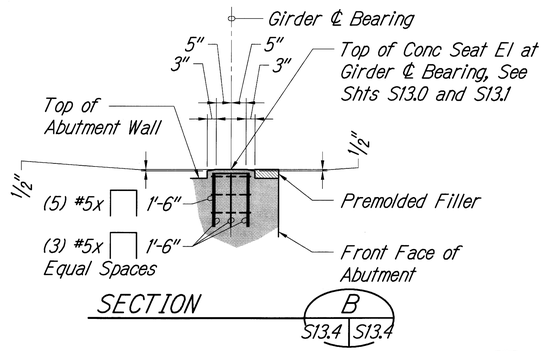


PLAN



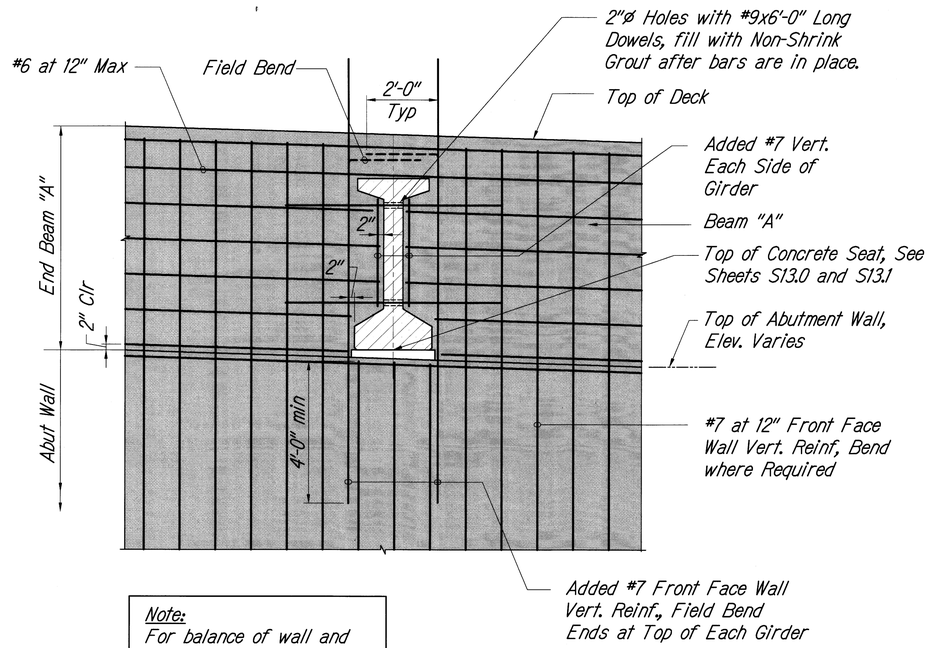
Note:
Conc seat shall be poured monolithically with the abutment wall

SECTION A
S13.4 | S13.4



SECTION B
S13.4 | S13.4

TYP ABUTMENT CONCRETE SEAT DETAILS 1
Scale: 1/2" = 1'-0"
S13.3 | S13.4



Note:
For balance of wall and deck reinf., See Sheet S13.3

BEAM "A" PARTIAL ELEVATION 2
Scale: 1/2" = 1'-0"
S13.2, S13.3 | S13.4

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ABUTMENT SECTIONS

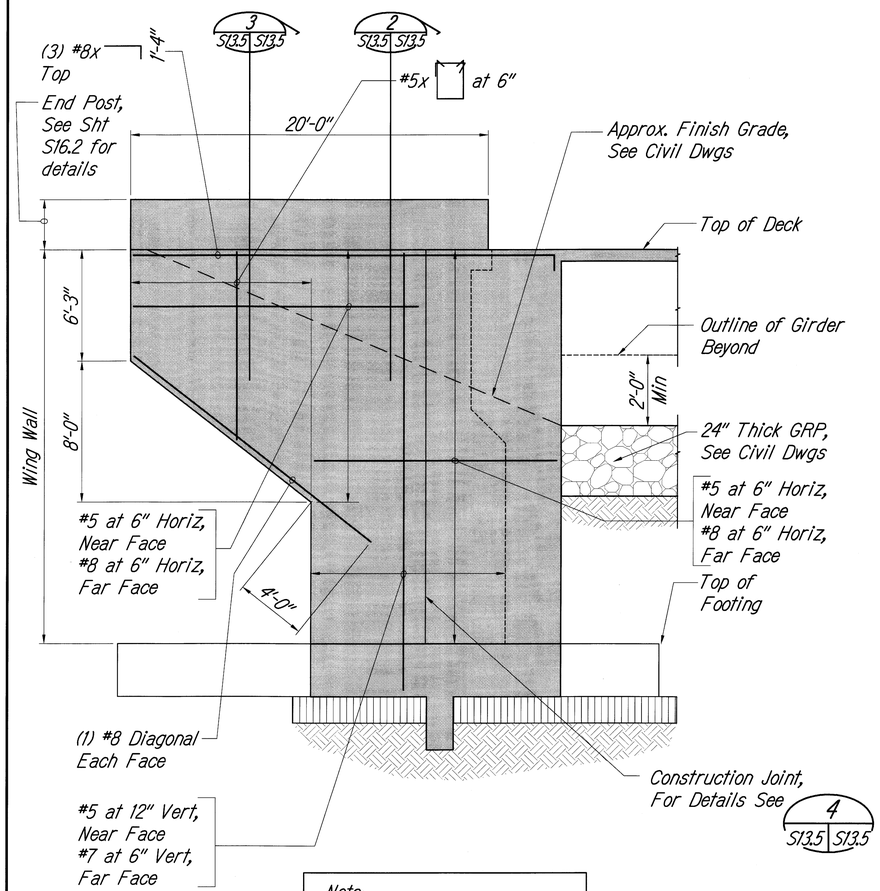
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S13.4 OF 54 SHEETS

P:\Drafting\2008-12-17_1917 bridge culvert\1917_S13-4.dwg, 24, 12/16/2009 3:08:12 PM, tamanaha, 1:1

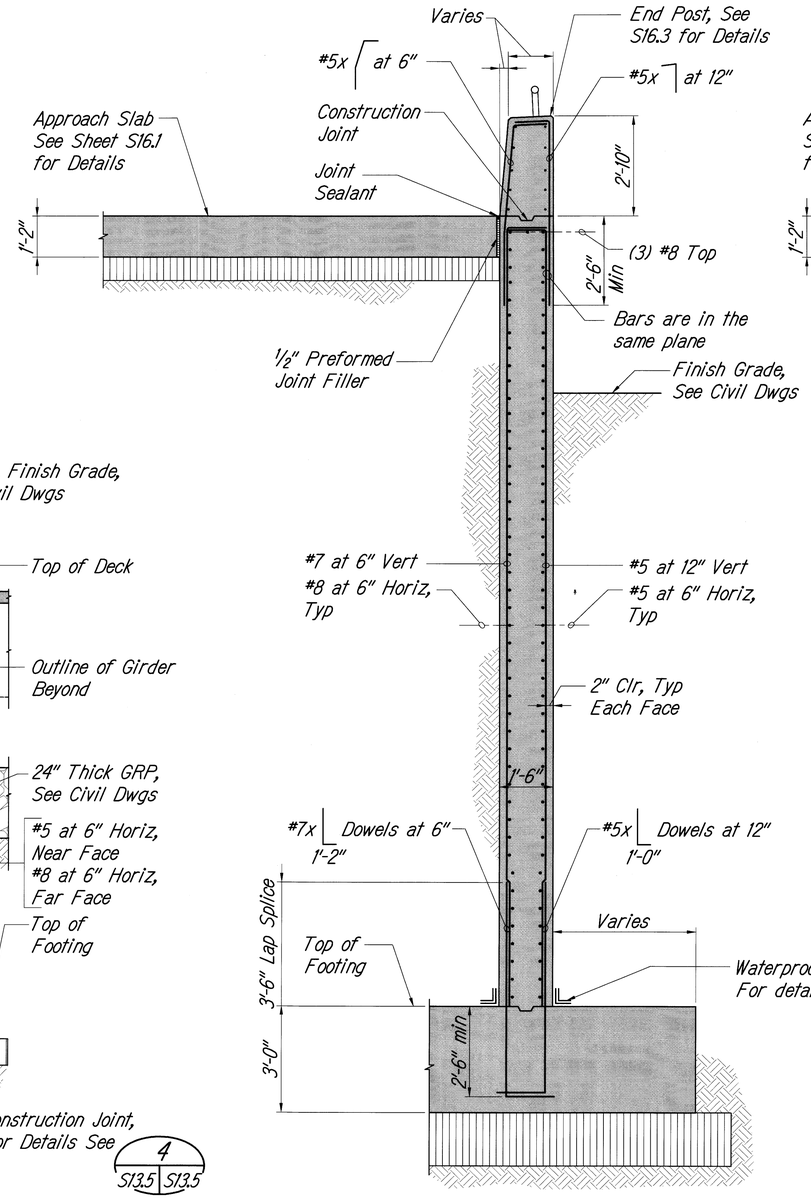
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	157	213



Note:
Footing, deck and end post reinf, not shown for clarity.

