| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | 20 | 31 |

## GENERAL:

1. FOR WALAOHIA BRIDGE, THE EXISTING INFORMATION SHOWN IN THESE DRAWINGS WERE OBTAINED FROM THE ORIGINAL BRIDGE DRAWINGS DATED NOVEMBER 1918 AND ARE PRESENTED FOR REFERENCE PURPOSES ONLY. NO RESPONSIBILITY IS ASSUMED FOR THE ACCURACY OF THE EXISTING INFORMATION PRESENTED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY INDEPENDENTLY ALL OF THE AS-BUILT INFORMATION.

2. FOR AAMAKOA BRIDGE, NO DRAWING OF ORIGINAL CONSTRUCTION IS AVAILABLE. INFORMATION FOR REINFORCING IN SUPERSTRUCTURE WAS OBTAINED FROM WALAOHIA BRIDGE ORIGINAL DRAWINGS. INFORMATION FOR REINFORCING IN FRONT FACE OF ABUTMENTS WERE OBTAINED BY SOUNDING AND PROBING. NO RESPONSIBILITY IS ASSUMED FOR THE ACCURACY OF THE EXISTING INFORMATION PRESENTED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VERIFY INDEPENDENTLY ALL OF THE AS-BUILT INFORMATION.

3. THE CONTRACTOR SHALL VISIT THE CONSTRUCTION SITE AND SHALL VERIFY ALL DIMENSIONS AND CONDITIONS PRIOR TO STARTING ANY WORK AND SHALL BE RESPONSIBLE FOR COORDINATION OF ALL WORK AND MATERIALS INCLUDING THOSE FURNISHED BY SUB-CONTRACTORS. THE HAWAII DEPARTMENT OF TRANSPORTATION (D.O.T.) REPRESENTATIVE SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES FOUND.

4. THE CONTRACT STRUCTURAL DRAWINGS AND SPECIFICATIONS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION.

5. THE CONTRACTOR SHALL PROVIDE ADEQUATE BRACING FOR EXCAVATIONS AND SHORING FOR ALL EXISTING ADJACENT STRUCTURES AND ROADWAYS. BRACING FOR EXCAVATIONS AND SHORING FOR CONSTRUCTION LOADS SHALL BE DESIGNED BY A HAWAII LICENSED CIVIL OR STRUCTURAL ENGINEER EXPERIENCED IN THIS KIND OF WORK.

## BASIS FOR SEISMIC RETROFIT:

1. THE INTENT OF THE PROJECT IS TO RETROFIT THE STRUCTURES TO PREVENT COLLAPSE DUE TO A SEISMIC EVENT WITH A MAXIMUM BEDROCK ACCELERATION COEFFICIENT OF 0.35g

2. WALAOHIA BRIDGE

   a. TWO 5'-0" DIAMETER DRILLED SHAFTS ARE PROVIDED BEHIND EACH ABUTMENT FOR CONSIDERATIONS OF SLOPE STABILITY OF THE SOIL AND TO PROVIDE REQUIRED LONGITUDINAL AND TRANSVERSE RESISTANCE DURING AN EARTHQUAKE.

   b. THE DRILLED SHAFTS ARE ALSO USED FOR CONNECTING CONCRETE ARMS TO JACK UP AND UNDERPIN THE ABUTMENTS TO RELIEVE SOIL BEARING PRESSURE UNDER ABUTMENTS.

   c. STAINLESS STEEL PLATES WITH STAINLESS STEEL EPOXY ANCHORS ARE PROVIDED ON THE OUTSIDE FACES OF THE EXTERIOR GIRDERS AT THE EXISTING EXPANSION JOINT OVER BENT 'B'. A PORTION OF THE EXISTING EXPANSION JOINT IS GROUT PACKED. THE PURPOSED IS TO PROVIDE CONTINUITY OF THE SUPERSTRUCTURE DURING AN EARTHQUAKE AND TO RESIST FLEXURAL BENDING DUE TO LATERAL SEISMIC MOVEMENT.

   d. THE THREE TRANSVERSE LINK BEAMS AT BENTS 'A', 'B', AND 'C' ARE WRAPPED WITH FIBER REINFORCED COMPOSITE (FRC)- SYSTEM TO INCREASE THEIR SHEAR CAPACITIES. SIMILARLY, THE TOP OF COLUMNS AT BENTS 'A' AND 'C' ARE WRAPPED WITH FRC SYSTEMS TO INCREASE THEIR DISPLACEMENT CAPACITIES.

3. AAMAKAO BRIDGE

   a. THE THRUST BEAM AT THE FRONT FACE OF EACH ABUTMENT IS PROVIDED TO TRANSFER COMPRESSIVE LONGITUDINAL LOADS FROM THE SUPERSTRUCTURE TO THE EARTH BEHIND THE ABUTMENT.

   b. THE DOWELS AND CREEP BLOCKS AT THE PIER ARE PROVIDED TO ANCHOR THE PIER TOP TO PREVENT PIER COLLAPSE.

## DRILLED SHAFT CONSTRUCTION:

1. THE DRILLED SHAFT CONTRACTOR SHALL HAVE THE APPROPRIATE EQUIPMENT AND TOOLS TO DRILL THROUGH BOULDERS AND MEDIUM HARD TO HARD BASALT ROCK. APPROPRIATE MEASURES SHALL BE TAKEN TO AVOID DISLODGING BOULDERS INTO THE DRILLED SHAFT HOLE DURING THE DRILLING AND DRILLED SHAFT INSTALLATION PROCESS.

2. THE CONTRACTOR SHALL SUBMIT INSTALLATION PLAN TO THE ENGINEER FOR REVIEW AT LEAST ONE MONTH PRIOR TO CONSTRUCTION.

3. TEMPORARY CASING MAY BE NEEDED TO REDUCE THE POTENTIAL FOR CAVING IN OF THE SOIL MATERIAL IN THE HOLES DURING THE DRILLING OPERATION DUE TO POSSIBLE PERCHED GROUND WATER ZONES.

4. A REPRESENTATIVE OF THE SOILS ENGINEER CONSULTANT SHALL BE PRESENT AT THE SITE TO OBSERVE THE DRILLING AND INSTALLATION OF DRILLED SHAFTS OPERATION DURING CONSTRUCTION.

5. CONCRETE PLACEMENT BY TREMIE METHODS SHALL BE USED DURING CONSTRUCTION OF THE DRILLED SHAFTS WHENEVER GROUND WATER IS PRESENT IN THE DRILLED HOLES. THE CONCRETE SHALL BE PLACED PROMPTLY AFTER THE COMPLETION OF DRILLING (WITHIN 18 HOURS) TO REDUCE THE POTENTIAL FOR CAVING IN OF THE SIDE WALLS.

6. THE CONCRETE SHALL BE PLACED IN A SUITABLE MANNER TO REDUCE SEGREGATION OF THE AGGREGATES.

## GENERAL NOTES:

1. GENERAL SPECIFICATIONS: HAWAII DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATION FOR ROAD, BRIDGE AND PUBLIC CONSTRUCTION, 1994, TOGETHER WITH SPECIAL PROVISIONS PREPARED FOR THIS CONTRACT.

2. DESIGN SPECIFICATIONS: AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 3RD EDITION WITH APPROPRIATE INTERIMS.

3. CALTRANS MEMO TO DESIGNERS 20-4, OCTOBER 1995.

4. GEOTECHNICAL ENGINEERING EXPLORATION, SEISMIC RETROFIT OF AKONI PULE HIGHWAY, WALAOHIA BRIDGE AND AAMAKOA BRIDGE, OCTOBER 16, 2003 BY GEOLABS, INC.

5. SEISMIC LOADING:

   A. SEISMIC PERFORMANCE CATEGORY ..... D

   B. ACCELERATION COEFFICIENT ..... 0.35g

6. CONCRETE CLASSES:

   A. EXISTING

      COLUMN, BENT CAP BEAMS (ASSUMED) ..... f'c = 3,300 PSI
      FOOTING (ASSUMED) ..... f'c = 3,300 PSI

   B. NEW

      CONCRETE DRILLED SHAFTS ..... f'c = 4,000 PSI
      CONCRETE ARMS AND BEAMS ..... f'c = 4,000 PSI
      CONCRETE GIRDER EXTENSION ..... f'c = 4,000 PSI
      CONCRETE THRUST BEAMS ..... f'c = 4,000 PSI
      CONCRETE CREEP BLOCKS ..... f'c = 4,000 PSI

7. DESIGN SLUMP OF CONCRETE SHALL BE AS FOLLOWS:

   a. DRILLED SHAFTS- AS CALLED FOR IN SHT. S-7 "DRILLED SHAFT NOTES."
   b. ARMS, BEAMS, GIRDER EXTENSION - WALAOHIA BRIDGE - 7"± 1"
   c. THRUST BEAMS, CREEP BLOCKS - AAMAKAO BRIDGE - 8"± 1"

8. REINFORCING STEEL:

   A. EXISTING

      COLUMN, MAIN REINF. AND DOWELS (ASSUMED) ..... fy = 33,000 PSI
      ALL OTHER (ASSUMED) ..... fy = 33,000 PSI

   B. NEW

      ALL BARS, DOWELS AND STIRRUPS ..... fy = 60,000 PSI
      WELDED BARS (ASTM A706) ..... fy = 60,000 PSI

9. STRUCTURAL STEEL:

      STAINLESS STEEL PLATES TYPE 316 ..... Fy = 36,000 PSI
      GALVANIZED STEEL PLATE ASTM A36 ..... Fy = 36,000 PSI

10. EPOXY ANCHOR - STAINLESS STEEL AISI 316 S.S.

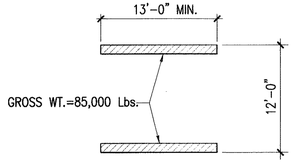
11. DRILLING OF ANCHORS, BARS AND BOLTS: LOCATE EXISTING REINFORCING AND AVOID THEM. HOLES IN STRAPS AND PLATES SHALL BE DRILLED AFTER EXISTING REINFORCEMENT ARE LOCATED. WHEN EXISTING BARS ARE ENCOUNTERED WHILE DRILLING, RELOCATE HOLES. DO NOT DAMAGE EXISTING BARS. FILL ABANDONED HOLES WITH DRY PACK POLYMER MODIFIED MORTAR. PAYMENT FOR LOCATING, RELOCATING AND REPAIRING SHALL BE INCIDENTAL TO THE WORK.

12. CRANE LOADS:

    BASED ON AVAILABLE DRAWINGS OF ORIGINAL CONSTRUCTION, THE WALAOHIA BRIDGE SHOULD BE CAPABLE OF SUPPORTING THE FOLLOWING LOADS, PROVIDED THEY TRAVEL SLOWLY ON THE BRIDGE.

    A. HS 20 TRUCK.

    B. 85,000 Lbs. WEIGHT DRILL RIG ON CRAWLERS, SPACED AS SHOWN.




THE CONTRACTOR SHALL OBTAIN PRIOR PERMIT FROM STATE DOT IN CASE THE CRANE LOAD EXCEEDS THE LEGAL LOAD CAPACITY OF THE BRIDGES ON WAY TO WALAOHIA BRIDGE.

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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| | DRAWN BY | |
| | TRACED BY | |
| NOTE BOOK | DESIGNED BY | |
| | QUANTITIES BY | |
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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

