DIVISION OF STATE PARKS

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

BOARD OF LAND AND NATURAL RESOURCES

Dawn N.S. Chang
Chairperson

CONTRACT SPECIFICATIONS AND PLANS

JOB NO. F46C602F
KOKE'E STATE PARK ELECTRICAL IMPROVEMENTS
WAIMEA, KAUAI, HAWAII

Civil Engineer: Fukunaga & Associates, Inc.
Electrical Engineer: MK Engineers, Ltd.

May 2026

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

CONTRACT SPECIFICATIONS AND PLANS

JOB NO. F46C602F
KOKE'E STATE PARK ELECTRICAL IMPROVEMENTS
WAIMEA, KAUAI, HAWAII

Approved: _____
ALAN B. CARPENTER
Acting Administrator
Division of State Parks

Approved: _____
DINA U. LAU, P.E.
Acting Chief Engineer
Engineering Division

May 2026

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DEPARTMENT OF LAND AND NATURAL RESOURCES INTERIM GENERAL CONDITIONS, DATED OCTOBER 1994 (Bound Separately)

NOTICE TO BIDDERS
(Chapter 103D, HRS)

COMPETITIVE BIDS for Job No. 25-06-100BG, Kokee State Park Electrical Improvements 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 Condition, dated October 1994, as amended, and the General Conditions –AG008, latest revision shall be made part of the specifications.

The project is located at Kokee State Park, Waimea, Kauai, Hawaii. Kokee Road (Hwy 550), Kauai, Hawaii. Tax Map Key: 4-1-4-001:013.

The work shall generally consist of installing new electrical services and feeders to existing buildings, electrical reconnection of existing loads, and related work.

To be eligible to submit a bid, the Bidder must possess a valid State of Hawaii Contractor's license classification "C-13".

The estimated cost of construction is $300,000.

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

Since the estimated value of the cost of construction is greater than $250,000, the apprenticeship agreement preference pursuant to Hawaii Revised Statutes §103-55.6 (ACT 17, SLH 2009) shall not 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 work shall generally consist of installing new waterline piping, appurtenances, and related work.

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.**

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. 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.

L. 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.

M. 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.

N. 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.

O. 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.

P. 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.

Q. 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.

R. 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.

S. 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 Phase 1 and the other phases of the project.

T. 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.

U. 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.

V. 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.

W. 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.

X. 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.

Y. 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

Z. 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.

AA. TOILET FACILITIES: All toilet facilities constructed or provided 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. Any costs for temporary toilet facilities shall be incidental to the project and be paid for by the contractor.

BB. 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.

CC. 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.

DD. 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.

EE. 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.

FF. 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.

GG. 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 $12.00 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.

P R O P O S A L

FOR

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
State of Hawaii

JOB NO. F46C602F
KOKE'E STATE PARK ELECTRICAL IMPROVEMENTS
WAIMEA, KAUAI, HAWAII

_____, 2026

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 to install new electrical services and feeders to existing buildings, electrical reconnection of existing loads, and related work, 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. F46C602F
KOKE'E STATE PARK ELECTRICAL IMPROVEMENTS
WAIMEA, KAUAI, HAWAII

on file in the office of the Engineering Division for the TOTAL BASE BID (Items 1 to 9) of:

_____

_____Dollars ($_____)
and will fully complete all work under this contract within 180 consecutive calendar days from the date of written notice to proceed, including date of said order, said total sum being itemized on the following pages.

PROPOSAL

Item No.	Quantity	Unit	Description	Unit Price	Total
		BASE BID			
1.	1	LS	Demolition Work; to include demolition, hauling & disposal as required to construct new improvements.		$_____
2.	1	LS	Garage 1 and Garage 2 Electrical Work, in place complete		$_____
3.	1	LS	Storage Building Electrical Work, in place complete		$_____
4.	1	LS	Workshop Electrical Work, in place complete.		$_____
5.	1	LS	Ranger's Cottage Electrical Work, in place complete		$_____
6.	1	LS	Park Headquarters Electrical Work, in place complete		$_____
7.		LS	Project Sign, in place complete.		$_____
8.	Allowance		Field Office		$ 10,000.00
				Subtotal Base Bid (Items 1-8)	$_____
9.		LS	Mobilization and Demobilization (not to exceed 10% of the Subtotal Base Bid)		$_____
				Total Base Bid (Items 1-9)	$_____

RECYCLED PRODUCTS PREFERENCE

This project allows a 10% price preference for recycled products in accordance with HRS 103D-1005. Please indicate your selection of 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, 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 9) selected by the Board of Land and Natural Resources. Write the total of bid items 1 to 9 on page P-1.

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 one hundred eighty (180) 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 for 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 HIePRO bid due date and time, 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 Zero Cents ($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 and providing the work of the required specialty contractor, 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

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.

Exact Legal Name of Company, Joint Venture or Partnership

Company is:
☐ Sole Proprietor ☐ Partnership ☐ Corporation ☐ Joint Venture ☐ Other _____

Contractor's License No.: _____

Federal I.D. No.: _____

Hawaii General Excise Tax License I.D. No.: _____

Payment address (other than street address below): _____

City, State, Zip Code: _____

Business Address (street address): _____

City, State, Zip Code: _____

Respectfully submitted,

By _____
Authorized (Original) Signature (*4)

Title: _____

Print Name: _____

Date: _____

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 "two hundred seventy-four (274)" 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 two hundred seventy-four (274) 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 replacing the last paragraph with the following:

In the event the Notice to Proceed is not issued within five hundred forty-eight (548) calendar days after the date of bid opening, the Contractor may submit a claim for increased labor and materials costs (but not overhead costs). The claim shall be for labor and material costs incurred after 548 days and the full duration of the contract time allowed for the performance of the work (Total Base Bid or Total Adjusted Base Bid) have elapsed. Such claims shall be accompanied with the necessary documentation to justify the claim. No payments will be made for escalation costs that are not fully justified as determined by the State.

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 HIePRO website.

Section 5 – Control of Work

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

ADD the following to Section 6.3 Sub-paragraph b:

4. If the substitution meets all the requirements of the specifications and plans.

Section 7 – Prosecution and Progress

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

"d. Proof of Insurance Coverage

A Certificate of Insurance or other documentary evidence, to the satisfaction of the Engineer, that the Contractor has in place all insurance coverage required by the contract. The Certificate of Insurance shall contain wording which identifies the Project number and Project title for which the certificate of insurance is issued. Refer to the following for insurance requirements:

1. Insurance Requirements

(a) Obligation of Contractor – Contractor shall not commence any work until it obtains, at its own expense, all required herein 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 laws of the State to issue such insurance in the State of Hawaii. Coverage by a "Non-Admitted" carrier is permissible provided the carrier has a AM Best's Rating of "A-VII" or better.

(b) 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.

(d) Certificate(s) of Insurance acceptable to the Department shall be filed with the Engineer prior to commencement of the work. Certificates shall identify if the insurance company is a "captive" insurance company or a "Non-Admitted" carrier to the State of Hawaii. The Best's Rating must be stated for the "Non-Admitted" carrier. Certificates shall contain a provision that coverages afforded under the policies will not be canceled or changed until at least thirty (30) 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.

(d) 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.

(e) All insurance described herein shall be primary and 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.

(f) 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.

(g) If the Contractor is self-insured, it shall furnish, upon the request and the satisfaction of the Engineer, any documentation to demonstrate the ability to self-insure itself. The Engineer, from time to time, can conduct an audit to determine the ability of the Contractor to be self-insured. Failure to comply with the Engineer's request will be considered a material breach of the contract, and at the discretion of the Engineer, may be sufficient grounds to terminate the contract, suspend any work or withhold future payments.

(h) It is the responsibility of the Contractor to notify the Department of any changes to its insurance policies or if the Contractor receives a notice of cancellation of any of its insurance policies. The Contractor will immediately provide written notice to the Department should the insurance policies evidenced on its Certificate of Insurance form be cancelled, limited in scope, or not renewed upon expiration.

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 worker's compensation insurance 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. The Contractor shall obtain General Liability insurance with a limit of not less than $1,000,000 per occurrence and $2,000,000 aggregate. The insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess polices."

(c) Comprehensive Automobile Liability. The Contractor shall obtain Auto Liability insurance covering all owned, non-owned and hired autos with a combined single Limit of not less than $1,000,000 per accident for bodily injury and property damage. The insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess polices.

Furthermore, the Contractor's commercial general liability insurance and automobile liability insurance 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 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.

(d) 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 insurance policy shall contain the following clauses: 1) "The State of Hawaii is added as an additional insured as respects to operations performed for the State of Hawaii."; and 2) "It is agreed that any insurance maintained by the State of Hawaii will apply in excess of, and not contributed with, insurance provided by this policy." The required limit of insurance may be provided by a single policy or with a combination of primary and excess policies.

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:

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.

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SECTION 01019

GENERAL SPECIFICATIONS

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. 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.

1.02 GENERAL

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

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

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

D. Disruption of Utility Services: All work related to the temporary disconnection of electrical system shall be pre-arranged with the Engineer so that any disruption of such services will be kept to a minimum. In the event temporary power hook-up is required, the Contractor shall provide the necessary services.

E. 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 interruption or interference to the facility's operations. Where the Contractor's operations would result in interruptions which would hamper the operations of the facilities, the Contractor shall rearrange the schedule of work accordingly.