WING WALL ELEVATION

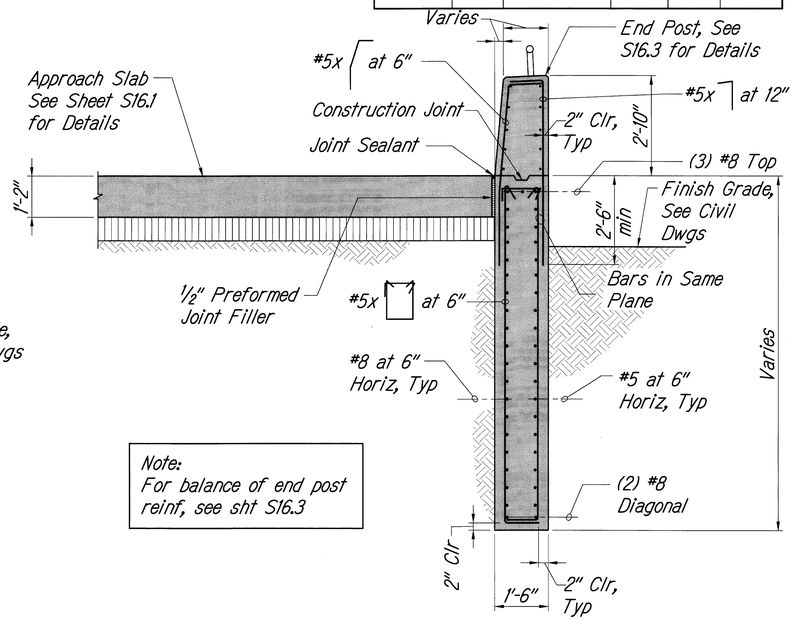
Scale: 1/4" = 1'-0" — 1 S13.0, S13.1 | S13.5



Note:
Footing reinf not shown for details see 1 S13.0, S13.1 | S13.3

SECTION

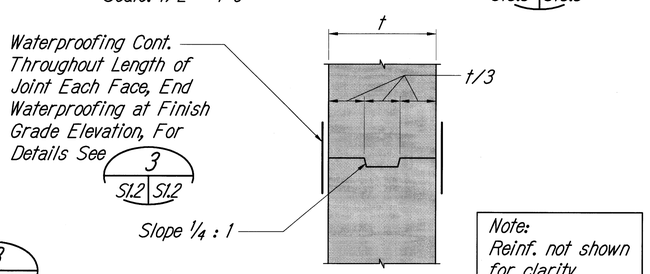
Scale: 1/2" = 1'-0" — 2 S13.5 | S13.5



Note:
For balance of end post reinf, see sht S16.3

SECTION

Scale: 1/2" = 1'-0" — 3 S13.5 | S13.5



Note:
Reinf. not shown for clarity.

TYPICAL CONSTRUCTION JOINT DETAIL

Not to Scale — 4 S13.5 | S13.5

HERN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6618-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

WING WALL ELEVATION AND SECTIONS

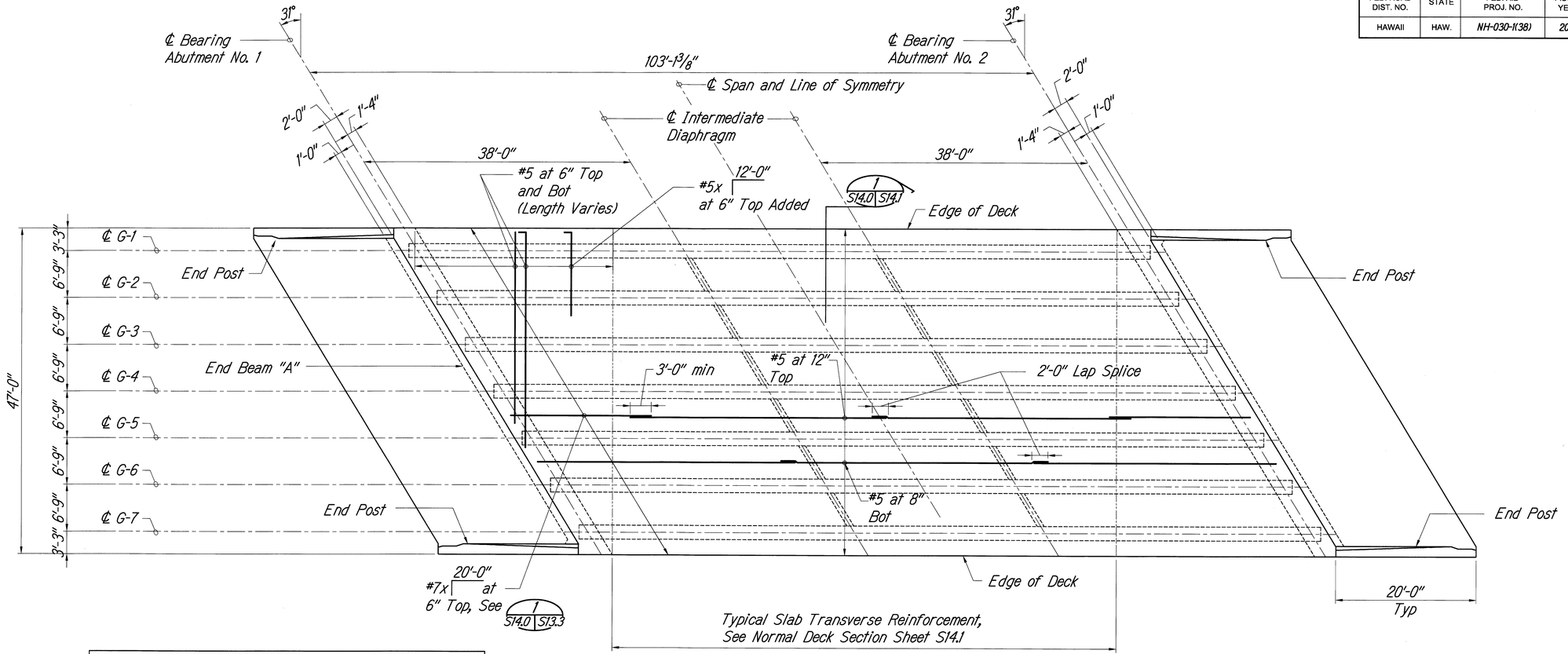
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown — Date: November 23, 2009

SHEET No. S13.5 OF 54 SHEETS

P:\Drafting\2008-12-17_1917 bridge culvert\1917_S13-5.dwg, 24, 12/16/2009 3:08:13 PM, tumanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	158	213



Legend:

G-1 to G-7 — Denotes Precast/Prestressed Girders, See Dwgs. S15.0 and S15.1 for Details

Note:

Bridge Railing not shown for clarity.

DECK FRAMING PLAN 1 S14.0 S14.0

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

HERMAN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

KAUAULA STREAM BRIDGE

DECK FRAMING PLAN

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1

Lahainaluna Rd. to Hokiokio Pl.

