FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	81	89

STRUCTURAL GENERAL NOTES:

1. General:

A. Workmanship and materials shall conform to the AASHTO LRFD Bridge Design Specification, 4th Edition and the Hawaii Standard Specifications for Bridge and Road Construction, as modified by the State of Hawaii Department of Transportation.

B. The Contractor shall compare the Civil 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 embankments, 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. Lateral Earth Pressures
- Earth Pressure (at MP 12.9) ———— 50 pcf
- Earth Pressure (at MP 26.1) ———— 40 pcf

B. Bearing Capacity
- Strength Limit State (at MP 12.9) ———— 3000 psf
- Extreme Event Limit State (at MP 12.9) ———— 6000 psf
- Strength Limit State (at MP 26.1) ———— 5400 psf
- Extreme Event Limit State (at MP 26.1) ———— 12000 psf

C. Anchor Bond Stress for Tiebacks
- (at MP 12.9) ———— 800 psf
- (at MP 26.1) ———— 1600 psf

D. Dynamic Earth Pressure
- (at MP 12.9) ———— $33.0H^2$
- (at MP 26.1) ———— $37.4H^2$

3. Foundation:

A. Retaining system design values are based on geotechnical investigations by Hirata and Associates, dated July 24, 2009.

B. 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.

C. Excavation boundaries and grade elevations for footing shall be approved by the Engineer prior to placing the concrete and reinforcing.

D. Fill and backfill shall consist of non-expansive granular material such as crushed coral or basalt. The select granular fill shall be well graded from coarse to fine with no particles larger than 3 inches in largest dimension. The material also shall contain less than 15 percent particles passing the No. 200 sieve. The meterial shall have a laboratory CBR value of 25 or more and shall have a maximum swell value of 1 percent or less.

4. Reinforcing Steel:

A. Reinforcing steel shall be deformed bars conforming to ASTM A615, Grade 60.

B. Clear concrete coverage for reinforcing bars shall be as follows, unless otherwise noted:
- a. Footing, Wall, etc. cast against earth ———— 3"
- b. Footing, Wall, etc. formed and exposed to earth ———— 2"
- c. Wall faces exposed to each or weather ———— 2"

C. Splices:
- a. Reinforcing steel shall be spliced only where indicated on plans. Provide lap splice length per typical details and schedule, unless otherwise noted.

D. Bar bends and hook shall be "standard hooks" in accordance with AASHTO 5.11.2. or as shown in Detail 1/S-2, whichever is greater.

5. Concrete:

A. Concrete shall be regular weight hard rock concrete and shall have a minimum 28-day compressive strength of 4000 psi.

B. All inserts, anchor bolts, plates, etc. embedded in concrete shall be hot-dip galvanized unless otherwise noted.

C. Conduits, pipes, and sleeves passing through a wall not conforming to typical details shall be located and submitted to the Engineer for approval.

D. Construction joints may be located by the Contractor and submitted to the Engineer for approval. Construction joints shall be made and located 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.

E. Non-shrink grout 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.

F. Unless otherwise noted, chamfer all concrete edges 3/4".

G. 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.

H. Reinforcing bars, anchor bolts, inserts and other items to be cast in the concrete shall be secured in position prior to placement of concrete.

6. Geocomposite Drain:

A. Submit manufacturer's literature and product data for geocomposite drain for Engineer's approval prior to placing the order.

B. Submit manufacturer's installation instruction for geocomposite drain for Engineer's review and approval.

C. Geocomposite drains shall be installed to ensure that the drains are hydraulically connected from the top to bottom of the retaining wall.

D. Geocomposite drains shall be attached to excavation surface by placing geotextile fabric directly against cut surface.

E. Geocomposite drains shall be placed in strips and connected in accordance with manufacturer's instructions to maintain continuity of flow channel through the drain.

F. Geocomposite drain strips shall be 2 feet wide and placed as shown in plans.

G. Geocomposite drain shall be suitably wrapped and protected from exposure to direct sunlight.

H. If the geotextile cover fabric become damaged during installation by tearing or puncturing, the damaged section shall be completely cut out and replaced. If, in the judgment of the engineer, the damage is not serious enough to warrant removal, the damaged area shall be repaired by overlaying with a piece of fabric, large enough to cover the damaged area and provide a 4 inch overlap on all sides, and taping it in place with 3 inch wide strips of waterproof, plastic tape.

I. Geocomposite drains shall be protected from damage and deleterious contamination where drains must remain exposed until they are covered with embankment or backfill material.

J. The cost for all components shall be considered incidental to various structural items. This includes, but not limited to, geocomposite drain strip, filter materials, geotextile fabric, PVC weep holes, and drain grates.

ORIGINAL PLAN	SURVEY PLOTTED BY		DATE
	DRAWN BY	R. Yamamoto	6/30/06
	TRACED BY		"
NOTE BOOK	DESIGNED BY	L. Chan	"
	QUANTITIES BY	L. Chan	"
No. ____	CHECKED BY	L. Chan	"

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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

STRUCTURAL GENERAL NOTES

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

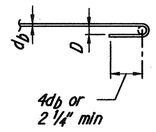
F.A. Project No. ER-15(21)

Scale: As Noted Date: December, 2009

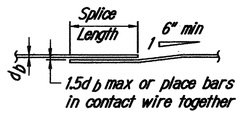
SHEET No. S-1 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	82	89

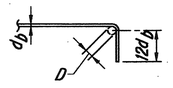
Minimum Splice and Development Lengths					
	Concrete Strength = 4,000 PSI				
	Lap Splice		Development		
			Straight		with
Bar Size	Top Bars	Other Bars	Top Bars	Other Bars	Standard Hook
#3	26"	20"	20"	16"	8"
#4	34"	26"	26"	20"	10"
#5	42"	32"	32"	24"	12"
#6	50"	38"	38"	30"	16"
#7	72"	54"	54"	42"	18"
#8	82"	62"	62"	48"	20"



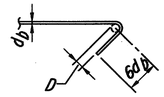
180° Bend



Bar Lap



90° Bend



135° Bend

Notes:

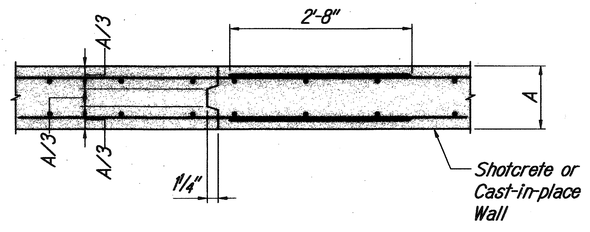
1. Lengths are for concrete with rebar space 6 bar diameters minimum. Increase 25% for bars spaced less than 6 bar diameters.
2. "Top Bars" are horizontal bars with 12" or more of concrete cast below.

