EXHIBIT B

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

TECHNICAL SPECIFICATIONS

SECTION 01300- SUBMITTALS

PART 1- GENERAL

1.1 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provision preceding these specifications shall govern this section of work.

1.2 DESCRIPTION:

A. This section supplements Section 5.4 “SHOP DRAWINGS AND OTHER SUBMITTALS" of the General Provisions and describes the requirements for the submission of progress charts and schedules, shop drawings, certificates, test reports, as-built drawings, and other data required by the contract.

1.3 DETAILED CONSTRUCTION SCHEDULE:

A. The Contractor shall submit a detailed construction schedule within seven (7) calendar days after the Notice to Proceed. The construction schedule shall be based on a detailed critical path analysis of construction activities and sequence of operations needed for the orderly performance and completion of the work in accordance with the Contract. The schedule shall be Critical Path Method (CPM) type in the form of an arrow diagram and activity listing. The network diagram shall show in detail and in any orderly sequence all activities on a time scale, their descriptions, durations and dependencies, which are necessary for the completion of the work. The activity listing shall show the following information for each activity on the network diagram:

1. Identification by code numbers and description.
2. Duration.
3. Craft and equipment.
4. Earliest start and finish dates.
5. Latest start and finish dates.
6. Total float time and free float time.
7. Completion of each task by roadway.

B. The construction schedule shall be complete in all respects, covering in addition to activities at the site of work, off-site activities such as design, fabrication and procurement of equipment, the scheduled delivery dates of such equipment and shall include a manpower forecast by trades. The Contractor shall also furnish an estimated billing chart for each month of the contract period. The Contractor shall promptly inform the State of any proposed change in the schedule and shall furnish the State with a revised schedule and billing chart each month. The schedule shall be kept up to date, taking into account the actual progress of work. The updated schedule shall show the requirements for the on-time completion of the entire project as set forth in the contract.

C. If at any time during the progress of the work, the Contractor's actual progress appears to be inadequate to meet the requirements of the contract, the State will notify the Contractor of such imminent or actual noncompliance with the contract. The Contractor shall thereupon take such steps as may be necessary to improve his progress and the State may require an increase in the labor force, the number of shifts, and/or overtime operations, days of work and/or the amount of construction plants all without additional cost to the State. Neither such notice by the State nor the failure to issue such notice shall relieve the Contractor from his obligation to achieve the quality of work and rate of progress required by the contract. Failure of the Contractor to comply with instructions of the State under these provisions may be grounds for determination by the State that the Contractor is not prosecuting work with such diligence as will assure completion within the times specified.

D. The Contractor shall submit to the State six (6) prints of the detailed construction schedule and of each revised schedule submitted thereafter.

1.4 SHOP DRAWINGS, SAMPLES, CATALOG CUTS & CERTIFICATES

A. All submissions by the Contractor to the Construction Manager are to be made in six copies.

Two copies will be returned to the submitter with information of review action. If more copies are needed, the Contractor shall submit additional quantities for his and his subcontractor's/supplier's use.

Submittals shall be returned to the Contractor no later than 15 calendar days after receipt by the Construction Manager

Each shop drawing, certificate of compliance, sample and equipment list shall be checked and certified correct by the Contractor, and shall be identified with the applicable information specified hereinafter under "Submittal Identification". Items are to be reviewed prior to commencing fabrication or delivery of material to the job site.

B. Each copy of the drawings, certificates, catalog cuts, and lists reviewed by the Construction Manager will be stamped with the appropriate action noted therein. The review of the Construction Manager shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory.

Acceptance of such drawings will not relieve the Contractor of the responsibility for any error or omission, which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work. Each shop drawing submitted for review shall have, in the lower right-hand corner just above the title a space 4" x 4" in which the Construction Manager can

place the stamp and indicate action taken. Contractor shall also inform his subcontractors to provide this space in their preparation of shop drawings.

C. Submittals that are rejected shall be revised or corrected and shall be resubmitted for review.

1.5 CERTIFICATE OF COMPLIANCE:

A. Six (6) copies of material manufacturer's certificates of compliance shall be submitted to the Construction Manager for approval prior to shipment of any material to the construction site.

1.6 LIST AND SOURCE OF MATERIALS:

A. List and source of materials to be used in this contract shall be submitted in six (6) copies to the Construction Manager for approval before any material is delivered to the construction site.

1.7 MAINTENANCE DATA AND OPERATING INSTRUCTIONS:

A. Six (6) copies of maintenance data and operating instructions shall be submitted at the conclusion of the equipment installation. The manual shall include instructions for operating, maintenance, repair, recommended inspection points and periods for inspection in a practical, complete, and comprehensive manner. The information shall be arranged in a logical, orderly sequence, including a general description of the equipment and significant technical characteristics. Test, adjustment, and calibration information shall include illustrations, diagrams, and step-by-step procedures.

1.8 TEST REPORTS:

A. Six (6) copies of test reports for any material used in this contract shall be submitted when specified or required by the Construction Manager.

1.9 SUBMITTAL IDENTIFICATION:

A. To avoid rejection and to clarify each submittal, the General Contractor shall stamp each submittal copy as follows:

_____

General Contractor's Name

Submittal Number_____

KALAELOA COMMUNITY DEVELOPMENT DISTRICT
KALAELOA ENERGY CORRIDOR

THIS SUBMITTAL HAS BEEN CHECKED BY THIS GENERAL CONTRACTOR AND IS CERTIFIED CORRECT AND IN COMPLIANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS.

DATE RECEIVED _____
SPECIFICATION SECTION # _____
SPECIFICATION PARAGRAPH# _____
DRAWING NUMBER _____
SUBCONTRACTOR NUMBER _____
SUPPLIER NAME _____
MANUFACTURER NAME _____
CERTIFIED BY_____
(Contractor's Signature)

A. This stamp "filled in" should appear on each shop drawing, on the cover sheet of copies of test and mill reports, certificate of compliance, catalog cuts, brochures, etc. The stamp should be placed on a heavy stock paper merchandise (approximately three inches by six inches - 3" x 6") and one tag tied to each sample submitted for approval. The tag on the samples should state what the sample is, so that if the tag is accidentally separated from the sample they can be matched up again. The back of this tag will be used by the Construction Manager for his receipt, approval, and log stamp and for any comments that relate to the sample.

B. Submission Number: Each submission is to be sequentially numbered in the space provided in the contractor's stamp. Correspondence and transmittals will refer to this number.

1.10 AS-BUILT DRAWINGS:

A. The Contractor shall maintain at the job site one (1) set of full size contract drawings, marking them in red to show all variations between the construction actually provided and that indicated or specified in the contract documents, including buried or concealed construction.

Where a choice of material or method is permitted herein or where variations in scope of character of work from that of the original contract or authorized, the drawings shall be marked to define the construction actually provided. Where equipment installation is involved, the size, manufacturer's name, model number, power input or output characteristics as applicable shall be shown on the as-built drawings.

The representation of such changes shall conform to standard drafting practice and shall include such supplementary notes, legends, and details as necessary to clearly portray the as-built construction.

The drawings shall be maintained and updated on a daily basis. The Contractor shall stamp, sign, and date each sheet with the following stamp:

1.11 AS-BUILT DRAWINGS/SPECIFICATIONS:

This certifies that the dimensions and details shown on this sheet reflect the dimensions and details, and specifications as constructed in the field.

_____

CONTRACTOR'S NAME

_____

Signature Date

Final payment to the Contractor will not be made until approval of the As-Built drawings. On completion of the work, the marked-up drawings shall be delivered to the Construction Manager for acceptance.

1.12 GUARANTEES:

A. Guarantee periods shall start at time of acceptance of the completed work by the State.

1.13 ANNOTATIONS OF EXISTING DAMAGES:

A. Prior to the commencement of work, an annotated description of all existing damages and missing items shall be submitted to the Authority. It will be the Contractor's responsibility to repair and/or replace to the Contracting Officer's satisfaction all items identified as damaged and/or missing that cannot be proven to have been in this condition prior to the commencement of this project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01505- MOBILIZATION

PART 1-GENERAL

1.01 GENERAL PROVISIONS: The Instruction to Bidders, the General Provisions and Special Provision preceding these specifications shall govern this section of work.

1.02 DESCRIPTION: The Contractor shall mobilize and transport his equipment including materials and supplies for operation to the site of work, construct temporary facilities as necessary, and assemble the equipment at the site as soon as possible after receipt of Notice to Proceed, subject to Article 7- "PROSECUTION AND PROGRESS" of General Provisions.

