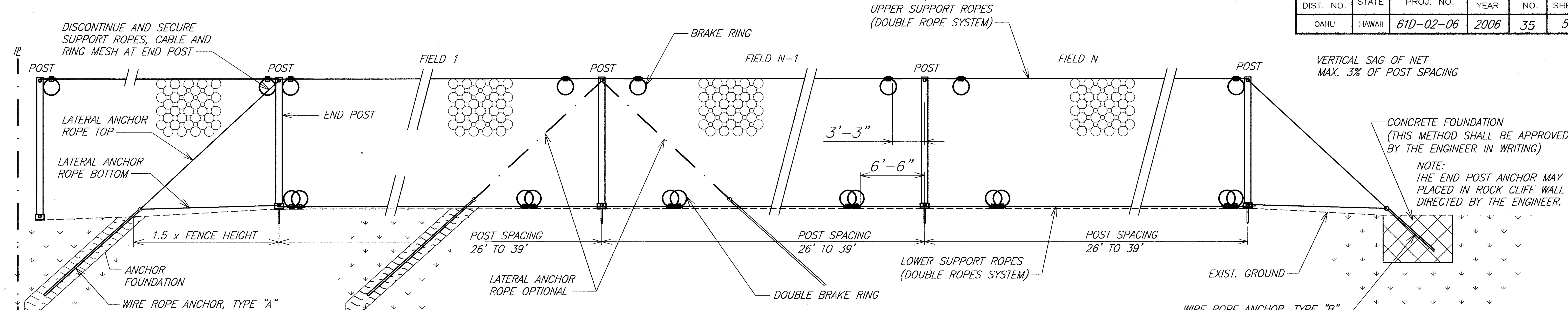
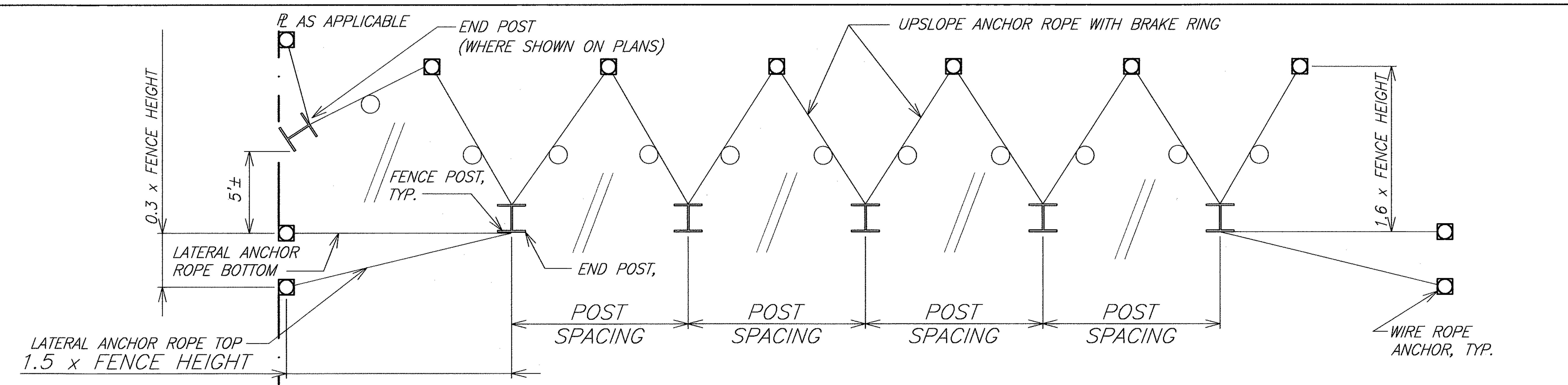
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35	57

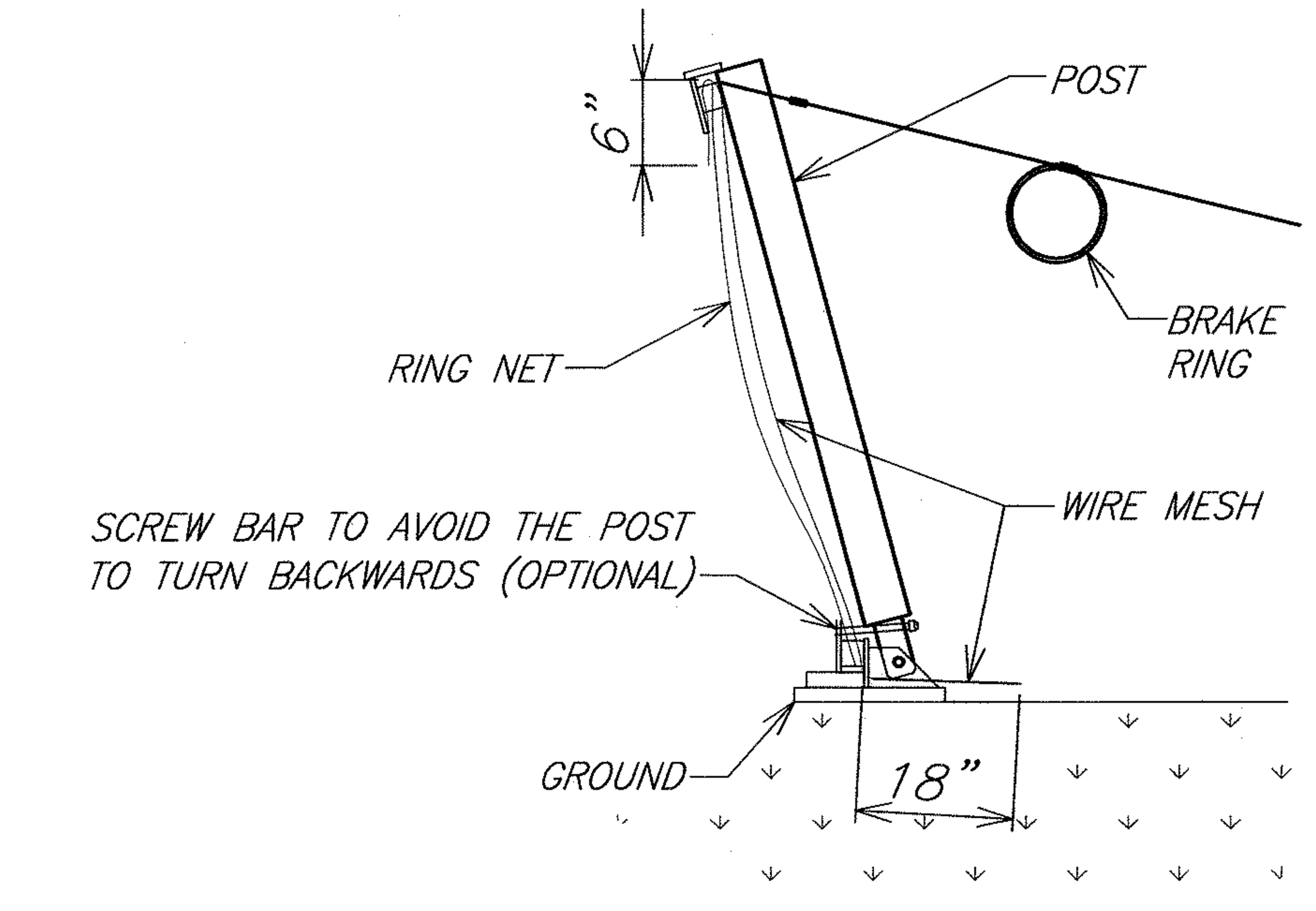


ELEVATION
NOT TO SCALE

NOTE:
CONTRACTOR SHALL SUBMIT ALL CALCULATIONS FOR PEDESTAL FOUNDATION AND ANCHORING TO THE ENGINEER FOR APPROVAL PRIOR TO START OF CONSTRUCTION.

