SECTION 641 - HYDRO-MULCH SEEDING

641.01 Description. This Section describes application of mulch, seed, native planting materials, 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% minimum
Crop Seed	1% maximum
Weed	0.5% maximum
Inert Material	5% maximum
Germination	85% 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. The 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) Native Groundcovers. Native planting materials sourced for the Project shall conform with the specifications in Subsection 619.02(A)5.

(1) Pili grass. Freshly harvested seeds shall be aged for six months or treated/dipped in 1% gibberellic acid prior to planting. Recommended seeding rate shall be at 5 pounds pure live seed per acre. Seeds should be broadcasted evenly in the field prior to hydromulch capping.

(2) Mauʻu ʻakiʻaki. Recommended seeding rate is 0.4 pounds pure live seed per acre.

(3) ʻAkiʻaki. Harvested stem cuttings should be presoaked for 24 hours in 5% solution of Dip ʻN Grow (rooting solution containing 250 ppm naphthalene acetic acid and 500 ppm indole butyric acid)

prior to planting. Recommended density of stem cuttings per square foot is 6.

(B) Fertilizer. Proper fertilizer shall be used in hydro-mulch mix, depending on condition of soil. The Contractor shall provide a Soil Analysis Report, if requested by the 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 and/or straw mulch, is allowable if accepted for use by 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 accepted additives. Tackifier shall consist of at least three different but complementary hydrocolloids, two of which shall be glactomannan and psyllium (finely ground muciloid coating of Plantago ovata or Plantago ispaghula seeds). 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% or greater sodium acylate/acrylamide copolymer. Anionic polyacrylamide tackifier must be anionic with a charge density of 8 to 35% 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 Adminstration (OSHA) Material Safety Data Sheet (MSDS) requirements and the manufacturers recommendations for the specified use conforming to all federal, state and local laws, 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 the 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.

The 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 the Engineer's acceptance for planting, begin hydro-mulch seeding of slopes. Acceptance for planting does not relieve the Contractor of responsibility for repair of slope damage until grassed areas are accepted as described in 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 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.

For native groundcovers, only mau'u ʻakiʻaki seed can be hydroseeded. Pili grass seeds and ʻakiʻaki stem cuttings should be manually

spread/broadcasted unto the prepared planting surface before it is covered with hydromulch. Recommended hydromulching rate for native species is 2,900 pounds per acre. The hydromulch mix should consist of 64% paper mulch and 36% straw mulch.

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

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 has been accepted by the 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 thorough "catch" according to Subsection 641.03(A) until the Engineer determines there is satisfactory growth.

(C) Plant Establishment. Plant establishment period is nine months after accepted completion date of planting period. During plant establishment period, water, fertilize, weed, and mow grass with accepted equipment when grass reaches average height of three inches. Replace grass the Engineer considers unsuitable, sick, or dead. 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 the Engineer 24 hours before applying fertilizer.

The Engineer will credit the Contractor with plant establishment days when work is done according to the Contract and when the Engineer determines that no work is required, regardless of whether the Contractor actually performs plant establishment work. The Engineer will not credit the

Contractor with plant establishment days when the Engineer determines that work is necessary but the Contractor fails to adequately perform plant establishment work.

(D) Acceptance. The 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. The Engineer will measure hydro-mulch seeding per square foot of actual ground surface planted.

641.05 Payment. The Engineer will pay for the accepted hydro-mulch seeding at the Contract unit price per square foot. Payment will be full compensation for the work prescribed in this Section and Subsection 109.02 – Scope of Payment.

The Engineer will pay for the following pay item when included in the Proposal Schedule:

Pay Item	**Pay Unit**
Hydro-mulch Seeding	Square Foot

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; and

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

END OF SECTION 641