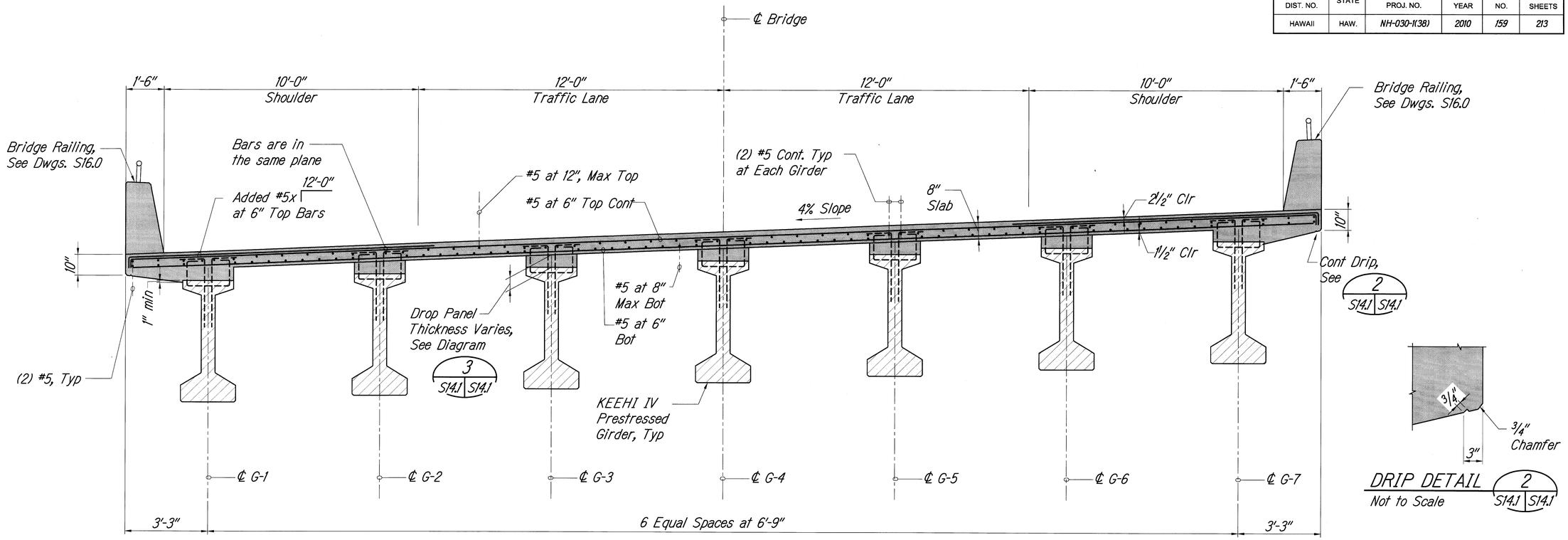
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S14.0 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S14-0.dwg, 96, 12/16/2009 3:08:14 PM, tumamaha, 1:1

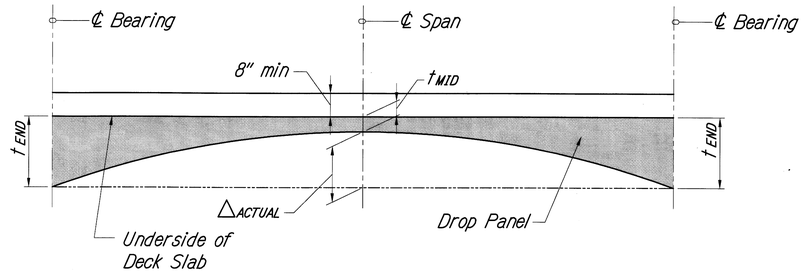
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	159	213



DRIP DETAIL 2 S14.1 S14.1
Not to Scale

Note:
Transverse bars shall be placed perpendicular to girder

NORMAL DECK SECTION 1 S14.0 S14.1
Scale: 1/2" = 1'-0"



DROP PANEL THICKNESS DIAGRAM 3 S14.1 S14.1
Not to Scale

Legend:

$\triangle_{ACTUAL}$	= Girder actual camber at erection prior to pouring deck concrete (inches)
t_{END}	= 6" (drop panel thickness at girder ℄ Bearing)
t_{MID}	= 6" - $\triangle_{ACTUAL}$ (drop panel thickness at midspan of girder)

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6816-S
HAWAII, U.S.A.
EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DECK SECTIONS AND DETAILS

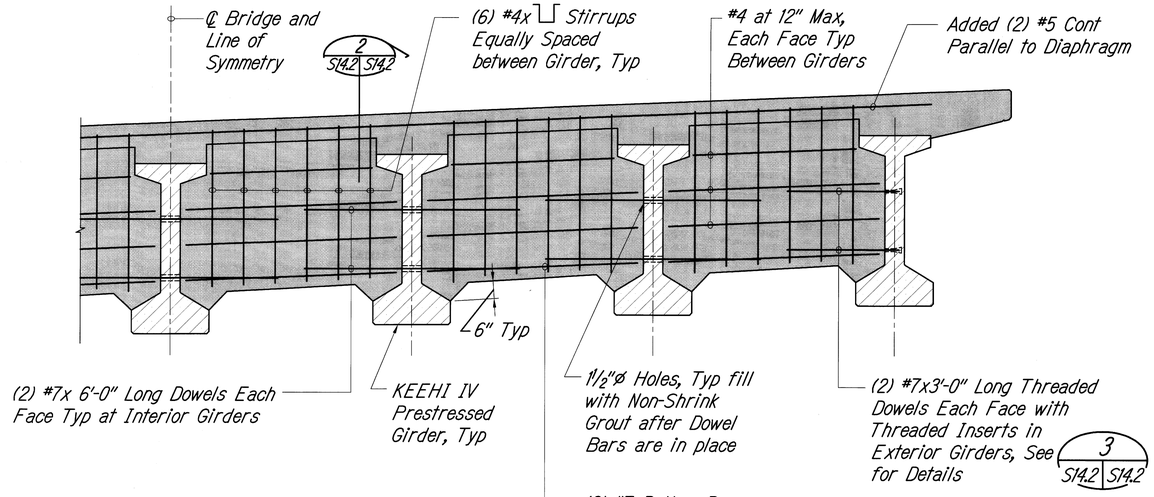
HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S14.1 OF 54 SHEETS

P:\Drafting\2009-12-17_1917 bridge culvert\1917_S14-1.dwg, 24, 12/16/2009 3:08:15 PM, tamanaha, 1:1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	160	213

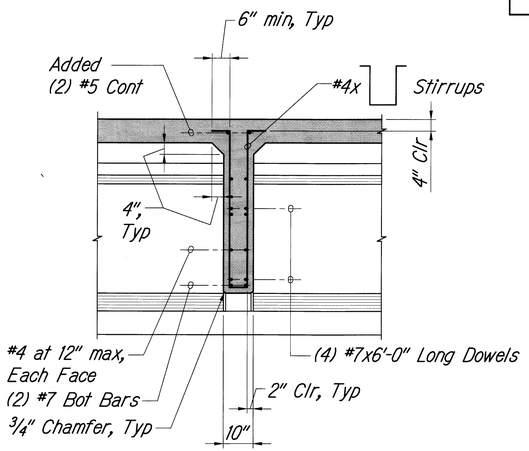


Note:
Deck Slab Reinf. and Bridge railing not shown for clarity.

TYPICAL INTERMEDIATE DIAPHRAGM ELEVATION

1 S14.0 S14.2

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

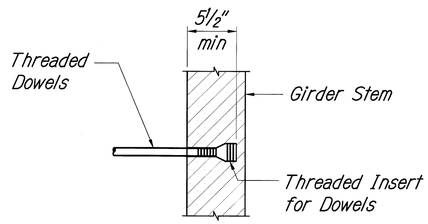


Note:
Deck slab reinf, not shown for clarity.