$D = 6d_b$

TYPICAL REBAR SPLICE AND EMBEDMENT LENGTH SCHEDULE

Not to Scale

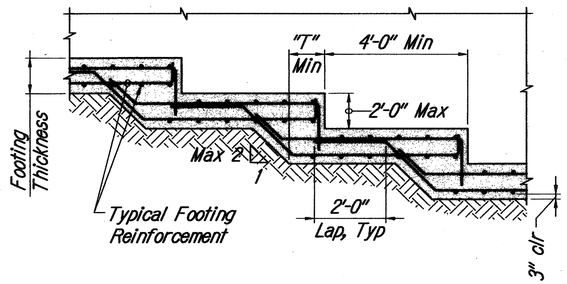
1 | S-2 | S-2



TYPICAL WALL CONSTRUCTION JOINT DETAIL

Not to Scale

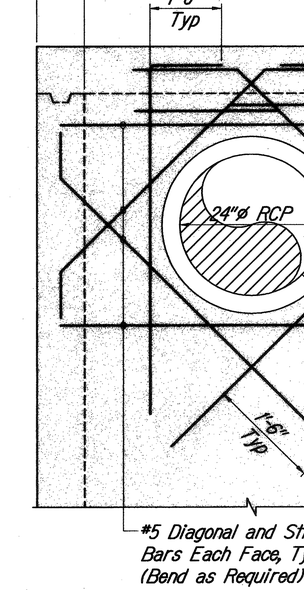
2 | S-2 | S-2



STEPPED FOOTING DETAIL

Not to Scale

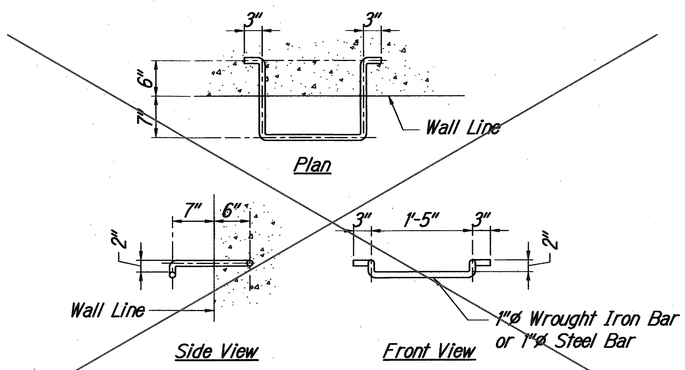
3 | S-2 | S-2



PIPE PENETRATION DETAIL

Not to Scale

4 | S-7 | S-2

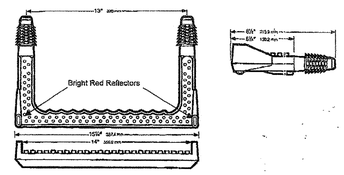


RUNG DETAIL

Not to Scale

5 | S-7 | S-2

P-1485O



SPECIFICATIONS
All Lane Poly Steps meet the requirements of ASTM C-478 and AASHTO M-199. The polypropylene conforms to ASTM D-4101. The ½" Grade 60 deformed reinforcing bar meets ASTM A-615.


RUNG

LANE POLYPROPYLENE MANHOLE STEPS

LANE INTERNATIONAL CORPORATION

P.O. Box 925 • 18067 S.W. Lower Boones Ferry Rd. • Tualatin, OR 97062 • 503-684-0077 • 800-665-0076
Fax 503-684-0078 • www.laneinternational.com

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY R. Yamamoto	6/30/06
	TRACED BY "	"
NOTE BOOK DESIGNED BY	L.Chin	"
	QUANTITIES L.Chin	"
No.	CHECKED BY L.Chin	"

PLOT DATE: 22-06-2010 @ 10:22 am
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"AS-BUILT"

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~~100.00~~	Double line for as-built deletion
Roadway	Text for as-built posting

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No. 6518-S
HAWAII, U.S.A.