1.03 ACCESS TO THE SITE

A. The Contractor shall use the construction access to the project site as indicated on the plans.

1.04 DEMOBILIZATION

The Contractor shall demobilize and transport his construction plant and equipment including materials, supplies and temporary facilities off the site as soon as possible after construction is completed. Demobilization and final cleanup shall be completed prior to final acceptance.

PART 2 (NOT USED)
PART 3 (NOT USED)
PART 4 (NOT USED)

PART 5- PAYMENT

5.01 APPLICABILITY

The maximum bid allowed for "Mobilization" is an amount not to exceed six (6) percent of the total original contract amount excluding the bid price of this item. If the proposal submitted by the bidder indicates an amount in excess of the allowable maximum, the indicated amount or amounts shall be reduced to the allowable maximum; the "Sum of All Items", in the proposal schedule shall be adjusted to reflect any such reduction. For the purposes of comparing bids and determining the contract price to be inserted in the contract awarded to the bidder, if any is so awarded, the "Sum of All Items" adjusted in accordance with the foregoing shall be used and the bidder's proposal shall be deemed to have been submitted for the amounts as reduced and adjusted in accordance herewith.

5.02 BASIS OF PAYMENT

Mobilization will be paid for on a lump sum basis. Payment will be made under:

Pay Item	Pay Unit
Mobilization	Lump Sum

Partial payments will be made as follows:

A. When 5 percent of the original contract amount is earned, 25 percent of the amount bid for mobilization will be paid.

B. When 10 percent of the original contract amount is earned, 50 percent of the amount bid for mobilization will be paid.

C. When 25 percent of the original contract amount is earned, 60 percent of the amount bid for mobilization will be paid.

D. When 65 percent of the original contract amount is earned, 90 percent of the amount bid for mobilization will be paid.

E. When 80 percent of the original contract amount is earned, 10 percent of the amount bid for mobilization will be paid.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

END OF SECTION

SECTION 01550 - TRAFFIC CONTROL

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work.

1.02 DESCRIPTION:

Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the furnishing, delivery, and installation of the work of this section, complete, as specified herein. The work includes, but is not limited to, the following:

A. Install construction signage, regulatory and warning traffic signs.

B. Install traffic control devices, including cones, delineators, barriers and traffic barricades.

C. Install temporary pavement markings and stripings.

D. Provide flaggers or police officers, as required.

1.02 WORK SPECIFIED IN OTHER SECTION:

A. Construction signs are specified in Section 02578 – Regulatory, Warning, and Construction Signs

PART 2 – PRODUCTS

2.01 MATERIALS:

All signs, traffic control devices, pavement marking and striping shall conform to the requirements of the Manual on Uniform Traffic Control Devices, 2003, as amended, Federal Highways Administration and the Hawaii Department of Transportation Standard Specifications

PART 3 – EXECUTION

3.01 TRAFFIC CONTROL PLANS:

All traffic control plans shall conform to the Manual on Uniform Traffic Control Devices, 2003, as amended, Federal Highways Administration: Part 6 – Temporary Traffic Control and the Hawaii Department of Transportation Standard Specifications.

3.02 INSTALLATION:

A. Traffic control devices shall be installed such that the sign or device farthest from the work area shall be placed first. The remaining traffic

control devices shall then be placed progressively toward the work area.

B. Cones or delineators shall be extended to a point where they are visible to approaching traffic.

C. Regulatory and warning signs within the construction zone that conflict with the traffic control plans shall be removed or covered. All signs shall be restored upon completion of the work.

D. Flaggers and/or police officers shall always be in sight of each other or in direct communication.

E. All State Highway traffic lanes shall be a minimum of 10 feet wide.

F. All construction warning signs shall be promptly removed or covered whenever the message is not applicable or not in use.

G. The backs of all signs used for traffic control shall be appropriately covered to preclude the display of inapplicable sign messages (i.e., when the signs have messages on both faces).

H. At the end of each day's work or as soon as the work is completed, all traffic control devices no longer needed to permit free and safe passage of public traffic shall be removed. Removal shall be in the reverse order of installation.

END OF SECTION

SECTION 01560 – ENVIRONMENTAL CONTROLS

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work.

1.02 DESCRIPTION:

A. With the exception of those measures set forth elsewhere in these specifications, environmental protection shall consist of the prevention of environmental pollution as the result of construction operations under this Contract. For the purpose of this specification, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare, unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utilization of the environment for aesthetic and recreational purposes.

B. All costs incurred in complying with the provisions of this section shall be borne by the Contractor. No separate payment will be made to the Contractor for measures required for environmental control during construction.

C. The work under this section shall include the following:

1. Obtain all permits required by the Department of Health.

2. Provide all air and water quality testing and monitoring work required by the permits during construction.

3. Provide all facilities, equipment and structural controls for minimizing adverse impacts upon the environment during the construction period.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. Erosion control is specified in Section 01561 – Soil Erosion Control.

1.04 APPLICABLE REGULATIONS:

In order to provide for abatement and control of environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this Contract, the work performed shall comply with the intent of the applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement, including, but not limited to, the following regulations:

A. State of Hawaii, Department of Health, Hawaii Administrative Rules, Title 11, Chapter 55, WATER POLLUTION CONTROL; Title 11, Chapter 54, WATER QUALITY STANDARDS.

B. State of Hawaii, Department of Health, Hawaii Administrative Rules, Title 11, Chapter 59, AMBIENT AIR QUALITY; Title 11, Chapter 60, AIR POLLUTION CONTROL LAW.

C. State of Hawaii, Department of Health, Hawaii Administrative Rules, Title 11, Chapter 44A, VEHICULAR NOISE CONTROL.

D. State of Hawaii, Occupational Safety and Health Standards, Title 12, Department of Labor and Industrial Relations, Subtitle 8, Division of Occupational Safety and Health, sub-paragraph 12-202-13, ASBESTOS; Environmental Protection Agency, Code of Federal Regulations, Title 40, Part 61, NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS, and Subpart M, NATIONAL EMISSION STANDARDS FOR ASBESTOS; and U.S. Department of Labor Occupational Safety and Health Administration (OSHA) Asbestos Regulations, Code of Federal Regulations, Title 29, Part 1910, Subpart Z, Section 1910.1001.

PART 2 – PRODUCTS

NONE

PART 3 – EXECUTION

3.01 AIR POLLUTION CONTROL:

A. Emission

The Contractor shall not be allowed to operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made, as determined by the Owner's Representative.

B. Dust

The Contractor, for the duration of the Contract, shall maintain all excavations, embankments, haul roads, permanent access roads, plant sites, waste disposal areas, borrow areas, and all other work areas within or without the project limits free from dust which would cause a hazard to the work or the operations of other contractors or to persons or property. Industry accepted methods of stabilization suitable for the area involved, such as sprinkling or similar methods, will be permitted. Chemicals or oil treating shall not be used.

C. Burning shall not be permitted.

3.02 WATER POLLUTION CONTROL:

A. Wastes

The Contractor shall not deposit at the site or in its vicinity solid waste or discharge liquid waste, such as fuels, lubricants, bituminous waste, untreated sewage, and other pollutants which may contaminate the existing coastal or ground water. The Contractor shall be responsible for the proper removal and disposal of contaminants in accordance with the applicable Federal, State and City requirements.

B. Spillages

Care shall be taken to ensure that no petroleum products, bituminous materials, or other deleterious substances, including debris, are allowed to fall, flow, leach, or otherwise enter existing coastal or ground water. The Contractor shall be responsible for the proper removal and disposal of contaminants in accordance with the applicable Federal, State and City requirements.

C. Erosion

See Section 01561.

D. Storm Water Runoff

The Contractor shall adhere to the conditions of the NPDES permit issued for coverage of construction storm water discharges associated with the project, as obtained by the Owner. The Contractor shall follow best management practices (BMP) plan incorporated with the permit and shall institute and implement any and all additional measures necessary to prevent storm water pollution due to the construction activities.

3.03 NOISE CONTROL:

Construction equipment shall be equipped with suitable mufflers to maintain noise within levels complying with applicable regulations.

3.04 POLLUTANTS AND HAZARDOUS MATERIALS:

A. During construction, excavation spoils and dewatered materials shall be tested to determine if pollutants, as defined by the DOH, are present in the sediment, excavation spoils and dewatered materials.

