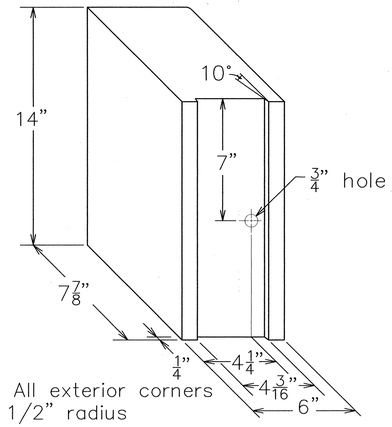
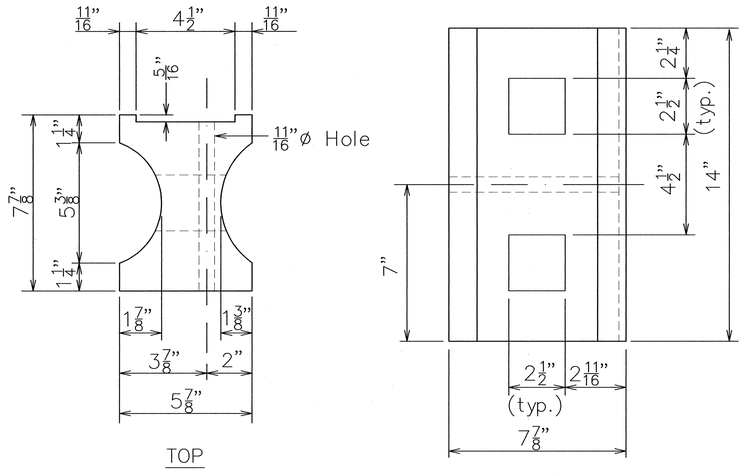
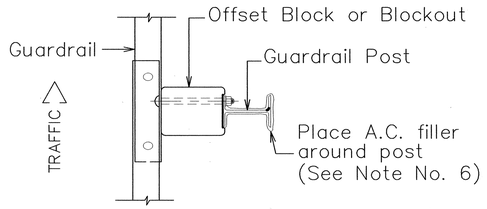
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	24	40



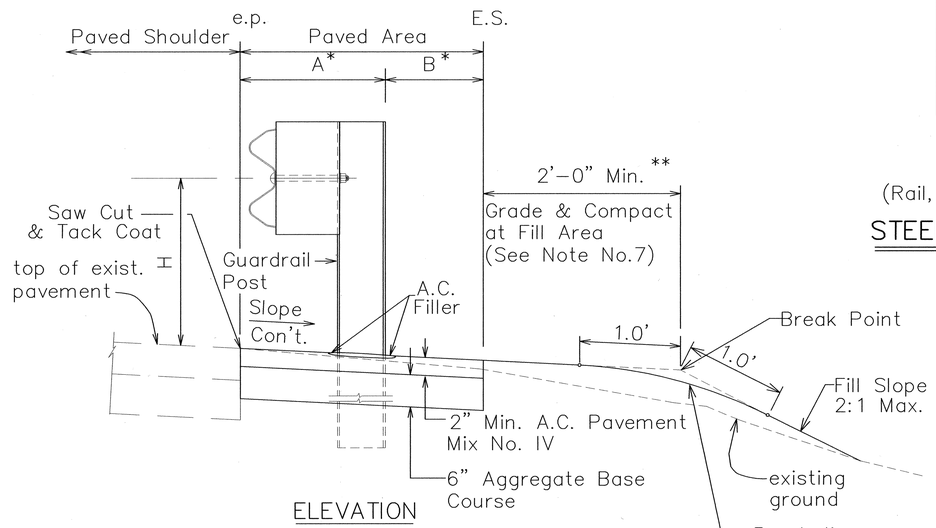
RECYCLED POLYETHYLENE OFFSET BLOCK (TYPE II)



RECYCLED PLASTIC BLOCKOUT (TYPE I)

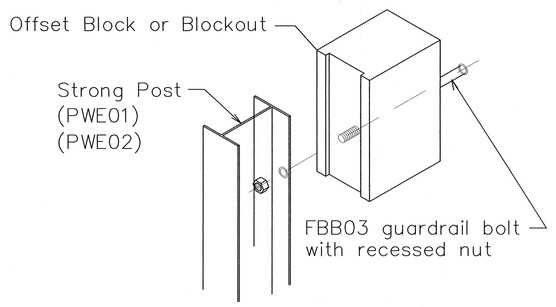


PLAN



ELEVATION

TYPICAL GUARDRAIL INSTALLATION



Exploded View
(Rail, washer and reflector not shown)

STEEL POST AND BLOCK DETAIL

GENERAL NOTES

1. All hardware, posts, and fasteners shall be hot-dip zinc coated galvanized after fabrication. No punching, drilling or cutting will be permitted after galvanizing.

2. Where conditions require, special post length in increments of 6 inches may be specified.

3. All fasteners, posts, and rail elements (i.e. FBB03, PWE01, RWM02a, etc.) shall conform to the latest edition and amendments of "A Guide to Standardized Highway Barrier Rail Hardware," a report prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, Subcommittee On New Highway Materials, Task Force 13 Report. Dimensions of fasteners, posts, and rail elements have been converted from metric units into their present form.