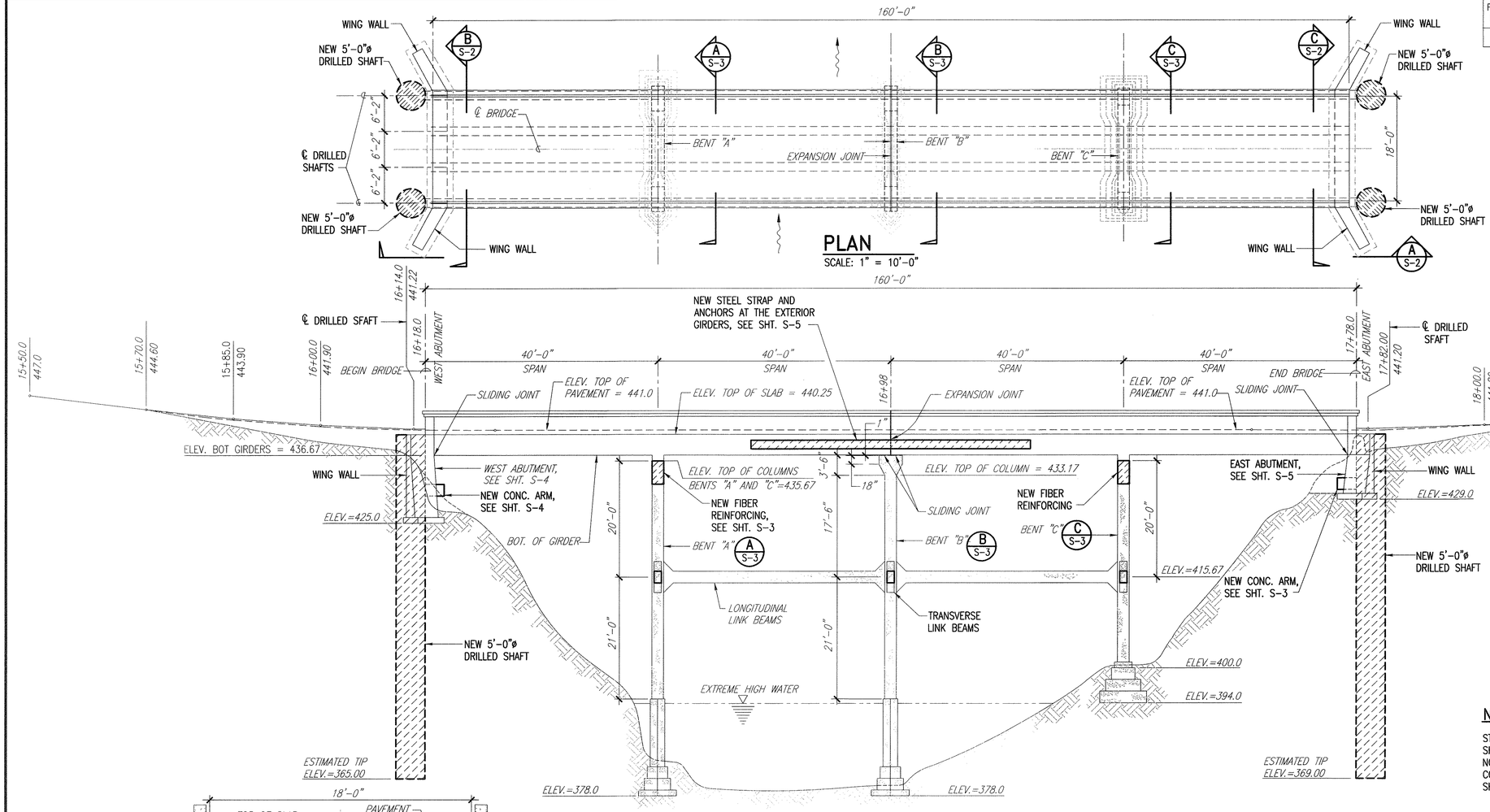
GENERAL BRIDGE RETROFIT NOTES
DRILLED SHAFT CONSTRUCTION NOTES

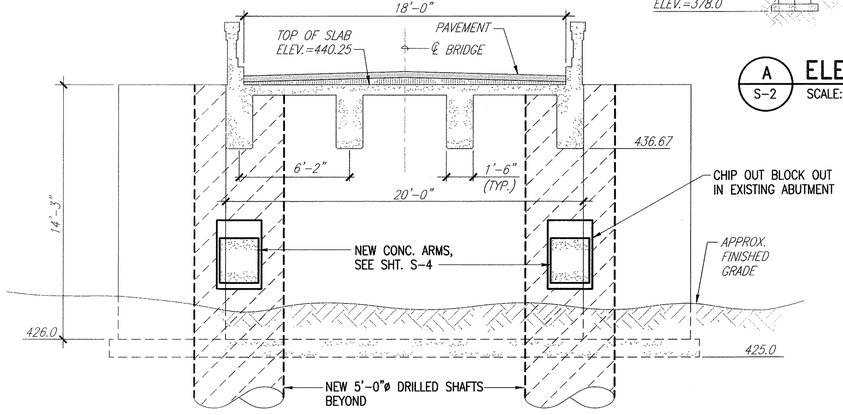
AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. S - 1 OF 12 SHEETS

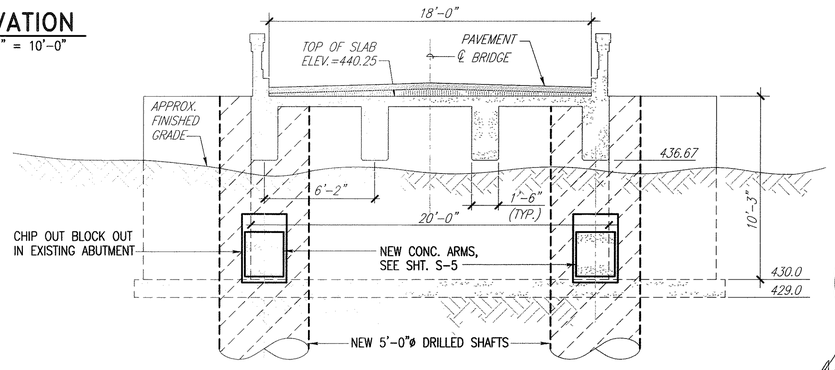
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **21** | 31 |




B S-2 **WEST ABUTMENT ELEVATION**
SCALE: 1/4"=1'-0"

A S-2 **ELEVATION**
SCALE: 1" = 10'-0"




C S-2 **EAST ABUTMENT ELEVATION**
SCALE: 1/4"=1'-0"

## NOTE:

STATIONING, ELEVATIONS, DIMENSIONS AND BY OTHERS DETAILS SHOWN ARE FROM ORIGINAL CONSTRUCTION DRAWING DATED NOV. 1918. ACTUAL CONDITIONS MAY DIFFER DUE TO ACTUAL CONSTRUCTION, REPAVING, AND OTHER CAUSES. CONTRACTOR SHALL VERIFY AS NECESSARY.

## GRAPHIC SCALES:

4' 0 4' 8' 12'
SCALE: 1/4" = 1'-0"

10' 0 10' 20' 30'
SCALE: 1" = 10'

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

# BRIDGE PLAN AND ELEVATIONS
# WALAOHIA BRIDGE

AKONI PULE HIGHWAY, SEISMIC RETROFIT
OF WALAOHIA AND AAMAKAO BRIDGES;
FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-2** OF 12 SHEETS

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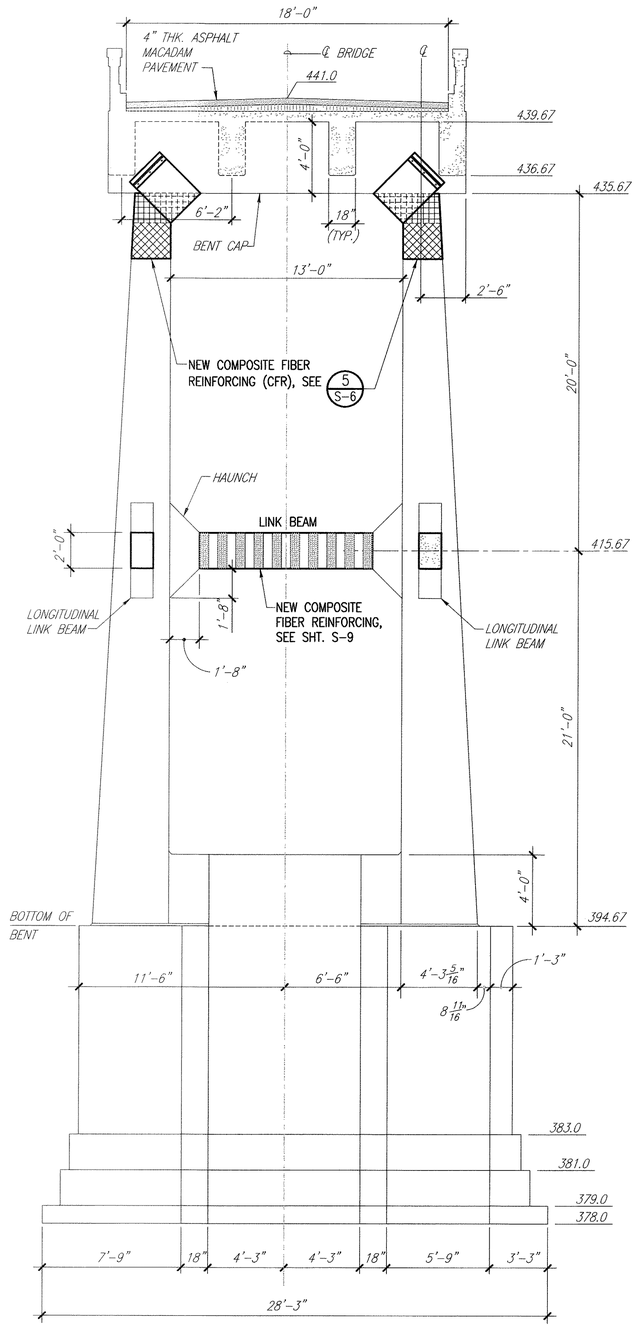
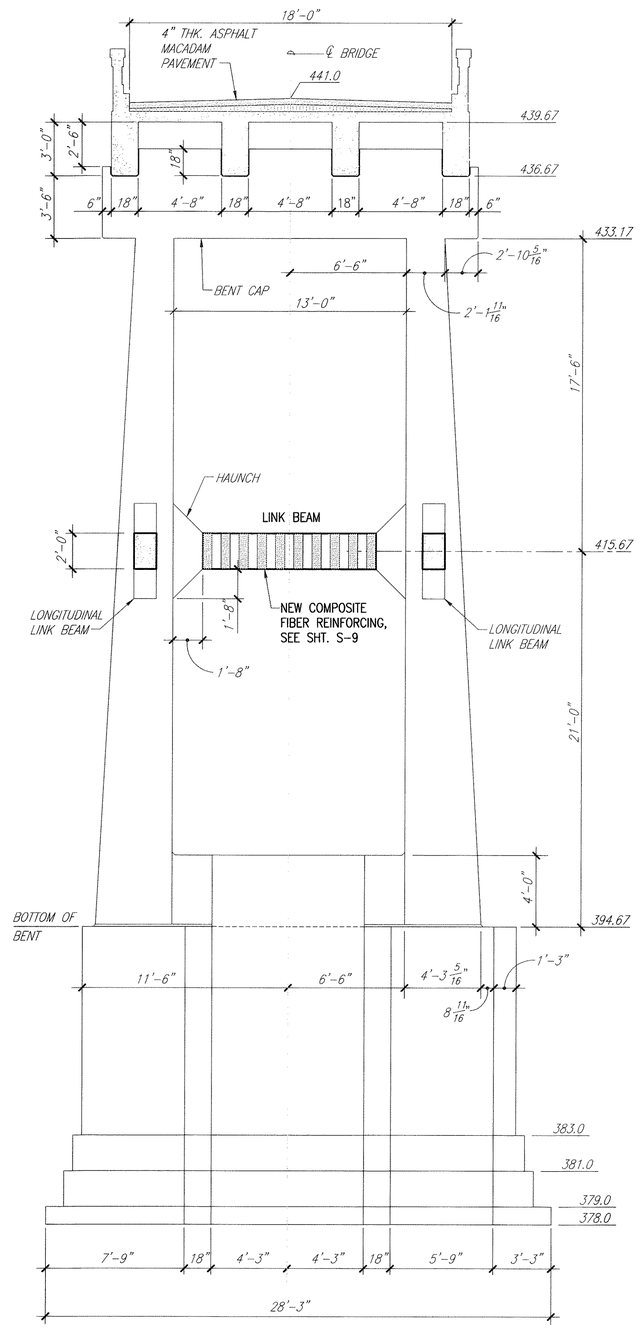
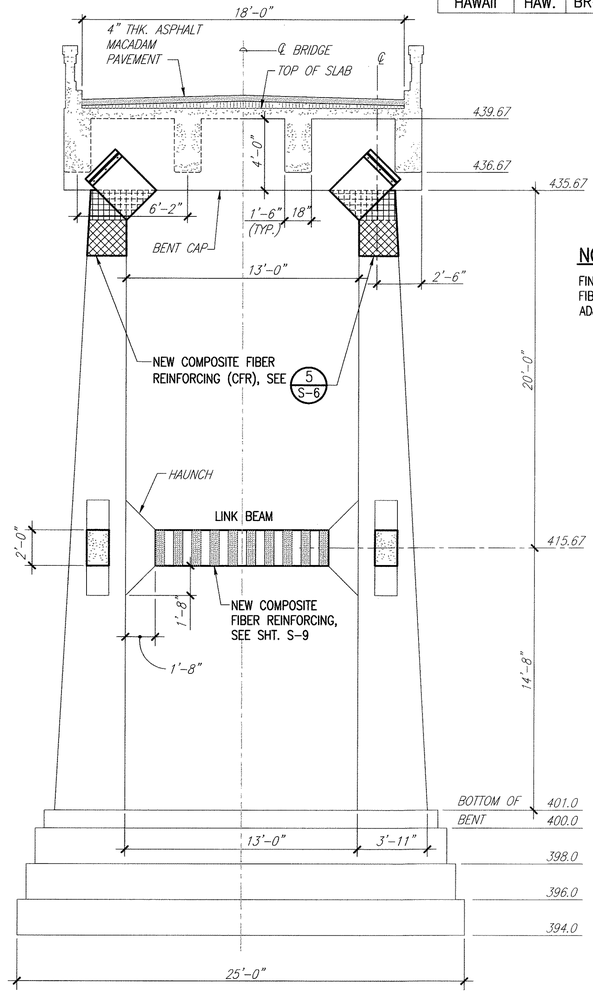



A S-3 **BENT "A" ELEVATION**
SCALE: 1/4"=1'-0"




B S-3 **BENT "B" ELEVATION**
SCALE: 1/4"=1'-0"




C S-3 **BENT "C" ELEVATION**
SCALE: 1/4"=1'-0"

**NOTE:**

FINISH AREAS RETROFITTED WITH COMPOSITE FIBER REINFORCING AS REQUIRED TO MATCH ADJACENT AREAS.