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

F. Lead Paint

1. When the project includes paint to be disturbed that was applied prior to 1980, it shall be assumed to contain lead. The Contractor shall inform its employees, subcontractors, and all other persons engaged in the project that lead

containing paints are present in the existing buildings at the job site and to follow the requirements of the Department of Labor and Industrial Relations, Division of Occupational Safety and Health, Title 12, Subtitle 8,Chapter 148, Lead Exposure in Construction, Hawaii Administrative Rules (Chapter 12-148, HAR).

G. Parking Policy for Contractor

1. The Contractor and its employees will not be allowed to park in zones assigned to facility personnel.

2. Areas to be used by the Contractor shall be as designated by the Engineer. Any lawn damaged by the Contractor shall be restored as instructed by the Engineer at no cost to the State.

H. Toilet Accommodations: The Contractor may use the existing toilet facilities if so designated by the Engineer; however, it is the Contractor's responsibility to keep same clean and in a sanitary condition at all times.

I. 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.

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

K. 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.

L. 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.

M. 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.

N. 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.

O. 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.

P. 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.

Q. Required Submittals

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

    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.

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
AA	Aluminum Association Incorporated 818 Connecticut Avenue, N.W. Washington, D.C. 20006
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
AEIC	Association of Edison Illuminating Companies 51 East 42nd Street New York, NY 10017
AFBMA	Anti-Friction Bearing Manufacturer's Association 60 East 42nd Street New York, NY 10017
AGA	American Gas Association 8501 East Pleasant Valley Road Cleveland, OH 44131
AGMA	American Gear Manufacturer's Association 1330 Massachusetts Avenue, N.W. Washington, D.C.
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
AITC	American Institute of Timber Construction 333 West Hampden Avenue Englewood, CO 80110
AMCA	Air Moving and Conditioning Association, Inc. 30 West University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute, Inc. 1430 Broadway New York, NY 10018
APA	American Plywood Association 1119 A Street Tacoma, WA 98401
API	American Petroleum Institute 1801 K Street N.W. Washington, DC 20006
ARI	Air-Conditioning and Refrigeration Institute 1814 North Fort Myer Drive Arlington, VA 22209
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017
ASCII	American Standard Code for Information Interchange United States of America Standards Institute 1430 Broadway New York, NY 10018
ASE Code	American Standard Safety Code for Elevators, Dumbwaiter and Escalators American National Standards Institute 1430 Broadway New York, NY 10018

ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers United Engineering Center 345 East 47th Street New York, NY 10017
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017
ASTM	American Society for Testing and Materials 1916 Race Street Philadelphia, PA 19103
AWPA	American Wood Preservers Association 1625 Eye Street Washington, DC 20006
AWS	American Welding Society 2501 N.W. 7th Street Miami, FL 33125
AWWA	American Water Works Association 6666 West Quincy Avenue Denver, CO 80235
CBM	Certified Ballast Manufacturers 2120 Keith Building Cleveland, OH 44115
CMAA	Crane Manufacturers Association of America, Inc. (Formerly called: Overhead Electrical Crane Institute – OECI) 1326 Freeport Road Pittsburgh, PA 15238
CRSI	Concrete Reinforcing Steel Institute 180 North La Salle Street Chicago, IL 60601
CSA	Canadian Standards Association 178 Rexdale Boulevard Rexdale, Ontario, M9W IR3, Canada

DEMA	Diesel Engine Manufacturer's Association 122 East 42nd Street New York, NY 10017
DIS	Division of Industrial Safety California Department of Industrial Relations 2422 Arden Way Sacramento, CA 95825
EEI	Edison Electric Institute 90 Park Avenue New York, NY 10016
EIA	Electronic Industries Association 2001 Eye Street N.W. Washington, DC 20006
EJMA	Expansion Joint Manufacturer's Association 331 Madison Avenue New York, NY 10017
ESO	Electrical Safety Orders, California Administrative Code, Title 8, Chap. 4, Subarticle 5 Office of Procurement, Publications Section P.O. Box 20191 8141 Elder Creek Road Sacramento, CA 95820
FEDSPEC	Federal Specifications General Services Administration Specification and Consumer Information Distribution Branch Washington Navy Yard, Bldg. 197 Washington, DC 20407
FEDSTDS	Federal Standards (see FEDSPECS)
FM	Factory Mutual Research 1151 Boston-Providence Turnpike Norwood, MA 02062
HEI	Heat Exchange Institute 122 East 42nd Street New York, NY 10017

HI	Hydraulic Institute 1230 Keith Building Cleveland, OH 44115
IAPMO	International Association of Plumbing and Mechanical Officials 5032 Alhambra Avenue Los Angeles, CA 90032
ICBO	International Conference of Building Officials 5360 South Workman Mill Road Whittier, CA 90601
ICEA	Insulated Cable Engineers Association P.O. Box P South Yarmouth, MA 02664
IEEE	Institute of Electrical and Electronics Engineers, Inc. 345 East 47th Street New York, NY 10017
IES	Illuminating Engineering Society C/O United Engineering Center 345 East 47th Street New York, NY 10017
ISA	Instrument Society of America 400 Stanwix Street Pittsburgh, PA 15222
JIC	Joint Industrial Council 7901 Westpark Drive McLean, VA 22101
MILSPEC	Military Specifications Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. 127 Park Street, N.E. Vienna, VA 22180

NAAMM	National Association of Architectural Metal Manufacturers 100 South Marion Street Oak Park, IL 60302
NACE	National Association of Corrosion Engineers P.O. Box 986 Katy, TX 77450
NEC	National Electric Code National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
NEMA	National Electrical Manufacturer's Association 155 East 44th Street New York, NY 10017
NESC	National Electric Safety Code American National Standards Institute 1430 Broadway New York, NY 10018
NFPA	National Forest Products Association (Formerly called: National Lumber Manufacturer's Association) 1619 Massachusetts Avenue, N.W. Washington, DC 20036
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
PPIC	The Plumbing & Piping Industry Council, Inc. Suite 402 510 Shatto Place Los Angeles, CA 90020
SAE	Society of Automotive Engineers 2 Pennsylvania Street New York, NY 10001

SAMA	Scientific Apparatus Makers Association One Thomas Circle Washington, DC 20005
SBCC	Southern Building Code Congress 1116 Brown-Marx Building Birmingham, AL 35203
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc. 8224 Old Courthouse Road Tysons Corner Vienna, VA 22180
SSPWC	Standard Specifications for Public Works Construction Building News, Inc. 3055 Overland Avenue Los Angeles, CA 90034
TEMA	Tubular Exchanger Manufacturer's Association 331 Madison Avenue New York, NY 10017
UBC	Uniform Building Code Published by ICBO
UL	Underwriters Laboratories Inc. 207 East Ohio Street Chicago, IL 60611
UMC	Uniform Mechanical Code Published by ICBO
UPC	Uniform Plumbing Code Published by IAPMO
USBR	Bureau of Reclamation U.S. Department of Interior Engineering and Research Center Denver Federal Center, Building 67 Denver, CO 80225
WWPA	Western Wood Products Association (Formerly called: West Coast Lumberman's Association – WCLA) Yeon Building Portland, CA 97204

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01100

ARCHAEOLOGICAL PROTECTION

PART 1 - GENERAL

1.01 This section covers the requirements for the protection and preservation of historical sites and values.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION METHOD: Representatives of the State will from time to time examine the area as work proceeds. If historical values are noted, the State may order a halt to the work in the vicinity of the historical values until the State can examine further. The Contractor shall notify the State if he finds anything he suspects to be of historic significance and shall discontinue further work in the vicinity of the find until the State can examine the area. In either case, further work in the vicinity of such historical or suspected historical values may proceed only upon approval by the State. Such approval can be normally expected within one week and shall in no case require more than one month.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1.01 SUBMITTALS

A. Shop drawings shall be required for:

1. Division 16 – Electrical Work.

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

B. Other required submittals shall include:

1. Piping Layout.

2. Manufacturer's Data.

3. Certificates of Warranty.

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

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

A. The Contractor is responsible for the coordination of all contractual work and submittals.

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

CONTRACTOR NAME

PROJECT: _____

_____

JOB NO: _____

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 copies of all shop drawings, piping layout, and/or catalog cuts for fabricated items and manufactured items (including mechanical and electrical equipment) 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 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 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 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 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.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01505

MOBILIZATION AND DEMOBILIZATION

PART 1 – GENERAL

1.01 ENERAL REQUIREMENTS

A. Description: This section covers the requirements for mobilization and demobilization.

1.02 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, and incidentals necessary to do the work covered by this contract.

1.03 DEMOBILIZATION: Demobilization shall consist of the dismantling and removal of the above-mentioned equipment, machinery, structures, utilities, materials, and incidentals, and the cleaning up of the site.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GUIDELINES: If the Contractor utilizes private lands other than the sites provided by the Department 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 landowner.

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.

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

END OF SECTION

SECTION 01530

BARRICADES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Description. This work shall consist of furnishing, installing and maintaining barricades in accordance with the requirements of the contract.

Barricade application shall be provided for in the latest edition of the FHWA publication, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and as amended.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Lumber: Lumber for rails, frames and braces shall be dry, sound, undamaged, well-seasoned, and free from any defect which may impair their strength and durability.

B. Hardware: Nails shall be galvanized wire nails. As many and as large a size as is practicable shall be used.

C. Paints: Paints shall be exterior enamel paint of the best grade or first line as made by approved manufacturers.

D. Sheet Reflecting Material: Sheet reflecting material shall conform to the applicable requirements of Subsection 712.20(C) of the "Standard Specifications for Road and Bridge Construction".