4. The Recycled Plastic Block or Offset Block shall be approved by the State.

5. New A.C. pavement at guardrails shall extend 6' longitudinally beyond terminal ends unless noted otherwise on plans.

6. After the guardrail posts are installed in the paved area, the Contractor shall place A.C. filler around the guardrail post and seal all cracks in the paved area that was caused during the guardrail post installation. If required by the Inspector/ Engineer, the Contractor shall tamper the paved area around the guardrail post prior to placing A.C. filler. The cost for this work shall not be paid for separately, but shall be considered incidental to the various guardrail items.

7. When standards for the fill slope area cannot be met, a site specific, Engineer-approved design may be used. No shoulder widening shall be done at guardrail locations unless noted otherwise on plans.

GUARDRAIL TYPE	DIMENSION		
	H	A*	B*
Strong Post w/W Beam	1'-9 5/8"	1'-6"	1'-0"
Rubrail	2'-0"	1'-6"	2'-0"
Modified Thrie Beam	2'-0"	2'-0"	1'-0"

* Unless noted otherwise on plans.
** Where room available.

PM: JJN
OPER: PT*/LSA/GKC
REVISED: 12/14/00

DATE: 12/18/98
SCALE: 1" = 1'
FILE: 9930-C18.DWG
JOB NO. 9930

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE 4-04-00
	DRAWN BY E. Reyes	" "
	TRACED BY	" "
NOTE BOOK	DESIGNED BY E.Reyes	" "
hw_whead	QUANTITIES BY	" "
no. ghmuk1s04	CHECKED BY	" "

JUNE J. NAKAMURA
LICENSED PROFESSIONAL ENGINEER
No. 4376-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
BY June J. Nakamura
DATE: 12-14-00

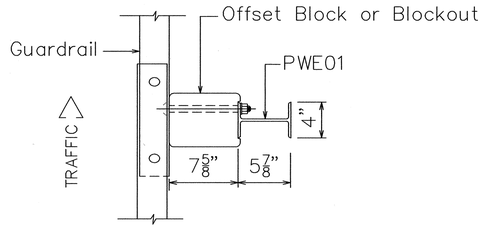
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

GUARDRAIL DETAILS & NOTES

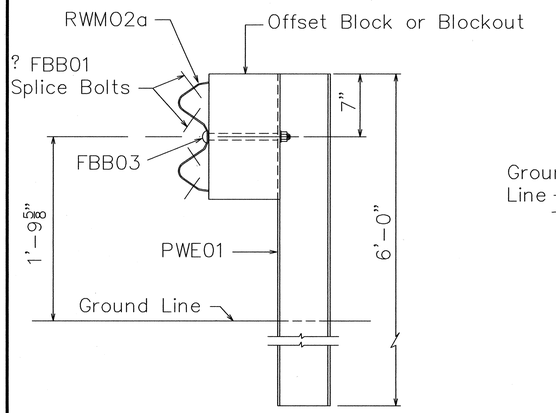
KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M
Scale: As Noted Date: 12/13/00

SHEET NO. C18 OF C23 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	25	40



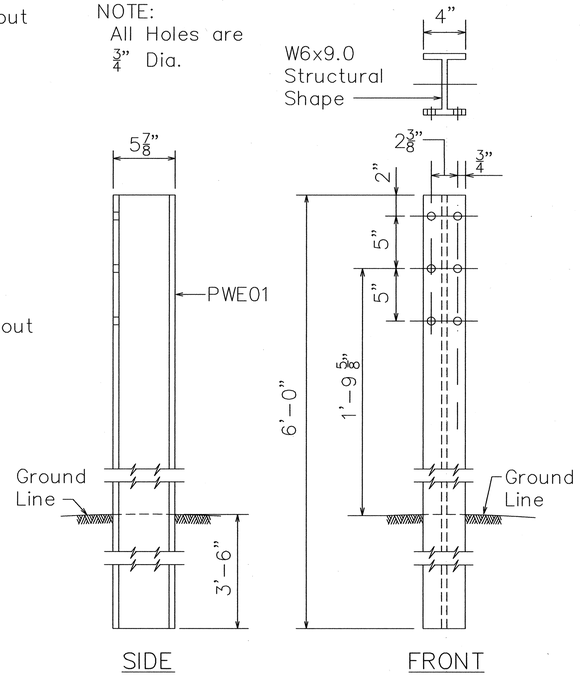
PLAN



ELEVATION

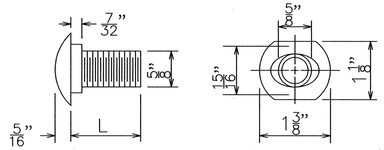
STRONG POST W-BEAM GUARDRAIL (SGR04a)

NOTE:
All Holes are $\frac{3}{4}$" Dia.