**GRAPHIC SCALE**

-4' 0 4' 8' 12' 16' 20'

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

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APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**BRIDGE BENT ELEVATIONS**

**WALAOHIA BRIDGE**

AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-3** OF 12 SHEETS

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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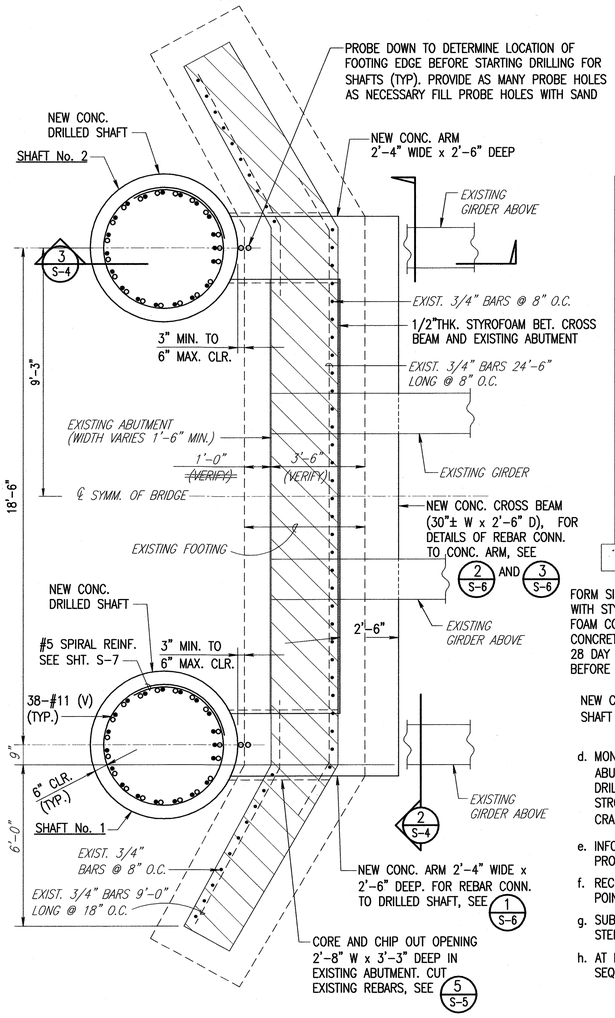
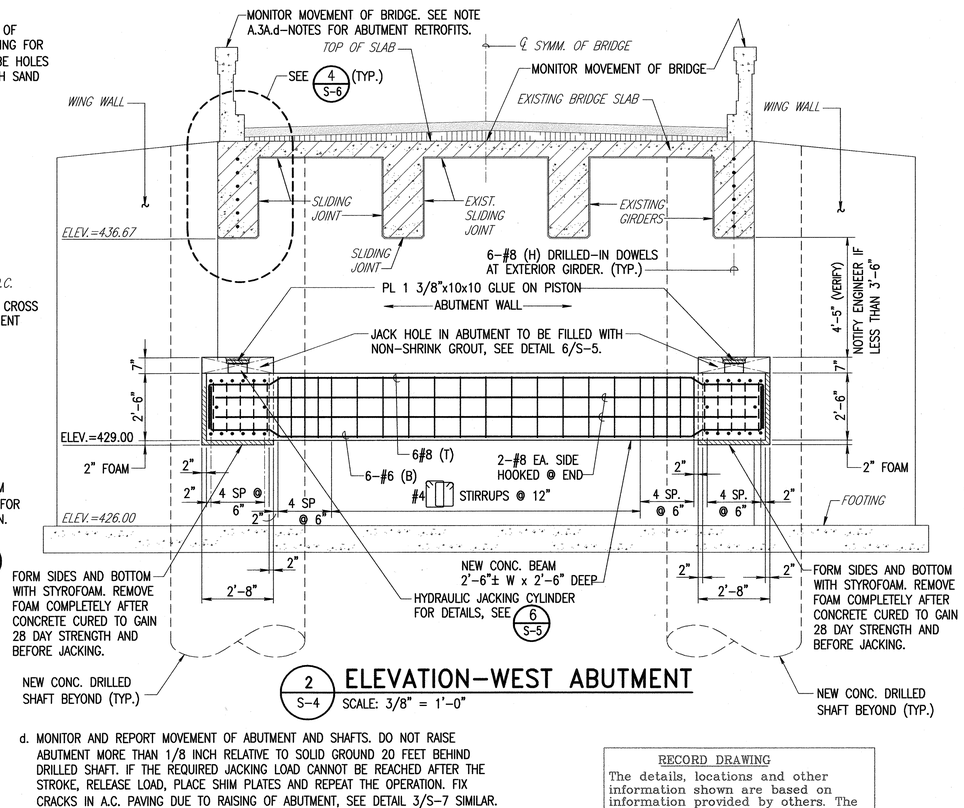
| HAWAII | HAW. | BR-0270(18) | 2006 | **23** | 31 |




## 1 S-4 PLAN–SECTION OF WEST ABUTMENT

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




## 2 S-4 ELEVATION–WEST ABUTMENT

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

d. MONITOR AND REPORT MOVEMENT OF ABUTMENT AND SHAFTS. DO NOT RAISE ABUTMENT MORE THAN 1/8 INCH RELATIVE TO SOLID GROUND 20 FEET BEHIND DRILLED SHAFT. IF THE REQUIRED JACKING LOAD CANNOT BE REACHED AFTER THE STROKE, RELEASE LOAD, PLACE SHIM PLATES AND REPEAT THE OPERATION. FIX CRACKS IN A.C. PAVING DUE TO RAISING OF ABUTMENT, SEE DETAIL 3/S–7 SIMILAR.

e. INFORM GEOTECHNICAL ENGINEER SUFFICIENTLY BEFORE STARTING JACKING PROCEDURES.

f. RECORD JACKING LOADS, TIME AND LOCATION AND ELEVATION OF MONITORING POINTS AT EVERY STEP OF THE PROCEDURE OUTLINED IN 3B.

g. SUBMIT SKETCHES, EQUIPMENT INFORMATION, RECORD KEEPING FORMS, AND STEP BY STEP JACKING PROCEDURE FOR APPROVAL. PRIOR TO JACKING.

h. AT EACH STEP OF JACKING PROCEDURE DESCRIBED HEREINAFTER, THE TRAFFIC CONTROL SEQUENCE SHALL BE AS FOLLOWS:

1. NO VEHICLE SHALL BE ALLOWED ON THE BRIDGE FOR 5 MINUTES MAX. DURING APPLICATION OF JACKING LOAD AND STABILIZATION OF THE READING GAUGES.
2. TRAFFIC SHALL BE ALLOWED TO PASS DURING A MIN. OF 10 MINUTES WAITING PERIOD.
3. NO TRAFFIC SHALL BE ALLOWED ON THE BRIDGE FOR 5 MINUTES MAX. DURING MONITORING AND MEASURING MOVEMENT OF THE BRIDGE.

B. PROCEDURE:

STEP 1:

AFTER 20% OF JACKING LOAD HAS BEEN REACHED AT SHAFT 1 AND 2 INSPECT ABUTMENT AND WING WALL FOR CONDITION OF DISTRESS. TAKE ELEVATION OF TOP OF THE SHAFTS AT CENTER AND TOP OF CONCRETE RAILINGS NEAR THE ABUTMENTS. MARK SPOTS SO ALL MEASUREMENTS ARE TAKEN AT SAME POINTS. LEVEL INSTRUMENT SHALL BE PLACED AT LEAST 20'–0" BEHIND ABUTMENT. WAIT 10 MINUTES MIN. BEFORE CHECKING JACKING FORCES, ELEVATIONS AND INSPECT ABUTMENTS BEFORE INCREASING JACKING LOAD.

STEP 2:

INCREASE TO 40% OF JACKING LOAD. REPEAT PROCEDURES IN STEP 1.

STEP 3 THROUGH 8:

INCREASE TO 60%, 70%, 80%, ~~85%,~~ 90% AND 95% OF JACKING LOAD IN ~~6~~ 5 STEPS. REPEAT PROCEDURES IN STEP 1 AT EACH STEP.

STEP 9:

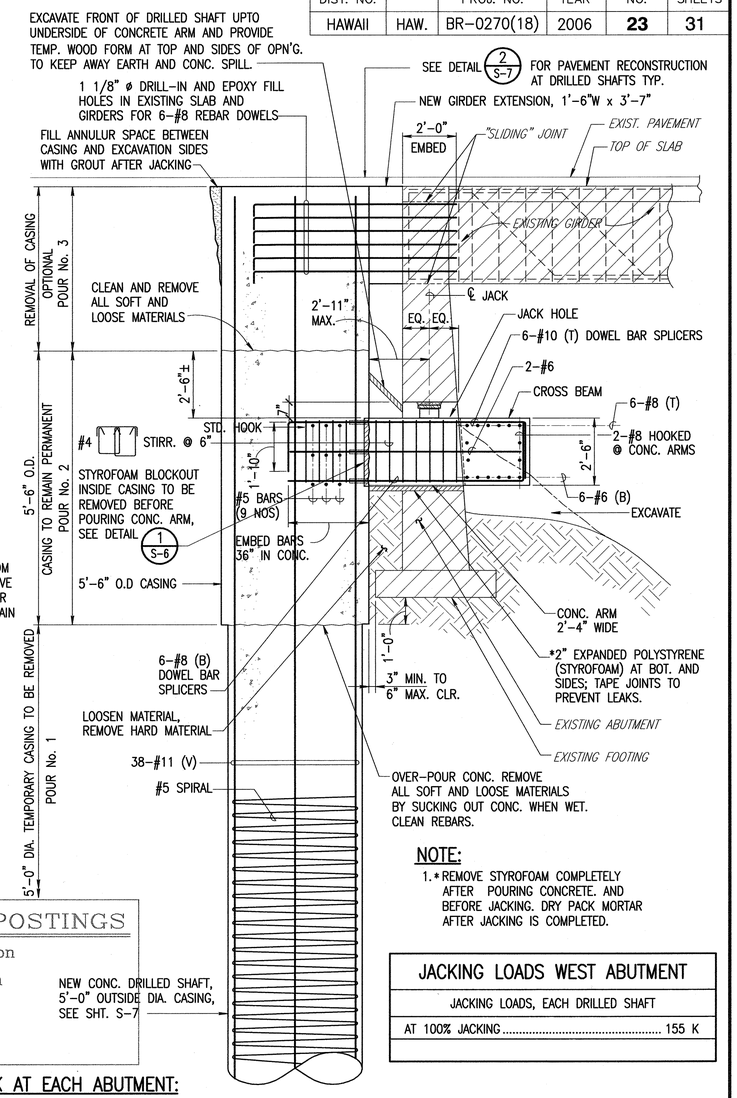
INCREASE TO 100% OF JACKING LOAD. REPEAT PROCEDURES IN STEP 1. MAX. 75% OF MAX. PUMP PRESSURE SHALL BE REACHED AT 100% LOADS. WAIT 12 HOURS. CHECK FORCES AND ELEVATIONS. IF FORCE IS LOST, JACK TO 100%. REPORT WHEN JACKING FORCE CAN BE SUSTAINED WITH LESS THAN 3% LOSS IN 8 HOURS, LOCK JACK AND SEAL.

STEP 10:

WHEN APPROVED BY ENGINEER, GROUT JACK HOLES. AS SHOWN IN DETAIL 6/S–5. DO NOT RELEASE JACK LOAD UNTIL GROUT IS CURED TO GAIN 7,000 PSI COMPRESSIVE STRENGTH.

RECORD DRAWING

The details, locations and other information shown are based on information provided by others. The design consultant cannot assure the accuracy and completeness of the information. The user of this drawing shall be responsible to verify its accuracy and completeness




NOTE:

1. *REMOVE STYROFOAM COMPLETELY AFTER POURING CONCRETE. AND BEFORE JACKING. DRY PACK MORTAR AFTER JACKING IS COMPLETED.

| JACKING LOADS WEST ABUTMENT |
|---|
| JACKING LOADS, EACH DRILLED SHAFT |
| AT 100% JACKING ..... 155 K |

LEGEND FOR AS–BUILT POSTINGS

| | |
|---|---|
| ~~Squiggly line~~ | Squiggly line for as–built deletion |
| ~~100.00~~ | Double line for as–built deletion |
| ☒ | "X" for as–built deletion |
| Roadway | Text for as–built posting |

## A. NOTES FOR ABUTMENT RETROFITS:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR THE INTEGRITY OF THE STRUCTURE AT ALL TIMES.
2. DO NOT DAMAGE EXISTING REBARS WHILE DRILLING FOR DOWELS IN EXISTING CONCRETE GIRDERS AND SLAB.
3. JACKING:

A. GENERAL:

a. USE ALL NECESSARY PRECAUTIONS TO PREVENT CONCRETE, MORTAR, ROCKS, HARD SOIL AND OTHER OBJECTS FROM PREVENTING TRANSFER OF ABUTMENT WEIGHT TO THE ALREADY POURED DRILLED SHAFT.

b. JACKS SHALL BE CALIBRATED. JACKING OF ABUTMENT AT BOTH DRILLED SHAFTS SHALL BE DONE SYNCHRONIZING TO ONE PUMP AFTER POUR No. 2 HAS ATTAINED 3,000 PSI STRENGTH AND BEFORE POUR No. 3 IS MADE. USE SAME TYPE JACK AND SAME CALIBRATION AT BOTH DRILLED SHAFTS. EACH ABUTMENT SHALL BE JACKED SEPERATELY.

c. JACKING LOAD SHALL BE AS SHOWN IN SCHEDULE AT EACH DRILLED SHAFT. APPLY JACKING LOADS AS CAILED FOR IN 3B–PROCEDURE.

## B. GENERAL PROCEDURES FOR RETROFIT WORK AT EACH ABUTMENT:

1. EXCAVATE AND POUR DRILLED SHAFT No. 1 UP TO POUR No. 1 AND REMOVE TEMPORARY CASING, IF PROVIDED. TAKE CONCRETE CYLINDERS TO VERIFY CONCRETE STRENGTH AT 3, 7, AND 28 DAYS. ~~TAKE 3 CORE SAMPLES AT TOP OF POUR No. 1 FOR TESTING.~~
2. POUR DRILLED SHAFT No. 1 UP TO POUR No. 2, PERMANENT CASING TO REMAIN. CORE AND CHIPOUT OPENINGS IN EXISTING ABUTMENTS. CUTOUT CASING AT INTERFACE WITH CONCRETE ARM ~~AND REMOVE STYROFOAM BLOCKOUT INSIDE CASING FORM AND POUR CONCRETE CANTILEVER ARM.~~ TAKE CONCRETE CYLINDERS TO VERIFY CONCRETE STRENGTH AT 3, 7, AND 28 DAYS. Cantilevered Concrete Arms for Shaft Nos. 1 and 2 and Cross Beam Poured Monolithically With Pour No. 2
3. COVER SHAFT No. 1 EXCAVATION TO PERMIT TRAFFIC OVER IT.
4. REPEAT STEP 1 AND 2 FOR SHAFT No. 2. ~~POUR CONCRETE CROSS BEAM BETWEEN CANTILEVER ARMS.~~
5. REPEAT STEP 3 FOR SHAFT No. 2
6. JACK ABUTMENT TO TRANSFER WEIGHT ONTO DRILLED SHAFTS. SEE NOTES A.3 ON THIS SHEET. KEEP VEHICLES OFF STRUCTURE DURING LAST MOVEMENT OF LOAD TRANSFER AT STEP 9.
7. AT SHAFT No. 2 PROVIDE DRILLED–IN DOWELS FROM EXTERIOR GIRDERS. FORM AND POUR NEW GIRDER EXTENSION AND POUR No. 3 OF DRILLED SHAFT.
8. REPEAT STEP 7 FOR SHAFT No. 1.