E. Alternate Designs: Alternate barricade designs such as plastic molded barricades may be used subject to the Engineer's approval. The Contractor shall submit shop drawings or catalog cuts for approval.

PART 3 - EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. General: Barricades shall be constructed in a first class, workmanlike manner in accordance with details shown on the plans and as specified herein.

Barricades shall be in good condition and approved by the Engineer for use within the project limits. Barricade application and installation shall be as shown on the plans and as directed by the Engineer in accordance with the guidelines provided in the latest edition of the FHWA publication, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and any amendments or revisions thereof as may be made from time to time.

Sand bags or other approved weights shall be provided where required or as directed by the Engineer. Sand bags or other approved weights shall not be placed on any striped barricade rail.

Steady burn and/or flashing lamps shall be required on selected barricades used during hours of darkness. Locations shall be as shown on the plans and as directed by the Engineer. Lamps shall be attached on the barricade ends closest to the traveled way and shall be visible to the motorist.

Barricades furnished and paid for as provided for as provided herein may be used for temporary detours, construction phasing, or other temporary traffic control work.

Barricades furnished and paid for use in temporary detours or construction phasing may be used for permanent location called for on the plans.

Upon completion of the construction work, barricades shall be left in place, relocated, or removed and disposed of as shown on the plans or as directed by the Engineer. Barricades left in place, or relocated to new permanent locations shall become the property of the State. Barricades directed to be removed and disposed of shall become the property of the Contractor.

B. Painting: Wooden rails, frames and braces shall be given a prime coat and 2 finish coats of new white exterior enamel paint. Rail faces to be reflectorized may be left unpainted unless otherwise specified or directed.

C. Reflectorization: Reflectorization of barricade rails shall be done in a first class, workmanlike manner and the attachment of reflective sheeting shall be as shown on the plans, specified herein, or as directed and approved by the Engineer.

Both vertical faces of each barricade rail shall be reflectorized as shown on the plans.

Wooden rails shall be reflectorized with one of the following:

1. Reflective sheeting specified in Subsection 712.20(C)(4) of the "Standard Specifications for Road and Bridge Construction" and backed with a 26 gage

galvanized steel sheet, or

2. a hardened aluminum backed reflective sheeting as specified in Subsection 712.20(C)(5) of the "Standard Specifications for Road and Bridge Construction."

D. Color: Rails, frames and braces shall be white.

The front and back faces of barricade rails shall have 6-inch wide alternative colored and white striped sloping downward toward the traveled way at an angle of 45 degrees with the vertical. The colored stripes shall be either orange or red in accordance with the following requirements:

1. Orange and white stripes shall be used in the following conditions:

   a. Construction work.

   b. Detours.

   c. Maintenance work.

2. Red and white stripes shall be used in the following conditions:

   a. On roadways with no outlet (ie. dead-ends, cul-de-sacs).

   b. Ramps or lanes closed for operational purposes.

   c. ermanent or semipermanent closure or termination of a roadway.

E. Maintenance: Barricades shall be kept in good condition throughout their usage during construction until the end of the contract.

F. The Contractor shall repair, repaint, clean or replace the barricades as required and as directed by the Engineer to maintain their effectiveness and appearance.

The Constructor shall immediately replace all lost, stolen or damaged barricades, lamps, sand bags and other approved weights.

Barricades used during construction phasing, temporary detours or other temporary traffic control work shall be cleaned and repaired as necessary, prior to being relocated to a permanent location shown on the plans or as directed.

No extra payment will be made for any repair work, repainting, or cleaning of barricades. The Engineer shall determine the suitable condition of each barricade and shall determine when each barricade shall be repaired, repainted or cleaned.

END OF SECTION

SECTION 01567

POLLUTION CONTROL

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Rubbish Disposal

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

2. No burying of debris and/or waste material except for materials which are specifically indicated elsewhere in these specifications as suitable for backfill shall be permitted on the project site.

3. All unusable debris and waste material shall be hauled away to an appropriate off-site dump area. During loading operations, debris and waste materials shall be watered down to allay dust.

4. No dry sweeping shall be permitted in cleaning rubbish and fines which can become airborne from floors or other paved areas. Vacuuming, wet mopping or wet or damp sweeping is permissible.

5. Enclosed chutes and/or containers shall be used for conveying debris from above to ground floor level.

6. 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.

B. Dust

1. The Contractor shall prevent dust from becoming airborne at all times including non-working hours, weekends and holidays in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 60 – Air Pollution Control.

2. The method of dust control and costs shall be the responsibility of the Contractor. Methods of dust control shall include the use of water, chemicals or asphalt over surfaces which may create airborne dust.

3. The Contractor shall be responsible for all damage claims in accordance with

Section 7.16 – "Responsibility for Damage Claims" of the GENERAL CONDITIONS.

C. Noise

1. 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 for Oahu. The Contractor shall obtain and pay for the Community Noise Permit from the State Department of Health when the construction equipment or other devices emit noise at levels exceeding the allowable limits.

2. All internal combustion engine-powered equipment shall have mufflers to minimize noise and shall be properly maintained to reduce noise to acceptable levels.

3. Pile driving operations shall be confined to the period between 9:00 a.m. and 5:30 p.m., Monday through Friday. Pile driving will not be permitted on weekends and legal State and Federal holidays.

4. Starting-up of construction equipment meeting allowable noise limits shall not be done prior to 6:45 a.m. without prior approval of the Engineer. Equipment exceeding allowable noise levels shall not be started-up prior to 7:00 a.m.

D. Erosion

1. During interim grading operations, the grade shall be maintained so as to preclude any damage to adjoining property from water and eroding soil.

E. Discharges Related to Construction Activities

1. No discharges related to construction activities shall enter State waters without an approved NPDES Permit issued by the State of Hawaii Department of health Clean Water Branch.

2. The Contractor shall be responsible for processing a Site-Specific Best Management Plan (SSBMP) and receive approval 30 days in advance of any discharge activity.

3. Waste water shall not be discharged into existing streams, watersays, or drainage systems such as gutters and catch basins unless treated to comply with the State Department of Health water pollution regulations.

F. Others

1. 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. Wastewater 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.

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

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

4. 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.

5. 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.

G. Suspension of Work

1. 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.

2. 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.

3. The Engineer may also suspend any operations which he feels are creating pollution problems although they may not be in violation of the above-mentioned requirements. In this instance, the work shall be done by force account as described in Subsection 4.2b -"Additional Work" of the GENERAL CONDITIONS and paid for in accordance with Subsection 8.4b – "Force – Account Work" therein. The count of elapsed working days to be charged against the contract in this situation shall be computed in accordance with Subsection 7.18 – "Contract Time" of the GENERAL CONDITIONS.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 01581

PROJECT SIGN

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

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

1.02 SUBMITTAL

The contractor shall provide the Engineer with six (6) shop drawings of the project sign for review and approval by the Engineer prior to ordering the sign.

1.03 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.

1.04 ARTWORK

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.

1.05 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

2.01 MATERIALS

A. LUMBER

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

2. 4"x4" signposts 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

3.01 GENERAL

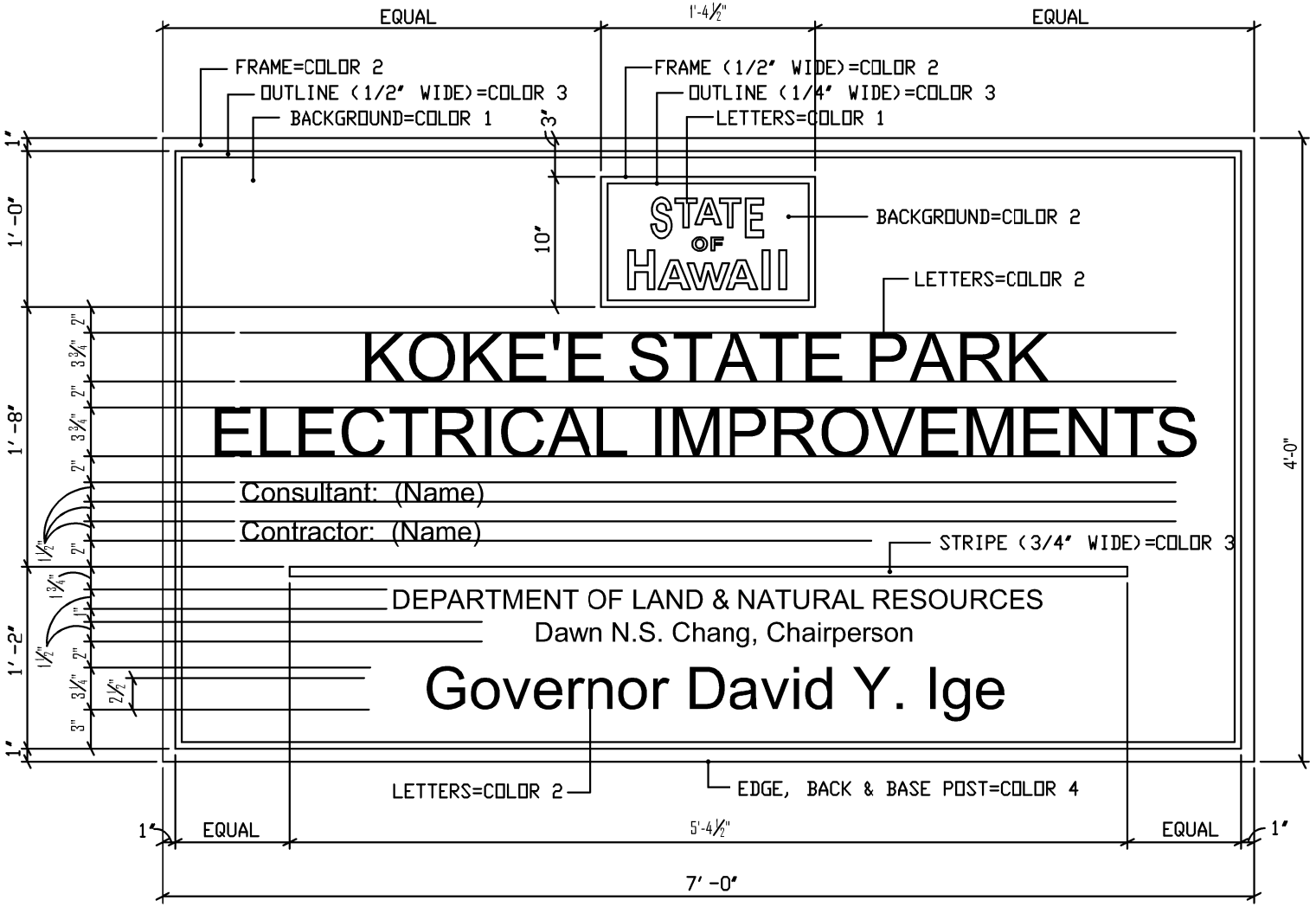
A. The Project Sign shall be constructed with new materials as specified above.