SECTION

2 S14.2 S14.2

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



Threaded insert shall have the following minimum safe working loads with a factor of safety of 3.0.
Tension = 6.0 kips
Shear = 5.0 kips

THREADED INSERT DETAIL

3 S14.2 S14.2

Not To Scale

IEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6518-S
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EXPIRATION DATE OF THE LICENSE 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

DECK SECTIONS AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S14.2 OF 54 SHEETS

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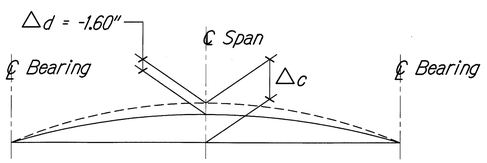
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	161	213

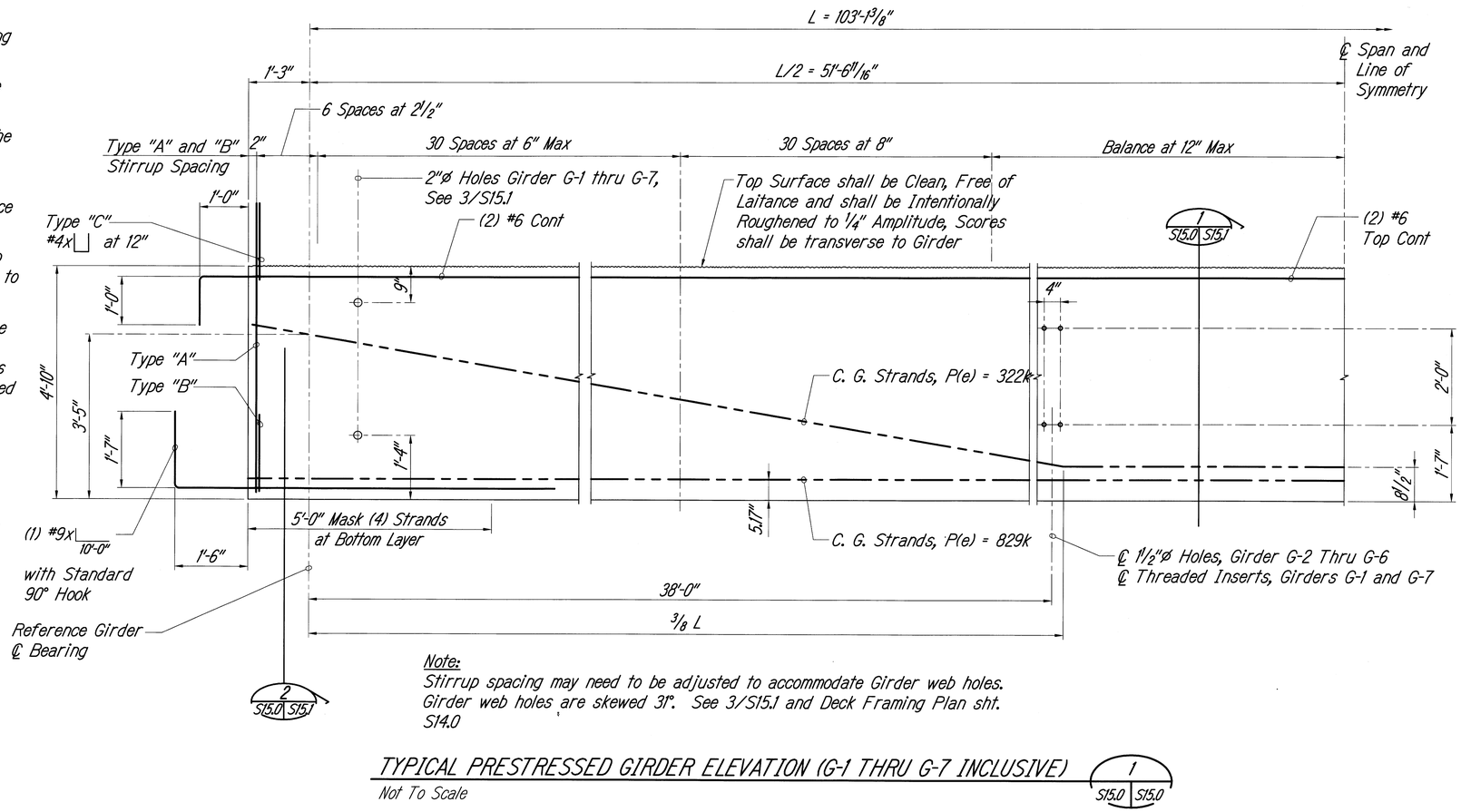
PRESTRESSED GIRDER NOTES:

1. Prestressed Concrete 28 Day Strength f'c = 7,000 psi.
   Prestressed Concrete Strength at time of release fci = 5,600 psi.
2. Prestressing Strands shall be (7) Wire 1/2"Ø Low Relaxation Steel Strands (Area = 0.153 ^{2}in) conforming to ASTM A416 with an Ultimate Tensile Strength of 270 ksi. Initial Strand Stress (before any Losses) = 202.5 ksi.
3. Non-Prestressed reinforcing Steel shall be deformed bars conforming to ASTM A615, Grade 60, unless noted otherwise.
4. Strand Pattern shall be symmetrical about the Longitudinal ℄ of the Girder.
5. Strand release sequence shall not induce any Lateral Delection of the Girder.
6. Contractor shall submit shop drawings indicating Proposed Strand Pattern, releasing sequence, Reinforcing details and Hold Down Device details to the Engineer prior to fabrication.
7. During curing, care shall be taken to avoid any Lateral Deflection to the Girder due to improper orientation. Steam curing may be used to accelerate Strength Gain.
8. Lifting Devices shall be placed as close as possible to the Centerline of Bearings of the Girder. Details and locations of Lifting Devices shall be submitted to the Engineer for approval. Such approval does not Relieve the Contractor of his responsibilities if Girder is damaged due to failure of the Lifting Device.
9. $P_{(e)}$ = Effective Prestress Force after all Losses
10. L = 103'-1 3/8" Length of Girder Bewtween Girder C ℄Bearing



PRESTRESSED GIRDER CAMBER DIAGRAM

	Calculated Camber △c
2 Days after Release of Prestress	2.71"
at Erection	4.80"



Note:
Stirrup spacing may need to be adjusted to accommodate Girder web holes. Girder web holes are skewed 31°. See 3/S15.1 and Deck Framing Plan sht. S14.0

TYPICAL PRESTRESSED GIRDER ELEVATION (G-1 THRU G-7 INCLUSIVE)

1 S15.0 S15.0

Not To Scale

CAMBER DIAGRAM NOTES:

1. The Calculated Camber, △c , includes the Effects of the initial Prestress Force and the Weight of the Precast Girder. The Calculated Camber value at erection has been Multiplied by Creep factors to approximate the Effect of Camber growth and concrete Creep. Positive values indicate a net Upward Deflection.
2. Camber values were obtained using Modulus of Elasticity, E = 3,902 ksi for concrete strength of 5,600 psi (k = 0.86 in AASHTO LRFD equation 5.4.2.4-1). Type of aggregate to be used in all the Girders shall be obtained from a Single supplier and Quarry site.
3. The Contractor shall measure the Actual Camber of each Girder no more than 2 days after the Release of Prestress and again just before Erection in the field. Actual Camber shall not vary from the Calculated values by +1".
4. Dead Load deflection, △d , is due to the Weight of the Concrete Deck.

