

ROCK SCALING NOTES

1. Rock slope scaling operations shall include removal of loose rocks and debris from the slope surfaces. Perform rock slope scaling to the limits shown by the plans, or at the location indicated by the plans, or to the limits of wire mesh systems.
2. Protect the roadway pavement and other facilities from damage. Damaged pavement shall be repaired by cold planing and resurfacing entire lane widths. Repairs shall be made at no additional cost to the State.
3. Provide, install, and maintain all necessary barriers, signs, lights, flares, barricades, markers, cones, and other protective devices and shall take all necessary precautions for the protection, convenience, and safety of the public.
4. Blasting is not allowed on this project.
5. The Contractor shall erect a movable temporary rockfall barrier (minimum 50ft. long by 10ft. high) within the active trimming/scaling area. The movable barrier shall be fabricated from ring net or cable net system capable of handling 100 ft-tons of impact energy.
6. Employ a qualified person as a "spotter" full time during rock slope scaling operations.
7. Submit for acceptance, three copies of a work plan reflecting how the Contractor plans to perform his/her rock slope scaling operations including public protection, protection of existing improvements, and traffic control.
8. Conduct a pre-construction condition survey of the adjacent area that may be impacted by the rock slope scaling operations prior to commencement of the scaling work. Submit a copy of the pre-construction condition survey to the Engineer for information only.
9. All public protection measures shall be in place and operational prior to commencing rock scaling. Protect the public against all rockfall hazards, at all times during scaling operations.
10. Each rock slope scaling crew shall consist of at least one scaling supervisor and two experienced slope scalars. Determine the number of slope scaling crews to be employed on this project based on the extent of the rock slope scaling to be performed and the duration available for performing the work as specified in the contract documents. A ground person will be required so the Engineer can communicate with the scaling supervisor and slope scalars for safety considerations.
11. Start rock slope scaling at the top of the slope and proceed down slope, removing loose rocks and other debris. All material on the slope face that is loose, overhanging or creates imminent or short-term safety hazards to the public shall be removed or stabilized to the Engineer's satisfaction prior to completion of the section of slope.
12. Remove the boulders or rock outcrops that are identified by the contract documents, or if determined in the field by the Engineer that said rock outcrops are unstable and hazardous.
13. All rocks that are loosened during the Contractor's operations, including rocks that are disturbed or stopped along falling rock trails, shall be removed at Contractor's own expense to the satisfaction of the Engineer.
14. Exercise extra care in the slope scaling work and avoid over-steepening the slope face that may cause instability of the slope. Immediately stop all work and notify the Engineers should he/she encounter unsafe slope conditions that may constitute a potential slide.
15. All rocks and debris removed from the slopes shall be the property of the Contractor. Dispose all rock and debris at an approved disposal location at the end of each slope scaling shift.

DRAPED WIRE MESH SYSTEM

1. Trim all vegetation flush to the ground, scale all loose and unstable rocks, debris, soils or any other material encountered on the slope, level slope surface, trim back overhangs, and smoothen sharp grade breaks prior to installing the wire mesh
2. The distance from the wire mesh panel to the slope face shall not be greater than 1.5 feet measured perpendicularly to the mesh.
3. All material and debris removed from the slope shall be the property of the Contractor and disposed of off-site at an approved disposal location.
4. Stake-out the top of the wire mesh system and the anchor locations in the field. Do not begin drilling until the Engineer has reviewed and approved the location of the wire mesh system. This work shall be incidental to the wire mesh system.
5. Provide the Engineer a schedule of grouting at least 5 days prior to grouting. All grouting operations shall be performed according to the schedule and shall be observed by the Engineer. Grouting performed not in the presence of the Engineer shall be grounds for rejection of the anchor. Notify the Engineer in writing at least 3 working days prior or any changes to the scheduled grouting operation.
6. Test 25 percent of the anchors selected by the Engineer. Should 25 percent or more of the anchors tested fail, test all anchors at no increase in contract price or contract time. All anchors that fail shall be replaced by the Contractor at no increase in contract price or contract time. Give the Engineer a minimum of 3 working days advance notice prior to each load testing.
7. Place the wire mesh panels on the slope in a manner that will follow the contours of the slope and minimize gaps and large voids between the mesh and the ground surface.
8. When permitted by the Engineer, supplemental anchors may be installed with a minimum depth of 4 feet in competent soil or 2 feet in competent bedrock, with a 1/8 inch stainless steel break-away connector cable to pull draped wire mesh down where a void under the mesh is over 1.5 feet high or over 8 cubic foot volume.