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.

3.02 MEASUREMENTS AND PAYMENT

The construction of the project sign, including all equipment, labor and material necessary to furnish and install the project sign will be paid for under the "Project Sign" proposal item.

END OF SECTION



Project Sign
01581-3

Job No.

NOTE: Number of signs required 1

SECTION 02100

SITE PREPARATION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. 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. Site preparation shall also include all Best Management Practices (BMP) work associated with Erosion Control Notes.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

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

B. When necessary, the Contractor shall provide and erect barriers, etc., with special attention to protection of personnel.

C. 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.

D. Fires: No burning of fires of any kind will be allowed.

E. Reference Points: Benchmarks, etc., shall be carefully maintained, but if disturbed or destroyed, shall be replaced as directed, at the Contractor's expense.

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

3.02 PERMITS

A. The Contractor shall apply for and obtain the necessary permits prior to the commencement of work. The Contractor shall pay for all fees.

3.03 EXISTING UTILITY LINES

A. 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.

3.04 CLEARING AND GRUBBING

A. The Contractor shall clear the site of all obstacles and obstructions not scheduled to remain, to include but not limited to tree limbs and stumps, the removal of which will be necessary for the proper reception, construction, execution and completion of other work included in this project.

B. All clearing and grubbing shall be done in accordance with Section 201 of the "Standard Specifications For Public Works Construction", State of Hawaii, dated September 1986.

C. The Contractor shall remove all required trees as noted in the plans within the graded areas and as required to perform grading work. Tree removal of stumps and roots shall be to a minimum of 12” below finish grades.

3.05 CLEAN UP OF PREMISES

A. 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 including replacement of all pavement markings disturbed to match pre-construction conditions to the satisfaction of the Engineer.

B. Displaced Material: Except where otherwise directed by the Engineer, all displaced materials having salvage value shall be carefully and neatly stacked or stored on the site where directed, and shall remain the property of the State. All materials having no salvage value, as determined by the Engineer, shall be completely removed and properly disposed of from the project site.

END OF SECTION

SECTION 02225

TRENCHING, BACKFILLING AND COMPACTION

PART 1 – GENERAL

1.01 GENERAL CONDITIONS

The General Conditions and Special Provisions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED

Furnish all labor, materials, services, equipment and related items necessary to excavate, fill, remove, transport, stockpile, place and dispose of all materials within the limits of the project required to construct the site work improvements in accordance with these specifications, dimensions, sections and details shown on the plans, and the approval of the Engineer.

1.03 REFERENCES

A. Work shall be governed by the Counties' "Standard Specifications for Public Works Construction" (Standard Specifications), dated 1986 as revised, except as amended in the plans and specifications here within. (Paragraphs concerning Measurement and Payment in the Sections are not applicable to this project).

B. The Contractor is expected to examine the site and decide for himself the character of materials to be encountered.

1.04 PROTECTION

A. The Contractor shall incorporate into his work schedule the Temporary Erosion Control Measures and the Permanent Erosion Control procedures indicated on the plans and as specified in the contract.

B. Every effort shall be made by the Contractor to keep dust to a minimum. Spraying the ground with water or other means of control shall be used wherever possible. The Contractor shall have an adequate supply of water for moisture conditioning of fill material.

C. Without limiting the generality or applicability of other indemnity provisions of the contract, the Contractor agrees that he shall indemnify and hold harmless the State from and against all suits, actions, claims, demands, damages, costs and expenses (including but not limited to attorney's fees) arising out of any damage to any

property whatsoever or injury to any person whomsoever, in any way caused or contributed to by dust from the Contractor's operations.

D. The Contractor shall be responsible for the protection of existing surface and subsurface utilities and poles within and abutting the project site, trench excavations and other work areas.

E. All subgrades shall be kept moist until covered by subbase, base course, or concrete. All finished grades shall be kept moist until covered by landscaping or other permanent groundcover. Where shrinkage cracks are noted after compaction of the subgrade or finished grade, the subgrade or finished grade shall be rescarified, moisture-conditioned to above the optimum moisture content, and recompacted to the specified requirement at no additional cost to the State. During construction, the Contractor shall properly grade and maintain all excavated surfaces to provide positive drainage and prevent ponding of water. In the event that ponding of water caused softening of the subgrades, the Contractor shall remove the soft soils and shall backfill the excavation with compacted fill at no additional cost to the State.

1.05 PERMITS

The Contractor shall obtain and pay for any required permits prior to the commencement of the work.

PART 2 – PRODUCTS

2.01 MATERIALS

Fills, backfills and select borrow fills shall conform to the reference documents that will be made part of these contract documents.

PART 3 – EXECUTION

2.02 GENERAL

A. Site excavation, embankment and grading shall be performed in accordance with "Standard Specifications for Public Works Construction" (Standard Specifications), dated 1986 as revised, and as specified herein.

B. The Engineer shall be notified by the Contractor after clearing and grubbing and before any fill is placed; and also at least two weeks in advance before grading operations are scheduled to begin. Further, the Contractor shall advise the Engineer

of the proposed overall schedule for earthwork operations.

C. All cuts and fills to be constructed shall be monitored by a licensed Geotechnical Engineer retained by the Contractor, who shall approve all site preparation, fill material, methods of placing and compaction and perform field density tests during the grading. Written approval shall be issued upon completion of cuts and fills. No deviation from these specifications shall be made except upon the written approval of the Engineer and/or other public agencies having jurisdiction.

D. The Engineer shall be notified at least five working days prior to start of grading. A pre-grading conference shall be held between the parties involved to discuss methods of operations, site problems and scheduling. Field density tests shall be taken by the Contractor's Geotechnical Engineer.

E. The Contractor shall have a responsible field superintendent on the project in full charge of the work with authority to make decisions at all times. He shall cooperate with the Engineer in carrying out the work. Any instructions given to him by the Engineer shall be considered to have been given to the Contractor personally.

F. No fill shall be placed, spread or rolled during unfavorable weather. When the work is interrupted by rain, operations shall not be resumed until field tests by the Engineer indicate that conditions will permit satisfactory results.

G. If unforeseen or undetected soil conditions such as soft spots, existing utility trenches, structure foundations, voids or cavities, boulders, seepage water or expansive soil pockets, etc. are encountered, the Contractor at his sole expense shall make all necessary corrective measures in the field as such conditions are detected.

2.03 LAYING OUT

A. The area shall be cleared of brush, weeds, vegetation, and debris. All of these materials shall be satisfactorily placed around the project site at no cost to the State.

B. The laying-out of base lines, establishment of finish grades and staking out of the entire work and verification of finished grades of the subbase to the required tolerances shall be done by a registered Surveyor licensed in the State of Hawaii. The Contractor shall carefully preserve all data and all monuments set by the Surveyor and, if displaced or lost, immediately replace them to the acceptance of the Engineer at no additional cost to the State.

C. Discrepancies: Should any discrepancies be discovered in the dimensions given in the plans, the Contractor shall immediately notify the Engineer before proceeding any further with the work, otherwise he will be held responsible for any costs

involved in the correction of the construction placed due to such discrepancies.

2.04 SITE PREPARATION

A. Prior to commencement of earthwork operations, all vegetation debris and other deleterious materials shall be removed from the site.

B. Soft spots, loose areas or uncompacted fills shall be overexcavated to stiff or dense materials, and the resulting depression backfilled.

2.05 ONSITE FILL

A. Onsite excavated material may be acceptable for reuse as backfill provided it conforms to the MATERIALS portion of this Section and accepted by the Geotechnical Engineer. Prior to reuse, all reused material shall be properly cleaned and prepared.

2.06 EXCAVATIONS

A. All excavation shall be made to the lines and grades as shown on the project plans. All excavation shall be inspected and accepted by the Geotechnical Engineer. Where conditions encountered require, the Geotechnical Engineer shall direct the necessary modifications to be made.