B. If pollutants are encountered, an environmental consultant shall be retained by the contractor to ensure property reporting and handling of the contaminated materials.

C. Pollutants, if encountered in the sediment, excavation spoils and dewatered materials, shall be removed in accordance with applicable U.S. Environmental Protection Agency (EPA) rules and regulations, EPA's Resource Conservation and Recovery Act (RCRA), U.S. Department of Transportation regulations and State of Hawaii Department of Health rules, regulations and policies.

D. If the pollutants are defined as hazardous waste under RCRA, the Contractor shall clean-up, handle, store, treat, remove and dispose the polluted materials as hazardous waste under RCRA.

E. If the pollutants are not hazardous, the requirements of RCRA shall not apply. However, the Contractor shall remove the pollutants as defined above by DOH from the polluted excavation spoils and dewatered materials by treatment, and then dispose the treated materials and pollutants if necessary, in accordance with DOH policies. Excavations shall not be backfilled with the original untreated excavation material if pollutants are present in this material, unless it can be demonstrated to the DOH that backfilling with clean soils will become contaminated or that backfilling with the treated originally excavated material will become recontaminated due to the existing polluted conditions at the site. In excavations where contamination of the backfill would occur, the backfill to the top of the groundwater table may consist of the original excavated contaminated material covered with uncontaminated material placed on top of the contaminated backfill and a cap of asphalt or concrete as provided to ensure no contaminated materials exist between the groundwater table and the surface.

F. The Contractor shall submit to the City copies of all test results. The Contractor shall furnish to the City affidavits certifying that polluted excavation spoils and dewatered materials have been treated, all pollutants as defined by the DOH have been removed from the materials, and only treated water meeting the DOH basic water quality criteria has been discharged in the existing drainage system and treated soils backfilled into the excavation.

G. The City will monitor the Contractor's work, if pollutants are encountered, to ensure compliance with the above requirements.

3.05 DISPOSAL:

H. Construction waste, such as crates, boxes, building materials, pipes and other rubbish shall be disposed of at DOH-licensed facilities. Other areas or methods proposed by the Contractor will be approved only if the Owner's Representative determines that their effect on the environment is equal to or less than those described herein.

I. Removal of wastes shall be a continuous ongoing operation. Wastes and debris shall not be allowed to accumulate in large open piles.

J. Windblown wastes and debris and wastes left by workers shall be collected by the Contractor and disposed as described above. No rubbish shall be deposited on the property.

K. Local regulations for hauling and disposal shall be complied with.

END OF SECTION

SECTION 01561 - SOIL EROSION CONTROL

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work.

1.02 DESCRIPTION:

A. This work shall consist of temporary control measures, as indicated, and the approved Soil Erosion Control Plan, as required by these specifications or as ordered by the Construction Manager during the life of the Contract to control dust and water pollution through the use of berms, screens, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, silt screens and other erosion control devices or methods.

B. Temporary erosion and siltation control measures as described herein shall be applied to any erodible material within this project, including local material sources and work areas.

C. The Contractor shall be responsible for removing all silt and debris resulting from his work and deposited in drainage facilities, roadways, neighboring lands, and other areas.

D. All costs incurred in complying with the provisions of this section shall be borne by the Contractor. No separate payment will be made to the Contractor for measures required for environmental control during construction.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. The work under this section is specified in the following section of the State Standard Specifications:

Section 209 – Temporary Water Pollution, Dust, and Erosion Control

All references to measurement and payment shall be deleted.

B. Pollution controls are specified in Section 01560 – Environmental Controls.

C. Site grading is specified in Section 02210 - Earthwork.

D. Utility trenching and backfilling is specified in Section 16100 – Electrical Work.

1.04 SUBMITTALS:

A. Best Management Practice (BMP) Plan: A written site-specific BMP describing activities to minimize water pollution and soil erosion into State waters and drainage

systems. The BMP shall conform to the requirements of Section 209 of the State Standard Specifications.

B. Submit technical data on geotextile fabric for silt fence and soil stabilization.

PART 2 – PRODUCTS

2.02 MATERIALS:

A. Mulches may be bagasse, hay, straw, fiber mats, netting, wood cellulose, bark, wood chips, or other suitable material acceptable to the Engineer and shall be reasonably clean and free of noxious weed and deleterious materials.

Mulch shall be specially processed fiber containing no growth or germination inhibiting factors. It shall be such that after addition and agitation in the hydraulic equipment with seed, fertilizer, water and other additives not detrimental to plant growth, the fibers will form a homogeneous slurry. When hydraulically sprayed on the soil, the fibers shall form a blotter-like ground cover which readily absorbs water and allows infiltration to the underlying soil. In every application, complete coverage of the soil shall be attained. Mulch shall be applied at the minimum rate of 2,000 pounds per acre with tackifier added to the mix at a rate of 85 pounds per acre.

B. Temporary tire wash berm shall be constructed of cold mix asphalt concrete pavement, or other material acceptable to the Engineer.

C. Grass shall be a quick growing species (such as rye grass, Italian rye grass, or cereal grasses) suitable to the area and which provide a temporary cover that does not later compete with the permanent cover.

1. The grass shall be obtained by digging up luxuriant growths from areas that are free of seeds, roots, plants, and grasses that are foreign to the specified grass. The grass will not be acceptable unless it is planted and watered within 24 hours after being dug out from its original growing position.

2. Seed for hydro-mulching, unless otherwise specified, shall be Bermuda *(Cynodon Dactylon)*, except giant varieties, certified and meeting the following requirements:

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

The seeds shall be applied at the rate of 125 pounds per acre (minimum) and within twelve (12) months of the date of the certified germination test.

D. Fertilizer

1. Fertilizer and soil conditioners shall be a standard commercial grade acceptable to the Engineer. Fertilizer shall conform to Subsection 712.18(A) of the State

Standard Specifications. Fertilizer shall be applied at a rate of 450 pounds per acre and reapplied at a rate of 250 pounds per acre every 90 calendar days.

2. The Contractor shall be responsible for determining the proper fertilizer required in the hydro-mulch mix for the existing soil condition. He shall be responsible for deciding the quantity and the analysis and ratio to ensure sufficient nutrients for the sustained growth of the grass.

E. Silt fences shall be constructed with a synthetic filter fabric mounted on posts and embedded into the ground.

F. Check dams shall consist of stones ranging from approximately 8 to 12 inches in size or other material acceptable to the Engineer.

PART 3 – EXECUTION

3.01 Earth material shall not be exposed until the BMP are installed and accepted by the Construction Manager. The maximum surface area of earth material exposed by clearing, grubbing, excavation, borrow and fill operations at any time is fifteen (15) acres. The Construction Manager has the authority to limit the surface area exposed by clearing and grubbing and to limit the surface area exposed by excavation, borrow and fill operations.

3.02 Except for specified measures indicated, the Contractor shall determine the appropriate erosion control measures to use. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, and slope drains and the use of temporary mulches, mats, and grassing or the construction and use of other control devices or methods as necessary to control erosion. If the Contractor's methods are insufficient and do not provide adequate erosion control, the Construction Manager may direct the Contractor to provide immediate, permanent, or temporary pollution control measures to prevent contamination of streams, lakes, ponds, drainage channels and pipes, roads, neighboring lands, and other areas at no additional cost to the HCDA.

3.03 The Contractor shall incorporate all erosion control measures indicated, which may be modified as necessary to adjust to conditions that develop during construction.

3.04 The Contractor shall limit the surface area exposed by grubbing, stripping of topsoil, and grading to that which is necessary to perform the next operation and which is within his capability in keeping the finish grading, mulching, grassing, and other such pollution control measures current.

The grubbing of the vegetative root mat and stumps and the stripping of topsoil shall be confined within the limits of grading which can be actively and continuously prosecuted within fifteen (15) calendar days. The area to be graded shall be limited to the minimum area necessary to accommodate the Contractor's equipment and work force and shall not at any time exceed fifteen (15) acres without prior acceptance of the Construction Manager.

Any area remaining bared or cleared for more than thirty (30) calendar days and which is not within the limits of active construction shall be remedied as directed by the Construction Manager at the Contractor's expense without cost to the State. All areas

where finish grading has been completed shall be grassed within 3 calendar days after the completion of grading for that area.

3.05 The Contractor shall, at the end of each work operation in any one day, shape the earthwork in such a manner as to control and direct the runoff of rainwater to minimize the erosion of soils. He shall construct earth berms along the top edges of embankments or along any critical area within the project, such as along the property line with adjacent properties, streams, and water channels, to intercept any runoff. Temporary slope drains shall be provided to carry runoff from the top of cuts and fills. Temporary facilities for controlled discharges shall be provided for runoff impounded, directed, or controlled by project activities or by any erosion control measure employed.