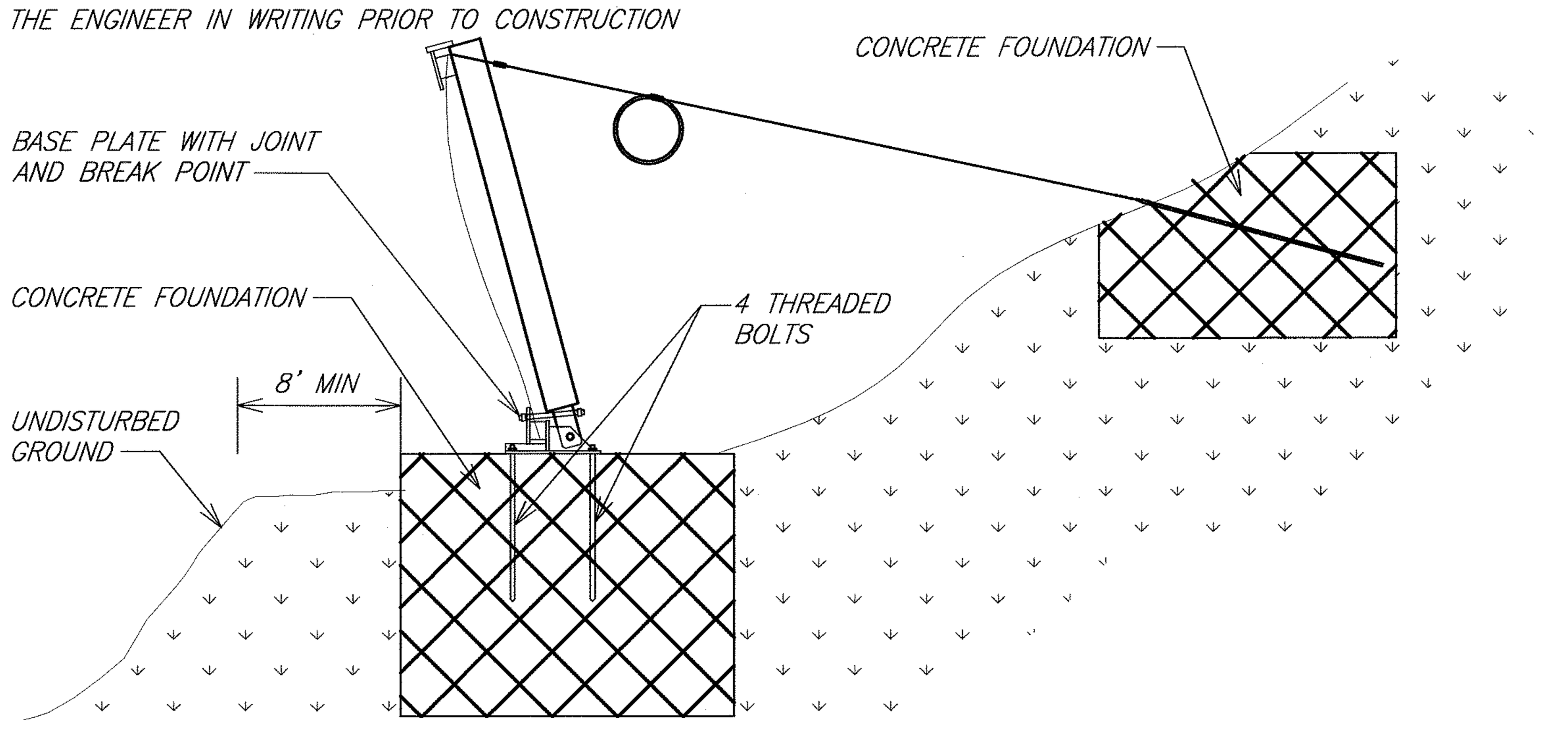


LAYOUT OF ANCHOR POINTS – PLAN
NOT TO SCALE

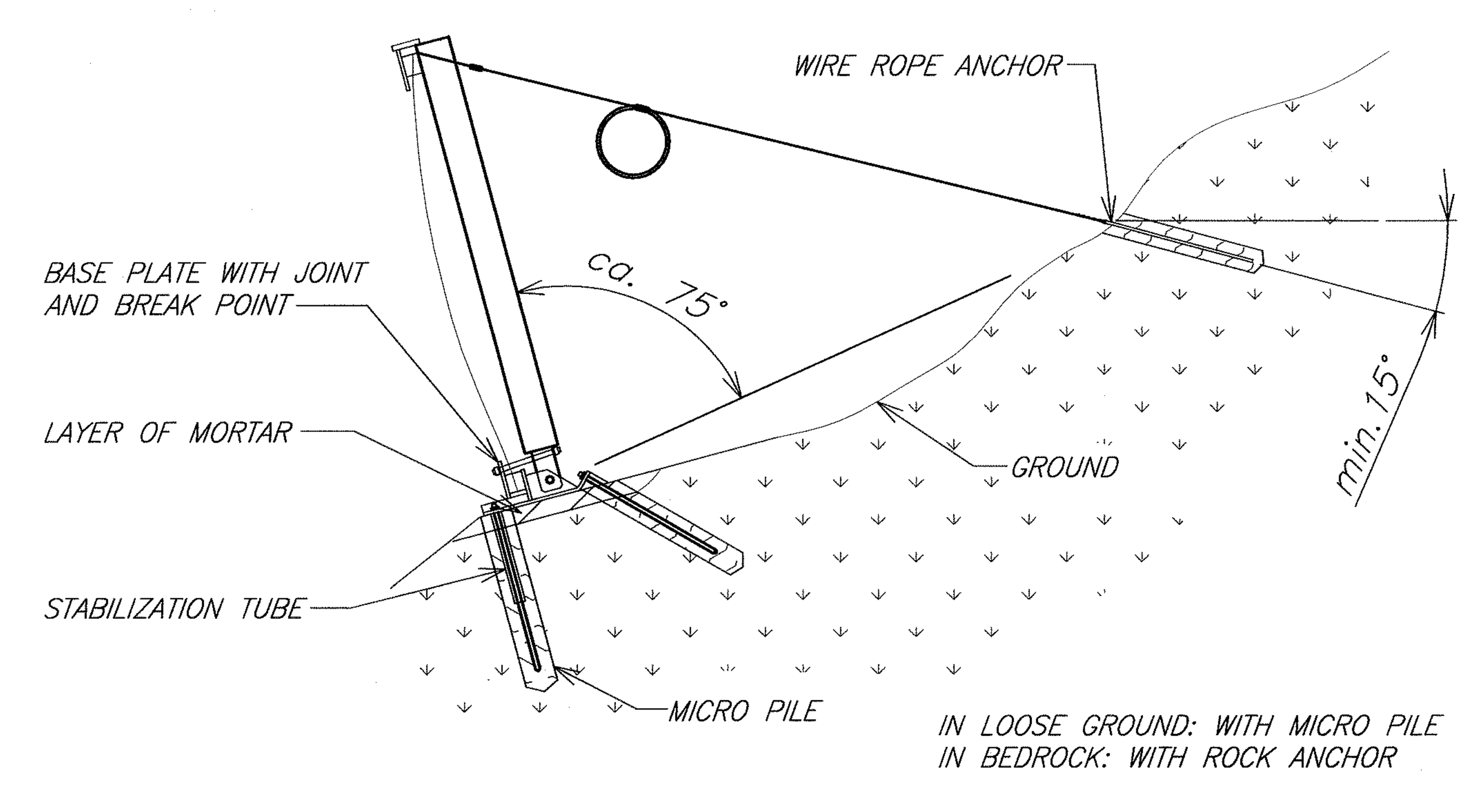


WIRE MESH
NOT TO SCALE

CONCRETE FOUNDATION: FOR ALL TYPES OF SOIL. THIS METHOD ALONG WITH FOUNDATION CALCULATIONS SHALL BY APPROVED BY THE ENGINEER IN WRITING PRIOR TO CONSTRUCTION