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

TYPICAL DETAILS

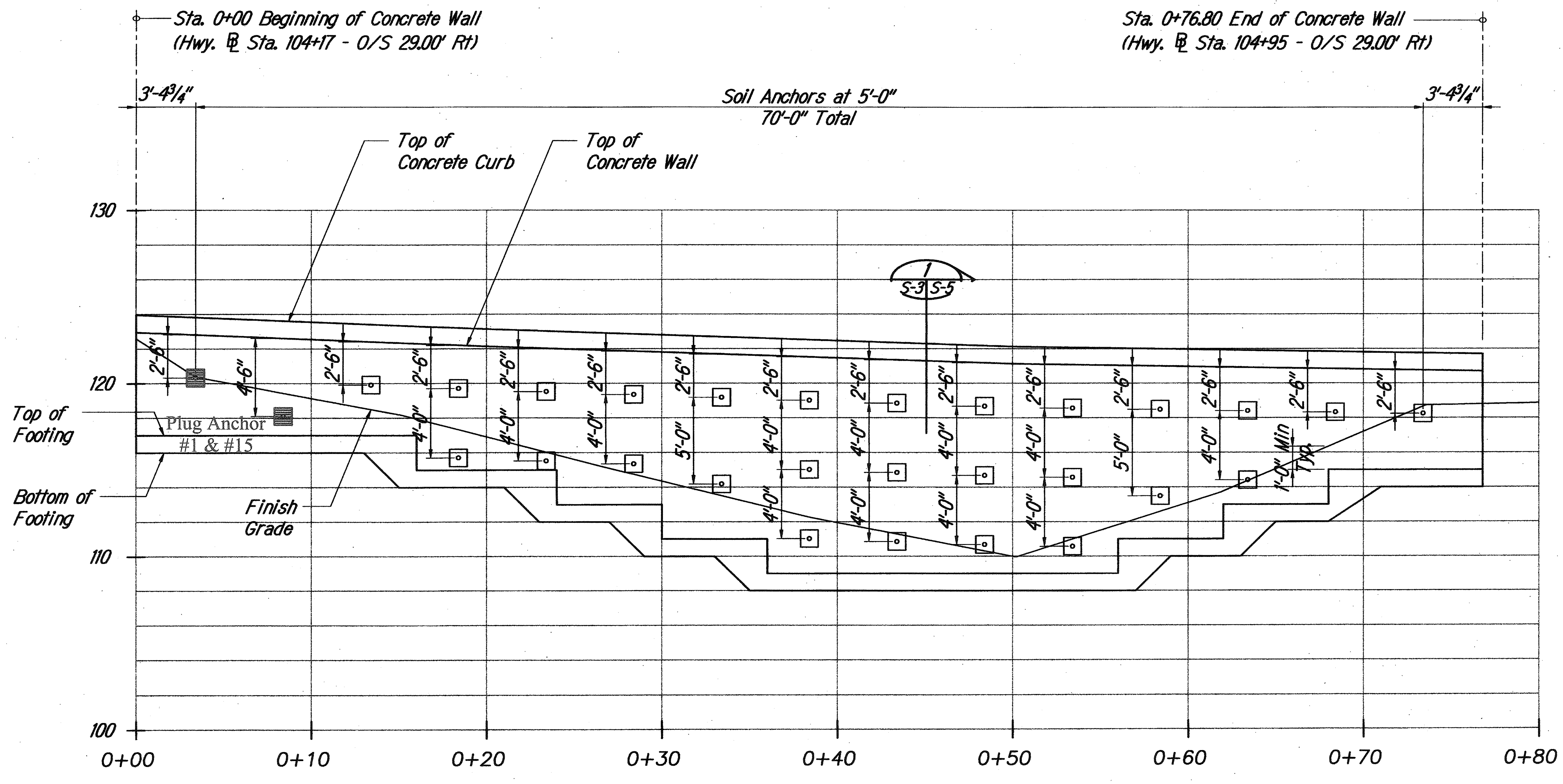
EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

F.A. Project No. ER-15(21)

Scale: As Noted Date: December, 2009

SHEET No. S-2 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	83	89



MP 12.9 ELEVATION (STATIONS ALONG FACE OF WALL) 1 S-3 | S-3

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

LEGEND FOR AS-BUILT POSTINGS

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Roadway	Text for as-built posting

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HIGHWAYS DIVISION

MP 12.9 CONCRETE RETAINING WALL ELEVATION

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

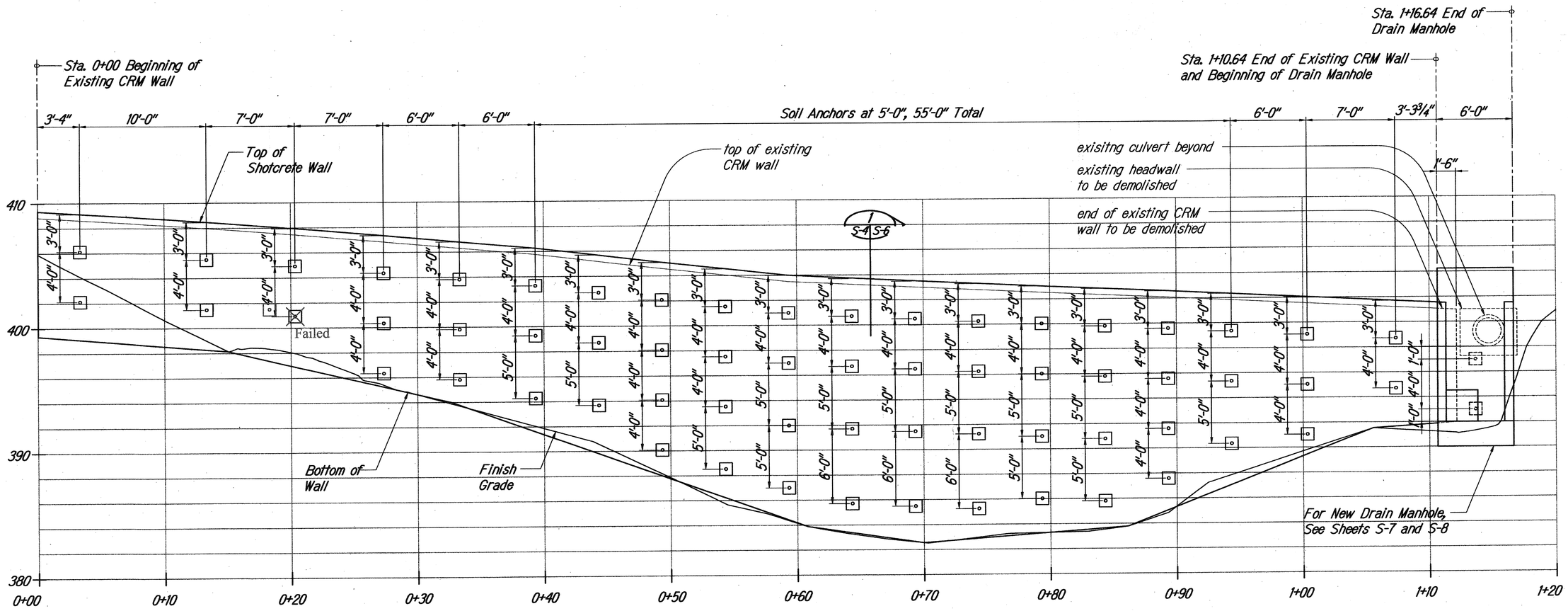
F.A. Project No. ER-15(21)

Scale: As Noted   Date: December, 2009

SHEET No. S-3 OF 9 SHEETS

"AS-BUILT"

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	84	89



MP 26.1 ELEVATION (STATIONS ALONG FACE OF WALL)