## 3 S-4 SECTION

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

GRAPHIC SCALE

2' 1' 0 2' 4' 6' 8'

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

DAVID M. YAMAMOTO — LICENSED PROFESSIONAL ENGINEER — No. 1399–S — HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APRIL 30, ~~2008~~ 2010

EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RETROFITTING WEST ABUTMENT
WALAOHIA BRIDGE

AKONI PULE HIGHWAY, SEISMIC RETROFIT
OF WALAOHIA AND AAMAKAO BRIDGES;
FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-4** OF 12 SHEETS

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
|---|---|---|
| | DRAWN BY | " |
| NOTE BOOK | TRACED BY | " |
| | DESIGNED BY | " |
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| | CHECKED BY | " |

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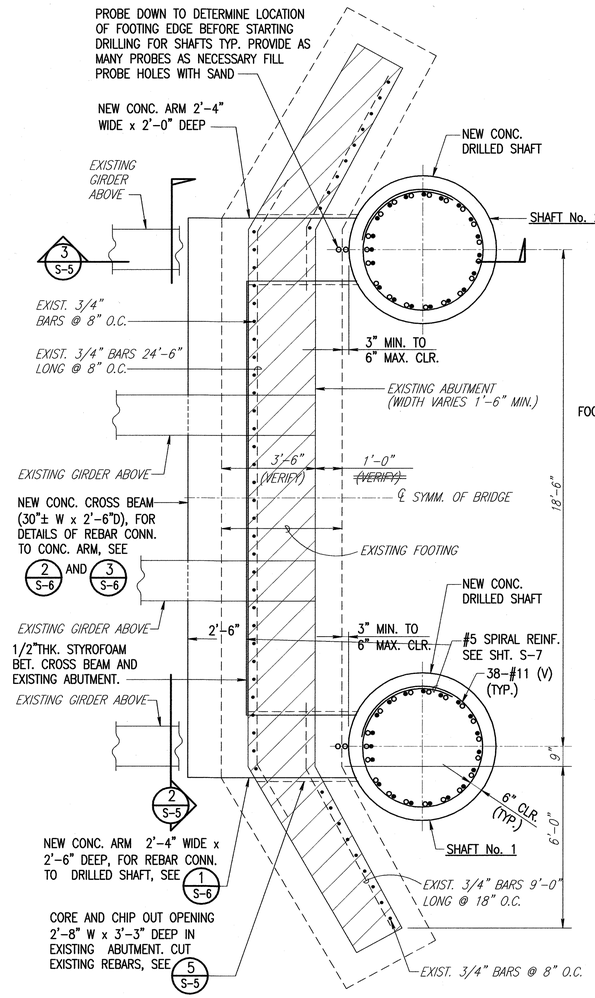
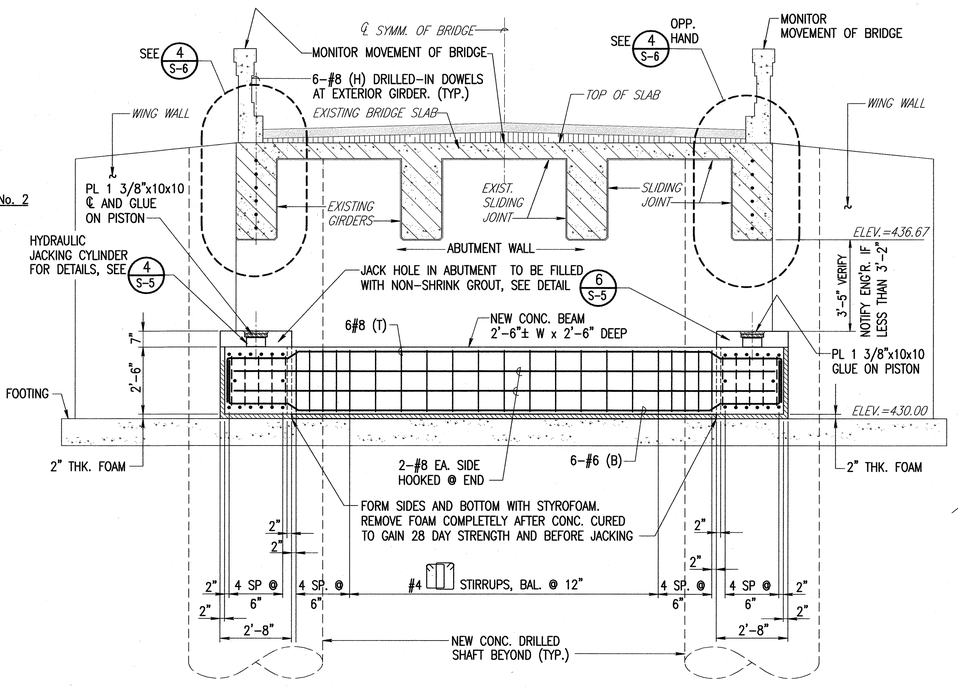
"AS–BUILT"

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **24** | 31 |



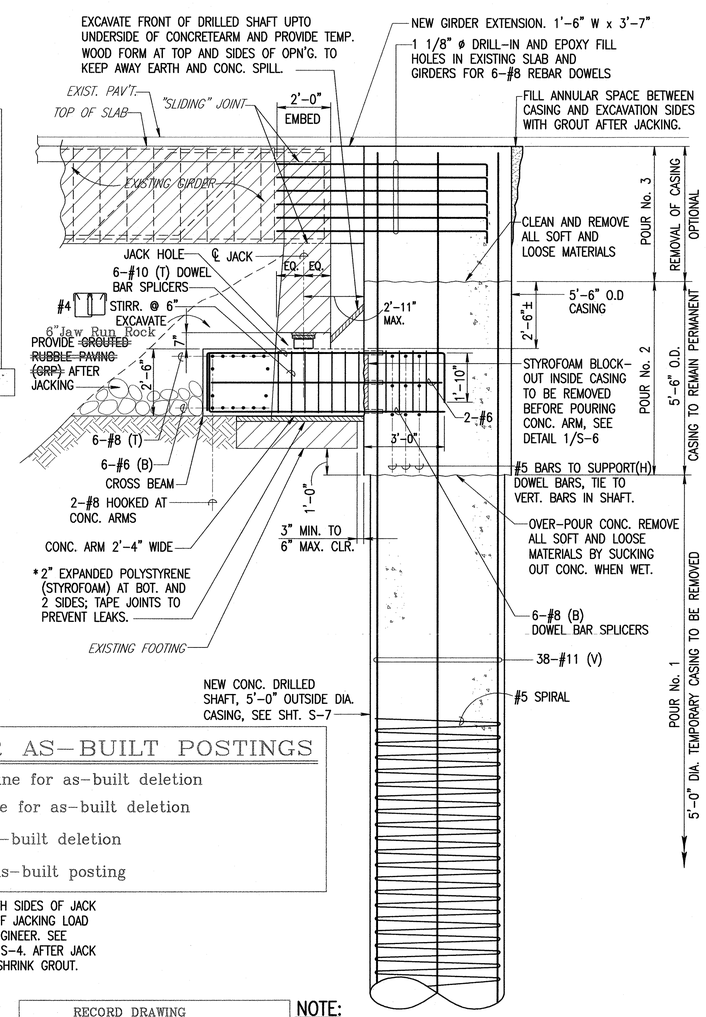

## 1 S-5 PLAN–SECTION OF EAST ABUTMENT

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



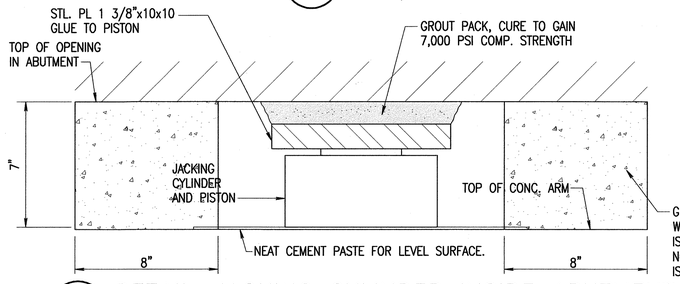

## 2 S-5 ELEVATION–EAST ABUTMENT

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




## 3 S-5 SECTION

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




GROUT THIS PORTION OF JACK HOLE BOTH SIDES OF JACK WITH NON–SHRINK GROUT AFTER 100% OF JACKING LOAD IS REACHED AND WHEN APPROVED BY ENGINEER. SEE NOTES ON JACKING PROCEDURE ON SHT S–4. AFTER JACK IS REMOVED, FILL ALL VOIDS WITH NON–SHRINK GROUT.

## 6 S-5 DETAIL–JACKING CYLINDER INSIDE ABUTMENT

SCALE: 3" = 1'-0"

### LEGEND FOR AS–BUILT POSTINGS

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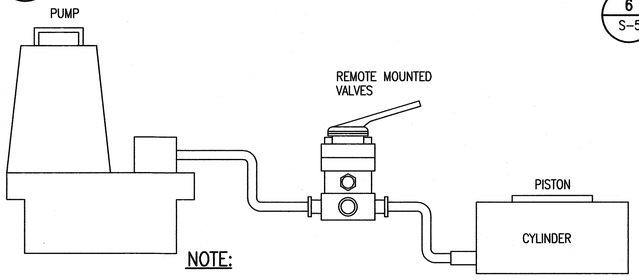
|---|---|
| ~~~~ | Squiggly line for as–built deletion |
| ~~100.00~~ | Double line for as–built deletion |
| ☒ | "X" for as–built deletion |
| Roadway | Text for as–built posting |

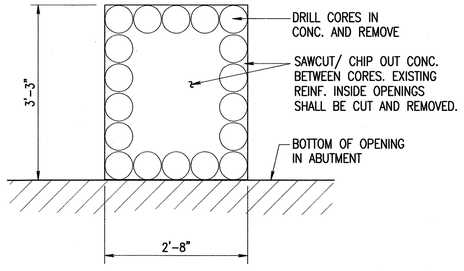



NOTE:

1. CONTRACTOR SHALL MAKE ARRANGEMENTS FOR COMPRESSOR, GENERATOR ETC. FOR OPERATING THE PUMP AND CYLINDER.

## 4 S-5 SCHEMATIC VIEW OF HYDRAULIC CIRCUIT FOR SINGLE ACTING CYLINDER

N.T.S.




## 5 S-5 DETAILS OF ABUTMENT CORING

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

NOTE:

1. SEE ABUTMENT RETROFITS NOTES SHT. S–4

| JACKING LOADS EAST ABUTMENT | |
|---|---|
| JACKING LOADS, EACH DRILLED SHAFT | |
| AT 100 % JACKING | 140 K |

GRAPHIC SCALE

2' 1' 0 2' 4' 6' 8'

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

RECORD DRAWING

The details, locations and other information shown are based on information provided by others. The design consultant cannot assure the accuracy and completeness of the information. The user of this drawing shall be responsible to verify its accuracy and completeness

NOTE:

1. * REMOVE STYROFOAM COMPLETELY AFTER POURING CONCRETE AND BEFORE JACKING, DRY PACK MORTAR AFTER JACKING IS COMPLETED.

DAVID M. YAMAMOTO LICENSED PROFESSIONAL ENGINEER No. 1399–S HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APRIL 30, ~~2008~~ 2010

EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RETROFITTING EAST ABUTMENT
WALAOHIA BRIDGE

AKONI PULE HIGHWAY, SEISMIC RETROFIT
OF WALAOHIA AND AAMAKAO BRIDGES;
FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

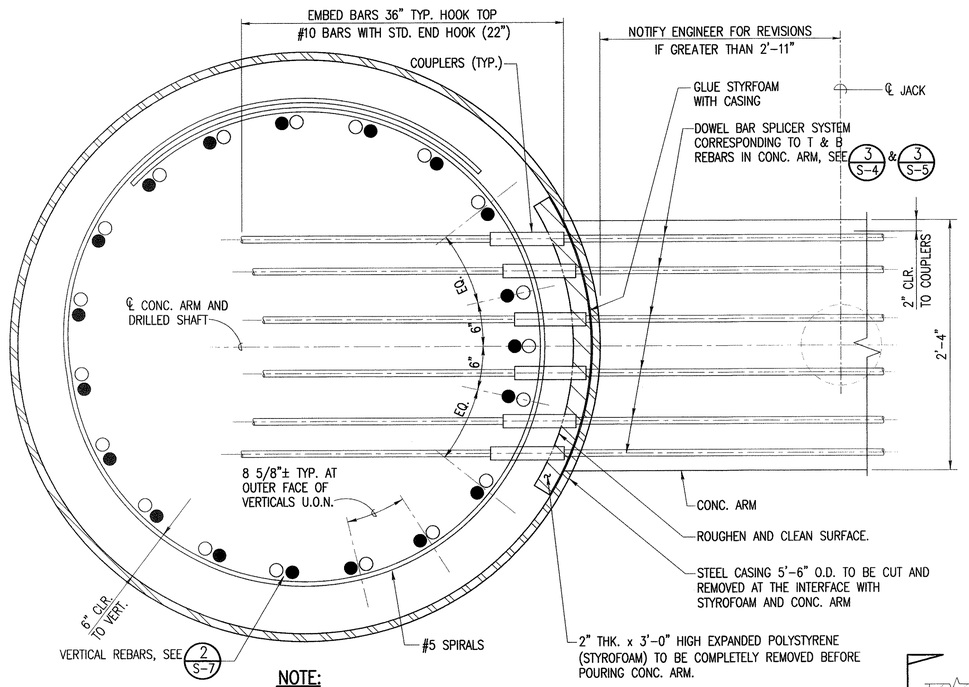
SHEET No. **S-5** OF 12 SHEETS

| | SURVEY PLOTTED BY | DATE |
|---|---|---|
| ORIGINAL PLAN | DRAWN BY | |
| | TRACED BY | |
| | DESIGNED BY | |
| NOTE BOOK | QUANTITIES BY | |
| No. | CHECKED BY | |

Date Saved: Thu, 23 Jul 2009 - 11:49am
File Location: Z:\Project Archive\02022-00\STRUCT\final\MAY 6-ADDITION\AS-BUILTS\S-05.dwg

"AS–BUILT"

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **25** | 31 |

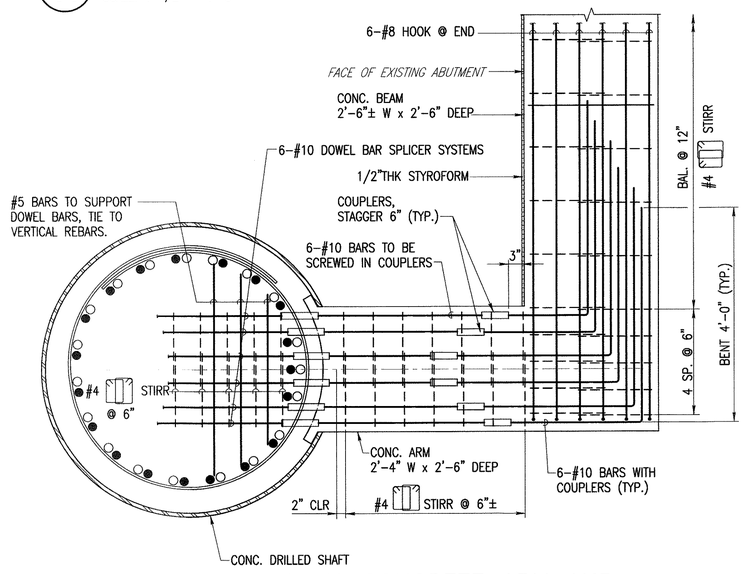



**NOTE:**

PROVIDE TEMPLATE, MARKERS ETC. TO PROPERLY LOCATE AND SECURE THE 'COUPLER'S BEFORE DRILLED SHAFT CONC. IS POURED.