ANCHORING TYPE "B"
NOT TO SCALE

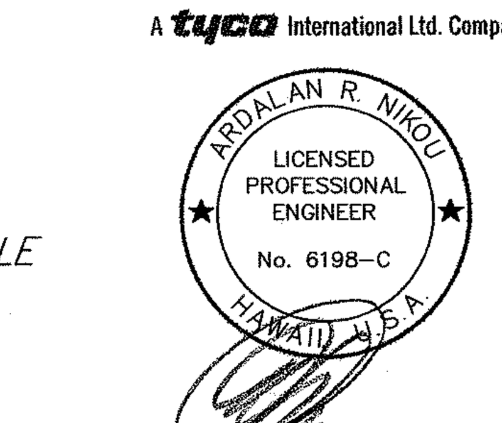


ANCHORING TYPE "A"
NOT TO SCALE

NOTES:

1. PROTECTION FENCE DETAILS SHOWN HERE ARE FOR GENERAL GUIDANCE. CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S AUTHORIZED DESIGN DRAWINGS AND DETAILS.
2. CONTRACTOR SHALL PROVIDE ROCKFALL PROTECTION FENCE SHOP DRAWINGS FOR APPROVAL TO THE ENGINEER. SHOP DRAWINGS SHALL BE REVIEWED AND STAMPED BY A STRUCTURAL ENGINEER LICENSED IN THE STATE OF HAWAII.
3. IMPACT ENERGY IS 300 FOOT TON, FENCE HEIGHT IS 10'-0"

EarthTech
A tyco International Ltd. Company



EXPIRATION DATE OF THE LICENSE 4/30/2008
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

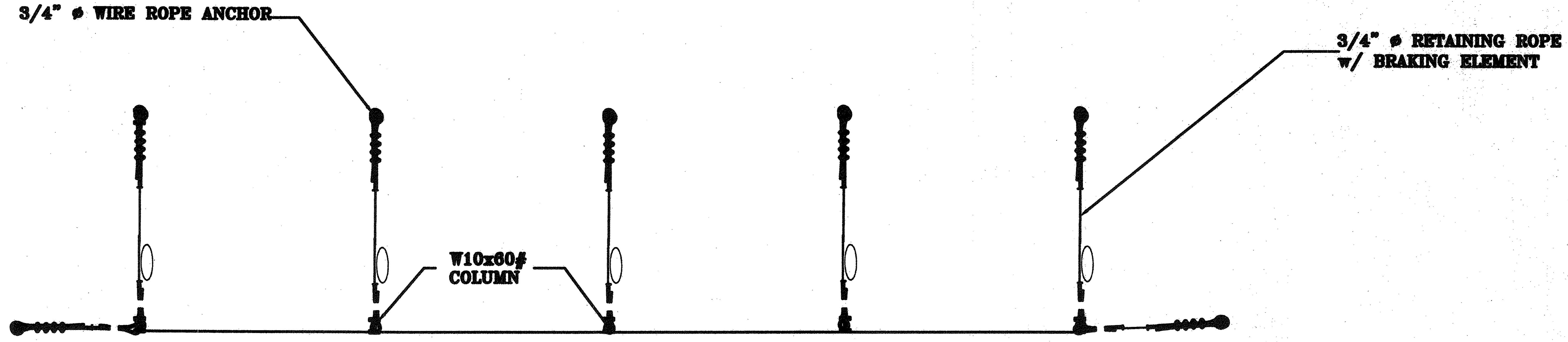
KAILUA ROAD PERMANENT ROCKFALL AND LANDSLIDE MITIGATION PROJECT NO. 61D-02-06

Scale: As Noted   Date: Aug 2006

SHEET No. 1 OF 1 SHEETS

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

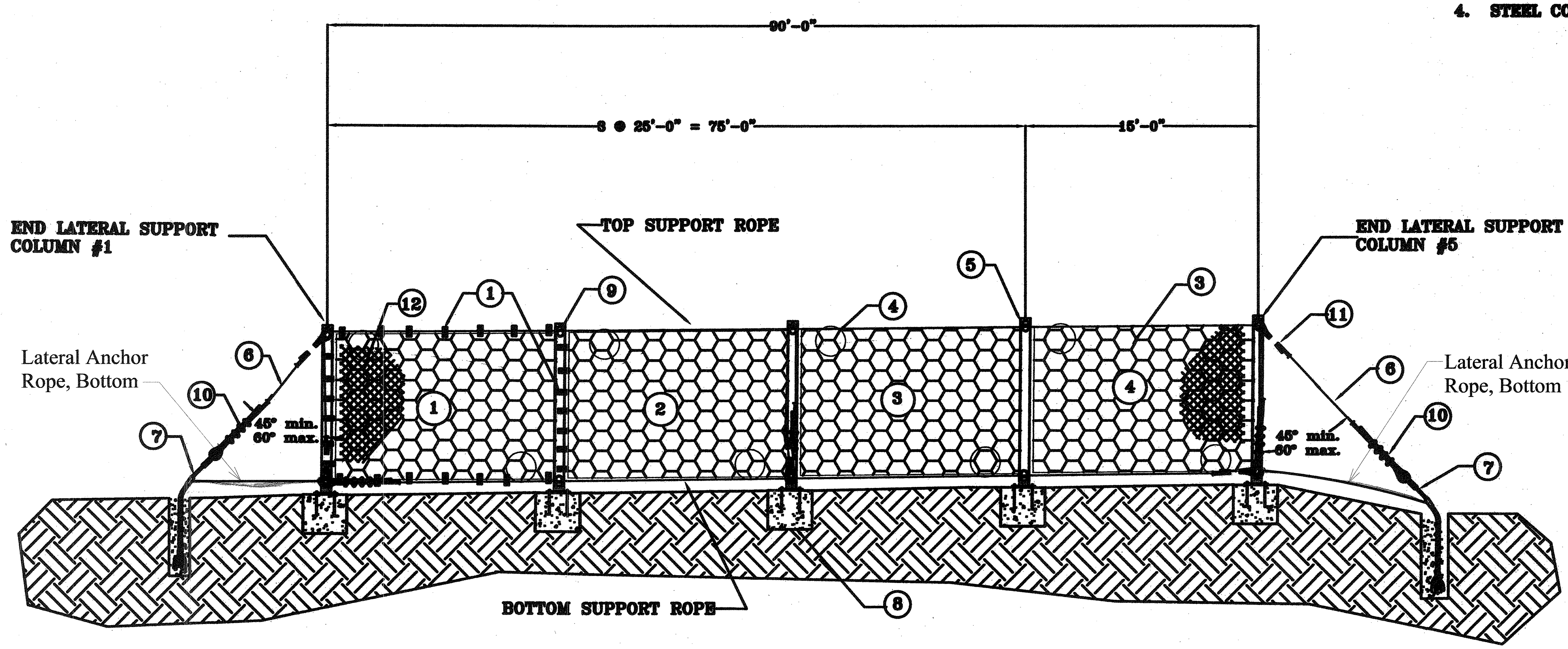
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35S-1	57



