SECTION 619 - PLANTING

619.01 Description. This section describes planting and transplanting trees, shrubs, vines, groundcover, and grass; and constructing plant barriers and rock landscaping.

619.02 Materials.

(A) Plant Material. Trees, shrubs, vines, groundcover, and grass shall be type and size shown in contract documents or as specified by Engineer.

(1) Certification of Plants. The Contractor's submission of a bid shall constitute certification of availability of plants of required type, size, and quantity.

(2) Selection, Tagging, and Ordering of Plants.

(a) Engineer will inspect plants at place of growth and after delivery to the Project. Engineer will tag with consecutively numbered plastic tamper resistant self locking seal with breaking strength of 55 lbs. Seals shall remain on trees and only be removed by Engineer at completion of the plant establishment period. Plants not conforming to contract documents requirements will be rejected.

(b) Contractor shall request plant inspection at least one month prior to start of planting work. Contractor shall submit a request for inspection and documentation to Engineer, not less than one month prior to start of planting work, that all plant materials have been ordered.

(3) Plant Names. Trees, shrubs, vines, groundcover, and grass shall be true to name and follow standards for nomenclature adopted by *The American Joint Committee on Horticultural Nomenclature*, and The Bernice P. Bishop Museum's Special Publication No. 50, *"In Gardens of Hawaii."*

(4) Condition of Plants. Plants shall conform to specified nomenclature, grades, and standards.

(a) General. Provide trees, shrubs, and groundcover, with normal habit of growth, such as, sound, healthy, vigorous, and free of disease and insect infestation.

(b) Trees. Trees shall be straight and uniformly shaped, unless unique or special characteristic is specified, and shall be undamaged.

(c) Container-grown Plants. Plants shall be grown in containers of specified size. Plant shall hold its root ball without being root bound upon removal from container.

(d) Seed.

1. Pure seed shall compose 95 percent minimum.

2. Crop seed shall compose 1 percent maximum.

3. Inert material shall compose 5 percent maximum.

4. Seed shall be tested for purity and germination by seed laboratory certified by The Association of Official Seed Analysts. Test date shall be within 12 months of application of seed. 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.

5. Seed shall be delivered to the Project in unopened, sealed containers labeled with supplier's name, percent purity, percent live seed, germination rate as determined by testing, and date of testing.

(5) Size of Plants. Plants shall meet size indicated by minimum and maximum height, and minimum and maximum spread, as specified in the proposal.

(a) Height.

1. Height shall be defined as vertical measurement from ground surface of plant in its natural growing position in nursery.

2. Measurement of height shall stop where main growth ends and shall not include fine or slender terminal leader, twig, or branch.

3. Range shall be specified for height of leggy plants.

(b) Spread.

1. Spread shall be defined as horizontal measurement of plant in its natural growing position in nursery.

2. Measurement of spread shall not include fine or slender terminal shoot.

3. Spread of plant shall be determined by averaging smallest and largest measurements. Smallest measurement shall not be less than 60 percent of largest.

(c) Caliper. Determine caliper by measuring tree trunk at height of 4-1/2 feet above ground.

(B) Hydro-Mulch. Mulch shall be specially processed fiber conforming to Subsection 641.02(C) - Mulch. Seed, sprigs, or stolons shall be added to mix as indicated in the contract documents.

(C) Herbicides. Chemical herbicides shall contain either or both glyphosate and cacodylic acid. Use only State Department of Agriculture approved herbicides.

Manufacturer's instructions for applying herbicide shall be followed. Adjustments shall be made for field conditions. Chemical herbicide shall be applied using photosensitive dye that does not stain concrete or painted surfaces, will not injure plants and animals, and disappears within three days after spraying. Application shall be between 8:30 a.m. and 3 p.m., on normal State workdays only. Spraying shall not be done when wind is brisk or when raining or where rain is expected. Avoid spraying areas where herbicide can enter storm drainage systems or receiving waters. Records shall be kept by Contractor of dates of application, type of herbicide or pesticide used, quantities, and areas that were covered and submitted to Engineer within 24 hours of application.

(1) Pre-emergent Herbicide. Pre-emergent herbicide shall be used to control weeds by absorption, including through plant's root system. Label of herbicide shall indicate that product is environmentally safe and non-toxic to humans and animals.