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EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPICAL PRESTRESSED GIRDER LONGITUDINAL SECTION

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S15.0 OF 54 SHEETS

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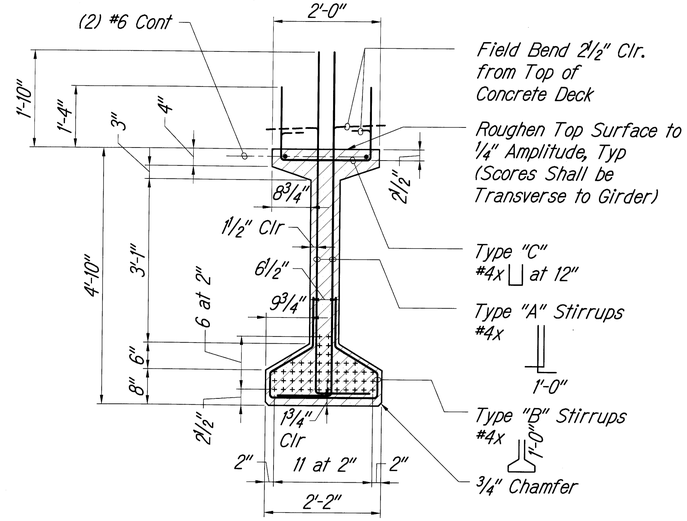
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	162	213

Legend:

+ Denotes 1/2"Ø Prestressing Strands

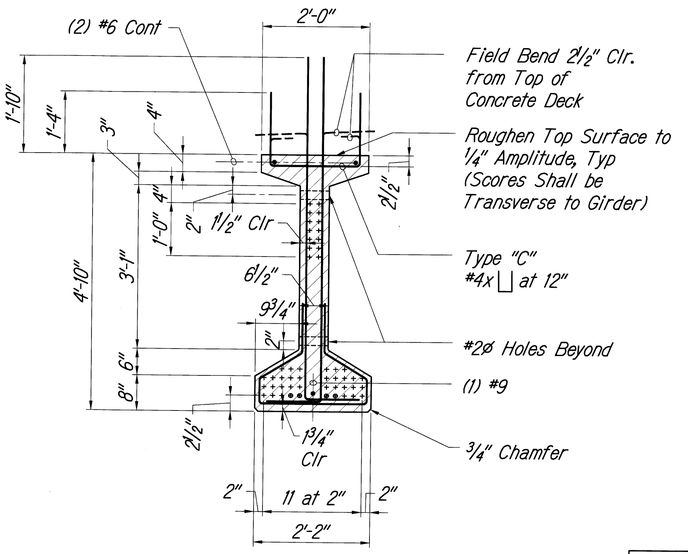
⊕ Denotes 1/2"Ø Prestressing Strands Masked 5'-0" at Each End

• Denotes Deformed Rebar

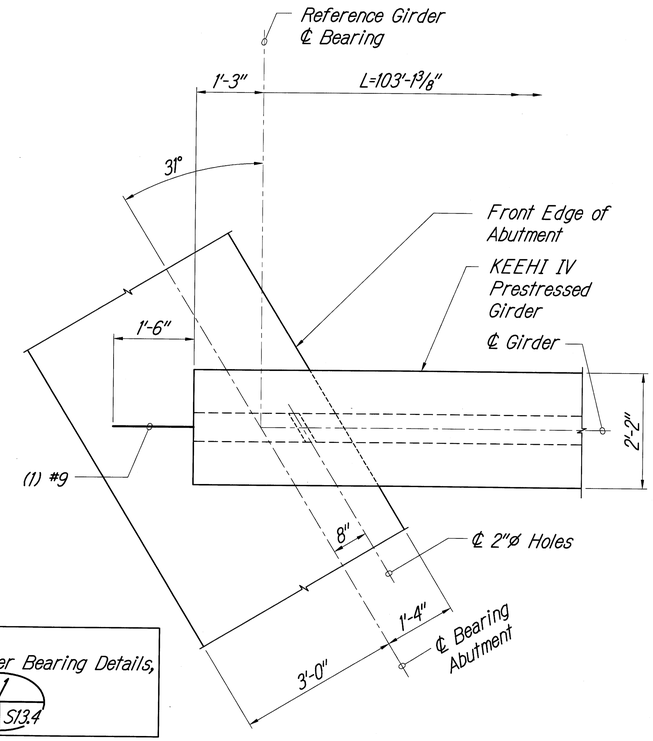


Notes:
1. Total No. of Prestressing Strands = 50 Each Girder
2. Minimum Spacing of Prestressing Strand shall be 2" o.c.

SECTION AT MIDSPAN — 1 — S15.0 | S15.1
Scale: 3/4" = 1'-0"



SECTION AT ℄ BEARING — 2 — S15.0 | S15.1
Scale: 3/4" = 1'-0"



Note:
For Girder Bearing Details, See 1 — S15.1 | S13.4

TYPICAL GIRDER END DETAIL — 3 — S15.1 | S15.1
Scale: 3/4" = 1'-0"

KEIN KAZUO HAYASHIDA
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No. 6516-S
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EXPIRATION DATE OF THE LICENSE: 4/30/2010
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

PRESTRESSED GIRDER SECTION AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S15.1 OF 54 SHEETS

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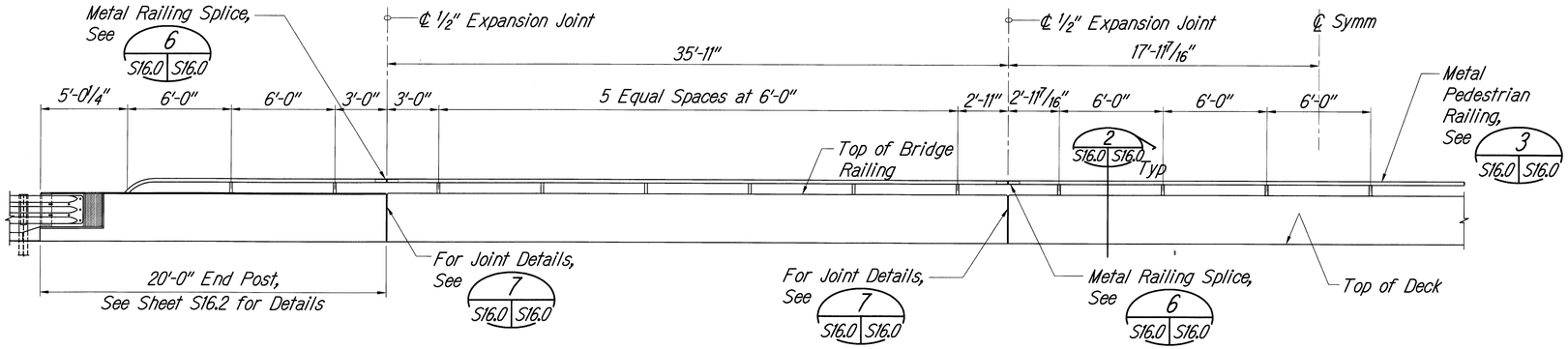
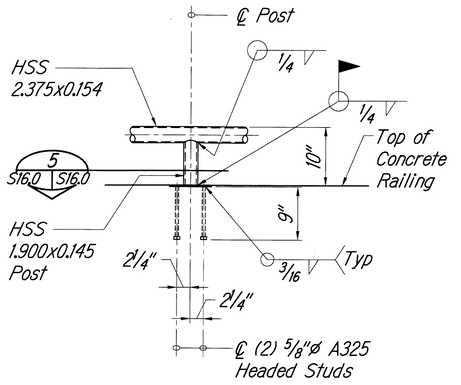
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	163	213



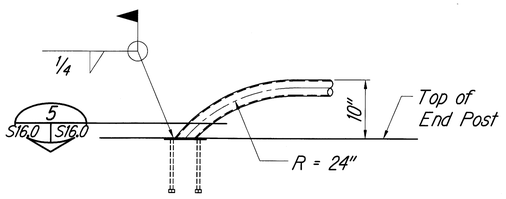
TYPICAL BRIDGE RAILING ELEVATION 1 S16.0 | S16.0

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



TYPICAL RAILING - POST CONNECTION 3 S16.0 | S16.0

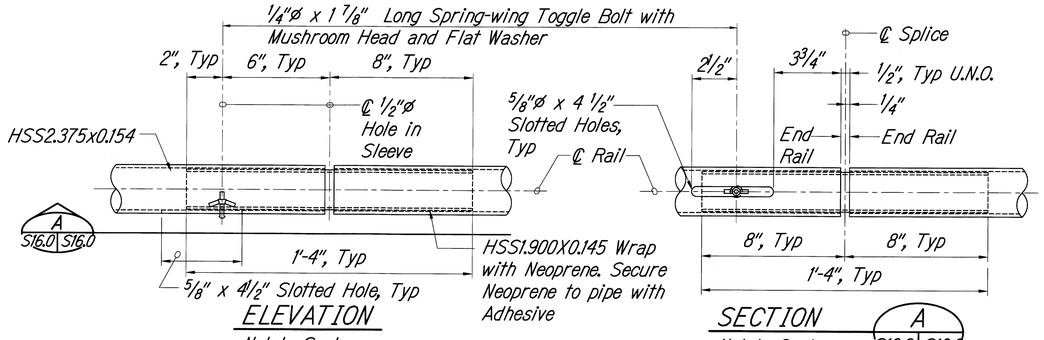
Scale: 1" = 1'-0"