PLAN VIEW
NTS

NOTES:

1. TOTAL LENGTH OF ROCKFALL BARRIER = 90'-0".
2. ANY ELEVATION CHANGE EXCEEDING 15% BETWEEN ANY TWO (2) COLUMNS WILL REQUIRE SURVEY DATA FOR COLUMN LOCATIONS (BY OTHERS) PRIOR TO FABRICATION OF NETS.
3. ROCKFALL BARRIER CONSISTS OF (1) SECTION @ 90'-0".
4. STEEL COLUMNS TO BE PAINTED BLACK, ALL OTHER MATERIAL TO BE POWDER COATED BLACK.



ELEVATION VIEW
NTS

LEGEND

1. 3/4" SHACKLE (NET TO SUPPORT ROPE), 3/4" SHACKLE (NET TO NET)
2. 3/4" ø SUPPORT ROPE w/ BRAKING ELEMENTS
3. 26'-3" x 10'-0" - 16/3/300 ROCCO RING NET
4. BRAKING ELEMENT
5. W 10 x 60# GALV. PAINTED STEEL COLUMN
6. 3/4" ø LATERAL SUPPORT ROPE
7. 3/4" ø WIRE ROPE ANCHOR (SEE 7274-2)
8. COLUMN FOUNDATION (BY CONTRACTOR)
9. CABLE GUIDE ASSEMBLY
10. WIRE ROPE LOOP (SEE 7274-2)
11. PRESS LOOP
12. 2", 9 GAGE, GALVANIZED CHAIN LINK MESH (BY CONTRACTOR)

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

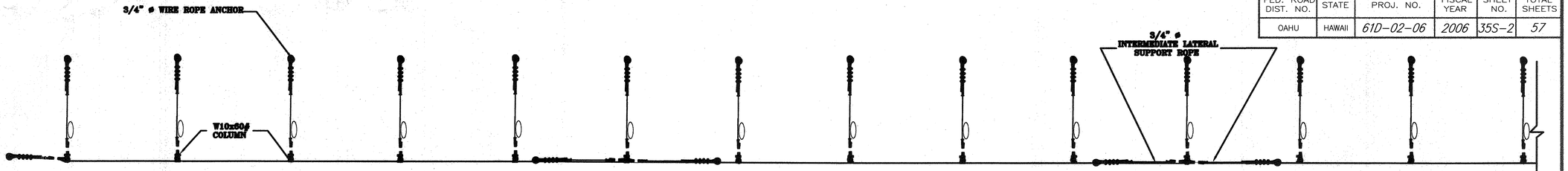
KAILUA ROAD PERMANENT
ROCKFALL AND LANDSLIDE MITIGATION
PROJECT NO. 61D-02-06

Scale: As Noted   Date: Aug 2006

SHEET No. 1 OF 5 SHEETS

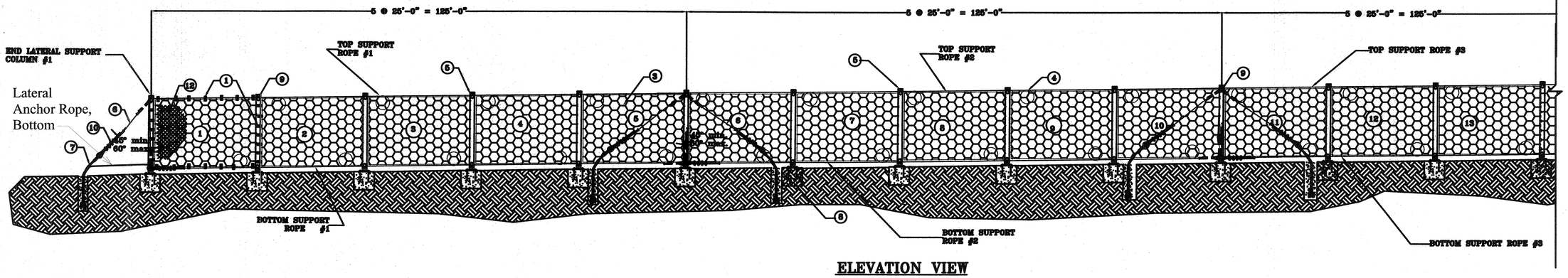
C.O. 35S-1

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35S-2	57



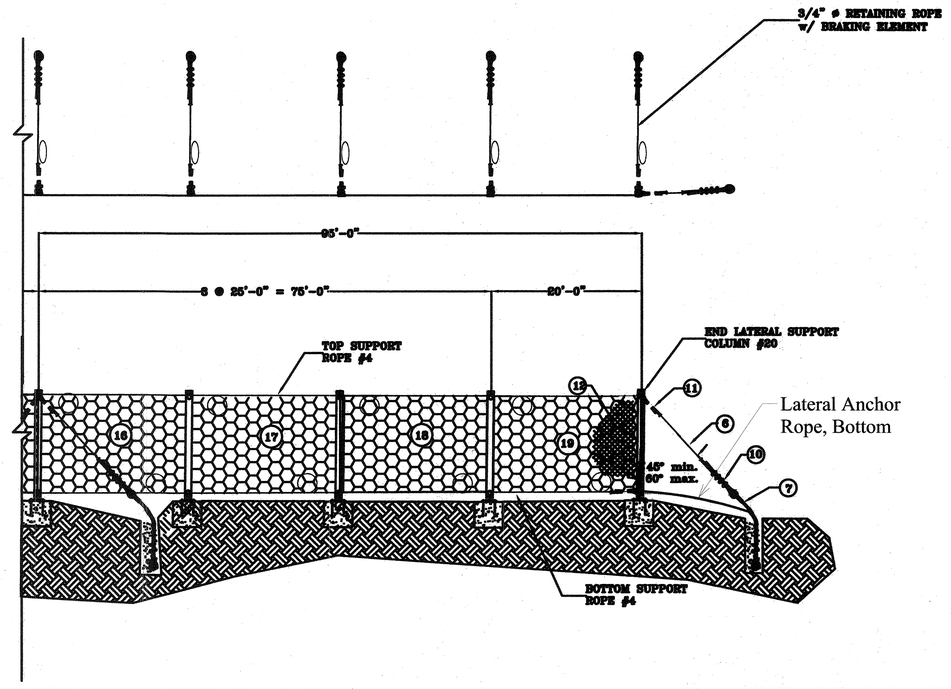
PLAN VIEW

NTS



ELEVATION VIEW

NTS



LEGEND

1. 3/4" SHACKLE (NET TO SUPPORT ROPE), 1/2" SHACKLE (NET TO NET)
2. 3/4" ø SUPPORT ROPE w/ BRAKING ELEMENTS
3. 25' x 10' (typ.) 16/3/300 ROCCO RING NET
4. BRAKING ELEMENT
5. W 10 x 60# GALV. PAINTED STEEL COLUMN
6. 3/4" ø LATERAL SUPPORT ROPE
7. 3/4" ø WIRE ROPE ANCHOR (SEE 7274-2)
8. COLUMN FOUNDATION (BY CONTRACTOR)
9. CABLE GUIDE ASSEMBLY
10. WIRE ROPE LOOP (SEE 7274-2)
11. PRESS LOOP
12. 2", 9 GAGE, GALVANIZED CHAIN LINK MESH (BY CONTRACTOR)

