Engineering Division

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
Honolulu, Hawaii

BOARD OF LAND AND NATURAL RESOURCES

Suzanne D. Case
Chairperson

CONTRACT SPECIFICATIONS AND PLANS

Job No. 500CK30B
Mana Drag Racing Strip Improvements Phase 2
Electrical Upgrades
Kauai, Hawaii

Civil Engineer:	The Limtiaco Consulting Group, Inc.
Electrical Engineer:	InSynergy Engineering, Inc.

April 2016

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DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
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Approved: _____

CARTY S. CHANG, P.E.
Chief Engineer
Engineering Division

April 2016

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NOTICE TO BIDDERS

(Chapter 103D, HRS)

COMPETITIVE BIDS for Job No. **500CK30B, MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2, ELECTRICAL UPGRADES** shall be submitted to the Department of Land and Natural Resources, Engineering Division on the specified date and time through the Hawaii State e-Procurement (HIePRO). HIePRO is accessible through the State Procurement Office website at www.spo.hawaii.gov.

The Department of Land and Natural Resources Interim General Conditions dated October 1994, as amended, and the General Conditions-AG008, latest revision shall be made a part of the specifications.

The project is located at TMK: (4) 1-2-002: 36, 40 & 009 (Por.), Kekaha, Waimea, Kauai, Hawaii.

The work shall generally consist of new overhead and underground electrical improvements, transformers, distribution and control panels, and lighting.

Due to the nature of work contemplated, bidders must possess a valid State Contractor's license, classification "C-13".

A **voluntary** pre-bid conference will be held at Mana Drag Racing Strip, Kekaha, Kauai, on May 17, 2016 at 10:00 a.m, near the drag racing strip start line.

Pre-bid substitution requests for the Track Lighting shall be submitted before May 21, 2016, 2:00 p.m. Please see the INFORMATION AND INSTRUCTIONS TO BIDDERS section of this solicitation for submittal requirements.

The estimated cost of construction is $250,000 to $500,000.

The award of the contract, if it be awarded, will be subject to the availability of funds.

This project is subject to preference to Hawaii Products established by Section 103D, Hawaii Revised Statutes. The Hawaii Product List may be examined at the State Procurement Office website.

Since the estimated cost of construction is $250,000 or more, the apprenticeship agreement preference pursuant to Hawaii Revised Statutes §103-55.6 (ACT 17, SLH 2009) shall apply.

Should there be any questions, please refer to the HIePRO solicitation.

INFORMATION AND INSTRUCTIONS TO BIDDERS

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INFORMATION AND INSTRUCTIONS TO BIDDERS

A. PROJECT LOCATION AND SCOPE OF WORK: The project location and scope of work shall be as generally described in the Notice to Bidders.

B. PROPOSALS: Bidders shall submit their bid, including the completed proposal form, bid bond, and any other documents required by the solicitation as part of their bid through the State of Hawaii e-Procurement System (HIePRO). See Item D, PROPOSAL FORM.

C. GENERAL CONDITIONS: The Department of Land and Natural Resources Interim General Conditions dated October 1994, as amended, shall be made a part of these contract specifications and are referred to hereafter as the General Conditions.

D. PROPOSAL FORM: **The Bidders shall fill out and upload the electronic copy of the proposal form to the HIePRO website when submitting the bid. Bid Proposals shall not be mailed, faxed or delivered to the State, unless requested to do so after the designated closing date. The successful Bidder shall fill out and print a hard copy of the proposal form, sign and submit the form with the contract award package.**

The Bidders shall submit as a part of their bid, a letter listing the manufacturer and model name of the track lighting system they propose to offer in line item No. 34, 36, 47 and 48 of their bid proposal. If a bidder lists an unapproved system manufacturer or model, the bidder shall submit product information for approval as indicated in Item JJ, PRE-BID REQUEST FOR SUBSTITUTION FOR TRACK LIGHTING. If a bidder fails to list a name or lists an unapproved manufacture and model without submitting a substitution request and approved product information, their bid will be deemed irregular and will be rejected.

E. OMISSIONS OR ERASURES: Any proposal which contains any omission or erasure or alteration not properly initialed, or conditional bid, or other irregularity may be rejected by the Board of Land and Natural Resources (Board).

F. NOTICE OF INTENT TO BID AND QUESTIONNAIRE:
A Notice of Intent to Bid is not required for this project. In compliance with HRS Section 103D-310, the lowest responsive and responsible bidder may be required to complete a questionnaire. When requested by the State, the completed questionnaire shall be submitted to the Chief Engineer for evaluation. Failure to furnish the requested information within the time allowed may be grounds for a determination of non-responsibility, in accordance with HRS Section 103D-310 and HAR Section 3-122-108.

G. BID SECURITY: A bid security will be furnished by each bidder as provided in sub-section 2.7 of the General Conditions. The successful bidder's bid security will be retained until Contract execution and furnished a performance and payment bond in an amount equal to one hundred percent (100%) of the total Contract price, including an amount estimated to be required for extra work, is furnished.

The Board reserves the right to hold the bid securities of the four lowest bidders until the successful bidder has entered into a contract and has furnished the required performance bond. All bid securities will be returned in accordance with sub-section 3.5 of the General Conditions.

Should the successful bidder fail to enter into a contract and furnish a satisfactory performance bond within the time stated in the proposal, the bid security shall be forfeited as required by law.

H. CONTRACTOR'S LICENSE REQUIRED: The Board will reject all bids received from contractors who have not been licensed by the State Contractors License Board in accordance with Chapter 444, HRS; Title 16, Chapter 77, Hawaii Administrative Rules; and statutes amendatory thereto.

I. IRREGULAR BIDS: No irregular bids or propositions for doing the work will be considered by the Board.

J. WITHDRAWAL OF BIDS: No bidder may withdraw his bid between the time of the opening thereof and the award of contract.

K. EVALUATION OF CRITERIA:

1. The total lump sum base bid price and additives will be adjusted to reflect the applicable preferences

2. Evaluating Bids with Additive Bid Items:

   a. After bid opening, the State will announce the project control budget. All bids will be evaluated on the basis of the same additive item.

   b. After adjusting for applicable preferences, the additives, in their precedence order, are added to the total lump sum base bid price. This (these) sum(s) are compared to the project control budget, and must be within the project control budget.

   c. If adding another additive would make the aggregate amount exceed the project control budget for all bidders, that additive will be skipped and the next additive will be added, provided an award might be made within the project control budget. This procedure will continue, until adding any remaining additives will result in the aggregate total amount for all the bidders to exceed the project control budget, or until no additional additives remain.

   d. The bidder with the lowest aggregate amount, within the project control budget (after application of the various preferences), for the total lump sum base bid plus the additives in their precedence order, is the "Low Bidder" for that project and is designated for award.

e. Additive Bid Example: The project control budget available is $100,000. In the order of precedence, bid additive 1, 3, 4, 5, and 6 are additive bids. After applying the preferences, the bids are ranked lowest price to highest price and are "Bid A", "Bid B", "Bid C", "Bid D" and "Bid E". Bid A's total lump sum base bid price and three additive bids (in the precedence order) are $80,000, $16,000, $10,000 and $5,000 respectively. Bid B's total lump sum base bid price and three additive bids (in the precedence order) are $82,000, $10,000, $9,000 and $3,000 respectively. Bid C's total lump sum base bid price and three additive bids (in the precedence order) are $85,000, $10,000, $8,000 and $4,000 respectively.

(1) In adding the additives to the bids, bid 1 is under the project control budget for all bids. The second bid additive 2 is initially skipped since it would cause the aggregate amount of all bids to exceed $100,000. The third bid 3 is added and the aggregate amounts, including base bid price plus bids 1 and 3, of both Bid B and Bid C, are under the project control budget.

(2) Bid A's aggregate total is $101,000. Bid B's aggregate total is $95,000. Bid C's aggregate total is $99,000.

(3) Bid B's price including bids A-1 and A-3 is the lowest bid price (over Bid C) and has an aggregate amount within the adjusted project control budget, and therefore is designated the "Low Bidder" for the project.

L. METHOD OF AWARD:

1. The contract will be awarded to the lowest responsive and responsible Bidder whose bid (including any additive which may be selected) meets the requirements and criteria set forth in the solicitation documents and as determined by the Comptroller.

2. In the event the Lump Sum Base Bid of all bidders exceeds the project control budget, the Department reserves the right to make an award to the bidder with the lowest total lump sum base bid, after application of the preferences is designated, if additional funds are available or by reducing the scope of work through negotiation.

M. SUCCESSFUL BIDDER TO FILE PERFORMANCE AND PAYMENT BONDS: The successful bidder will be required to file performance and payment bonds each; in the amount equal to the total contract price, including amounts estimated to be required for extra work, as provided in sub-section 3.6 of the General Conditions.

N. NUMBER OF EXECUTED ORIGINAL COUNTERPARTS OF CONTRACT DOCUMENTS: If requested by the Board, six copies of the Contract, performance and payment bonds shall be executed.

O. CHANGE ORDERS: No work of any kind in connection with the work covered by the plans and specifications shall be considered as change order work, or entitle the Contractor to extra compensation, except when the work has been ordered in writing by the Chief Engineer (Engineer) and in accordance with sub-section 4.2 of the General Conditions.

The Contractor shall clearly identify and inform the Engineer in writing of any deviations from the contract documents at the time of submission and shall obtain the Engineer's written approval to the specified deviation prior to proceeding with any work.

P. WAGES AND HOURS: In accordance with sub-sections 7.3 to 7.9 of the General Conditions relative to hours of labor, minimum wages and overtime pay, the current minimum wage rates promulgated by the Department of Labor and Industrial Relations (DLIR) shall be paid to the various classes of laborers and mechanics engaged in the performance of this contract on the job site. The minimum wages shall be increased during the performance of the contract in an amount equal to the increase in the prevailing wages for those kinds of work as periodically determined by the DLIR.

The Department of Land and Natural Resources will not recognize any claim for additional compensation because of the payment by the Contractor of any wage rate in excess of the said minimum wage rates. The possibility of wage increase is one of the elements to be considered by the Contractor in determining his bid, and will not, under any circumstances, be considered as the basis of a claim against the Department under this Contract.

No work shall be done on Saturdays, Sundays, legal State holidays, and/or in excess of eight (8) hours each day without the written consent of the Engineer. Should permission be granted to work at such times, the Contractor shall pay for all inspection administrative costs thereof. No work shall be done at night unless authorized by the Engineer.

Q. PERMITS: The State will process permit applications whenever possible, and the Contractor shall procure the pre-processed permits and pay the required fees. If permit applications are not processed by the State, the Contractor shall process the permit applications, permits and licenses, and pay all charges and fees. In all cases, the Contractor shall give all notices necessary and incident to the due and lawful prosecution of the work.

R. PROPERTY DAMAGE: It shall be the responsibility of the contractor to respect State property and to prevent damage to existing improvements. The Contractor will be responsible for damages resulting from construction operations. Immediately upon discovery, the Contractor shall repair such damage to the satisfaction of the Engineer.

All trees and shrubbery outside the excavation, embankment or construction limits shall be fully protected from injury.

S. TIME: The time of completion is specified in the Proposal. It is the Board's intention to insist the Contractor diligently prosecute the work to completion within the specified time.

Prospective bidders are reminded that the State has the option to proceed with or abandon a project depending on whether the project can be completed for occupancy in the specified time.

It is the bidder's responsibility to check the availability of all materials before bidding. The bidder shall select sub-contractors and suppliers who can warrant availability and delivery of all specified or qualified materials to assure project completion within the specified time.

The successful bidder must assume all risks for completing the project by the specified date. There shall be no extension of time for any reason except for delays caused by acts of God, labor disputes involving unions, or actions of the State. If for any reason the project falls behind schedule, the Contractor shall at its own cost, take necessary remedial measures to get the project back on schedule, i.e., working overtime, air freighting all materials, etc. In addition, if the Contractor fails to fully complete the project by the completion date, Contractor will be required to make the facility usable at its own cost.

T. BIDDER'S RESPONSIBILITY TO PROVIDE PROPER SUPERINTENDENCE: The successful low bidder shall designate in writing to the Engineer the name of its authorized superintendent (Superintendent), who will be present at the job site whenever any work is in progress. The Superintendent shall be responsible for all work, receiving and implementing instructions from the Engineer in a timely manner. The cost for superintendence shall be considered incidental to the project.

If the Superintendent is not present at the site of work, the Engineer shall have the right to suspend the work as described under sub-section 5.5 c. and 7.20 - Suspension of Work of the General Conditions.

U. LIQUIDATED DAMAGES: Liquidated damages in the amount specified in the Proposal will be assessed for each and every calendar day from and after the expiration of the time period stated in the Contract for the completion of the project.

V. HIRING OF HAWAII RESIDENTS: The Contractor shall comply with Act 68, SLH 2010, in the performance and for the duration of this contract. The Contractor shall ensure that Hawaii residents compose not less than eighty percent of the workforce employed to perform the contract work on the project. The eighty percent requirement shall be determined by dividing the total number of hours worked on the contract by Hawaii residents, by the total number of hours worked on the contract by all employees of the Contractor in the performance of the contract. The hours worked by any Subcontractor of the Contractor shall count towards the calculation for this section. The hours worked by employees with shortage trades, as determined by the Department of Labor and Industrial Relations (DLIR), shall not be included in the calculation for this section.

The requirements shall apply to any subcontract of $50,000 or more in connection with the Contractor, that is, such Subcontractors must also ensure that Hawaii residents compose not less than eighty percent of the Subcontractor's workforce used to perform the subcontract.

W. WATER AND ELECTRICITY: The Contractor shall make all necessary arrangements and pay all expenses for water and electricity used in the construction of this project.

X. PUBLIC CONVENIENCE AND SAFETY: The Contractor shall conduct construction operations with due regard to the convenience and safety of the public at all times. No materials or equipment shall be stored where it will interfere with the safe passage of public traffic. The Contractor shall provide, install, and maintain in satisfactory condition, all necessary signs, flares and other protective facilities and shall take all necessary precautions for the protection of the work and the convenience and safety of the public. The Engineer shall have the right to suspend the performance of the work in accordance with sub-section 7.20 - Suspension of Work of the General Conditions.

Y. WORK TO BE DONE WITHOUT DIRECT PAYMENT: Whenever the contract that the Contractor is to perform work or furnish materials of any kind for which no price is fixed in the contract, it shall be understood that the Contractor shall perform such work or furnish said materials without extra charge or allowance or direct payment of any sort. The cost of performing such work or furnishing said material is to be included by the Contractor in a unit price for the appropriate item unless it is expressly specified that such work or material is to be paid for as extra work.

Z. AS-BUILT DRAWINGS: As-built drawings, the intent of which is to record the actual in-place construction so that any future renovations or tie-ins can be anticipated accurately, shall be required. All authorizations given by the Engineer to deviate from the plans shall be drawn on the job site plans. All deviations from alignments, elevations and dimensions which are stipulated on the plans shall be recorded on the as-built drawings. Final as-built drawings shall be submitted to the Engineer for review and approval. After the Engineer approves the as-built drawings, the contractor shall submit an electronic copy in Adobe PDF format on CD ROM.

AA. ASBESTOS CONTAINING MATERIALS: The use of asbestos containing materials or equipment is prohibited. The Contractor shall insure that all materials and equipment incorporated in the project are asbestos-free

BB. WORKER SAFETY: The Contractor shall provide, install and maintain in satisfactory condition all necessary protective facilities and shall take all necessary precautions for the protection and safety of its workers in accordance with the Occupational Safety and Health Standards for the State of Hawaii. The Engineer shall have the right to suspend the performance of the work in accordance with sub-section 7.20 - Suspension of Work of the General Conditions.

CC. TOILET FACILITIES: All toilet facilities constructed at the project site shall be in accordance with the Public Health Regulations of the State Department of Health (DOH). All necessary precautions shall be observed at the project site. The use of sanitary facilities shall be strictly enforced and workers violating these provisions shall be promptly discharged.

DD. SIGNS: Whenever the project involves closing or obstructing any public thoroughfare, the Contractor shall provide traffic signs conforming to the applicable provisions of the current edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways", published by the Federal Highway Administration as directed by the Engineer for the purpose of diverting or warning traffic prior to the construction area. All traffic signs shall bear proper wording stating thereon the necessary information as to diverting or warning traffic.

When indicated in the Proposal, the Contractor shall provide a project sign, size 4'-0" x 7'-0" to be placed as directed by the Engineer. The sign shall be constructed in accordance with Section 01581 - Project Sign of these specifications and approved by the Engineer. All wording, type and size of lettering and color selection shall be as specified in these specifications or as approved by the Engineer.

All signs shall be kept neat and clean, and properly erected at all times.

EE. FIELD OFFICE AREA FOR DEPARTMENT: When indicated in the Proposal, the Contractor shall provide a housed working area of at least 100 square feet adjacent to the Contractor's office for the Department's use. This area will be used by the Engineer to perform tests and to store equipment. As a minimum, the field office shall include the following: standard sized office desk and chair, lighting, ventilation, window-type air conditioning rated at 5,000 BTU, door and window with locking hardware, electrical outlets, and working communications facilities (a cellular telephone is acceptable). The Department will pay for all long distance toll charges made by the Engineer.

FF. QUANTITIES: All bids will be compared on the basis of quantities of work to be done as shown in the Proposal; the quantities shown in the Unit Price items are estimated, being given as a basis for comparison of bids. The Board reserves the right to increase or decrease the quantities given under the items or delete items entirely as may be required during the progress of the work.

GG. OTHER HEALTH MEASURES: Forms of work site exposure or conditions which may be detrimental to the health or welfare of workers or of the general public shall be eliminated or reduced to safe levels as required by the DOH codes, standards, and regulations. Suitable first aid kits and a person qualified to render first aid, as specified in the DOH regulations, shall be provided at all times when work is scheduled.

HH. HAWAII BUSINESS OR COMPLIANT NON-HAWAII BUSINESS REQUIREMENT: Bidders (Contractors) shall be incorporated or organized under the laws of the State or be registered to do business in the State as a separate branch or division that is capable of fully performing under the contract, as stipulated in §3-122-112 HAR.

II. COMPLIANCE WITH §3-122-112 HAR:

As a condition for award of the contract and as proof of compliance with the requirements of 103D-310(c) HRS, the apparent low bidder shall furnish the required documents to the Department. If the valid required certificates are not submitted on a timely basis for award of a contract, a bidder otherwise responsive and responsible may not receive the award. Bidder is responsible to apply for and submit the following documents to the Department.

A. TAX CLEARANCE REQUIREMENTS (HRS Chapter 237): Bidder shall obtain a tax clearance certificate from the Hawaii State Department of Taxation (DOTAX) and the Internal Revenue Service (IRS). The certificate is valid for six months from the most recently approved stamp date on the certificate; the certificate must be valid on the date received by the Department.

B. Department of Labor (DLIR) "**Certificate of Compliance**". (HRS Chapter 383 - Unemployment Insurance, Chapter 386 - Workers' Compensation, Chapter 392 - Temporary Disability Insurance, and 393 – Prepaid Health Care): Bidder shall obtain a certificate of compliance from the Hawaii State Department of Labor and Industrial relations (DLIR). The certificate is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

C. Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG) "**Certificate of Good Standing**". Bidder shall obtain a certificate of good standing issued by the Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG). The certificate of good standing is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

Alternately, instead of separately applying for these certificates at the various state agencies, bidder may choose to use the Hawaii Compliance Express (HCE), which allows businesses to register online through a simple wizard interface at http://vendors.ehawaii.gov to acquire a "Certificate of Vendor Compliance" indicating the bidder's status is compliant with the requirements of §103D-310(c), HRS, and shall be accepted for contracting and final payment purposes. Bidders that elect to use the new HCE services will be required to pay an annual fee of $15.00 to the Hawaii Information Consortium, LLC (HIC). Bidders choosing not to participate in the HCE program will be required to provide the paper certificates as instructed in the previous paragraphs.

JJ. PRE-BID REQUEST FOR SUBSTITUTION FOR TRACK LIGHTING

If bidders would like to provide an alternate track lighting system than what is specified in the plans and specification, a written substitution request shall be submitted through the HIePRO system and emailed to the Engineer. Substitution request will need to be submitted by the specified date and time stated in Notice to Bidders and shall include a statement of variances and all required product information specified in Section 16531 – Track Lighting. The statement of variances must list all features of the proposed substitution which differ from the contract documents, and must further certify that the

substitute has no other variant features. The brochures must include sufficient evidence to enable the State to evaluate each feature listed as a variance. Should an unlisted variance be discovered after installation or delivery of the item, the Contractor shall immediately replace the item with the specified item at no cost to the State and without any extension to the contract completion time.

The written substitution request shall be submitted in the following format:

SECTION ITEM SPECIFIED SUBSTITUTE VARIANCE

(A sample Request for Substitution form is provided in the following appendices)

If sufficient evidence to make a determination of acceptability of the proposed substitute does not accompany a request for substitution, the request shall be denied unless the State allows further evidence to be submitted to qualify the same model and provided that such evidence is submitted prior to the specified deadline unless such period is extended by the State.

Substitution requests not complying with the above requirements will be denied.

Approved substitutions will be posted in an addendum after the submittal date and prior to bid opening and the requestor will be notified whether their substitution request is approved or not. Substitution requests are only permitted for the track lighting system. **The Bidders shall submit as a part of their bid, a letter listing the manufacturer and model name of the track lighting system they propose to offer in line item No. 34, 36, 47 and 48 of their bid proposal. If a bidder lists an unapproved system manufacturer or model, the bidder shall submit product information for approval as indicated in Item JJ, PRE-BID REQUEST FOR SUBSTITUTION FOR TRACK LIGHTING. If a bidder fails to list a name or lists an unapproved manufacture and model without submitting a substitution request and approved product information, their bid will be deemed irregular and will be rejected.**

(REQUEST FOR SUBSTITUTION - SAMPLE)

DATE: _____

(Email to: Adrian.n.chang@hawaii.gov before 5/21/2016 2:00 pm)

To Whom it May Concern:

SUBJECT: REQUEST FOR SUBSTITUTION

PROJECT TITLE: Mana Drag Racing Strip Improvements Phase 2
Electrical Upgrades
Job No. 500CK30B

In accordance with the requirements of the Special Provisions, we hereby submit for substitution the descriptive literature, technical brochures and/or plans, and statement of variances for your review and approval for the item(s) shown below:

SECTION/ ITEM	SPECIFIED BRAND	SUBSTITUTE OR ALTERNATE BRAND	VARIANT FEATURES
16531 Track Lighting			

I further certify that my request for substitution of the above item(s) has no other variant features.

_____
COMPANY

_____
SIGNATURE Date

_____
ITS

NOTE: 1. Use own letterhead.
2. Sign and email a copy of the letter.
3. If no variant feature, indicate "None".
4. Submit the literature, technical brochures and/or plans
5. Shall be emailed before 5/21/2016 2:00 pm

PROPOSAL

FOR

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
State of Hawaii

JOB NO. 500CK30B
MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2, ELECTRICAL UPGRADES

_____, 20__

Chief Engineer
Engineering Division
Department of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Dear Sir:

The undersigned, having carefully examined the local conditions and all available records and information covering conditions which may affect the cost of the work to be performed, and having carefully examined the Plans and Specifications, and other contract documents, hereby proposes to furnish and pay for all materials, tools, equipment, labor and other incidental work necessary for the electrical and lighting upgrades, and all appurtenances as required or called for in this Proposal, all according to the true intent and meaning of the Notice to Bidders, Information and Instructions to Bidders, Proposal, Detailed Specifications, Interim General Conditions, Plans, and any and all addenda for:

JOB NO. 500CK30B
MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2, ELECTRICAL UPGRADES

on file in the office of the Engineering Division for the TOTAL SUM BID (Items 1 thru 29) of:

_____

_____Dollars ($_____)
and will fully complete all work under this contract within _180_ consecutive calendar days, inclusive of the KIUC infrastructure improvements, from the date of written notice to proceed, including date of said order, said total sum being itemized on the following pages.

MANA DRAGE RACING STRIP IMPROVEMENTS PHASE 2
ELECTRICAL UPGRADES
Job No. 500CK30B

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			BASIC BID		
General Site Improvements					
1	L.S.		Mobilization and Demobilization, including demolition, restoration, cleanup, permit fees, and all incidentals (Not to exceed 10% of the subtotal Basic Bid)	$ _____	$ _____
2	L.S.		Temporary Erosion and Sediment Control, in place complete	$ _____	$ _____
3	L.S.		Construction Layout, including survey before and after site improvements and flood certification	$ _____	$ _____
Electrical Improvements					
4	1	EA	Switchboard Concrete Equipment Pad	$ _____	$ _____
5	1	EA	Transformer Concrete Equipment Pad	$ _____	$ _____
6	1	EA	Meter Enclosure Concrete Equipment Pad	$ _____	$ _____
7	4	EA	Stanchions	$ _____	$ _____
8	1	EA	3' X 5' Handhole	$ _____	$ _____
9	2	EA	2' X 4' Handhole (EHH-10 to EHH-11)	$ _____	$ _____
10	1	EA	NEMA 4X 316 Stainless Steel Enclosure	$ _____	$ _____
11	1	EA	NEMA 1 Integrated Switchboard	$ _____	$ _____
12	1	EA	NEMA 3R 316 Stainless Steel Enclosure	$ _____	$ _____
13	1	EA	Lockable Cabinet	$ _____	$ _____
14	2	EA	Push Button Controls	$ _____	$ _____
15	60	L.F.	4" PVC Duct, Schedule 40	$ _____	$ _____
16	750	L.F.	2" PVC Duct, Schedule 80	$ _____	$ _____
17	175	L.F.	1" PVC Duct, Schedule 80	$ _____	$ _____

MANA DRAGE RACING STRIP IMPROVEMENTS PHASE 2
ELECTRICAL UPGRADES
Job No. 500CK30B

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
18	20	L.F.	#500kcmil Wire	$ _____	$ _____
19	20	L.F.	#1/0 Wire	$ _____	$ _____
20	2	EA	Receptacle, Duplex, GFCI, Weather Proof, 120V	$ _____	$ _____
21	115	C.Y.	Trenching and Backfill for Direct Buried Electrical Conduit	$ _____	$ _____
22	20	C.Y.	Trenching and Backfill for Concrete Encased Electrical Conduit	$ _____	$ _____
23	8	C.Y.	Concrete for Electrical Encasement	$ _____	$ _____
24	L.S.		Project Sign	$ _____	$ _____
25	* Allowance		Field Office		$ 14,000.00
26	* Allowance		KIUC Customer Contribution		$ 200,000.00
27	* Allowance		KIUC Underground Service Fee		$ 40,000.00
28	* Allowance		Archaeological Monitoring		$ 48,000.00
29	* Allowance		Biological Monitoring		$ 14,000.00

****

TOTAL SUM BASIC BID
(Items 1 thru 29, Inclusive) **$** _____

MANA DRAGE RACING STRIP IMPROVEMENTS PHASE 2
ELECTRICAL UPGRADES
Job No. 500CK30B

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			ADDITIVE NO. 1		
Handhole and Conduit (EHH-9 to EHH-2A)					
30	8	EA	2' X 4' Handhole; 625 LF 2" PVC Duct; Excavation and Backfill (EHH-10 to EHH-2B); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
31	1	EA	2' X 4' Handhole; 300 LF 2" PVC Duct; Excavation and Backfill (EHH-2B to EHH-2A); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
32	1	EA	3900 LF of #4/0 Wire, 1300 LF of #2 Wire, and all incidentals, in place complete (Switch Board to EHH-2B)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.1 (Item 30 thru 32, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 2		
Wiring (Switchboard to EHH-19)					
33	* Allowance		Electronic Scoreboard, including all incidentals, in place complete		$ 60,000.00
			TOTAL SUM ADDITIVE NO.2 (Item 33, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 3		
Track Lighting System (P2)					
34	1	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P2)	$ _____	$ _____
35	1	EA	4200 LF of #4/0 Wire, 1400 LF of #2 Wire, and all incidentals, in place complete (Switch Board to EHH-2A)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.3 (Item 34 thru 35, Inclusive)		**$** _____
			**********		

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			ADDITIVE NO. 4		
Track Lighting System (P3)					
36	1	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P4)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.4 (Item 36, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 5		
Handhole and Conduit (EHH-2A to EHH-1)					
37	1	EA	2' X 4' Handhole; 320 LF 2" PVC Duct; Excavation and Backfill (EHH-2A to EHH-1); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.5 (Item 37, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 6		
Handhole and Conduit (EHH-11 to EHH-19)					
38	1	EA	2' X 4' Handhole; 465 LF 2" PVC Duct; 465 LF 1 1/2" PVC Conduit; Excavation and Backfill (EHH-11 to EHH-12); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
39	1	EA	2' X 4' Handhole; 630 LF 2" PVC Duct; 100 LF 1 1/2" PVC Conduit; Excavation and Backfill (EHH-12 to EHH-13 and Tower); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
40	5	EA	2' X 4' Handhole; 630 LF 2" PVC Duct; Excavation and Backfill (EHH-13 to EHH-18); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
41	1	EA	2' X 4' Handhole; 430 LF 2" PVC Duct; Excavation and Backfill (EHH-18 to End); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____

TOTAL SUM ADDITIVE NO.6
(Item 38 thru 41, Inclusive) **$** _____

****

ADDITIVE NO. 7

Wiring (Switchboard to EHH-1)

42	4,800	LF	#4/0 Wire	$ _____	$ _____
43	1,600	LF	#2 Wire	$ _____	$ _____

TOTAL SUM ADDITIVE NO.7
(Item 42 thru 43, Inclusive) **$** _____

****

ADDITIVE NO. 8

Wiring (Switchboard to EHH-19)

44	10,200	LF	#4/0 Wire	$ _____	$ _____
45	3,400	LF	#2 Wire	$ _____	$ _____
46	1,800	LF	#12 Wire	$ _____	$ _____

TOTAL SUM ADDITIVE NO.8
(Item 44 thru 46, Inclusive) **$** _____

****

ADDITIVE NO. 9

Track Lighting System (P1, P3, P5 to P11)

47	9	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P1, P3, P5 to P11)	$ _____	$ _____

TOTAL SUM ADDITIVE NO.9
(Item 47 Inclusive) **$** _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			ADDITIVE NO. 10		
Track Lighting System (P12 to P19)					
48	8	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P12 to P19)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.10 (Item 48 Inclusive)		**$** _____
			ADDITIVE NO. 11		
Spectator Area					
49	4	EA	Additional Erosion Control	$ _____	$ _____
50	4	EA	2' X 4' Handhole (EHH-20 to EHH-23)	$ _____	$ _____
51	1,300	L.F.	2" PVC Duct, Pull String, End Cap	$ _____	$ _____
52	80	C.Y.	Excavation and Backfill for Electrical Work, including disposal, including all incidentals	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.11 (Items 49 thru 52, Inclusive)		**$** _____

HAWAII PRODUCTS PREFERENCE AND/OR USE OF HAWAII PRODUCTS

In accordance with Act 175, SLH 2009, the Hawaii products preference is applicable to this solicitation. Hawaii products may be available for items noted on the Offer Form. The Hawaii Products List is available on the SPO webpage at http://hawaii.gov/spo. Click on *Procurement of Goods, Services and Construction-Chapter 103D, HRS*; under *Procurement* click on *Preferences*, *Hawaii Products* and select *Hawaii Products List* to view.