Note:
For Balance of Information, See 3 S16.0 | S16.0

TYPICAL RAILING - END POST CONN 4 S16.0 | S16.0

Scale: 1" = 1'-0"



ELEVATION

Not to Scale

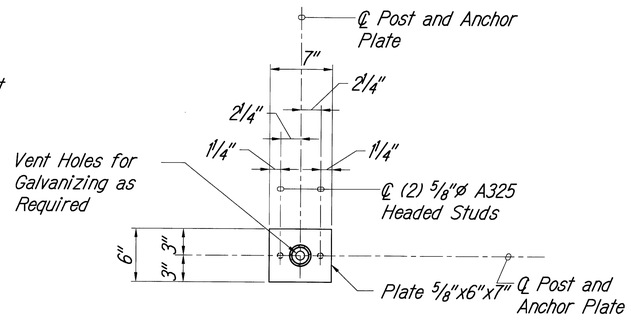
SECTION A S16.0 | S16.0

Not to Scale

Notes:
1. Slotted Hole and Toggle Bolt shall be Located on Underside of pipe.
2. After Field Welding, Clean and Coat Damaged Galvanized Coating According to Note 8, Metal Pedestrian Railing, Sheet S1.1.

TYPICAL PIPE SPLICE DETAIL 6 S16.0 | S16.0

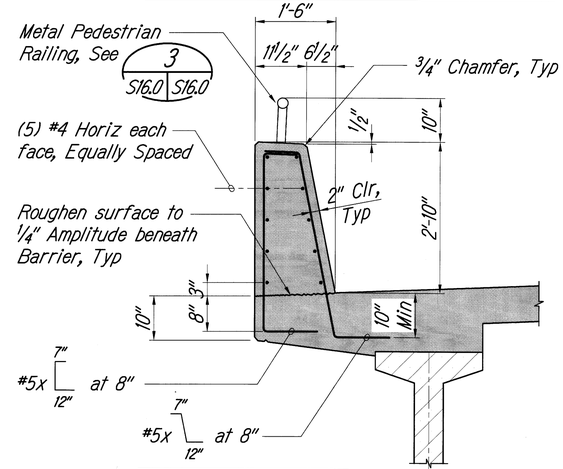
Not to Scale



TYPICAL RAILING - ANCHOR PLATE DETAIL 5 S16.0 | S16.0

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

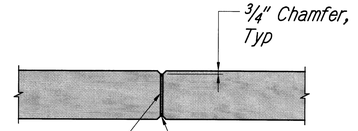
3. Metal Pedestrian Railing Shall be Painted According to Paint Schedule and Notes, Sheet S1.1.



Note:
Girder and Deck Slab Reinf. not shown for clarity.

SECTION 2 S16.0 | S16.0

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



BRIDGE RAILING EXPANSION JOINT DETAILS (PLAN) 7 S16.0 | S16.0

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

KENJI KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE RAILING DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S16.0 OF 54 SHEETS

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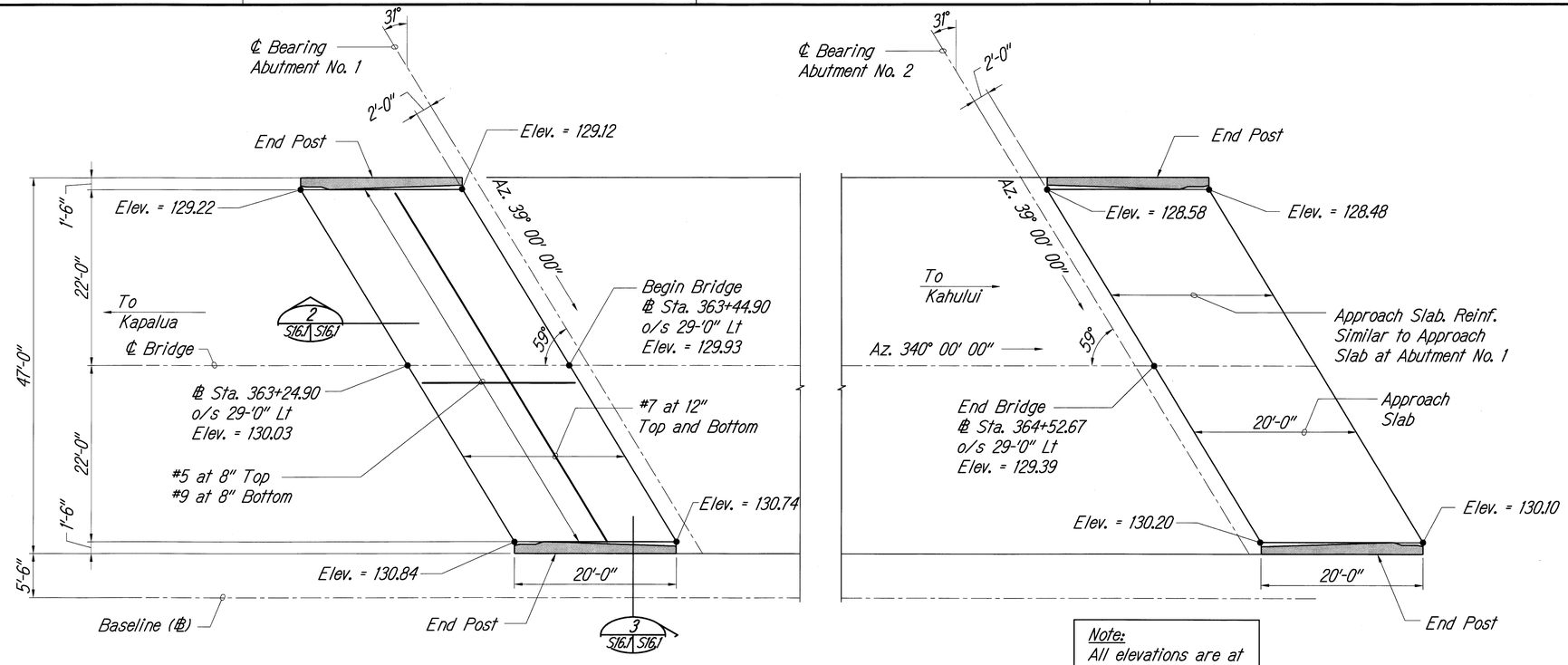
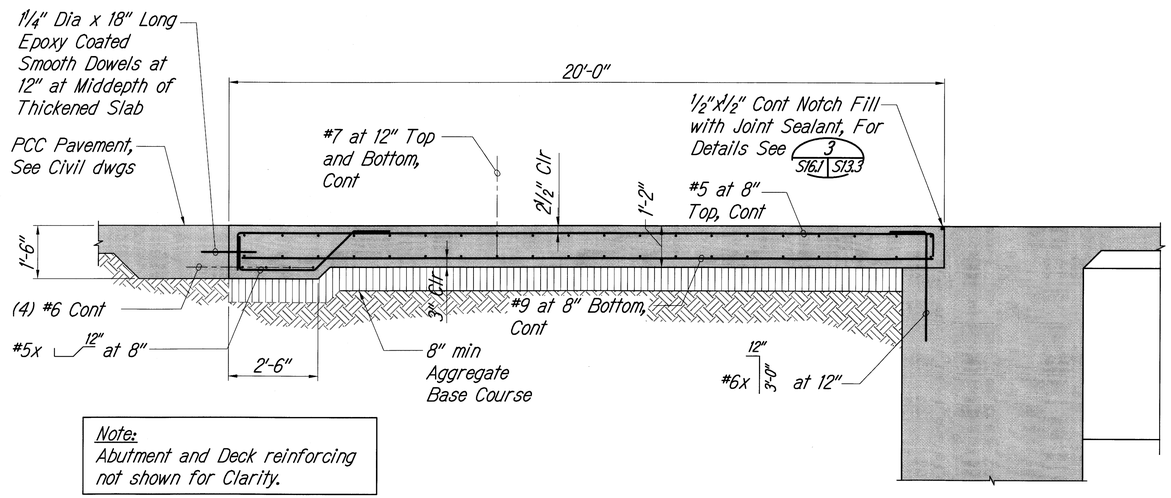
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	164	213