NOTES:

1. TOTAL LENGTH OF ROCKFALL FENCE = 470 Lft.
2. ANY ELEVATION CHANGE EXCEEDING 15% BETWEEN ANY TWO (2) COLUMNS WILL REQUIRE SURVEY DATA FOR COLUMN LOCATIONS (BY OTHERS) PRIOR TO FABRICATION OF NETS.
3. ROCKFALL BARRIER CONSISTS OF (3) SECTIONS @ 125 Lft. & (1) SECTION @ 95 Lft.
4. STEEL COLUMNS TO BE PAINTED, ALL OTHER MATERIAL TO BE POWDER COATED - BLACK.

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

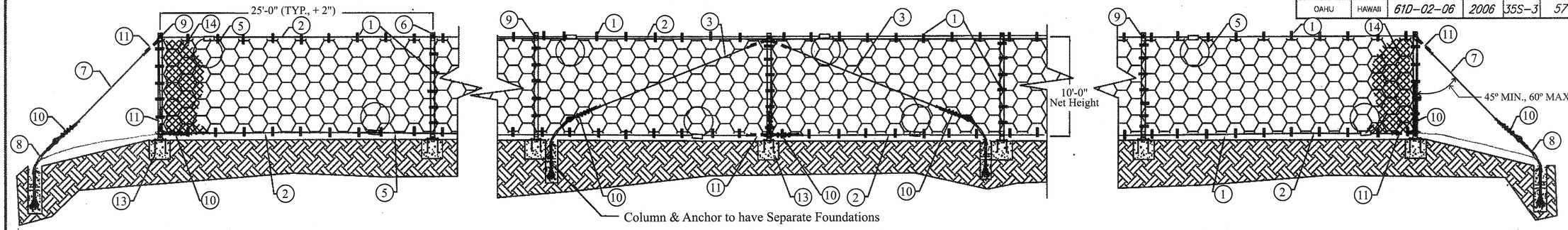
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

KAILUA ROAD PERMANENT
ROCKFALL AND LANDSLIDE MITIGATION
PROJECT NO. 61D-02-06

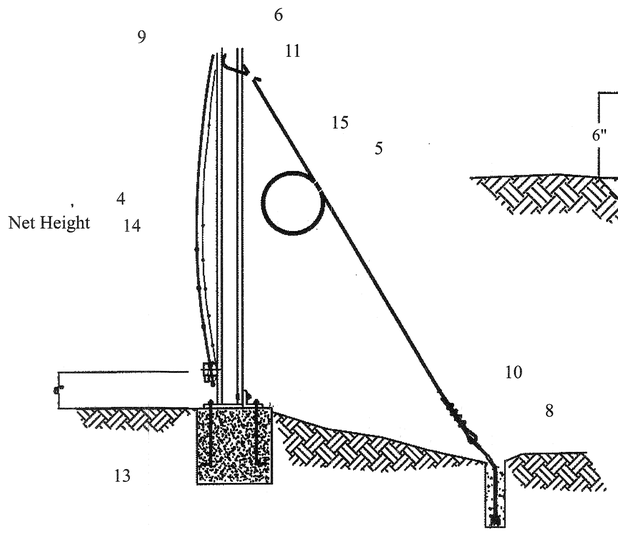
Scale: As Noted Date: Aug 2006

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35S-3	57



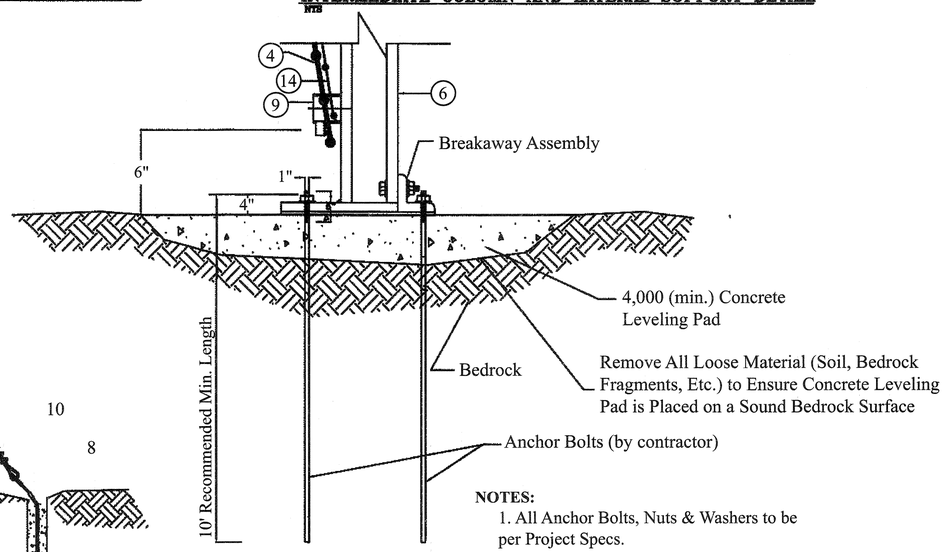
END COLUMN AND LATERAL SUPPORT DETAIL

NTS



INTERMEDIATE COLUMN AND LATERAL SUPPORT DETAIL

NTS



NOTES:

1. All Anchor Bolts, Nuts & Washers to be per Project Specs.

BEDROCK FOUNDATION DETAIL

NTS

END COLUMN AND LATERAL SUPPORT DETAIL

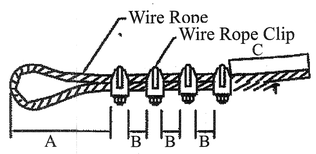
NTS

LEGEND:

1. 3/4" SHACKLE (NET TO SUPPORT ROPE), 1/2" SHACKLE (NET TO NET)
2. 3/4" ⌀ SUPPORT ROPE
3. 3/4" ⌀ INTERMEDIATE LATERAL SUPPORT ROPE
4. 16/3/300 ROCCO RING NET
5. BRAKING ELEMENT
6. W 10 X 60# GALV. PAINTED STEEL COLUMN
7. 3/4" ⌀ END LATERAL SUPPORT ROPE
8. 3/4" ⌀ WIRE ROPE ANCHOR
9. CABLE GUIDE ASSEMBLY
10. WIRE ROPE LOOP
11. PRESS LOOP
12. CAST-IN-PLACE CONCRETE FOUNDATION OR BED ROCK FOUNDATION (BY CONTRACTOR)
13. 2", 9 GAGE, GALVANIZED CHAIN LINK MESH (BY CONTRACTOR)
14. 3/4" ⌀ RETAINING ROPE W/ BRAKING ELEMENT

NOTES:

1. ANCHOR HOLES TO BE DETERMINED BY CONTRACTOR TO ACHIEVE REQUIRED PULLOUT STRENGTH OF 20 TONS.
2. REFER TO DWG. NO. 7274-1A & 7274-1B FOR ANCHOR LOCATIONS.
3. WIRE ROPE ANCHOR ENDS TO BE "SPLAYED" BEFORE SETTING IN CONCRETE.
4. WIRE ROPE CLIP ORIENTATION IS TO BE EXACTLY AS SHOWN ON DRAWINGS, SADDLE ON THE LIVE ROPE AND U-BOLT ON THE DEAD TAIL ROPE.
5. ANCHORS TO BE TESTED IN ACCORDANCE W/ PROJECT SPECIFICATIONS.
6. ANCHORS ARE SUPPLIED IN 10' LENGTHS AND CAN BE CUT ON SITE IF REQUIRED PULLOUT STRENGTH CAN BE ACHIEVED WITH A SHORTER ANCHOR LENGTH.
7. ALL MATERIAL TO BE POWEDER COATED - BLACK.