Bidder offering a Hawaii product ("HP") shall identify the HP in the table below. Any person desiring a Hawaii product preference shall have the product(s) certified and qualified, if not currently on the Hawaii Products List, prior to the deadline for receipt of offer(s) specified in the procurement notice and solicitation. The responsibility for certification and qualification shall rest upon the person requesting the preference.

Persons desiring to qualify their product(s) not currently on the Hawaii Product List, shall complete Form SPO-38, *Certification for Hawaii Product Preference*, and submit the completed form to the Procurement Officer providing any additional information required by the Procurement Officer. One form shall be completed and submitted for each product. Form SPO-38 is available on the SPO webpage at http://hawaii.gov/spo, under the *Quicklinks* menu click on *Forms for Vendors/Contractors/Services Providers*.

For the purpose of selecting the low bid when a solicitation contains both HP and non-HP, the price offered for a HP item shall be decreased by subtracting 10% for the class I or 15% for the class II HP item(s) offered. The lowest total offer, taking the preference into consideration, shall be awarded the contract, unless the offer provides for additional award criteria. The contract amount of any contract awarded, however, shall be the amount of the price offered, exclusive of the preferences.

In the event of any change that materially alters the bidder's ability to supply the Hawaii product(s), the bidder shall immediately notify the procurement officer in writing and the parties shall enter into discussions for the purpose of revising the contract or terminating the contract for convenience.

Item No.	Pre-Approved Hawaii Product Description & Manufacturer	Class (I or II)	Quantity	Unit Measure	Unit Price	Total Price

RECYCLED PRODUCTS PREFERENCE

This project allows a 10% price preference for recycled products in accordance with HRS 103D-1005. Please indicate your recycled or non-recycled product by indicating its cost FOB jobsite unloaded in the schedule below, including applicable General Excise & Use Taxes.

DESCRIPTION	RECYCLED PRODUCT COST	NONRECYCLED PRODUCT COST
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____
_____	$_____	$_____

The bidder requesting a recycled product preference shall also complete and submit the form "CERTIFICATION OF RECYCLED CONTENT" as shown in the Interim General Conditions and provide all supporting information with this proposal. Additional information may be requested to qualify a product.

The following definitions are applicable to the CERTIFICATION OF RECYCLED CONTENT form:

"Post-consumer recovered material" means any product used by a consumer, including a business that purchases the material, that has served its intended end use, and that has been separated or diverted from the solid waste stream for the purpose of use, reuse, or recycling.

"Product" includes materials, manufactures, supplies, merchandise, goods, wares, and foodstuffs.

"Recovered material" means waste material and by-products that have been separated, diverted, or removed from the solid waste stream after a manufacturing process for the purpose of use, reuse, or recycling. Recovered material does not include those materials and by-products that are generated and normally reused on-site or within original manufacturing processes (such as mill broke, in the case of paper products).

"Recycled content" means the percentage of a product composed of recovered material, or post-consumer recovered material, or both.

"Recycled product" means a product containing recovered material, or post-consumer recovered material, or both.

The bidder agrees that preference for recycled products shall be taken into consideration to determine the low bidder in accordance with said Section and the rules promulgated, however, the award of contract will be in the amount of the bid offered exclusive any preference.

APPRENTICESHIP AGREEMENT PREFERENCE

1. If applicable to this project, any bidder seeking the preference must be a party to an apprenticeship agreement registered with the State Department of Labor and Industrial Relations (DLIR) at the time the bid is submitted for each apprenticeable trade the bidder will employ to construct the project. "Employ" means the employment of a person in an employer-employee relationship.

    a. The apprenticeship agreement shall be registered with the DLIR and conform to the requirements of Hawaii Revised Statutes Chapter 372.

    b. Subcontractors do not have to be a party to an apprenticeship agreement for the bidder to obtain preference.

    c. The bidder is not required to have apprentices in its employ at the time the bid is submitted to qualify for the preference.

2. A bidder seeking the preference must state the apprenticeable trade the bidder will employ for each trade to be employed to perform the work by submitting a completed signed original *Certification Form 1* verifying participation in an apprenticeship program registered with DLIR. "Apprenticeable trade" shall have the same meaning as "apprenticeable occupation" pursuant to Hawaii Administrative Rules (HAR) §12-30-5.

    a. The *Certification Form 1* shall be authorized by an apprenticeship sponsor listed on the DLIR list of registered apprenticeship programs. "Sponsor" means an operator of an apprenticeship program and in whose name the program is approved and registered with the DLIR pursuant to HAR §12-30-1.

    b. The authorization shall be an original signature by an authorized official of the apprenticeship sponsor.

    c. The completed signed original *Certification Form 1* for each trade must be submitted with the bid. Previous certifications shall not apply.

    d. When filling out the *Certification Form 1*, the name of Apprenticeable Trade and Apprenticeship Sponsor must be the same as recorded in the List of Construction Trades in Registered Apprenticeship Programs that is posted on the DLIR website. "Registered apprenticeship program" means a construction trade program approved by the DLIR pursuant to HAR §12-301 and §12-30-4.

    e. The *Certificate Form 1* and the List of Construction Trades in Registered Apprenticeship Programs is available on the DLIR website at: http://hawaii.gov/labor/wdd.

3. Upon receiving the *Certification Form 1*, the Procurement Officer will verify that the apprenticeship program is on the List of Construction Trades in Registered Apprenticeship Programs and that the form is signed by an authorized official of the Apprenticeship Program Sponsor. If the programs and signature are not confirmed by the DLIR, the bidder will not qualify for the preference.

4. If the bidder is certified to participate in an apprenticeship program for each trade which will be employed by the bidder for the project, a preference will be applied to decrease the bidder's bid

amount by five percent (5%) for evaluation purposes.

5. Should the bidder qualify for other preferences (e.g. Hawaii Products), all applicable preferences shall be applied to the bid price.

CONTRIBUTIONS BY STATE AND COUNTY CONTRACTORS PROHIBITED

Contractors are hereby notified of the applicability of Section 11-355, HRS, which states that campaign contributions are prohibited from specified State or county government contractors during the term of the contract if the contractors are paid with funds appropriated by a legislative body.

CONDITION OF AWARD

It is understood that the award of the contract will be made on the basis of the lowest responsible Total Base Bid (Items 1 to 29) selected by the Board of Land and Natural Resources. Write the total of bid items 1 to 29 on page P-1.

In the event the low bid is below the available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized to award Additives to the lowest bidder.

After adjusting for applicable preferences, the additives, in their precedence order, are added to the total lump sum base bid price. This (these) sum(s) are compared to the project control budget, and must be within the project control budget. If adding another additive would make the aggregate amount exceed the project control budget for all bidders, that additive will be skipped and the next additive will be added, provided an award might be made within the project control budget. This procedure will continue, until adding any remaining additives will result in the aggregate total amount for all the bidders to exceed the project control budget, or until no additional additives remain.

The bidder with the lowest aggregate amount, within the project control budget (after application of the various preferences), for the total lump sum base bid plus the additives in their precedence order, is the "Low Bidder" for that project and is designated for award.

It is understood and agreed that the Board of Land and Natural Resources reserves the right to reject any and/or all bids and waive any defects when, in the Board's opinion, such rejection or waiver will be for the best interest of the State of Hawaii.

In the event all bids exceed available funds certified by the appropriate fiscal officer, the head of the purchasing agency responsible for the procurement in question is authorized in situations where time or economic considerations preclude resolicitation of work of a reduced scope to negotiate an adjustment of the bid price, including changes in the bid requirements, with the low responsible and responsive bidder, in order to bring the bid within the amount of available funds. It is understood and agreed upon that the head of the purchasing agency may delete a portion or all of any item(s) in the proposal at the stated unit or lump sum price as necessary to stay within the available funding. The bidder is responsible to make an earnest effort to represent the actual cost of each item, including all materials, labor, equipment, overhead and profit in their bid proposal to preclude claims of anticipated profit or loss of profit because of an unbalanced bid proposal.

It is also understood that if a mutually agreeable cost for the reduced scope of work necessitated by a lack of available funds cannot be agreed upon between the bidder and the head of the purchasing agency within 14 calendar days after the bid opening, then the bid may be rejected in the best interest of the purchasing agency, and the head of the purchasing agency may negotiate in progressive order (lowest to highest) with the next lowest responsible and responsive bidder.

It is also understood and agreed that the award of the contract shall be conditioned upon funds being made available for this project and further upon the right of the Board of Land and Natural Resources to hold all bids received for a period of ninety (90) days from the date of the opening thereof, unless otherwise required by law, during which time no bid may be withdrawn.

It is also understood that Notice to Proceed may be delayed up to one (1) year after the bid opening date, and that no additional compensation will be provided for any claim for escalation or delay of issuance of Notice to Proceed on or before that date.

It is also understood and agreed that the quantities given herewith are approximate only and are subject to increase or decrease, and that the undersigned will perform all quantities of work as either increased or decreased, in accordance with the provisions of the Contract Specifications.

It is also understood and agreed that the estimated quantities shown for the items for which a UNIT PRICE is asked in this Proposal are only for the purpose of comparing on a uniform basis, bids offered for the work under this contract, and the undersigned agrees that he is satisfied with and will at no time, dispute said estimated quantities as a means of claims for anticipated profit or loss of profit, because of a difference between the quantities of the various classes of work done or the materials and equipment installed, and the said estimated quantities. On UNIT PRICE bids, payment will be made only for the actual number of units incorporated into the finished project at the contract UNIT PRICE.

After the proposals are opened and read, the figures will be extended and/or totaled in accordance with the bid prices of the acceptable proposals and the totals will be compared. In the comparison of bids, words written in the proposal shall govern over figures and unit prices will govern over totals. Until the award of the contract, however, the right will be reserved to reject any and all proposals and to waive any defects or technicalities as may be deemed best for the interest of the State.

It is also understood and agreed that liquidated damages in the amount of One Hundred Fifty and No/100 Dollars ($ 150.00) for each and every calendar day in excess thereof prior to completion of the contract shall be withheld from payments due to the Contractor.

It is also understood and agreed that if this bid is accepted, the successful bidder must enter into and execute a contract with the Board of Land and Natural Resources and furnish a Performance and Payment Bond, as required by law. These bonds shall conform to provisions of Section 103D-324 and 325, Hawaii Revised Statutes and any law applicable hereto.

It is also understood and agreed that the successful bidder will provide all necessary labor, materials, tools, equipment, and other incidentals necessary to do all the work and furnish all the materials specified in the contract in the manner and time herein prescribed, and according to the requirements of the Engineer as therein set forth.

It is understood that by submitting this proposal, the undersigned is declaring that his firm has not

been assisted or represented on this matter by an individual who has, in a State capacity, been involved in the subject matter of this contract in the past two years.

It is understood that by submitting this proposal in accordance with HAR 3-122-192, the undersigned is declaring that the price submitted is independently arrived without collusion.

It is also understood that by submitting this proposal, a Certification for Safety and Health Programs for bids in excess of $100,000 (in accordance with HRS 396-18), the undersigned certifies that his organization will have a written safety and health plan for this project that will be available and implemented by the Notice to Proceed date of this project. Details of the requirements of this plan may be obtained from the Department of Labor and Industrial Relations, Occupational, Safety and Health Division (HIOSH).

It is further understood and agreed that the successful bidder shall comply with paragraph 3.1.a "SUBCONTRACTING" of the General Provisions which requires that the contractor shall perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than twenty percent (20%) of the value of all work embraced in the Contract, except that certain contract items of work, if specifically referred to in the special provisions, will be exempted from said twenty percent requirement.

Compliance with §103-310 HRS. As a condition of award all bidders shall comply with all laws governing entities doing business in the State, including Chapter 237 HRS (general excise tax); Chapter 383 HRS (employment security – unemployment insurance); Chapter 386 HRS (workers compensation); Chapter 392 HRS (temporary disability insurance); and Chapter 393 HRS (pre-paid health care), and shall produce all documents to the State (DLNR, Engineering Division) required to demonstrate compliance with these subsections. Any bidder making a false affirmation or certification under this subsection shall be suspended and may be debarred from further offerings or awards pursuant to §103D-702 HRS.

RECEIPT OF ADDENDA

The bidder also acknowledges receipt of any and all addenda issued by the Engineering Division, by recording the date of receipt of the respective addenda in the space provided below:

Addendum	Date Received	Addendum	Date Received
No. 1	_____	No. 5	_____
No. 2	_____	No. 6	_____
No. 3	_____	No. 7	_____
No. 4	_____	No. 8	_____

It is understood that failure to receive any such addendum shall not relieve the Contractor from any obligation under this Proposal as submitted.

It is also understood and agreed that if this Proposal is accepted and the undersigned should fail or neglect to contract as aforesaid, the Board may determine that the bidder has abandoned the Contract, and thereupon, forfeiture of the security accompanying his proposal shall operate and the same shall become the property of the Board.

JOINT CONTRACTORS OR SUBCONTRACTORS TO BE ENGAGED ON THIS PROJECT

The Bidder agrees that the following is a complete listing of all joint contractors or subcontractors covered under Chapter 444, Hawaii Revised Statutes (HRS), who will be engaged by the Bidder on this project to perform the required work indicated pursuant to Section 103D-302, HRS. It is the sole responsibility of the contractor to review the requirements of this Project and determine the appropriate licenses that are required to complete the Project. The Bidder certifies that the completed listing of joint contractors or subcontractors fulfills the requirements for the project and the Bidder, together with the listed subcontractors or joint contractors have all the specialty contractor's licenses to complete the work, except as provided for in HRS §103D-302(b). Failure of the Bidder to comply with this requirement may be just cause for rejection of the bid.

"A" General Engineering Contractors and "B" General Building Contractors are reminded that due to the Hawaii Supreme Court's January 28, 2002 decision in Okada Trucking Co., Ltd. v. Board of Water Supply, et al., 97 Haw. 450 (2002), they are prohibited from undertaking any work, solely or as part of a larger project, which would require the general contractor to act as a specialty contractor in any area in which the general contractor has no license. Although the "A" and "B" contractor may still bid on and act as the "prime" contractor on an "A" or "B" project (See, *HRS §444-7 for the definitions of an "A" and "B" project.*), respectively, the "A" and "B" contractor may only perform work in the areas in which they have the appropriate contractor's license (*An "A" or "B" contractor obtains "C" specialty contractor's licenses either on its own, or automatically under HAR § 16-77-32*). The remaining work must be performed by appropriately licensed entities.

General Engineering "A" Contractors automatically have these "C" specialty contractor's licenses: C-3, C-9, C-10, C-17, C-24, C-31a, C-32, C-35, C-37a, C-37b, C-38, C-43, C-49, C-56, C-57a, C-57b and C-61.

General Building "B" Contractors automatically have these "C" specialty contractor's licenses: C-5, C-6, C-10, C-12, C-24, C-25, C-31a, C-32a, C-42a and C-42b.

In completing the Joint Contractors or Subcontractors List, describe the specialty contractor's nature and scope of work to be performed for this project and provide the complete firm name of the joint contractor or subcontractor in the respective columns. If the Bidder is a general contractor providing the work of a required specialty contractor, whose license is not automatically held pursuant to HAR 16-77-32, fill in the Bidder's (general contractor's) name and nature and scope of work to be performed on this project.

List only one joint contractor or subcontractor per required specialty contractor's classification, unless within the same specialty, the work of each joint contractor or subcontractor can be described so that there is no overlap in work descriptions.

If a contractor's license is required by law for the performance of the work which is called for in this bid, the bidder and all subcontractors must have the required license before the submission of the bidder's proposal in the case of a non-federal aid project, and for federal-aid projects, the bidder must have the required license prior to the award of the project and all subcontractors prior to the start of the subcontracted work.

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

JOINT CONTRACTORS OR SUBCONTRACTORS
LIST FOR ADDITIVE BID ITEM(S)

The Bidder agrees that for projects with additive bid item(s), the Bidder, joint contractor or subcontractor listed in the completed "Joint Contractors of Subcontractors List for the Additive Bid Item(s)" will perform work for the respective additive bid item(s).

ADDITIVE BID ITEM 1

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	**NATURE AND SCOPE OF WORK TO BE PERFORMED**

ADDITIVE BID ITEM 2

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 3

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 4

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 5

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 6

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 7

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 8

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 9

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 10

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

ADDITIVE BID ITEM 11

COMPLETE FIRM NAME OF JOINT CONTRACTOR OR SUBCONTRACTOR	NATURE AND SCOPE OF WORK TO BE PERFORMED

CERTIFICATION OF COMPLIANCE
WITH HRS 396-18, SAFETY AND HEALTH PROGRAMS

MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2, ELECTRICAL UPGRADES
JOB NO. 500CK30B

This is to certify that the undersigned will comply with the requirements of HRS 396-18, as follows:

(A) Pursuant to HRS 396-18, all bids and proposals in excess of $100,000 shall include a signed certification from the Offeror that a written safety and health plan for the job will be available and implemented by the notice to proceed dates of the project. The written safety and health plan shall include:

(1) A safety and health policy statement reflecting management commitment;

(2) A description of the safety and health responsibilities of all levels of management and supervisors on the job and a statement of accountability appropriate to each:

(3) The details of:

(a) The mechanism for employee involvement in job hazard analysis;
(b) Hazard identification, including periodic inspections and hazard correction and control;
(c) Accident and "near-miss" investigations; and
(d) Evaluations of employee training programs;

(4) A plan to encourage employees to report hazards to management as soon as possible and to require management to address these hazards promptly; and

(5) A certification by a senior corporate or company manager that the plan is true and correct.

(B) Failure to submit the required certification may be grounds for disqualification of the bid.

(C) Failure to have available on site or failure to implement the written safety and health plan by the project's notice to proceed date shall be considered willful noncompliance and be sufficient grounds to disqualify the award and terminate the contract.

_____
Name of Offeror

_____
Signature and Title

Date: _____

Enclosed herewith is a:

1.	Surety Bond (*1)	)	
2.	Legal Tender (*2)	)	
3.	Cashier's Check (*3)	)	
4.	Certificate of Deposit (*3)	)	in the
5.	Certified Check (*3)	)	amount
6.	Official Check (*3)	)	of
7.	Share Certificate (*3)	)	
8.	Teller's Check (*3)	)	
9.	Treasurer's Check (*3)	)	

(Cross Out Those Not Applicable)

_____

_____Dollars ($_____)

as required by law.

Respectfully submitted,

_____
Name of Company, Joint Venture
or Partnership

_____
Contractor's License No.

By _____
Signature (*4)

Title _____
Print Name _____
Date _____
Address _____
_____
Telephone No. _____

E-Mail Address _____

NOTES:

1. Surety bond underwritten by a company licensed to issue bonds in this State;

2. Legal tender; or

3. A certificate of deposit; share certificate; or cashier's, treasurer's, teller's, or official check drawn by, or a certified check accepted by, and payable on demand to the State by a bank, a savings institution, or credit union insured by the Federal Deposit Insurance Corporation or the National Credit Union Administration.

   A. These instruments may be utilized only to a maximum of $100,000.

   B. If the required security or bond amount totals over $100,000, more than one instrument not exceeding $100,000 each and issued by different financial institutions shall be accepted.

4. Please attach to this page evidence of the authority of this officer to submit bids on behalf of the Company and also the names and residence addresses of all officers of the Company.

5. Fill in all blank spaces with information asked for or bid may be invalidated. PROPOSAL MUST BE INTACT, MISSING PAGES MAY INVALIDATE YOUR BID.

End of Proposal

SPECIAL PROVISIONS

Amend INTERIM GENERAL CONDITIONS, dated October 1994, as follows:

Section 2 – Proposal Requirements and Conditions

1. **AMEND** Section 2.1 Qualification of Bidder with the following:

Written Notice of Intent to Bid or Offer: A written Notice of Intent to Bid is not required for the Solicitation.

Standard Qualification Questionnaire: Bidders may be required to complete a standard qualifications questionnaire. When requested, the information shall be furnished within two working days or longer at the discretion of the Engineer. Failure to furnish the requested information within the time allowed may be grounds for a determination of non-responsibility, in accordance with HRS Section 103D-310 and HAR Section 3-122-108.

Hawaii Business or Compliant Non-Hawaii Business Requirement: Bidders shall be incorporated or organized under the laws of the State or be registered to do business in the State as a separate branch or division that is capable of fully performing under the contract, as stipulated in §3-122-112 HAR. A certified letter is not required prior to bid opening.

Compliance with §3-122-112 HAR: As a condition for award of the contract and as proof of compliance with the requirements of 103D-310(c) HRS, the apparent low bidder shall furnish the required documents to the Department. If the valid required certificates are not submitted on a timely basis for award of a contract, a bidder otherwise responsive and responsible may not receive the award. Bidder is responsible to apply for and submit the following documents to the Department.

A. Tax Clearance (HRS Chapter 237): Bidder shall obtain a tax clearance certificate from the Hawaii State Department of Taxation (DOTAX) and the Internal Revenue Service (IRS). The certificate is valid for six months from the most recently approved stamp date on the certificate; the certificate must be valid on the date received by the Department.

B. Department of Labor (DLIR) "Certificate of Compliance". (HRS Chapter 383 - Unemployment Insurance, Chapter 386 - Workers' Compensation, Chapter 392 - Temporary Disability Insurance, and 393 – Prepaid Health Care): Bidder shall obtain a certificate of compliance from the Hawaii State Department of Labor and Industrial relations (DLIR). The certificate is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

C. Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG) "Certificate of Good Standing". Bidder shall obtain a certificate of good standing issued by the Department of Commerce and Consumer Affairs (DCCA), Business Registration Division (BREG). The certificate of good standing is valid for six months from the date of issue; certificates must be valid on the date received by the Department.

Hawaii Compliance Express. Alternately, instead of separately applying for these certificates at the various state agencies, bidder may choose to use the Hawaii Compliance Express (HCE), which allows businesses to register online through a simple wizard interface at http://vendors.ehawaii.gov to acquire a "Certificate of Vendor compliance" indicating that bidder's status is compliant with requirements of §103D-310(c), HRS, shall be accepted for contracting and final payment purposes.
Bidders that elect to use the new HCE services will be required to pay an annual fee of $15.00 to the

Hawaii Information Consortium, LLC (HIC). Bidders choosing not to participate in the HCE program will be required to provide the paper certificates as instructed in the previous paragraphs.

2. **ADD** Section 2.4a, Pre-Bid Conferences

Required Pre-bid Conferences: For construction and design-build projects with an estimated value of $500,000 or more and solicited under the competitive sealed bid method (103D-302 HRS); and for construction and design-build projects with an estimated value of $100,000 or more and solicited under the competitive sealed proposal method (103D-303 HRS); a pre-bid conference is required.

Other Pre-Bid Conferences: The Department may require a pre-bid conference for construction or design-build projects that are below the dollar threshold listed in above or when projects have special or unusual requirements.

Other Conditions: The Department may require the prospective Bidders to make a physical inspection of the project site and make attendance at the pre-bid conference a condition for submitting an offer.

Nothing stated at the pre-bid conference shall change the solicitation unless a change is made by written addendum.

3. **DELETE** Section 2.5, Addenda and Interpretations, in its entirety and replace with the following:

"Discrepancies, omissions, or doubts as to the meaning of drawings and specifications should be communicated using the question and answer section on the HIePRO solicitation for interpretation and must be received in the time frame set in the HIePRO solicitation. Any interpretation, if made and any supplemental instructions will be in the form of written addenda to the plans and specifications and made available prior to the offer due date. It shall be the prospective bidder's sole responsibility to verify and obtain any said addenda. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents."

Section 3 – Award and Execution of Contract

1. **AMEND** Section 3.3, Award of Contract, by deleting "sixty (60)" and replacing with "ninety (90)" in the first paragraph.

2. **AMEND** Section 3.3, Award of Contract, by adding the following after the first paragraph:

"If the contract is not awarded within the ninety (90) days, the Department may request the successful Bidder to extend the time for the acceptance of its bid. The Bidder may reject such a request without penalty; and in such case, the Department may at its sole discretion make a similar offer to the next lowest responsive and responsible bidder and so on until a bid is duly accepted or until the Department elects to stop making such requests."

3. **AMEND** Section 3.9, Notice to Proceed, by deleting "180 days" and replacing with "one (1) year" in the last paragraph.

4. **ADD** Section 3.10, Protests:

"**3.10 PROTESTS**—Pursuant to Section 103D-701, Hawaii Revised Statutes, an actual or prospective offeror who is aggrieved in connection with the solicitation or award may submit a protest. Any protest

shall be submitting in writing to the Chairperson, Department of Land and Natural Resources, 1151 Punchbowl Street, Honolulu, Hawaii 96813, or designee as specified in the solicitation.

A protest shall be submitted in writing within five (5) working days after the aggrieved person knows or should have known the facts giving rise thereto; provided that a protest based upon the content of the solicitation shall be submitted in writing prior to the date set for receipt of offers. Further provided that a protest of an award or proposed award shall be submitted within five (5) working days after the posting of the award of the contract.

The notice of award, if any, resulting from this solicitation shall be posted on the Procurement System on the SPO website: http://hawaii.gov/spo2/.

Section 5 – Control of Work

1. **ADD** the following to Section 5.3 Coordination of Contract Documents:

   "In the event of any conflict amongst the various tangible or written documentation governing a project, the following order of priorities shall apply to all phases: (1) Addenda to contract documents, the later or newer addenda to govern over all prior or older addenda; (2) Special Provisions; (3) Proposal; (4) Technical Specifications; and (5) Drawings."

2. **AMEND** Section 5.8 Value Engineering Incentive by deleting "$100,000" and replacing with "$250,000" in the first paragraph.

Section 6 – Substitution of Materials and Equipment

DELETE Section 6.3a and replace it with the following:

"a. Before Bid Opening

1. In any section of the specifications and/or plans where one or more brand names of materials or equipment are specified to indicate a quality, style, appearance or performance, the bidder shall base his bid on one of the specified brand names. Alternate brands, makes, or methods may be accepted through the submittal of a written request for substitution to the Engineer for review and approval. An alternate brand, make, or method approved for one project is not to be considered as approved for any other project. Unless otherwise specified in the contract, the request for substitution shall comply with the provisions of this section.
2. Substitutions may not be made without the prior written approval of the Engineer and only for the following reasons:
   i) The specified or prequalified item is delayed by a lengthy strike in the factory or other unforeseeable contingency beyond the control of the Contractor which would cause an abnormal delay in the project completion; or
   ii) All specified or prequalified items are found to be unusable or unavailable due to change or other circumstances; or
   iii) The Contractor is willing to provide a more recently developed or manufactured model or item of the same name manufacturer which the Engineer determines to be equal or better than the one specified or prequalified; or for
   iv) Any other reason which the Engineer may determine to be acceptable in the best interest of the State.
3. Any savings in cost will be credited to the State and any additional cost for the

substituted items will be paid for by the Contractor.