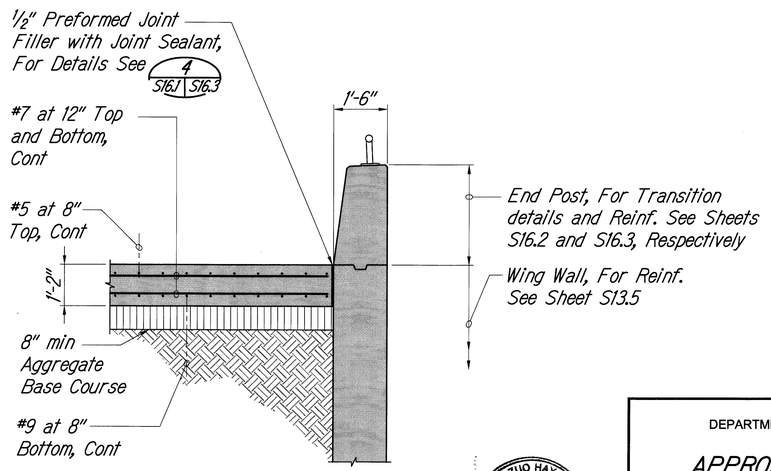
BRIDGE LAYOUT PLAN
Scale: 1/8" = 1'-0"
1 S16.1 S16.1

Note:
All elevations are at the top of deck.



Note:
Abutment and Deck reinforcing not shown for Clarity.

SECTION
Scale: 1/2" = 1'-0"
2 S16.1 S16.1



SECTION
Scale: 1/2" = 1'-0"
3 S16.1 S16.1

KENT KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 6818-S
HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

APPROACH SLAB PLAN AND SECTIONS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S16.1 OF 54 SHEETS

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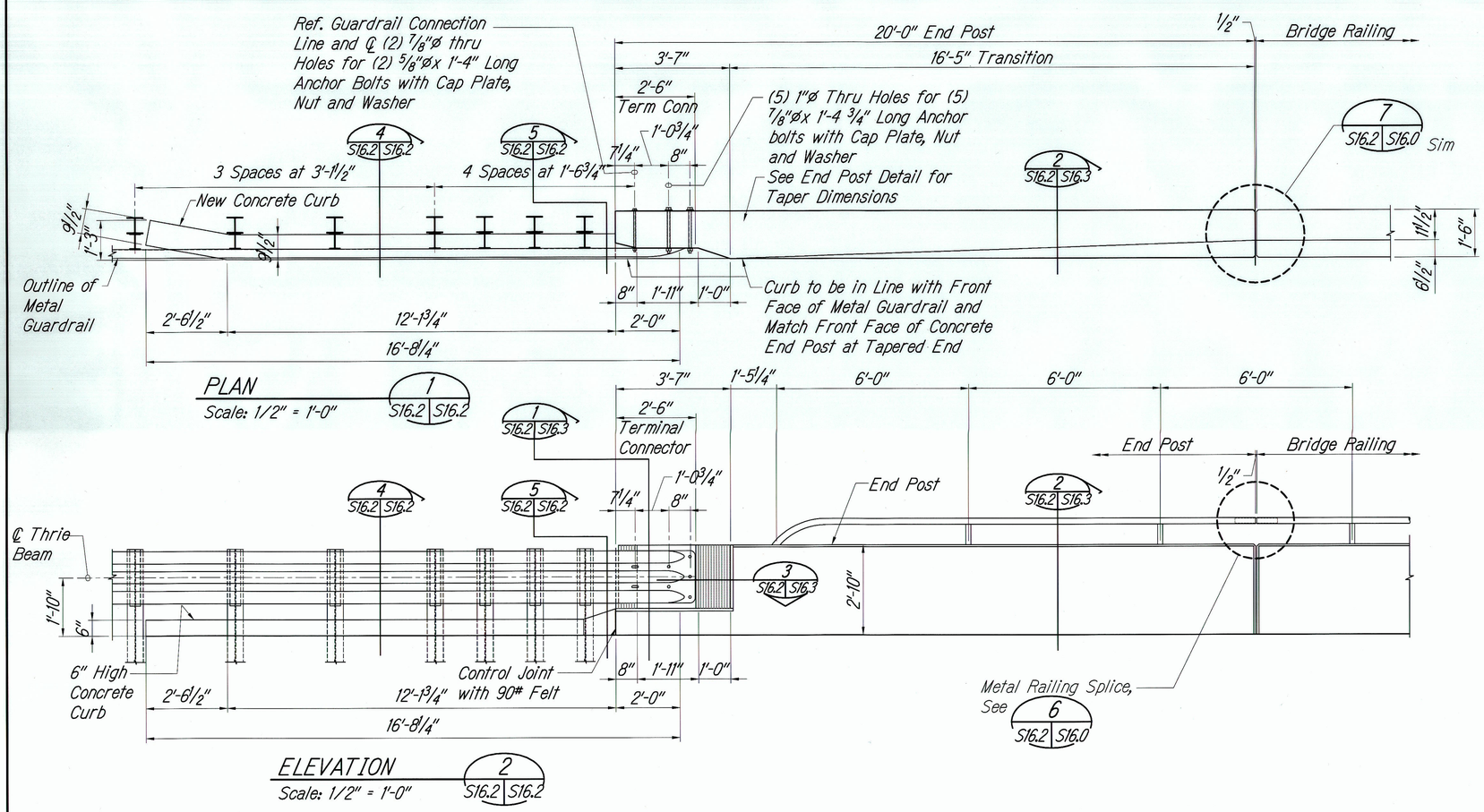
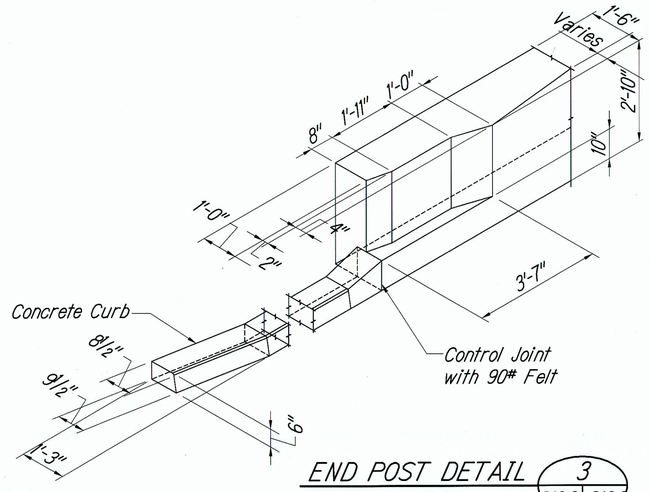
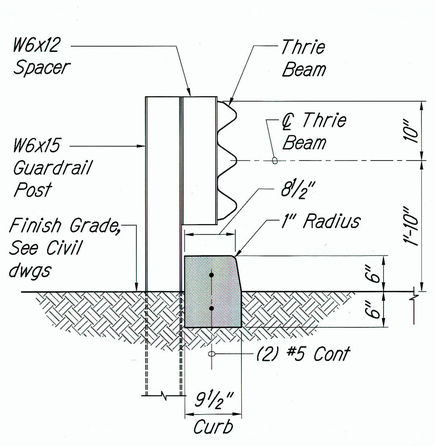
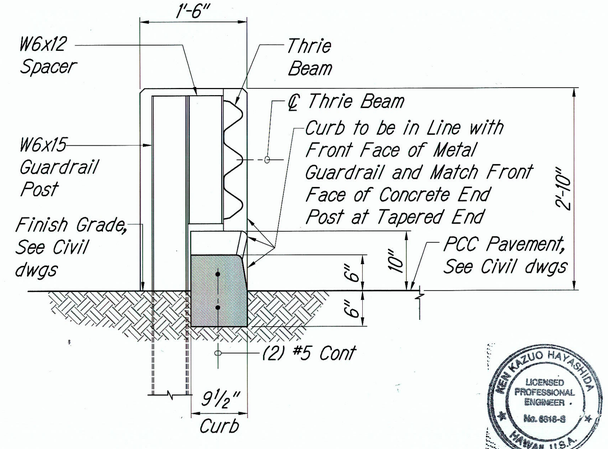
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	165	213