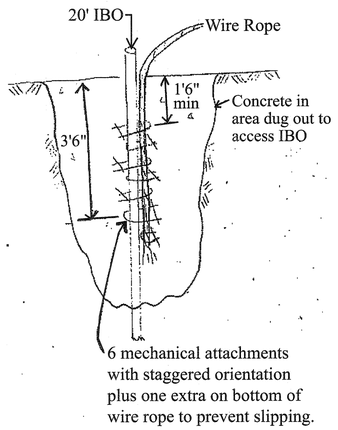
WIRE ROPE LOOP DETAIL

NTS

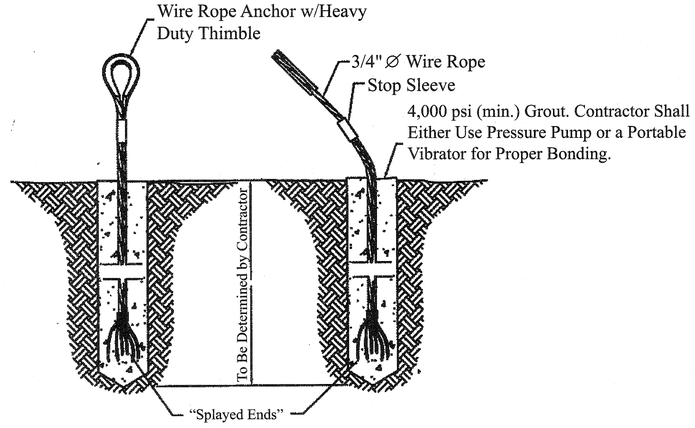
SPLICING WIRE ROPE DETAIL

NTS

Rope ⌀ mm	Rope ⌀ IN.	Wire Rope Clip Size mm	Wire Rope Clip Size IN.	Wire Rope Clip Quan.	A mm	A IN.	B mm	B IN.	C mm	C IN.	Torque Required J	Torque Required ft-lbs
19	3/4	19	3/4	5	229	11	102	5	152	6	173	130



ALTERNATE TO WIRE ROPE ANCHOR DETAIL



WIRE ROPE ANCHOR DETAIL

NTS

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

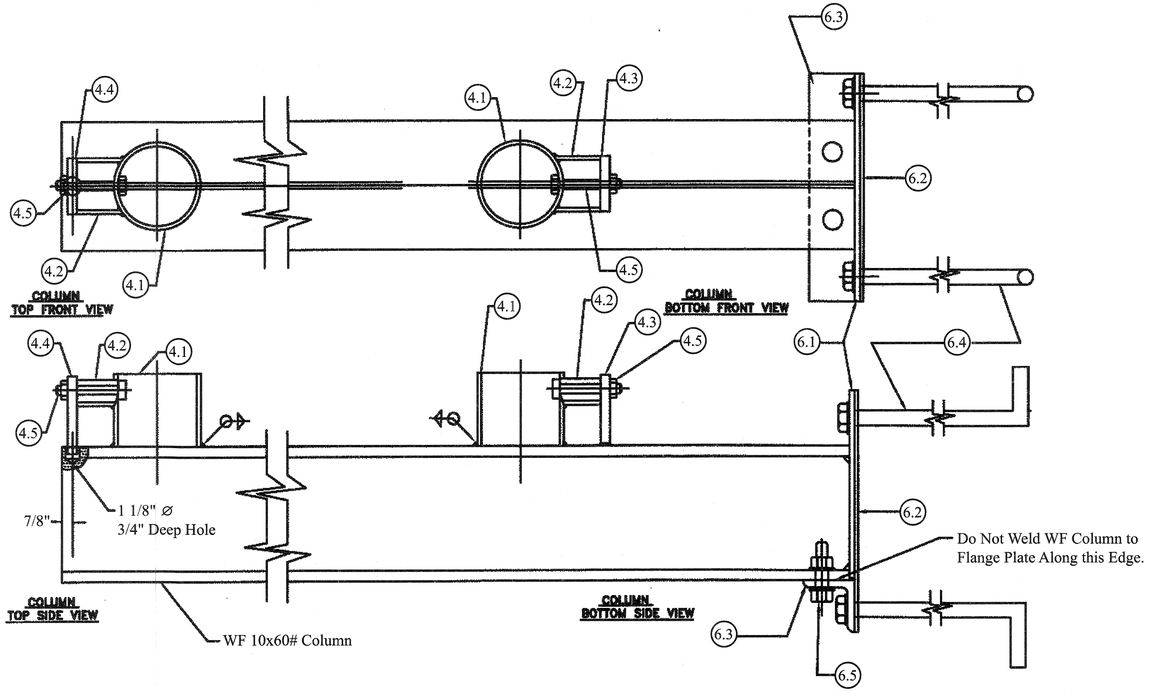
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

KAILUA ROAD PERMANENT
ROCKFALL AND LANDSLIDE MITIGATION
PROJECT NO. 61D-02-06

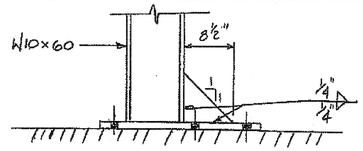
Scale: As Noted Date: Aug 2006

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35S-4	57

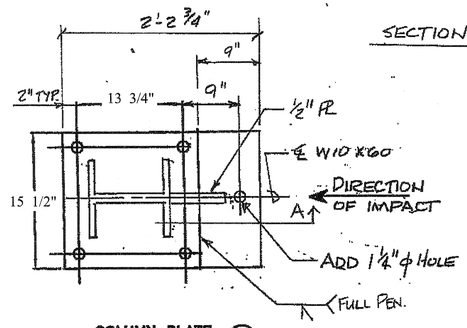


CABLE GUIDE ASSEMBLY
NTS

COLUMN BREAKAWAY ASSEMBLY
NTS



SECTION A



COLUMN PLATE 6.2
NTS

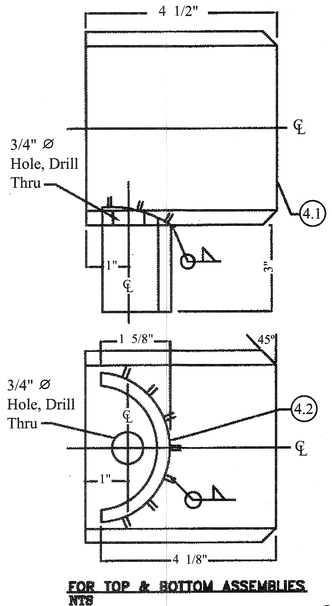
NOTES:

1. ALL STEEL MATERIAL IS TO BE ASTM A-36.
2. REMOVE ALL BURRS AND SHARP EDGES FROM COLUMNS PRIOR TO SHIPPING.
3. COLUMNS TO JOB SITE FULLY ASSEMBLED AND NUTS ARE TO BE ATTACHED IN THEIR APPROPRIATE LOCATIONS.
4. DRILL AND EPOXY ANCHOR BOLTS IN 15" DEEP HOLES.
5. USE HIT HY 150 MAX ADHESIVE ANCHOR BY HILTI OR APPROVED EQUAL.
6. ANCHOR BOLTS SHALL BE 1 1/8" ⌀ A36, H.D. GALV.