2.07 GRASSING

A. Sod, plant or hydromulch all slopes and exposed areas immediately after the grading work has been completed.

2.08 DRAINAGE

A. Care shall be exercised during grading so that areas involved will drain properly. Water shall be prevented from running over the slopes by the temporary berms or drainage swales.

2.09 UNSUITABLE EXCAVATED MATERIAL

A. The Contractor shall remove from the project site all unsuitable excavated material unless specified otherwise by the Engineer.

B. Removal, including hauling and placement, of the unsuitable material will not be paid for directly, but shall be considered incidental to the project.

END OF SECTION

SECTION 02242

GEOTEXTILE

PART 1 – GENERAL

1.01 GENERAL CONDITIONS: The General Conditions and Special Provisions preceding these specifications shall govern this section of the work.

1.02 WORK INCLUDED: Provide geotextile filter fabric as specified in the contract documents, as specified by the product manufacturer.

PART 2 – PRODUCTS

2.01 MATERIALS: Geotextile filter fabric shall be as specified below. Mirafi 170N or approved equal.

A. Mechanical Properties:

1.	Grab Tensile Strength:	ASTM D 4632
	Strength at Ultimate	0.80 kN or 180 lbs
	Elongation at Ultimate	50%
2.	Mullen Burst Strength: ASTM D 3786	2412 kPa or 350 psi
3.	Trapezoidal Tear Strength: ASTM D 4355	0.33 kN or 75 lbs
4.	Puncture Strength: ASTM D 4833	0.50 kN or 105 lbs
5.	CBR Puncture Strength: ASTM D 6241	2.0 kN or 450 lbs
6.	UV Resistance after 500 hrs: ASTM D 4355	70% strength

B. Hydraulic Properties:

1.	Apparent Opening Size: ASTM D 4751	US Sieve 100 or 0.150 mm

2. Permittivity:
   ASTM D 4491 — 1.2 sec^{-1}

3. Flow Rate:
   ASTM D 4751 — 4277.7 $l/min/m^2$ or 105 $gal/min/ft^2$

PART 3 – EXECUTION

3.01 Shall be as specified to the product manufacturers specifications.

END OF SECTION

SECTION 02512

ASPHALTIC CONCRETE PAVEMENT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS:

The Counties' STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION (Standard Specifications) dated September 1986 and STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION dated September 1984 as revised, except as amended in the plans and/or specifications herewith. (Paragraphs concerning Measurements and Payments in the Sections are not applicable to this project).

1.02 WORK SPECIFIED IN OTHER SECTIONS:

Excavation and fill are specified in Section 02210 – EARTHWORK.

1.03 SUBMITTALS

The mix design for the asphalt concrete pavement.

PART 2 – PRODUCTS

2.01 MATERIALS

Materials for roads and parking areas shall be constructed in accordance with the below- listed sections of the Counties' STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION dated September 1986, except as amended in the plans and/or specifications herewith.

Subgrade ..... Section 29

Select Borrow for Subbase Course .....Section 30

Aggregate Base Course.....Section 31

Asphalt Concrete Pavement.....Section 34

PART 3 – EXECUTION

3.01 INSTALLATION

The subgrade shall be prepared and compacted in accordance with Section 29 of the Standard Specifications. Soil test shall be made at the subgrade level and the final payment structure verified or modified as necessary.

The subbase course and base course shall be constructed in accordance with Sections 30 and 31 of the Standard Specifications. Field density tests shall be made by the Soils Engineer to verify that the compaction obtained meets the specifications.

The asphalt concrete pavement shall be constructed in accordance with Section 34 of the Standard Specifications.

Any pavement not acceptable to the County or Owner shall be reconstructed at no additional cost to the Owner.

END OF SECTION

SECTION 02513

PRIME COAT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

This section covers the requirements for furnishing and installing of prime coat.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Bituminous Material: Bituminous material for prime coat shall be a medium curing liquid asphalt, Grade MC-30, conforming to the applicable requirements of Section 702 – Bituminous Materials, State of Hawaii, Department of Transportation "Standard Specifications of Road and Bridge Construction."

The Contractor shall submit a Certificate of Compliance accompanied by test data, conforming to the requirements of ASTM M82-75 Cut-Back Asphalt (Medium Curing Type), for each lot or batch of MC-30. Medium curing liquid asphalt, grade MC-30 will not be accepted without adequate documentation.

The Engineer reserves the right to waive any of the requirements for the MC-30 provided that its performance is not affected.

PART 3 – EXECUTION

3.01 DETAILS

A. Immediately before applying the prime coat, the surface to be treated shall be swept clean of all loose material, dirt, excess dust or other objectionable material.

Prime coat shall not be applied when the surface to be treated is appreciably damp or when weather conditions are unsuitable.

B. The material shall be uniformly applied by a vehicle, mounted, pressure operated, sprayer type distributor at an approximate rate of 0.35 of a gallon per square yard. The exact rate of application shall be determined by the Engineer. After the prime coat has penetrated the surface, deficient areas shall receive additional applications and areas of excess bituminous material shall be blotted with clean sand. Traffic shall be kept off the prime coat until the material has been completely absorbed.

C. Curbs, sidewalks and gutters shall be protected from prime coat. Any material sprayed on adjoining improvements shall be immediately cleaned off. The edges of existing asphalt paving, manholes and catch basin frames, concrete gutters, etc., against which asphaltic concrete pavement is to be placed shall be given a prime coat.

END OF SECTION

SECTION 02514

TACK COAT

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

This section covers the requirements for furnishing and installing bituminous tack coat.

PART 2 – PRODUCTS

2.01 All sections or subsections called for in the specifications shall be referred to the State of Hawaii, Department of Transportation, "Hawaii Standard Specifications for Road and Bridge Construction," 1985.

2.02 MATERIALS

Bituminous material for tack coat shall be slow-setting emulsified asphalt, Type SS-1 or Type SS-1H, conforming to the applicable requirements of Section 407 – Bituminous Tack Coat.

Water shall conform to the requirements of Subsection 712.01 – Water.

PART 3 – EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Weather Limitations: Tack coat shall not be applied on a wet surface or when weather conditions otherwise shall prevent proper construction.

B. Equipment: The Contractor shall provide equipment for heating and applying the bituminous material. This equipment shall meet the requirements of Subsection 405.03(B) – Equipment.

C. Preparation of Surface: Immediately before applying the tack coat, the surface to be treated shall be swept clean of all loose material, dirt, excess dust or other objectionable matter. A power broom or power blower, supplemented by hand methods if necessary, shall be used.

D. Application of Bituminous Material: The emulsified asphalt shall be diluted with water at a rate of one part emulsion to one part of water by volume. The quantity, rate of application, temperature, and areas to be treated will be approved prior to

application.

Tack coat shall be placed only so far in advance of the surface course placement as is necessary for it to cure to the proper condition for placement of such surface course.

Unless otherwise specified, tack coat shall be applied at the rate of 0.05 – 0.15 gallon per square yard on surface of base course.

Tack coat will not be measured for payment. Tack coat will be considered as incidental to the various contract items.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SUMMARY

A. This section supplements SECTION 39 – PORTLAND CEMENT CONCRETE and SECTION 40 – CONCRETE STRUCTURES of the Standard Specifications for Public Works Construction (September 1986).

B. This section covers concrete used for concrete curbs, gutters, cut-off walls, walkways, shower tree slab and post base, street light bases and any other repairs identified by the Officer-in-charge.

1.02 DEFINITIONS

A. Cementitious Materials

Portland Cement in combination with one or more of fly ash and other pozzolans.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTALS.

B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

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

2. Submit copies of fiber manufacturers printed batching and mixing instructions.

C. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Curing materials

2. Bonding agents

3. Repair materials

4. Joint-filler

1.04 QUALITY ASSURANCE

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

B. 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.

C. 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.

D. All concrete construction shall conform to the "Building Code Requirements for Reinforced Concrete" (ACI 318) with modification as noted in the drawings. Other ACI specifications that apply are:

1. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

2. ACI 347R "Guide to Formwork for Concrete."

1.05 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver concrete until forms, reinforcement, embedded items, chamfer strips, and reveal strips are in place and ready for concrete placement. Protect materials from contaminants such as grease, oil and dirt. Ensure materials can be accurately identified after bundles are broken and tags removed.

PART 2 – PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Comply with ACI 347R. Provide new or good finish form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other ACI 347R approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

   a. High-density overlay, Class 1, or better.

   b. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

   c. Structural 1, B-B, or better, mill oiled and edge sealed.

   d. B-B (Concrete Form), Class 1, or better, mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Form oils or waxes shall not be used for concrete surfaces intended to be painted.

   1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

D. Form Ties: Factory-fabricated, removable or snap-off stainless steel or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.

   2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.

2.02 REINFORCEMENT

All reinforcing steel shall be detailed and placed in conformance with the "Specifications for Structural Concrete for Buildings" (ACI 301), the CRSI "Manual of Standard Practice", and the "ACI Detailing Manual-1994."

A. Tie Wire shall be stainless steel, Type 304 or Type 316, 18 gage minimum.

B. Reinforcing bars shall conform to ASTM 1035, Chromx 4100 or approved equal.

C. Anchor bolts, dowels and other embedded items are to be securely tied in place before concrete is poured.

D. All reinforcing bar bends shall be made cold.

E. Reinforcing splices shall be made only where indicated on the drawings.

F. Dowels between footing and wall or columns shall be the same grade, size, spacing, and number as the vertical reinforcing respectively, unless otherwise noted.