(2) Non-selective, Post-emergent Granular Herbicide. Non-selective, post-emergent granular herbicide shall be used to eradicate weeds by absorption, including through roots of plant. Product shall not leave long-lasting residue in soil.

(3) Selective, Post-emergent Granular Herbicide. Selective, post-emergent granular herbicide shall be used to control annual grasses and broadleaf weeds in turf and wide variety of woody ornamentals, shrubs, vines, and trees. Product shall kill young seedlings on contact during germination.

(4) Post-emergent, Non-granular Herbicide. Post-emergent, non-granular herbicide shall be used to control weeds by absorption, including through roots of plant. Label of herbicide shall indicate that product is environmentally safe and non-toxic to humans and animals.

(D) Decorative Boulders. Decorative boulders shall be fieldstone, lava rock, or moss rock that has been accepted by Engineer for use as selected or imported material. Boulders shall be clean, hard, sound, and durable. Size of each boulder shall be 2 feet minimum and 6 feet maximum in any direction.

(1) Selected Boulder Material. Selected boulder material shall be obtained within the Right-of-Way from locations designated by the Engineer as specified in Section 203 – Excavation and Embankment. Boulders shall be cleaned before placement and stained if requested by Engineer. Boulders that have paint marks or scars are not acceptable. Boulders that Engineer considers unsuitable for use shall be disposed of as specified in Section 202 – Removal of Structures and Obstructions.

(2) Imported Boulder Material. Imported boulder material shall be lava rock or moss rock obtained from sources outside the Right-of-Way that has been accepted by Engineer. Imported boulders shall be matched with on-site boulders. Boulders shall be stained if necessary to match color accepted by Engineer. Contractor will be responsible for arrangements and costs to import boulders.

Imported boulders shall not be removed and hauled to the Project until Engineer accepts material and source.

(E) Plastic Header. Plastic headers shall be bed dividers made from flexible polyethylene with 3.5 to 4 percent carbon black concentrate added for ultraviolet stabilization. Density shall be medium and melt factor under 2. Headers shall have overall height of 5 inches. Anchor stakes shall be rigid steel, 9 inches long and 1 inch wide.

(F) Tree Guard. Tree guards shall be flexible polyethylene with ultraviolet inhibitor.

(G) Root Control Barrier. Root control barriers shall be high density, high impact polypropylene with ultraviolet inhibitor. Barriers shall have

minimum thickness of 0.06 inch, raised vertical ribs, and locking strips made of same material. Bio-chemical root control barriers are allowable as alternative if acceptable to Engineer.

(H) Fertilizer.

(1) Commercial Fertilizer. Fertilizer shall be in new, clean, sealed, and properly labeled bags or containers. Fertilizer shall be protected from weather after delivery to the Project. Fertilizer shall be:

(a) Nitrogen, phosphoric acid, and potash (N-P-K) in percentages recommended in the Soil Analysis Report, uniform in composition, free flowing, and suitable for application;

(b) Agriform 21-gram plant tablet conforming to criteria in (a) above.

(2) Manure. Manure shall be from chickens, horses, or cattle. Manure shall be aged three months to two years before use.

(3) Application Records. Records shall be kept by Contractor of dates of application, type of fertilizer or manure used, quantities, and areas that were covered and shall be submitted to Engineer within 24 hours of application.

(I) Mulch and Soil Amendments.

(1) Wood Chips. Mulching wood chips shall be nitrogen stabilized and free of leaves, twigs, shavings, and bark. Maximum size shall be 3 inches by 1-1/2 inches by 1/2 inch thick.

(2) Aggregates. Aggregates for mulch shall be gravel, crushed stone, lava rock, or coral that passes 3-inch sieve.

(3) Burnt Bagasse. Burnt bagasse shall be product of sugar cane waste that is free of weed seed, fungus, chemicals, and materials deleterious to plant growth.

(4) Recycled Mulch Material. Recycled material, such as processed newspaper, is allowable for use as mulch if acceptable to Engineer.

(J) Stakes.

(1) Wood Stakes. Wood stakes shall be rough construction-grade redwood or eucalyptus, 2x2's, 8 feet long, unpainted and unstained.

(2) Pipe Stakes. Pipe stakes shall be galvanized iron pipe, 3/4-inch diameter and 3 feet long.