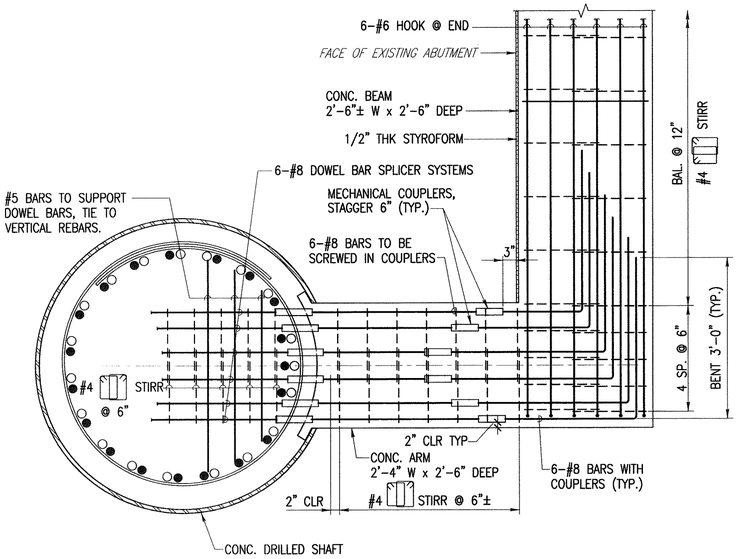
## 1 S-6 DETAIL PLAN–CONC. ARM CONNECTION TO DRILLED SHAFT

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



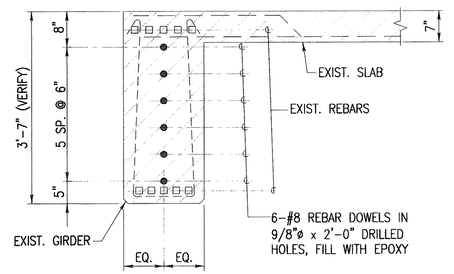

## 2 S-6 DETAIL PLAN–CONCRETE ARM AND CROSS BEAM TOP REINFORCING

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



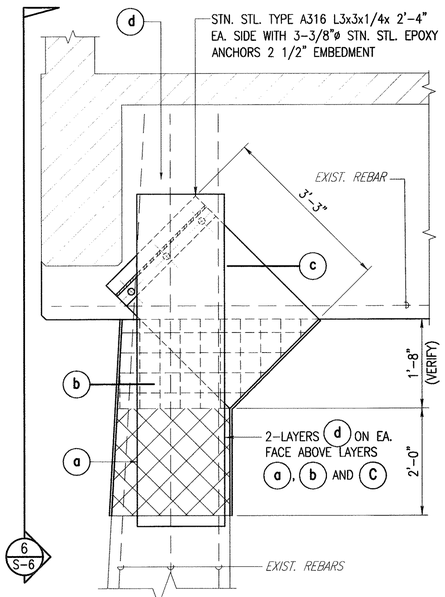

## 3 S-6 DETAIL PLAN–CONCRETE ARM AND CROSS BEAM BOTTOM REINFORCING

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




## 4 S-6 DETAIL–ANCHORING ABUTMENT AT BRIDGE EXTERIOR GIRDERS

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




**LEGEND:**

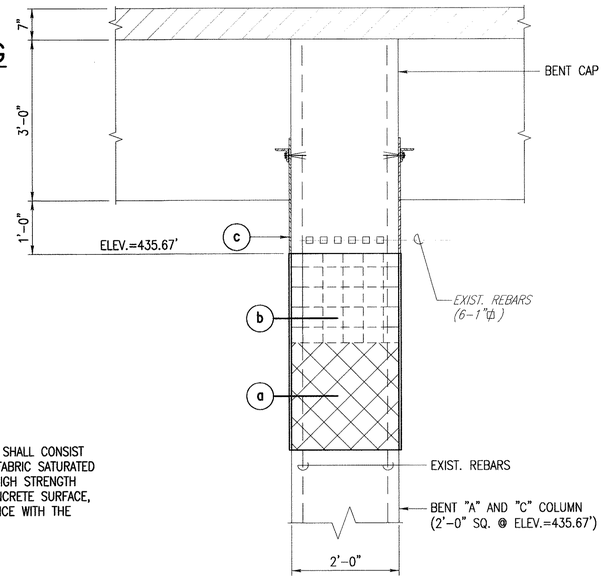
- a – DENOTES 2 LAYERS OF COMPOSITE GLASS FIBER REINF. 4 SIDES.
- b, c – DENOTES 2 LAYERS OF COMPOSITE GLASS FIBER REINF. 3 SIDES.
- d – DENOTES 2 LAYERS OF COMPOSITE GLASS FIBER REINF. 2 SIDES.

## 5 S-6 DETAIL–'CFR' REPAIR AT COLUMN

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

**NOTE:**

COMPOSITE FIBER REINFORCEMENT (CFR) SHALL CONSIST OF GLASS FIBER REINFORCED POLYMER FABRIC SATURATED IN FABRIC SATURANT RESIN. APPLY ON HIGH STRENGTH EPOXY PRIMER PLACED ON THE DRY CONCRETE SURFACE, FREE OF DUST. APPLY CFR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.




## 6 S-6 DETAIL–'CFR' REPAIR AT COLUMN

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

DAVID M. YAMAMOTO
LICENSED PROFESSIONAL ENGINEER
No. 1399–S
HAWAII, U.S.A.

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APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**MISCELLANEOUS RETROFIT DETAILS**

**WALAOHIA BRIDGE**

AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)

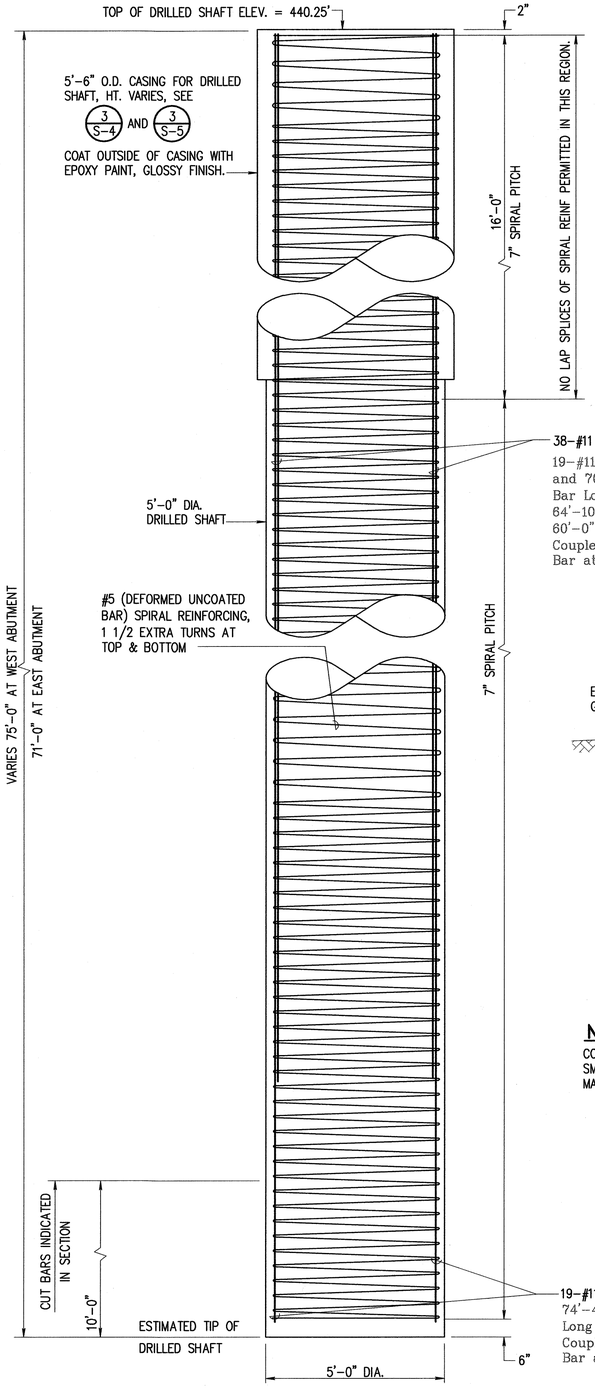
SCALE: AS NOTED DATE: May 2006

SHEET No. **S-6** OF 12 SHEETS

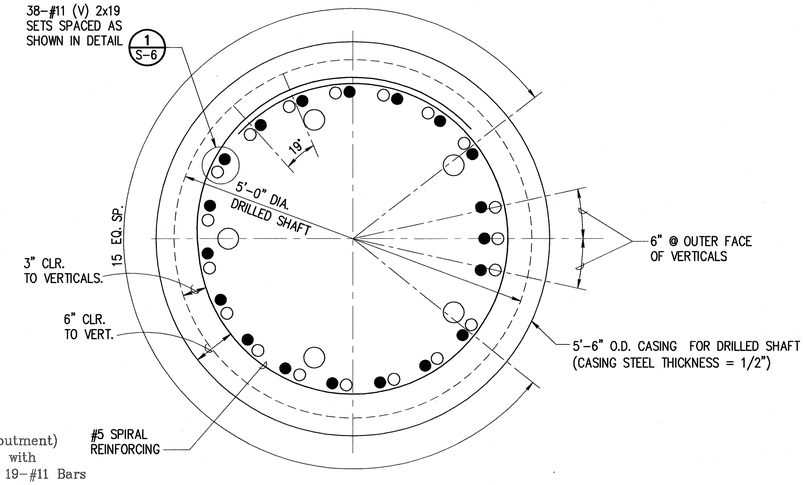
| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
|---|---|---|
| | DRAWN BY | " |
| | TRACED BY | " |
| NOTE BOOK | DESIGNED BY | " |
| | QUANTITIES BY | " |
| No. | CHECKED BY | " |

Date Saved: Thu, 11 May 2006 - 10:04am
File Location: S:\02022-00-STRUCT\final\WAY 6-ADDITION\S-06.dwg

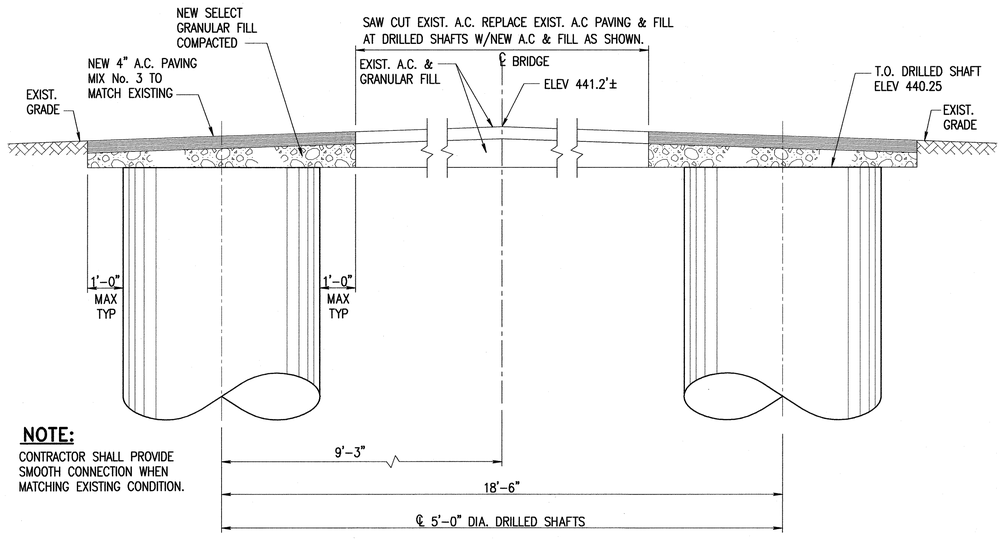
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **26** | 31 |




1 S-7 **ELEVATION – DRILLED SHAFT**
SCALE: 1/2"=1'-0"




2 S-7 **SECTION**
SCALE: 1"=1'-0"




**NOTE:**
CONTRACTOR SHALL PROVIDE SMOOTH CONNECTION WHEN MATCHING EXISTING CONDITION.

3 S-7 **SECTION–PAVEMENT RECONSTRUCTION DETAIL AT DRILLED SHAFTS**
SCALE: 1/2"=1'-0"

## VERTICAL AND LATERAL LOAD ON EACH DRILLED SHAFT

| LOCATION | LOADING CONDITION | LOADING DIRECTION | HORIZONTAL (Kips) | VERTICAL (Kips) | LATERAL DEFLECTION | MOMENT (Kips Ft) |
|---|---|---|---|---|---|---|
| WEST ABUTMENT | LIMIT STATE | LONGITUDINAL (IN) | 242 | 170 | 3.6" | 3252 |
| | EXTREME EVENT | LONGITUDINAL (OUT) | 53 | 170 | 3.6" | 1605 |
| EAST ABUTMENT | LIMIT STATE | LONGITUDINAL (IN) | 254 | 145 | 3.6" | 4160 |
| | EXTREME EVENT | LONGITUDINAL (OUT) | 133 | 145 | 3.6" | 2942 |
| WEST ABUTMENT | LIMIT STATE EXTREME EVENT | TRANSVERSE | 110 | 170 | | |
| EAST ABUTMENT | LIMIT STATE EXTREME EVENT | TRANSVERSE | 100 | 145 | | |

## LEGEND

- ○ CUT BARS
- ● CONTINUOUS BARS
- ◯ 2" I.D. MIN. ACCESS TUBES (5–TOTAL EQUALLY SPACED) FOR CROSSHOLE SONIC LOG TESTING OF DRILLED SHAFTS. INSTALL FULL DEPTH OF EACH DRILLED SHAFT. AND SECURE WITH THE REINFORCING CAGE. FILL WITH GROUT AFTER TESTING IS COMPLETED.