3" NAME DATE

Depressed "V" letters 3/8" deep

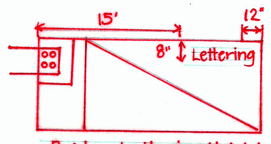
Use Correct Name of Bridge — Year Built — 1/2"

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



KEN KAZUO HAYASHIDA LICENSED PROFESSIONAL ENGINEER No. 6818-S HAWAII, U.S.A.

EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

END POST PLAN, ELEVATION AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown — Date: November 23, 2009

SHEET No. S16.2 OF 54 SHEETS

"AS-BUILT"

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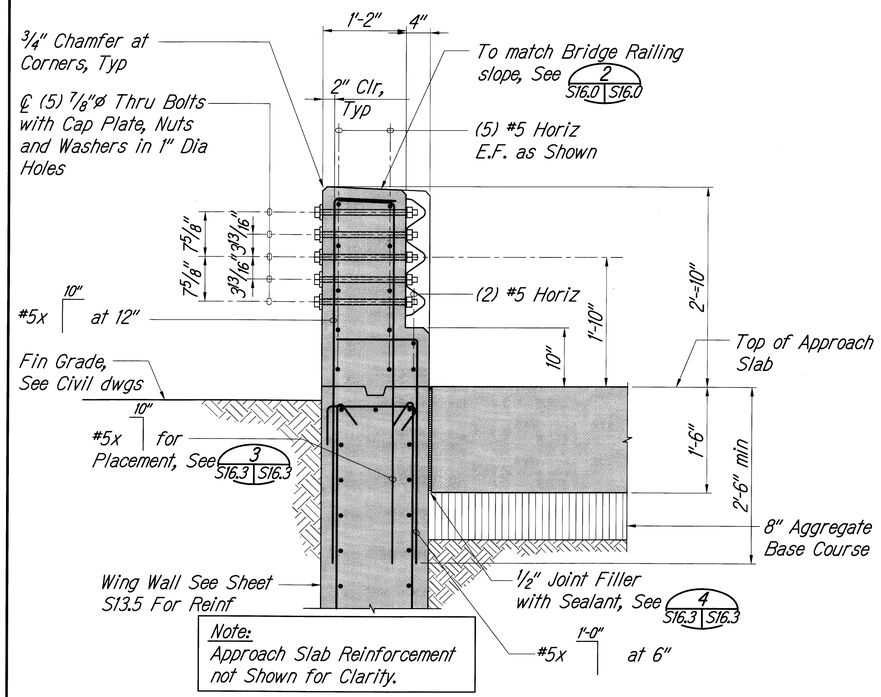
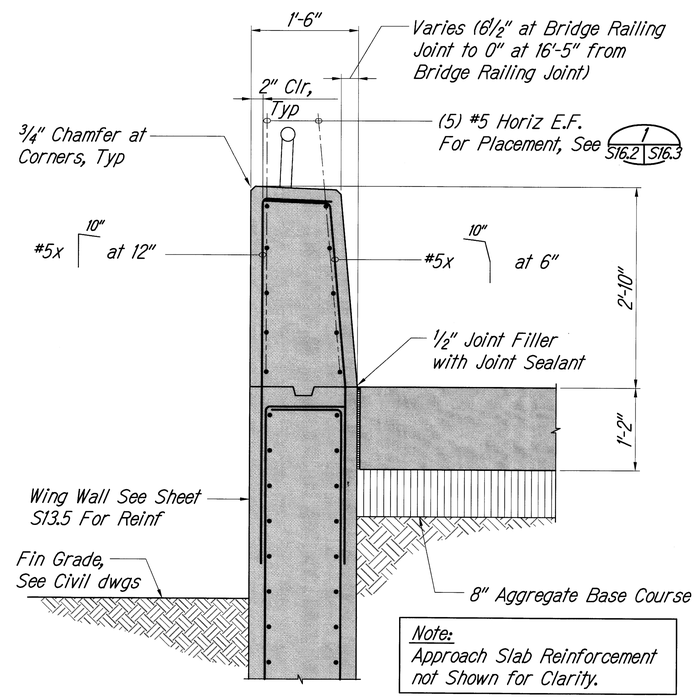
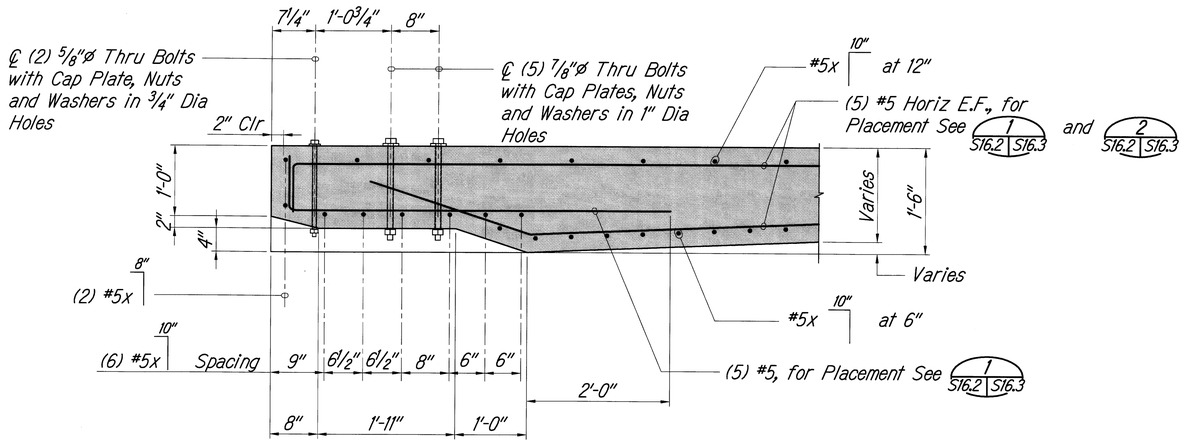
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	NH-030-1(38)	2010	166	213



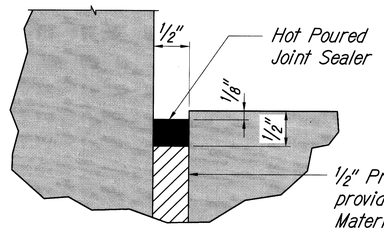
SECTION 1 — S16.2 | S16.3
Scale: 1" = 1'-0"



SECTION 2 — S16.2 | S16.3
Scale: 1" = 1'-0"



PARTIAL PLAN SECTION SHOWING REINF. 3 — S16.2 | S16.3
Scale: 1" = 1'-0"



TYP EXPANSION JOINT DETAIL 4 — S16.3 | S16.3
Not To Scale

KEN KAZUO HAYASHIDA
LICENSED PROFESSIONAL ENGINEER
No. 8818-S
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EXPIRATION DATE OF THE LICENSE: 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

END POST SECTIONS AND DETAILS

HONOAPIILANI HIGHWAY REALIGNMENT, PHASE 1B-1
Lahainaluna Rd. to Hokiokio Pl.
Federal Aid Project NO. NH-030-1(38)

Scale: As Shown Date: November 23, 2009

SHEET No. S16.3 OF 54 SHEETS

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