3.06 Cut slopes shall be shaped, topsoiled if necessary, and planted as the work progresses. Whenever major excavation is suspended or halted and the slope is bared for more than fifteen (15) consecutive days, the exposed surfaces shall be hydro-mulch seeded or protected as directed by the Construction Manager at the Contractor's expense without cost to the State.

Fill slopes shall be finished as specified and in accordance with the requirements previously outlined herein for cut slopes.

3.07 Construction of berms, cofferdams, or other such construction in or near the vicinity of waterways or other bodies of water shall be of approved materials.

3.08 All truck tires shall be cleaned of mud before leaving the job site and entering a public roadway.

3.09 The temporary erosion and siltation control measures outlined in these specifications are minimum requirements and shall not preclude the provision of any additional measures which the Contractor may deem necessary. Damages caused by the erosion of soils and the pollution of downstream areas shall be the responsibility of the Contractor and all costs for repairing, correcting, replacing, and cleaning such damaged or polluted facilities shall be borne by the Contractor, including any penalties imposed by Federal and State regulatory agencies.

3.10 Grassing for erosion control can be undertaken by sprigging, matting or hydro-mulch seeding.

A. Sprigging or Matting

1. Ground Preparation: Prior to planting, the areas to be grassed shall be cleared of all unwanted plants (including their root systems), stones over three (3) inches in diameter, papers, trash and debris.

   If the existing soil in the areas to be grassed is suitable for use as topsoil, the soil shall be scarified to a depth of six (6) inches from the finished surface and worked until it is of a uniform and loose texture.

   Areas unsuitable for planting shall be finished with a 4-inch layer of topsoil, spread and graded to conform to the finish grade shown on the plans.

2. Planting: Planting shall be by sprigging, matting, or other methods at the option of the Contractor. If planting is by sprigging or matting, the surface shall be rolled with a suitable lawn roller after planting has been completed.

3. Water shall be applied within the same day of planting in such quantities as to moisten the soil to the depth of the planted grass. Additional application shall be made so that the planted areas are continually kept damp to the grass depth and until the commencement of plant establishment work.

4. Fertilizer shall be applied at not less than the rate of 300 pounds per acre, 23 to 30 days after the grass has been planted.

B. Hydro-mulch Seeding

1. The Contractor shall begin hydro-mulch seeding operations after the areas prepared or designated for seeding have been accepted by the Owner's Representative. Acceptance shall include observation of slopes to ensure provision has been made for the collection and disposal of surface water to protect planted areas from erosion. Acceptance shall not relieve the Contractor of his responsibility to restore any damage to the slope or planted areas not yet accepted by the Owner.

2. The hydro-mulch equipment shall be capable of mixing all the necessary ingredients to a uniform mixture and of applying the slurry to provide uniform coverage. Seed, fertilizer, and mulch mix shall be applied in one operation by approved hydraulic equipment.

3. Areas inaccessible to hydro-mulching application shall be seeded, fertilized and mulched by hand methods.

4. Water shall be applied immediately following mulching in such quantities as to moisten the soil and mulch. Watering shall be continued in such manner, quantity, and frequency to ensure proper germination and growth and shall be done in a way that will prevent erosion and will not cause damage to the planted areas.

3.11 Maintain erosion controls until acceptance of the work by the HCDA and State DOT. Remove all temporary slope drains, berms, silt basins, and other BMP measures and restore areas to the satisfaction of the Owner.

END OF SECTION

SECTION 02100 – SITE PREPARATION

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work

1.02 DESCRIPTION:

Provide all labor, materials, appliances, tools, equipment, facilities, transportation and services necessary for and incidental to performing all operations in connection with the furnishing, delivery and installation of the work of this section, complete, as specified herein. The work includes, but is not limited to, the following:

A. Examine all other sections for work related to those other sections and required to be included as work under this section.

B. Clearing the site of all obstacles and obstructions, removing cleared materials, constructing, executing and completing the other work included in this Contract.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. The work under this section is specified in the following sections of the State Standard Specifications:

Section 201 – Clearing and Grubbing

Section 202 – Removal of Structures and Obstructions

All references to measurement and payment shall be deleted.

B. Earthwork is specified in Section 02210 – Earthwork.

1.04 CONDITION AT SITE

A. The Contractor shall visit the site, examine and note all existing conditions and the extent of work involved for the preparation of the site and clearing and grubbing.

B. The plans do not show all existing trees that must be removed. The Contractor shall make his own evaluation on the extent of tree removal.

PART 2 – PRODUCTS

NONE

PART 3 – EXECUTION

3.01 GENERAL

A. Maintenance of Traffic:

The Contractor shall conduct operations with minimum interference to existing roadways. When necessary, the Contractor shall provide and erect barriers, etc., with special attention to protection of personnel.

B. Protection:

Throughout the progress of the work, protection shall be provided for all property and equipment and temporary barricades shall be provided as necessary. Work shall be done in accordance with the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Contractors of America, and the State of Hawaii's Occupational Safety and Health Standards, Rules and Regulations.

C. Fires:

No burning of fires of any kind will be allowed.

D. Reference Points:

Benchmarks, traverse points, property pins and other physical survey control points shall be carefully maintained, but if disturbed or destroyed shall be replaced as directed by the Construction Manager at the Contractor's expense.

E. Disposal:

All materials resultant from operations under this section shall become the property of the Contractor and shall be removed from the site. Loads of materials shall be trimmed to prevent droppings.

3.02 EXISTING UTILITY LINES:

The existence of active underground utility lines within the construction area is not definitely known other than those indicated in their approximate locations as indicated. Should any unknown line be encountered during excavation, the Contractor shall immediately notify the Construction Manager of such discovery. The Construction Manager shall then investigate and issue instructions for the preservation or disposition of the unknown line. Authorization for extra work shall be issued by the Construction Manager only as he deems necessary.

3.03 CLEARING AND GRUBBING:

A. The Contractor shall clear the areas indicated, removing pavements, rubbish, debris, trees, structures and other obstructions, the removal of which will be necessary for the proper reception, construction, execution and completion of other work included in this Contract.

B. After clearing has been completed, the entire site shall be stripped of the organically contaminated near-surface soils to a minimum depth of two (2) to six (6) inches. Remove excess material upon completion of the project. All such material shall become the property of the Contractor.

C. Remove trees and roots to a minimum of three (3) feet below existing ground level. Remove all large roots in excess of two (2) inches in diameter, and backfill and compact the resulting depression in accordance with Section 02210.

D. The Contractor shall protect from injury and damage all surrounding trees, plants, and other vegetation and shall leave all in as good a condition as at present. Any damage to existing improvements shall be repaired or replaced by the Contractor to the satisfaction of the Construction Manager.

3.04 DEMOLITION

A. Existing pavement shall be saw cut from the adjacent pavement prior to demolition.

B. Existing asphaltic concrete pavement and underlying base and subbase materials shall be removed and disposed of off-site. Reuse of the demolished materials in the new construction will not be permitted.

3.05 CLEANUP OF PREMISES

Clean up and remove all debris accumulated from clearing and demolition operations from time to time to prevent a nuisance and as directed by the Owner's Representative.

END OF SECTION

SECTION 02500 – ASPHALT CONCRETE PAVING

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work.

1.02 DESCRIPTION:

Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the furnishing, delivery and installation of the work of this section, complete, as specified herein. The work includes, but is not limited to, the following:

A. Examine all other sections for work related to those other sections and required to be included as work under this section.

B. Construct asphalt concrete pavement, including subgrade preparation, base course, prime coat, and tack coat.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. The work under this section is specified in the following sections of the State Standard Specifications:

Section 301 – Hot Mix Asphalt Base Course

Section 305 – Aggregate Subbase Course

Section 306 – Untreated Permeable Base Course

Section 401 – Hot Mix Asphalt Pavement

Section 407 –Tack Coat

Section 420 – Primer for Untreated Permeable Base Course

All references to measurement and payment shall be deleted.

B. Earthwork is specified in Section 02210 – Earthwork.

C. Pavement striping is specified in Section 02577 – Pavement Striping and Marking.

1.04 SOILS TESTING AND ANALYSES:

The services of a Soils Engineer shall be obtained. A soil technician or engineer shall be present at the site to observe and direct paving operations and to take density or make

visual tests as appropriate. Where low density test results are noted, the area shall be reworked by the Contractor and retested.