## DRILLED SHAFT NOTES:

1. THE CONTRACTOR SHALL REFER TO THE SPECIAL PROVISIONS SECTION 511 "DRILLED SHAFTS".
2. ALL EXCAVATION AND DRILLING OPERATIONS SHALL BE MONITORED BY THE ENGINEER.
3. BOTTOM OF DRILLED SHAFT TIP ELEVATIONS SHALL BE VERIFIED BY THE ENGINEER PRIOR TO INSTALLING REINFORCING BAR CAGE.
4. CONCRETE SHALL NOT BE PLACED WITHOUT THE APPROVAL OF THE ENGINEER.
5. DRILLED SHAFT CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 psi AT 28 DAYS OF AGE. MAXIMUM SIZE COARSE AGGREGATE SHALL BE 3/4". SLUMP SHALL BE 7 INCHES ± 1 INCH FOR CONCRETE POURED IN WATER FREE HOLE AND 8 INCH ± 1 INCH FOR CONCRETE PLACED UNDER WATER OR UNDER DRILLING SLURRY.
6. LONGITUDINAL BARS SHALL CONFORM TO ASTM A615, GRADE 60 TIES AND SPIRAL REINFORCING SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.
7. LONGITUDINAL BARS SHALL NOT BE LAP SPLICED. SPLICES, IF REQUIRED, SHALL BE MECHANICAL SPLICES CAPABLE OF DEVELOPING IN TENSION AND COMPRESSION AT LEAST 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF SMALLER BAR CONNECTED. SPLICES SHALL BE STAGGERED.
8. MINIMUM LAP LENGTH FOR SPIRAL LATERAL REINFORCEMENT SHALL BE 36 INCHES.
9. PLASTIC SPACER WHEELS, RIGIDLY SECURE RELATIVE TO REINFORCING SHALL BE USED TO MAINTAIN PROPER POSITION AND CLEARANCE OF THE REINFORCEMENT CAGE WITHIN THE SHAFT.

## LEGEND FOR AS–BUILT POSTINGS

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| ~~~~~ | Squiggly line for as–built deletion |
| ~~100.00~~ | Double line for as–built deletion |
| ☒ | "X" for as–built deletion |
| Roadway | Text for as–built posting |

## GRAPHIC SCALES

1' 0 1' 2' 3'
SCALE: 1" = 1'-0"

2' 0 2' 4' 6'
SCALE: 1/2" = 1'-0"

RECORD DRAWING
The details, locations and other information shown are based on information provided by others. The design consultant cannot assure the accuracy and completeness of the information. The user of this drawing shall be responsible to verify its accuracy and completeness

DAVID M. YAMAMOTO
LICENSED PROFESSIONAL ENGINEER
No. 1399–S
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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
APRIL 30, ~~2008~~ 2010
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

**DRILLED SHAFT DETAILS**
**WALAOHIA BRIDGE**
**AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)**

SCALE: AS NOTED DATE: May 2006

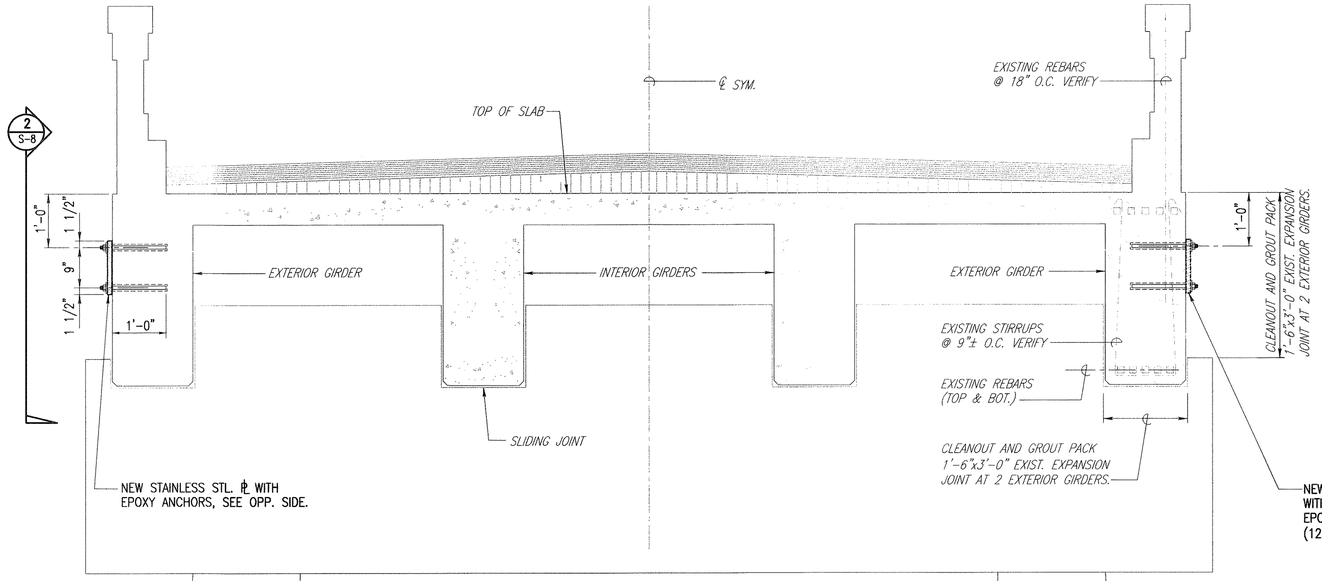
SHEET No. **S-7** OF 12 SHEETS

| | | |
|---|---|---|
| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
| | DRAWN BY | " |
| | TRACED BY | " |
| NOTE BOOK | DESIGNED BY | " |
| | QUANTITIES BY | " |
| No. | CHECKED BY | " |

Date Plotted: Thu, 23 Jul 2009 - 11:50am
File Name:d:\Project Archive\08\2122-00\STRUCT\final\MAY 6-ADDITION-AS-BUILTS\S-07.dwg

"AS–BUILT"

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **27** | 31 |

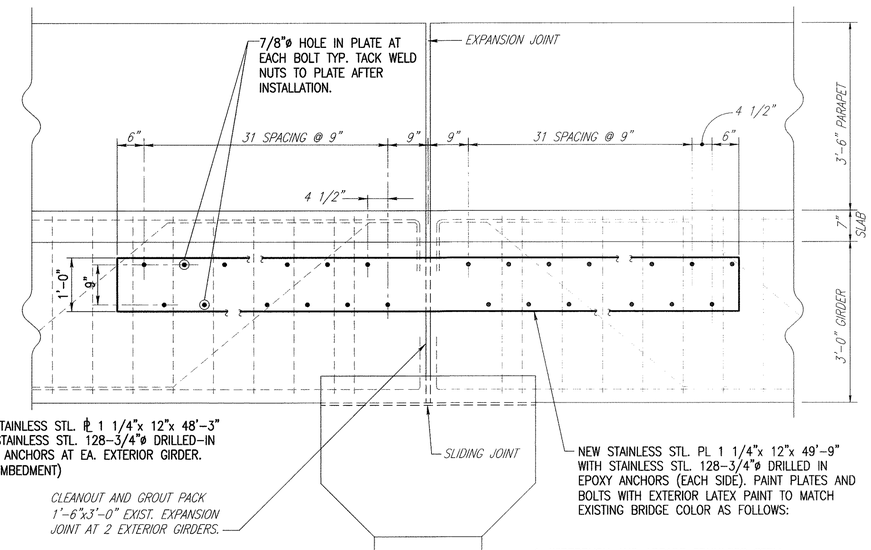



## NOTE:

1. DO NOT DAMAGE EXISTING REBARS WHILE DRILLING. MOVE HOLES MARGINALLY IF EXISTING REBARS ARE ENCOUNTERED. LOCATE REBARS BY ULTRASOUND, MAGNETIC AND OTHER METHODS BEFORE DRILLING HOLES IN CONCRETE AND PLATES. HOLES IN PLATES SHALL MATCH WITH EPOXY ANCHOR LOCATIONS IN CONCRETE. FILL ABANDONED HOLES IN CONCRETE WITH DRY PACK POLYMER MODIFIED MORTAR.
2. STAINLESS STEEL PLATES SHALL BE TYPE 316 ..... Fy = 36 Ksi
3. STAINLESS STEEL ANCHORS SHALL BE TYPE 316 SS ..... FY = 36 Ksi
4. THE ADHESIVE SHALL BE TWO-COMPONENT INJECTABLE EPOXY COMPATIBLE WITH THE TYPE OF ANCHORING SYSTEM.

## 1 S-8 CROSS SECTION OF BRIDGE AT BENT B

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




1. WIREBRUSH AND ABRADE STAINLESS STELL PLATE TO HAVE A DULL EXTERIOR SURFACE.
2. POWER TOOL CLEAN ACCORDING TO SPECIFICATION No. SSPC-SP3 OF THE "STEEL STRUCTURES PAINTING COUNCIL HANDBOOK"
3. APPLY ONE PRIME COAT OF WATERBORNE ACRYLIC PRIMER AND TWO COATS OF WATERBORNE ACRYLIC SEMI-GLOSS ENAMEL PAINT. PRIMER AND PAINT SHALL BE SUITABLE AND COMPATIBLE TO THE STAINLESS STEEL SURFACES.
4. USE TOUCH-UP PAINT TO PAINT BOLT HEADS AND OTHER AREAS WHERE THE PAINT IS DAMAGED DURING ERECTION.

## STAINLESS STEEL PLATE WELDING NOTES:

1. THE STAINLESS STEEL PLATES 49'-9" LONG MAY BE BUILT-UP IN SECTIONS THAT ARE WELDED WITH FULL PENETRATION BUTT WELDS IN ACCORDANCE WITH AWS D1.6-STRUCTURAL WELDING CODE, STAINLESS STEEL.
2. USE FILLER MATERIAL TO MATCH BASE METAL.
3. USE ONLY QUALIFIED WELDER. PROVIDE PROOF OF WELDERS' QUALIFICATIONS TO THE ENGINEER FOR ACCEPTANCE PRIOR TO WELDING.
4. DO NOT PERFORM ANY WELDING CLOSE ENOUGH TO REINFORCING BARS TO CAUSE THEM TO BE DAMAGED/WEAKENED BY HEATING.
5. EMPLOY AN INDEPENDENT TESTING AGENCY TO VISUALLY INSPECT AND TEST BY ULTRASONIC TESTING WELDS FOR ACCEPTANCE BY AWS STANDARD IN ACCORDANCE WITH SPECIAL PROVISIONS SECTION 501.

## 2 S-8 ELEVATION

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

GRAPHIC SCALE

1' 0 1' 2' 3' 4'

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

DAVID M. YAMAMOTO
LICENSED PROFESSIONAL ENGINEER
No. 1399-S
HAWAII, U.S.A.