4. The Engineer shall determine whether or not to consider any substitution request.
5. Burden of Proof. The burden of proof as to the comparative quality and suitability of substitute equipment, materials, devices, systems, or methods of construction, shall be upon the Contractor. The Contractor shall furnish, at the Contractor's own expense, such information relating thereto as may be required by the Engineer.
6. Engineer's Decision. Nothing herein shall be construed to mean that the Engineer must accept or approve any substitution request submitted under this section. Contractors should not furnish substitute brands, makes, or methods without first obtaining approval from the Engineer. The Engineer reserves the right to reject any request that the Engineer deems irregular or not in the best interest of the State. The Engineer shall also have the right to terminate the process of evaluation of any request for substitution if continuation of the evaluation will result in a lengthy delay. The Engineer shall judge as to what constitutes acceptability of the substitution with the cost factor to be considered. The Engineer's approval of a substitute brand, make, or method shall not release the Contractor from the responsibility of ensuring that the substitute brand, make, or method will provide the same or superior result expected. A request for substitution shall not in any way constitute a justification for an extension of contract time."

Section 7 – Prosecution and Progress

1. **DELETE** Section 7.2d in its entirety and replace with the following:

"d. Insurance Requirements

1. Obligation of Contractor

The Contractor shall not commence any work until it obtains, at its own expense, all required insurance. Such insurance must have the approval of the Department as to limit, form and amount and must be maintained with a company authorized by law to issue such insurance in the State of Hawaii.

All insurance described herein will be maintained by the Contractor for the full period of the contract and in no event will be terminated or otherwise allowed to lapse prior to written certification of final acceptance of the work by the Department.

Certificate(s) of Insurance acceptable to the Department shall be filed with the Engineer prior to commencement of the work. These certificates shall contain a provision that coverages afforded under the policies will not be canceled or changed until at least thirty days written notice has been given to the Engineer by registered mail. The insurance policies shall name the State of Hawaii, its officers and employees as an additional insured and such coverage shall be noted on the Certificate. Should any policy be canceled before final acceptance of the work by the Department, and the Contractor fails to immediately procure replacement insurance as specified, the Department, in addition to all other remedies it may have for such breach, reserves the right to procure such insurance and deduct the cost thereof from any money due to the Contractor.

Nothing contained in these insurance requirements is to be construed as limiting the extent of Contractor's responsibility for payment of damages resulting from its operations under this contract, including the Contractor's obligation to pay liquidated damages, nor shall it affect the

Contractor's separate and independent duty to defend, indemnify and hold the Department harmless pursuant to other provisions of this contract. In no instance will the Department's exercise of an option to occupy and use completed portions of the work relieve the Contractor of its obligation to maintain the required insurance until the date of final acceptance of the work.

All insurance described herein shall cover the insured for all work to be performed under the contract, all work performed incidental thereto or directly or indirectly connected therewith, including traffic detour work or other work performed outside the work area, and all change order work.

The Contractor shall, from time to time, furnish the Engineer, when requested, satisfactory proof of coverage of each type of insurance required or a copy of the actual policies covering the work. Failure to comply with the Engineer's request may result in suspension of the work, and shall be sufficient grounds to withhold future payments due the Contractor and to terminate the contract for Contractor's default.

2. Types of Insurance

The Contractor shall purchase and maintain insurance described below which shall provide coverage against claims arising out of the Contractor's operations under the contract, whether such operations be by the Contractor itself or by the subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

(a) Worker's Compensation. The Contractor and all subcontractors shall obtain full worker's compensation insurance coverage for all persons whom they employ or may employ in carrying out the work under this contact. This insurance shall be in strict conformity with the requirements of the most current and applicable State of Hawaii Worker's Compensation Insurance laws in effect on the date of the execution of this contract and as modified during the duration of the contract.

(b) Commercial General Liability Insurance and Automobile Insurance. Contractor's commercial general liability insurance and automobile liability insurance shall both be obtained in a combined, single limit of not less than $1,000,000 per occurrence that shall include coverage for bodily injury, sickness, disease or death of any person, arising directly or indirectly out of, or in connection with, the performance of work under this contract.

The Contractor's property damage liability insurance shall provide for a single combined limit of not less than $1,000,000 for all damages arising out of injury to or destruction of property of others including the Department's, arising directly or indirectly out of or in connection with the performance of the work under this contract including explosion or collapse.

The Contractor shall either:

i. Require each of its subcontractors to procure and to maintain during the life of its subcontract, subcontractors' comprehensive general liability, automobile liability and property damage liability insurance of the type and in the same amounts specified herein; or

ii. Insure the activities of its subcontractors in its own policy.

The Contractor will be permitted, in cooperation with insurers, to maintain a self insured retention for up to 25% of the per occurrence combined single limits of the commercial general liability and the automobile liability policies. The existence of the self insured retention must be noted on the certificate of insurance coverage submitted to the Department or else it will be understood that the insurer is providing first dollar coverage for all claims. For all claims within the self-insured retention amount, the rights, duties and obligations between the Contractor and the Department shall be identical to that between a liability insurer and the Department, as an additional insured, as if there was no self-insured retention.

(c) Builder's Risk Insurance. Unless included in the Specifications of this project, the Contractor shall not be required to provide builder's risk insurance. If required as noted in the Specifications, builder's risk insurance shall be provided during the progress of work and until final acceptance by the Department upon completion of the contract. It shall be "All Risk" (including but not limited to earthquake, windstorm and flood damage) completed value insurance coverage on all completed work and work in progress to the full replacement value thereof. Such insurance shall include the Department as additional name insured. The Contractor shall submit to the Engineer for its approval all items deemed to be uninsurable. The policy may provide for a deductible in an amount of up to 25% of the amount insured by the policy. With respect to all losses up to any deductible amount, the relationship between the Contractor and the Department shall be that of insurer and additional insured as if no deductible existed".

2. **DELETE** Section 7.16 in its entirety and replace with the following:

"RESPONSIBILITY FOR DAMAGE CLAIMS; INDEMNITY – The Contractor shall indemnify the State and the Department against all loss of or damage to the State's or the Department's existing property and facilities arising out of any act or omission committed in the performance of the work by the Contractor, any subcontractor or their employees and agents. Contractor shall defend, hold harmless and indemnify the Department and the State, their employees, officers and agents against all losses, claims, suits, liability and expense, including but not limited to attorneys' fees, arising out of injury to or death of persons (including employees of the State and the Department, the Contractor or any subcontractor) or damage to property resulting from or in connection with performance of the work and not caused solely by the negligence of the State or the Department, their agents, officers and employees. The State or the Department may participate in the defense of any claim or suit without relieving the Contractor of any obligation hereunder. The purchase of liability insurance shall not relieve the Contractor of the obligations described herein.

The Contractor agrees that it will not attempt to hold the State and its Departments and Agencies and their officers, representatives, employees or agents, liable or responsible for any losses or damages to third parties from the action of the elements, the nature of the work to be done under these specifications or from any unforeseen obstructions, acts of God, vandalism, fires or encumbrances which may be encountered in the prosecution of the work.

The Contractor shall pay all just claims for materials, supplies, tools, labor and other just claims against the Contractor or any subcontractor in connection with this contract and the surety bond will not be released by final acceptance and payment by the Department unless all such claims are paid or released. The Department may, but is not obligated to, withhold or retain as much of the monies due or to become due the Contractor under this contract considered necessary by the Engineer to cover such just claims

until satisfactory proof of payment or the establishment of a payment plan is presented.

The Contractor shall defend, indemnify and hold harmless the State and its Departments and Agencies and their officers, representatives, employees or agents from all suits, actions or claims of any character brought on account of any claims or amounts arising or recovered under the Worker's Compensation Laws or any other law, by-law, ordinance, order or decree.

Section 8 – Measurement and Payment

1. **DELETE** Section 8.7a in its entirety and replace with the following:

a. Tax Clearances from the State of Hawaii Department of Taxation and Internal Revenue Service, subject to section 103D-328, HRS, current within two months of issuance date indicating that all delinquent taxes levied or accrued under State Statutes against the contractor have been paid.

2. **ADD** Section 8.7d, Certificate of Compliance:

d. A Certification from the Contractor affirming that the Contractor has, as applicable, remained in compliance with all laws as required by Section 103D-310, HRS, and Section 3-122-112, HAR. A contractor making a false affirmation shall be suspended and may be debarred pursuant to section 103D-702, HRS.

1. Certification of Compliance for Final Payment, State Procurement Office Form-22. Must be Signed Original.

3. **ADD** Section 8.7e, Hawaii Compliance Express:

e. In lieu of submitting the tax clearances from Taxation and IRS, and SPO Form -22, the Contractor may choose to use the Hawaii Compliance Express as described on page SP-1 of this Special Provisions.

DETAILED SPECIFICATIONS

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SECTION 01019

GENERAL SPECIFICATIONS

PART 1 – GENERAL

1.1 SUMMARY

Work shall consist of furnishing all labor, tools, materials and equipment necessary and required to construct in place complete all work as indicated on the drawings and as specified herein.

1.2 GENERAL REQUIREMENTS

A. Construction Lines, Levels and Grades: The Contractor shall verify all lines, levels and elevations indicated on the drawings before any clearing, excavation or construction begins. Any discrepancy shall be immediately brought to the attention of the Engineer, and any change shall be made in accordance with the Engineer's instruction. The Contractor shall not be entitled to extra payment for failing to report the discrepancies before proceeding with any work whether within the area affected or not.

All lines and grades shall be verified and established by a licensed surveyor or licensed Civil Engineer, registered in the State of Hawaii. The Contractor shall submit evidence of current registration.

B. Examination of Premises: The Contractor shall contact the Engineer and obtain permission before visiting the site.

C. Notices: The Contractor shall notify the Engineer and give at least three (3) working days notice before starting any work.

D. Contractor's Operations

1. The Contractor must employ, insofar as possible, such methods and means of carrying out the work so as not to cause any damage to the adjacent properties, roadways, structures, or utilities. Where the Contractor's operations do result in damages, the Contractor shall be solely responsible for the restoration work.

2. The Contractor shall maintain safe passageway to and from the adjacent properties for the user agency personnel and the public at all times.

E. Staging and Storage: The Contractor shall coordinate staging and storage areas with the Engineer and Garden Isle Racing Association prior to mobilization. Any damages resulting from the Contractor’s use shall be restored as instructed by the Engineer at no cost to the State.

F. Stockpiling: The Contractor shall coordinate stockpile of material with the Engineer and

Garden Isle Racing Association prior to mobilization. Any damages resulting from the Contractor's use shall be restored as instructed by the Engineer at no cost to the State

G. Toilet Accommodations: The contractor is responsible for providing, maintaining, and cleaning his own portable toilets.

H. Protection of Property: The Contractor shall continually maintain adequate protection of all its work from damage and shall protect all property, including but not limited to buildings, equipment, furniture, grounds, vegetation, material, utility systems located at and adjoining the job site. The Contractor shall repair, replace or pay the expense of repair of damages resulting from its operations.

I. Use of Power Driven Equipment: The Contractor is cautioned to take all necessary safety precautions to protect the public whenever power driven equipment is used.

J. Safety: The Contractor shall carefully read and strictly comply with the requirements of the Hawaii Occupational Safety and Health Law, Chapter 396, Hawaii Revised Statutes, as amended, is applicable and made a part of the Contract.

K. Clean Up Premises: The Contractor shall clean up and remove from premises all debris accumulated from operations as necessary or as directed. See also Section 7.25 of the General Conditions.

L. Responsibility

1. The State will hold the Contractor liable for all the acts of Subcontractors and shall deal only with the prime Contractor in matters pertaining to other trades employed on the job. The Contractor shall be responsible for coordinating the work of all trades on the job.

2. Should the Contractor discover any discrepancy in the plans or specifications, the Contractor shall immediately notify the Engineer before proceeding any further with the work, otherwise, the Contractor will be held responsible for any cost involved in correction of work placed due to such discrepancy.

M. Cooperation With Other Contractors: The State reserves the right at any time to contract for or otherwise perform other or additional work within the contract zone limits of this Contract. The Contractor of this project shall, to the extent ordered by the State, conduct its work so as not to interfere with or hinder the progress or completion of the work performed by other Contractors.

N. Division of the Work: The Divisions and Sections into which these Specifications are divided shall not be considered an accurate or complete segregation of work by trades. This also applies to all work specified within each Section.

O. Drawings and Specifications

1. The Contractor shall not make alterations in the drawings and specifications. In the event the Contractor discovers any errors or discrepancies, the Contractor shall immediately notify the Engineer in accordance with the General Conditions.

2. Where devices, or items, or parts thereof are referred to in the singular, it is intended that such reference shall apply to as many such devices, items or parts as are required to properly complete the work.

3. Specifications and drawings are prepared in abbreviated form and include incomplete sentences. Omission of words or phrases such as "the Contractor shall", "as shown on the drawings", "a", "an", and "the" are intentional. Omitted words and phrases shall be provided by inference to form complete sentences.

P. Required Submittals

1. Required submittals as specified in the Technical Sections of these specifications include one or more of the following: Shop drawings; material samples; technical data; schedules of materials; schedules of operations; guarantees; maintenance manuals; and as-built drawings.

2. The Contractor shall make a comprehensive list of the required submittals, by Specification Section, and submit this list to the Engineer within 15 days after notice to proceed.

3. As-Built Drawings: When as-built drawings are required for submittal, the following shall apply:

   a. As-built drawings, the intent of which is to record the actual in-place construction so that any future renovations or tie-ins can be anticipated accurately, shall be required.

   b. All deviations from alignments, elevations and dimensions which are stipulated on the plans shall be recorded in red on the as-built drawings.

   c. The following procedure shall be followed:

      1) Immediately after these changes are constructed in place, the Contractor shall record them on the field office plans.

      2) Within two weeks after final inspection of the project, the Contractor shall transfer the changes marked on the field office plans onto a clean copy of plans using a red pencil. Any deletions shall be so noted and redrawn as necessary. The Contractor shall stamp or mark the tracings "AS-BUILT", and also sign and date each drawing so marked.

3) The Contractor shall submit the as-built drawings together with the marked-up field office plans to the Engineer.

4) Any as-built drawing which the Engineer determines does not accurately record the deviation shall be corrected by the State, and the Contractor shall be charged for the services.

Q. Permits: A National Pollutant Discharge Elimination System (NPDES) general permit Notice of Intent (NOI) general form and Form C have been submitted to the State Department of Health (DOH). The Contractor shall submit site specific Best Management Practices to DOH at least 30 days prior to construction for approval.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01090

STANDARD REFERENCES

PART 1 – GENERAL

Wherever used in the project, the following abbreviations will have the meanings listed:

Abbreviation	Company
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, N.W., Suite 225 Washington, D.C. 20001
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI
AISC	American Institute of Steel Construction 101 Park Avenue New York, NY 10017
AISI	American Iron and Steel Institute 1000 16th Street, N.W. Washington, D.C. 20036
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, NY 10018
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWS	American Welding Society 550 N.W. LeJune Road Miami, FL 33126
FHWA	Federal Highway Administration 1200 New Jersey Avenue, SE Washington, DC 20590

Abbreviation	Company
NHRA	National Hot Rod Association 2035 Financial Way Glendora, CA 91741
OSHA	Occupational Safety and Health Act U.S. Department of Labor San Francisco Regional Office 450 Golden Gate Avenue, Box 36017 San Francisco, CA 94102
UBC	Uniform Building Code Published by ICBO
UL	Underwriters Laboratories Inc. 207 East Ohio Street Chicago, IL 60611
UPC	Uniform Plumbing Code Published by IAPMO

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01115

CONTRACTOR USE OF PREMISES

PART 1 – GENERAL

1.1 SUMMARY

Contractor shall have full use of the construction zone for construction operations, including use of the project site during the construction period. The Contractor's use of the premises is limited only by the State's and/or facilities operations, right to perform work, or to retain other Contractors on portions of the project site.

1.2 GENERAL REQUIREMENTS

A. The Contractor, and its subcontractor, shall be familiar with the project site and familiarize themselves with existing conditions and the amount and kind of work to be performed relating to methods of construction and labor under which the work will be performed.

B. The Contractor shall continually maintain adequate protection of all his work from damage and shall protect all property at the project site, including structures, equipment, grounds, vegetation, materials, utility systems located at the job site, etc. The Contractor shall repair, replace or pay the expense of repair or damages resulting from his fault or negligence.

1.3 COMMENCEMENT OF WORK

A. The Contractor will submit a request to the Engineer, when he determines that sufficient materials are available at the job site for this work to begin without any break in the construction period to wait for delivery of additional items. No onsite work will begin until the Engineer concurs and approves this request from the Contractor. Once on site work commences, the Contractor, if need be, shall air freight at his own cost, all materials and equipment needed at the jobsite in order to complete the work within the project completion time.

B. Within seven days of the Award of Contract or within such further time as the Engineer may allow, the Contractor shall submit for approval, a performance schedule to include all construction and phasing activities related to this project, to the Engineer. This schedule shall clearly identify when major activities, including but not limited to the implementation of BMP measures, installation of utility and lighting poles, and trenching and of conduit and ductbanks. This schedule shall clearly identify when temporary utility connections will occur and/or when GIRA operations shall be affected.

1.4 FACILITY OPERATIONS AND ACCESS

Contractor shall allow provisions for safe access for GIRA and State personnel to maintain operations and maintenance of the existing facility while it is fully operational unless otherwise authorized by the Engineer and GIRA.

1.5 RESTRICTIONS

A. No work of any kind shall be undertaken until all necessary materials are available at the job site for this project.

B. Contractor's use of premises is restricted as follows:

1. Construction Times and Schedule:

    a. Night, weekend and overtime work may be allowed when approved by the Engineer unless restricted elsewhere.

    b. Schedule: No on-site work shall be performed during holidays unless approved by the Engineer.

2. Parking for the Contractor's employees (or Subcontractors) shall be coordinated and approved by the Engineer and GIRA.

3. Noise and Dust Control: Contractor shall address noise and dust control in accordance with Section 01567 – ENVIRONMENTAL PROTECTION.

4. Historical, Archaeological, and Cultural Resources: Contractor shall address historical, archaeological, and cultural resources in accordance with Section 01567 – ENVIRONMENTAL PROTECTION.

5. Floral and Fauna Resources: Contractor shall address floral and fauna resources in accordance with Section 01567 – ENVIRONMENTAL PROTECTION.

6. Tree Protection and Preservation: Install temporary fencing outside the drip line of trees to protect vegetation from construction damage. Protect existing landscaping and tree root systems from damage, flooding, and erosion due to construction activity.

7. Other Conditions:

    a. Arrange for construction debris and trash to be removed from the Project site weekly.

    b. Contractor shall provide for their own temporary facilities and utilities.

c. Contractor shall at all times conduct his operations to ensure the least inconvenience to the public. Operate machinery and equipment with discretion and with minimum interference to driveways and walkways. Do not leave machinery and equipment unattended on roads and driveways.

d. Store materials in the areas as designated by the Engineer. Locate construction equipment, machinery, equipment and supplies within Project Contract Limits.

e. Keep access roads to the project site free of dirt and debris. Provide, erect and maintain lights, barriers, signs, etc. when working on driveways and walkways to protect pedestrians and moped/bicycle riders. Obey facility traffic and safety regulations.

f. Contractor shall comply with all legal load restrictions in the hauling of materials.

1.6 NOTIFICATION

A. Contractor shall notify the Engineer a minimum of five (5) working days' notice before starting any work.

B. Contractor shall notify the Engineer a minimum of three (3) working days prior to start of any critical activities including, but not limited to, activities impacting noise, access, and air quality.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1.1 SUBMITTALS

A. Shop drawings shall be required as called for in the plans, specifications or by the Engineer.

B. Other required submittals shall include:

1. Manufacturer's Data.

2. Certificates of Warranty.

3. Any others as called for in the plans, specifications, or by the Engineer.

1.2 BIDDER'S SPECIAL RESPONSIBILITY FOR COORDINATING CONTRACTUAL WORK AND SUBMITTALS:

A. The Contractor is responsible for the coordination of all contractual work and submittals and shall certify the submittals were reviewed and coordinated.

B. The Contractor shall have a rubber stamp made up in the following format:

CONTRACTOR NAME

PROJECT: **Mana Drag Racing Strip Improvements Phase 2, Electrical Upgrades**
JOB NO: **500CK30B**

THIS SUBMITTAL HAS BEEN CHECKED BY THIS GENERAL CONTRACTOR. IT IS CERTIFIED CORRECT, COMPLETE, AND IN COMPLIANCE WITH CONTRACT DRAWINGS AND SPECIFICATIONS. ALL AFFECTED CONTRACTORS AND SUPPLIERS ARE AWARE OF, AND WILL INTEGRATE THIS SUBMITTAL INTO THEIR OWN WORK.

DATE RECEIVED: _____
SPECIFICATION SECTION: _____
SPECIFICATION PARAGRAPH: _____
DRAWING NUMBER: _____
SUBCONTRACTOR NAME: _____
SUPPLIER NAME: _____
MANUFACTURER NAME: _____

CERTIFIED BY: _____

C. This stamp, "filled in", should appear on the title sheet of each shop drawing, on a cover sheet of submittals in an 8-1/2" x 11" format, or on one face of a cardstock tag (min. 3" x 6") tied to each sample. The tag on the samples should state what the sample is so that, if the tag is accidentally separated from the sample, it can be matched up again. The back of this tag will be used by the Engineer for his receipt, review, and log stamp and for any comments that relate to the sample.

D. All submittals for material, equipment, and shop drawings listed in the contract documents, including dimensioned plumbing shop drawings, shall be required and shall be reviewed by the Engineer, prior to any ordering of materials and equipment.

E. Unless otherwise noted, the Contractor shall submit to the Engineer for his review eight (8) copies of all shop drawings required for the construction. Drawings shall be submitted in sufficient time to allow the Engineer not less than twenty regular working days for examining the drawings.

F. The drawing shall be accurate, distinct, and complete and shall contain all required information, including satisfactory identification of items, units and assemblies in relation to the contract drawings and specifications.

G. Unless otherwise approved by the Engineer, shop drawings shall be submitted only by the Contractor, who shall indicate by a signed stamp on the drawings or other approved means that the Contractor has checked the shop drawings and that the work or equipment shown is in accordance with contract requirements and has been checked for dimensions and relationship with work of all other trades involved. All deviations from the plans and specifications shall be noted and listed. The practice of submitting incomplete or unchecked shop drawings for the Engineer to correct or finish will not be acceptable, and shop drawings which, in the opinion of the Engineer, clearly indicate that they have not been checked by the Contractor will be considered as not complying with the intent of the contract documents and will be returned to the Contractor for resubmission in the proper form.

H. When the shop drawings have been reviewed by the Engineer, two (2) sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the drawing may be rejected and one (1) set will be returned to the Contractor with such changes or corrections indicated, and the Contractor shall correct and resubmit eight copies of the drawings, unless otherwise directed by the Engineer. No changes shall be made by the Contractor to the resubmitted shop drawings other than those changes indicated by the Engineer. The resubmittal shall be so indicated on the shop drawing.

I. The review of such drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for correctness of the dimensions, fabrication details, and space requirements or for deviations from the contract drawings and specifications, unless the Contractor has called attention to such deviations, in writing, by a letter accompanying the drawings and the Engineer approved the change or deviations, in writing, at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility

for errors in the shop drawings. When the Contractor does call such deviations to the attention of the Engineer, he shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

J. The approval of the above drawings, lists, prints, specifications, or other data shall in no way release the Contractor from his responsibility for the proper fulfillment of the requirements of this contract nor for fulfilling the purpose of the installation nor from his liability to replace the same should it prove defective or fail to meet the specified requirements.

1.3 SUBSTITUTION OF MATERIALS AND EQUIPMENT:

Substitution requests shall be in accordance with Section 6 – Control of Materials and Equipment of the GENERAL CONDITIONS.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01505

MOBILIZATION AND DEMOBILIZATION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

This section covers the requirements for mobilization and demobilization.

1.2 MOBILIZATION

Mobilization shall consist of the transporting, assembling, constructing, installing, and making ready for use at the job site, all the equipment, machinery, structures, utilities, materials, labor, field office, and incidentals necessary to do the work covered by this contract.

1.3 DEMOBILIZATION

Demobilization shall consist of the dismantling and removal of the above-mentioned equipment, machinery, structures, utilities, materials, field office, and incidentals, and the cleaning up and restoration of the site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GUIDELINES

A. The Contractor shall coordinate staging and stockpiling areas for equipment or materials with the Engineer and Garden Isle Racing Association prior to mobilization.

B. If the Contractor utilizes private lands for mobilization purposes, the provisions of this section shall apply, and the mobilization and demobilization work on said private lands shall be in accordance with the agreement between the Contractor and the land owner.

C. Any and all additional mobilization or demobilization costs in excess of the maximum amounts specified in the Proposal shall be included in the appropriate unit prices bid in the Proposal. The Contractor shall not receive any compensation for mobilization and demobilization in addition to those specified in the Proposal.

D. All equipment, machinery, buildings, utilities and incidentals mobilized and demobilized under this section shall remain the property of the Contractor.

END OF SECTION

SECTION 01567

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Furnish all labor, material and equipment and perform all work required for the prevention of environmental pollution during and as the result of construction operations under this contract.

B. This Section contains general specifications pertaining to the prevention of environmental pollution and disturbance as a result of construction operations under this contract and shall be maintained until completion of the contract and become a part of the work of all other Sections as applicable. The requirements of this Section take precedence over conflicting or contradictory provisions of other Sections.

C. The work in this Section shall include the following:

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

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

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

D. Related Work Described Elsewhere: Additional information pertaining to pollution control work including erosion control and temporary grassing will be found in various specific technical sections.

1.2 DEFINITIONS

A. For the purpose of this specification, Environmental Pollution is defined as the presence of chemical, physical, or biological elements or agents which:

1. Adversely affect human/animal health or welfare.

2. Unfavorably alter ecological balances important to human/animal life.

3. Affect other species of importance to man.

4. Degrade the utility of the environment for its normal daily function, for aesthetic, and for recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves noise control, solid waste management, and management of other pollutants.

1.3 GENERAL REQUIREMENTS

A. Comply with all applicable Federal and State laws, including the latest Hawaii Public Health regulations, local laws and regulations concerning pollution control and abatement.

B. The Contractor shall become familiar with the latest requirements of the National Pollutant Discharge Elimination System (NPDES) Permit and all other necessary permits to discharge water to State receiving waters, into storm drainage system and into sanitary sewer system prior to bidding on this project. The Contractor will apply for appropriate NPDES permits required by the State Department of Health (DOH). The Contractor shall prepare and submit a written site-specific construction BMP Plan to DOH thirty (30) calendar days prior to constructions as required.

C. Notification: The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions and the action to be taken. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose of notification. After receipt of such notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

D. Sub-Contractor: Compliance with the provisions of this Section by subcontractors will be the responsibility of the Contractor.

1.4 APPLICABLE REGULATIONS

A. 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:

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

2. State of Hawaii, Department of Health, Administrative Rules, Chapter 59, AMBIENT AIR QUALITY; Chapter 60.1, AIR POLLUTION CONTROL LAW.

3. State of Hawaii, Department of Health, Administrative Rules, Chapter 42, VEHICULAR NOISE CONTROL; Chapter 46, COMMUNITY NOISE CONTROLS.

4. Other regulations as noted on the drawings.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 LAND RESOURCES PROTECTION

A. General: Unless otherwise indicated on the drawings, existing land resources within the property lines and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, confine construction activities to areas defined by the plans or specifications.

B. Restoration of Damage: Restore all existing improvements, trees or other landscape feature scarred or damaged by the Contractor's equipment or operations to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used and whether damaged trees or other landscape feature shall be treated and healed or removed from the site and replaced with new.

C. Location of Storage and Construction Facilities: The Contractor's storage and other temporary construction buildings required temporarily in the performance of the work shall be located on the project property. The location shall be upon cleared portions of the job site or areas to be cleared, as indicated on the plans and approved by the Engineer.

D. Post-Construction Clean-Up: Obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Engineer. No separate payment will be made for post-construction cleanup or obliteration and all cost thereof shall be considered a portion of the Contract Price, except as otherwise provided for in the Contract Documents.

3.2 BURNING

No materials may be burned within the contract area at any time within the contract period.

3.3 WATER POLLUTION

A. General

1. 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 any surface water or ground water.

2. Care shall be taken to ensure that no petroleum products, bituminous materials, or other hazardous substances, including debris, are allowed to fall, flow, leach, or otherwise enter any surface or ground water.

3. Contractor shall provide any necessary temporary drainage, dikes, and similar facilities to prevent erosion damage to the site. Run-off shall be controlled to prevent damage to surrounding area.

B. Water Pollution Conference: Schedule a water pollution and erosion control conference with the Engineer at least 14 calendar days before the start of construction work to discuss the sequence of work, plans and proposals for water pollution and erosion control. Submit a water pollution and erosion control plan, as detailed below, a minimum of 10 calendar days before the scheduled conference.