G. Welding of reinforcing steel is not permitted unless otherwise shown on the drawings.

H. Contractor shall submit reinforcing bar layouts and details for the Engineer's review prior to fabrication. Fabricate from reviewed drawings only.

I. Reinforcing bars shall be as long as practicable and as detailed and shall be lapped at splices and corners not less than 32 bar diameter (24" minimum), unless otherwise shown. Stagger horizontal wall bar splices. In general, bar splices shall be made at points of minimum stress. In beams and slabs, splice top bars at mid-span, bottom bars over supports, unless otherwise shown.

J. Embedded metal components made up of alloys that are dissimilar to that of the reinforcing steel shall not be attached directly to reinforcing. Measures shall be taken to electrically isolate said components from any reinforcing to prevent cathodic effects.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

B. Pozzolans: Fly Ash: ASTM C 618, Class F.

C. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:

1. Class: Moderate weathering region, but not less than 3M.

2. Aggregate Size: No. 57 (1 inch to No.4).

3. Aggregate Size: No. 67 (3/4 inch to No.4).

D. Size of Coarse Aggregate: Except when otherwise specified or permitted, maximum size of coarse aggregate shall not exceed three-fourths of the minimum clear spacing between reinforcing bars (or bundled bars), one-fifth of the narrowest dimension between the sides of forms, or one-third of the thickness of slabs or toppings.

E. Water: Potable and complying with ASTM C 94.

2.04 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Water-Reducing Admixture: ASTM C494, Type A.

C. Water-Reducing and Retarding Admixture: ASTM C494, Type D

D. High-Range, Water-Reducing Admixture: ASTM C494, Type F.

E. High-Range Water-Reducing and Retarding Admixture: ASTM C494, Type G.

2.05 CURING MATERIALS AND EVAPORATION RETARDERS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 18 to 22 percent solids.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, 18 to 22 percent solids.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.06 RELATED MATERIALS

A. Joint-Fillers: ASTM D 1751, asphalt-saturated cellulose fiber or ASTM D 1752,

cork or self-expanding cork.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, Type IV and V.

D. Cementitious Coatings: Cement based polymer modified concrete finish materials. Available Products subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. ProFinish by Bonded Materials

2. Polycoat by Tremcrete Systems Incorporated

3. Durus by Durus High Tech Cement

4. MBT RS-1150 by Master Builders Technologies

2.07 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:

B. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.

C. Proportion normal-weight concrete mix as follows:

Compressive Strength (28 Days): 4,000 psi.
Compressive Strength (28 Days): 3,000 psi.

D. Cementitious Materials:

1. Fly Ash: Add with cement. Fly ash content must be a minimum of 25 percent by weight of cementitious material.

E. Maximum Water-Cementitious Materials Ratio: 0.45.

F. Limit water-soluble, chloride-ion content in hardened concrete per ACI 318-14 Chapter 19.

G. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.45.

2.08 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: Project-Site mixing with the approval of the Officer-In-Charge. 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. 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., increase mixing time by 15 seconds for each additional 1 cu. yd.

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 to make up shortages for thresholds, curbs and gutters, thrust blocks and utility trench encasements.

PART 3 – EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8"

2. Class S, 1/4"

3. Class C, 1/2"

4. Class D, 1"

D. Construct forms to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds. Maintain the integrity of the vapor retarder membrane.

G. Provide openings for weep holes and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete unless otherwise indicated on the construction drawings.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor bolts, stainless steel plates and rebar, accurately located, to elevations required.

2. Install inserts, hangers, metal ties, nailing strips, blocking, grounds and other fastening devices needed for attachment of other work.

3.03 REMOVING AND REUSING FORMS

A. Leave formwork, for structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. 28-day design compressive strength or 14 days after placing concrete, whichever is longer.

2. Determine compressive strength of in-place concrete by testing representative field or laboratory-cured test specimens according to ACI 301.

3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to

close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Officer-In-Charge.

3.04 SHORES AND RESHORES

A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

B. Plan sequence of removal of shores and reshores to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

C. Due to the reinforcing's very low specific gravity, it may tend to float in concrete during vibration. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces

3.05 JOINTS

A. General: Construction joints should be true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Officer-In-Charge.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Locate horizontal joints in walls at underside of slabs and beams, and at the top of footings.

3. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near comers, and in concealed locations where possible.

4. Use a bonding agent or epoxy adhesive scrubbed into the surface at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces. Bond agent or epoxy adhesive should be wet or tacky when new concrete is placed on it. If bonding agent or epoxy adhesive is dry, completely remove and reapply.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items are complete and that required inspections have been performed. Provide two day notification to Officer-In-Charge for each scheduled pour.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Officer-In-Charge.

1. Do not add water to concrete after adding high-range water reducing admixtures to mix.

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 layers 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 Officer-In-Charge. Plan pours to continuously place concrete from one construction joint to another.

F. Deposit and consolidate concrete for mass structure on land side of seawall in a continuous operation, until placement of a section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around 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. 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 degrees 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. Fog-spray forms, reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

H. Lean Concrete shall be used for concrete cut-off walls to provide a uniform and level surface that supports the 0-Face Concrete Curbs.

Grade of concrete: M5: 1:5:10 or M7.5: 1:4:8 (Cement: Sand: Aggregates)

3.07 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive hot temperatures. Comply with recommendations in ACI 305R for hot weather protection during curing. Cure concrete for at least 7 days.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams,

supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the curing methods listed in paragraph 3.10 D.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including concrete poured on land side of seawall and other repaired surfaces, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.

   b. Continuous water-fog spray.

   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

   b. Moist cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to top slab of wall and concrete poured on land side of seawall in a continuous operation by spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application where

recommended by the manufacturer. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.08 JOINT FILLING

A. Prepare, clean, and install joint-filler according to manufacturer's written instructions. Defer joint filling as long as possible. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.09 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas. Remove and replace concrete that cannot be repaired and patched to Officer-in-Charge's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part Portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing. Compressive strength at 28 days shall be not less than 4,000 psi.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock rockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Officer-in-Charge.

D. Repairing Unformed Surfaces: Test unformed surfaces for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surface

sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

5. Repair defective areas, except random cracks and single holes 1-inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and exposed reinforcement with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1-inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Officer-in-Charge's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Officer- in-Charge's approval.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement

according to requirements specified in this Article.

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 one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

2. 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.

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

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

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

5. 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.

D. Test results shall be reported in writing to Officer-In-Charge, 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 Officer-In-Charge but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting 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 Officer-In-Charge. 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 Officer-In-Charge.

PART 4 – PAYMENT

A. Payment for furnishing and placement of concrete, rebar and dowels to form concrete curbs, gutters, cut-off walls, grade adjustment walls, fence post footings, base and walkway for shower, and other repairs identified by the Officer-in-charge shall be included in the various items established in the Offer. Such payment will be full compensation for all labor, materials, equipment, transportation, tools, bracing, and all other items necessary and incidental to the completion of the work, except items listed for payment elsewhere in the contract.

B. Demolition and removal of unusable concrete, debris, excavated material, forms, trench support, tie wires, bracings, straps, structural struts, surface finishing, curing, mixing, hauling, furnishing and placing reinforcing and all other incidentals necessary to complete the work shall also be included in the items established in the Offer.

END OF SECTION

SECTION 16050

ELECTRICAL GENERAL REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. This section applies to all sections of DIVISION 16 – ELECTRICAL of this project specification unless specified otherwise in the individual sections.

B. Electrical characteristics for this project shall be 208Y/120V three phase, four wire, 60Hz, 120/208V, single phase, three wire, 60 Hz, and 120/240V, single phase, three wire, 60 Hz. Final connections to the power distribution system shall be made by the Contractor or utility company.

1.02 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. This section applies to all sections of Division 16 – ELECTRICAL of this project specification unless specified otherwise in the individual sections.

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 100	(2000; Archived) The Authoritative Dictionary of IEEE Standard Terms
IEEE C2	(2023) National Electrical Safety Code

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020) National Electrical Code

B. Comply with ordinances of the county having jurisdiction over this project.

C. Applicable portions of the latest edition of Standard Specifications for Public Works Construction, issued by the County, are included as a part of this Section.

D. Installation of any aerial or underground distribution system for public utility

service use shall comply with Chapter 6-73, Hawaii Administrative Rules, "Installation, Operation, and Maintenance of Overhead and Underground Electrical Supply and Communication Lines."

E. Obtain and comply with all utility company standards and drawings related to this project.

1.04 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES.

B. Submittals required in the sections which refer to this section shall conform to the following additional requirements. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout dimensions, capacity, project specification and technical paragraph reference. Submittals shall also include applicable industry and technical society publication references, years of satisfactory service, and other information necessary to establish contract compliance with each item to be provided. Photographs of existing installations are unacceptable and will be returned without approval. Transmittal letter shall include a listing of all items by manufacturer and catalog number which are included in the submittal package and shall clearly identify the submittal with this project.

C. Submittals for each manufactured item shall be current manufacturer's descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristic curves, and catalog cuts. Handwritten and typed modifications and other notations not part of the manufacturer's preprinted data may result in the rejection of the submittal. Should manufacturer's data require supplemental information for clarification, the supplemental information shall be submitted as specified for certificates of compliance.