(3) Steel Bar Stakes. Steel bar stakes shall be reinforcing steel bar, 3/4-inch diameter and 3 feet long.

(K) Hose and Wire Ties. Garden hose shall be 1/2-inch diameter. Wire ties shall be No. 11 gage zinc-coated steel wire.

(L) Guy Wires. Guy wires shall be No. 12 gage zinc-coated steel wire for 15-gallon and 25-gallon trees, and No. 9 gage zinc-coated steel wire for field-grown trees. Half-inch diameter garden hose shall be provided.

(M) Turnbuckles. Turnbuckles shall be zinc-coated steel. Size of turnbuckle shall depend on size of guy wire. One turnbuckle per guy wire shall be provided.

(N) Markers. Markers shall be bright-colored plastic surveyor tape at least 18 inches long. Tape of same color shall be used throughout the Project.

(O) Weed-blocking Geotextile. Weed-blocking geotextile shall be woven or non-woven, rot-proof, mildew and chemical resisting, delustered polypropylene product that allows passage of air, water, fertilizer, and insecticide into soil but precludes growth of weeds.

619.03 Construction.

(A) Codes and Standards. Perform work in accordance with applicable laws, codes, and regulations. Provide inspections and permits required by Federal, State, and local governmental authorities.

(B) Preparing Areas for Landscaping.

(1) Before starting soil preparation work or trenching for irrigation system, remove trash, debris, and weeds from work area. Planting areas shall be free from stones greater than a 1/2 inch in diameter. Dispose of material outside the Right-of-Way as specified in Section 201 – Clearing and Grubbing.

(2) Within limits of clearing, grub natural ground to depth necessary to remove stumps, roots, and other objectionable material.

(3) Before applying chemical herbicide, obtain Engineer's acceptance of proposed weed control program.

(4) Apply herbicide before weeds become taller than two inches.

(C) Verifying Subgrade Preparation. Excavate and remove material from islands and medians that will be overlaid with aggregate. Obtain Engineer's verification and acceptance of subgrade before proceeding.

(D) Placing Boulders and Moss Rock. Place boulders and moss rock in accordance with contract documents. For boulder groupings, use minimum of three boulders per grouping. Mix size of boulders in each grouping. Bury 1/3 of each boulder below finished grade.

(E) Installing Plastic Header. Trench ditches four inches deep. Install plastic headers in accordance with manufacturer's instructions. Backfill and compact while maintaining proper alignment of header.

(F) Installing Weed-blocking Geotextile. Prepare subgrade, install headers, and plant trees. Install geotextile in accordance with manufacturer's instructions.

(G) Placing Aggregates. After installing plastic header and excavating to required depth, place aggregates over weed-blocking geotextile as indicated in the contract documents. When completed, surface of aggregate bed shall be one inch below top of plastic header. Aggregate layer under curbs shall not be thicker than 1-1/2 inches.

(H) Planting Soil. Place planting soil as specified in Section 617 – Planting Soil.

(I) Adding Fertilizer and Amendments.

(1) Uniformly distribute fertilizer and amendments over planting areas as recommended by the Soil Analysis Report as specified in Section 617 – Planting Soil. Rototill top four inches of soil to evenly incorporate fertilizer and amendments. Rototill before installing drip irrigation system.

(2) Do not add soil amendment when slope is steeper than 3H:1V.

(3) Level undulations or irregularities caused by tilling or other work from surface of soil before proceeding to plant.

(J) Coordinating with Roadway Work. Adjust planting work for conformance with ground and weather conditions. Plant so that finished grades of planted areas are properly related to finished elevations of pavements and curbs.

(K) Herbicides. After establishing finish grade, commence weed control program using pre-emergent or post-emergent herbicide. Maintain control program through planting period to prevent weeds from emerging.

(L) Preparing for Planting. Do not plant until ground has been prepared, site is neat and orderly, and Engineer accepts site for planting.

(M) Planting.

(1) Locating Plants. The Engineer will direct Contractor to site of planting or target location with stakes or other markers provided by Contractor. Provide labor, materials, and transportation Engineer needs to locate plants. Engineer will determine direction trees are to face.