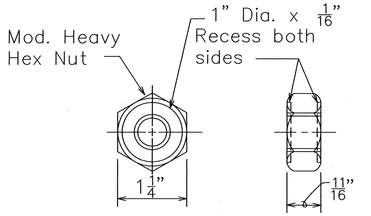


SIDE FRONT

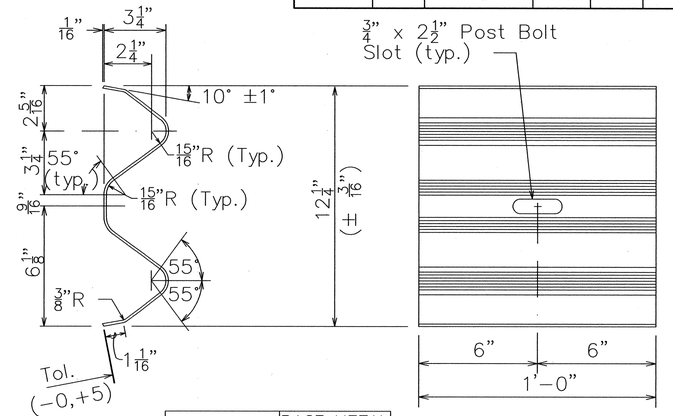
W-BEAM STRONG POST (PWE01)



DESIGNATOR	L
FBB01	1 3/8"
FBB02	2"
FBB03	10"

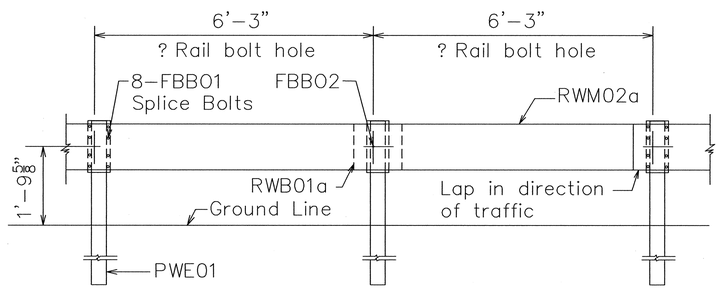


GUARDRAIL BOLTS AND RECESSED NUT



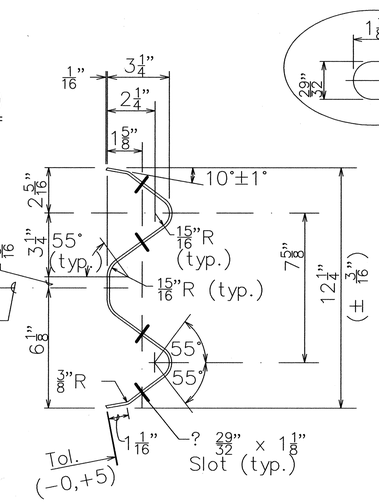
DESIGNATOR	BASE METAL THICKNESS
RWB01a	17/128"

W-BEAM BACK-UP-PLATE (RWB01a)

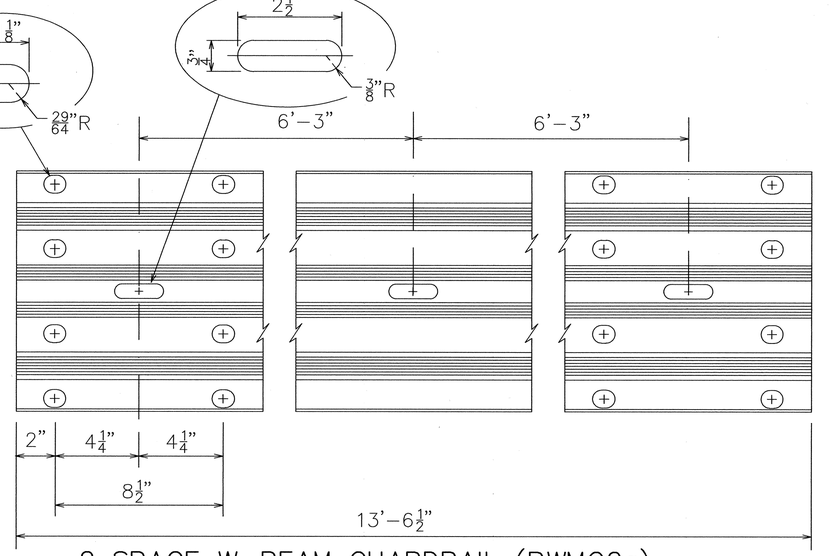


ELEVATION

STRONG POST W-BEAM GUARDRAIL WITH RECYCLED OFFSET BLOCK OR PLASTIC BLOCKOUT



? $\frac{3}{4}$" x $2\frac{1}{2}$" Post Bolt Slot



2 SPACE W-BEAM GUARDRAIL (RWM02a)

DESIGNATOR	BASE METAL THICKNESS
RWM02a	17/128"

JUNE J. NAKAMURA LICENSED PROFESSIONAL ENGINEER No.4376-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

BY: June J. Nakamura

DATE: 12-14-00

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

STRONG POST W-BEAM GUARDRAIL

KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M

Scale: As Noted Date: 12/13/00

SHEET NO. C19 OF C23 SHEETS

PM: JUN
OPER: LSA*
REVISED: 12/14/00

DATE: 12/18/98
SCALE: 1" = 1'
FILE: 9930-C19.DWG
JOB NO. 9930

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE 4-04-00
	DRAWN BY F. Reyes	
NOTE BOOK	TRACED BY	
hwy.k.head	CHECKED BY F. Reyes	
Nakumk1&4	QUANTITIES BY	
	CHECKED BY	

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	26	40

NOTES

A. The work necessary to connect guardrail to concrete end post shall include all labor, materials, tools, equipment and incidentals necessary to complete the work and will not be paid for separately.

B. Lap terminal connector and rail element in direction of traffic to prevent snagging.

C. All anchor bolts shall be high strength bolts conforming to the requirements of ASTM 325 and Standard Specification, Section 713.04.