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

1
S-4 | S-4

ORIGINAL PLAN
SURVEY PLOTTED BY R. Yamamoto 6/30/06
DRAWN BY " "
NOTE BOOK DESIGNED BY L. Chan
QUANTITIES BY L. Chan
No. ____ CHECKED BY L. Chan

LAST UPDATED: 23-06-2010 @ 1529 am PLOT DATE: 23-06-2010 @ 1523 am
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Roadway	Text for as-built posting

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

MP 26.1 SHOTCRETE RETAINING WALL ELEVATION

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS
AT VARIOUS LOCATIONS
F.A. Project No. ER-15(21)

Scale: As Noted Date: December, 2009

SHEET No. S-4 OF 9 SHEETS

"AS-BUILT"

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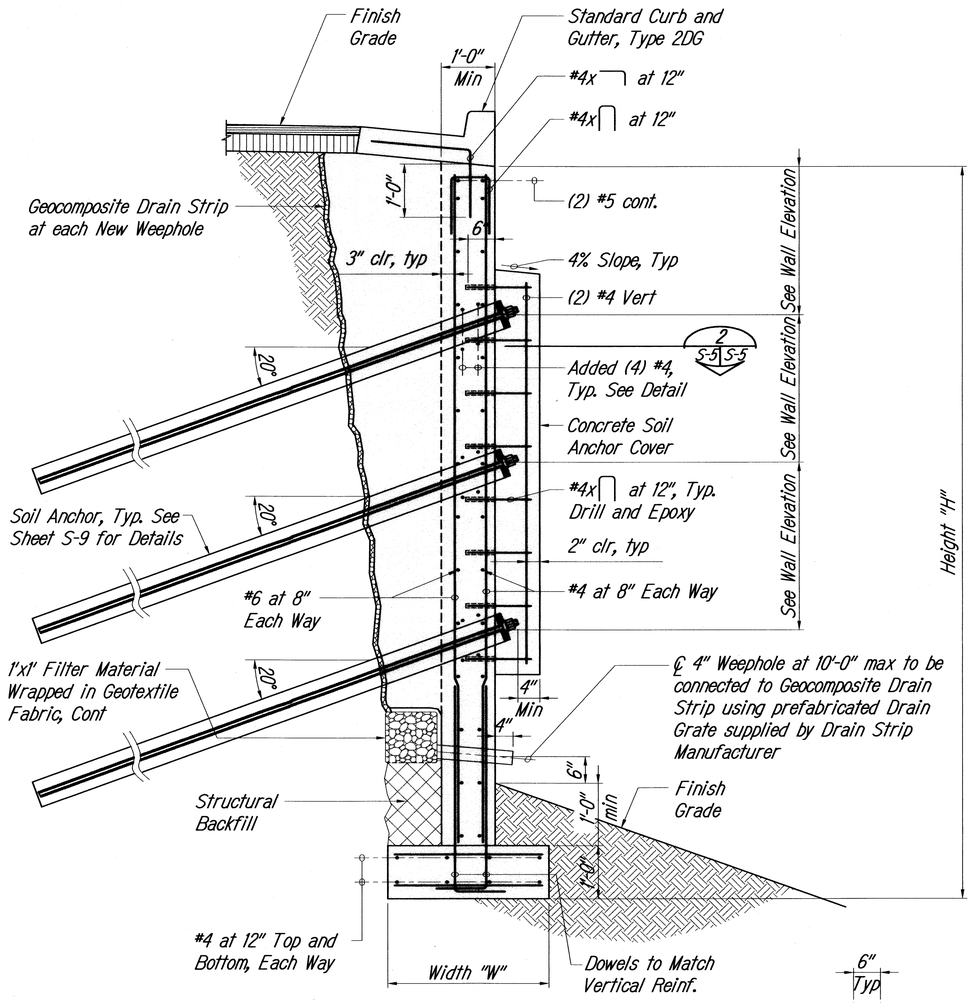
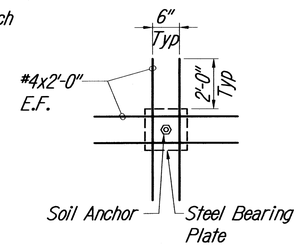
HAWAII	HAW.	ER-15(21)	2010	85	89

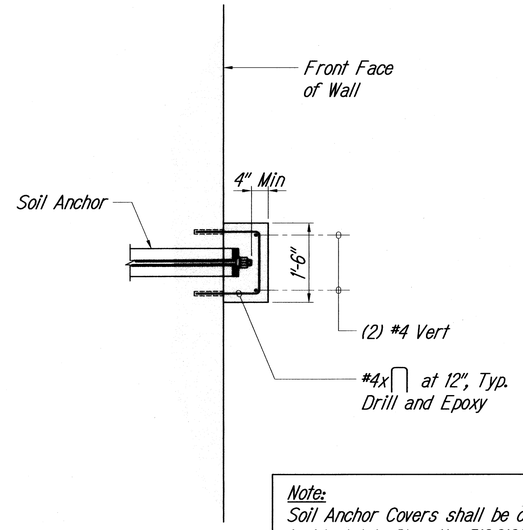


RETAINING WALL SCHEDULE	
HEIGHT "H"	"W"
≤ 14'-0"	3'-0"
≤ 12'-0"	2'-6"
≤ 10'-0"	2'-0"

CONCRETE RETAINING SYSTEM SECTION AT MP 12.9 — 1 / S-3 | S-5
Scale: 3/4" = 1'-0"



Added Rebar at Soil Anchor Detail



Note:
Soil Anchor Covers shall be considered incidental to Item No. 512.0100 Soil Anchor.