C. Water Pollution Submittals:

Submit the following:

1. A written site-specific construction BMP Plan describing activities to minimize water pollution and soil erosion into State waters, drainage or sewer systems. The construction BMP Plan shall include: an identification of potential pollutants and their sources, a list of all materials and heavy equipment to be used during construction; descriptions of the methods and devices used to minimize the discharge of pollutants into State waters, drainage or sewer systems; details of the procedures used for the maintenance and subsequent removal of any erosion or siltation control devices; details of maintaining and ensuring proper operation of any devices used to minimize the discharge of pollutants including the removal of collected debris; methods of removing and disposing hazardous wastes encountered during construction; and methods of storing and handling of fuels, oils, paints and other products used for the project.

   At minimum, show or address the following to the Engineer: material storage and handling areas, and other staging areas; concrete truck washouts; fueling and maintenance vehicles and other equipment; use of form oils, paints and other products on the job site; tracking of sediment offsite from the project; litter management; dust control; and spill control.

   The construction BMP Plan must be signed and a copy kept on site throughout the duration of the project. Any revisions to the construction BMP Plan shall be included with the original construction BMP Plan, and all Drawings, documentations modified to reflect the revisions.

2. Plans indicating location of water pollution and erosion control devices; plans and details of construction BMPs to be installed or utilized; areas of soil disturbance in cut and fill, areas used for the storage of soil or waste, and areas where vegetative practices are to be implemented. The plans shall indicate the intended drainage pattern. Submit a separate drawing for each phase of construction which alters the drainage patterns.

3. Construction schedule.

4. The name(s) of the specific individual(s) designated to be responsible for the water pollution and erosion controls on the project site along with their home and business telephone and fax numbers.

D. Construction Requirements:

1. Do not begin work on the project until the submittals detailed in 3.3 C. above are completed and reviewed by the Engineer.

2. Address all comments subsequently received from the Engineer.

3. Modify and resubmit the plans and construction schedules to correct conditions that develop during construction which were unforeseen during the design and pre-construction states.

4. Coordinate any temporary control provisions with the permanent control features throughout the construction and post-construction period.

5. Apply accepted erosion control measures to all exposed erodible or stockpiled material within 15 calendar days of exposure. If after 15 calendar days, the erosion control measures have not been applied, apply an accepted erosion control measure on the sixteenth day at no cost to the State. Failure to apply erosion control measures will result in the increase in the amount of retainage and/or the withholding of the monthly progress payment.

6. Provide for controlled discharge of waters impounded, directed, or controlled by project activities or erosion control measures.

7. Properly maintain all erosion control features. Inspect, remove debris collected and make necessary repairs to all erosion control measures at the following intervals:

   a. Weekly during dry periods,

   b. Within 24 hours of any rainfall of 0.5 inch or greater which occurs in a 24-hour period,

   c. Daily during periods of prolonged rainfall,

   d. When existing erosion control measures are damaged or not operating properly as specified by the Engineer,

   e. Temporary removal of construction BMPs that may affect drainage or cause a potential flooding hazard in the event of a weather advisory warning.

8. Protect finished and previously seeded areas from damage and from spillover materials placed in the upper lifts of the embankment.

9. The Contractor's designated representative specified in 3.3 C.4. above shall address any water pollution and erosion control concerns brought up by the Engineer within 24 hours of notification. If the Contractor fails to satisfactorily address these concerns, the Engineer's own labor forces to provide the necessary corrective measures. The Engineer will charge the Contractor such incurred costs plus any associated project engineering costs. The Engineer will make appropriate deductions from the Contractor's monthly progress estimate.

10. When there are conflicts between these requirements and laws, rules, or regulations of other Federal or State local agencies, the more restrictive laws, rules, or regulations shall apply.

11. Failure to conform with the above requirements and regulations of the Federal or State local agencies will be cause for temporary or permanent suspension of operations. If operations are suspended due to the Contractor's failure to conform, the Contractor shall maintain the project during the period of suspension at no cost to the State.

E. Non-Compliance: The Engineer will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Engineer with the authorization of the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

3.4 DUST CONTROL

A. For the duration of the contract, the Contractor, at his own expense, shall keep the project area and the surrounding areas free from dust that would cause a hazard or nuisance to the work or the operations of other contractors or to persons or property. The work shall be in conformance with the Air Pollution Control Standards and the Regulations of the State Department of Health. Contractor shall construct dust fence as designated on plan and submit dust fence assembly and materials used for fence. Approved temporary methods of stabilization consisting of sprinkling or similar methods may be permitted to control dust. If approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Chemicals or oil treating shall not be used.

B. Control dust as the work proceeds and whenever a dust nuisance or hazard occurs. Controls shall be maintained from the start of construction until completion of the project or as directed by the Engineer. No separate or direct payment will be made for dust control and the cost thereof shall be considered incidental to and included in the Contract price.

C. The Contractor shall construct dust screens around all non-granular stockpile materials and spoil materials.

3.5 NOISE CONTROL

A. Noise shall be kept within acceptable levels at all times in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 46 - Community Noise Control. The Contractor shall obtain and pay for the Community Noise Permit from the State Department of Health when construction equipment or other devices emit noise at levels exceeding the allowable limits. Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air shall have mufflers. The Contractor shall comply with conditional use of the permit as specified in the rules and the conditions issued with the permit. Should there be a baseyard or stockpile area located adjacent to residences, mitigative measures, such as barriers or berms, shall be developed in the event that noise complaints are received.

B. The Contractor shall implement the best available control technology to ensure that the maximum permissible sound levels of 70 dBA (Class C Zoning District - Industrial) are not exceeded as measured from the property line or 50 feet from the generator, whichever is closer.

C. Where required, the Contractor shall obtain and maintain a Community Noise Permit. The Contractor shall comply with the conditional use of the permit as specified in the rules and the conditions issued with the permit.

D. The Contractor is forewarned that failure to employ best management noise limiting practices could lead to complaints from the public and/or penalties by the State of Hawaii Department of Health as provided in section 342F-11, HRS, and section 11-46-18, HAR Title 11 Chapter 46. The Contractor is responsible for all monetary fines or corrective action required as a result of complaints from the public and/or penalties from the County, State or Federal agencies at no additional cost to the State.

E. Blasting and use of explosives will not be permitted.

F. Construction activities shall not emit noise in excess of the maximum permissible sound levels. No work shall be conducted on weekends and/or holidays unless approved by the Engineer.

G. Compliance with the provisions of this Section by the subcontractors will be the responsibility of the Contractor.

H. The Engineer will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

I. The Contractor is forewarned that failure to employ best management noise limiting practices could lead to complaints from the public. The State of Hawaii Department of

Health is empowered to reduce the allowable hours of work or to revoke the noise variance in its entirety on the basis of public complaints, even if the Contractor is monitored to be within the preceding numerical noise limits. The Contractor shall not be given a time extension or compensated for additional costs or damages due to a reduction of work hours or revocation of the variance.

3.6 EMISSION CONTROL

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 Engineer.

3.7 MAINTENANCE

During the life of this Contract, maintain all environmental protection and pollution controls specified herein as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.8 EROSION CONTROL PLAN

A. The Contractor shall follow and provide erosion control measures in accordance to County regulations.

B. Temporary berms, cut-off ditches and other erosion control provisions which may be required because of the Contractor's method of operations shall be installed at no cost to the State.

C. All erosion control measures shall be constructed and maintained as shown on the plans to minimize erosion and pollution of waterways during construction.

3.9 POLLUTANTS AND HAZARDOUS MATERIALS

A. The Contractor shall provide the appropriate pretreatment methods and/or devices to remove pollutants if discharging into the County Sewer System or State waters such that the effluent complies with applicable County, State and Federal regulations. It will be unacceptable for the Contractor to pump and discharge polluted water into the existing sewer system or State waters during dewatering without treatment.

B. The Contractor shall, at a minimum, remediate polluted water and shall monitor the treatment process on a regular basis. Only treated water meeting County’s basic water quality criteria shall be discharged into the existing sewer system.

C. 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.

D. Pollutants, if encountered in the sediment, excavation spoils and dewatered materials, shall

be removed from the polluted materials 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.

E. 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.

F. 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.

G. The Contractor shall submit to the State copies of all test results. The Contractor shall furnish to the State 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.

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

3.10 DISPOSAL

A. Construction waste, such as crates, boxes, building materials, pipes and other rubbish shall be disposed of at approved County Disposal areas. Large size objects shall be reduced to a size acceptable by the County specifications.

B. No burning of debris and/or waste materials shall be permitted on the project site.

C. Removal of wastes shall be a continuous on-going operation. Wastes and debris shall not be allowed to accumulate in large open piles.

D. Wind-blown wastes and debris shall be collected by the Contractor and disposed as described above.

E. No burying of debris and/or waste material except for materials which are specifically

indicated elsewhere in these specifications as suitable for backfill and/or riprap shall be permitted on the project site.

F. All unusable debris and waste material shall be hauled away to an appropriate and County approved off-site dump area. The Contractor shall provide to the Engineer disposal receipts for all materials disposed of off-site.

G. During loading operations, debris and waste materials shall be watered down to allay dust.

H. Clean-up shall include the collection of all waste paper and wrapping materials, cans, bottles, construction waste materials and other objectionable materials, and removal as required. Frequency of clean-up shall coincide with rubbish producing events.

3.11 OTHERS

A. Wherever trucks and/or vehicles leave the site and enter surrounding paved streets, the Contractor shall prevent any material from being carried onto the pavement. Waste water shall not be discharged into existing streams, waterways, or drainage systems such as gutters and catch basins unless treated to comply with the State Department of Health water pollution regulations.

B. Trucks hauling debris shall be covered as required by PUC Regulation. Trucks hauling fine materials shall be covered.

C. No dumping of waste concrete will be permitted at the job-site.

D. Except for rinsing of the hopper and delivery chute, and for wheel washing where required, concrete trucks shall not be cleaned on the job-site.

E. Except in an emergency, such as a mechanical breakdown, all vehicle fueling and maintenance shall be done in a designated area. A temporary berm shall be constructed around the area when runoff can cause a problem.

3.12 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

A. All items having any apparent historical, archeological, or cultural interest discovered in the course of construction activities shall be carefully preserved. Leave the archeological find undisturbed and immediately report the find to the Engineer, Kaliko Santos at the Office of Hawaiian Affairs (OHA) Kauai Office at phone (808) 241-3506, and the State Historic Preservation Division (SHPD) Office from the State Department of Land and Natural Resources (DLNR) at phone (808) 692-8015 to assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

B. Archaeological Inventory Survey (AIS): An archaeological inventory survey report was conducted for the project and will be provided to prospective bidders. The Contractor shall be responsible for all requirements as stated in the report entitled, Archaeological Inventory Survey and Testing in Support of Lighting and Electrical Improvements at the Mānā Drag Racing Strip, Waimea Ahupuaʻa, Kona District, Island of Kauaʻi, Hawaiʻi,

prepared by Pacific Consulting Services, Inc., dated November 2015.

C. Archaeological Monitoring: The Contractor shall develop an Archaeological Monitoring Plan (AMP), conduct on-site archaeological monitoring during construction including any work to be completed by the Kauai Island Utility Cooperative (KIUC), and prepare an archaeological monitoring report all in accordance with and approved by SHPD.

3.13 FLORAL AND FAUNAL RESOURCES

A. General:

1. Constant vigilance shall be kept for the presence of protected species during all aspects of the proposed action. Protected species include plants and animals listed or proposed for listing as threatened or endangered under Endangered Species Act (ESA), birds covered under the Migratory Bird Conservation Act, as well as all marine mammals. Protected species of concern: Hawaiian petrel, Newell's shearwater, Band-rumped storm petrel, Hawaiian black-necked stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian duck, Hawaiian goose, band-rumped storm-petrel, Hawaiian hoary bat, green sea turtle, Hawaiian monk seal, and the Panicum niihauense.

2. All on-site project personnel, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.), shall be apprised of the status of any protected species potentially present in the project area and the protections afforded to those species under Federal laws. Brochures explaining the laws and guidelines for listed species in Hawaii, American Samoa, and Guam may be downloaded from http://www.nmfs.noaa.gov/prot_res/MMWatch/hawaii.htm and http://www.fws.gov/pacificislands/wesa/endspindex.html#Hawaiian.

3. The project foreman shall designate an appropriate number of competent observers to survey the area adjacent to the proposed action for protected species. The project foreman shall also have in his/her possession at the jobsite a handout with photographs of protected species that may enter the construction site to assist with identification of the protected species. (U.S. Fish and Wildlife Service – Pacific Islands Fish and Wildlife Office (PIFWO) will provide the informational handout).

4. Surveys of the project area shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour, to ensure that no protected species are within 50 yards of the project area. All work shall be postponed or halted when protected species are present, and shall only begin/resume after the animals have voluntarily departed the area. In the case of sessile species, a conservation plan shall be developed and approved between the Regulatory Branch, U.S. Army Corps of Engineers and PIFWO and/or National Marine Fisheries Service Pacific Islands Regional Office (PIRO).

5. If an onsite protected species does not depart the area on its own for 3 days or more, the Contractor shall contact PIFWO for further technical assistance and guidance (808) 792-9400.

6. Any interaction with or incidental take of protected species shall be reported immediately to the Regulatory Branch, U.S. Army Corps of Engineers (808) 438-9258. Additionally, pursuant to the ESA, any take of ESA-listed species (other than marine mammals) must be reported to the U.S. Fish and Wildlife Office of Law Enforcement in Honolulu at 1-808-861-8525. Any incidental take of marine mammals shall be reported immediately to the National Oceanic and Atmospheric Administration's (NOAA) 24-hour hotline at 1-888-256-9840. Information reported must include the name and phone number of a point of contact, location of the incident, and nature of the take and/or injury.

B. Hawaiian Goose:

1. Prior to start of construction including work to be completed by KIUC, or after any subsequent delay in work of three or more days, a biologist familiar with the nesting behavior of the Hawaiian goose shall survey the area. If a nest is discovered, work shall immediately cease and the United States Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office (USFWS) shall be contacted.

2. All on-site project personnel should be apprised that Hawaiian geese may be in the vicinity of the project at any time during the year.

3. If a Hawaiian goose (or geese) appears within 100 feet of ongoing work, all activity shall be temporarily suspended until the Hawaiian goose (or geese) leaves the area of its own accord.

C. Hawaiian Hoary Bat:

1. Woody plants greater than 15 feet tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). If disturbance of such trees is necessary during bath birthing and pup rearing season, a survey will be first conducted by a knowledgeable wildlife biologist to prevent disturbance of the horay bat.

D. Seabirds:

1. Seabirds typically fly at night and are attracted to artificially-lighted areas resulting in disorientation and subsequent fallout due to exhaustion. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer, such as utility lines and extended equipment. Construction activities shall be limited during daylight hours, especially during the peak fallout period of September 15 through December 15.

E. Hawaiian Waterbirds:

1. Prior to the start of construction including work to be completed by KIUC, the USFWS shall be notified and a biologist familiar with the behaviors of the

Hawaiian Waterbird, shall survey the area. A report of the preconstruction survey and findings shall be submitted to USFWS prior to start of construction.

2. If a nest is discovered, the USFWS shall be contacted immediately. A 100-foot buffer shall be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No potentially disruptive activities or habitat alteration shall occur within this buffer.

3. A biological monitor(s) shall be present on the project site during all construction or earth moving activities, including all work to be completed by KIUC, to ensure that the Hawaiian Waterbirds and nests are not adversely impacted. If a listed Hawaiian Waterbird is observed within the project site, or flies into the site while activities are occurring, all activities within 100 feet of the individual shall be temporarily suspended until the Hawaiian Waterbird leaves the area of its own accord.

4. A post construction report shall be submitted to the USFWS within 30 days of the completion of the project. The report shall include the results of the Hawaiian Waterbird surveys, the location and outcome of documented nests, and any other relevant information.

3.14 SUSPENSION OF WORK

A. Violations of any of the above requirements or any other pollution control requirements which may be specified in the Technical Specifications herein shall be cause for suspension of the work creating such violation. No additional compensation shall be due the Contractor for remedial measures to correct the offense. Also, no extension of time will be granted for delays caused by such suspensions.

B. If no corrective action is taken by the Contractor within 72 hours after a suspension is ordered by the Engineer, the State reserves the right to take whatever action is necessary to correct the situation and to deduct all costs incurred by the State in taking such action from monies due the Contractor.

END OF SECTION

SECTION 01581

PROJECT SIGN

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

Furnish all labor, materials and equipment necessary to construct and install all project sign as specified hereinafter.

1.2 SUBMITTAL

The Contractor shall provide the Engineer with eight (8) shop drawings of the project sign for review and approval by the Engineer prior to ordering the sign.

1.3 LETTER STYLE

Copy is centered and set in Adobe Type Futura Heavy. If this specific type is not available, Futura Demi Bold may be substituted. Copy should be set and spaced by a professional typesetter and enlarged photographically for photo stencil screen process.

1.4 ART WORK

Constant elements of the sign layout - frame, outline, stripe, and official state information - may be duplicated following drawing measurements, or be reproduced and enlarged photographically using a layout template if provided. The "STATE OF HAWAII" masthead should be reproduced and enlarged as specified, using the artwork provided.

1.5 TITLES

The specific major work of the project under construction is emphasized by using 3-3/4" type, all capitals. Secondary information such as location or buildings uses 2-1/4" type, all capitals. Other related information of lesser importance uses letter heights as indicated on 01581-3, upper / lower case letters.

Design should follow the example on page 01581-3.

PART 2 – PRODUCTS

2.1 MATERIALS

A. LUMBER

1. Panel is 3/4" exterior grade high density overlaid plywood, with resin-bonded surfaces on both sides.

2. 4"x4" sign posts shall be Douglas Fir No. 1 or better.

B. PAINTS & INKS

Screen print inks are matte finish. Paints are satin finish, exterior grade. References to Ameritone Color Key Paint are for color match only.

COLOR:	1.	1BL10A	Bohemian Blue
	2.	2H16P	Softly (White)
	3.	2VR2A	Hot Tango (Red)
	4.	1M52E	Tokay (Gray)

C. CONCRETE

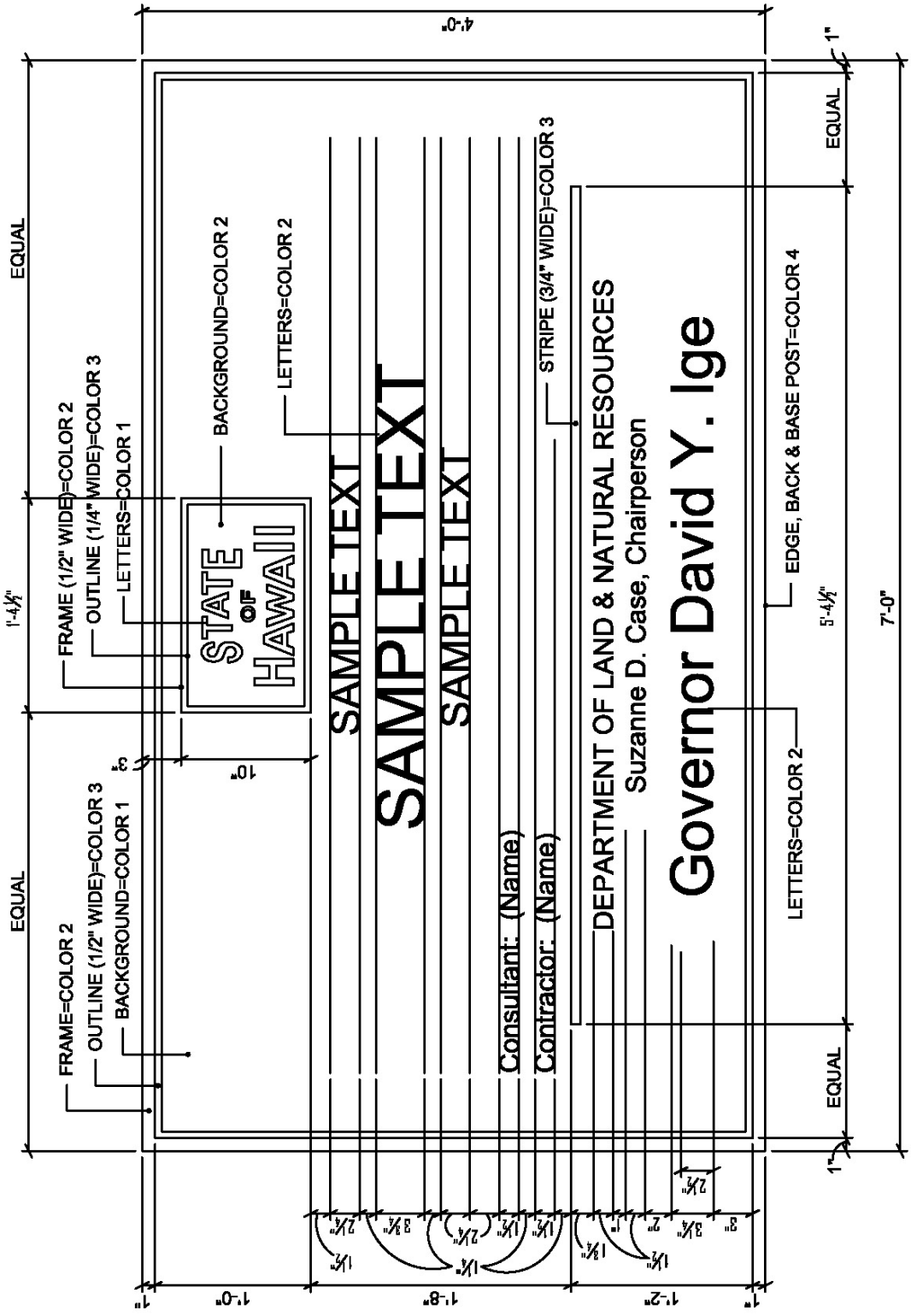
Concrete shall be class B with a 2,500 psi 28-day compressive strength.

PART 3 – EXECUTION

3.1 GENERAL

A. The Project Sign shall be constructed with new materials as specified above.

B. The Project sign shall be installed at the location indicated on the drawings or as designated by the Engineer. The project sign shall be erected upon commencement of work.



NOTE: Number of signs required 1

END OF SECTION

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This Section includes general procedural requirements governing execution of the Work including the following:

1. Construction layout. Field engineering and surveying.

2. General installation of products.

3. Progress cleaning.

4. Starting and adjusting.

5. Protection of installed construction.

6. Correction of the Work.

B. Related Sections

Section 01770 - CLOSEOUT PROCEDURES.

1.2 NOTIFICATION

Contact the Engineer at least 3 working days prior to starting any onsite work.

1.3 PROJECT AND SITE CONDITIONS

A. Project Contract Limits (Contract Zone Limits) indicate only in general the limits of the work involved. Perform necessary and incidental work, which may fall outside of these demarcation lines. Confine construction activities within the Project Contract Limits and do not spread equipment and materials indiscriminately about the area.

B. Disruption of Utility Services: Prearrange work related to the temporary disconnection of electrical and other utility systems with the Engineer. Unless a longer notification period is required elsewhere in the Contract Documents, notify the Engineer at least 15 days in advance of any interruption of existing utility service. Time and duration of interruptions are subject to the Engineer's approval. Keep the utility interruptions and duration to a minimum so as not to cause inconvenience or hardship to the facility. If temporary electrical or other utility systems hook-up is required, provide the necessary services. Pay for temporary services as part of the contract, unless specifically noted otherwise.

C. Contractor's Operations - Provide means and methods to execute the Work and minimize interruption or interference to the facility's operations. Rearrange the construction schedule when construction activities result in interruptions that hamper the operations of the facilities.

D. Maintain safe passageway to and from the facility's occupied buildings, rooms and other occupied spaces for the using agency personnel and the public at all times.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor with a license to practice in Hawaii.

B. Professional Engineer Qualifications: A professional engineer with a license to practice in Hawaii.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 KIUC SERVICE INSTALLATION

A. KIUC Project Number 15-04-100BG has been established for the proposed overhead utility lines

B. Within in 30 days of the Notice to Proceed, the contractor shall contact, schedule, and coordinate the KIUC service installation.

C. Contractor shall engage a licensed land surveyor to establish and provide benchmarks, control points, and property stakes to locate each element of the project, including KIUC work and County Flood Elevation Certification requirements.

3.2 COUNTY FLOOD ELEVATION CERTIFICATION

A. Contractor shall engage a licensed land surveyor to establish and provide benchmarks, control points, property stakes to locate each element, and provide elevation certification for the project elements in the County Flood Hazard Zones.

3.3 EXAMINING THE SITE

A. Contractor and Subcontractors are expected to visit the site and make due allowances for difficulties and contingencies to be encountered. Compare contract documents with work in place. Become familiar, with existing conditions, the conditions to be encountered in performing the Work, and the requirements of the drawings and specifications.

B. Verify construction lines, grades, dimensions and elevations indicated on the drawings before any clearing, excavation or construction begins. Bring any discrepancy to the attention of the Engineer, and make any change in accordance with the Engineer instruction.

C. Obtain all field measurements required for the accurate fabrication and installation of the Work included in this Contract. Verify governing dimensions and examine adjoining work on which the Contractor or Subcontractor's work is in any way dependent. Submit differences discovered during the verification work to the Engineer for interpretations before proceeding with the associated work. Exact measurements are the Contractor's responsibility.

D. Furnish or obtain templates, patterns, and setting instructions as required for the installation of all Work. Verify dimensions in the field.

E. Contractor shall accept the site in the condition that exists at the time access is granted to begin the Work. Verify existing conditions and dimensions shown and other dimensions not indicated but necessary to accomplish the Work.

F. Locate all general reference points and take action to prevent their destruction. Lay out work and be responsible for lines, elevations and measurements and the work executed. Exercise precautions to verify figures and conditions shown on drawings before layout of work.

3.4 SITE UTILITIES AND TONING

A. Cooperate, coordinate and schedule work to maintain construction progress, and accommodate the operations and work of the owners of underground or overhead utility lines or other property in removing or altering the lines or providing new services.

B. Contact all the various utility companies before the start of the work to ascertain any existing utilities and to develop a full understanding of the utility requirements with respect to this Project. Furnish the Engineer with evidence that the utility companies were contacted.

C. Should the Contractor discover the existence and location of utilities in the contract drawings are not correct, do not disturb the utilities and immediately notify the Engineer.

D. Do not disturb or modify any utilities encountered, whether shown or not on the Contract Drawings, unless otherwise instructed in the drawings and specifications or as directed by the Engineer. Repair and restore to pre-damaged condition any utilities or any other property damaged by construction activities.

E. Transfer to "Field Posted As-Built" drawings the location(s) and depth(s) of new and existing utilities that differ from the Contract Drawings. Locate by azimuth and distance and depth(s) from fixed referenced points.

F. Toning: Prior to the start of grading, or excavation or trenching work verify and confirm the presence, location and depth of existing underground utility lines in the area affected by the project, by “toning” or by other appropriate means acceptable to the Engineer. The intent of this advanced toning is to afford the Engineer an opportunity to identify utility lines that may or may not be shown on the drawings and issue a directive to address the existing conditions.

1. Perform toning using instruments specifically developed and designed for the detection of underground pipes and cable utilities.

2. Notify the Engineer 48 hours in advance before toning operations. Provide information on the proposed toning method and other pertinent information.

G. Recording Toning Information: Upon completion of the toning operation, submit drawings that show the location and approximate depth of the existing and newly discovered utility lines. Identify the type of utility lines. Also, identify where utility lines indicated on the drawings are not shown in their approximate location or where new utility lines are found or pointed out in the field.

H. After ascertaining the exact location and depth of utilities within the project area, mark and protect the locations.

1. Acquaint personnel working near utilities with the type, size, location, depth of the utilities, and the consequences that might result from disturbances.

2. Do not start trenching or start similar operations until reasonable and appropriate precautions to protect the utilities are taken.

I. For newly identified utility lines, if directed by the Engineer, manually excavate within 2-feet of the utility line to avoid damage. Under this directive, manual excavation is considered additional work.

J. Existing Irrigation Systems: Where work is located in areas with existing irrigation systems, Contractor shall test the existing systems and document all deficiencies prior to any work that may damage the existing systems.

3.5 FIELD MEASUREMENTS

A. Take field measurements to fit and install the Work properly. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress.

B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

C. Review of Contract Documents and Field Conditions: Submit a Request For Information (RFI) immediately upon discovery of the need for clarification of the Contract Documents. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.6 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify the Engineer promptly.

B. General: Engage a licensed land surveyor to lay out the Work using accepted surveying practices.

1. Establish and provide benchmarks, control points, property stakes, lines and levels at each story or level of construction and elsewhere as needed to locate each element of Project and conformance with the County Flood Ordinance.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify the Engineer when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including structures, pavements, grading, fill and topsoil placement, utility location, alignment, and slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level the foundations and piers from 2 or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by the Engineer.