ANCHORED WIRE MESH SYSTEM

1. Trim all vegetation flush to the ground, Scale all loose and unstable rocks, debris, soils or any other material encountered on the slope, level slope surface, trim back overhangs, and smoothen sharp grade breaks prior to installing the wire mesh.
2. Stake-out the top of the wire mesh system limits and the State right-of-way in the field. Do not begin drilling until the Engineer has reviewed and approved the location of the wire mesh system.
3. Excavate a dell for each grouted soil/rock anchor to be used for tensioning the mesh.
4. Install and test the grouted soil/rock anchors in accordance with the contract documents.
5. Lay the high strength wire mesh on the slope by unrolling down the slope. The rolls can be shortened or lengthened as necessary by removing or adding sections, respectively.
6. Install the required boundary wire ropes and fasten the wire mesh to the boundary wire rope with special compression claws.
7. Place the spike plate onto the anchors. Using a torque wrench or hydraulic press , tighten the nuts and push the spike plates and wire mesh into the dells in order to tension the anchored wire mesh to at least 3.0 kips (27 kN).

ROCKFALL IMPACT BARRIER SYSTEM

1. Prior to ordering the materials, stake-out the proposed barrier alignment in the field. Do not order materials or begin construction until the barrier alignment has been reviewed in the field and approved by the Engineer.
2. The Contractor shall furnish materials, labor and equipment necessary to install the rockfall protection system as shown on the plans and as specified below, in place complete and operational. The Contractor shall provide evidence of past experience and familiarity with the installation of these types of rockfall protection systems.
3. The Contractor shall submit to the Engineer for approval shop drawings, calculations, and test results for the rockfall impact barrier system to be used. The Contractor shall allow the Engineer fourteen (14) calendar days after receipt of the submittal to review the documents prior to any fabrication and securing of materials. Fabrication of impact barrier shall commence only after the review and approval of the working drawings by the Engineer.
4. Effective height of the rockfall impact barrier is determined as the overall height from the known existing grade to the top supporting rope of the barrier. If Contractor's construction operations result in a lower finish grade at post location(s), then effective height shall be assumed from the pre-existing grade at the post location to top supporting rope.
5. The Impact fence shall meet the following:
 - A. Materials and fabrication shall be to industry standards and shall be by an established manufacturer.
 - B. Capable of being installed along a sloped site and up steep grades.
 - C. Rockfall impact barrier system shop drawings shall be reviewed and stamped by a licensed structural engineer.
 - D. No metal portions of the fence system shall be in contact with earth.
 - E. All steel components shall be hot dipped galvanized coated.
 - F. All exposed surfaces shall be powder coated flat black to 3 mils thickness by an approved paint manufacturer.
6. Rockfall impact barrier system shall consist of, but not limited to, the following main components: concrete foundation; ground plates; steel posts; steel net; chain link mesh netting; upslope anchor ropes; downslope anchor ropes, lateral anchor ropes, top and bottom support ropes, and ground anchors.
7. Rockfall impact barrier system shall be assembled and installed per strict adherence to the manufacturer's written recommendations.

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	ER-15(21)	2010	6	89

ORIGINAL PLAN	DATE
NO.	
SURVEY PLOTTED BY	
DRAWN BY	
DESIGNED BY	
CHECKED BY	

PLAN/FILENAME: P:\ET\10032-001 Earthquake Permanent Repairs\04_P&S\01 Drawings\6 Rockfall Notes.dwg
LAST UPDATE: 04-22-2009 @ 12:53 pm
PLOT DATE: 04-29-2010 @ 08:30 am

AECOM



STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION	
ROCKFALL MITIGATION NOTES	
EMERGENCY EARTHQUAKE ROCKFALL REPAIRS	
AT VARIOUS LOCATIONS	
F.A. Project No. ER-15(21)	
Scale: As Noted	Date: December, 2009
SHEET No. 1 OF 1 SHEETS	