D. Anchor bolt length shall be such that a snug fit of the elements and full thread engagement plus 1/4" (max) is attained.

E. "Terminal Connector", "Transition Section" and thrie beam shall be fabricated from 10 gauge steel conforming to the requirements of AASHTO M 180, Type II, Class B.

F. "Terminal Connector" and standard spacer, including all anchor bolts, cap PL, nuts and washers, shall be hot-dip galvanized after fabrication.

G. Cap PL shall be fabricated from ASTM A 36.

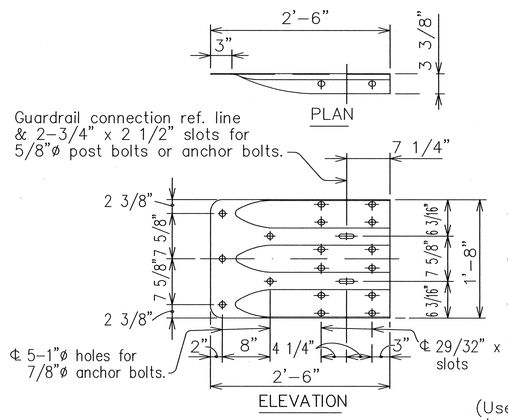
H. First 25'-0" of guardrail adjoining "Terminal Connector" shall be galvanized steel and supports spaced as shown on the detail drawings. This section of rail shall be placed on tangent to end post or parallel to roadway, unless conditions at site renders it impossible to do so. Flare point to be determined in field.

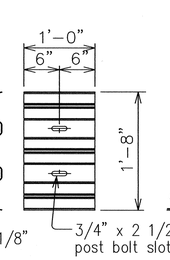
I. Double (nest 1st panel) thrie beam elements at all end post connections, except on highways with one-way traffic pattern, use single thrie beam elements at end post on trailing end only.

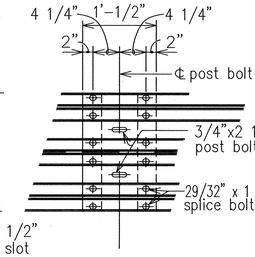
J. Where double (nested) beam occur, 12" "Back-up Plate" not required.

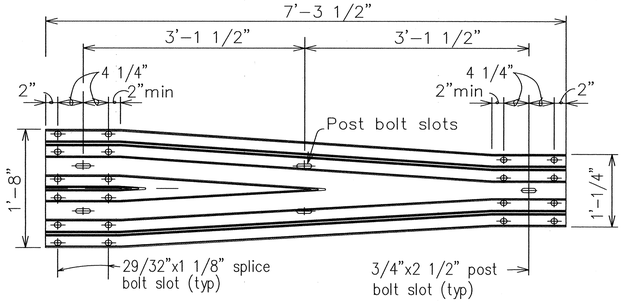
K. Heads of through anchor bolts shall be placed on the traffic side of the rail.

L. All steel shapes, rails and plates shall conform to ASTM A 36 specifications.



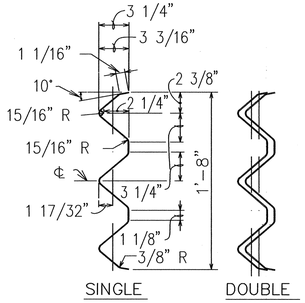






TERMINAL CONNECTOR

Scale: 1" = 1'-0"



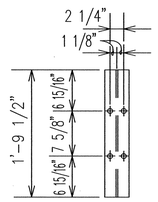
SECTION THRU RAIL ELEMENT

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

(Use at posts where splices do not occur.)

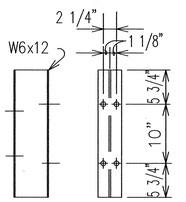
BACKUP PLATE

Scale: 1" = 1'-0"



RAIL SPLICE

Scale: 1" = 1'-0"



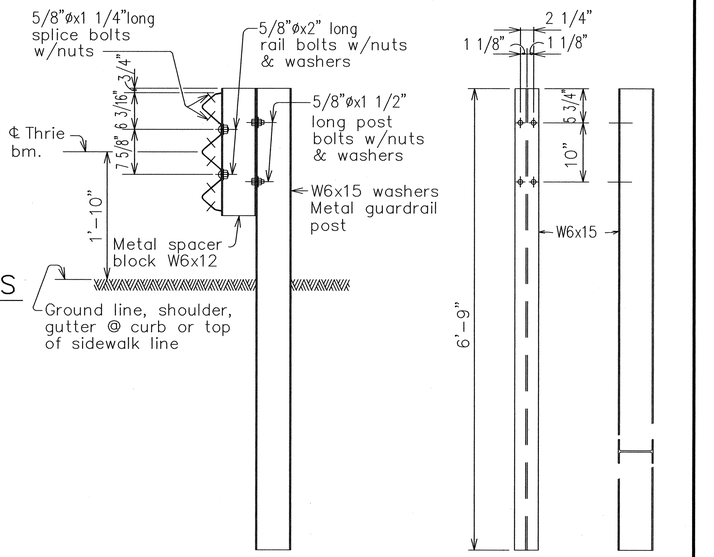
FRONT SIDE REAR

SPACER BLOCK DETAILS

Scale: 1" = 1'-0"

TRANSITION SECTION

Scale: 1" = 1'-0"