D. Submit drawings a minimum of 11 inches by 17 inches in size using a minimum scale of 1/8 inch per foot. Include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

E. Where installation procedures or part of the installation procedures is required to be in accordance with manufacturer's instructions, submit printed copies of those instructions prior to installation. Installation of the item shall not proceed until manufacturer's instructions are received. Failure to submit manufacturer's instructions shall be cause for rejection of the equipment or material.

F. Submit manufacturer's certifications as required for products, materials, finishes, and equipment as specified in the technical sections. Certificates from material suppliers are not acceptable. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified material." Certifications shall simply state that the item conforms to the requirements specified. Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorization to sign certificates of compliance.

G. Where equipment or materials are specified to conform to industry and technical society reference standards of organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance.

H. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

I. Submit text of posted operating instructions for each system and principal item of equipment as specified in the technical sections.

J. All shop drawings and other required submittals shall be submitted in electronic PDF format.

1.05 DEFINITIONS

A. Unless otherwise specified or indicated, electrical and electronics terms used in these specifications, and on the drawings, shall be as defined in IEEE 100.

B. The technical sections referred to herein are those specification sections that describe products, installation procedures, and equipment operations and that refer to this section for detailed description of submittal types.

C. The technical paragraphs referred to herein are those paragraphs in PART 2 – PRODUCTS and PART 3 – EXECUTION of the technical sections that describe products, systems, installation procedures, equipment, and test methods.

1.06 QUALITY ASSURANCE

A. Provide materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the 2-year period.

B. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70.

C. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, excluding the manufacturers' factory or laboratory tests, is furnished.

D. The equipment items shall be supported by service organizations which are reasonably convenient for the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract. Where two or more items of the same class of equipment are required, these items shall be products of a single manufacturer; however, the component parts of the item need not be the products of the same manufacturer unless stated in the technical section.

E. Each item of equipment shall have a nameplate bearing the manufacturer's name, address, model number, and serial number securely affixed in a conspicuous place; the nameplate of the distributing agent will not be acceptable.

F. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the County Building Department.

1.07 NAMEPLATE

A. Electrical Apparatus: Provide laminated plastic nameplates for each panelboard, equipment enclosure, relay, enclosed circuit breaker, and disconnect switch. Each nameplate inscription shall identify the function and, when applicable, the position. Nameplates shall be melamine plastic, 0.125-inch thick, white center core. Surface shall be matte finish. Corners shall be square. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be 1 by 2.5 inches. Lettering shall be a minimum of 0.25-inch high normal block style.

B. Electrical Devices: Provide an adhesive vinyl nameplate for all light switches,, receptacles, and miscellaneous devices requiring power. The nameplate shall indicate the panel serving the device and the corresponding circuit assignment. Lettering shall be 1/8" high. "Dymo" type impression labels utilizing an adhesive embossing tape are not acceptable. Utilize the Brother label maker system or approved substitute.

1.08 ELECTRICAL REQUIREMENTS

A. Electrical installations shall conform to IEEE C2, NFPA 70, and requirements specified herein.

1.09 INSTRUCTION TO OWNER PERSONNEL

A. Give full instruction to personnel in the adjustment, operation, and maintenance of the installed systems and equipment, including pertinent safety requirements as required. Instructors shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over for regular operation. When significant changes or modifications in the equipment or system are made under the terms of the contract, provide additional instructions to acquaint the operating personnel with the changes or modifications.

1.10 AS-BUILT DRAWINGS

A. Submit as-built drawings as required in SPECIAL PROVISIONS.

1.11 PAYMENT OF FEES

A. Obtain and pay for all building and/or electrical permits as required.

B. Pay for all utility company charges related to this project where charges are required.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 JOBSITE CONDITIONS

A. These specifications are accompanied by construction drawings including building and site plans of all trades showing locations of all outlet, switches, service runs,

feeder runs, devices, and other electrical equipment. The locations are approximate and before installing, study adjacent architectural details and make installation in most logical manner. Any device may be relocated within 10'-0" before installation at direction of the Contracting Officer without additional cost to the project.

B. Before installing, verify all dimensions and sizes of equipment.

C. Verify that electrical system may be installed in strict accordance with the original design, the Drawings and Specifications and the manufacturer's recommendation.

D. In the event of discrepancy, immediately notify the Contracting Officer. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

E. Re-route all existing branch circuits and exposed cabling systems to facilitate the installation of all new and/or relocated equipment. Field verifying existing conditions and identify all loads impacted. Schedule and coordinate all power outages with the Contracting Officer.

3.02 PAINTING OF EQUIPMENT

A. Electrical equipment shall have factory-applied painting systems which shall meet the requirements specified in the technical sections.

B. Paint electrical equipment as required to match the finish of adjacent surfaces or to meet the indicated or specified safety criteria.

C. Painting of Electrical Equipment shall be as follows:

1. Interior Locations: Prime and paint all exposed conduits, boxes, fittings, support channels, mounting hardware and accessories with two finish coats to match the surface on which they are mounted or to match the finish of the adjacent surfaces. Equipment surfaces/components with factory-applied paint finish need not be painted.

2. Exterior Locations: Prime all exposed conduits, boxes, fittings, support channels, mounting hardware and accessories with a 2-part epoxy primer and finish with 2 coats of aliphatic acrylic urethane paint. Paint finish to match the surface on which they are mounted or to match the finish of the adjacent surfaces. Stainless steel materials need not be painted.

3.03 NAMEPLATE MOUNTING

A. Provide number, location, and letter designation of nameplates as indicated. Fasten

nameplates to the device with a minimum of two sheet-metal screws or two rivets.

3.04 EARTHQUAKE BRACING

A. Provide earthquake bracing for all electrical equipment, apparatus, luminaires and raceways. Bracing shall, as a minimum, comply with the County Building Code.

3.05 COORDINATION OF WORK WITH THE UTILITY COMPANIES

A. Coordinate all work for this project with the utility companies involved. The contractor is responsible for obtaining all utility company requirements and incorporating them in the work. The Contracting Officer shall be informed if there are any differences between what is required by the utility companies and what is shown on the contract documents before any work is performed.

3.06 INSPECTION

A. Arrange for periodic inspection by the local authorities and deliver certificate of final inspection to the Contracting Officer. Arrange for periodic inspection by the utility companies of work over which they have jurisdiction and obtain their approval therefor.

3.07 AS-BUILT DRAWINGS

A. Submit as-built drawings incorporating all field changes and modifications on reproducible media at the conclusion of the project.

END OF SECTION

SECTION 16302

UNDERGROUND ELECTRICAL WORK

PART 1 – GENERAL

1.01 SUMMARY

A. Provide all underground distribution system components and accessories as indicated in the specifications and on the drawings.

B. SECTION 16050 – ELECTRICAL GENERAL REQUIREMENTS applies to this Section with additions and modifications specified herein.

1.02 REFERENCE SPECIFICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D1557	(2012; E 2015) Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3) (2700 kN-m/m3)

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE 81	(2025) IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA RN 1	(2018) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

UNDERWRITERS LABORATORIES, INC. (UL)

UL 6	(2022) UL Standard for Safety Electrical Rigid Metal Conduit-Steel

UL 44	(2018; Reprint Oct 2025) UL Standard for Thermoset-Insulated Wires and Cables
UL 83	(2017; Reprint Oct 2025) UL Standard for Thermoplastic-Insulated Wires and Cables
UL 467	(2022) UL Standard for Safety Grounding and Bonding Equipment
UL 510	(2020; Dec 2022) UL Standard for Polyvinyl Chloride, Polyethylene and Rubber Insulating Tape
UL 514B	(2012; Reprint Mar 2024) UL Standard for Safety Conduit, Tubing and Cable Fittings
UL 651	(2011; Reprint Jan 2026) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 854	(2020; Reprint Jul 2024) Standard for Service-Entrance Cables

B. In the text of this section, the words conduit and duct are used interchangeably and have the same meaning.

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES.

B. Submit the following to the Contracting Officer.

1. Insulation resistance test

2. Continuity test

3. 600 volt cable tests

4. Grounding electrodes and system tests

C. Identify each cable for 600-volt cable tests. When testing grounding electrodes and systems, identify each electrode and system for each test.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new, and equipment satisfying the requirements of NEC Articles 90-6 and 110-3 shall be listed or labeled by a nationally recognized electrical testing laboratory.

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.

2.02 CONDUIT DUCTS, AND FITTINGS

A. Rigid Metal Conduit: UL 6, galvanized steel.

B. Rigid Metal Conduit, PVC Coated: NEMA RN 1.

C. Plastic Conduit and Tubing: UL 651, Schedule 40 PVC or Schedule 80 PVC as indicated.

D. Conduit Sealing Compound: Compounds for sealing ducts and conduit shall have a putty-like consistency workable with the hands at temperatures as low as 2 degrees C (35 degrees F), 35 degrees F, shall neither slump at a temperature of 150 degrees C (300 degrees F), 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.

E. Fittings:

1. Metal Fittings: UL 514B.

2. PVC Conduit Fittings: UL 514B, UL 651.

2.03 WIRING AND MATERIALS

A. Tape: UL 510, plastic insulating tape, capable of performing in a continuous temperature environment of 80 degrees C.

B. Wire and Cable Conductor Sizes: As designated by American Wire Gauge AWG). Conductors shall be copper. Insulated conductors shall bear the date of

manufacture imprinted on the wire insulation with other identification. Do not use wire and cable manufactured more than 6 months before delivery to the job site. Provide conductor identification within each enclosure where a tap, splice or termination is made.

