FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-19(002)	2018	6	--

A. GENERAL ROCKFALL MITIGATION NOTES:

1. A grading permit is not procured nor required for this slope stabilization project.

2. The Contractor shall be responsible for procuring a right-of-entry to utilize the properties beyond the right-of-way shown during construction.

3. Earth materials placed by the Contractor on sloping ground to establish a temporary construction access/working platform for construction shall be completely removed and the slope restored to the pre-existing natural slope condition.

4. Verify and check all dimensions and details on the contract documents and specifications for discrepancies. Discrepancies shall be brought to the attention of the Engineer for clarification before proceeding with the work.

5. The Contractor shall compile documentation and records of the existence of any significant existing improvements adjacent to the project site immediately before beginning work (pre-construction survey). Documentation shall be performed by the Contractor on the day work commences and shall be done by labeled photographic records and annotated site plan showing the location of existing improvements, such as roadways and utilities.

6. Work incidental to the contract and necessary to complete the project, although not specifically referred to in the contract documents, shall be furnished and performed by the Contractor.

7. Incidental work shall include, but not be limited to, the clearing of existing boulder and vegetation obstructions from the slope face to facilitate construction in accordance with the contract documents. Cut vegetation shall be disposed of properly offsite. Boulders and scaling debris shall be removed from the project site. Select material will be allowed to be placed in an appropriate stable area if approved by the Engineer in writing.

8. In performing all work, the Contractor shall exercise due care and caution necessary to avoid damage to and impairment in the existing utility lines. Any damage inflicted on existing utility lines or structures shall be immediately repaired or restored as directed by the Engineer at the Contractor's expense.

9. The Contractor agrees that he/she will assume sole and complete responsibility for the job site and conditions during the course of construction of the project including safety of all persons and property. This requirement shall apply continuously and shall not be limited only to normal working hours. The Contractor shall indemnify and hold the owner and the Engineer harmless from any and all liability, real or alleged, in connection with the performance of the work on the project, except for liability arising out of the sole negligence of the Engineer.

10. The Contractor shall be responsible for providing a safe working environment on the project site meeting all applicable federal, state, and local requirements while executing the work contained in the contract documents.

11. All construction lines, grades, and survey monument stakeouts shall be performed by a licensed surveyor. The established survey stakeouts must be protected by the use of appropriate off-set survey pin markers for location reference during the construction period.

12. Underground utility lines known to exist by the Engineer are indicated on the plans. Location of the existing utility lines shown on the plans are approximate; therefore, no assurance can be provided that the actual locations will be precisely as shown in the contract documents. The Contractor shall verify the location and depth of the facilities and exercise proper care when excavating in the area.

13. The Contractor shall verify the location of all existing utility lines, whether shown on the plans or not, and shall be responsible for the repair or replacement of same in the event of damages resulting from his/her construction activities. The Contractor shall coordinate his/her work with the respective utility companies or agencies.

14. The Contractor shall make arrangements for utilities such as water, electricity, etc., required for the construction activities and all costs shall be borne by the Contractor.

15. No construction equipment shall be parked within the road such that the equipment will obstruct the normal movement and sight distance of the motorists.

16. The Contractor shall conduct all tests as required in the contract documents or as requested by the Engineer. The Contractor shall be responsible for the expenses incurred in conducting the tests.

17. The Contractor shall anticipate variable subsurface ground conditions consisting of, but not limited to, large embedded boulders, consolidated rocky colluvium, weathered and unweathered basalt rock formation. Foundation excavations encountering hard basalt rock material shall be anticipated by the Contractor. Hard rock excavation may require the use of hoeram and/or rock chipping tools.

B. EROSION CONTROL NOTES AND BEST MANAGEMENT PRACTICES:

1. Measures to control erosion and other pollutants such as temporary storm drain protection shall be in place before any construction work is initiated. These measures shall be properly constructed and maintained throughout the construction period.

2. Temporary silt fence shall be properly constructed and anchored in-place.

3. All erosion control measures shall be checked and repaired or replaced as necessary.

4. All slopes and exposed areas affected by the slope stabilization construction that are flatter than 1H:1V shall be mulched and/or sodded as soon as the rockfall protection system has been completed.

5. Temporary erosion control shall not be removed before permanent erosion control measures are in place and established.

6. All temporary erosion control measures shall be removed by the Contractor after completion of the project prior to final acceptance or as directed by the Engineer in the field.