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APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RETROFITTING EXTERIOR
GIRDERS AT EXPANSION JOINT

AKONI PULE HIGHWAY, SEISMIC RETROFIT
OF WALAOHIA AND AAMAKAO BRIDGES;
FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-8** OF 12 SHEETS

| | | | |
|---|---|---|---|
| ORIGINAL PLAN | SURVEY PLOTTED BY | | DATE |
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| | TRACED BY | | |
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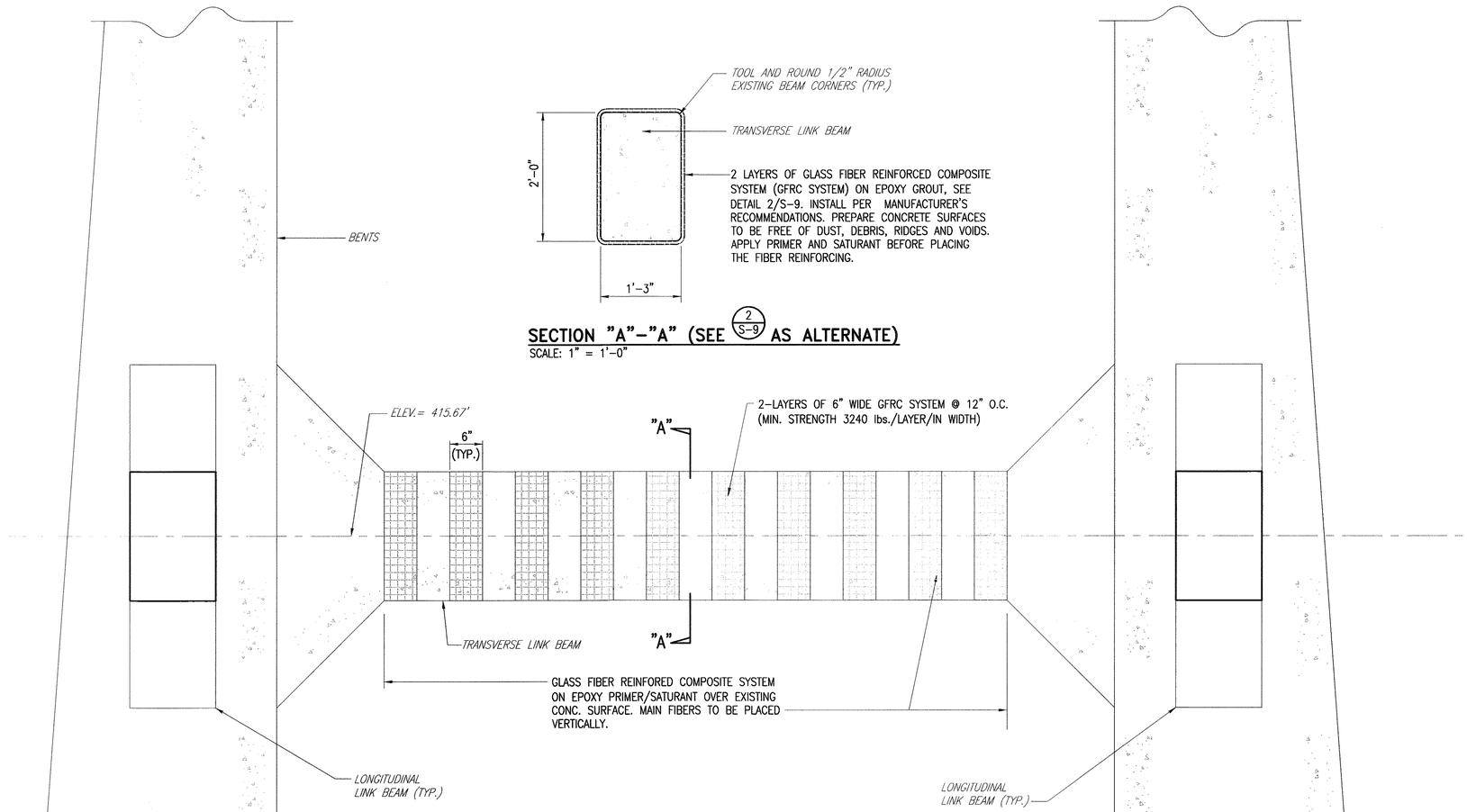
Date Plotted: Thu, 11 May 2006 - 10:11am
File Name:S:\02022-60\STRUCT\final\MAY 6-ADDITION\S-08.dwg

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **28** | 31 |

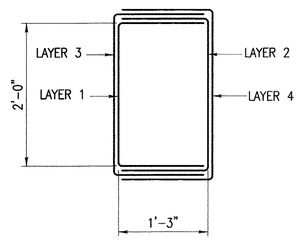






## SECTION "A"–"A" (SEE 2/S-9 AS ALTERNATE)
SCALE: 1" = 1'-0"

## 1/S-9 RETROFITTING TRANSVERSE LINK BEAM AT BENTS A, B AND C
SCALE: 1" = 1'-0"




NOTE:
GLASS FIBER REINF. CAN ALSO BE PLACED IN 2 LAYERS CONT. WRAP.

## 2/S-9 DETAIL–GLASSFIBER REINF. LAYER (ALTERNATE)
SCALE: 1" = 1'-0"

GRAPHIC SCALE
1' 0 1' 2' 3'
SCALE: 1" = 1'-0"

DAVID M. YAMAMOTO LICENSED PROFESSIONAL ENGINEER No. 1399-S HAWAII, U.S.A.

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APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RETROFITTING TRANSVERSE LINK BEAMS
WALAOHIA BRIDGE
AKONI PULE HIGHWAY, SEISMIC RETROFIT
OF WALAOHIA AND AAMAKAO BRIDGES;
FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-9** OF 12 SHEETS

| ORIGINAL PLAN | | DATE |
|---|---|---|
| | SURVEY PLOTTED BY | |
| | DRAWN BY | |
| | TRACED BY | |
| NOTE BOOK | DESIGNED BY | |
| | QUANTITIES BY | |
| No. | CHECKED BY | |

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**28**

| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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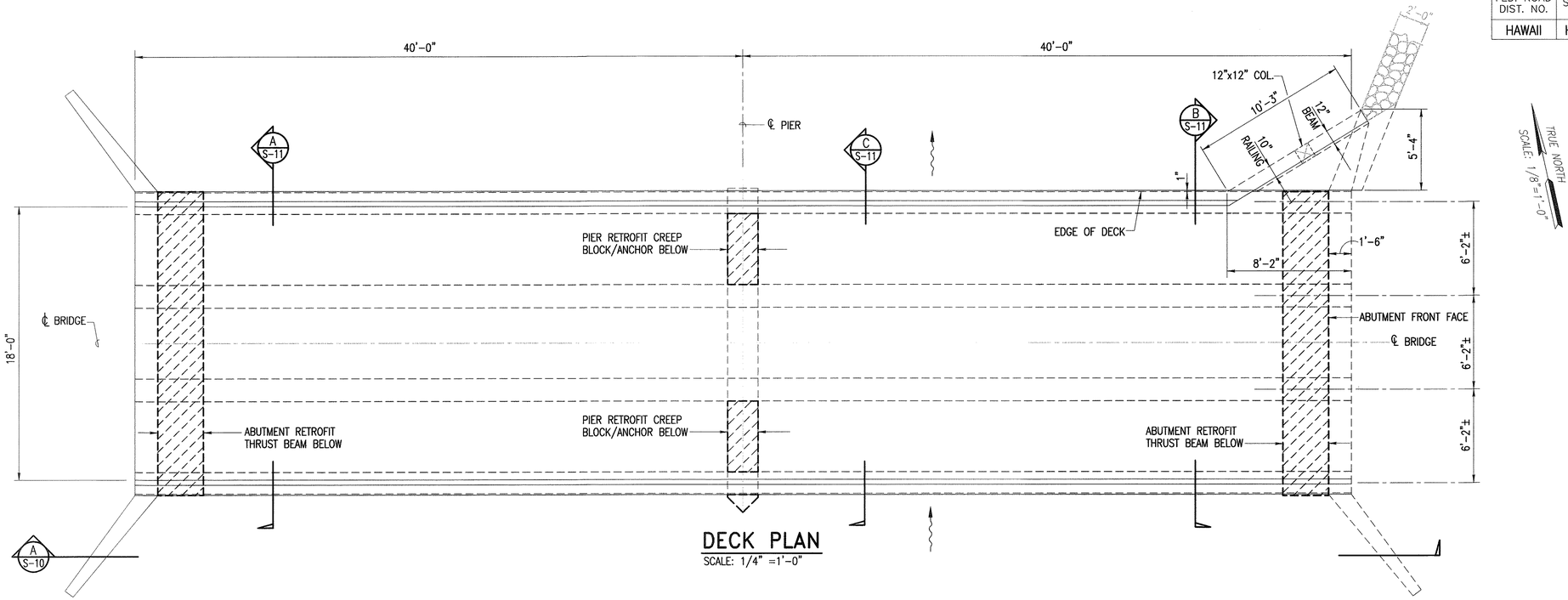
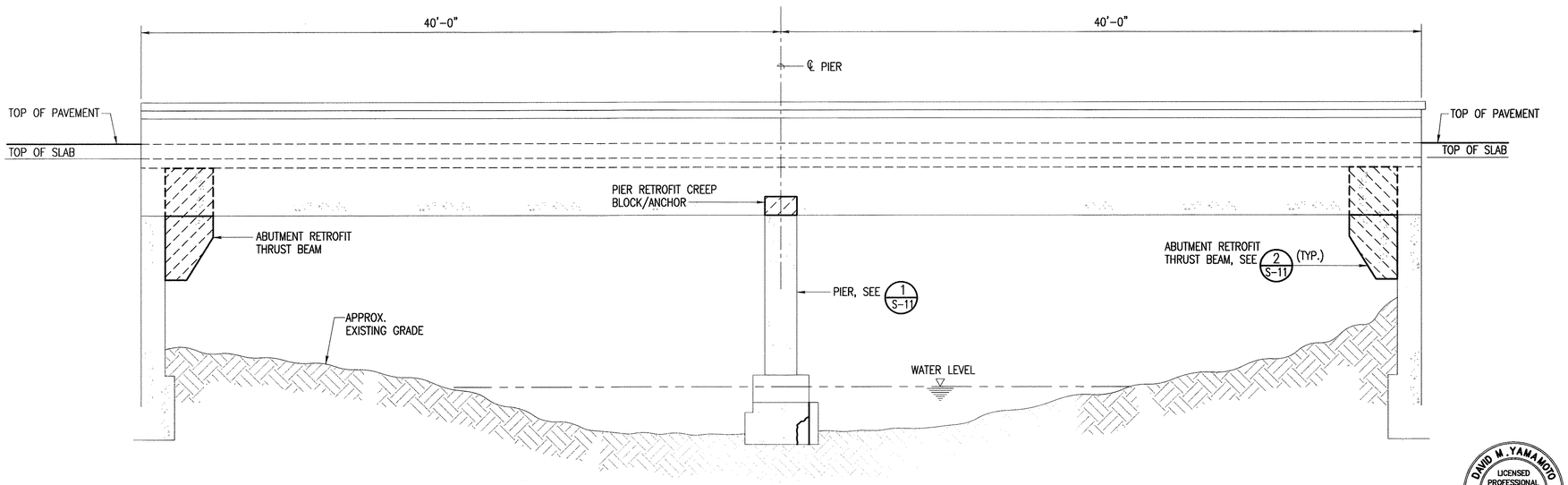



## DECK PLAN
SCALE: 1/4" =1'-0"




## A S-10 PIER ELEVATION
SCALE: 1/4" = 1'-0"

GRAPHIC SCALE

-5' 0 5' 10' 15' 20'

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

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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

APRIL 30, 2008
EXPIRATION DATE OF LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BRIDGE PLAN AND ELEVATION

AAMAKAO BRIDGE

AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S - 10** OF 12 SHEETS

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
|---|---|---|
| | DRAWN BY | " |
| | TRACED BY | " |
| NOTE BOOK | DESIGNED BY | " |
| | QUANTITIES BY | " |
| No. | CHECKED BY | " |

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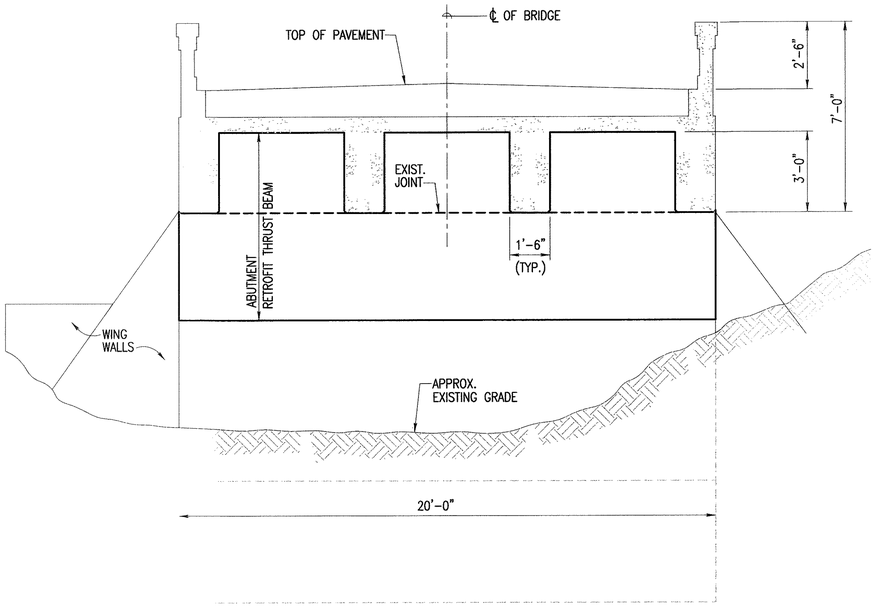
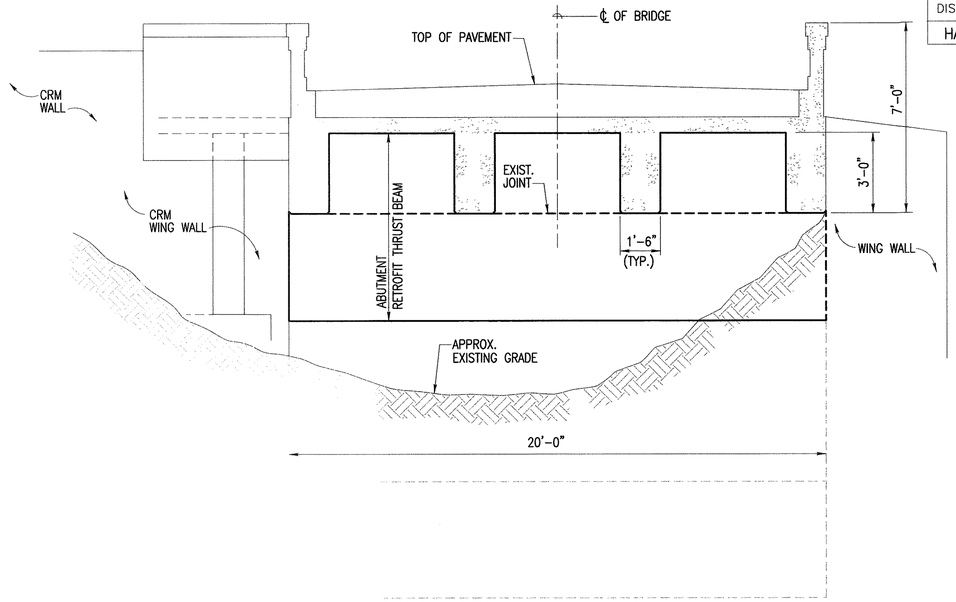
File Location: S:\02222-00\STRUCT\final\MAY 6-ADDITION\S-10.dwg