SECTION — 2 / S-5 | S-5
Scale: 3/4" = 1'-0"

ORIGINAL PLAN SURVEY PLOTTED BY — DATE 6/30/06
DRAWN BY R. Yamamoto "
TRACED BY "
NOTE BOOK DESIGNED BY L. Chan "
QUANTITIES BY L. Chan "
No. CHECKED BY L. Chan "

LAST UPDATE: 19-06-2010 @ 10:18 am PLOT DATE: 22-06-2010 @ 10:22 cm
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EXPIRATION DATE OF THE LICENSE 4/30/2010
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

CONCRETE RETAINING WALL SECTIONS

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

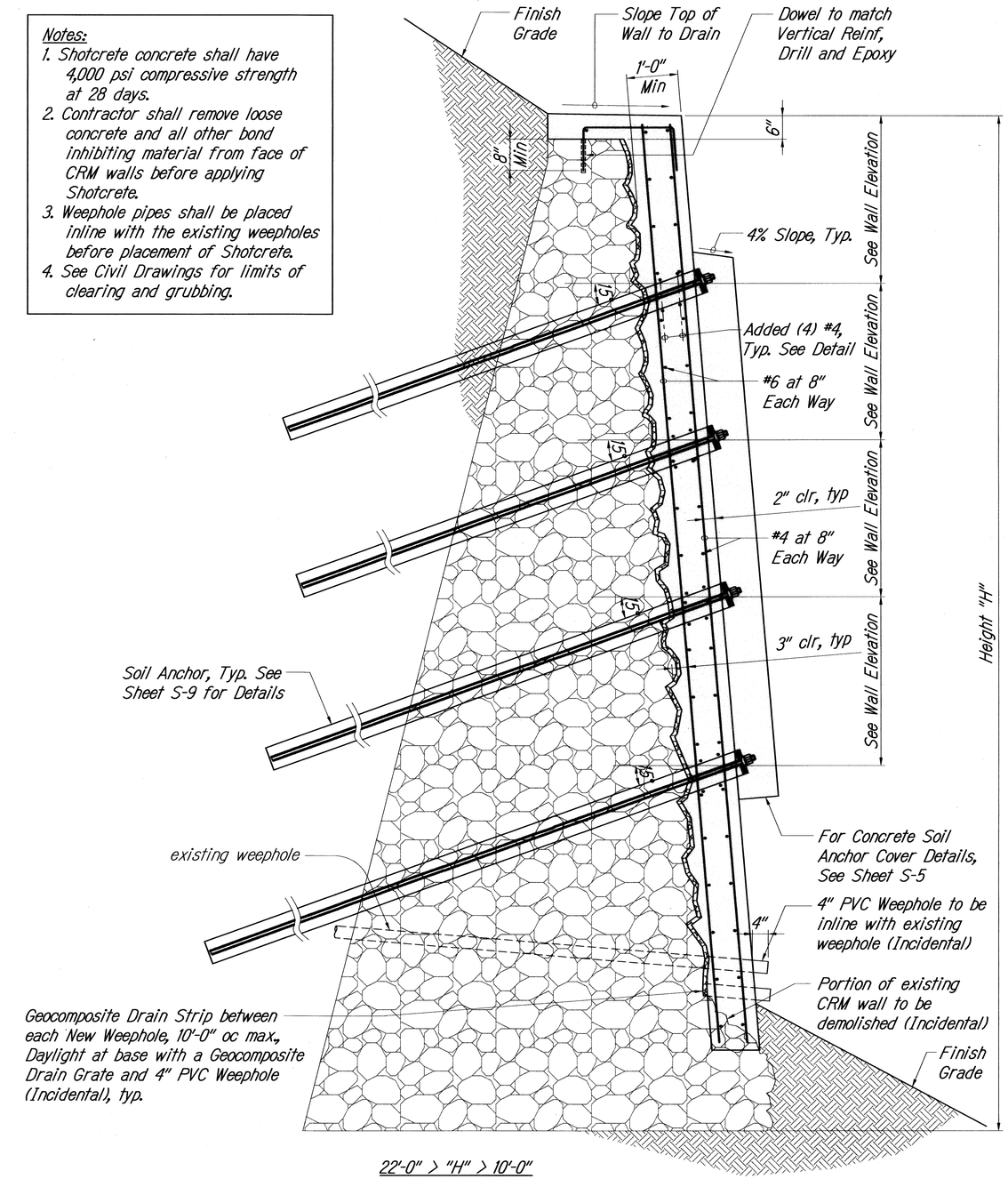
F.A. Project No. ER-15(21)

Scale: As Noted — Date: December, 2009

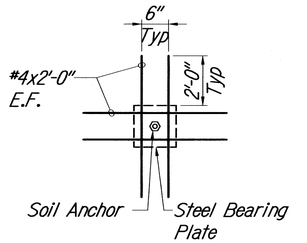
SHEET No. S-5 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	86	89

Notes:
1. Shotcrete concrete shall have 4,000 psi compressive strength at 28 days.
2. Contractor shall remove loose concrete and all other bond inhibiting material from face of CRM walls before applying Shotcrete.
3. Weephole pipes shall be placed inline with the existing weepholes before placement of Shotcrete.
4. See Civil Drawings for limits of clearing and grubbing.



22'-0" > "H" > 10'-0"



Added Rebar at Soil Anchor Detail

"H" < 10'-0"

Note:
Structural backfill over wall footings backfill shall consist of non-expansive granular material. See Note 3.D.

SHOTCRETE RETAINING SYSTEM SECTION AT EXISTING CRM WALL AT MP 26.1

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

1 / S-4 | S-6

		DATE
ORIGINAL PLAN	SURVEY PLOTTED BY	
	DRAWN BY	K. Yamamoto 6/30/06
NOTE BOOK	TRACED BY	" "
	DESIGNED BY	L. Chan "
	QUANTITIES BY	L. Chan "
No.	CHECKED BY	L. Chan "

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

SHOTCRETE RETAINING WALL SECTIONS

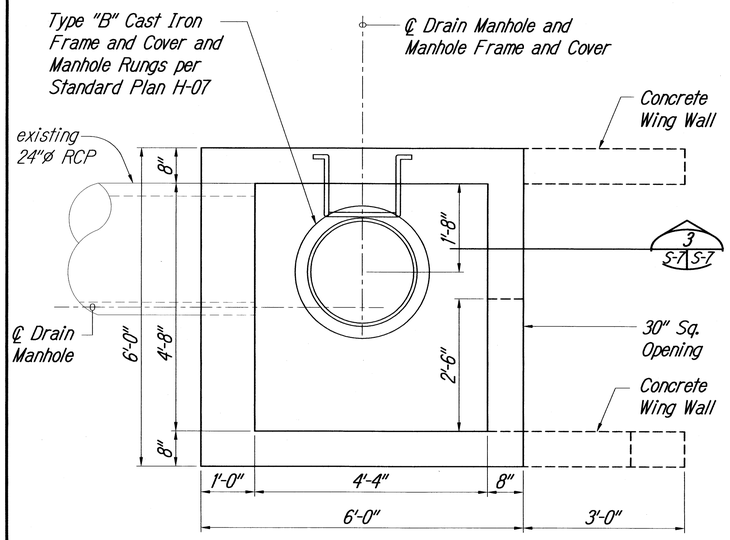
EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