7. Wash down and cleanup of equipment is not permitted within or adjacent to the existing paved surfaces of the project site.

C.1. ANCHORED WIRE MESH CONSTRUCTION SEQUENCE:

1. Clear slope face of vegetation, loose materials, and protruding rock outcrops.

2. Stake out grouted soil and/or rock anchors in general accordance with the project spacing requirements taking into account the low spots. Obtain Engineer's approval before starting work.

3. Excavation of the dell for pre-tensioning of the anchored wire mesh before drilling the grouted soil and/or rock anchors.

4. Installation of the grouted soil and/or rock anchors (final anchor heads shall not project above the terrain line or predominant slope line).

5. Lay and anchor erosion control matting in areas to receive new anchored wire mesh system in accordance with manufacturer's recommendations. Erosion control matting shall meet or exceed the following properties:

   Fibers: extruded monofilaments
   Specific Mass: g_m = 600 g/m^2
   Material: Polypropylene (PP)
   Structure: irregular loopy structure
   Thickness: h_m = 18 mm
   Tensile Strength: MD: z_m > 1.8 kN/m, CMD: z_m > 0.6 kN/m
   Tensile Strain: MD: ε = 20%, CMD: ε = 20%

6. Lay the steel wire mesh panels on the slope.

7. Join the steel wire mesh panels together with appropriate clips.

8. Fit the boundary wire ropes around the perimeter of the anchored wire mesh system and fasten the wire mesh to the boundary ropes with appropriate clips.

9. Install the spike plates and pre-tension the anchors with torque wrench in order to tension the anchored wire mesh to the grouted soil/rock anchors to at least 11.2 kips.

STATE OF HAWAI'I
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROCKFALL PROTECTION NOTES-1

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
Proj. No. ER-19(002)

Scale: As Noted Date: May 29, 2018

SHEET No. G-1 OF SHEETS

6

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

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FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-19(002)	2018	7	--

C.2 SLOPE PREPARATION NOTES:

1. The Contractor shall be responsible for protecting the highway and all appurtenances from damage resulting from the Contractor's activities. The Contractor shall be solely responsible for repairing any damage resulting from the clearing and/or other construction activities.

2. The Contractor shall protect the traffic on the highway from any rockfall or debris hazards at all times during the Contractor's activities.

3. Prior to drilling the soil/rock anchors for the new anchored wire mesh system, the slope face shall be cleared of all trees and shrubs.

4. The slope face to receive the new anchored wire mesh system shall be hand scaled to remove loose and/or excess materials to expose a firm substrate on the slope face to the Engineer's satisfaction.

5. Protruding rock outcrops shall be trimmed to provide a smooth face to receive the anchored wire mesh to the Engineer's satisfaction.

6. The tops of all slopes shall be rounded to the Engineer's satisfaction.

7. The Contractor shall exercise extra care in the hand scaling work and shall avoid over-steepening the slope face that may cause instability of the slope face. If the Contractor encounters unstable slope conditions that may constitute a potential landslide during the slope preparation work, notify the Engineer immediately.

8. Debris or other materials that hang up on the slope during the slope preparation operations shall be removed and completed to the satisfaction of the Engineer.

9. The Contractor shall maintain equipment on-site at all times to remove debris from the highway to allow the passage of emergency vehicles in the event that emergency vehicles require passage through the project area along the highway during the lane closure times. The slope preparation activities shall be temporarily suspended to allow the passage of the emergency vehicles through the project area along the highway.

C.3 ANCHORED WIRE MESH SYSTEM MATERIALS:

1. All hardware for the anchored wire mesh system shall be powder coated with a black pigment, and boundary wire rope shall be PVC coated (black in color).

2. Boundary wire rope and grouted soil and/or rock anchors (including the steel reinforcing bar for the grouted anchor, wire rope, heavy duty wire rope thimbles, wire rope clips (cable clamps), steel plates, heavy hex nuts, washers, etc.) shall be hot dipped galvanized. All exposed hardware shall be powder coated black.

3. Heavy-duty wire rope thimble shall not be in contact with the threads of the steel reinforcing bar.

4. The stainless steel sleeve (swage) shall be placed outside of the galvanized steel plate (trap plate) and within one wire rope diameter of the end of the heavy-duty wire rope thimble in accordance with the manufacturer's recommendations.

5. The saddle of the wire rope clip shall be placed on the live end of the wire rope cable and the U-bolt shall be placed on the dead end of the wire rope cable.