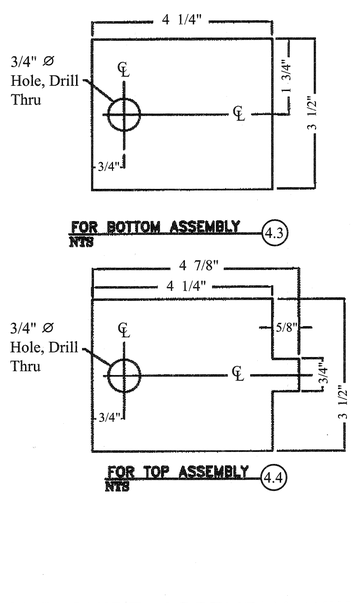
QUANTITY FOR W 10x60# COLUMNS

ITEM	QTY.	DESCRIPTION
3	25	COLUMN W/ 10x60# 10'-10 1/4"
4.1	50	PIPE 4" ⌀ NOMINAL (EXTRA STRONG)
4.2	50	PIPE 3" ⌀ NOMINAL (EXTRA STRONG)
4.3	25	PLATE 3 1/2" x 4 1/4" x 3/4" THICK
4.4	25	PLATE 3 1/2" x 4 7/8" x 3/4" THICK
4.5	50	5/8" ⌀ x 5" LONG A-325 BOLTS W/NUTS & WASHERS
6.1	25	FLANGE PLATE 14" x 15 1/2" x .50" THICK
6.2	25	COLUMN PLATE, 17 1/2" x 15 1/2" x .50" THK.
6.3	25	BREAKAWAY ANGLES, 3 1/2" x 3 1/2" x .50" THK. x 15 1/2" LONG
6.4	100	1" ⌀ ROCK BOTS AND/OR ANCHOR BOTS, (BY OTHERS)
6.5	50	A-307 BOLTS, 3/4" ⌀ w/ NUTS x 3" LONG (NO WASHERS)

A-307 BOLTS w/ NUTS & WASHERS TO BE FITTED WHEN ASSEMBLED.



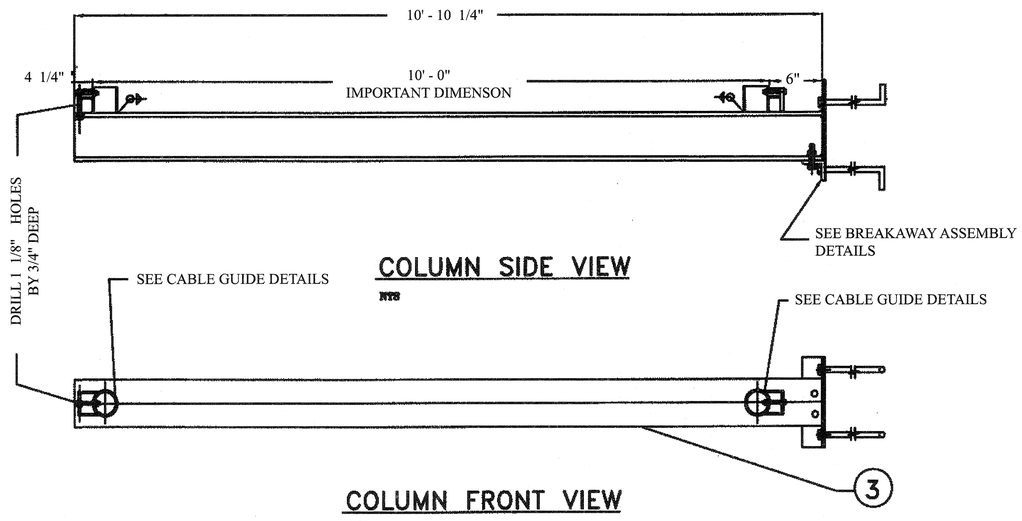
FOR TOP & BOTTOM ASSEMBLIES
NTS



FOR BOTTOM ASSEMBLY
NTS

FOR TOP ASSEMBLY
NTS

CABLE GUIDE ASSEMBLY DETAILS
NTS



COLUMN SIDE VIEW
NTS

COLUMN FRONT VIEW
NTS

NOTE:
COLUMNS TO BE GALV. & HAVE (1) COAT PRIMER & (2) COATS BLACK PAINT.