F.A. Project No. ER-15(21)

Scale: As Noted Date: December, 2009

SHEET No. S-6 OF 9 SHEETS

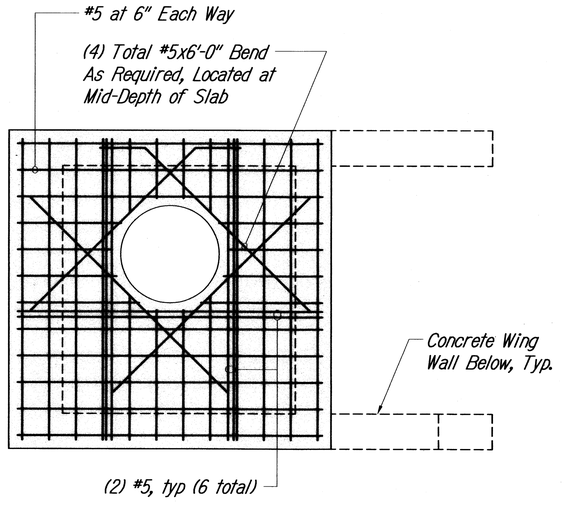
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	87	89



DRAIN MANHOLE PLAN AT CULVERT AT MP26.1

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

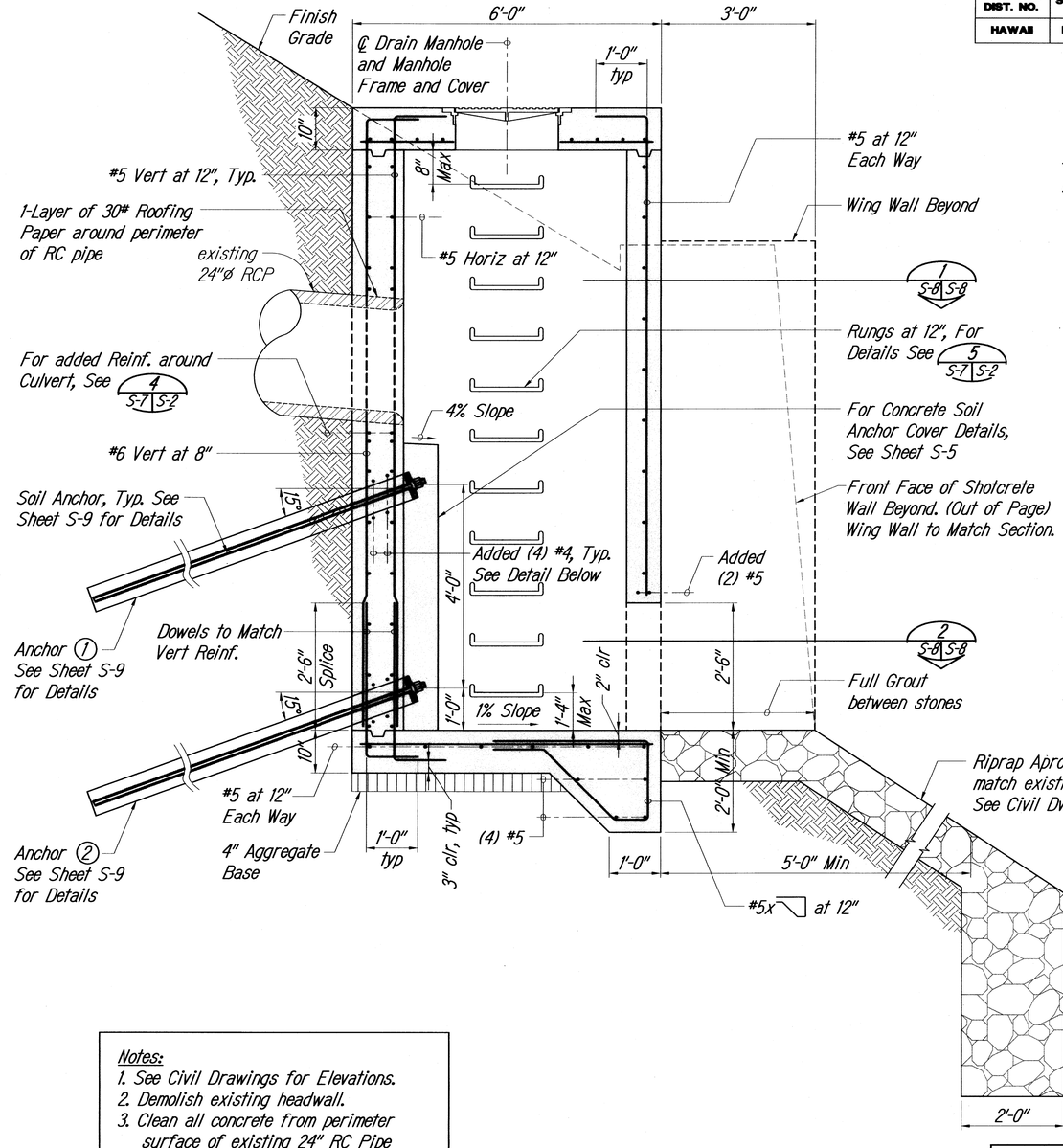
1 S-7 S-7

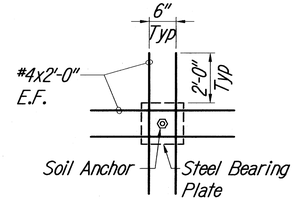


TOP SLAB PLAN

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

2 S-7 S-7





Added Rebar at Soil Anchor Detail

Notes:
1. See Civil Drawings for Elevations.
2. Demolish existing headwall.
3. Clean all concrete from perimeter surface of existing 24" RC Pipe after demolition of concrete headwall.