6. The Contractor shall follow the wire rope manufacturer's recommendation for the spacing of the wire rope clips and torque for the u-bolts.

7. The torque on 10% of the wire rope clips shall be checked after loading in the presence of the Engineer.

8. The grouted soil and/or rock anchors shall have a design pullout capacity (design load) of 36 kips unless directed otherwise by the Engineer. The Contractor shall test a minimum of 5% of the grouted soil and/or rock anchors for pullout in accordance with the specifications.

9. The steel wire mesh for the anchored wire mesh system shall be manufactured from 0.157-inch (4-mm) diameter high-tensile steel wire. The high-tensile steel wire shall have a minimum tensile strength of 256,000 psi.

10. The grouted soil and/or rock anchor shall consist of 1.375-inch diameter (38-mm diameter) high-strength Grade 75 solid threaded bar installed in a minimum 8-inch diameter drilled hole filled with non-shrink grout. Alternately, grouted soil and/or rock anchor consisting of hollow threaded bar with outside and inside diameters of 1.57 and 0.63 inches, respectively, and minimum yield load capacity of 118 kips may be used. The non-shrink grout shall be non-shrink, non-metallic, non-gaseous and shall have a minimum unconfined compressive strength of 4,000 psi or greater.

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STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

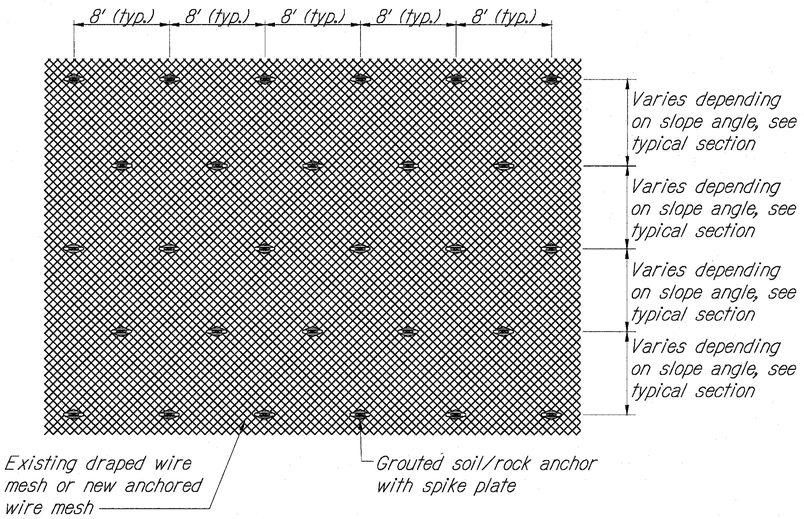
ROCKFALL PROTECTION NOTES-2

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
Proj. No. ER-19(002)