If the field observation and test results, in the opinion of the testing personnel or Soils Engineer, indicate that the paving is not in general conformance to the intent of the plans and specifications, the discrepancy shall be reported to the Contractor for corrective action with the Construction Manager notified.

1.05 SUBMITTALS:

A. Submit manufacturer's certificates of compliance for all materials herein specified in accordance with the requirements of Section 01300.

B. Submit certification that specified herbicides were applied at the specified application rate over the entire subgrade to be paved.

C. Submit Certification from a licensed surveyor employed by the Contractor that the monument stakeout and installation is correct. The certification shall include the elevation of all monuments and the azimuths and distances between monuments.

PART 2 – PRODUCTS

2.01 AC PAVEMENT MATERIALS:

Materials for roads and parking areas shall be constructed in accordance with the State Department of Transportation Standard Specifications, dated 2005, except as amended in the plans and/or specifications herewith.

A. Prime Coat for pavement shall be SS-1h.

B. Tack Coat for pavement shall be SS-1 or SS-1h.

C. Asphalt Concrete Pavement shall be Mix No. IV.

2.02 HERBICIDES:

A. Pre-paving Vegetation Clearing shall be Roundup by Monsanto or accepted equivalent.

B. Pre-emergence Control shall be Treflan by Elanco Products Company or accepted equivalent.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION:

A. The subgrade shall be prepared and compacted in accordance with Section 02210. Soil tests shall be made at the subgrade level and the final pavement structure verified or modified as necessary.

B. Apply pre-paving herbicide to all new pavement areas. Application shall not be made immediately after heavy rains or when rain is forecasted within the next 48 hours. The herbicide shall be applied in accordance with the manufacturer's recommended

procedures and rates. Perform two (2) herbicide applications at least three (3) days apart.

3.02 PAVEMENT BASES:

A. The pavement bases shall be constructed in accordance with the State Standard Specifications. Field density tests shall be made by the Soils Engineer to verify that the compaction obtained meets the specifications.

B. Apply pre-emergence herbicide on the prepared base for new asphalt concrete pavements in accordance with the manufacturer's recommendations.

3.03 ASPHALT CONCRETE PAVEMENT:

The asphalt concrete pavement shall be constructed in accordance with the State Standard Specifications.

3.04 PAVEMENT STRIPING:

Restripe pavements to restore existing markings or stripe and install signage as indicated. Perform striping and marking in accordance with the requirements of Section 02577.

END OF SECTION

SECTION 02577 – PAVEMENT STRIPING AND MARKING

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instruction to Bidders, the General Provisions and Special Provisions preceding these specifications shall govern this section of work.

1.02 DESCRIPTION:

Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the furnishing, delivery, and installation of the work of this section, complete, as specified herein. The work includes, but is not limited to, the following:

A. Examine all other sections for work related to those other sections and required to be included as work under this section.

B. Install, complete in place, reflectorized white and yellow traffic pavement striping, pavement markers and other markings in accordance with the plans and specifications and as required to restore existing work.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. The work under this section is specified in the following section of the State Standard Specifications:

Section 629 - Pavement Markers

All references to measurement and payment shall be deleted.

B. Traffic signage is specified in Section 02578 – Regulatory, Warning, and Construction Signs.

1.04 SUBMITTALS:

Submit manufacturer's certificates of compliance for all materials herein specified in accordance with the requirements of Section 01300.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Reflectorized traffic paint shall conform to the requirements of premixed reflectorized white and yellow traffic paint.

B. Only those traffic paints which have qualified in the latest completed prequalification tests conducted by the State Department of Transportation and having a weighed rating (W) of at least 6.5 for reflectorized white and 7.0 for reflectorized yellow at the

completion of the road test will be permitted for use on this project. Quick-dry paints shall not be used.

C. The phrase "latest completed prequalification tests" shall mean either those traffic paints which have been prequalified by the State Department of Transportation at the time this Contract becomes effective or those traffic paints which have been listed by the State Department of Transportation as meeting the State Department of Transportation's prequalification tests at the time the Contractor is doing pavement striping.

The following is the prevailing list of prequalified traffic paints:

WHITE	YELLOW
Pervo 5870RR	Centerline V51L002
Centerline V51W002	

D. The Contractor may use other materials designed for pavement striping, such as adhesive striping, on temporary detours with the acceptance of the Engineer. Such materials shall meet the color and reflection requirements for traffic paints.

E. PAVEMENT MARKERS

1. Markers: Rectangular, clear, highly impact resistant plastic top embossed with striated prismatic patterns on the underside. Underside is lined with a highly polished reflectorized plastic lens which is colored yellow for roadway centerlines or blue for fire hydrants. Interior of top is filled with a poured material which reinforces the impact resistant plastic top. Reflector shall meet requirements of the State Standard Specifications.

2. Adhesive: Provide standard set type or rapid set type pavement marker adhesive compatible with roadway surface in compliance with the State Standard Specifications.

3. Adhesive solvent: Provide manufacturer’s recommended solvents to remove excess adhesive from roadway or marker.

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS:

A. Work shall conform to the requirements of Section 629.03 of the State Standard Specifications and as herein below specified.

B. Before application of the markings, the portion of the roadway surface in the work area shall be thoroughly cleaned of all dust, dirt, curing compound, grease, oil, moisture, loose or unsound layers and any other material which would adversely affect the bond of the markings.

C. Traffic stripes shall be of the length, width, and placement specified or to match existing. Unless otherwise specified, the Contractor shall establish control points spaced at intervals that will ensure accurate locations of the stripe.

D. No markings shall be applied when moisture or foreign matter is present on the surface to be marked, or when wind conditions are such as to cause dust to be deposited on the prepared areas or to prevent satisfactory application of the marking.

E. The Contractor shall apply all pavement striping before opening roadways to public traffic except that when connections to existing pavements are made or when temporary detours carry public traffic, the Contractor shall stripe the connecting pavements on the day that the roadway is open to traffic. If it is necessary to run public traffic over roadways which have not received final striping, the Contractor shall paint temporary guide dashes at the traffic stripe location on the pavement as guidance for drivers until the permanent striping can be installed.

F. The Contractor shall install temporary guidelines and outline of legends and crosswalks with a 2-inch wide line on the day the roadway is opened to traffic.

G. The Contractor shall furnish and place all warning and directional signs necessary to direct and control the traffic during the striping operations. Warning signs shall be set up before the beginning of each operation and extra signs shall be kept well ahead of the marking equipment. The freshly marked stripe shall be protected by cones or other satisfactory devices until the traffic marking is dry and will not transfer to car tires. The drying time for no pickup shall be not less than five (5) minutes or more than forty (40) minutes. All stripes damaged by traffic or pavement marked by traffic crossing wet marking shall be repaired or corrected as specified below.

H. Perform thermoplastic marking in accordance with the requirements of Section 629.03(C)(3) of the State Standard Specifications.

I. Traffic paint shall be applied in two (2) separate coats at a nominal film thickness of 0.015 inch. The traffic paint applicator machine shall have appropriate shields or nozzle controls which will permit sharp pavement stripe definition. The traffic paint applicator machine shall have an air stream nozzle which can direct compressed air immediately before the area of paint application for the purpose of cleaning the pavement prior to paint application.

J. Pavement legends shall be applied with appropriate templates.

K. No stripe shall be less than the specified width. No stripe shall exceed the specified width by more than 1/2 inch. The length of the 15-foot painted segment for skip stripe may vary plus or minus one foot and the 25-foot gap between segments may vary plus or minus one foot. The alignment of the stripe shall not deviate from the intended alignment by more than one inch on tangents and on curves up to and including one degree. On curves exceeding one degree, the alignment of the stripe shall not deviate from the intended alignment by more than two (2) inches.

L. Install pavement markers as indicated and in accordance with the State Standard Specifications Section 629.03.

3.02 FINAL REVIEW:

A. All stripes and segments of stripes shall present a clean-cut, uniform, and workmanlike appearance. All markings which fail to have a uniform, satisfactory appearance shall be corrected by the Contractor at his expense.