3.7 FIELD ENGINEERING

A. Reference Points: Locate existing permanent or temporary benchmarks, control points and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without the Engineer's approval. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to the Engineer before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base all replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two (2) permanent or temporary benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.8 INSTALLATION

Install materials, items, fixtures required by the various Divisions and Sections of the Specifications in accordance with Contract Documents, by workers specially trained and skilled in performance of the particular type of work, to meet guarantee and regulatory agency requirements. Should the drawings or specifications be void of installation requirements, install the materials, items, and fixtures in accordance with the manufacturer's current specifications, recommendations, instructions and directions.

3.9 CUTTING AND PATCHING

A. Oversee cutting and patching of concrete, masonry, structural members and other materials where indicated on drawings and as required by job conditions. Unless noted elsewhere in the contract documents, do not cut or patch existing or new structural members without previously notifying the Engineer.

B. Provide patch materials and workmanship of equal quality to that indicated on the drawings or specified for new work.

3.10 CLEANING

A. General: Clean the Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold waste more than 7 days unless approved otherwise by the Engineer.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use only cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.11 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.12 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions to provide proper temperature and relative humidity conditions.

3.13 CORRECTION OF THE WORK

A. Repair or replace defective construction. Restore damaged substrates and finishes. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair defective components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including the following:

1. Project Record Documents.

2. Warranties.

3. Instruction for the State's personnel.

4. Flood Elevation Certificate.

5. Hawaiian Waterbird Post-Construction Report.

B. Related documents include the following:

1. Section 01700 – EXECUTION REQUIREMENTS.

2. Section 01567 – ENVIRONMENTAL PROTECTION.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting a Final Inspection to determine Substantial Completion, complete the following items in addition to requirements of Section 7 - Prosecution and Progress of the GENERAL CONDITIONS.

1. Advise the Engineer of pending insurance changeover requirements.

2. Submit specific warranties, final certifications, and similar documents.

3. Obtain and submit occupancy permits, operating certificates, and similar releases and access to services and utilities, unless waived by the Engineer.

4. Arrange to deliver tools, spare parts, extra materials, and similar items to a location designated by the Engineer. Label with manufacturer's name and model number where applicable.

5. Complete startup testing of systems.

6. Submit test, adjust, and balance records.

7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

8. Advise the Engineer of changeover in other utilities.

9. Submit changeover information related to the State's occupancy, use, operation, and maintenance.

10. Complete final cleaning requirements, including touch up painting.

11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

12. Submit the Flood Elevation Certificate for review.

13. Submit Field-Posted As-Builts.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Within 10 days from the Project Acceptance Date, complete the following items in addition to requirements of Section 7 - Prosecution and Progress of the GENERAL CONDITIONS:

1. Instruct the State's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training media materials.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit 2 copies of any updated and action taken list. In addition to requirements of Section 7 - Prosecution and Progress of the GENERAL CONDITIONS, include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.

3. Include the following information at the top of each page:

a. Project Name and Title.

b. DLNR Job No.

c. Date and page number.

d. Name of Contractor.

1.5 PROJECT RECORD DOCUMENTS AND REQUIREMENTS

A. General:

1. Definition: "Project Record Documents", including Record Drawings, shall fulfill the requirements of "Field-Posted As-Built Drawings" listed in the GENERAL CONDITIONS.

2. Do not use Project Record Documents for daily construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Engineer's reference during normal working hours. Maintain these documents as specified in paragraph entitled "Record Drawings" hereinafter.

3. The Designer, under contract with the State, will update the drawings to show all addendum, PCD, and sketch changes. The Engineer will transmit these drawings (mylar or vellum) to the Contractor who will make all "red-line" corrections to these drawings to record the changes depicted on the Contractor's Field Posted Record ("As-Builts") by accepted drafting practices as approved by the Engineer.

4. Where the recorded changes depicted on the Contractor's Field Posted Record ("As-Builts") are in the form of shop drawings, the Contractor shall provide those shop drawings electronically on the same sheet size as the drawings transmitted to the Contractor. The new drawing sheets shall be titled and numbered to conform to the construction drawings and clearly indicate what information they supersede in the actual construction drawings. For example a new drawing that replaces drawing M-3, could be numbered M3a.

5. The Contractor shall bring to the attention of the Engineer any discrepancy between the changes made by the Designer and those depicted on addendum, PCD, and sketch changes. The Engineer will resolve any conflicts.

6. Submit final Record Documents (Field Posted Record Drawings) before the Final Inspection Date and no later than the Final Settlement of Contract, unless the GENERAL CONDITIONS require otherwise.

7. The Contractor shall guarantee the accuracy of its final Record Documents. The State will hold the Contractor liable for costs the State incurs as a result of inaccuracies in the Contractor's Record Documents.

8. Prepare and submit construction photographs and electronic files and similar final record information as required by the Engineer.

9. Deliver tools, spare parts, extra materials, and similar items to a location designated by the Engineer. Label with manufacturer's name and model number where applicable.

10. Submit stamped and signed Flood Elevation Certificate.

11. Complete and submit the notice of Cessation Form (CWB-NOC Form) to the Department of Health within two (2) weeks of completion of project or as indicated in the approved Notice of General Permit Coverage (NGPC) for the NPDES Form C. Provide a copy of submittal confirmation from the Department of Health.

12. Submit a copy of all Federal, State, or County permit closeout procedure requirements.

B. Record Drawings:

1. Maintain a duplicate full-size set as the Field Posted Record ("As-Builts") Drawings at the job site. Clearly and accurately record all deviations from alignments, elevations and dimensions, which are stipulated on the drawings and for changes directed by the Engineer that deviate from the drawings.

2. Record changes immediately after they are constructed in place and where applicable, refer to the authorizing document (Field Order, Change Order, or Contract Modification). Use red pencil to record changes. Make Field Posted Record Drawings available to the Engineer at any time so that its clarity and accuracy can be monitored and can be countersigned for validity.

    a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.

    b. Accurately record information in an understandable drawing technique.

    c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

    d. Mark the contract drawings or the shop drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on contract drawings.

    e. Mark important additional information that was either shown schematically or omitted from original Drawings.

    f. Locate concealed building utilities by dimension from bench marks or permanent structures. Locate site utilities by dimensions, azimuth and lengths from bench marks or permanent structures.

g. Note field order numbers, Change Order numbers, Contract Modification numbers, Alternate numbers, post-construction drawing numbers (PCD) and similar identification (RFI numbers) where applicable.

h. The Contractor shall initial each deviation and each revision marking.

3. Use the final updated Contract Drawing set (including all addenda, PCD, and sketches) plus applicable shop drawings for making the final Field Posted Record Drawings submittal.

4. Certify drawing accuracy and completeness. Label and sign the record drawings or use digital electronic signature as approved by the Engineer.

5. Label the title sheet and on all sheets in the margin space to the right of the sheet number, written from the bottom upward, with the title "FIELD POSTED RECORD DRAWINGS" and certification information as shown below. Provide a signature line and company name line for each subcontractor that will also certify the respective drawing. Adjust size to fit margin space.

FIELD POSTED RECORD DRAWINGS Certified By: _____ Date: _____
[Contractor's Company Name]

6. Revise the Drawing Index and label the set "FIELD POSTED RECORD DRAWINGS". Include the label "A COMPLETE SET CONTAINS [_____] SHEETS" in the margin at the bottom right corner of each sheet. Quantify the total number of sheets comprising the set.

7. If the Engineer determines a drawing does not accurately record a deviation or omits relevant information, the State will correct any FIELD POSTED RECORD DRAWINGS sheet. Contractor will be charged for the State's cost to correct the error or omission.

8. Use the final Field Posted Record Drawings sheets and create one electronic version of the set. The set shall be recorded in Adobe Acrobat PDF (Portable Document Format). Create a single indexed, bookmarked PDF file of the entire set of drawings.

1.6 WARRANTIES

A. Submittal Time: Submit written manufacturer's warranties at request of the Engineer for designated portions of the Work where commencement of warranties other than Project Acceptance date is indicated.

B. Partial Occupancy: Submit properly executed manufacturer's warranties within 45 days of completion of designated portions of the Work that are completed and occupied or used by the State during construction period by separate agreement with Contractor.

C. Organize manufacturer's warranty documents into an orderly sequence based on the table of contents of the Specifications.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 inch x 11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer and prime contractor.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES", Project Name and Title, DLNR Job Number, and name of Contractor.

4. Use the final submittal of the warranties to create an electronic Adobe Acrobat PDF (Portable Document Format) version of the bound warranty documents files. Each sheet shall be separately scanned, at 600 DPI or better into a PDF file, indexed.

1.7 FLOOD ELEVATION CERTIFICATE

A. Quality Assurance: The Contractor shall retain and pay for the services of a land surveyor to measure and record finish elevations and prepare and sign the flood Elevation Certificate. The land surveyor shall be a professional land surveyor with a license to practice in Hawaii.

B. In accordance with Chapter 15, Article 1, of the Kauai Code 1987, as amended, complete, sign, and submit the County accepted flood Elevation Certificate.

1.8 HAWAIIAN WATERBIRD POST-CONSTRUCTION REPORT

A. Within 30 days of the completion of the project, the Contractor shall submit a post construction summary report to the United States Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office (USFWS), including results of the Hawaiian Waterbird surveys, the location and outcome of documented nests, and any other relevant information.

PART 2 - PRODUCTS

2.1 MATERIALS

Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct the State's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually accepted times.

3. Schedule training with the State's users, through the Engineer with at least 7 days advanced notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.

2. Review of documentation.

3. Operations.

4. Adjustments.

5. Troubleshooting.

6. Maintenance.

7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. In addition to requirements of Section 7 - Prosecution and Progress of the GENERAL CONDITIONS, conduct cleaning and waste-removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturers written instructions unless noted

otherwise. Complete the following cleaning operations before requesting final inspection for entire Project or for a portion of Project:

1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits resulting from construction activities.

3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

4. Remove tools, construction equipment, machinery, and surplus material from Project site.

5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

6. Remove debris and surface dust from limited access spaces, including: roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

7. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass surfaces, taking care not to scratch surfaces.

8. Remove labels that are not permanent.

9. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

10. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.

11. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

12. Replace parts subject to unusual operating conditions.

13. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

14. Leave Project clean and ready for occupancy.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the State's property. Do not discharge volatile, harmful, or dangerous materials into drainage and sewer systems or onto State property. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

The work to be performed under this section shall include clearing the premises of all obstacles and obstructions, the removal of which will be necessary for the proper reception, construction, execution and completion of the other work included in this contract.

1.2 RELATED SECTIONS

A. Section 01567 – ENVIRONMENTAL PROTECTION.

B. Section 01700 – EXECUTION REQUIREMENTS.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 GENERAL

A. Maintenance of Traffic: The Contractor shall conduct operations with minimum interference to streets, driveways, sidewalks, passageways, etc.

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: Bench marks, etc., shall be carefully maintained, but if disturbed or destroyed, shall be replaced as directed, at the Contractor's expense.

E. Disposal: All materials resultant from operations under this Section, except as indicated or specified otherwise, shall become the property of the Contractor and shall be removed

from the site. Loads of materials shall be trimmed to prevent droppings.

3.2 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 on the Drawings. Should any unknown line be encountered during excavation, the Contractor shall immediately notify the Engineer of such discovery. The Engineer shall then investigate and issue instructions for the preservation or disposition of the unknown line. Authorization for extra work shall be issued by the Engineer only as he deems necessary.

3.3 CLEARING AND GRUBBING

A. The Contractor shall clear the premises of all obstacles and 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 6 inches. Remove trees and roots to a minimum of 3 feet below existing ground level. Remove all large roots in excess of 2 inches in diameter, and backfill and compact the resulting depression. All debris accumulated from this operation shall be completely removed from the premises by the Contractor.

C. The Contractor shall protect from injury and damage all surrounding trees, plants, etc., and shall leave all in as good as condition as at present. Any damage to existing improvement shall be repaired or replaced by the Contractor to the satisfaction of the Engineer.

3.4 CLEAN UP OF PREMISES

Clean up and remove all debris accumulated from building operations from time-to-time as directed. Upon completion of the construction work and before final acceptance of the contract work, remove all surplus materials, equipment, scaffoldings, etc., and leave entire job site raked clean and neat to the satisfaction of the Engineer.

END OF SECTION

SECTION 02320

TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

Furnish all labor, materials and equipment necessary for the trenching and backfilling of utility trenches as shown on the Contract Drawings and specified herein.

1.2 REFERENCES

The "Standard Specifications for Public Works Construction", September 1986, of the Department of Public Works, including all revisions, as applicable to the City and County of Honolulu, hereafter referred to as STANDARD SPECIFICATIONS, or as herein specified.(Paragraphs concerning Measurement and Payment are not applicable to this project.)

1.3 SUBMITTALS

A. Submit in accordance with Section 01300 –SUBMITTALS.

1. Test Reports: Submit test reports as directed by the Engineer. Contractor shall verify all requirements prior to the start of earthwork operations.

2. Certification of Compaction: Geotechnical testing laboratory shall test and certify all compaction work. Certifications and test results shall be submitted to the Engineer within three (3) days of the test.

3. Field Dry Density and Moisture Content Tests: Submit field test data not listed above sufficiently in advance of construction so as not to delay work. Furnish a drawing showing test locations, test numbers, and elevations. Submit test results within 3 days of test date.

4. Manufacturer's product literature: Submit manufacturer's product literature including description of material and physical properties and laboratory test data for bedding material, satisfactory fill, structural fill, and woven and non-woven fabric to the Engineer for approval at least 15 calendar days prior to construction.

5. Shoring and sheeting plan: Describe materials of shoring system to be used. Indicate whether or not components will remain after filling or backfilling. Provide plans, sketches, and details along with calculations by a professional engineer licensed in Hawaii. Indicate sequence and method of installation and removal.

6. Dewatering plan: Describe methods for removing collected water from open trenches and excavations, and diverting surface water or piped flow away from

work area and excavations. Describe equipment and procedures for installing and operating the dewatering system.

1.4 QUALITY ASSURANCE

A. Compaction requirements are defined by American Society for Testing and Materials (ASTM) publication D-1557 "Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-inch Drop."

B. Design of all excavation support systems by a structural engineer licensed in the State of Hawaii. The Contractor's engineers shall verify the actual subsurface conditions are consistent with the subsurface conditions used in their design and shall make modifications to the excavation support and dewatering systems where necessary.

C. Shoring System Plan: Describe materials or shoring system to be used. Indicate whether or not any components will remain after filling or backfilling. Provide plans, sketches, or details along with calculations by a licensed professional structural or geotechnical engineer licensed in Hawaii. Indicate sequence and method for installation and removal.

D. Dewatering System**:** Describe methods to be employed in removing water from exposed surfaces and diverting surface water from other areas or structures. The dewatering system shall protect against excavation instability, boiling, and/or blow out of the excavation and trench bottoms, damage to existing utilities, and settlement and/or ground movements, instability, and distress to buildings, foundations, walls, structures, and pavements. Describe the basic components of the dewatering system proposed and its planned method of operation. Provide dewatering plan, sketches, or details along with calculations by a licensed professional civil engineer specializing in geotechnical engineering and licensed in Hawaii.

1.5 CONTRACTOR'S RESPONSIBILITIES

A. The Contractor shall retain and pay for the services of a Soils Engineer to monitor and perform testing during the utility trench excavation and backfilling operations. The Soils Engineer shall be a Civil Engineer licensed in the State of Hawaii and specializing in geotechnical engineering with at least 5 years of licensed experience.

B. It is the Contractor's responsibility to prepare the ground surface to receive the fills and to place, spread, mix, moisture condition, and compact the fill in accordance with the Specifications herein. The Contractor shall also remove all unsuitable and deleterious materials.

C. It is also the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment shall be shut down to allow completion of compaction. Sufficient watering apparatus will also be provided by the Contractor with due consideration for the fill material, rate of placement, and the time of year.

D. The Contractor shall not implement blasting as a means for removal of material.

E. The Soils Engineer shall promptly notify both the Contractor and the Engineer verbally of any failing compaction tests and the results of such tests to the extent the tests show a lack of compliance with Specifications. These items shall also be documented by the Soils Engineer.

F. If field density test indicate inadequate compaction or moisture content, the Contractor shall moisture condition and recompact and retest until adequate compaction and adequate moisture content is achieved.

G. During construction, drainage shall be provided to minimize ponding of water adjacent to or on foundation and pavement areas. Ponded areas shall be drained immediately. Any subgrade soil that has become soft due to ponding shall be removed to firm material and replaced with compacted structural fill.

PART 2 - PRODUCTS

2.1 BACKFILL MATERIALS

A. General: Refer to the aforementioned City and County STANDARD SPECIFICATIONS for materials not listed below.

B. Satisfactory soil materials are defined as those complying with the Unified Soil Classification System (USCS) and ASTM D 2487 soil classification GW, GP, GM, GW-GM, GP-GM, SW, SP, SM, SW-SM, or SP-SM. Satisfactory material shall be free of organic matter, unsatisfactory materials, asphaltic and concrete debris, and particles greater than 3-inches in any dimension. Fine-grained shall have a California Bearing Ratio (CBR) swell value of less than 2 percent when compacted at optimum moisture content and after 4 days of soaking. It shall not be used in the top 24 inches of the backfill under pavements. Satisfactory soil materials may be used as trench backfill zone above the pipe bedding

C. Unsatisfactory soil materials are defined as those complying with the Unified Soil Classification System (USCS) and ASTM D 2487 soil classification groups CL, ML, CL-ML CH, MH, PT, OL, or OH. These materials shall not be used in the trench backfill.

D. Bedding material shall consist of a clean, granular basaltic gravel conforming to ASTM D448 No. 67 (#3B fine) size aggregate.

E. Oversized rock particles greater than 3-inch in maximum dimension resulting from the excavation process shall not be used in the trench and excavation backfill unless it can be crushed and screened to provide a well graded, fine to coarse granular mixture conforming to the trench backfill requirements stated herein.

F. Structural fill and structural backfill shall consist of a granular, well-graded material with particles ranging from coarse to fine and classified as GW, GM, GP-GM, GW-GM, SW, SM, SP-SM, or SW-SM, according to Unified Soil Classification System. It shall be free

of vegetation, organics, debris, trash, concrete, old pavements, and particles larger than three (3) inches in maximum dimension. It shall be non-expansive with between 8 and 20 percent passing a U.S. No. 200 standard sieve, a California Bearing Ratio (CBR) value of at least 15, a CBR swell of one percent or less after 4 days of soaking, and a plasticity index of less than 10.

G. Imported material for trench backfill shall conform to Select Borrow for Subbase Course, Section 30, of the Standard Specifications for Public Works Construction of September 1986. It shall also have a plasticity index of 10 or less.

H. All trench backfill and imported materials shall be checked and tested by a qualified geotechnical engineer before they are used in backfills at the site. All material to be used as trench backfill shall be approved by the Engineer. If in the opinion of the Engineer that the Contractor's proposed backfill do not meet the material requirements specified herein, the Contractor shall resubmit and provide material test results that meet the material requirements of this project.

PART 3 – EXECUTION

3.1 SITE PREPARATION

A. Prior to trenching for new utility lines and manholes within existing paved areas, the areas along the proposed utility alignment should be prepared by saw-cutting and removing the existing pavements. All old pavements shall be demolished and removed off-site by the Contractor at his own expense in compliance with all regulatory agency requirements.

B. Prior to trenching and excavating for the new utility lines and manhole installations, the as-built conditions of all underground utilities and structures, including mains and laterals, should be field verified to check on their locations and depths.

C. The location of the existing utilities shown on the Plans is approximate. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction. The Contractor shall scan the project site with electromagnetic and sonic equipment and mark the surface of the ground where existing underground utilities are discovered.

D. Any existing underground utilities and structures that may interfere with the new utility lines shall be removed and/or relocated, if still in use. The remaining portions of any lines to be abandoned and left in-place shall be properly cut and plugged.

3.2 TRENCH EXCAVATION AND DEWATERING CONSIDERATIONS

A. Excavation, dewatering, and trench stability are the responsibility of the Contractor. Excavation and trenches shall be shored and braced to prevent cave-ins of the walls on manhole pits and subsidence of areas adjacent to the trench. In addition, when excavating near or under existing structures or facilities, the Contractor shall be responsible not only for properly sheeting and bracing the excavation but also for stabilizing the existing ground to render it safe and secure from possible slides, cave-ins, ground movements, settlements, instability, and undermining, and for properly supporting existing structures and facilities with beams, struts, or underpinning to fully protect them from damage.

B. The Contractor's excavation support and dewatering system shall protect against excavation instability, boiling, and/or blow out of the excavation and trench bottoms, damage to existing utilities, and settlement and/or ground movements, instability, and distress to buildings, structures, and pavements. The need and requirements for underpinning of structures near the proposed new lines shall be determined by the Contractor. All phases of trenching, excavations, and shoring shall be performed in accordance with applicable Federal, State, and local safety regulations, including current OSHA trench excavation safety standards.

C. The Contractor shall retain qualified structural and geotechnical engineers who are licensed in the State of Hawaii and experienced in excavation support to design the underpinning, shoring, bracing, trench support, and dewatering systems. The Contractor's excavation support and dewatering system shall protect against excavation instability, boiling, and/or blow out of the excavation and trench bottoms, damage to existing utilities, and settlement and/or ground movements, instability, and distress to buildings, foundations, walls, structures, and pavements.

D. Remove the support system from the trench and excavation in a manner to avoid undermining of existing building, structures, walls, utilities, and pavements. The support system removed shall remain the property of the Contractor and shall be removed from the site.

E. Prevent ground settlement and movement, and damages to existing building, structures, pavements, and new improvements during all excavating, trenching, and dewatering operations. Should ground settlement and movement, or damage occur, the Contractor shall immediately stop his operations and perform corrective measure. The Contractor shall not be allowed to recommence any excavating or dewatering operations until the appropriate corrective actions to his methods or sequence, and the necessary repairs have been made.

F. Blasting will not be permitted at the site.

G. The trench width shall be kept to a minimum to reduce the potential for ground settlements. The trench payment width shall be as specified on the Plans.

3.3 SURPLUS MATERIAL

Unless otherwise specified in the Plans or Specifications, or ordered by the Engineer, surplus excavated material shall become the Contractor's property and shall be removed from the work site and disposed of at no cost to the State.

3.4 DIRECT BURIED CONDUIT SUBGRADE TREATMENT

A. Prior to the placement of any bedding, the bottom of the trenches shall be compacted to provide a firm bottom and to check for yielding and soft areas. Any yielding or soft areas that do not readily compact or excavations exposing groundwater should be overexcavated to a minimum depth of 18 inches and replaced with crushed rock, such as #2 Coarse, wrapped in a geotextile fabric. Compaction is not required if the excavation bottom consist of hard, intact rock.

B. Any part of the trench excavated below grade by the Contractor shall be replaced with properly compacted structural fill or bedding material as directed by the Engineer at no additional cost to the State. Over excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with properly compacted structural fill or lean concrete as directed by the Engineer, and at no additional cost to the State.

3.5 TRENCH BACKFILL, PLACEMENT AND COMPACTION

A. All backfill material shall be placed in the trench by hand or by approved mechanical methods. The compaction of backfill material shall be done by tamping with hand tools or approved pneumatic tampers, by using vibratory compactors, or other suitable equipment.

B. Care shall be taken to protect the pipes from damage during the backfilling operations.

C. Bedding material shall be used to backfill the trench from at least 6 inches below the direct buried conduit pipe invert to at least 6 inches above the crown of the pipe. The bedding material shall be placed and tamped, supplemented by hand shoveling, to provide full contact with the entire periphery of the pipes. Jetting of the trench bedding and backfill shall not be allowed.

D. Place bedding material in not more than 8-inch thick loose lifts and compacted with hand-operated vibratory equipment to a dense consistency as indicated by little to no settlement of the gravel under repeated passes with the compaction equipment but not less than 6 passes per lift. Supplement by hand shoveling to provide full contact with the entire periphery of the pipe. Exercise care to protect the pipe from damage during the backfilling operation. Jetting of the trench bedding shall not be allowed.

E. The trench backfill above the pipe bedding or concrete duct bank and to within 24 inches of the top of pavement shall be placed in not more than 8-inch thick horizontal loose lifts, moisture conditioned to about 2 percent above optimum moisture content for the material being placed, and compacted to a relative compaction of at least 90 percent.

F. Structural fill and structural backfill materials shall be placed in not more than 8-inch thick horizontal loose lifts, moisture conditioned to about 2 percent above optimum moisture content for these materials, and compacted to a relative compaction of at least 95 percent.

G. The upper 24 inches of backfill under areas to be paved or covered with slabs shall consist of base course, subbase course, and structural fill and shall be compacted to a relative compaction of at least 95 percent. Replacement pavement sections shall be equal to or better than the original.

H. Unless covered by AC pavement, the upper 12 inches of backfill shall consist of low permeability soil, compacted to a minimum 90 percent compaction.

3.6 FIELD QUALITY CONTROL

A. Assure that trenches are not backfilled until all tests have been completed.

B. Check bedding and backfill for proper layer thickness and compaction.

C. Where compaction and minimum relative density requirements are indicated, test trench backfill for moisture-density relations in accordance with ASTM D 1557. Perform at least one moisture-density relations test for each materials used and provide additional test for each change of source. Perform one field density and moisture content test in accordance with ASTM D 1556 or ASTM D 6938 per 50 feet or fraction thereof of trench backfill in each lift but not less than one test per lift. Furnish a plan showing test location, test number, elevation, and test results to the Engineer within 2 days of the test date. If field density test indicate inadequate compaction, the Contractor shall recompact and retest until adequate compaction is achieved. Verify that test results conform to the specified requirements, and that sufficient tests are performed.

D. Assure that defective work is removed and properly replaced.

END OF SECTION

SECTION 02520

PORTLAND CEMENT CONCRETE PAD/PAVEMENT

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

This section covers requirements for furnishing and installing portland cement concrete pads and pavement.

1.2 REFERENCES

The "STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION", dated September 1986, as revised, except as amended in the plans and/or specifications herewith, of the Department of Public Works, as applicable to the County of Kauai, hereafter referred to as the "DPW Standard Specification", or as herein specified. (Paragraphs concerning Measurement and Payment are not applicable to this project)

1.3 SUBMITTALS

A. Submit in accordance with Section 01300 – SUBMITTALS.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Material Certificates: For each of the following, signed by manufacturers:

2. Cementitious materials.
3. Admixtures.
4. Form materials and form-release agents.
5. Steel reinforcement and accessories.
6. Curing compounds.
7. Bonding agents.
8. Vapor retarders.
9. Repair materials.

E. Field quality-control test and inspection reports.

1.4 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for formwork and shoring and reshoring installations that are similar to those indicated for this Project in material, design, and extent.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated and maintain a copy at the field office.

1. ACI 301, “Specification for Structural Concrete.”

2. ACI 117, “Specifications for Tolerances for Concrete Construction and Materials.”

3. ACI 347R “Guide to Formwork for Concrete”

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Avoid damaging coatings on steel reinforcement.

PART 2 – PRODUCTS

2.1 MATERIALS

Materials for concrete pads shall be constructed in accordance with the below-listed sections of the DPW Standard Specifications. (Paragraphs concerning Measurements and Payments in the Sections are not applicable to this project.)

1. Subgrade ..... Section 29
2. Select Borrow for Subbase ..... Section 30
3. Base Course ..... Section 31
4. Portland Cement Concrete ..... Section 39
   (Class A: 3,000 psi)
5. Reinforcing Steel ..... Section 48

2.2 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and ASTM C 1116 and furnish batch ticket information. Batch ticket information shall include design mix reference, water that can be added at the jobsite, and admixtures. For transit mixing, complete not less than 70 revolutions of the drum at the manufacturer's rated mixing speed. Discharge concrete into its final position within 90 minutes after introduction of batch water to the cement. If a retarder admixture is used, the discharge time limit of 90 minutes may be increased by the time specified for retardation by the admixture manufacturer or the concrete supplier. Mix concrete a minimum of one minute at mixing speed immediately prior to discharge.

B. Project-Site Mixing: Measure, batch, and mix concrete materials according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd.0.76 cu. m or less, continue mixing at least one and one-half minutes, but not more than five minutes after all ingredients are in mixer, before any part of batch is released.

2. For mixer capacity larger than 1 cu. yd.0.76 cu. m, increase mixing time by 15 seconds for each additional 1 cu. yd.0.76 cu. m.

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of concrete placement in structure.

4. Hand mixed concrete will not be allowed, except for utility trench encasements.

PART 3 – EXECUTION

3.1 GENERAL

A. Stake out the areas of new pads or pavements, using wooden stakes on which the final finish elevations, base course, subbase course and subgrade elevations are clearly marked. All such stakes and elevations shall be approved by the Engineer before any work is done.

3.2 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Provide one day notification to the Engineer for each scheduled pour.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by the Engineer.

C. Convey concrete from mixer to the place of final deposit rapidly by methods that prevent segregation or loss of ingredients and will insure the required quality of concrete. Use conveying equipment, conveyors, hoppers, baffles, chutes, pumps that are sized and designed to prevent cold joints from occurring and prevent segregation in discharged concrete. Clean conveying equipment before each placement.

D. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

E. Deposit concrete in forms in horizontal layers with proper consolidation into previous layers and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

3. Make construction joints only where located on Drawings unless otherwise approved by the Engineer. Plan pours to continuously place concrete from one construction joint to another.

F. Deposit and consolidate concrete for slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleed-water appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.3 MISCELLANEOUS CONCRETE ITEMS

A. Electrical Work: Use 3/4" maximum size of aggregates for duct encasement. Unless detailed otherwise, encase underground ducts or conduits as follows:

1. Provide 3 inches minimum concrete cover around ducts or conduits. Use spacers to place and hold ducts. Provide 18 inches minimum earth cover over top of concrete encasement unless otherwise detailed.

2. For future connections, provide a one foot section of ducts or conduits to extend beyond concrete encasement and terminate with a coupling or end cap.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Contractor shall retain and pay for a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.

1. The independent firm will perform tests and other services required by the Specifications, Contract Drawings, and as required by the Engineer.

2. Cost: Cost of engaging a testing firm, execution of inspection and tests; and reporting results shall be included in the Contractor's costs.

3. Re-testing: Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Contractor at no extra cost to the State.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

1. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

2. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F4.4 deg C and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

4. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day’s pour of each concrete mix.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    b. Cast and field cure one set of four standard cylinder specimens for each composite sample.

1. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.

    a. Test two field-cured specimens at 7 days and two at 28 days.

    b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength

and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to the Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by the Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by the Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by the Engineer.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section outlines the wiring requirements for the electrical work, and forms a part of all other Sections of these specifications unless otherwise specified.

B. Related Work Not Included in this Section

1. Service and Distribution

2. Lighting

3. Electrical Controls

1.2 SUBMITTALS

Submit for the State's approval material lists, shop drawings, factory test reports and technical data to the extent required in this Section, Section 01300, Section 16100, and the General Conditions.

1.3 WIRING

Wiring for Furnished Equipment. The wiring from switchboard, electrical panels and control centers to the furnished equipment shall include all the required materials and installations to complete the wiring as shown on the drawings, specified and required for a complete and operable electrical system.

PART 2 - PRODUCTS

2.1 GENERAL

Provide basic materials and all wiring installations as indicated, specified and required. All exposed metal (boxes, supports, hardware, etc.) shall be 316 stainless steel. If products are not furnished in 316 stainless steel, galvanized steel will be acceptable.

2.2 METAL CONDUITS

A. Conduits shall be 316 stainless steel and equipped with couplings and thread protector caps. The surfaces and threads shall be corrosion-resistant coated. Conduits shall be in ten-

foot lengths and manufactured by Triangle, Republic, Youngstown, Allied, or approved equal. Supports shall be provided for all conduits.

B. Rigid Steel Conduit. For aboveground installations, steel conduit shall be a minimum size of 3/4 inch.

C. All exposed metal conduit shall be painted to match adjacent surfaces.

2.3 NONMETALLIC CONDUITS

A. Nonmetallic conduits shall be Triangle high impact styrene, Triangle, Canon polyvinyl chloride, or approved equal. All of the conduit shall be of one type, and low temperature, corrosion, and moisture resistant PVC Sch.40 or Sch.80.

B. Nonmetallic Conduit. Rigid steel bends and risers shall be used with nonmetallic conduit wherever conduit rises to above grade equipment and to be left flush with floor, wrapped with 33 mil tape. Each nonmetallic conduit shall contain a code sized grounding conductor.

C. All exposed PVC conduit shall be painted to match adjacent surfaces.

2.4 FLEXIBLE CONDUIT

A. Liquid tight flexible metal conduit shall be provided for short connections to equipment as shown on the drawings and as required which withstand temperatures from -50°F to +220°F.

B. Liquid tight Conduit. Liquid tight conduit shall have an interlocked flexible galvanized steel core with a permanently bonded exterior gray polyvinyl chloride jacket.

C. Flexible Conduits, 1-1/4 Inch and Smaller. Conduits, 1-1/4 inch and smaller, shall have an internal copper bonding conductor wound spirally in the space between each convolution for the equipment ground provided by the manufacturer.

D. Separate Ground Conductor. Separate ground conductors shall be provided by the Contractor in liquid tight flexible conduits that do not have the internal copper bonding conductors included by the manufacturer.

E. Manufacturers. Manufacturers for liquid tight flexible conduit shall be Anaconda, Electri-Flex, Universal or approved equal.

2.5 FLEXIBLE COUPLINGS

A. Couplings. The couplings shall be capable of withstanding internal explosive pressures. Couplings shall have conductivity on a similar length basis, equal to rigid steel conduit.

B. Manufacturers. Manufacturers for flexible couplings shall be Crouse-Hinds, Appleton, Pyle-National, or approved equal.

2.6 CAST METAL BOXES AND FITTINGS

A. Provide conduit outlet bodies, boxes, fittings, gaskets and covers for exposed conduit installations as indicated and required. The outlet bodies, boxes, fittings, and covers shall be cast copper free aluminum iron alloy with threaded hubs, and of sufficient size to provide free space for all conductors that shall be enclosed. The materials shall be manufactured by Killark, Appleton, Pyle-National, or approved equal.

B. Covers and Gaskets. Covers and gaskets shall be provided for all conduit outlet bodies, boxes and fittings. The covers shall be cast copper free aluminum iron alloy and equipped with neoprene gaskets.

C. Seal Fittings. Seal fittings shall be provided as required.

D. Plastic Fittings. Plastic fittings shall be solvent weld type, and shall match the conduit to which they shall be connected.

E. Thread Lubricant. Thread lubricant shall be provided for all metal conduit threads. The lubricant shall inhibit corrosion and maintain grounding continuity, and shall be Crouse-Hinds STL, Thomas and Betts “Koper-Shield”, or approved equal.

F. Couplings and Elbows. Couplings and elbows shall be of the same type as the conduit to which they shall be connected. For metallic conduits, the couplings and elbows shall be threaded and one-piece. For plastic conduits, couplings and elbows shall have plain ends for tight weld fits, which form watertight joints.

2.7 STEEL BOXES AND FITTINGS

A. Provide the steel boxes and fittings as indicated and required.

B. Pull Boxes. Pull boxes shall be of sufficient size to accommodate the connected conduits and enclosed conductors. Boxes 24 inches square and smaller shall have gasketed screw type covers. Larger boxes shall have bi-parting gasketed hinged doors with latch mechanisms, handles and cylinder locks complete. Provide two keys for each lock. Pull boxes shall be painted as specified in Section 16100. The pull boxes shall be Hoffman, Boss, Circle A-W, or approved equal.

C. The boxes shall be 316 stainless steel, square or octagonal, and of sufficient size to accommodate all the required conductors enclosed in the box. Box extensions and covers shall fit. Outlet boxes and fittings shall be Appleton, Bowers, Steel City, or approved equal.

2.8 WATER SEAL FITTINGS

A. Provide the malleable iron water seal fittings connected to rigid steel conduits as indicated, specified and required.

B. Sealing Bushings. Sealing bushings shall be provided on the ends of exterior underground conduits that terminate at enclosed equipment. The bushing shall consist of a thick neoprene sealing ring secured between two metal plates by socket head screws. When the conduit sealing bushing is in place and the screws are tightened, the neoprene shall become compressed between the metal plates and be forced against the conduit inside wall and also against the conductor insulation to form a watertight seal inside the conduit.

C. Wall and Floor Seals. Wall and floor seals shall be provided to completely seal the areas around the conduits that pass through concrete walls and floors. Seals shall have a neoprene grommet between two pressure rings, which provides a watertight seal on the outer surface of the entering conduits.

2.9 CONDUIT FITTINGS

A. Provide all the 316 stainless steel, and iron conduit fittings required to complete the wiring installation.

B. Liquid tight Conduit Fittings. Liquid tight conduit fittings shall be Types LT, ST, CT as manufactured by Crouse-Hinds, Appleton, Pyle-National, or approved equal.

C. Union. Union shall be provided, as required, for conduit connections to threaded outlet bodies, boxes, and equipment, and for connecting two steel conduits together. Union shall be Appleton, Crouse-Hinds, Pyle-National, or approved equal.

D. Bushing Reducers. Bushing reducers shall be provided in conduit fitting hubs for connection to smaller conduits. Reducers shall be Appleton, Thomas and Betts, Efcor, or approved equal.

E. Conduit Enlargers. Conduit enlargers shall be provided for connecting two conduits of different sizes together. The enlargers shall be Appleton, Thomas and Betts, Efcor, or approved equal.

F. Locknuts. Locknuts shall be provided on the threads of conduits that enter through close fitting openings in enclosures. Locknuts shall have notches all around for tightening with a screwdriver. Locknuts shall be Appleton, O-Z, Thomas and Betts, or equal.

G. Metallic Insulated Bushings. Metallic insulated bushings with ground terminals shall be provided on the ends of threaded metal conduits and nipples that terminate through openings in sheet steel enclosures. The malleable iron grounding bushings shall have smooth and well rounded surfaces to protect the conductor insulation. The conduit threads shall be deep, clean and easily attached to the conduits. The bushings shall be O-Z, Efcor, Thomas and Betts, or approved equal.

H. Plugs. Plugs shall be the recessed type and installed in all unused conduit fitting hubs and couplings. Plugs shall be Appleton, Crouse-Hinds, or approved equal.

I. Interchangeable Hubs. Interchangeable hubs shall be provided for rigid metal conduit connections to sheet steel enclosures. The interchangeable hub shall have an insulated throat, sealing ring and vibration-proof nut. Machined serrations on hub and nut shall bite into the metal enclosure assuring an equipment ground. The hubs shall be Myers "Scru-Tite", Efcor "Space-Saver", or approved equal.

2.10 CONDUCTORS AND CABLES

A. Conductors and cables shall be new, single conductor, copper, not smaller than #12 AWG unless otherwise indicated, and as shown on the drawings.

B. Conductors 250 MCM and Larger. Conductors 250 MCM and larger shall be stranded, 500 volts, and Type XHHW. Conductors shall be Okonite, General Electric, Rome, XLP, or approved equal.

C. Conductors Smaller than 250 MCM. Smaller than 250 MCM conductors shall be V stranded, 600 volt and Type THWN 75°c unless otherwise noted. Conductors shall be Rome, General Electric, or approved equal.

D. High Temperature Conductors. High temperature (90°c) conductors shall be provided in areas where indicated. Conductors shall be stranded, 600 volt and Type THHW, XHHW. Conductors shall be General Electric, Rome, or approved equal.

E. Ground Conductors. Ground conductors shall be provided for the required ground wiring. The conductors shall be stranded copper, 600 volt and Type THHN Neutral conductors shall be identified by continuous white or natural gray insulation color. Equipment and structural ground conductors shall be identified by a continuous green insulation color or a continuous green insulation color with one or more yellow stripes. Ground conductors shall be Rome, Anaconda, or approved equal.

F. Instrumentation Signal Cables. Instrumentation signal cables shall be single twisted pair or multi-twisted pairs of stranded, 600 volt, copper cables with 15 mil polyvinyl chloride insulation over each conductor, overall aluminum-mylar tape shield, overall tinned copper drain wire and 45 mil minimum polyvinyl chloride jacket overall. Twisted pair cables that are required to be shielded, shall have aluminum-mylar tape shields and tinned copper drain wires over individual twisted pairs of cable. Single twisted pair cables shall be #16 AWG minimum. Cables shall be Okonite "Okoseal-N-Type TC", Belden, or approved equal.

G. Wire Lubricant. Wire lubricant shall be provided to ease the pulling of cables and conductors in conduits. The lubricant shall be Burndy "Slikon", Holub "Hi-Green", Ideal "Yellow 77", or approved equal.

H. Identifications. Identifications on the conductors and cables shall be continuous and include the type, voltage, manufactured date and name of the manufacturer. All 120/208 volt conductors shall be color coded as follows: Phase A-black, Phase B-red, Phase C-blue. All 277/480 volt conductors shall be color coded as follows: Phase A-Brown, Phase B-Orange, Phase C-Yellow.

I. Welding Cable. Welding Cable shall not be used whether factory installed or field installed.

2.11 WIRE CONNECTORS

A. Connectors shall be provided for splices and terminal connections of all copper conductors and cables. The connector shall fit the conductor to which it shall be connected, and the assembly shall have joint contact surfaces not less than 50 percent.

B. Compression Connectors. Connectors for No. 8 AWG and larger shall be copper lugs for terminal connections, and two-way copper sleeves and taps for splice connections. A crimping tool shall be provided to make tight and neat compression connections. The connectors and crimping tool shall be Anderson-Square D, Thomas and Betts, Buchanan, or approved equal.

C. Tapered Spring Connectors. Connectors shall have live springs attached to inner steel housings and enclosed with plastic insulators. Connectors shall be provided for No. 10 AWG conductors and smaller, and shall be Buchanan Type B2, Scotchlok Type B, Thomas and Betts Type PT, or approved equal.

D. Ground Clamps. Ground clamps shall be provided for cable connections to ground rods and metal pipes as shown on the drawings. Clamps shall be copper alloy, heavy duty, corrosion resistant and consist of U-bolts and saddles with bolted cable connections. The ground clamps shall be O-Z, Thomas and Betts, Burndy, or approved equal.

E. Electrical Tape. Tape shall be plastic, 0.007 inches thick, and resistant to abrasion, alkalies, acids, corrosion, moisture, low and high temperatures. The tape shall be Scotch No. 33 Plus, Plymouth Premium Black No. 4453, or approved equal.

F. Wire Markers. Markers shall be provided to identify conductors and cables at equipment terminals, and in boxes, and handholes. The markers shall be adhesive and manufactured by Thomas and Betts, Brady, or approved equal.

2.12 PANELBOARDS

A. Panelboards shall be factory assembled, metal enclosed, dead front and equipped with thermal-magnetic molded case circuit breakers as shown on the drawings.

B. Circuit Breakers. Circuit breakers shall be molded case, toggle type, quick-make, quick-break, trip free, single and multipole, and bolted type. Each circuit breaker shall have clear visual indications for “ON”, “OFF”, and “TRIP” positions. The minimum interrupting

capacity shall be 10,000 symmetrical amperes at 240 volts. As indicated, provide devices to lock the branch circuit breaker in the “ON” and “OFF” positions.

C. Copper Bus. Plated Copper bus shall be provided for single phase (120/240 volt) and three phase (120/208 volt) panelboards and be rated as shown on the Drawings.

D. Bussing. Panelboards, shall be bussed so that any adjacent single-pole breakers shall be connected to different phases (distributed phase). A single handle two-pole breaker or three-pole breaker can be installed at any location.

E. Terminals and Connectors. Terminals and connectors shall be provided for the feeder, neutral and branch conductors shown on the drawings.

F. Circuit Numbers. Circuit numbers shall start at the top of the panelboard. Odd numbers shall be assigned in sequence on the left side, and even numbers shall be in sequence on the right side of the panelboard.

G. Cabinet. The cabinet shall enclose the bus and breaker assembly, and shall be steel fabricated and coated with corrosion-resistant finish as specified in Section 16100. The front of the panelboard shall include a trim, hinged door, flush cylinder lock with catch. The lock shall be furnished with two keys, and all locks shall be keyed alike. Fronts shall not be removable when the door is in the locked position.

H. Circuit Directory. The circuit directory frame and card with clear plastic covering shall be provided on the inside of the door. The directory card shall provide a space at least 1/4-inch high and 3 inches long for each branch circuit. The card shall be completely typed to identify each connected and spare circuit.

I. Manufacturers. Manufacturers for the panelboards shall be Square D, Cutler-Hammer, or approved equal.

2.13 OVERCURRENT PROTECTION

A. Circuit breakers, fuses, relays and other protective devices that protect the conductors and equipment against overload currents and short circuit currents shall be provided as indicated, specified and required.

B. Circuit Breakers. Circuit breakers shall be molded case type unless otherwise indicated. Breakers shall be quick-make and quick-break on manual or automatic operation. The drawings shall indicate the number of poles and ampere trip ratings. The handle mechanism shall be trip-free which prevents holding the contacts against overload or short circuit conditions.

1. The thermal device shall provide time-delay tripping on overloads, and the magnetic device shall provide instantaneous tripping on short circuits. The instantaneous magnetic trip shall be adjustable and accessible from the front of the circuit breaker on frame sizes above 100 amperes. Non-automatic breakers shall

have no tripping devices, and shall be used for manual switching of circuits. Molded case thermal-magnetic circuit breakers shall have at least the following interrupting capacities in symmetrical amperes at 480 volts unless otherwise indicated.

100 Ampere Frame - 18,000
225 Ampere Frame - 25,000
400 Ampere Frame - 30,000

2.14 WIRING DEVICES

A. Receptacles and switches shall be specification grade, heavy duty and provided in cast metal boxes with gasketed covers as identified and located on the drawings. Unless otherwise indicated, the device phenolic color shall be ivory for all duplex receptacles and local switches.

B. Local and Weatherproof Switches. Switches shall be toggle type, rated 20 amperes and 120-277 volts AC, and equipped with side screw terminals for copper wire. Single pole switches shall be #1221, #1991, #4901 ivory. Three-way switches shall be #1 223, #1 993, #4903 ivory. The switches shall be manufactured by Hubbell, Arrow, Bryant, or approved equal.

2.15 DISCONNECT SWITCHES

A. Provide the fusible disconnect switches, or non-fusible as indicated, specified and required.

B. Switches shall be steel enclosed, heavy duty, NEMA I and NEMA 3R and NEMA 12 as required, 2-pole and 3-pole, 250 volt and 600 volt, ampere rating as indicated, and finished as specified in Section 16100. On the front of the enclosure, attach a plastic nameplate that identifies the load. Disconnect switches shall be Square D Type RB, Westinghouse Type H-600, l-T-E “Vacu-break”, or approved equal.

C. Mechanisms. Mechanisms shall have quick-make and quick-break operating handles and provisions for padlocking in the “OFF” position. The switch shall have an interlock to prevent unauthorized opening of the hinged cover when the switch is in the “ON” position, and an interlock to prevent closing the switch mechanism with the hinged cover open.

D. Copper Lugs. Copper lugs shall be included for the copper wire connections. The lug shall fit the conductor which shall be connected to the lug.

2.16 SUPPORTS

A. Provide the 316 stainless steel channels, fittings, stanchions, clamps, hangers, and required hardware to support all conduit and equipment as required.

B. Channels. The channels shall be steel and cold rolled. One side of the channel shall have a continuous slot. On both sides of the slot, the edges turn inward and form a guide for the spring nuts. The fittings shall be fabricated from steel and attached to the channel with bolts and spring nuts. The channel, fittings, and hardware shall be 316 stainless steel and manufactured by Unistrut, Power-Strut, Kindorf, or approved equal.

C. One-hole Clamps. Clamps shall be 316 stainless steel and equipped with clamp-backs. The clamps shall be Efcor, Thomas and Betts, Appleton, or approved equal.

D. Beam Clamps. Clamps shall be 316 stainless steel, right angle and parallel types. The clamps shall be manufactured by Efcor, Thomas and Betts, Appleton, or approved equal.

E. Spacers. Spacers shall be plastic and provided to support underground conduits for concrete encasements. The spacers shall be Canon, Johns-Manville, Underground Products, or approved equal.

F. 316 Stainless Steel Anchors. 316 stainless steel anchors shall be sleeve and stud types for securing equipment to concrete foundations, floors, and walls. The anchors shall be Phillips “Red Head”, Diamond, or approved equal.

G. Toggle Bolts. Toggle bolts shall be 316 stainless steel, spring wing type for securing equipment to hollow walls and ceilings. Toggle bolts shall be Phillips “Red-Head”, Diamond, or approved equal.

H. Hardware. Hardware shall be 316 stainless steel and provided to securely attach all equipment and materials.

2.17 NAMEPLATES

A. Plastic nameplates shall be provided for switchboards, panelboards, receptacles, local switches, and individually enclosed circuit breakers, disconnect switches, relays, and control stations unless otherwise indicated.

B. All nameplates shall be NEMA ES-1, 3-ply, 1/16-inch thick, beveled and satin finished and shall be attached using rivets.

C. Nameplates. The nameplates shall be laminated black plastic with 1/4-inch high (unless otherwise specified) white letters. Nameplates on receptacles and local switchplates shall have 3/16-inch high letters. Nameplate inscriptions shall include the identifications for the equipment and loads and shall identify the controls on control equipment as shown on the drawings. Nameplate inscriptions on receptacles and local switchplates shall include the panelboard number and circuit that the device is connected to, i.e., “PA1-1”.

D. Lockout/Tagout Nameplates shall be provided for all pumps and other mechanical equipment where multiple devices including but not limited to switches, circuit breakers, by-pass contactors, variable frequency drives, solid state starters, etc., may cause the equipment to be energized. Said nameplates shall be installed over the main circuit breaker

or disconnect switch which will solely remove power from the equipment and all appurtenant controls and circuitry contained in the panel negating the possibility of power being applied by another source.

E. The nameplate shall be laminated red plastic with 3/8-inch high (unless otherwise specified) white letters. The inscription shall read “LOCKOUT/TAGOUT LOCATION FOR _____“ with a description identifying the equipment (i.e. “PUMP P-1”).

PART 3- EXECUTION

3.1 GENERAL

A. Provide the wiring installations and equipment installations, including connections and interconnections as indicated, specified and required.

B. Assure proper fits for all equipment and materials in the spaces shown on the drawings.

C. Excavations and Backfills. Earthwork shall be performed for equipment foundations, supports and underground conduits as indicated and as specified in Division 2.

D. Concrete. Concrete shall be provided for electrical equipment foundations, support foundations and conduit encasements and shall have a minimum 3000 psi compressive strength. All concrete encasements shall contain red dye unless otherwise noted.

E. Painting. Painting shall be provided for installations having unfinished surfaces. Field damaged factory finishes on equipment shall be touched-up with paint that is equal in quality and color to the original factory finish.

3.2 RACEWAYS

A. Provide all the conduit installations, including the outlet bodies, boxes, gaskets, covers, fittings and supports to complete the raceway systems as shown on drawings and as required. Install ground conductors in all non-metallic conduits.

B. Underground Installations. Provide the required rigid steel conduits and plastic conduits with watertight connections and completely encased with concrete. Provide at least 3 inches of concrete between the conduits and the outside of the encasement, and 2 inches of concrete between the conduits unless otherwise indicated. Install spacers and adapters to support and terminate non-metallic conduits. Connect the adapters to rigid steel conduit risers that terminate at above-grade equipment wrapped with 33 mil tape. The steel conduit riser shall be completely concrete encased to finish grade. The top of the concrete encasement shall be a minimum of 24 inches below finish grade. Trench backfilling shall be done according to Division 2 of these specifications. Restore the finish grade surface to match existing. Repave the trench to match existing pavement if trench passes through a paved area. Concrete shall contain red dye.

C. Conduits in Concrete. Conduits shall be installed in concrete encasements (red dyed), slabs, foundations, floors, and walls as shown on the drawings. The conduits shall be properly positioned in the concrete forms to provide the required clearance space with reinforcing steel. Conduit stub up's shall be 316 stainless steel conduit wrapped with 33 mil tape. Refer to paragraph in this section labeled "Stub ups."

D. Flexible Conduits. Flexible conduits shall be liquidtight with fittings for short tight connections (30 inches maximum) to equipment. A separate ground conductor shall be installed in flexible conduit that does not have the internal copper bonding conductor included by the manufacturer.

E. Threads. All metal conduit threads shall be coated with a corrosion resisting lubricant, and the connections shall be made watertight. The lubricant shall maintain the grounding continuity.

F. Locknuts and Bushings. Locknuts and bushings shall be installed on the threads of metal conduits that enter through close-fit openings in enclosures.

G. Sealing Bushings. The bushings shall be installed on the ends of exterior conduits that terminate at indoor equipment. The bushing shall provide a watertight seal inside the conduit.

H. Seal Fittings. Seal fittings shall be connected to rigid metal conduits. Sealing fittings shall be installed to completely water-seal inside conduits.

I. Penetrations. Penetrations through concrete for sleeves and conduits shall be approved by the State. Submit the sizes, locations, and methods for all penetrations.

J. Stub-ups. All steel conduit stub-ups shall have a coupling installed flush with the floor.

K. Tool Marks. Conduits and fittings that have tool marks shall be smoothed and finished with paint that matches the original finish.

L. Alterations. Alterations to existing installations shall be completed as indicated and specified.

3.3 BOXES AND FITTINGS

A. Outlet bodies, boxes, gaskets, covers, fittings and supports shall be installed as indicated, specified and required.

B. Cast Metal. Cast metal outlet bodies, boxes, gasketed covers and fittings shall be connected to exposed aluminum conduits.

C. Sheet Steel. Sheet steel boxes shall be provided with close-fit holes for steel conduit connections. Weatherproof boxes shall be provided with interchangeable conduit hubs for steel conduit connections as indicated.

D. Interchangeable Hubs. The hubs shall be installed in steel enclosures for rigid metal conduit connections as required. Cut a close fitting hole in the sheet steel enclosure and place the interchangeable hub in the ‘opening. Connect the hub on the conduit and make a tight connection to the enclosure.

3.4 CONDUCTORS AND CABLES

A. Install all the conductors and cables for the wiring as indicated, specified and required.

B. Conductors. Conductors shall be completely installed and connected. Apply wire lubricant to ease the pulling of conductors in conduits. Recommended pulling tensions shall not be exceeded. Splice and terminal connections shall be made tight with spring and compression connectors. The connectors shall be crimped with a tool that provides uniform and tight connections. Connectors shall be sized as outlined in paragraph on “Wire Connectors” in this section. Include all the required wiring interconnections.

C. Insulate. All connections shall be insulated as required with tight wraps of plastic tape. Apply insulation putty to fill irregularities and voids in splices. High and medium voltage cable splices shall be completed as instructed by the cable manufacturer.

D. Wire Marking. All wires shall be marked with wire markers at each end and at each intermediate j-box, pull box, or enclosure except for short “jumper” wires. Wire markers shall indicate the designation/destination of the wiring in the conduit. Example being- LPCB1 - REC1 to indicate lighting panel circuit breaker #1 to receptacle #1; MCCCB4 - MTR4 indicating Motor Control Center Breaker #4 to Motor #4 etc. Conduit numbers shall be imprinted on brass tags with the numbers as indicated on the “conduit and wire schedule”.

3.5 PANELBOARDS

A. Install and completely connect all the factory assembled panelboards as shown on the drawings.

B. Elevation. The elevation to the top of the panelboard shall be six feet above the floor unless otherwise indicated.

C. Circuit Directory Card. Completely type the card to identify each connected and spare circuit.

D. Tight Connections. Provide tight connections for feeder and branch circuit wiring.

3.6 OVERCURRENT PROTECTION

A. Install all the overcurrent protective equipment as indicated, specified and required.

B. Metal Enclosures. The enclosures for individual equipment shall be constructed to satisfy the condition in the location where they shall be installed.

C. Trip Settings. Circuit breakers shall assure the required circuit protection with the indicated trip settings.

3.7 WIRING DEVICES

Install the required local switches, convenience outlets and clock outlets complete, including the supports and wiring.

3.8 SUPPORTS

A. Install the required hardware to securely attach and support all the equipment and conduits.

B. Painting. Brackets, stanchions and other unfinished steel supports shall be painted.

3.9 NAMEPLATES

A. Plastic nameplates shall be positioned and lined-up to provide a neat appearance. They shall be attached to the cleaned metal surfaces of enclosures with machine screws or escutcheon pins. Nameplates shall be attached to receptacle and local switchplates with an adhesive or equal for circuit identification and placed above the device.

B. Nameplate Location. Nameplates shall be installed on toggle switches, convenience receptacles, motor control centers, panelboards, and individually enclosed circuit breakers, disconnect switches, magnetic starters, manual starters, relays and control stations unless otherwise indicated.

3.10 CHECKING, ADJUSTING AND TESTING

A. Provide the required labor and equipment, and all checking, adjusting and testing operations on the electrical installations.

B. Check. All wire terminals shall be checked to assure tight connections.

C. Adjust. Adjust repeat cycle timers, interval timers and time delay relays and other devices so the controls shall operate in the indicated sequence.

D. Wiring Tests. The tests shall be performed to detect wrong connections, short circuits, continuity and grounds. Insulation tests shall be made with a hand crank or battery operated test instrument on all cables, conductors and motors. Power feeders branch conductors and motors shall be tested phase-to-phase, and phase-to-ground. A copy of the test results for feeders and motors shall be submitted to the Engineer when completed (after any deficiencies have been noted and corrected). Correct any installation and electrical defects in the wiring systems.

E. Equipment Tests. Perform equipment tests as indicated and directed by the manufacturer.

F. Test Data. Test data for equipment, shielded cables and supply voltage shall be submitted to the Engineer.

G. Supply Voltage. Test the supply voltage while the normal facility loads are operating. If the voltage is not within normal limits (plus or minus one percent), notify the Engineer.

H. Operation Tests. Perform operation tests and observe that all loads operate satisfactorily. Refer to Section 16100 paragraph 3.14 Testing and Inspection.