FRONT SIDE

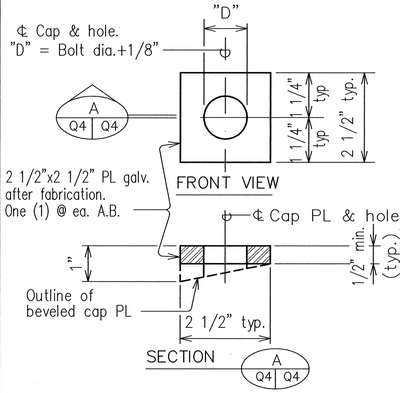
TYPICAL SECTION

METAL GUARDRAIL ON METAL POST WITH METAL SPACER BLOCK

Scale: 1" = 1'-0"

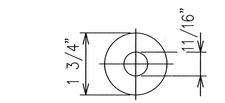
POST DETAILS

Scale: 1" = 1'-0"



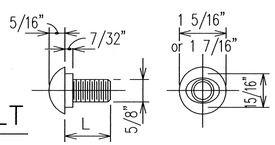
CAP (BEARING) PLATE DETAIL

Scale: 6" = 1'-0"

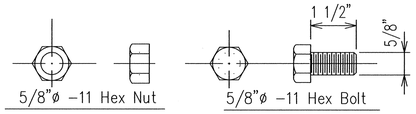


STEEL WASHER FOR 5/8"ø BOLT

Scale: 6" = 1'-0"

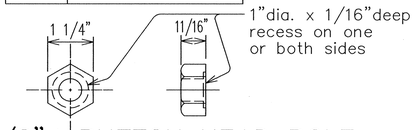


L	Thread Length
1 1/4"	Full thread
2"	1 1/2" min. thread length



5/8"ø HEX BOLT & NUT

Scale: 6" = 1'-0"



5/8"ø BUTTON HEAD BOLT & RECESS NUT

Scale: 6" = 1'-0"

METAL GUARDRAIL TYPE 3 THRIE BEAM AND APPURTENANCES DETAILS

PM: JUN
OPER: LSA
REVISED: 12/14/00

DATE: 12/18/98
SCALE: 1 = 1
FILE: 9930-C20.DWG
JOB NO. 9930

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE 4-04-00
	DRAWN BY F. Reyes	" " "
NOTE BOOK dgn, mdl, ksh	DESIGNED BY Reyes	" " "
	QUANTITIES BY	
	CHECKED BY	

JUNE J. NAKAMURA
LICENSED PROFESSIONAL ENGINEER
No. 4376-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
BY June J. Nakamura
DATE: 12-14-00

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

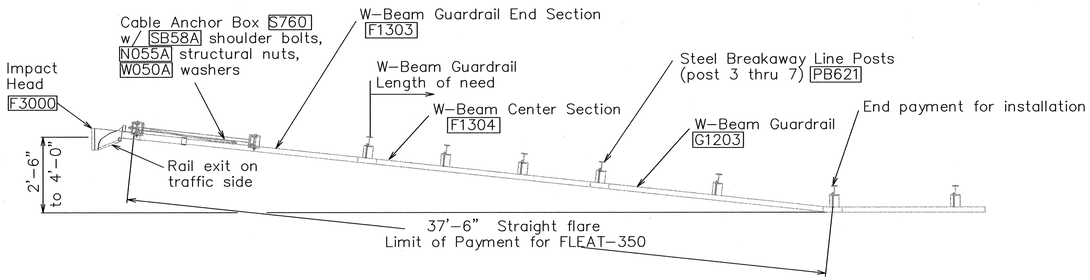
STRONG POST MODIFIED THRIE-BEAM GUARDRAIL

KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M

Scale: As Noted Date: 12/13/00

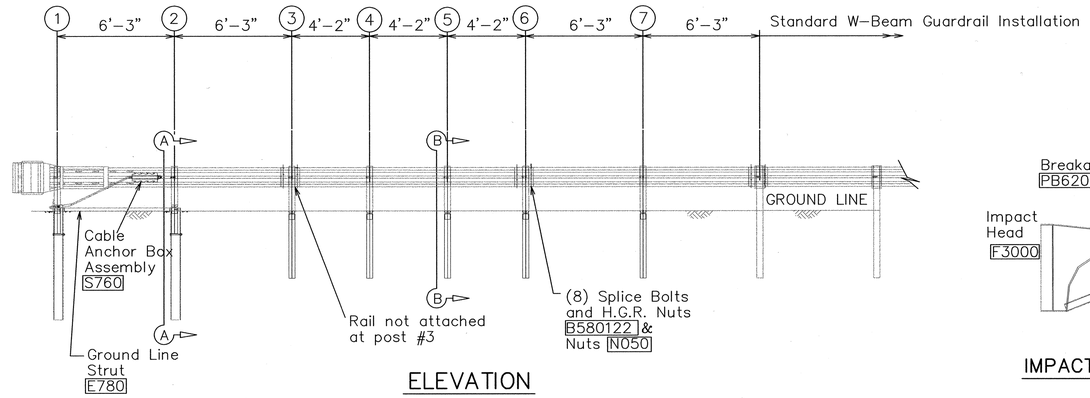
SHEET NO. C20 OF C23 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	27	40

