

| FED. ROAD DIST. NO. | STATE | PROJ. NO. | FISCAL YEAR | SHEET NO. | TOTAL SHEETS |
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| HAWAII | HAW. | 72B-02-02 | 2002 | 9 | 23 |

A. SLOPE SCALING NOTES:

- Slope scaling activity for the project will be limited to seven (7) days a week over a period of three (3) weeks and to the limited hours, as specified on the Contract drawings. The slope scaling activities, including removing debris from the highway at the end of each slope scaling shift, shall be conducted within the times and duration specified on the Contract drawings.
- Each slope scaling crew shall consist of one scaling supervisor and three (3) slope scalars. Additional slope scaling crews shall consist of one scaler foreman (in-lieu of the scaling supervisor) and three (3) slope scalars.
- The Contractor shall determine the number of slope scaling crews to be employed on this project based on the extent of the slope scaling to be performed and the duration available for performance of slope scaling, as specified in the Contract drawings. The number of crews proposed for the project shall be approved by the Engineer.
- The Contractor shall not commence slope scaling work until approval of the Contractor's qualifications and work plan has been obtained in writing from the Engineer.
- The Contractor shall be responsible for protecting the highway and all appurtenances from damage resulting from the Contractor's activities. The highway shall be protected from damage by laying protection mats over the road surface, and/or placing a temporary protective barrier to prevent the majority of the slope materials from reaching the rock wall barrier at the edge of the highway, and/or other methods with prior approval of the Engineer. The Contractor shall be solely responsible for repairing any damage resulting from the scaling, controlled blasting, or other construction activities.
- A pre-construction condition survey of the existing highway, rock masonry wall barriers, and all appurtenances shall be conducted by the Contractor prior to commencement of the slope scaling activities. A copy of the pre-construction condition survey shall be submitted to the Engineer for information only.
- A ground person will be required to enable the Engineer to communicate with the scaling supervisor, scaler foremen and slope scalars and for safety considerations.
- Slope scaling work shall begin only after the highway protection measures as described in the work plan are put in place at the beginning of each slope scaling shift. The Contractor shall protect the traffic on the highway and public on the adjacent beach from any rockfall hazards at all times during the Contractor's activities.
- Start all slope scaling at the top of the slope and proceed down slope, removing loose rock and other debris as the work progresses. All material on the slope face that is loose, hanging or creates a safety hazard to the public must be removed or stabilized, to the Engineer's satisfaction, during or on completion of the section of slope.
- The Contractor shall exercise extra care in the slope scaling work and shall avoid over-steepening the slope face that may cause instability of the slope face. If during the slope scaling work, the Contractor encounters unstable slope conditions that may constitute a potential slide, immediately notify the Engineer.
- Blocks of rock or debris that hang up on the slope during the slope scaling operations shall be removed upon completion of the first pass of slope scaling. The Contractor shall continue scaling of the slopes until the slope scaling has been completed to the satisfaction of the Engineer.

- The Contractor shall remove the rock outcrops designated for removal on the Contract drawings by "controlled blasting."
- The Contractor shall sweep the highway clean of all debris (within the total closure times of the highway) at the end of each slope scaling shift before allowing traffic to pass. The Engineer will inspect the "cleaned up" highway prior to opening of the highway to the public on a daily basis.
- 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 designated closure times. The slope scaling activities shall be temporarily suspended to allow the passage of the emergency vehicles through the project area along the highway.

B. ROCKFALL PROTECTION NETTING NOTES:

- All hardware for the rockfall protection netting (draped wire mesh) and grouted rock anchors (includes lateral anchors and bottom anchors) including the steel reinforcing bar for the grouted rock anchor, wire rope, heavy duty wire rope thimbles, wire rope clips (cable clamps), steel plates, heavy hex nuts, washers, etc. shall be galvanized in accordance with Subsection 712.10 - Zinc Coating of the Standard Specifications.
- The heavy-duty wire rope thimble shall not be in contact with the threads of the steel reinforcing bar.
- 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.
- 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.
- The Contractor shall follow the wire rope manufacturer's recommendation for the spacing of the wire rope clips and torque for the U-Bolts.
- The torque on 10% of the wire rope clips shall be checked after loading in the presence of the Engineer.
- The grouted rock anchors (and lateral anchors) shall have a pullout capacity of 10 tons (20 kips) with a factor of safety of 1.5. The Contractor shall test a minimum of 10% of the grouted rock anchors for pullout to 150% of the pullout capacity in accordance with the specifications.
- The draped wire mesh is designed to keep rockfall near the bottom of the cut slope and is not designed to retain masses of material or an accumulation of materials behind the draped wire mesh.
- The stainless steel ring fasteners (Spenax clips or equal) shall be manufactured from 0.120 mm diameter, Type 302 stainless steel wire. The wire shall have a minimum tensile strength of 222,000 psi.
- Stainless steel ring fasteners shall be staggered and placed at 6 inches on center horizontally and vertically at all horizontal and vertical laps or seams.

C. CONTROLLED BLASTING NOTES:

- The Contractor shall submit a detailed plan for performance of "controlled blasting" to remove the rock outcrops designated for removal on the Contract drawings for review and comment by the Engineer prior to commencing the slope scaling work.
- The Contractor shall design the controlled blasting such that the rock outcrop to be removed will be broken down to rock fragments no larger than 3 feet maximum dimension in any direction.
- The Contractor, when blasting, shall use all necessary warnings, mats, and other safeguards to properly and adequately protect the public, all workmen on the job, and all property from damage, injury or unnecessary annoyance and/or inconvenience.
- The Contractor shall shield the area to be blasted to control the potential for flyrock and/or loose debris from traveling from the limits of the highway.
- When blasting is required, the explosive force shall be sufficient to remove the specified rock outcrop but shall not damage the surrounding rock. If drilling is required as part of the removal process (trimming), the drill holes shall be drilled parallel to the face (in a straight line) and shall have a spacing equal to ten times the drill hole diameter. The drill holes shall be loaded with sufficient explosives to break the rock between the drill holes but shall not damage the new face.
- After controlled blasting of the designated areas, the slope shall be hand scaled to remove loose and/or excess materials on the new slope face.
- The Contractor shall use the utmost care not to endanger life or property when handling explosives for use in the controlled blasting operations.
- The Contractor shall be responsible for obtaining all the necessary permits to handle the materials required for blasting and to perform the controlled blasting.
- The Contractor shall transport explosives to the site of work and store, distribute, and handle in accordance with the safety provisions of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America and also in accordance with local County and State Regulations.
- The Contractor shall be responsible for damage or injury to property or persons due to (either directly or indirectly) the use of explosives on the work, and shall indemnify the State, Representatives of the State, and Design Engineers against all claims arising therefrom, including all costs, charges, and attorney's fees and commissions.

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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
 [Signature]
 GEOLABS, INC.

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| STATE OF HAWAII DEPARTMENT OF TRANSPORTATION HIGHWAYS DIVISION |
| GEOTECHNICAL NOTES |
| Kalanian'aoale Highway Rock Scaling at Makapuu Project No. 72B-02-02 |
| Scale: NTS Date: April 2002 |
| SHEET No. 6-1 OF 9 SHEETS |