SECTION 641 - HYDRO-MULCH SEEDING

641.01 Description. This section describes application of mulch, seed adapted to site, fertilizer, and water using hydraulic equipment in designated areas. This section also provides instructions for continuous care and maintenance.

641.02 Materials.

(A) Seed. Seed adapted to site shall be certified to following properties:

- Pure Seed 95 percent minimum
- Crop Seed 1 percent maximum
- Weed 0.5 percent maximum
- Inert Material 5 percent maximum
- Germination 85 percent minimum

Seed shall comply with Hawaii Administrative Rules Title 4, Subtitle 6, Chapter 67 Seed Rules; shall be certified for compliance by a Hawaii-licensed seed dealer; and shall be purchased from that dealer.

Seed shall be delivered to the Project in labeled and sealed containers. Seed and labels shall be subject to testing provisions of the Association of Official Seed Analysts. Engineer will not accept for use seed that is more than 12 months old from date of certified germination test. Recommendation of seed producer shall be followed in determining quantity of seed to apply per acre.

(B) Fertilizer. Proper fertilizer shall be used in hydro-mulch mix, depending on condition of soil. Contractor shall provide a Soil Analysis Report, if requested by Engineer, and shall use report to determine quantity and ratio of fertilizer for sustained growth of grass.

(C) Mulch. Mulch shall be specially processed fiber containing no growth or germination inhibiting components. Recycled mulch material, such as processed newspaper, is allowable if its use is acceptable to the Engineer. Fibers shall form homogeneous slurry after addition and agitation in hydro-mulch seeder with seed, fertilizer, water, and other additives non-detrimental to plant growth. When hydraulically sprayed on soil, fibers shall form blotter-like ground cover that readily absorbs water and allows infiltration to underlying soil.
(D) Soil and Mulch Tackifier. Tackifier used with mulch shall be hydrocolloidal, organic, or anionic polyacrylamide.

(1) Hydrocolloidal Tackifier. Hydrocolloidal tackifier shall be formulated for use with hydraulically planted grass seed or stolons, alone or in combination with fertilizer, wood fiber mulch, and other additives acceptable to Engineer. Tackifier shall consist of at least three different but complementary hydrocolloids, two of which shall be Glactomannan and Plantago Ovata. Latter component shall have muciloid content of at least 85 percent.

Tackifier shall be applied at rate of 80 pounds per acre, shall be pH stable with fertilizer, and shall hydrate and disperse in mixing tank with water and other materials to form homogeneous slurry. Tackifier shall leave loose, chain-like stabilizing film on surface of soil, allow moisture to percolate into soil during seed germination and seedling growth, and break itself down through microbial action. Tackifier shall not inhibit plant germination or growth.

(2) Organic Tackifier. Organic tackifier shall be starch-based tackifier formulated for use with conventional mulches. Active ingredient in tackifier shall be 100 percent derived from plant starch.

Dry powder tackifier shall be blended with insolubilizer. After blending and mixing with water, tackifier shall swell, become sticky, and be suitable for use during heavy rain. Tackifier shall be applied at rate of 80 pounds per acre. Emulsion shall cure on surface of soil and become insoluble. Tackifier shall not inhibit plant germination or growth.

(3) Anionic Polyacrylamide Tackifier. Anionic Polyacrylamide tackifier shall be specifically formulated for hydroseeding and erosion/sediment control. Anionic Polyacrylamide tackifier shall consist of 90 percent or greater sodium acylate/acrylamide copolymer. Anionic Polyacrylamide tackifier must be anionic with a charge density of 8 to 35 percent by weight and have a molecular weight of 6 to 24 Mg/mole. Mixture must be non-combustible.

Must be accompanied by MSDS and toxicity information from manufacturer that the Anionic Polyacrylamide tackifier and any required additives are non-toxic to aquatic biota. Cationic Polyacrylamide is strictly not allowed.

Anionic Polyacrylamide tackifier shall be applied at rate of 3 to 5 pounds per acre. Anionic Polyacrylamide tackifier shall be mixed in accordance with all Occupational Safety and Health Administration (OSHA) MSDS requirements and the manufacturer's
recommendations for the specified use conforming to all Federal, State and local laws, ordinances, rules and regulations.