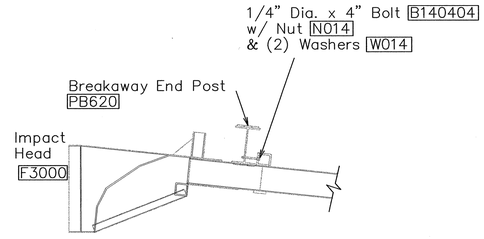


PLAN

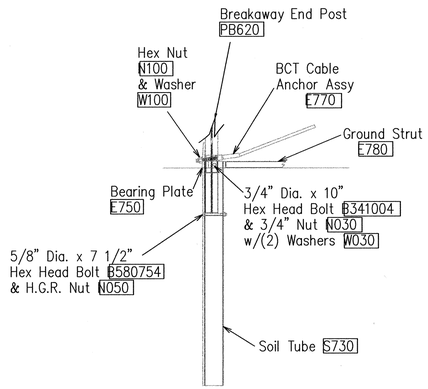
TRAFFIC



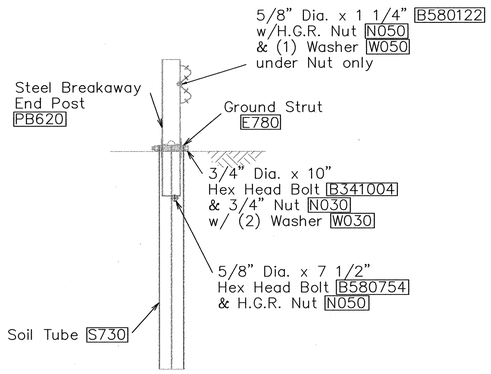
ELEVATION



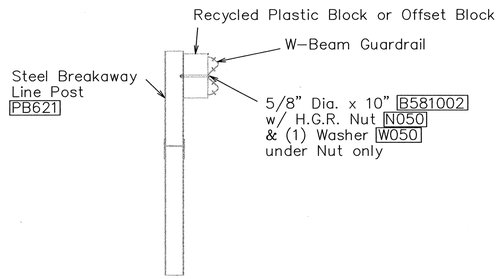
IMPACT HEAD CONNECTING DETAIL



PARTIAL VIEW OF POST 1



SECTION A-A
(@ Post #2)



SECTION B-B
(Typical @ Post 3 - 7)
NOTE: RAIL NOT BOLTED @ POST #3

GENERAL NOTES

1. Breakaway posts are required with the FLEAT Terminal.
2. All bolts, nuts, cable assemblies, cable anchors and bearing plates shall be galvanized.
3. The soil tubes shall not protrude more than 4" above ground (measured along a 5' cord). Site grading may be necessary to meet this requirement.
4. The soil tubes may be driven with an approved driving head. Soil tubes should not be driven with the post in the tube. If the tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent settlement.
5. When rock is encountered during excavation, a 12" Dia. post hole, 20" deep may be used if approved by the Engineer. Granular material will be placed in the bottom of the hole approx. 2 1/2" deep to provide drainage. The soil tubes will be field cut to length, placed in the hole and backfilled with adequately compacted material excavated from the hole.
6. The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening nuts.

ITEM NO.	QTY	BILL OF MATERIALS
F3000	1	IMPACT HEAD
F1303	1	W-BEAM GUARDRAIL END SECTION, 12 GA.
F1304	1	W-BEAM GUARDRAIL CENTER SECTION, 12 GA.
G1203	1	W-BEAM GUARDRAIL, 12 GA.
S730	2	*FOUNDATION SOIL TUBE, 6" x 8" x 72"
E750	1	BEARING PLATE
S760	1	CABLE ANCHOR BOX
E770	1	BCT CABLE ANCHOR ASSEMBLY
E780	1	GROUND STRUT
PB620	2	STEEL BREAKAWAY END POST
PB621	5	STEEL BREAKAWAY LINE POST
	5	RECYCLED PLASTIC BLOCKOUT OR OFFSET BLOCK
		HARDWARE
B580122	25	5/8" Dia. x 1 1/4" SPLICE BOLT, POST #2
B580754	2	5/8" Dia. x 7 1/2" HEX BOLT
B341004	2	3/4" Dia. x 10" HEX BOLT
B581002	5	5/8" Dia. x 10" H.G.R. BOLT (POST 3 THRU 7)
N050	32	5/8" Dia. H.G.R. NUT (SPLICE 24, SOIL TUBES 2, POST 2 THRU 7, 6)
N030	2	3/4" Dia. HEX NUT
W050	6	H.G.R. WASHER
W030	4	3/4" ID WASHER
N100	2	1" ANCHOR CABLE HEX NUT
W100	2	1" ANCHOR CABLE WASHER
B140404	2	1/4" x 4" HEX BOLT
N014	2	1/4" HEX NUT
W014	4	1/4" WASHER
SB58A	8	CABLE ANCHOR BOX SHOULDER BOLT
N055A	8	1/2" A325 STRUCTURAL NUT
W050A	16	1 1/16" OD x 9/16" ID A325 STR. WASHER

Foundation Tube Options For Posts 1 & 2

*6'-0" Split Foundation Tubes S730
*6'-0" Solid Foundation Tubes E731
*5'-0" Foundation Tubes S735 W/Soil Plates SP600
*4'-6" Foundation Tubes E735 W/Soil Plates SP600