B. Traffic striping which fails to meet the requirements specified herein or is marred or damaged by traffic or from other causes shall be corrected prior to acceptance by the HCDA and State Department of Transportation at the Contractor's expense. For all misted areas, drip and spattered paint and excess markings shall be removed to the satisfaction of the Construction Manager. When it is necessary to remove paint or markings, it shall be done by means which will not damage the underlying surface of the pavement. When necessary to correct a deviation which exceeds the permissible tolerance in alignment, that portion of the stripe so affected shall be removed plus an additional 25 feet in each direction and a new stripe then painted in accordance with these specifications.

END OF SECTION

SECTION 02578 – REGULATORY, WARNING, AND CONSTRUCTION SIGNS

PART 1 – GENERAL

1.01 GENERAL PROVISIONS:

A. The Instructions to Bidders, the General Provisions and Special Provisions preceding specifications shall govern this section of work.

1.02 DESCRIPTION:

Provide all labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the furnishing, delivery, and installation of the work of this section, complete, as specified herein. The work includes, but is not limited to, the following:

A. Examine all other sections for work related to those other sections and required to be included as work under this section.

B. Install, complete in place, regulatory and warning traffic signs, including construction signage.

1.03 WORK SPECIFIED IN OTHER SECTIONS:

A. The work under this section is specified in the following section of the State Standard Specifications:

Section 630 – Traffic Control Guide Signs

Section 631 – Traffic Control, Regulatory, Warning and Miscellaneous Signs

All references to measurement and payment shall be deleted.

B. Pavement striping is specified in Section 02577 – Pavement Striping and Marking.

1.04 SUBMITTALS

Submit manufacturer's certificates of compliance for all materials herein specified in accordance with the requirements of Section 01300.

PART 2 – PRODUCTS

2.01 MATERIALS

All signs shall conform to the requirements of the Manual on Uniform Traffic Control Devices for Streets and Highway dated 2003, as amended, of the Federal Highways Administration.

PART 3 – EXECUTION

3.01 TRAFFIC SIGNS

A. Each sign shall be carefully installed in accordance with Section 631.03 of the State Standard Specifications at the locations indicated and in accordance with the mounting details indicated.

B. Signs posts shall be vertical and there shall be a minimum of seven (7) feet clearance to the bottom of the sign.

3.02 CONSTRUCTION SIGN

A. Construction signs may be mounted on portable frames or supports. Signs shall be placed to provide clear and safe passage for vehicles and pedestrians.

B. Cover or remove signs that are not applicable to the site activities.

END OF SECTION

DIVISION 16 - ELECTRICAL

SECTION 16301 - EXTERIOR ELECTRICAL WORK

PART 1 - GENERAL

1.01 GENERAL CONDITIONS:

A. The General Conditions and Special Provisions preceding this Specification shall govern this section.

B. Specification and Plans complement each other and what is specified, scheduled or mentioned by one shall be binding as if called for by both. Specification and Plans are intended to specify nature, quantity and quality of electrical work.

C. Before bidding, visit project site, carefully review each section of the Specification and all Drawings of this Contract, and obtain from utility companies their standards, drawings and specifications for the work to be provided. Verify details, report any error, conflicts or omissions to the Owner's representative (hereafter referred to as Engineer) at least 10 calendar days before submission of bids for interpretation or clarification. If errors or omissions are not reported, Contractor shall provide necessary work at no cost to the Department to properly complete intent of Specification and Drawings.

By submitting a proposal of the work included in this contract, the Contractor shall be deemed to have made such examination and to be familiar with and accept all conditions of the job site.

1.02 WORK INCLUDED:

A. In general, provide complete underground electric, communications, and power systems within project boundaries. Furnish all labor, materials (except as hereinafter noted), tools, equipment and appliances required to provide and install all Electrical Work, complete, as indicated on the Drawings and/or as herein specified, and as required for its correct and proper operation. The Drawings note various sizes of equipment as determined for basis of design; the Electrical Work, however, shall be installed to comply with the equipment furnished by the successful supplier. The work shall include but not necessarily be limited to:

1. Complete underground raceway system including trenches, ducts, manholes, and boxes, to be used by the Hawaiian Electric Company (HECO) for their cables and equipment.

2. Complete underground raceway system including trenches, ducts, manholes, and boxes, to be used by Hawaiian Telcom (HTCO) for their cables and equipment.

3. Complete underground raceway system including trenches, ducts, manholes, and boxes, to be used by Oceanic Time Warner Cable (CATV) for their cables and equipment.

4. Coordinate work and arrange for periodic inspections by HECO, HTCO, CATV, City and County of Honolulu and State Inspectors and Engineer.

5. Pass test mandrel through all ducts and conduits, and make corrections as directed by inspectors or Engineer.

6. Provide pulling wire, No. 12 AWG galvanized steel or polypropylene cord, in all empty ducts and conduits, unless indicated otherwise. Provide duct measuring/cable pulling tape in all utility ducts and conduits.

7. Immediately report and pay for damages to existing equipment.

B. Obtain and pay for electrical permits, arrange for periodic inspection by local authorities and deliver certificate of final inspection to Engineer.

C. Contractor shall check and test the installation for completeness and functional operation as described by the Drawings and specified herein. Final test shall be in the presence of Engineer and representatives of the utility companies, and the City and State. Contractor shall arrange and pay for all testing costs. Should intermediate or final inspections of the duct system reveal crushed, damaged or impassable ducts, the Contractor shall repair those sections of duct system, including repairs to paved surfaces and concrete structures, at no additional cost to the State.

1.03 SPECIAL CONDITIONS:

A. Contractor shall install duct systems and schedule the electric and communications work within the timetable set by the General Contractor.

B. Contractor shall verify duct entry configurations and their locations, for each utility company's manhole and handhole with respective utility company.

C. Contractor shall make detailed arrangements for work by utility companies pertaining to this Contract. Payment to utility companies for their work shall be by the HCDA.

D. Arrange for the General Contractor to identify the locations of all civil site utilities (i.e. drain, water and sewer lines, etc.) and driveways prior to layout of electric and communications systems.

E. Contractor and General Contractor shall closely supervise and coordinate all electrical work with the utility companies to ensure that proper roadway drainage is maintained during construction. Should damage and erosion occur during construction, the Contractor or General Contractor shall repair

all damage and restore existing grade at no additional cost to the City and/or State.

1.04 RELATED WORK BY OTHERS:

A. Service cables and transformer(s), final connection thereto, and metering equipment by HECO. Obtain service raceway, grounding, transformer, and metering requirements before bidding, fabricating, constructing and installing. Make detailed arrangements for all work by utility company pertaining to Contract.

B. Telecommunications utility cables and equipment shall be by HTCO and CATV.

C. Equipment utilizing electricity shall be provided by respective sections of Specification. Furnishing of equipment controllers (motor starters), unless otherwise specified, and providing complete control and interlock is provided by respective section supplying equipment. Installation of complete feeder or branch circuit system, and power wiring to equipment and controllers shall be part of electrical work.

1.05 SUBMITTALS:

A. Submit in accordance with SECTION 01330 – SUBMITTALS AND SUBSTITUTIONS.

B. Shop Drawings: Within four weeks of award of Contract and prior to installation, submit complete shop drawings and manufacturer's literature for Engineer's review before any work is fabricated. Submit six sets of manufacturer's literature and/or fabrication drawings for the following:

1. Complete electric and utility system manholes, conduit and accessories. For utility system manholes, obtain approvals from respective utility company prior to submission for Engineer’s review.

2. Utility companies' drawings.

B. Prequalification: Brand names, manufacturer's names and catalog numbers indicate standard of design and quality required. Where materials or products specified herein are designated by manufacturer's name, any request to substitute materials or products other than those specified shall be approved by the Engineer. Burden of proof of equality of proposed substitutions will be the responsibility of the Contractor. List of substitute material together with qualifying data shall be submitted for approval at least ten days before bid opening.

Submission shall be as follows:

EXAMPLE:

Item	Manufacturer and Catalog Number Specified	Substitute Manufacturer And Catalog Number

Cable	John Doe - No. 3200	King - No. 2200

C. Shop drawings and catalogue cuts for substitute materials shall clearly specify compliance with and/or deviation from specified material. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; and "achieve the same end use and results as materials formulated in accordance with the referenced publications". Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance. Review of shop drawings and catalogue cuts shall not release Contractor from complying with intent of Drawings and Specifications.

D. Intent of Shop Drawing and Catalog Cut Review:

1. Shop drawing and catalog cut submittals processed by the Engineer are not Change Orders. The purpose of the submittals by the Contractor is to demonstrate to the Engineer that he understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use;

2. If deviations, discrepancies or conflicts between shop drawings and Specifications are discovered either prior to or after shop drawing submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed;

3. The fact that a manufacturer does not offer a specific option or meet a minimum guaranteed performance specification, called for herein or in a formal bid specification, is not deemed proprietary when such is available from one or more manufacturers.