DRAIN MANHOLE SECTION

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

3 S-7 S-7

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY R. Yamamoto	2/20/06
NOTE BOOK	TRACED BY "	"
	DESIGNED BY L. Chan	"
	QUANTITIES BY L. Chan	"
No.	CHECKED BY L. Chan	"

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

DRAIN MANHOLE PLANS AND SECTIONS

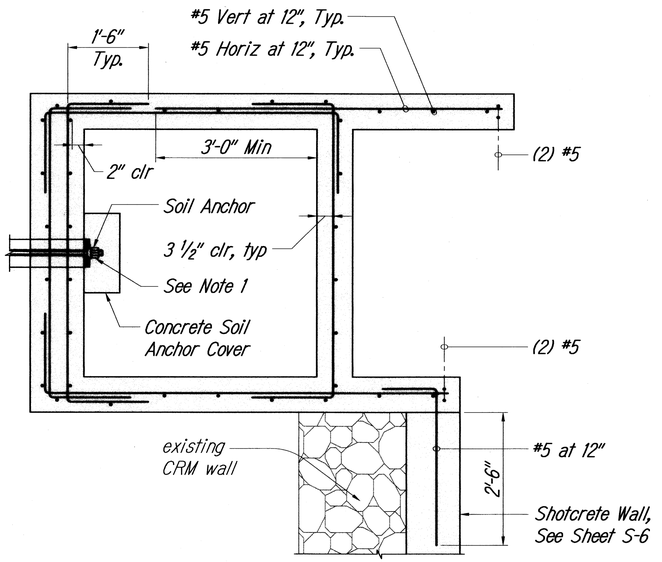
EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

F.A. Project No. ER-15(21)

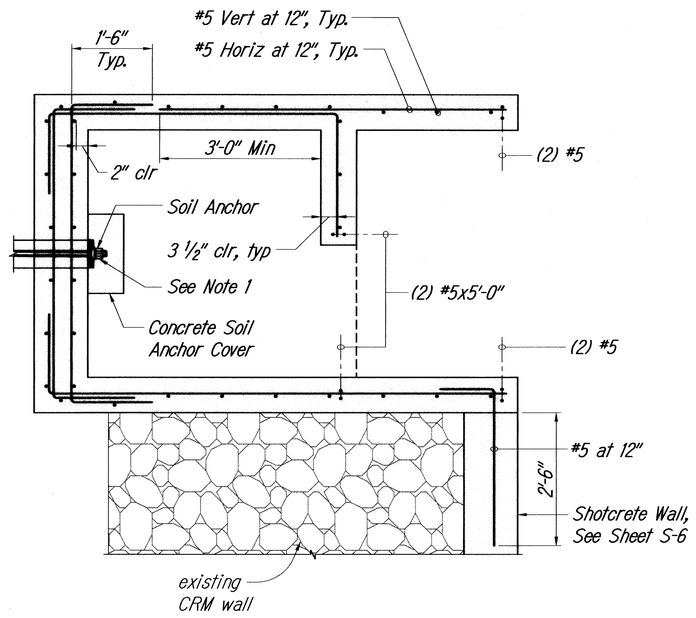
Scale: As Noted Date: December, 2009

SHEET No. S-7 OF 9 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	88	89



SECTION 1 S-8 | S-8
Scale: 3/4" = 1'-0"



SECTION 2 S-8 | S-8
Scale: 3/4" = 1'-0"

Note:
See Detail 3 on Sheet S-7 for added reinforcing at soil anchors.

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY R. Yamamoto	6/30/10
	TRACED BY "	"
NOTE BOOK	DESIGNED BY L. Chan	"
	QUANTITIES BY L. Chan	"
No.	CHECKED BY L. Chan	"

PATH/FILENAME: P:\Drafting\2010-01-05_2234\2234_S-8.dwg LAST UPDATE: 21-06-2010 @ 10:21 am PLOT DATE: 22-06-2010 @ 10:22 am

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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
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DRAIN MANHOLE SECTIONS

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS
AT VARIOUS LOCATIONS
F.A. Project No. ER-15(21)

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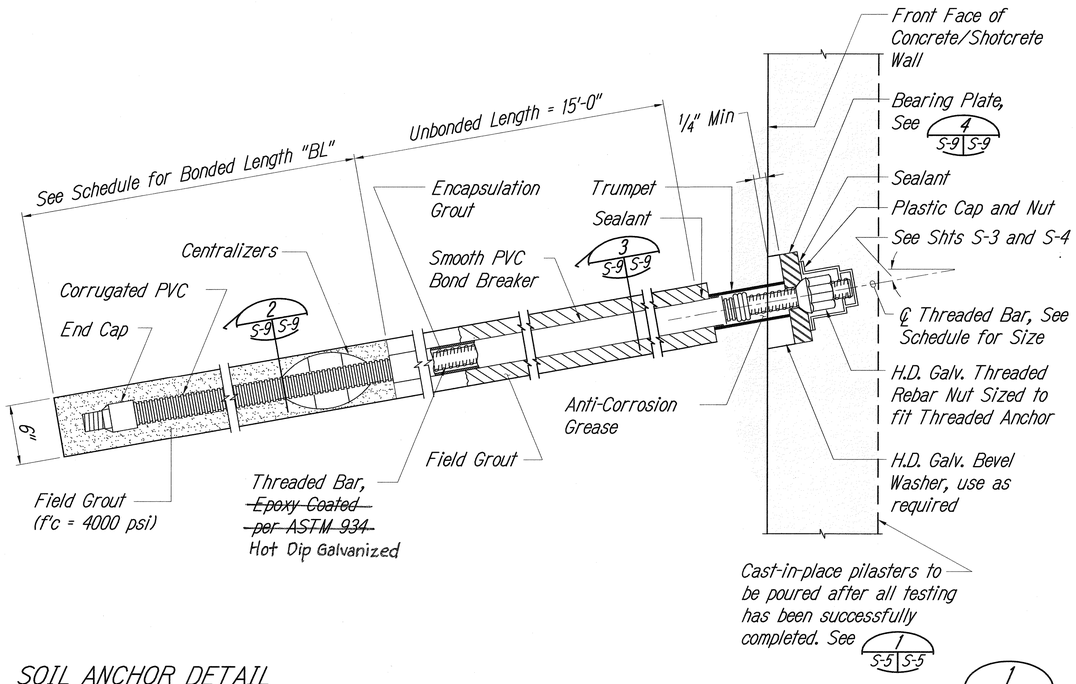
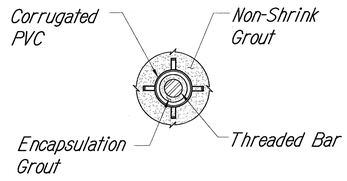
SHEET No. S-8 OF 9 SHEETS