END OF SECTION

SECTION 16100

ELECTRICAL

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

Furnish all labor and materials required to complete all electrical work as indicated on the drawings and/or specified herein

1. Installation of main switchboard.

2. Power and light systems, including branch circuits, outlets, panelboards, transformers, contactors, light fixtures wiring devices, and wiring.

3. Wiring, up to and including safety switches, for items described under other sections of these Specifications.

4. Wiring and connecting of all electrical equipment supplied for installation and use in this contract and not specifically listed as work by others, including the furnishing of disconnects for all equipment.

5. Exterior lighting system complete.

6. Underground electrical ductline, handholes and pullwires including all trenching and backfilling.

7. Service and metering equipment per utility company requirements.

8. Test the completed installation.

1.2 GENERAL REQUIREMENTS

It is the intent of the plans and specifications to provide a complete installation. Should there be omissions or discrepancies in the plans and specifications, the Contractor shall call the attention of the Engineer to such omissions and discrepancies in advance of the date of bid opening so that the necessary corrections can be made. Otherwise the Contractor shall furnish and install the omissions or discrepancies as if the same were specified and provided for.

1. Before bidding on this work, carefully examine each of the drawings and the site. 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.

2. Standards:

a. The entire installation shall be made in strict accordance with the latest rules and regulations of the National Electrical Code, the National Board of Fire Underwriters, NFPA, ANSI, NEMA, and IPCEA, and the local ordinances, rules and regulations of State.

b. The Electrical 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 Electrical Contractor shall pay all inspection fees and shall deliver certificates of completion and inspection to the Engineer before final payment will be made

c. Arrange with Kauai Island utility cooperative and pay for service charges and any work by them pertaining to the project.

d. The project is located in the County Flood Zone. Installation and certification of the electrical improvements shall be in strict accordance with Chapter 15, Article 1 of the Kauai Code 1987, as amended.

3. Drawings:

a. Contract Drawings: These specifications are accompanied by floor plans of the building, and diagrammatic electrical layouts showing the approximate location of the outlets, switches, devices and other equipment.

The wiring layouts and schedules show the approximate locations of all outlets, switch controls, service runs and other electrical apparatus. These locations are approximate and before installing, the Contractor shall study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10'-0" before installation at the direction of the Engineer, whose decision shall be final.

b. Shop Drawings: Submit six (6) copies of shop drawings, manufacturer's technical brochures and catalog cuts accompanied by a letter of transmittal from the Electrical Contractor. Submittals which fail to provide sufficient information for evaluation, will be returned to the Contractor for resubmittal without extensions of time or waiver. Shop drawings, or catalog cuts, of the following equipment shall be submitted

(1) Light fixtures and poles, including data on lamps and ballasts.

(2) Panelboard(s), circuit breakers, safety switches, secondary transformers.

(3) Switchboards.

(4) Pushbuttons.

(5) Special wiring devices.

(6) Lighting contactors.

(7) Cabinets.

(8) Any built-to-order equipment.

Shop drawings 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.

c. As-Built Drawings: The Contractor shall keep at the job site a complete, neat and accurate record of all approved deviations from the contract /drawings, shop drawings and specifications, indicating the work as actually installed. These changes shall be recorded on prints of the drawings affected and the shop drawings. Above reference to deviation shall not be construed to allow deviations without prior approval. As-builts shall be submitted prior to final acceptance to Engineer.

4. Symbols: The standard electrical symbols together with special symbols, notes, and instructions shown on the drawings indicate the work and equipment required and are all to be included as a part of these specifications.

1.3 QUALITY ASSURANCE

A. 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.

B. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.

1.4 WARRANTY

All work and materials executed under this Section shall be under warranty to be free from defects of materials and workmanship for one (1) year from date of final acceptance of project as a whole, except lamps, which shall be warranted for 50% of the rated life as published by the manufacturer. All repair and replacement work required, including other work damaged by this work's defects shall be performed without cost to the State. Should any equipment or material fail within this period, the Contractor shall replace or repair that

item at no cost to the State for material and/or services, if such is due to faulty workmanship or quality of material furnished. The Contractor shall be responsible for all damages to any part of the premises caused by failure in the equipment furnished under this section for a period of one year after the final acceptance of the work as a whole.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials shall be new and of the best quality available in their respective kinds, free from all defects, comply with applicable provisions of ASTM Standards, NEC Articles 90.7 and 110.3 and those items listed by the Underwriters' Laboratories shall bear "UL" label of approval and shall be of the make and types specified for approval.

B. Brand names and catalog numbers indicate standards of design and quality required. In case of obsolescence, supersedure, or error in catalog number, the associated description and intent implied by the application shall govern. Substitute materials may be used if qualified by written permission from Engineer in accordance with the general conditions. List of substitute materials together with qualifying data shall be submitted for approval.

Example:

Item	Manufacturer and Catalog No. Specified	Substitute Manufacturer & Catalog Number
Cable	Joe Doe - No. 3200	King - No. 3200

Failure to obtain approval of substitute materials prior to bidding shall mean that materials as specified shall be provided. Qualifying data shall include cuts, shop drawings, and specifications to show equality with material specified herein and in drawings. The decision of the Engineer shall govern as to what materials or equipment may be substituted for that specified. The burden of proof as to the equality of any proposed substitution shall be upon the Contractor.

C. All exposed metal (boxes, supports, hardware, etc.) shall be 316 stainless steel unless otherwise specified in the construction documents. If products are not furnished in 316 stainless steel, galvanized steel will be acceptable.

2.2 MATERIALS

A. Raceways:

1. Rigid Metal Conduit - Rigid steel, 316 stainless steel inside and outside, zinc-coated, round bore for use with threaded fittings, 1/2 3/4 inch minimum diameter, except as noted. Other sizes to conform to NEC requirements, based on THW wires. Manufacture and install according to NEC Article 346. Aluminum conduits not allowed.

2. Rigid Non-Metallic Conduit - Non-metallic conduit shall be polyvinyl chloride (PVC) schedule 40 round bore for underground use where encased in concrete, and PVC schedule 80 round bore for underground use where direct buried. Non-metallic conduits shall be permitted only where indicated on Drawings. Manufacture and install according to NEC Article 347.

3. Flexible Metallic Tubing - Flexible, 316 stainless steel used in conjunction with factory approved fittings. Manufacture and install according to NEC Article 349.

4. Liquidtight Flexible Metal Conduit - Flexible 316 stainless steel, zinc-coated, jacketed with high density polyethylene or polyvinyl-chloride jacket. Use with factory approved fittings. Manufacture and install according to NEC Article 351.

5. Intermediate Metal Conduit – 316 stainless steel conduit, zinc-coated inside and outside with additional silicone epoxy-ester lubricating coating inside; 3/4 inches minimum diameter. Manufacture and install according to NEC Article 345.

B. Wires:

1. Conductors shall be copper, 600 volts, No. 12 AWG minimum. Conductors No. 10 and smaller, solid and round. Conductor No. 8 and larger, 7 or 19 strands, concentric. All conductors No. 6 and smaller shall be NEC Type TW, XHHW and THW. All conductors No. 4 and larger shall be NEC Type XHHW or THW.

   Fixture wiring shall be NEC Type XHHW, THHW, RHW-USE or cross-linked polyethylene, Style USE.

2. Color Code: Black-Phase "A", Red-Phase "B", Blue-Phase "C", White-Neutral, Green-Ground (208/120V System). Color coding shall be maintained throughout entire system. Use other colors when more wires than above listed are contained on one raceway. For 480 volt system, brown - phase "A", orange - phase "B", yellow - phase "C".

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C. Disconnect Switch: Heavy duty fusible or non-fusible safety switch shall be horsepower rated when used as motor disconnect. Contacts shall be lever operated and spring loaded. When for use with fuses, conventional or of current limiting type, blades shall be rejection type. Enclosures to have provision for padlocking. Provide NEMA 4X 316 SS for exterior locations.

D. Fuses: Fuses shall be current limiting "Class J or Class R". For each current rating, furnish six (6) spare fuses of each type and rating.

E. Circuit Breakers: Individual breakers shall be molded plastic case, with toggle operated mechanism thermal-magnetic overload trips. Inter-changeable trip shall be provided when available. Toggle positions "ON", "TRIPPED" and "OFF", engraved on body of toggle.

Enclosed in NEMA style steel box. Boxes shall be NEMA 4X 316 SS 1 for exterior locations.

F. Panelboards: Provide as shown on plans, unit circuit breaker panelboard as indicated. See plans for schedule.

1. Enclosures: Panelboard enclosures shall be corrosion resistant 316 stainless steel with removable end walls. Fronts shall be cold-rolled steel, coated with a phosphatized rust inhibitor and then finish coated with ANSI 61 light gray enamel.

2. Fronts: A four-piece front shall be furnished to provide ease of wiring access. A door shall be a one-piece bolt on front with a lockable hinged door over the protective devices. All door hinges shall be continuous piano hinges which are welded to the door and bolt on front. Door locks shall be provided. Provide 2 keys. All screw fasteners are zinc coated to retard corrosion.

3. Main and Branch Devices: Main and branch circuit breakers shall be quick-make, quick break, and trip indicating. All three-pole breakers with ampere ratings greater than 100 ampere shall have interchangeable trips when available. Interrupting rating of circuit breakers shall not be less than the maximum short circuit current available at the incoming line terminals as shown on plans. A UL-Listed series rating alternative may be provided.

4. Interiors: Panelboard symmetrical interior shall be designed and assembled such that the circuit breakers are mounted onto the bus bar with positive gripping jaw assemblies and locked pressure connections. The circuit breaker shall be removed or replaced without disturbing adjacent protective devices and without removing the main bus or branch circuit connections. The interiors shall allow installation of fusible switches and molded-case circuit breakers in the same panelboard. Insulation barriers shall be installed over the vertical bus behind the dead front shield to provide increased safety when field service is required.

5. Bus Bars: Bus bars shall be copper, current density rated and meet UL67 temperature rise limits through actual tests. All bus bars shall be silver plated. Bus bar current density rating shall be 1000 amperes per square inch for copper. Bus bars shall be sequenced-phased, and rigidly supported by high impact resistant, insulated bus supporting assemblies to prevent vibration or short circuits. All solderless terminations shall be suitable for either copper or aluminum UL Listed wire or cable and shall be tested and listed in conjunction with appropriate UL standards.

   The neutral bar shall be fully rated and capable of being located in either corner of the enclosure at the line end to facilitate conductor termination.

   Ground wire terminations shall be provided as an option in kit form suitable for installation by the panelboard installer without voiding UL label.

6. Other: A panel directory, neatly typed on factory-card giving branch circuit "USE" and general location of outlets shall be provided. Provide feed-thru lugs for panelboards larger than 12 poles

   Panelboard shall be listed and labeled by Underwriters Laboratories, Inc. in accordance with UL Standard 67, and shall conform to the latest requirements of the National Electric Code NEMA Standard PB.1. The panelboard shall meet service entrance requirements when required.

G. Nameplates: Nameplates for identification or instruction on equipment enclosures shall be engraved laminated phenolic plastic, screw mounted. Plates shall be three layered, black-white-black. Plates shall be engraved to show 3/8" high engraved commercial single stroke gothic white letters on black background. Nameplate all feeder breakers, switches, panels, cabinets and large junction boxes.

Breakers and Switches:	By panels or loads served
Panels:	By designation, voltages, phase & wires
Cabinets:	By use (such as telephone, TV, etc.)
Boxes:	By use and voltages

H. Pullboxes: Pullboxes shall be provided where required by the NEC or Utility Company requirements. Boxes shall be code gauge steel and NEMA 4X 316 SS construction when installed in locations exposed to rain. Utility pullboxes shall be sealable.

I. Enclosures and Cabinets: Enclosures and cabinets for panelboards, breakers, and switches shall be NEMA 4X type, fabricated from 316 stainless steel, prime painted and enamel finished according to NEMA specifications.

J. Outlet Boxes: Outlet boxes shall be of size and type best suited to particular use or location but in any case shall be of sufficient size to contain without crowding all conductor and connections which may be required in any outlet box. Manufacture and install according to NEC Article 351.

   1. Exposed boxes and weather exposed boxes, recessed boxes, including lighting outlets on exterior shall be 316 stainless steel with threaded hubs for conduit connections.

K. Devices: Approved equal products manufactured by Arrow-Hart, Bryant, Cooper, Hubbell, Leviton, Pass & Seymour.

   1. Switches: Single or double pole, 3 or 4 way as required, non-mercury quiet, 20 amperes, 120-277 volts, UL labeled AC type, silvered contacts, ivory plastic body, tumbler switch with endurance of 10,000 make-breaks. Hubbell No. 1220 series,

Arrow Hart No. 1990 series, Bryant No. 4000 series, Cooper 1220 series or approved equal.

2. GFCI Receptacles: Duplex, 20-amperes, 125 volts, back and side wired, 3 wire, specification grade, ivory plastic body, with parallel and ground U-shaped slots, NEMA 5-20R; Cooper #XGF20I, Hubbell #GF5362I, or approved equal.

3. Device Plates: Plates for exposed and weather exposed boxes shall be cast metal with neoprene gasket for sealing against entry of water and moisture into box. Switch plates shall be provided with neoprene cover over handle or raintight lever mechanism.

L. Light Fixture: Complete with necessary stem, lamps, ballasts, starters and accessories, according to "Fixture Schedule".

1. Metal-Halide Lamps: Size as indicated on drawings. Lamp will have correlated color temperature of 4200K with a color rendering index of at least 65 and a constant lumen output of 134,000 lumens. Color temperature shall shift no more than 200K over rated lamp life.

2. HID Ballasts: High power factor, regulated type or constant wattage type.

M. Relays and Contactors: Electrically or magnetically held as indicated, tungsten rated silver alloy contacts, amperes as indicated. ITE, Allen Bradley, Cutler Hammer, Westinghouse, General Electric, Sylvania or approved equal.

N. Ground Rods: Ground rods shall be copper clad, 3/4" x 10' long minimum.

O. Combination Meter Socket: Combination meter socket with main circuit breaker shall be as indicated, sealable and suitable for exterior installation, UL listed, Circle AW or approved equal.

P. Watthour Meter: Watthour meter shall be compatible with meter socket as indicated. Meter shall be dial type or digital reading type. Westinghouse or approved equal.

Q. Switchboard: Switchboard shall be a 480Y/277 volts, 3 phase, 4 wires, circuit breaked distribution center. The switchboards shall be designed, built and tested in accordance with NEMA PB-2 and Underwriters laboratories no. UL 891 and the latest requirements of the National Electrical Code. All sections and devices shall be UL listed and labeled. Unit shall consist of:

1. Enclosure, NEMA 1 floor mounted, free standing, prime painted enamel finished steel cabinet, fabricated from smooth 14 gauge steel panels folded into pans for rigidity and reinforced with 12 and 10 gauge steel angles and channels, side and front panels shall be screw fastened for easy removal. Corners shall be ground smooth or folded. Busses shall be mounted on supports of high impact non-tracking insulating material and shall be braced to withstand mechanical forces

exerted during short circuit conditions when connected directly to a power source having the indicated short circuit. Busses shall be silver plated copper on the basis of 1,000 amperes per square inch, insulated for 600V service, and braced for available fault current. Bottom member shall be fabricated from steel channel with bottom opening for conduits and provided with leveling screws.

2. Circuit breakers shall be bolted to switchboards busses, 600 volts, ampere ratings as shown on drawings. Current rating, and breaker positions shall be engraved on switch plate.

3. Switchboard shall conform to applicable specifications of ANSI and NEMA.

4. Manufacturer shall be General Electric, Cutler Hammer, Square D or approved equal.

5. Provide switchboard exterior enclosure, NEMA 4X stainless steel, floor mounted, free standing.

R. 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 316 stainless steel for corrosion protection, and non-ferrous materials shall be brass or bronze. All wood screws shall be 316 stainless steel.

S. Other Materials: All other materials not specifically described but required for a complete and operable electrical installation, shall be new, first quality of their respective kinds, and as selected by Contractor subject to approval by Engineer.

PART 3 - EXECUTION

3.1 INSTALLATION AND WORKMANSHIP

A. Perform all work in accordance with equipment manufacturer's requirements and applicable NFPA standards. Install equipment and materials in a workmanlike manner conforming to recognized commercial standards.

B. Construction Methods:

1. Comply with local ordinances and regulations of the County. Workmanship subject to approval of Engineer who shall be afforded every opportunity to determine skill and competency. Concealed work re-opened at random during formal inspection by Engineer without additional charge to the State.

2. Construction shall conform to construction practices as recommended by American Electricians Handbook by Croft (latest edition) Edison Electric Institute,

National Electrical Code, National Electrical Safety Code and applicable instructions of manufacturers of equipment and materials supplied for project.

3.2 SURFACE CONDITIONS

A. Inspection: Prior to work of this section, carefully inspect installed work of other trades and verify that all such work is complete to point where this installation may properly commence.

B. Discrepancies: In event of discrepancy, immediately notify Engineer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.3 PREPARATION

A. Coordination: Coordinate installation of electrical items with schedules for work of other trades to prevent unnecessary delays in total work. Where electrical items are shown in conflict with locations of structural members and mechanical or other equipment, furnish and install required supports and wiring to clear encroachments.

B. Accuracy of Data: The data indicated on drawings and in specifications are as exact as could be secured but their absolute accuracy is not guaranteed. Exact locations, distances, levels and other conditions will be governed by job decisions of Engineer.

3.4 TRENCHING AND BACKFILLING

Perform all trenching and backfilling required in connection with work of this Section in strict accordance with provisions of applicable Sections of these Specifications.

3.5 INSTALLATION OF RACEWAYS AND FITTINGS

A. Polyvinyl chloride conduit may be used only in below grade installation. Transition to steel conduit elbow shall be made at floor line. All conduits below ground floor level shall be concrete encased.

B. Conduits shall be of ample size to allow drawing in or removing of wires and cables without undue strain and suitable bushings shall be installed on each end of every run of conduit where wires are installed.

C. Conduit system shall be continuous from outlet to outlet or fitting to fitting so that electrical continuity is obtained between all conduits of the system.

D. Cut raceways square, and ream inner edges. Adjoining lengths shall butt together evenly in couplings to provide passage for installing conductors. Factory threads shall be cleaned with die before installation of conduit. Use of running threads not permitted. Where conduits cannot be joined by standard threaded couplings, approved watertight conduit unions shall be used.

E. Bends, offsets, and crossing of conduits shall be avoided wherever possible. When necessary make bends and offsets with hickey or conduit bending machine. Do not use vise or pipe tee. Flattened or crushed conduit shall not be acceptable. Bends made so that interior cross-sectional area will not be reduced. Radius of curve of inner edge of field bend shall be not less than ten times internal diameter of raceway.

F. Cap raceways during construction with plastic or metal-capped bushings to prevent entrance of dirt or moisture. Swab all raceways out and dry before wires or cables are pulled in.

G. Fish wires, cords, strings, chains or the like shall not be placed or inserted in the conduit system during installation of the conduits.

H. After conduit system has been installed, empty conduits shall be left with a nylon drag wire.

I. Install insulating bushings and two locknuts on each end of every run of conduit at enclosures and boxes. Provide grounding bushings as required to grounding receptacles and connect conduits to service ground, per NEC Article 250.

J. Run exposed raceways parallel with, or at right angles to structural or architectural elements.

K. Bury all underground conduits, except under concrete slabs placed on fill, to a depth of at least eighteen inches below finish grade unless otherwise indicated on Drawings. Trenchings for all underground conduits shall be excavated to depths required to keep curvature of conduits below top of slab indicated on plans. Bottoms of trenches shall be tamped hard. Rocks, when encountered, shall be excavated to depths of 3" below bottom of conduit jacket and before conduit is laid, space between bottom of conduit jacket and rock surface shall be filled with gravel to the satisfaction of the Engineer. After conduits have been inspected and approved by Engineer and prior to backfilling, forms shall be removed and excavation shall be cleaned of trash and debris. Material for backfilling shall be cleaned of trash and backfilling shall be cleaned of trash and debris. Material for backfilling shall consist of excavated material except adobe, trash, lumber or other debris. Backfill shall be placed in horizontal layers, not exceeding 8" in thickness and properly moistened. Each layer shall be compacted to density equal to that of adjacent undisturbed material that will prevent excessive settlement or shrinkage.

L. Ductlines shall be polyvinyl chloride (PVC) ducts in concrete jackets and shall be installed by electrician. Lay ducts and/or conduits in trenches on plastic saddles or on concrete spacers. Spacing between ducts shall be as indicated. Slope ducts 4 inches per hundred feet to drain into manholes or pullboxes. After laying, bind ducts with #2 wire and anchor to prevent movement during concrete pouring. Coat tapered ends of ducts or conduits with sealing compound before coupling is applied to insure watertight joint. Reinforcing steel, shoring and forming where required, shall be installed according to applicable sections of these specifications. Concrete shall be poured without the use of mechanical

vibrators. Tamp concrete manually with wooden rods. Thickness of concrete encasement is minimum and may be increased to fit actual shape of trench. Changes in direction of runs exceeding 5 degrees shall be accomplished by using special couplings or bends manufactured for this purpose. If it is necessary to cut tapered end of piece of conduit at site, cut shall be made with saw and tapered with lathe designed to match original taper. After ductline is installed, pull a mandrel not less than 12" long having diameter 1/4" less than inside diameter of conduit through each conduit. After this, pull brush with stiff bristles through to make certain that no particles of earth, sand or gravel have been left in line. Install stranded nylon pull line in all empty raceways. Plug all spare raceways with non-corrodible plugs manufactured for the purpose.

3.6 INSTALLATION OF CONDUCTORS

A. Except for cables and wires otherwise called for, install all conductors in conduit, wireway or cable tray.

B. Color Coding: Wires shall be color-coded in accordance with requirements of the NEC.

C. Tag all feeders for identification.

D. Splicing:

1. Wires shall be formed neatly in enclosures and boxes. Conductors, #10 and smaller shall be twisted and made secure with wirenut suitable for the purpose. Splice conductors #8 through #4/0 with high pressure compression (indent) copper sleeve connectors

2. Insulate all splices with a minimum of two half-lapped layers of vinyl-plastic electrical tape where insulation is required.

3. Splice insulation shall be 200% in thickness of original wire insulation and of same electrical and mechanical characteristics.

E. Lubricants: Chemically neutral to insulation and sheath. Sherwin-Williams "flaxsoap." Apply liberally during pulling. Other means of lubricating allowed with written approval of Engineer.

F. Pulling Conductors: Mechanical means for pulling to be torque limiting type and not to be used for No. 2 AWG and smaller wires. Pulling tensions shall not exceed manufacturer's recommendations. Form neatly in enclosure for minimum of cross-overs.

3.7 INSTALLATION OF OUTLET BOXES

Provide outlet boxes to suit conditions encountered. When two or more switches are installed at single location, mount in gang box under single device plate. Close all unused knockouts and hubs.

3.8 INSTALLATION OF RECEPTACLES

Receptacles installed vertically, shall be installed with the ground prong up. Receptacles installed horizontally, shall be installed with the neutral prong up.

3.9 GROUNDING

Service entrance, metallic enclosures, raceways and electrical equipment grounded according to requirements of National Electrical Code, Article 250. At service entrance, install copper clad steel ground rods (number as required) to obtain ground to 25 ohms or less as measured by three-point potential method with electrical ground meter. Connect service entrance ground to building service entrance equipment via ground wire (size as per NEC Article 250-94) and nearest cold water pipe with No. 1/0 bare copper wire. Ground connection to equipment, raceways, grounding type receptacles and other metallic parts directly exposed to ungrounded electric conductors by continuous metal raceways, No. 14 AWG minimum, AWG copper, NEC type TW, green insulated.

1. A No. 6 bare copper wire shall be used to connect ground to intercommunication cabinet. A four-foot slack of grounding wire shall be left in cabinet.

3.10 DRY TRANSFORMER INSTALLATION

Install dry transformers as indicated on drawings. Provide minimum of 18 inches of flexible conduits for wiring connections to isolate vibration noises from structure of building.

3.11 EQUIPMENT CONNECTIONS

Connect all equipment and appliances.

3.12 MISCELLANEOUS DETAILS

Cut, core and patch as required to install electrical system. Repair any surface damaged or marred by notching, coring or any other process necessary for installation of electrical work. Cutting, repairs and refinishing shall be subject to the approval of the Engineer. Need for remedial work determined by the Engineer as attributable to poor coordination and workmanship shall be cause for reconstruction to the satisfaction of the Engineer at no cost to the State.

3.13 FINISHING

A. Patch, repair and restore all structural and architectural elements cut or drilled for installation of electrical system. Drilling, cutting, patching, repairing and restoring shall be finished by suitable trades subject to approval of Engineer.

B. Attach electrical equipment to wood by wood screws, and attach to concrete by embedded or expansion inserts and bolts. Use power-driven charge with approval only. Close

unused knock-outs on boxes or enclosures with metal cap. Powder actuated fasteners shall not be used on precast concrete. Do not use powder activated fasteners to attach enclosures and boxes to the building.

C. Wipe clean all exposed raceways and enclosures with rag and solvent. Factory finished enclosures shall not be painted. Panelboard, switches, circuit breakers, junction boxes, and equipment shall be identified by stenciling with engraved plastic nameplates on cover or door. Voltage and phase shall be indicated on nameplates for panelboards, switches and circuit breakers.

D. Connect circuits to circuit assignments shown on drawings. Provide neatly typewritten circuit directory for all panelboards. Circuit directory shall indicate location of loads served by each circuit. For example: "LTS - PARKING, RECEP - OFFICE."

E. Mark all control wires with wire markers attached to conductors in all enclosures.

F. Paint all exposed PVC, 316 stainless steel, and galvanized steel conduit to match adjacent surfaces.

3.14 TESTING AND INSPECTIONS

A. After the installation has been completed, and at such time as the Engineer may direct, the Contractor shall conduct all tests required to secure approval of the installation from all agencies having jurisdiction. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Engineer. The Contractor shall furnish the necessary instruments and personnel required for the test, and the State will furnish the necessary electrical power.

1. All wiring shall be tested to insure proper operation according to functions specified. All systems shall test free from short circuits and grounds, shall be free from mechanical and electrical defects. All systems shall show proper neutral connections.

2. Proper operation of all electrical devices shall be demonstrated at request of Engineer during final inspection.

3. Balance loading on each feeder.

4. Measure ground resistance at service equipment in the presence of the Engineer. Submit four (4) copies of test results to Engineer.

B. The Contractor shall retape splices which have been bared for inspection. The Electrical Contractor shall test all portions of the electrical system furnished by him for proper operation and freedom from accidental grounds. All tests shall be subject to the approval of the Owner Engineer.

C. Wherever test or inspection reveals faulty equipment or installation, the Contractor shall take corrective action, at his own expense repairing or replacing equipment or installation as directed.

D. If the Engineer shall discover any of the following errors, the Contractor, at his own expense shall go over all similar portions of the entire job, taking the necessary or directed remedial action.

1. Loose connections.

2. Impaired clearance.

3. Improper finish.

4. Improper adjustment.

3.15 CLEAN UP

Upon completion of all installation, lamping and testing, thoroughly inspect all exposed portions of the electrical installation and completely remove all exposed labels, soil, markings and foreign material.

END OF SECTION

SECTION 16200

ELECTRICAL DISTRIBUTION SYSTEM, UNDERGROUND

PART 1 – GENERAL

1.1 GENERAL CONDITIONS

As specified in Section 01001.

1.2 DELIVERY, STORAGE, AND HANDLING

Visually inspect materials, devices, and equipment when received and prior to acceptance from conveyance. Protect stored items from the environment in accordance with the manufacturer's published instructions. Damaged items shall be replaced.

PART 2 – PRODUCTS

2.1 STANDARD PRODUCT

A. Provide material and equipment which are the standard product of a manufacturer regularly engaged in the manufacture of the product and that essentially duplicate items that have been in satisfactory use for at least 2 years prior to bid opening. Items of the same classification shall be identical including equipment, assemblies, parts, and components.

B. Where materials or equipment are specified to conform to the standards of the Underwriters Laboratories (UL) or to be constructed or tested, or both, in accordance with the standards of the American National Standards Institute (ANSI), the Institute of Electrical and Electronics Engineers (IEEE), or the National Electrical Manufacturers Association (NEMA), submit proof that the items provided conform to such requirements. The label of, or listing by, UL will be acceptable as evidence that the items conform. Either a certification or a published catalog specification data statement, to the effect that the item is in accordance with the referenced ANSI or IEEE standard, will be acceptable as evidence that the item conforms. A similar certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard, by a company listed as a member company of NEMA, will be acceptable as evidence that the item conforms.

2.2 NAMEPLATES

Submit catalog cuts, brochures, circulars, specifications, product data, and printed information in sufficient detail and scope to verify compliance with the requirements of the contract documents.

2.3 CONDUIT AND DUCTS

A. Ducts shall be single, round-bore type, with wall thickness and fittings suitable for the application.

B. Nonmetallic Ducts

1. Concrete Encased Ducts: UL 651 Schedule 40.

2. Concrete Encased Ducts: UL 651 Schedule 80.

C. Conduit Sealing Compound: Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 35 degrees F, shall neither slump at a temperature of 300 degrees F, nor harden materially when exposed to the air. Compounds shall adhere to clean surfaces of fiber or plastic ducts; metallic conduits or conduit coatings; concrete, masonry, or lead; any cable sheaths, jackets, covers, or insulation materials; and the common metals. Compounds shall form a seal without dissolving, noticeably changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect upon the hands of workmen or upon materials.