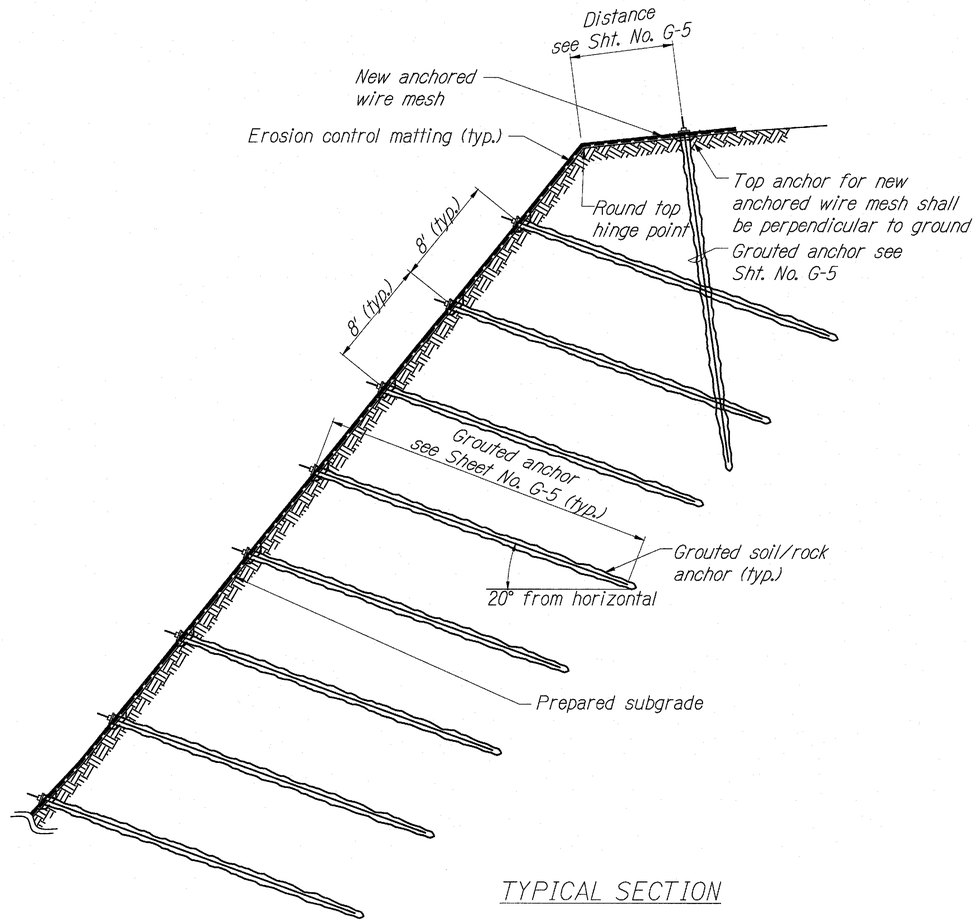
Scale: As Noted Date: May 29, 2018

SHEET No. G-2 OF SHEETS

FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-19(002)	2018	8	--



TYPICAL ELEVATION VIEW



TYPICAL SECTION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

SLOPE STABILIZATION
TYPICAL SECTION

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
Proj. No. ER-19(002)

Scale: None Date: May 29, 2018

SHEET No. G-3 OF SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
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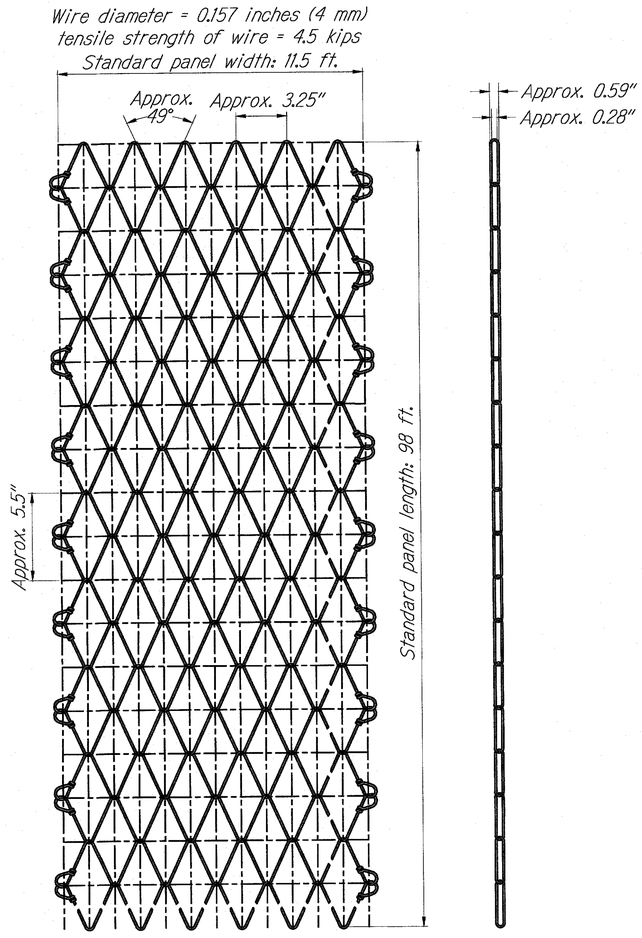
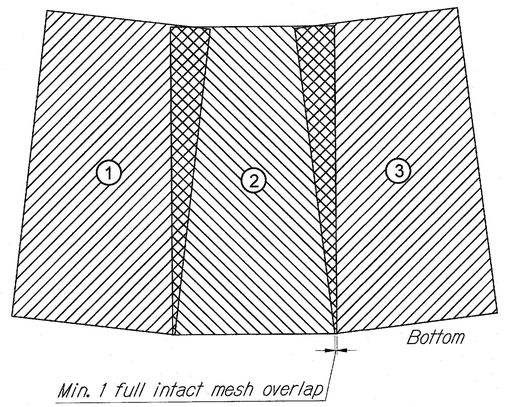
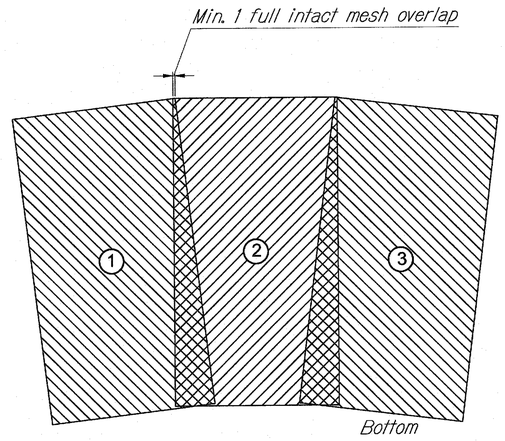
FED. ROAD DIST. NO.	STATE	FEDERAL AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-19(002)	2018	9	–