E. Approvals rendered on shop drawings shall be considered as a guarantee of measurements or site conditions. Where drawings are approved, said approval does not relieve the Contractor from his responsibility for furnishing material or performing work as required by the Contract Drawings and Specifications.

1.06 GUARANTEE AND CERTIFICATE:

Defective materials and workmanship shall be removed and replaced at no cost to the Department. For period of one year after acceptance of work by the Department, materials and workmanship developing defects and malfunctions shall be repaired and/or replaced, to conform to intent of the Specification and Drawings at no additional cost to the Department.

PART 2 - PRODUCTS

2.01 GENERAL: All materials shall be new, except as specifically noted, and shall bear the label of Underwriters's Laboratories whenever standards have been established and label service is normally and regularly furnished by the agency.

2.02 MATERIALS:

A. Concrete Encased Conduits (for below grade use): Conduits for electric systems shall be round bore, PVC Schedule 40 plastic or approved equal. Conduits for communications systems shall be round bore, PVC Schedule 40 plastic or approved equal. Conduits for street lighting system shall be PVC Schedule 80.

B. Conduit and Duct Accessories: Couplings, spacers, plugs, and accessories shall be as recommended by the manufacturer of conduits and ducts and shall be of the same schedule as the ducts which are connected to it.

C. Wire Mesh: Welded steel wire fabric for reinforcing concrete, galvanized, conforming to ASTM Specification A185.

D. Concrete: Ready mixed type with compressive strengths as shown on Drawings. Concrete material and aggregates shall conform to latest ASTM Specifications. Concrete aggregates for ductlines shall be 3/4" maximum in size.

E. Backfill Material Type A: Black or beach sand, earth or earth and gravel mixture. Material used shall be non-expansive. If earth and gravel mixture, rock size shall be 1-inch or smaller and shall not contain more than 50% rock particles by volume. This fill shall be used over concrete encased ducts and over direct buried ducts after backfill Type B has been placed.

F. Backfill Material Type B: Black or beach sand, earth or earth and gravel mixture. Material used shall be non-expansive. If earth and gravel, mixture must pass a 2-inch screen and contain not more than 20% rock particles by volume. This fill shall be used all around direct buried conduits.

G. Hardware, Supports, Backing, Etc.: All hardware, supports, backing and other accessories necessary to install electrical equipment shall be provided. Wood materials shall be "wolmanized" treated against termites, iron or steel materials shall be galvanized for corrosion protection, and non-ferrous materials shall be brass or bronze.

PART 3 - EXECUTION

3.01 GENERAL:

A. Rules and Permit: The entire installation shall conform to ordinances of the City and County of Honolulu; General Order No. 10, Public Utilities Commission, State of Hawaii; and shall be made in strict accordance with the latest rules and regulations of the National Board of Fire Underwriters,

the currently adopted edition of the National Electrical Code (NEC) and the local Electrical Bureau. The Contractor shall obtain and pay for the electrical permit as required by local laws and rules. All work shall be inspected by the proper local authorities as it progresses. The Contractor shall pay all inspection fees and shall deliver certificates of completion and inspection to the Engineer before final payment will be made. Costs of permits and inspection fees shall be included in the Contractor's bid price.

B. Materials and Workmanship: All labor and materials of every kind shall be subject to the approval of the Engineer who shall be afforded every facility for ascertaining the competence of such labor and examining such materials as he may deem necessary. Concealed work shall be reopened at random as directed during formal inspection by Engineer or Electrical or Utility Inspector.

C. Qualification of Installers: For actual fabrication, installation and testing of the Work of this section, use only thoroughly trained and experienced workmen completely familiar with items required and with manufacturers' recommended methods of installation. In acceptance or rejection of installed work, no allowance will be made for lack of skill on part of workmen.

D. Construction Methods: Construction shall conform to construction practices as recommended by the American Electricians Handbook by Croft (latest edition), American National Standards Institute (ANSI), Edison Electric Institute, National Board of Fire Underwriters (NBFU), National Electrical Code (NEC), National Electrical Manufacturer's Association (NEMA), National Electrical Safety Code (NESC), National Fire Protection Association (NFPA), Underwriters' Laboratories, Inc. (UL) and applicable instructions of manufacturers of equipment and material supplied for this project.

E. Inspection: Skill and competency of workmanship shall be subject to the approval of the Engineer, inspectors of the utility companies, the State of Hawaii and the City and County of Honolulu. Notification for inspection shall be given to the respective companies or agencies three working days in advance of work.

F. Record Drawings: The Contractor shall maintain an accurate and adequate record of each change as it occurs, regardless of how ordered. As-built drawings shall be prepared in accordance with project requirements.

G. Plans and Specification: This specification is intended to cover all labor, materials and standards of workmanship to be employed in the work indicated on the plans and called for in the specification or reasonably implied therein. The plans and specification supplement one another. Any part of the work mentioned in one and not represented in the other, shall be done the same as if it has been mentioned in both. The Contractor shall not make alterations in the drawings and specification.

H. Discrepancies and Interpretations:

1. Should the Contractor find any discrepancies in or omissions from

any of the documents or be in doubt as to their meaning, he shall advise the Engineer who will issue any necessary clarification within a time period which does not disrupt the progress of the work.

2. All interpretation and supplemental instructions will be in the form of a written addenda to the Contract Documents.

3. Should any discrepancy arise from the failure of the Contractor to notify the Engineer, the higher quality or larger quantity of item shall prevail. Engineer shall make the final interpretation and judgment.

4. In the event of a discrepancy between small scale drawings and large scale details, or between drawings and specification, on which is in violation of any regulations, ordinances, laws or codes, the discrepancy, if known by the Contractor, shall be immediately brought to the attention of the Engineer for a decision before proceeding with the particular work involved. Work carried out disregarding these instructions will be subject to removal and replacement at the Contractor's expense.

I. Symbols: The standard electrical symbols together with the special symbols, notes and instructions shown on the drawings indicate the work and outlets required and are all to be included as a part of this specification.

J. Coordination: This specification is accompanied by plans, sections and elevations, and site plans indicating locations of all outlets, controls, service runs, and other electrical apparatus. These locations are approximate and, before installing, the Contractor shall study the adjacent civil utility and landscaping details and actually make the installation in the most logical manner. Any outlet may be relocated within ten feet before installation at the direction of the Engineer. The circuit routing is typical only and may be varied in any logical manner.

K. Before installation, verify all dimensions, conditions and sizes of equipment at job site. Installation shall be complete in every detail as specified and ready for use.

L. Work shall conform to ordinances of the City and County of Honolulu; latest edition of National Electrical Code (NEC); General Order No. 10, Public Utilities Commission, State of Hawaii; and Regulations and Standard Practices of HECo, HTCO and CATV.

M. Applicable rules, standards and specifications of following associations shall apply to materials and workmanship:

American National Standards Institute (ANSI)
Illumination Engineer Society (IES)
National Board of Fire Underwriters (NBFU)
National Electrical Manufacturer's Association (NEMA)
National Fire Protection Association (NFPA)
Underwriters' Laboratories, Inc. (UL)

Applicable instructions of manufacturers of equipment and material supplied for this project.

N. All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust-inhibiting treatment and standard finish by the manufacturer. All such parts as boxes, bodies, fittings, guards and miscellaneous parts made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A153. The Contractor shall not join dissimilar metals that will result in deterioration due to galvanic corrosion.

3.02 CONSTRUCTION REQUIREMENTS:

A. Trench Excavation:

1. Dimensions and locations of trenches for boxes, transformer and equipment pads, direct buried conduits and ductlines shall be as indicated on Drawings. Trench width and depths shall be sufficient to accommodate proper installation of conduit banks and cables.

2. Where a trench is excavated on slope, sides are to be vertical, and depth measured at lowest side. All measurements are to be based on final grades.

3. Bottom of trenches to be flat and smooth.

4. Trenches shall be widened at equipment pads, manhole, handhole, and pullbox sites to permit proper entry of conduits.

5. Trenches shall be approved by respective utility inspectors prior to any ducts being installed.

6. Sheathing and bracing as required shall be provided to support sides of excavations from cave-ins.

7. Provide drainage and pumps to keep trenches dry.

8. Saw cut all edges of existing sidewalks and pavement before trenching.

9. Excavated material may be placed alongside trench; however, it shall not interfere with utility company work.

B. Backfill:

1. Ducts, boxes, and conduit installations shall be approved by the respective inspector from utility company prior to backfilling. All excavations for boxes in excess of the required depths shall be filled with concrete or crushed lava rock.