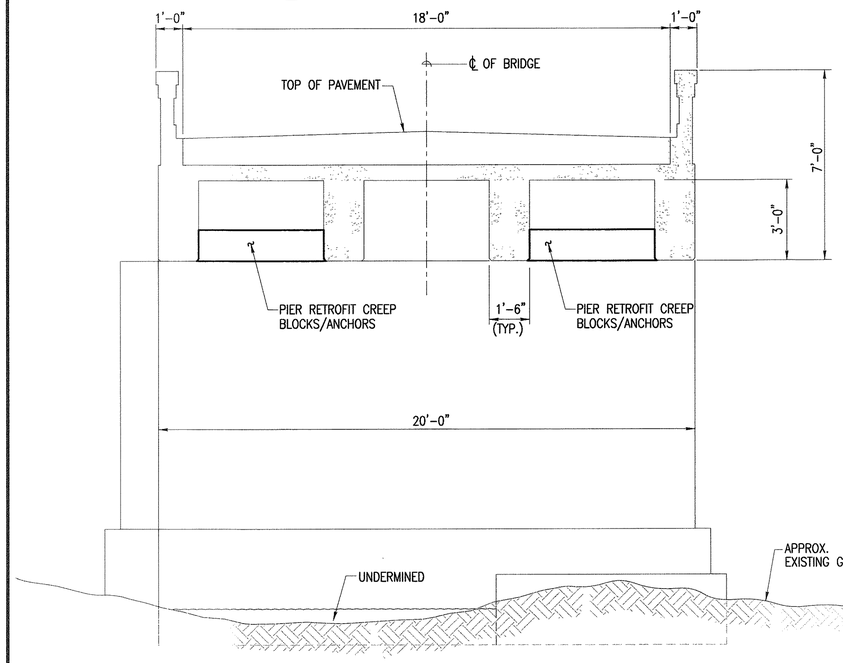
| FED. ROAD DIST. NO. | STATE | FED. AID PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | **30** | 31 |



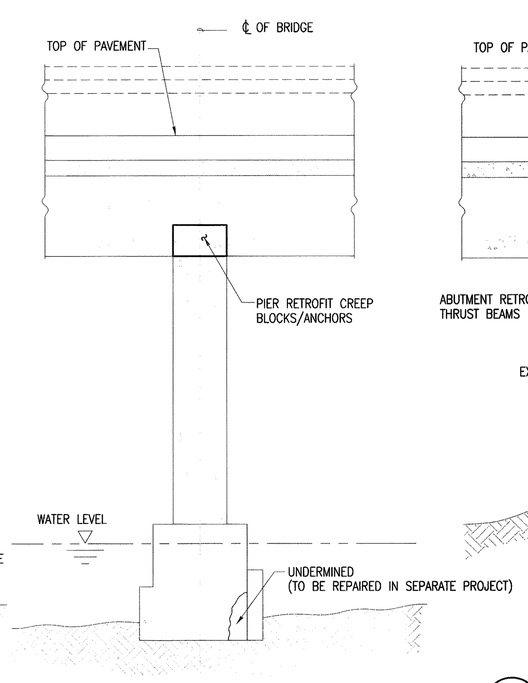

A S-11 **WEST ABUTMENT ELEVATION**
SCALE: 3/8" = 1'-0"



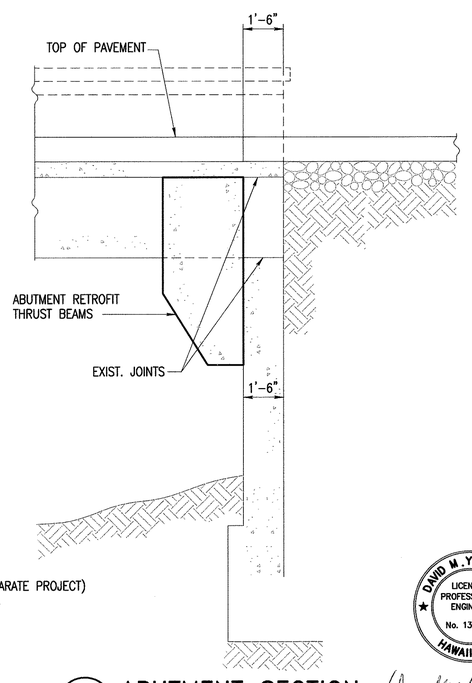

B S-11 **EAST ABUTMENT ELEVATION**
SCALE: 3/8" = 1'-0"




C S-11 **PIER ELEVATION**
SCALE: 3/8" = 1'-0"




1 S-11 **PIER SECTION**
SCALE: 3/8" = 1'-0"




2 S-11 **ABUTMENT SECTION**
SCALE: 3/8" = 1'-0"

**GRAPHIC SCALE:**

2' 1' 0 2' 4' 6' 8'

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

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# ABUTMENTS & PIER SECTIONS & ELEVATIONS

AAMAKAO BRIDGE

AKONI PULE HIGHWAY, SEISMIC RETROFIT OF WALAOHIA AND AAMAKAO BRIDGES; FAIP NO. BR-0270(18)

SCALE: AS NOTED DATE: May 2006

SHEET No. **S-11** OF 12 SHEETS

**30**

| ORIGINAL PLAN | SURVEY PLOTTED BY | DATE |
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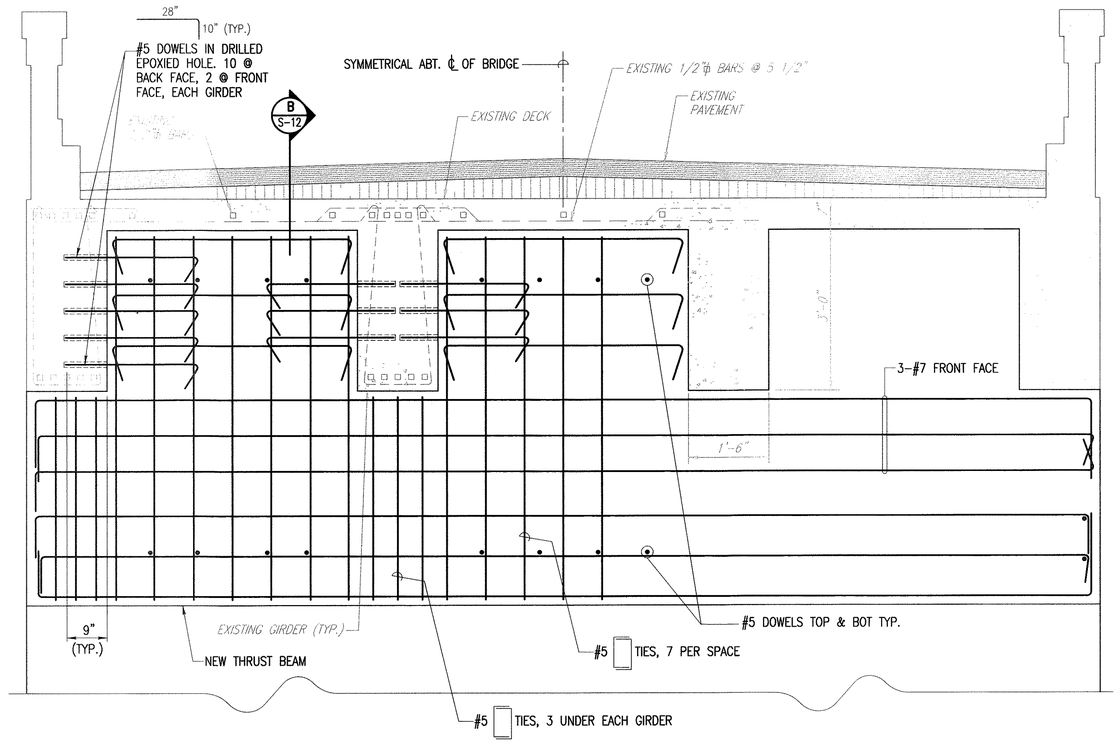
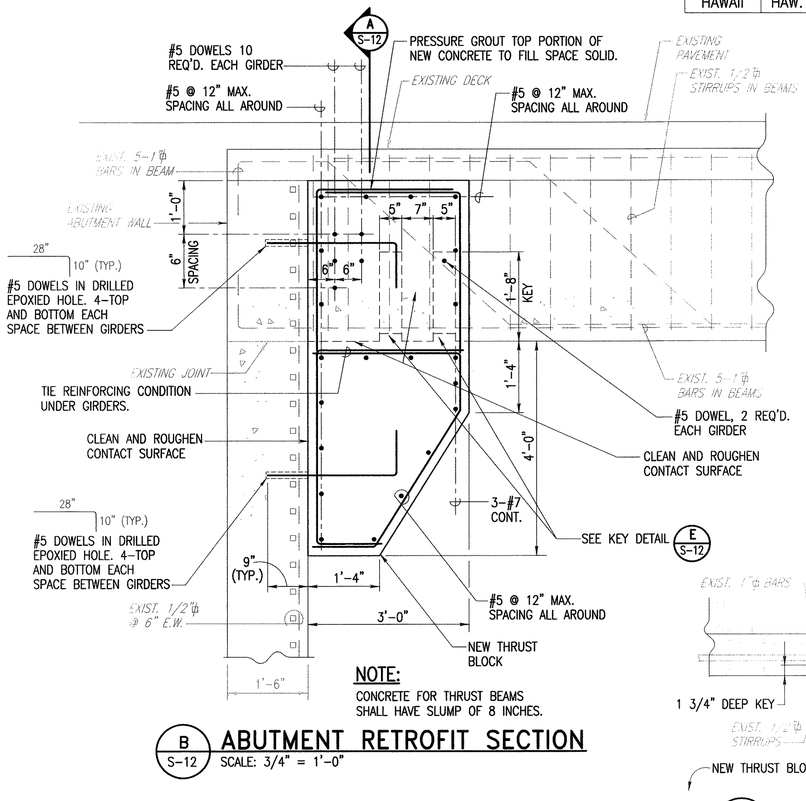
|---|---|---|---|---|---|
| HAWAII | HAW. | BR-0270(18) | 2006 | 31 | 31 |




## A S-12 ABUTMENT RETROFIT ELEVATION

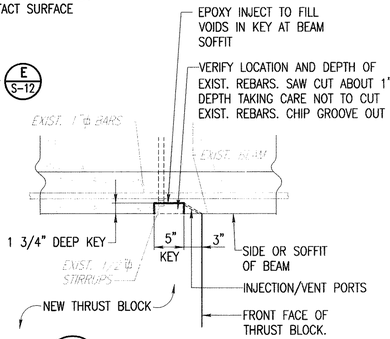
SCALE: 3/4" = 1'-0"




NOTE:
CONCRETE FOR THRUST BEAMS SHALL HAVE SLUMP OF 8 INCHES.

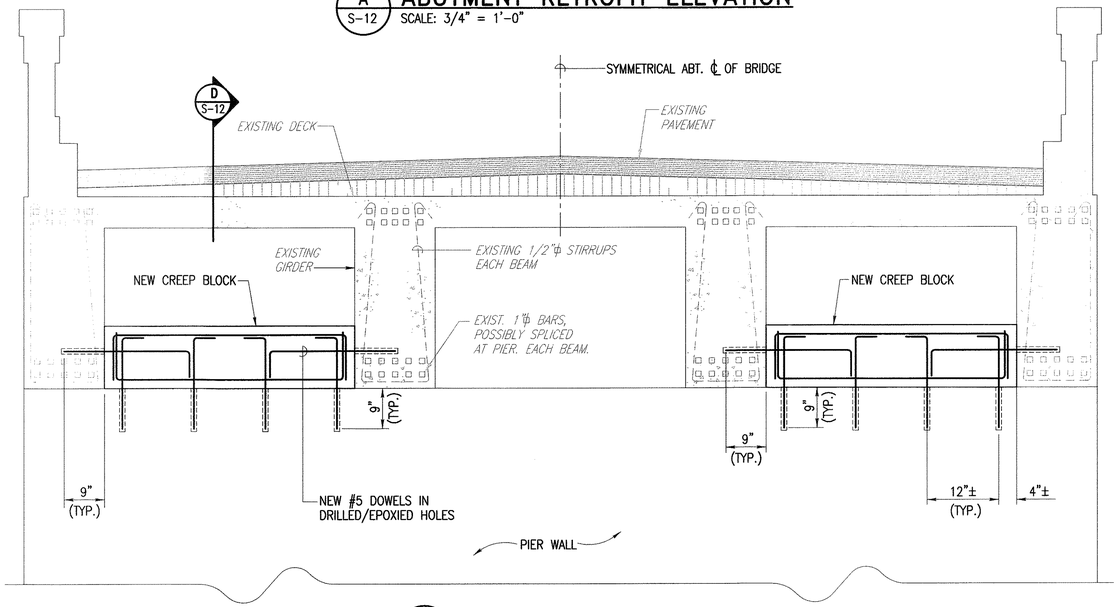
## B S-12 ABUTMENT RETROFIT SECTION

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



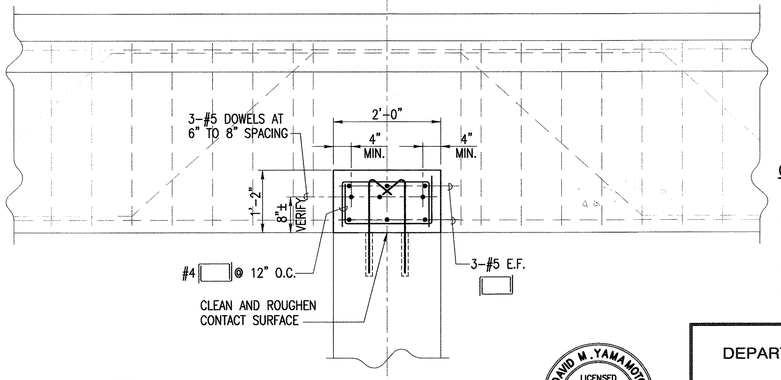

## E S-12 KEY DETAIL

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




## C S-12 PIER RETROFIT ELEVATION

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




## D S-12 PIER RETROFIT SECTION

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

GRAPHIC SCALES:

1' 0 1' 2' 3'
SCALE: 1" = 1'-0"

1' 0 1' 2' 3' 4'
SCALE: 3/4" = 1'-0"

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HIGHWAYS DIVISION

RETROFITS DETAILS

AAMAKAO BRIDGE

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SCALE: AS NOTED DATE: May 2006

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