2.4 HANDHOLES

A. Handholes shall be as indicated. Strength of handholes and their frames and covers shall conform to the requirements of IEEE C2. Precast-concrete manholes shall have the required strength established by ASTM C478, ASTM C478M. Frames and covers shall be made of gray cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. Cast iron shall comply with ASTM A48/A48M, Class 30B, minimum.

2.5 METERING AND PROTECTIVE DEVICES

A. Fuses, Low-Voltage, Including Current-Limiting: Low-voltage fuses shall conform to NEMA FU 1. Time delay and nontime delay options shall be as required. Equipment provided under this contract shall be provided with a complete set of properly rated fuses when the equipment manufacturer utilizes fuses in the manufacture of the equipment, or if current-limiting fuses are required to be installed to limit the ampere-interrupting capacity of circuit breakers or equipment to less than the maximum available fault current at the location of the equipment to be installed. Fuses shall have a voltage rating of not less than the phase-to-phase circuit voltage, and shall have the time-current characteristics required for effective power system coordination.

1. Cartridge Fuses: Cartridge fuses, current-limiting type, Class RK1 shall have tested interrupting capacity not less than 200,000 amperes. Fuse holders shall be the type that will reject Class H fuses.

a. Class R fuses shall conform to UL 198M.

2. Transformer Circuit Fuses: Transformer circuit fuses shall be Class RK1, current-limiting, time-delay with 200,000 amperes interrupting capacity.

B. Instrument Transformers:

1. General: Instrument transformers shall comply with NEMA/ANSI C12.11 and IEEE C57.13. Instrument transformers shall be configured for mounting in/on the device to which they are applied. Polarity marks on instrument transformers shall be visually evident and shown on drawings.

2. Current Transformers: Unless otherwise indicated, bar, wound, or window-type transformers are acceptable; and except for window-type units installed over insulated buses, transformers shall have a BIL rating consistent with the rated BIL of the associated switchgear or electric power apparatus bushings, buses or conductors. Current transformers shall have the indicated ratios. Thermal and mechanical ratings of current transformers and their primary leads shall be coordinated with the design of the circuit breaker and shall be not less than the momentary rating of the associated circuit breaker. Circuit protectors shall be provided across secondary leads of the current transformers to prevent the accident open-circuiting of the transformers while energized. Each terminal of each current transformer shall be connected to a short-circuiting terminal block in the circuit interrupting mechanism cabinet, power transformer terminal cabinet, and in the associated instrument and relay cabinets.

3. Current Transformers for Metal-Enclosed Switchgear: Single-ratio units, used for metering and relaying, shall have a metering accuracy class rating of 6.3 B.0.5.

4. Current Transformers for Kwh and Demand Metering (Low-Voltage): Current transformers shall conform to IEEE C57.13. Provide current transformers with a metering accuracy Class of 0.3 through B-0.2, with a minimum RF of 4.0 at 30 degrees C, with 600-volt insulations, and 10 kV BIL. Provide butyl-molded, window-type current transformers mounted in the current transformer cabinet.

5. Voltage Transformers: Voltage transformers shall have indicated ratios. Units shall have an accuracy class rating of 0.3. Voltage transformers shall be of the drawout type having current-limiting fuses in both primary and secondary circuits. Mechanical interlocks shall prevent removal of fuses, unless the associated voltage transformer is in a drawout position. Voltage transformer compartments shall have hinged doors.

C. Watthour Meters: Meter sockets meeting utility company standard will be provided. Watthour meter sockets shall be of the drawout switchboard type.

2.6 GROUNDING AND BONDING

A. Driven Ground Rods: Ground rods shall be copper-clad steel conforming to UL 467 not less than 3/4 inch in diameter by 10 feet in length. Sectional type rods may be used.

B. Grounding Conductors: Grounding conductors shall be bare, except where installed in conduit with associated phase conductors. Insulated conductors shall be of the same material as phase conductors and green color-coded, except that conductors shall be rated no more than 600 volts. Bare conductors shall be ASTM B8 soft-drawn unless otherwise indicated. Aluminum is not acceptable.

2.7 CONCRETE AND REINFORCEMENT

Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of specification Section 02520 PORTLANT CEMENT CONCRETE PAD/PAVEMENT.

PART 3 – EXECUTION

3.1 EXAMINATION

After becoming familiar with details of the work, verify dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

3.2 INSTALLATION REQUIREMENTS

A. As a minimum, submit installation procedures for transformers, substations, switchgear, and splices. Procedures shall include cable pulling plans, diagrams, instructions, and precautions required to install, adjust, calibrate, and test the devices and equipment. Equipment and devices shall be installed and energized in accordance with the manufacturer's published instructions.

1. Conformance to Codes: The installation shall comply with the requirements and recommendations of NFPA 70 and IEEE C2 as applicable.

3.3 CABLE INSTALLATION

A. Obtain from the manufacturer an installation manual or set of instructions which addresses such aspects as cable construction, insulation type, cable diameter, bending radius, cable temperature, lubricants, coefficient of friction, conduit cleaning, storage procedures, moisture seals, testing for and purging moisture, etc.

B. Cable Installation Plan and Procedure: Cable shall be installed strictly in accordance with the cable manufacturer's recommendations. Each circuit shall be identified by means of a fiber, laminated plastic, or non-ferrous metal tags, or approved equal, in each manhole or

handhole, and each terminal. Each tag shall contain the following information; cable type, conductor size, circuit number, circuit voltage, cable destination and phase identification.

1. Cable Inspection: The cable reel shall be inspected for correct storage positions, signs of physical damage, and broken end seals. If end seal is broken, moisture shall be removed from cable in accordance with the cable manufacturer's recommendations.

2. Duct Cleaning: Duct shall be cleaned with an assembly that consists of a flexible mandrel (manufacturers standard product in lengths recommended for the specific size and type of duct) that is 1/4 inch less than inside diameter of duct, 2 wire brushes, and a rag. The cleaning assembly shall be pulled through conduit a minimum of 2 times or until less than a volume of 8 cubic inches of debris is expelled from the duct.

3. Duct Lubrication: The cable lubricant shall be compatible with the cable jacket for cable that is being installed. Application of lubricant shall be in accordance with lubricant manufacturer's recommendations.

4. Cable Installation: Provide a cable feeding truck and a cable pulling winch as required. Provide a pulling grip or pulling eye in accordance with cable manufacturer's recommendations. The pulling grip or pulling eye apparatus shall be attached to polypropylene or manila rope followed by lubricant front end packs and then by power cables. A dynamometer shall be used to monitor pulling tension. Pulling tension shall not exceed cable manufacturer's recommendations. Do not allow cables to cross over while cables are being fed into duct.

C. Duct Line: Cables shall be installed in duct lines where indicated. Cable joints in medium-voltage cables shall be made in manholes or approved pullboxes only.

3.4 DUCT LINES

A. Requirements: Numbers and sizes of ducts shall be as indicated. Duct lines shall be laid with a minimum slope of 4 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a terminal, a manhole, a handhole, or between manholes or handholes. Short-radius manufactured 90-degree duct bends may be used only for pole or equipment risers, unless specifically indicated as acceptable. The minimum manufactured bend radius shall be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter. Otherwise, long sweep bends having a minimum radius of 25 feet shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends, but the maximum curve used shall be 30 degrees and manufactured bends shall be used. Ducts shall be provided with end bells whenever duct lines terminate in handholes.

B. Treatment: Ducts shall be kept clean of concrete, dirt, or foreign substances during construction. Field cuts requiring tapers shall be made with proper tools and match

factory tapers. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. Ducts shall be stored to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Ducts shall be thoroughly cleaned before being laid. Plastic ducts shall be stored on a flat surface and protected from the direct rays of the sun.

C. Concrete Encasement: Ducts requiring concrete encasements shall comply with NFPA 70. The separation between adjacent electric power and communication ducts shall conform to IEEE C2. Duct line encasements shall be monolithic construction. Where a connection is made to a previously poured encasement, the new encasement shall be well bonded or doweled to the existing encasement. Tops of concrete encasements shall be not less than the cover requirements listed in NFPA 70.

D. Installation of Couplings: Couplings in each type of duct shall be made up in accordance with the manufacturer's recommendations for the particular type of duct and coupling selected and as approved.

E. Duct Line Markers: Duct line markers shall be provided as indicated. In addition to markers, a 5 mil brightly colored plastic tape, not less than 3 inches in width and suitably inscribed at not more than 10 feet on centers with a continuous metallic backing and a corrosion-resistant 1 mil metallic foil core to permit easy location of the duct line, shall be placed approximately 12 inches below finished grade levels of such lines.

3.5 HANDHOLES

A. Handholes: Handholes shall be located approximately as shown. Handholes shall be of the type noted on the drawings and shall be constructed in accordance with the details shown.

B. Ground Rods: A ground rod shall be installed at the service entrance, per entrance, per NEC and specifications.

3.6 PAD-MOUNTED EQUIPMENT INSTALLATION

A. Pad-mounted equipment shall be installed on concrete pads in accordance with the manufacturer's published, standard installation drawings and procedures, except that they shall be modified to meet the requirements of this document. Units shall be installed so that they do not damage equipment or scratch painted or coated surfaces. After installation, surfaces shall be inspected and scratches touched up with a paint or coating provided by the manufacturer especially for this purpose.

B. Concrete Pads:

1. Construction: Concrete pads for pad-mounted electrical equipment may be either pre-fabricated or poured-in-place. Pads shall be constructed as indicated, except that exact pad dimensions and mounting details are equipment specific and are the

responsibility of the Contractor. Tops of concrete pads shall be level and shall project 4 inches above finished floor and sloped to drain. Edges of concrete pads shall have 3/4 inch chamfer. Conduits for primary, secondary, and grounding conductors shall be set in place prior to placement of concrete pads. Where grounding electrode conductors are installed through concrete pads, PVC conduit sleeves shall be installed through the concrete to provide physical protection.

2. Concrete and Reinforcement: Concrete work shall have minimum 3000 psi compressive strength and conform to the requirements of specification Section 02520 PORTLAND CEMENT CONCRETE PAD, PAVEMENT.

3. Sealing: When the installation is complete, seal all conduit and other entries into the equipment enclosure with an approved sealing compound. Seals shall be of sufficient strength and durability to protect all energized live parts of the equipment from rodents, insects, or other foreign matter.

3.7 GROUNDING

A. Equipment frames of metal-enclosed equipment, and other noncurrent-carrying metal parts, such as cable shields, cable sheaths and armor, and metallic conduit shall be grounded. At least 2 connections shall be provided from a switchgear ground bus to the ground ring. Metallic frames and covers of handholes and pull boxes shall be grounded by use of a braided, copper ground strap with equivalent ampacity of No. 6 AWG.

B. Grounding Electrodes: Grounding electrodes shall be installed as shown on the drawings and as follows:

1. Driven Rod Electrodes: Unless otherwise indicated, ground rods shall be driven into the earth until the tops of the rods are approximately 1 foot below finished grade.

2. Ground Ring; A ground ring shall be installed as shown consisting of bare copper conductors installed not less than 30 inches below finished top of soil grade. Ground ring conductors shall be sized as shown.

3. Additional Electrodes; When the required ground resistance is not met, additional electrodes shall be provided interconnected with grounding conductors to achieve the specified ground resistance.

C. Grounding and Bonding Connections: Connections above grade shall be made by the fusion-welding process or with bolted solderless connectors, in compliance with UL 467, and those below grade shall be made by a fusion-welding process. Where grounding conductors are connected to aluminum-composition conductors, specially treated or lined copper-to-aluminum connectors suitable for this purpose shall be used.

D. Grounding and Bonding Conductors: Grounding and bonding conductors include conductors used to bond equipment frames to the grounding electrode system. Grounding

and bonding conductors shall be sized as shown, and located to provide maximum physical protection. Bends greater than 45 degrees in ground conductors are not permitted. Routing of ground conductors through concrete shall be avoided. When concrete penetration is necessary, nonmetallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground conductor, and the opening shall be sealed with a suitable compound after installation.

E. Handhole Grounding: Ground rods installed in handholes shall be connected to cable racks, cable-pulling irons, the cable shielding, metallic sheath, and armor at each cable joint or splice by means of a No. 4 AWG braided tinned copper wire. Connections to metallic cable sheaths shall be by means of tinned terminals soldered to ground wires and to cable sheaths. Care shall be taken in soldering not to damage metallic cable sheaths or shields. Ground rods shall be protected with a double wrapping of pressure-sensitive plastic tape for a distance of 2 inches above and 6 inches below concrete penetrations. Grounding electrode conductors shall be neatly and firmly attached to handhole walls and the amount of exposed bare wire shall be held to a minimum.

3.8 FIELD TESTING

A. General: Furnish all materials, labor, and equipment necessary to conduct field tests. Perform all tests and inspections recommended by the manufacturer unless specifically waived by the Contracting Officer. Maintain a written record of all tests which includes date, test performed, personnel involved, devices tested, serial number and name of test equipment, and test results. Field test reports shall be signed and dated by the Contractor.

B. Safety: Provide and use safety devices such as rubber gloves, protective barriers, and danger signs to protect and warn personnel in the test vicinity. Replace any devices or equipment which are damaged due to improper test procedures or handling.

C. Ground-Resistance Tests: The resistance of each grounding electrode system and the ground ring shall be measured using the fall-of-potential method defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.

1. Single rod electrode - 25 ohms.

2. Ground ring - 25 ohms.

D. Circuit Breaker Tests: The following field tests shall be performed on circuit breakers. Pass-fail criteria shall be in accordance with the circuit breaker manufacturer's specifications.

1. Insulation resistance test phase-to-phase.

2. Insulation resistance test phase-to-ground.

3. Closed breaker contact resistance test.

4. Power factor test.

5. High-potential test.

6. Manual and electrical operation of the breaker.

E. Pre-Energization Services: Calibration, testing, adjustment, and placing into service of the installation shall be accomplished by a manufacturer's product field service engineer or independent testing company with a minimum of 2 years of current product experience. The following services shall be performed on the equipment listed below. These services shall be performed subsequent to testing but prior to the initial energization. The equipment shall be inspected to ensure that installation is in compliance with the recommendations of the manufacturer and as shown on the detail drawings. Terminations of conductors at major equipment shall be inspected to ensure the adequacy of connections. Bare and insulated conductors between such terminations shall be inspected to detect possible damage during installation. If factory tests were not performed on completed assemblies, tests shall be performed after the installation of completed assemblies. Components shall be inspected for damage caused during installation or shipment to ensure packaging materials have been removed. Components capable of being both manually and electrically operated shall be operated manually prior to the first electrical operation. Components capable of being calibrated, adjusted, and tested shall be calibrated, adjusted, and tested in accordance with the instructions of the equipment manufacturer. Items for which such services shall be provided, but are not limited to, are the following:

1. Metal-enclosed switchboard.

F. Operating Tests: After the installation is completed, and at such times as the Contracting Officer may direct, conduct operating tests for approval. The equipment shall be demonstrated to operate in accordance with the requirements herein. Submit 6 copies of the tests report in 8-1/2 by 11 inch binders having a minimum of three rings, including a separate section for each test. Sections shall be separated by heavy plastic dividers with tabs. The operating test report shall include the following:

1. A list of equipment used, with calibration certifications.

2. A copy of measurements taken.

3. The dates of testing.

4. The equipment and values to be verified.

5. The condition specified for the test.

6. The test results, signed and dated.

7. A description of adjustments made.

3.9 ACCEPTANCE

Final acceptance of the facility will not be given until the Contractor has successfully completed all tests and after all defects in installation, material or operation have been corrected.

END OF SECTION

SECTION 16500

ELECTRICAL LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes outdoor lighting fixtures and associated supports and lenses.

1. Fixture catalog numbers listed on Drawings indicate manufacturer fixture design, appearance, and performance required. Modify these fixtures, if necessary, to comply with subsequent specification.

2. Completely provide lighting fixtures of manufacturers shown on Drawings.

B. Related Work Specified Elsewhere: Refer to Section 16100 and Sections in Division 1, GENERAL REQUIREMENTS.

C. Accept responsibility for coordination of substituted fixtures with balance of building construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lighting fixtures shall bear the UL labels.

1. Fixture component parts shall be manufactured and assembled at manufacturing plant for shipment in one or more packages. Shipment from fixture manufacturer shall include integrally- mounted and remote mounted ballasts where ballasts are required for the proper operation of fixture lamps.

B. High Intensity Discharge (H.I.D.) Fixtures:

1. Provide fixtures specified, complete with ballast, ballast protection, and mounting hardware. Use ballast protection consisting of suitably sized fuses (in fuse holder) on line side of ballast. Where fixtures are pole mounted, use fuse- holder consisting of Bussman “TRON” type HEB holder complete with fuse and insulating boots located within the pole handhole.

2. Ballasts: Provide single lamp, high power factor, constant wattage type ballasts. Use ballasts suitable for 150 degrees F. (66 degrees C.) for interior application and 20 degrees F. (7 degrees C.) outside. Ballast regulation shall not exceed plus or

minus 10 percent line volts and plus or minus 3 percent watts output. Line starting current shall not exceed line normal current.

C. Lamps: Provide lamps manufactured by General Electric, Phillips, or Sylvania, conforming with the following and as scheduled on Drawings.

1. Metal Halide: Provide lamps as recommended by fixture manufacturer.

D. Special Accessories: Provide accessories, such as plaster frames, stem, canopies, and cords, necessary to mount fixture in a proper and approved method.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. Provide concrete bases for pole mounted fixtures as specified and detailed on Drawings.

a. Use 3000 psi (21 MPa) concrete.

b. Provide anchor bolts of size and orientation recommended by manufacturer. Recommendations of manufacturer govern installation of anchor bolts irrespective of any conflicting information.

2. Where conductors are strung within poles, take steps necessary to ensure that conductor insulation will not wear by virtue of pole movement caused by wind or similar action. Consult pole manufacturer for recommendations.

3. Grounding: Connect the green ground wire to pole ground and luminaire ground.

4. Contractor shall perform geo-technical investigation, including, but not limited to soil borings, and provide report for lighting pole foundation design basis.

END OF SECTION

SECTION 16531

TRACK LIGHTING

PART 1 – GENERAL

1.1 SCOPE

A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.

B. The purpose of these specifications is to define the performance and design standards for the Mana Drag Strip lighting project. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth by the criteria set forth in these specifications.

C. The sports lighting will be for the following areas:

1. Staging Area

2. Burnout / Starting Line Area

3. ¼ Mile Track

4. Deceleration Area

5. Shutdown Area

6. Return Road

D. The primary goals of this sports lighting project are:

1. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the drivers and the enjoyment of spectators. Therefore the lighting system shall be designed such that the light levels are guaranteed.

2. Environmental Light Control: It is a primary goal to minimize spill light and glare. Sports lighting system shall be designed with external light control visors and meet the specified spill light requirements.

3. Life Cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate.

1.2 LIGHTING PERFORMANCE

A. Performance Requirements: Specified Areas shall be lit to an average constant light level and uniformity as specified in the chart below. Light levels shall be held constant. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Average illumination level shall be measured in accordance with the IESNA LM-5-04. Light levels shall be guaranteed from the first 100 hours of operation for the maximum warranty period.

Area of Lighting	Average Constant Light Levels	Max to Min Uniformity Ratio	Grid Points	Grid Spacing
Staging Area	15 footcandles	15:1	60	20’ x 20’
Burnout / Starting Line Area	25 footcandles	2:1	18	20’ x 20’
¼ Mile Track Horizontal FC (1320’ x 60’)	25 footcandles	2:1	198	20’ x 20’
¼ Mile Track Vertical FC at 15 Degree Vertical (1320’ x 60’)	30 footcandles	2:1	198	20’ x 20’
Deceleration Area	15 footcandles	2.5:1	198	20’ x 20’
Shutdown Area	14 footcandles	8:1	198	20’ x 20’
Return Road	5 footcandles	N/A	300	20’ x 20’

1. Lumen maintenance control strategy: A constant light system shall use automatic power adjustments to achieve a lumen maintenance control strategy as described in the IESNA Lighting Handbook 10th Edition Lighting Controls Section page 16-8: "Lumen maintenance involves adjusting lamp output over time to maintain constant light output as lamps age, and dirt accumulation reduces luminaire output. With lumen maintenance control, either lamps are dimmed when new, or the lamp's current is increased as the system ages."

2. Independent Test Report: Manufacturer’s bidding any form of a constant light system must provide an independent test report clarifying the system meets the lumen maintenance control strategy above and verifying the field performance of the system for the duration of the useful life of the lamp based on lamp replacement hours. Report shall be signed by a licensed professional engineer with outdoor lighting experience. If report is not provided at least 10 days prior to bid opening, the manufacturer shall provide the initial and maintained designs called for under section 1.8., Alternate System Requirements.

3. Project References: Manufacturers bidding any form of a constant light system must provide a minimum of five (5) project references within the state of Hawaii that have been completed within the last calendar year utilizing this exact technology. Manufacturer will include project name, project city, and if required, contact name and contact phone number for each reference.

B. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide optimal glare control, maximum pole height shall be 60 feet. Pole locations shall be per the electrical plans.

1.3 ENVIRONMENTAL LIGHT CONTROL

A. Spill Light Control: Manufacturer shall submit spill light calculations for approval to bid. Maximum horizontal footcandles 200 feet from the edge of the track pavement to the north, and 200 feet from the edge of the return road to the south shall not exceed 0.1 FC. Maximum vertical footcandles at the same locations shall not exceed 0.7 FC with the meter aimed at the brightest light bank. Footcandle readings shall be taken at 30' intervals along the specified line. Average illumination level shall be measured in accordance with IESNA LM-5-04 at the first 100 hours of operation.

1.4 LIFE CYCLE COSTS

A. Energy Consumption: The average kWh consumption for the field lighting system shall be 200 kWh or less.

B. 25-Year Life Cycle Cost: Manufacturer shall submit 25-year life cycle cost calculations as follows. Equipment price and total life cycle cost shall be entered separately on bid form.

Luminaire Energy Consumption # luminaires x __kW demand per luminaire x $.15 kWh rate x 50 annual usage hours x 25 years		
TOTAL 25-Year Life Cycle Operating Cost	=	

1.5 WARRANTY AND GUARANTEE

10-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system, excluding fuses and lamps, for 10 years from the date of shipment. Labor shall be included for 2 years. Lamps shall be warranted for 2 years for parts, and 1 year for labor. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1.6 DELIVERY TIMING

Equipment On-Site: The equipment must be on-site within 60 days from receipt of approved submittals and receipt of complete order information.

1.7 SUBMITTALS

A. Approved Product: Musco's Green Generation Lighting® sports lighting system or approved equal.

B. Submit in accordance with Section 01300 – SUBMITTALS.

C. Computer-generated photometric plans for each area are required to verify proposed luminaires and locations meet the required performance criteria of the design using the applicable light loss factor (LLF). Photometric plan submittals must include:
- Horizontal illuminance (or luminance for roadways) measurements at pavement, taken at a maximum of every 20 feet.
- Minimum and maximum illuminance (or luminance for roadways) levels.
- Average maintained illuminance (or luminance for roadways) level.
- Average to minimum and maximum to minimum ratios for horizontal illuminance (or luminance for roadways).
- Lighting power density (Watts per square foot or per square meter).
- LLF

D. Submit shop drawings for panelboards and switchboards. Shop drawings of electrical distribution equipment shall be submitted to utility companies for approval prior to ordering. Submit product data for receptacles, circuit breakers, and switches.

E. Structural Parameters as described in 2.2 Structural Parameters

1.8 SYSTEM REQUIREMENTS

A. Light Level Requirements: Manufacturer shall provide computer models guaranteeing light levels on the track over 25 years. If a constant light level cannot be provided, the specified maximum Recoverable Light Loss Factor and maintenance/group relamping schedule shall be provided in accordance with recommendations in the Pennsylvania State University report "Empirical Light Loss Factors for Sports Lighting", presented at the 2009 IESNA Annual Conference.

Lamp Replacement Interval (hours)	**Recoverable Light Loss Factor (RLLF)**
2,100	0.69

For alternate systems, scans for both initial and maintained light levels shall be submitted.

Area of Lighting	Average Initial Light Levels	Average Target/Maintained Light Levels	Max to Min Uniformity Ratio	Grid Points
Staging Area	21.7 footcandles	15 footcandles	15:1	60
Burnout / Starting Line Area	36.2 footcandles	25 footcandles	2:1	18

¼ Mile Track Horizontal FC (1320’ x 60’)	36.2 footcandles	25 footcandles	2:1	198
¼ Mile Track Vertical FC at 15 Degree Vertical (1320’ x 60’)	43.5 footcandles	30 footcandles	2:1	198
Deceleration Area	21.7 footcandles	15 footcandles	2.5:1	198
Shutdown Area	20.3 footcandles	14 footcandles	8:1	117
Return Road	7.2 footcandles	5 footcandles	N/A	80

B. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include changes to service entrance, panel, and wire sizing.

PART 2 – PRODUCT

2.1 LIGHTING SYSTEM CONSTRUCTION

A. System Description: Lighting system shall consist of the following:

1. Galvanized steel poles and cross-arm assemblies.

2. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied. Concrete, direct bury steel poles, and wood poles are not approved to bid.

3. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system. Luminaries must have external glare control visors and internal optics to provide optimal spill and glare control.

4. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 10’ above grade. The enclosures shall include ballast, capacitor and touch-safe fusing to indicate when a fuse is to be replaced for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.

5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.

B. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.

C. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed carbon steel shall be hot dip galvanized per ASTM A123. All exposed aluminum shall be powder coated with high performance polyester or anodized. All exterior reflective inserts shall be anodized, coated, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All exposed hardware and fasteners shall be stainless steel of 18-8 grade or better, passivated and coated with aluminum-based thermosetting epoxy resin for protection against corrosion and stress corrosion cracking. Structural fasteners may be carbon steel and galvanized meeting ASTM A153 and ISO/EN 1461 (for hot dipped galvanizing), or ASTM B695 (for mechanical galvanizing). All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.

D. Enhanced corrosion protection package: Due to the potentially corrosive environment for this project, manufacturers must provide documentation that their products meet the following enhanced requirements in addition to the standard durability protection specified above:

1. Exposed carbon steel horizontal surfaces on the cross-arm assembly shall be galvanized to a five (5) mil minimum average thickness.

2. Exposed die cast aluminum components shall be Type II anodized per MIL-STD-8625 and coated with high performance polyester.

3. Exposed extruded aluminum components shall be Type II anodized per MIL-STD-8625 and coated with high performance polyester.

D. Lightning Protection: Manufacturer shall provide integrated lightning grounding via concrete encased electrode grounding system as defined by NFPA 780 and be UL Listed per UL 96 and UL 96A.

1. If grounding is not integrated into the structure, the Manufacturer shall supply grounding electrodes, copper down conductors and exothermic weld kits. Electrodes and conductors shall be sized as required by NFPA 780. The grounding electrode shall be not less than 5/8 inch diameter and 8 feet long, with a minimum of 10 feet embedment. Grounding electrode shall be connected to the structure by a grounding electrode conductor with a minimum size of 2 AWG for poles with 75 feet mounting height or less, and 2/0 AWG for poles with more than 75 feet mounting height.

E. Safety: All system components shall be UL Listed for the appropriate application.

F. Electric Power Requirements for the Sports Lighting Equipment:

1. Electric power: Voltage and phasing as shown on the electrical plans.

2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

2.2 STRUCTURAL PARAMETERS

A. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the 2009 IBC Building Code, wind speed of 110 mph, exposure category C, and an importance factor of 1.0. Luminaire, visor, and cross-arm shall withstand 150 mph winds and maintain luminaire aiming alignment.

B. Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO 2009 (LTS-5) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

C. Foundation Drawings: Project specific foundation drawings designed by a structural engineer licensed in the state of Hawaii. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole. The Contractor’s engineers shall verify the actual subsurface conditions are consistent with the subsurface conditions used in their design.

D. Flood Plain Management: The Project is located in the Federal Emergency Management Area (FEMA) Flood Zone AE and VE with flood elevations ranging from 9’ to 11’. Design of the track lighting system shall be in accordance with the Flood Plain Management Ordinance, Chapter 15, Article 1, County Code 1987 as amended. The Contractor shall prepare Flood Fringe Certifications for each flood zones stamped by an engineer licensed in the State of Hawaii.

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Engineer, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-01, Appendix B.

B. Correcting Non-Conformance: If, in the opinion of the Engineer, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer shall be liable to any or all of the following:

1. Manufacturer shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.

2. Manufacturer shall minimize the State's additional long term fixture maintenance and energy consumption costs created by the additional fixtures by reimbursing the State the amount of $1,000.00 (one thousand dollars) for each additional fixture required.

3. Manufacturer shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

END OF SECTION