2. Should material below utility company direct buried conduits not be

equal to 3" (thickness) of backfill material Type B, trench shall be deepened by 3", and backfilled with Type B backfill.

3. Backfilling shall be to finished grades indicated on accompanying Drawings, and matching existing conditions.

4. Backfill material shall be completely free of wood or other debris. Excavated material may be reused as backfill, providing that it conforms to the requirements of Type A and Type B backfill.

5. Type B backfill over conduits shall be installed under the supervision of the respective utility companies' inspector.

6. Backfill material shall be placed in maximum of 8" layers in loose thickness before compacting. Backfill shall be thoroughly compacted with hand or mechanical tampers to 95% of ASTM D1557 maximum dry density. In no case shall tamping be accomplished by using the wheels or tracks of a vehicle.

7. Backfill over conduit bends at transformer pads shall be Type A or better.

C. Installation of Conduit and Duct Bank:

1. Bottom of trench shall be clean, smooth, and well-graded and approved by utility company inspectors.

2. Saw cut, ream and taper ducts and conduits with manufacturers' approved tool.

3. Couplings and bells shall be tight to prevent entry of dirt or concrete into ducts and conduits. Stagger the joints of the ducts by rows and layers so as to provide a ductline having the maximum strength.

4. Provide spacers to maintain proper separation between ducts.

5. Changes of direction shall not exceed 4 degrees per length of conduit or duct. Radii and turns shall be made with appropriate duct bends and sweeps.

Horizontal bends for communications conduits/ducts shall be constructed with 25-foot minimum radius curves unless indicated otherwise or approved by the inspector or Engineer, respectively. Angled couplings are not permitted. If factory made bends are to be provided, the contractor shall demonstrate their suitability to the Engineer and inspectors by pulling the respective mandrel completely through the bend prior to installation. Vertical bends for communications conduits/ducts shall be constructed with 20-foot minimum radius curves unless indicated otherwise or approved by the respective inspector or Engineer.

6. Ducts shall be clean and free from debris and rubbish.

7. After each day's work, provide temporary watertight conduit plugs or seals at the end of conduit banks to prevent entry of dirt, rubbish, debris, or concrete.

8. Pass a test mandrel conforming to the respective utility company, City and County of Honolulu, State of Hawaii or the Engineer's requirements, through the entire length of each duct or conduit to test for burrs and obstructions. Unless indicated otherwise, mandrel shall be 14" long and shall have diameter of 2" less than inside diameter of duct. If burrs or obstructions are encountered, that section shall be replaced at no additional cost.

9. Unless indicated otherwise, install #12 AWG galvanized iron pulling wire or polypropylene cord, having a breaking strength of at least 200 pounds, in each conduit after testing.

    a. For electric utility company ducts, provide cable pulling tape (NEPTCO WP1800P Muletape or approved equal) in each new duct.

    b. For communication ducts, provide duct measuring/cable pulling tape (NEPTCO WP1800P Muletape or approved equal) in each new duct.

10. Terminate ducts in end-bells where ductlines enter manholes and handholes. Ducts shall enter handholes at 90 degree angle. Ducts entering handholes at angles other than 90 degrees may be permitted, but only when specified by the Engineer.

11. Apply thin coat of sealing compound on ducts and conduits at couplings and bells.

12. Conduits stubbed for future connections shall be plugged and marked.

13. Securely anchor duct banks prior to pouring concrete encasement to prevent ducts from floating. Utility Company duct banks shall be inspected and approved by the respective inspector prior to placing concrete and backfilling.

14. When pouring concrete, prevent heavy masses of concrete from falling directly on ducts. If unavoidable, protect ducts with plank.

15. Direct flow of concrete down sides of duct bank to bottom, allowing concrete to rise between ducts, filling all open spaces uniformly.

16. To ensure against voids in concrete, work a long, flat splicing bar or spatula liberally and carefully up and down the vertical rows of ducts. Mechanical vibrators shall be used for stacked duct banks of three ducts or higher.

17. Cure concrete for a minimum of 72 hours before permitting traffic and/or backfilling.

18. Warning Tapes:

    a. 6" wide warning tape, red in color with a black imprinted message ACAUTION ELECTRIC LINE BURIED BELOW@, shall be placed 12" below finish grade over electric ducts or the concrete jacket for electric ducts for the entire length of ductline installations.

    b. A 3" wide warning tape, orange in color with black imprinted message "CAUTION BURIED TELEPHONE CABLE BELOW" shall be placed 12" above HTCO ducts or the concrete jacket for said ducts for the entire length of ductline installations.

D. Concrete and Brick Work:

1. Concrete, ready mixed according to ASTM C94-98.

2. Convey concrete from mixer to forms rapidly to prevent segregation. Free drop shall be limited to five feet, unless authorized by inspector.

3. Placing:

    a. Clean and remove all debris from inside forms and trenches before placing concrete.

    b. Place concrete only on clean damp surfaces, free from water.

    c. Place concrete in forms, in horizontal layers not exceeding 18" thickness.

    d. Place concrete to avoid segregation of materials and displacement of ducts, inserts and reinforcing.

    e. Vibrate structural concrete thoroughly during and immediately after placing to ensure dense watertight concrete.

    f. Prior to placing concrete for utility company ductlines, the Contractor shall obtain the approval of the respective inspector.

4. Forming:

   a. Forms shall be of good sound lumber with sufficient strength and conforming to shapes and dimensions indicated on Drawings.

   b. Forms shall be treated with non-staining form oil immediately before each use.

5. Patching: Patch all voids, pour joints and holes before concrete is thoroughly dry. Use mortar of same proportions as original concrete.

6. Curing: Curing of concrete shall be accomplished by impervious membrane method with liquid membrane compound. Apply two or more coats to obtain a total of one gallon for each 150 square feet of concrete surface.

7. Reinforcing Steel:

   a. Clean reinforcing of mill or rust scale and form to dimensions indicated.

   b. Install reinforcing in proper locations and secure in place to prevent movement during concrete placing or vibrating.

8. Concrete Brick and Hollow Concrete Block Work:

   a. Concrete brick and hollow block shall be laid in full bed of mortar, both horizontally and vertically.

   b. Mortar shall be one part (by volume) cement and three parts (by volume) fine aggregate, thoroughly mixed and used when fresh. Retampering will not be allowed. Mortar shall have a minimum 28 days strength of 2,500 psi.

   c. Setting bed shall be of depth required to bring top of blocks flush with finish line.

E. Structural Steel and Miscellaneous Metal Work: Structural steel work including bolts, nuts, anchors, pulling-in irons, etc. shall be galvanized by hot-dipped process after fabrication into largest practical sections.

3.03 EXISTING UNDERGROUND UTILITIES:

Underground utilities indicated on plans are approximate in location. It is not the intention of plans to imply that all existing utilities are drawn and located. It shall be the responsibility of Contractor to coordinate locations of existing utilities prior to doing any excavation work. Any damage to existing utilities shall be repaired by Contractor at no cost to the Department.

3.04 CLEANING AND REPAIRING:

A. During the progress of work, all rubbish, waste lumber, displaced materials, etc. shall be removed as soon as possible and upon completion of the work, Contractor shall remove from Owner's property and from all public and private property, at his own expense, all temporary structures, rubbish and waste material resulting from his operations.

B. The Contractor shall restore all removed or damaged pavement, gutters, curbs, sidewalks, sign posts, trees and landscape damaged by his operations to as near their original condition or better.

3.05 TESTS:

A. Ground Resistance: Ground resistance measurements of each ground rod shall be taken and certified by the Contractor. Ground resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds. Upon completion of the project, the Contractor shall submit in writing to the Engineer, the measured ground resistance of each ground rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made.

B. Test all 600 volt class conductors to verify that no short circuits or accidental grounds exist. Make tests using an instrument which applies a voltage of approximately 500 volts to provide a direct reading in resistance, and measure the insulation resistance from phase to phase and phase to neutral. All test results shall be recorded and submitted.

C. Wherever test or inspection reveals faulty materials or installation, Contractor shall take corrective action, at his own expense, repairing or replacing materials or installation as directed. The materials or installation shall then be retested.

END OF SECTION