PM: JUN
OPER: LSA*/GKC
REVISED: 12/14/00
DATE: 12/18/98
SCALE: 1 = 1
FILE: 9930-C21.DWG
JOB NO. 9930

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE 4-04-00
	DRAWN BY F. Reyes	" "
NOTE BOOK	TRACED BY	" "
hwyk Heads	DESIGNED BY F. Reyes	" "
Nakamura64	QUANTITIES BY	" "
	CHECKED BY	

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

FLEAT-350

FLARED ENERGY ABSORBING TERMINAL

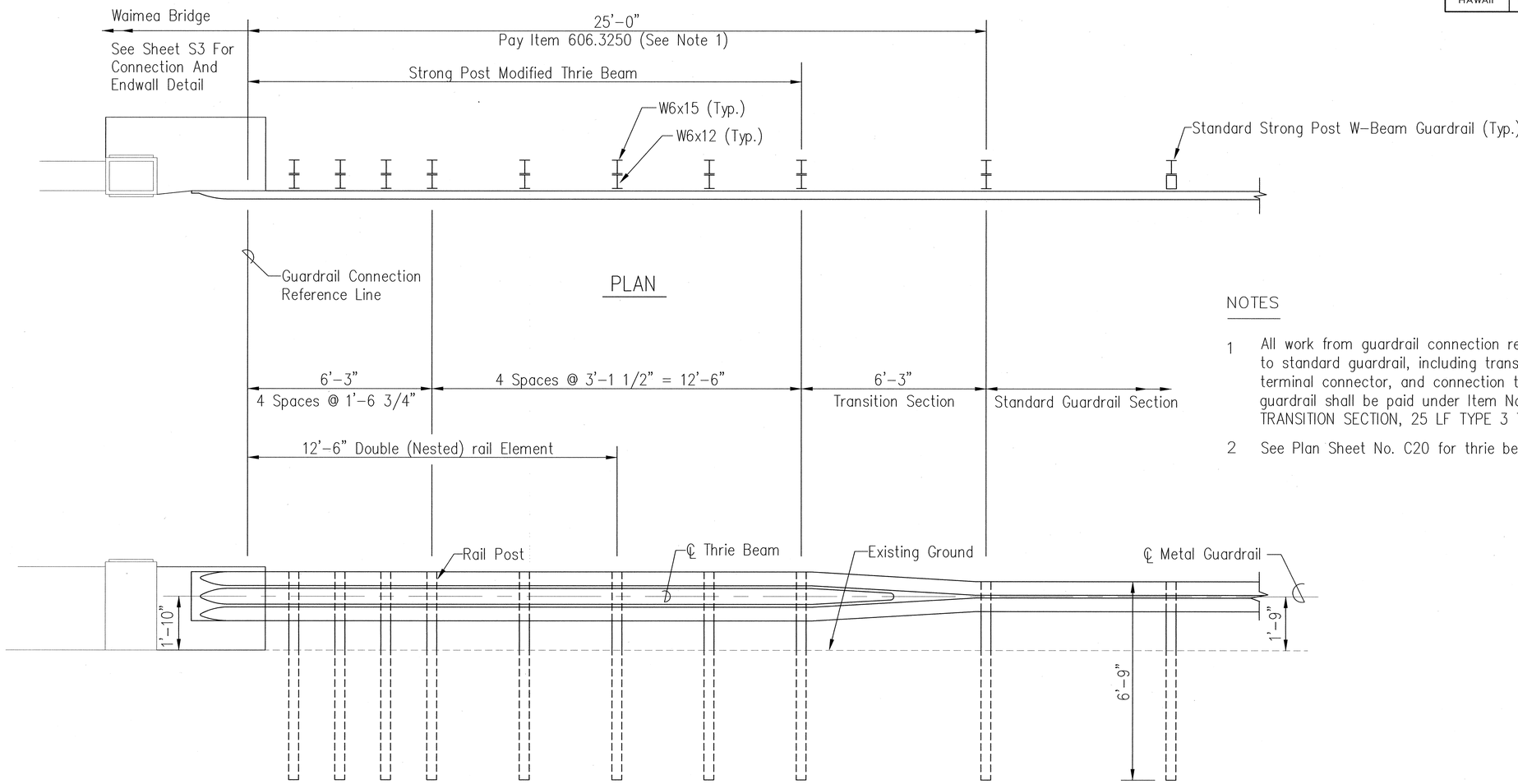
KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M
Scale: As Noted Date: 12/13/00

JUNE J. NAKAMURA
LICENSED PROFESSIONAL ENGINEER
No. 4376-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
BY: June J. Nakamura
DATE: 12-14-00

SHEET NO. C21 OF C23 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	28	40



PLAN

ELEVATION

NOTES

1. All work from guardrail connection reference line to standard guardrail, including transition section, terminal connector, and connection to standard guardrail shall be paid under Item No. 606.3250 – TRANSITION SECTION, 25 LF TYPE 3 THRIE BEAM
2. See Plan Sheet No. C20 for thrie beam details.