(2) Plant Holes. Place trees and shrubs in plant pits as indicated in the contract documents. Break up coral, rock, and hardpan to depth not less than 12 inches below normal bottom of pit.

(3) Setting Container Plants. Perform planting without delay to prevent foliage from effects of evaporation and drying. Prune bruised or broken roots with clean cut at time of planting.

(a) Set plants to keep soil surface level within pit, even with finished grade, and planted to give the best appearance in relationship to adjacent structures or surroundings.

(b) Use appropriate excavated material to continue filling plant pits. Set plant plumb, brace rigidly in position, and tamp backfill mix solidly around root ball. After pit is 3/4 full, water thoroughly to saturate root ball.

(c) Distribute plant tablets or comparable fertilizer within pit in accordance with manufacturer's instructions. Continue filling pit to finished grade with backfill mix.

(d) Install root control barriers as indicated in the contract documents.

(e) When the plant pit is filled, form saucer berm around plants as necessary or as noted on details. Form water basins around the perimeter of the shrub bed.

(f) Water immediately after planting in moderate stream until soil around and below root ball is thoroughly saturated.

(4) Staking. Stake trees immediately after planting as indicated in the contract documents.

(5) Protecting Trees. Install tree guard at base of each tree.

(6) Windbreaks. Erect windbreaks immediately after planting if tree is less than 8 feet tall. Place windbreak to face prevailing wind. Remove windbreaks after conclusion of plant establishment period.

Construct windbreak that consists of two wood panels forming right angle with apex of angle facing wind, and three wood posts. Drive posts two feet into ground to secure windbreak. Cover panels with screen material such as palm leaves or burlap. Finished panels shall be 6 feet high. Each panel shall be 4 feet wide.

Locate post where two panels meet at center of windbreak, and another post at end of each panel. Post shall be 2x3 by 8 feet long. Nail 1x3 horizontal wood battens securely to posts at top of panel and bottom near ground. Lumber does not have to be new, but must be sound and free of discoloration. Staple screen material to posts and battens.

(7) Removing Surplus Excavated Material. Scatter and level surplus excavated material from tree pits and shrub holes. Break clay lumps to leave neat and smooth appearance. Dispose of material that is unsuitable for use as planting soil as specified in Section 203 – Excavation and Embankment. Do not place surplus excavated material on top of root systems of existing trees.

(8) Cleanup. Remove and dispose of empty containers and accumulated debris when planting is completed.

(N) Planting Period. Planting period extends 90 days from date Engineer accepts site to start planting period. When area has mixture of grass with either or both trees and shrubs, planting period shall not start until all trees, shrubs, and grass in area are planted. Replace plants that fail to develop healthy growth or die during planting period. Provide replacements within two weeks of receiving notification from Engineer that plants are unacceptable. Apply fertilizer at time of planting and 40 to 50 days after planting, at following rates:

(1) Trees – 1/4 pound per inch of trunk diameter.

(2) Shrubs and Vines – 1/4 pound per plant.

(3) Ground Cover – two pounds per 1,000 square feet.

Notify Engineer 24 hours in advance of fertilization. If satisfactory growth is attained before 90 days, Contractor may submit written request for earlier end of planting period.

(O) Hydro-mulching. Perform hydro-mulch planting as specified in Section 641 – Hydro-mulch Seeding.

(P) Placing Mulch. Apply 2 inches of mulch to tree basins and 4 inches to shrub beds at planting. Protect and cover wood chip mulch in windy areas.

(Q) Pre-emergent Herbicide. Broadcast granular pre-emergent herbicide over mulched areas in tree basins and shrub beds. Water thoroughly to wash herbicide off plants.

(R) Pruning. Prune existing trees that will be included in landscape. Trees should be pruned when necessary during the construction phase.

(1) Remove by methods acceptable to Engineer, no more than 20 percent of the canopy from trees, preserving natural shape and characteristics of the trees. Canopy removal shall be completed during the clearing and construction phase. Broken or badly bruised branches shall be removed with a clean cut during the construction phase, before wounds are allowed to dry out.

(2) Use qualified orborist or tree worker to perform pruning. Trim in accordance with publication ISBN 1-881956-07-5, “Tree-Pruning Guidelines,” of the International Society of Arboriculture. Dispose of cuttings outside the right-of-way.