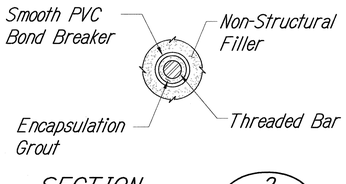
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	89R	89



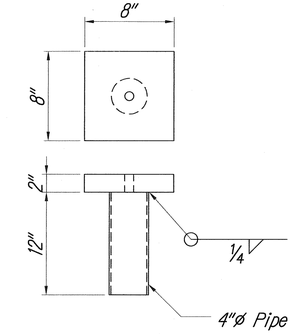
SOIL ANCHOR DETAIL
Not to Scale
1 S-9 S-9



SECTION
Not to Scale
2 S-9 S-9



SECTION
Not to Scale
3 S-9 S-9



BEARING PLATE DETAIL
Not to Scale
4 S-9 S-9

Soil Anchor Notes:

1. Soil Anchor threaded bar shall be ASTM A722, type II, Grade 150 and galvanized per ASTM A153. See Schedule for Bar diameter. Yield strength shall not be reduced by more than 5% after galvanizing. In addition, angle compensating nuts or bevel washer set shall be galvanizing per ASTM 123.
2. See Schedule for required soil anchor design load, DL, test load, TL, and lock off load, LL.
3. Grout tubes shall be placed thru the 2" x 8" x 8" steel bearing plate. Size and locations shall ensure full grouting of hole. The contractor shall submit grouting details for approval by the engineer.
4. Centralizers shall be placed at 10-feet intervals in the bonded length, with the bottom centralizer located 5 feet from the bottom of the bonded length.
5. Drilling of the soil anchor holes may encounter loose/soft fill extremely weathered basalt rock and hard unweathered basalt rock. Special drilling tools for drilling into the basalt rock formation will be required. Temporary casing of the drilled holes for the soil anchors may be required when cave-in conditions occur during the drilling of the soil anchor holes, especially in the loose/soft fill and the extremely weathered basalt rock at the site.
6. Grouts shall attain a minimum compressive strength of 4000 psi prior to stressing. Testing for compressive strength shall conform to ASTM C-109 mortar and sand.
7. Smooth and corrugated sheaths/sleeves shall be High-Density Polyethylene (HDPE) conforming to ASTM D 3350 and having a minimum strength of 7,000 psi and 0.06 in wall thickness.
8. When lifting the soil anchors for installation into the holes, multiple pick points shall be used to avoid bending or damaging the threaded bar and/or encapsulation grout.
9. Soil anchor threaded bar shall be new and free of any surface damages, kinks, and sharp bend.
10. A Geotechnical Engineer, licensed in the State of Hawaii, shall be present to monitor the installation and testing of soil anchors. Contractor shall coordinate the installation and testing schedule with the State's Project Engineer.
11. A performance test on the first installed soil anchor shall be performed. See specifications for details.
12. All other soil anchors shall be proof tested. See specifications for details.

SOIL ANCHOR BONDED LENGTH AND LOADING SCHEDULE

	AT MP 12.9						AT MP 26.1					
HEIGHT "H"	"A"	"S"	"BL"	"DL"	"TL"	"LL"	"A"	"S"	"BL"	"DL"	"TL"	"LL"
≤ 22'-0"	-	-	-	-	-	-	1 1/4"	5'-0"	50'-0"	28	37	22
≤ 20'-0"	-	-	-	-	-	-	1 1/4"	5'-0"	45'-0"	22	29	18
≤ 18'-0"	-	-	-	-	-	-	1 1/4"	5'-0"	40'-0"	15	20	12
≤ 16'-0"	-	-	-	-	-	-	1"	5'-0"	35'-0"	15	20	12
≤ 14'-0"	1"	5'-0"	45'-0"	25	33	20	1"	6'-0"	35'-0"	12	16	10
≤ 12'-0"	1"	5'-0"	40'-0"	28	37	22	1"	7'-0"	35'-0"	10	13	8
≤ 10'-0"	1"	5'-0"	35'-0"	19	26	16	1"	10'-0"	35'-0"	8	11	7

TRUMPET OPENING SIZE SCHEDULE

ANCHOR DIAMETER	TRUMPET OPENING SIZE
1"	3 1/2"
1 1/4"	3 3/4"

SOIL ANCHOR SCHEDULE AT MP 26.1 AT DRAIN MANHOLE

ANCHOR	"A"	"BL"	"DL"	"TL"	"LL"
Anchor (1)	1"	35'-0"	12	15	9
Anchor (2)	1"	35'-0"	9	12	7

Legend:
A = Anchor Threaded Bar Diameter (in)
S = Max Horizontal Anchor Spacing (ft)
BL = Bonded Length (ft)
DL = Design Load (kips)
TL = Test Load (kips)
LL = Lock Off Load (kips)

ORIGINAL SURVEY PLOTTED	BY	DATE
PLAN TRACED	BY R. Yamamoto	" 8/30/06
NOTE BOOK DESIGNED	BY L. Chan	"
QUANTITIES	BY L. Chan	"
No. ____ CHECKED	BY L. Chan	"

LAST UPDATE: 06-04-2010 @ 10:01 am PLOT DATE: 22-06-2010 @ 10:22 am
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6-30-10	Revised Soil Anchor Detail per Addendum 2.
1	
DATE	REVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SECTIONS AND DETAILS

EMERGENCY EARTHQUAKE ROCKFALL REPAIRS AT VARIOUS LOCATIONS

F.A. Project No. ER-15(21)

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SHEET No. S-9 OF 9 SHEETS

KEN KAZUO HAYASHIDA
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