THRIE BEAM INSTALLATION AT WAIMEA BRIDGE (LIHUE END)

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

PM: JJN
OPER: GKC/LSA
REVISED: 12/14/00

DATE: 10/6/00
SCALE: 1 = 1
FILE: 9930-C22.DWG
JOB NO. 9930

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

JUNE J. NAKAMURA
LICENSED PROFESSIONAL ENGINEER
No. 4376-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

BY: June J. Nakamura
DATE: 12-14-00

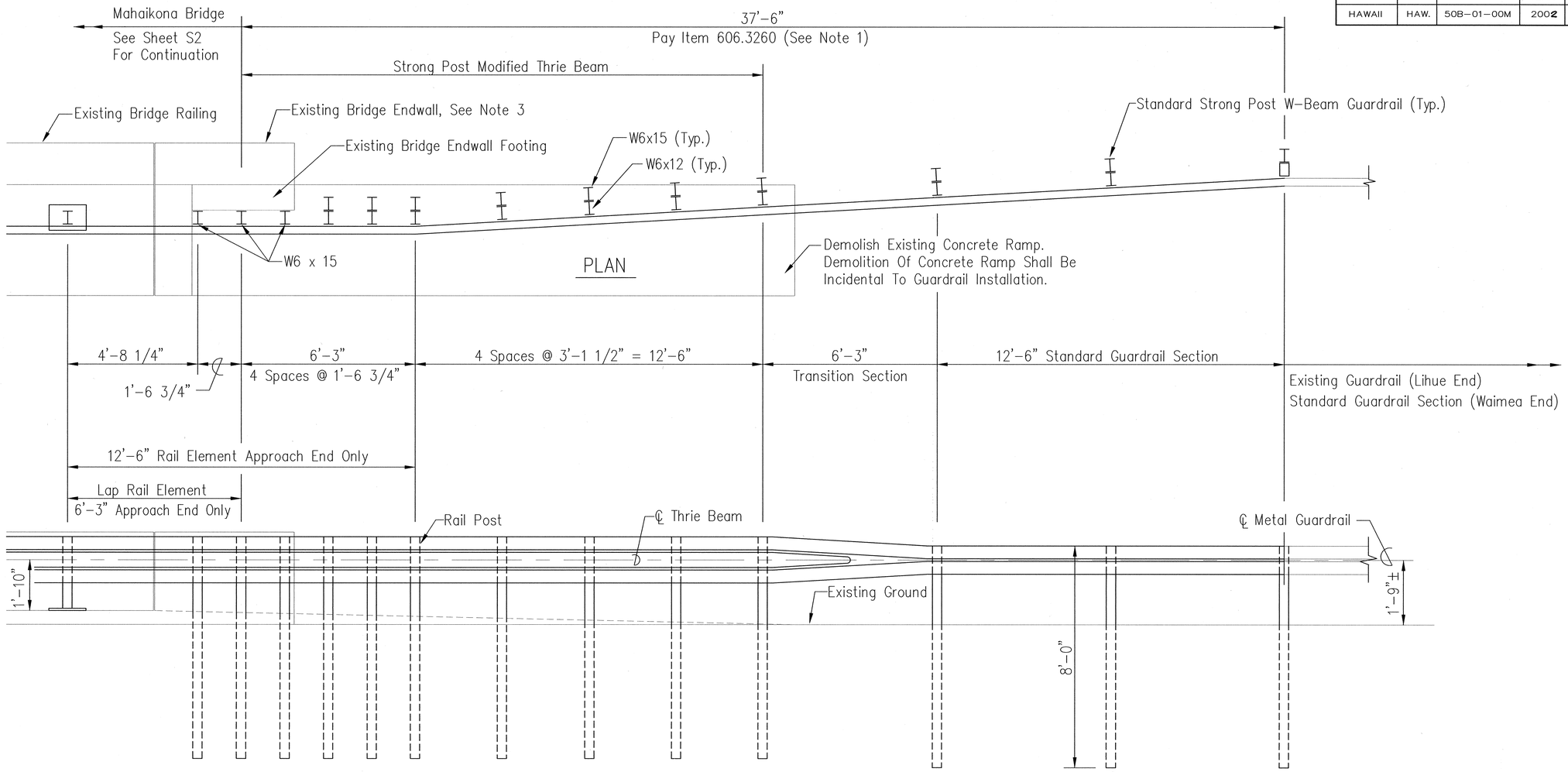
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

THRIE BEAM INSTALLATION
AT WAIMEA BRIDGE
KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M

Scale: As Noted Date: 12/13/00

SHEET NO. C22 OF C23 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	50B-01-00M	2002	29	40



ELEVATION

NOTES

1. All Work From Guardrail Connection Reference Line to Standard Guardrail, Including Transition Section And Connection To Standard Guardrail Shall be Paid Under Item No. 606.3260, Transition Section, 37.5 LF Type 3 Thrie Beam
2. See Plan Sheet C20 For Thrie Beam Details
3. Verify Locations Of Existing Endwall Footings Before Guardrail Installation.
4. Lap Rail Element In Direction Of Traffic to Prevent Snagging.

THRIE BEAM INSTALLATION AT MAHAIKONA BRIDGE

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

PM: JJN
OPER: GKC/LSA
REVISED: 12/14/00

DATE: 10/6/00
SCALE: 1 = 1
FILE: 9930-C23.DWG
JOB NO. 9930

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

JUNE J. NAKAMURA
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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

THRIE BEAM INSTALLATION
AT MAHAIKONA BRIDGE
KAUMUALII HIGHWAY RESURFACING
Mahaikona Bridge To Waimea Canyon Drive
Project No. 50B-01-00M

Scale: As Noted Date: 12/13/00

SHEET NO. C23 OF C23 SHEETS