(S) Watering. After initial watering, continue to water in quantity and frequency necessary to sustain plant growth.

(T) Plant Establishment Period. Plant establishment period shall extend nine months from accepted completion date of planting period, unless extended by Engineer because of Contractor’s failure to perform required work.

During plant establishment period, water, fertilize, cultivate, weed, prune, and apply pesticide when required. Replace plants that fail to develop healthy growth, become injured, or die. Provide replacements within two weeks of receiving notification from Engineer that plants are unacceptable.

(1) Barricades. Where safety allows, set up barricades after planting to keep traffic out of newly planted areas.

(2) Watering. Water to keep planted areas moist but not over-saturated, and to ensure good growth. Regulate quantity of water to prevent erosion and formation of gullies.

(3) Fertilizing. In addition to fertilizing during planting period, fertilize minimum of four times during plant establishment period, at least 2-1/2 months apart. Apply fertilizer at following rates:

(a) Trees – 1/4 pound per inch of trunk diameter.

(b) Shrubs and vines – 1/4 pound per plant.

(c) Ground cover beds – one pound per 1,000 square feet.

Exercise caution when fertilizing to avoid burning plants.

(4) Controlling Weeds. Keep planted areas at least 90 percent free of weeds and grass considered undesirable by Engineer. Remove weeds by pulling roots. Do this daily if necessary. Deposit trash in appropriate containers. Chemical weed control, if chosen, shall be by method acceptable to the Engineer.

(5) Disease or Insect Infestation.

(a) Inspect plants, including grass, weekly for disease or insect damage. Treat infected plants immediately.

(b) Remove damaged or diseased growth from trees and shrubs.

(6) Dead or Dying Plants. Remove immediately plants that are not in vigorous thriving condition. Replace with plants of same type and size as originally planted.

(7) Guys and Stakes. Reset plants to upright or proper growing position. Restake, tighten, or repair guys as necessary. Remove guys and stakes at the conclusion of plant establishment period.

(8) Windbreaks. Adjust, repair, or replace windbreaks that have sustained damage or moved out of position.

(9) Plastic Headers. Replace or reset headers that have been damaged during maintenance.

(10) Boulders and Aggregates. Remove weeds, trash, and debris from boulder and aggregate beds at least weekly. Dispose of refuse outside right-of-way. Replace lost aggregate and restore bed to

original finished grade. Replace boulders that have been damaged during maintenance. Restain boulders if necessary.

Engineer will credit Contractor with plant establishment days when work is done as indicated in the 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.

(U) Acceptance. Acceptance, if granted, will be at end of plant establishment period. For hydro-mulched areas, Engineer will base acceptance on 98 percent minimum coverage with healthy, well-established ground cover or grass. Grass shall be at least three inches tall. There shall be not more than 2 square feet of bare earth for every 100 square feet of planted area. Plants shall be in healthy growing condition.

Engineer will schedule semi-final inspection to decide acceptability 90 days before end of plant establishment period. At this time, Engineer will notify Contractor of plants that need to be replaced and other apparent deficiencies.

Final inspection will be scheduled 90 days after Contractor provides plant replacements.

619.04 Measurement. Trees, shrubs, and vines will be paid on a lump sum basis. Measurement for payment will not apply.

619.05 Payment. Engineer will pay for the accepted trees, shrubs, and vines on a contract lump sum basis. Payment will be full compensation for work prescribed in this section and contract documents.

The Engineer will pay for each of the following pay items when included in proposal schedule:

Pay Item	Pay Unit
Tree (Named Type and Size)	Lump Sum
Transplanted Tree (Named Type)	Lump Sum
Shrub (Named Type and Size)	Lump Sum
Vine (Named Type and Size)	Lump Sum

Partial Payment Schedule For Planting Period With Plant Establishment Period. The Engineer will pay for:

(A) 60 percent of the contract bid price upon completion of planting.

(B) 15 percent of the contract bid price in three monthly payments of 5 percent for satisfactory progress during the planting period.

(C) 20 percent of the contract bid price in eight monthly payments of 2-1/2 percent for satisfactory progress during the plant establishment period.

(D) 5 percent of the contract bid price at final acceptance of the plant establishment period.

The Engineer will pay for planting soil as specified in Section 617 - Planting Soil.

END OF SECTION 619