641.03 Construction.

(A) Seeding. Apply seeded mulch within two days after completion of slopes or portion of slope when exposed face attains height of 15 feet. Notify Engineer not less than 24 hours ahead of hydro-mulch seeding operation. Do not hydro-mulch until the Engineer inspects and accepts areas for planting.

Engineer will inspect slopes to ensure that surface and subsurface water are properly collected and disposed of and areas to be planted are protected from erosion. Upon Engineer's acceptance for planting, begin hydro-mulch seeding of slopes. Acceptance for planting does not relieve Contractor of responsibility for repair of slope damage until grassed areas are acceptable to Engineer in accordance with Subsection 641.03 (D) - Acceptance.

Place seeded mulch evenly and completely over ground in one application at minimum rate of 1,500 pounds of mulch per acre. Use Engineer-accepted hydro-mulch seeder with built-in agitation system and operating capacity sufficient for uniform mixing until slurry is pumped out of tank. Equip seeder with distribution and discharge lines large enough to prevent stoppage, and hydraulic discharge spray nozzles that provide uniform distribution of slurry.

In areas that are inaccessible to hydro-mulch seeder, plant by hand methods acceptable to Engineer.

When hydro-mulch seeding is done in conjunction with erosion control matting, install erosion control matting to completion and follow with hydro-mulching within 24 hours.

Water immediately after planting to moisten soil and mulch. Continue watering as necessary to ensure proper germination and growth. Water in a way that will prevent erosion, using equipment that will not damage planted areas. Replace watering equipment that causes erosion or runoff.

If there is slope erosion or movement of silt, remove displaced material immediately. Restore areas that are eroded to depth greater than two inches of original grade or width greater than three inches.

(B) Planting Period. Begin planting period immediately after seeding area is accepted by Engineer. If area has mixture of trees, shrubs, and grass, do not start planting period until all trees, shrubs, and grass have been planted. If only grass is planted, during planting period provide 95 percent
coverage with 5-inch tall healthy grass within 90 days. Reseed areas after 30
days that do not show satisfactory growth in accordance with Subsection
641.03(A) - Seeding until Engineer determines there is satisfactory growth.

(C) Plant Establishment. Plant establishment period is nine months after
completion date of planting period acceptable to Engineer. During plant
establishment period, water, fertilize, weed, and mow grass when grass
reaches average height of three inches. Replace grass Engineer considers
unsuitable or sick. Remove and dispose of trash and debris. Provide insect
and disease protection and control.

In addition to fertilizer that is applied during initial hydro-mulch
seeding, fertilize plantings at least four times during plant establishment
period. Fertilize at rate of not less than 300 pounds per acre per application.
Interval between fertilizations shall not be closer than 2-1/2 months. Notify
Engineer 24 hours before applying fertilizer.

Engineer will credit Contractor with plant establishment days when
work is done in accordance with contract documents and when Engineer
determines that no work is required, regardless of whether Contractor
actually performs plant establishment work. Engineer will not credit
Contractor with plant establishment days when Engineer determines that
work is necessary but Contractor fails to adequately perform plant
establishment work.

(D) Acceptance. Engineer will base acceptance of planted areas on 98
percent coverage with healthy, well-established grass, at least three inches
tall, at end of plant establishment period. No 100 square foot area shall show
more than two square feet of bare earth. Mow grass before requesting
acceptance.

641.04 Measurement. Hydro-mulch seeding will be paid on a lump sum basis.
Measurement for payment will not apply.

641.05 Payment. Engineer will pay for the accepted hydro-mulch seeding on a
contract lump sum basis. Payment will be full compensation for work prescribed in
this section and contract documents.

Engineer will pay for the following pay item when included in proposal
schedule:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
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<tbody>
<tr>
<td>Hydro-mulch Seeding</td>
<td>Lump Sum</td>
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The Engineer will allow partial payment of hydro-mulch seeding as follows:
(1) 30 percent of the contract unit price upon completion of hydro-mulch seeding.

(2) 15 percent of the contract unit price in three equal monthly payments for satisfactory performance during the planting period.

(3) 48 percent of the contract unit price in eight equal monthly payments for satisfactory performance during the plant establishment period.

(4) 7 percent of the contract price upon final acceptance at the end of the plant establishment period.

END OF SECTION 641