WIRE MESH PANEL ((typ.)) PROFILE VIEW



MESH OVERLAP FOR CONVEX SLOPE



MESH OVERLAP FOR CONCAVE SLOPE

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STATE OF HAWAII
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HIGHWAYS DIVISION

ANCHORED WIRE MESH DETAILS

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
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SHEET No. G-4 OF SHEETS

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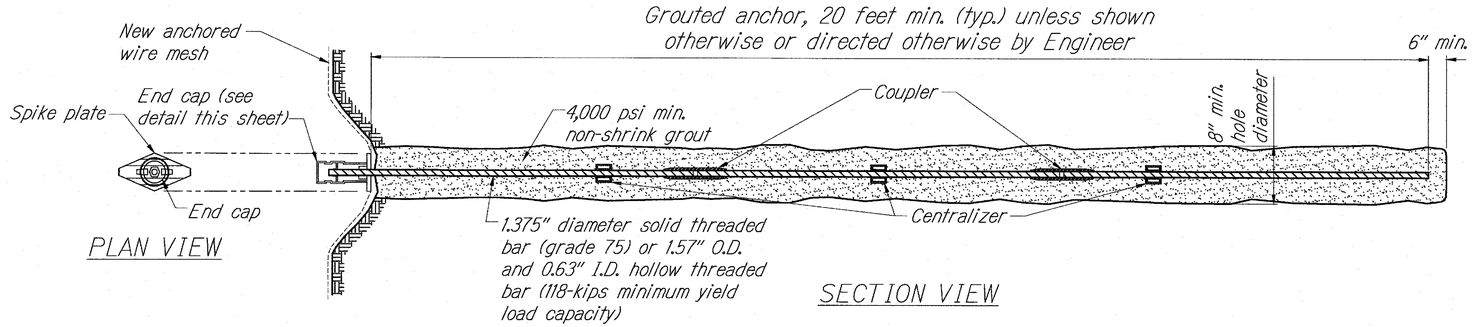
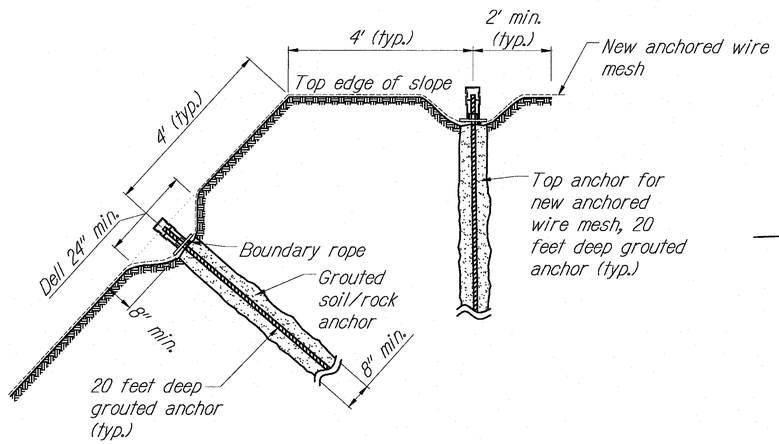
HAWAII	HAW.	ER-19(002)	2018	10	–

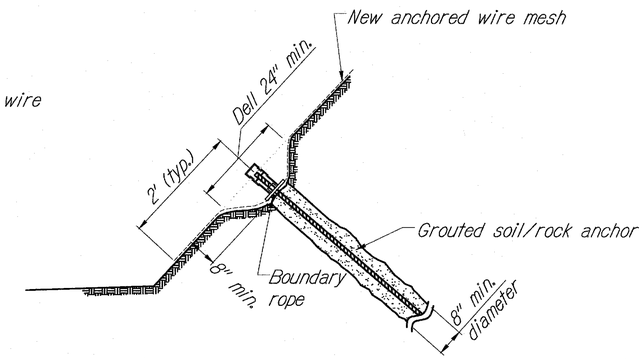


Note: Grouted Anchor Length Below:

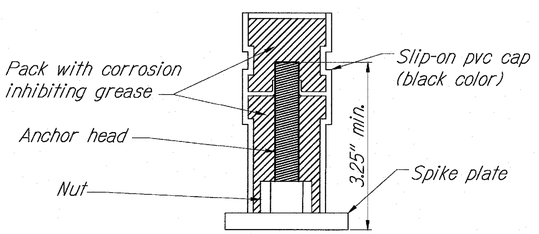
Location	Grouted Anchor Length (feet)
Landslide Zone A	40
Landslide Zone B	40



TYPICAL DELL OR DEPRESSION AROUND GROUTED ANCHOR CONDITION AT TOP EDGE OF ANCHORED WIRE MESH



TYPICAL DELL OR DEPRESSION AROUND GROUTED ANCHOR CONDITION AT BOTTOM EDGE OF ANCHORED WIRE MESH



GROUTED ANCHOR END CAP ELEVATION

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STATE OF HAWAII
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GROUNTED SOIL/ROCK ANCHOR DETAILS

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
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Scale: None Date: May 29, 2018

SHEET No. G-5 OF SHEETS

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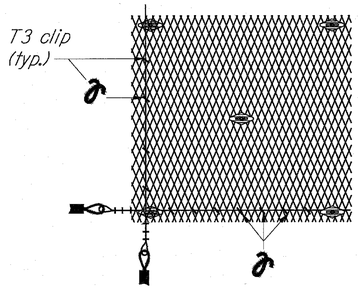
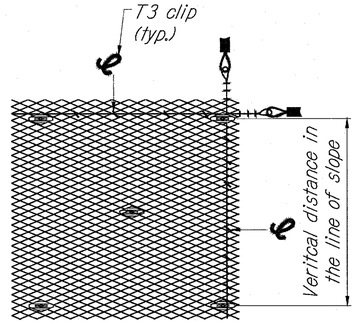
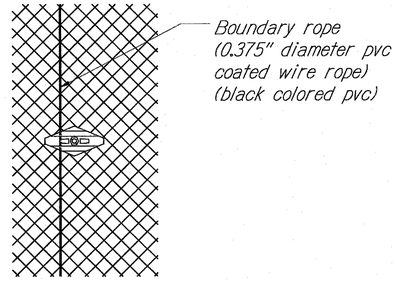
HAWAII	HAW.	ER-19(002)	2018	11	--



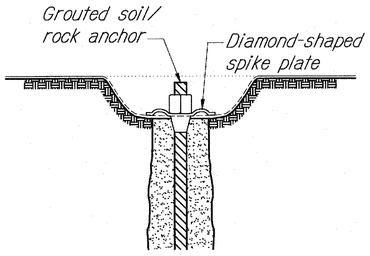
BOUNDARY ROPE AT
THE BOTTOM AND SIDE OF
ANCHORED WIRE MESH SYSTEM



BOUNDARY ROPE
AT THE TOP AND SIDE OF
ANCHORED WIRE MESH SYSTEM

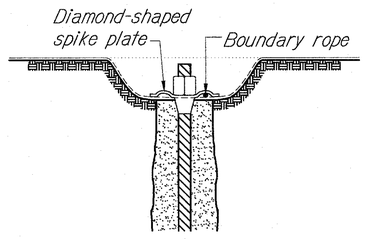


GROUTED SOIL/ROCK
ANCHOR AND SPIKE PLATE
WITH VERTICAL BOUNDARY ROPE



GROUTED SOIL/ROCK
ANCHOR AND SPIKE PLATE

Note: Plastic end cap
on grouted anchor
not shown



GROUTED SOIL/ROCK
ANCHOR AND SPIKE PLATE
WITH HORIZONTAL BOUNDARY ROPE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BOUNDARY ROPE DETAILS

KAUAI EMERGENCY FLOOD REPAIRS & CLEANUP
At Various Locations April 2018, Rte. 560
Proj. No. ER-19(002)

Scale: None Date: May 29, 2018

SHEET No. G-6 OF SHEETS

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ORIGINAL PLAN
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