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

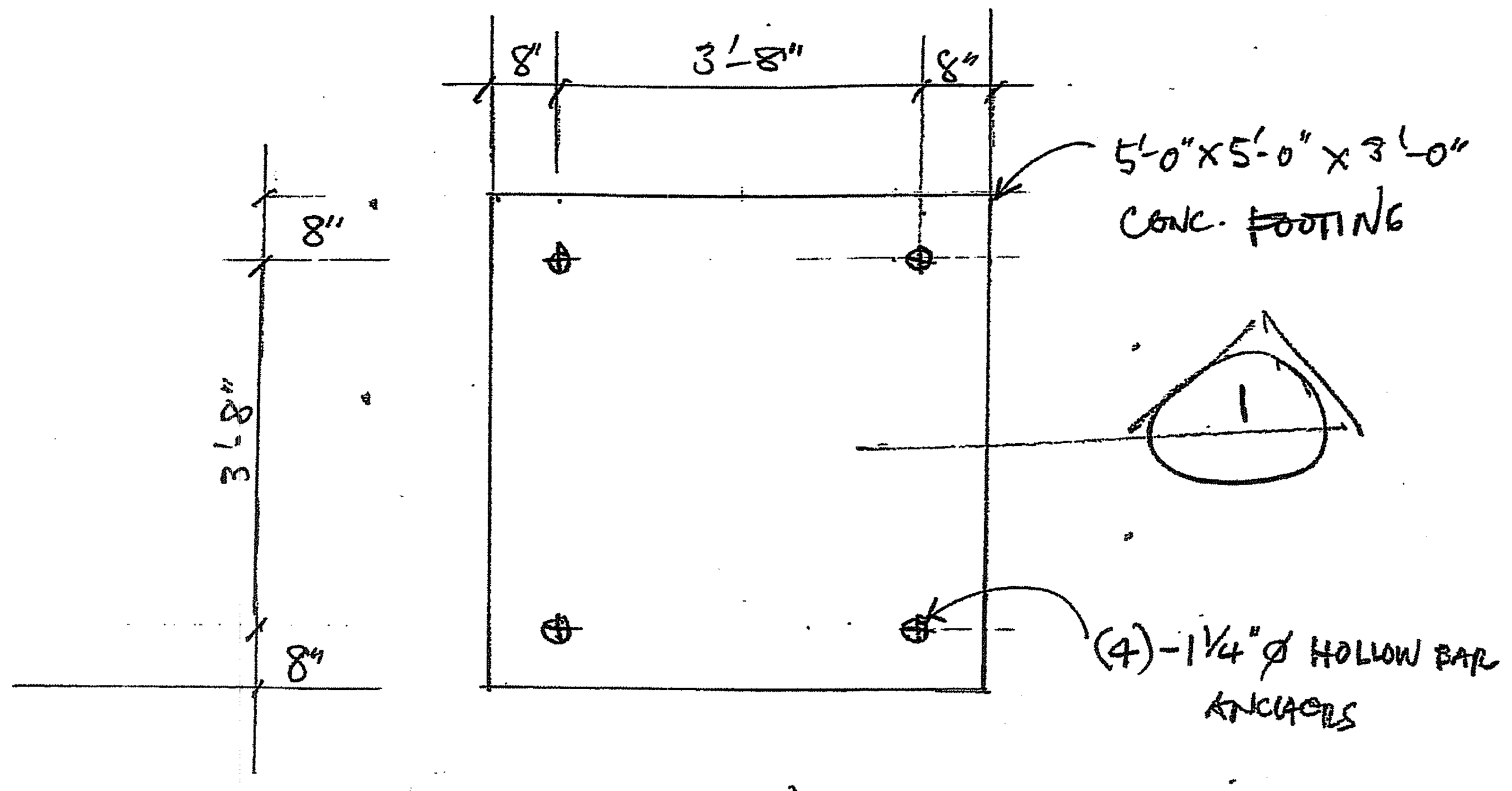
KAILUA ROAD PERMANENT ROCKFALL AND LANDSLIDE MITIGATION PROJECT NO. 61D-02-06

Scale: As Noted *Date: Aug 2006*

SHEET No. 4 OF 5 SHEETS

C.O. 35S-4

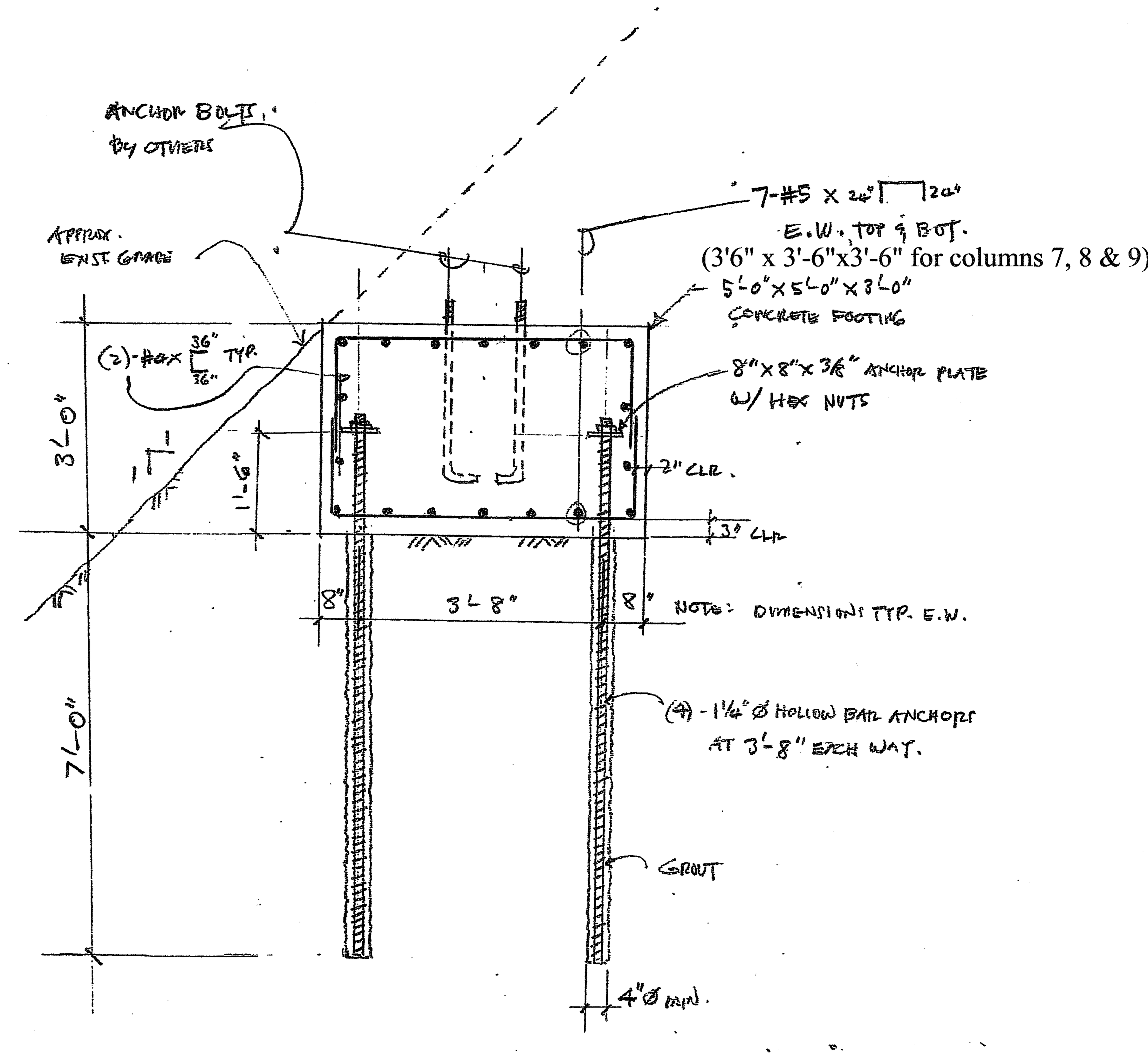
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
OAHU	HAWAII	61D-02-06	2006	35S-5	57



2 PLAN

NOTES:

1. DESIGN LOADS AT THE TOP OF THE FOOTING (EXTREME EVENT).
   a) HORIZONTAL LOAD = 8.64 KIPS
   b) OVERTURNING MOMENT = 11.5 K-FT.
2. ULTIMATE ANCHOR COMPRESSIVE CAPACITY = 16 KIPS
3. ULTIMATE ANCHOR PULL OUT CAPACITY = 14 KIPS
4. SOIL ANCHORS:
   a.) ANCHORS SHALL BE WILLIAMS/MAI HOLLOW BAR ANCHORS R32N OR APPROVED EQUAL. INSTALL PER MANUFACTURER'S RECOMMENDATIONS.
   b) ANCHORS, HEX NUTS AND PLATES SHALL BE HOT-DIPPED GALVANIZED.
   c.) MINIMUM BOREHOLE DIAMETER SHALL BE 4"Ø.
5. CONCRETE SHALL HAVE MINIMUM 28 DAY COMPRESSIVE STRENGTH, f'c = 3,000 psi.
6. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60.



1 NON-BEDROCK FOUNDATION DETAIL
Not to Scale

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

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCK PROTECTION FENCE

KAILUA ROAD PERMANENT
ROCKFALL AND LANDSLIDE MITIGATION
PROJECT NO. 61D-02-06

Scale: As Noted   Date: Aug 2006

SHEET No. 5 OF 5 SHEETS

C.O. 35S-5