C. 600 Volt Wires and Cables: UL 83 THHN/THWN-2. Only use wires with "W" type designation in wet or damp locations. Use No. 12 minimum sized conductors, unless otherwise noted.

OR

600 Volt Wires and Cables: UL 44 XHHW-2 or RHW-2. Only use wires with "W" type designation in wet or damp locations. Use No. 12 minimum sized conductors, unless otherwise noted. Use Type "USE-2" conforming to UL 854 for direct burial cable.

D. Pull Wire: Plastic rope having a minimum tensile strength of 200 pounds in each empty duct. Leave a minimum of 24 inches of slack at each end of the pull wires.

E. Grounding and Bonding Equipment: UL 467.

PART 3 – EXECUTION

3.01 INSTALLATION AND WORKMANSHIP

A. These specifications are accompanied by diagrammatic electrical plans showing approximate locations of electrical equipment, ductline runs and other utilities. Contractor shall study plans and details of other trades and make installation in most logical manner. Verify all dimensions on drawings and sizes of equipment at job site before proceeding with the work. Any device may be relocated within 10 feet before installation at the direction of the Contracting Officer without additional cost to the State.

Construction Methods: Program the work and coordinate with other facets of this project. Construction shall conform to accepted industry practices and to the recommendations of the American Electricians Handbook by Croft (latest edition), National Electrical Code and applicable instructions of manufacturers of equipment and materials supplied for this project.

3.02 CONCRETE

A. Concrete shall be composed of fine aggregate, coarse aggregate, Portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The

coarse aggregate shall be reasonably well graded from 3/16 to one inch. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean and free from salts, alkali, organic matter, and other impurities. Concrete shall have a compressive strength of 3000 psi at the age of 28 days. Slump shall not exceed 3 inches. Retempering of concrete will not be permitted. Concrete shall be cured for a period of not less than 7 days, and concrete made with high early strength Portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar.

3.03 EARTHWORK FOR UTILITIES

A. General Excavation and Trenching: Keep excavations free from water while construction is in progress. Notify the Contracting Officer immediately in writing if it becomes necessary to remove rock or hard, unstable, or otherwise unsatisfactory material to a depth greater than indicated. Make trench sides as nearly vertical as practicable except where sloping of sides is allowed. Sides of trenches shall not be sloped from the bottom of the trench up to the elevation of the top of the conduit. Excavate ledge rock, boulders, and other unyielding material to an overdepth at least 6 inches below the bottom of the conduit unless otherwise indicated or specified. Blasting will not be permitted. Use gravel placed in 6 inch maximum layers to refill overdepths to the proper grade. At Contractor’s option, the excavations may be cut to an overdepth of not less than 4 inches and refilled to required grade as specified. Grade bottom of trenches accurately to provide uniform bearing and support for each section of conduit on undisturbed soil at every point along its entire length. Trench dimensions shall be as indicated.

B. Backfilling: Construct backfill in two operations (initial and final) as indicated and specified in this section. Place initial backfill in 6 inch maximum loose lifts to one foot above conduit unless otherwise specified. Ensure that initially placed material is tamped firmly under pipe haunches. Bring up evenly on each side and along the full length of conduit. Ensure that no damage is done to the conduit or its protective coating. Place the remainder of the backfill (final backfill) in 9 inch maximum loose lifts unless otherwise specified. Compact each loose lift as specified in paragraph entitled "Compaction" before placing the next lift. Where settlements greater than the tolerance typically allowed for grading occur in trenches due to improper compaction, excavate to the depth necessary to rectify the problem, then backfill and compact the excavation as specified herein and restore the surface to the required elevation. Coordinate backfilling with testing of conduits. Provide buried warning and identification tape installed in accordance with the manufacturer's recommendation.

C. Compaction: Use hand-operated, plate-type, vibratory, or other suitable hand tampers in areas not accessible to larger rollers or compactors. Avoid damaging conduits and protective conduit coatings. Compact material in accordance with the

following unless otherwise specified. If necessary, alter, change, or modify selected equipment or compaction methods to meet specified compaction requirements.

1. Compaction of Conduit and Initial Backfill: Compact each lift to a dense consistency as evidenced by little to no settlement of the gravel under repeated passes with the compaction equipment but not less than a minimum of five passes of a hand operated type vibratory compactor with the vibrator turned on.

2. Compaction of Final Backfill: Moisture condition the final backfill to between optimum and 3 percent wet of the optimum content and compact to at least 90 percent ASTM D1557 maximum dry unit weight. Under areas to be seeded or sodded, compact succeeding layers of final backfill to 85 percent of ASTM D1557 maximum dry unit weight. For conduits under structures and pavements, the top 24 inches of backfill below the finish subgrade level shall consist of controlled backfill placed in not more than 8 inch thick loose horizontal lifts, moisture conditioned to within 2 percent of optimum moisture content, and compacted to at least 95 percent of ASTM D1557 maximum dry unit weight.

3.04 UNDERGROUND DUCT WITHOUT CONCRETE ENCASEMENT

A. The top of the duct shall be not less than 24 inches below grade, unless otherwise indicated, and shall have a minimum slope of 3 inches in each 100 feet away from buildings and toward underground structures and other necessary drainage points. Run duct in straight lines except where a change of direction is necessary. As each conduit run is completed, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; after which draw a nonflexible testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the inside diameter of the conduit through the conduit; then immediately install conduit plugs. Provide not less than 3 inches clearance from the conduit to each side of the trench. Grade bottom of trench smooth; where rock, soft spots, or sharp-edged materials are encountered, excavate the bottom for an additional 3 inches, fill and tamp level with original bottom with sand or earth free from particles, that would be retained on a 1/4-inch sieve.

3.05 UNDERGROUND DUCT WITH CONCRETE ENCASEMENT

A. Construct underground duct lines of individual conduits encased in concrete. Except where rigid galvanized steel conduit is indicated or specified, the conduit shall be Schedule 40 PVC or Schedule 80-PVC. Do not mix different kinds of conduit in any one duct bank. As each conduit run is completed, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; after which draw a nonflexible testing mandrel not less than 12 inches long with a

diameter 1/4 inch less than the inside diameter of the conduit through the conduit; then immediately install conduit plugs. The concrete encasement surrounding the bank shall be rectangular in cross-section and shall provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 2 inches, except separate light and power conduits from control, signal, and telephone conduits by a minimum concrete thickness of 3 inches.

1. Under roads and paved areas, encase ducts in concrete. Extend the concrete encasement at least 5 feet beyond the edges of paved areas and roads. Where conduit runs under existing roads or other paved areas, cut and patch the pavement as indicated.

2. Underground duct burial depth requirements shall be as indicated in the drawings.

3.06 DUCT AND CONDUIT PLACEMENT

A. Duct lines shall have a continuous slope downward toward underground structures and away from buildings with a pitch of not less than 3 inches in 100 feet. Sweep bends may be made up of one or more curved or straight sections or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with conduits of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger.

3.07 TERMINATION AND CLEANING OF CONDUIT

A. Separators shall be of precast concrete, high impact polystyrene, steel, or a combination of these. Stagger conduit joints by rows and layers to provide a duct line having the maximum strength. During construction, protect partially completed duct lines from the entrance of debris such as mud, sand, and dirt with suitable conduit plugs. As each section of a duct line is completed, draw a stiff bristle brush having the same diameter of the duct through the duct, until duct is clear of particles of earth, sand, and gravel; after which draw a nonflexible testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the inside diameter of the conduit through the conduit; then immediately install end plugs.

3.08 UNDERGROUND CONDUIT FOR SERVICE FEEDERS, CONCRETE ENCASED

A. Underground conduit for service feeders into buildings shall be concrete encased Schedule 40 PVC or Schedule 80 PVC from the service equipment to a point 5 feet beyond the building and projections thereof. Protect the ends of the conduit by threaded metal caps or bushings, and coat the threads with graphite grease or other suitable coating. Clean and plug conduit until conductors are installed.

3.09 GROUND RODS

A. Ground rods shall be 3/4-inch by 10-foot copper-bonded steel.

3.10 CABLE PULLING

A. Test duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables. Pull cables down grade with the feed-in point at the underground structure or building of the highest elevation. Accumulate cable slack at each junction box where space permits by training cable around the interior to form one complete loop. Maintain minimum allowable bending radii in forming such loops.

3.11 CABLE LUBRICANTS

A. Use lubricants that are specifically recommended by the cable manufacturer for assisting in pulling jacketed cables. Cable lubricants shall be soapstone, graphite, or talc for rubber or plastic jacketed cables. Lubricant shall not be deleterious to the cable sheath, jacket, or outer coverings.

3.12 CABLE PULLING TENSIONS

A. Tensions shall not exceed the maximum pulling tension recommended by the cable manufacturer.

3.13 SECONDARY CABLE RUNS IN NONMETALLIC DUCT CONDUIT

A. Although not indicated, include an insulated copper equipment grounding conductor sized as required by the rating of the overcurrent device supplying the phase conductors, in nonmetallic duct, for secondary cable runs, 600 volts and less.

3.14 CABLE TERMINATING

A. Protect terminations of insulated cables from accidental contact, deterioration of coverings and moisture by providing terminating devices and materials. Install terminations of insulated cable in accordance with the manufacturer's requirements. Make terminations with materials and methods as indicated or specified herein or as designated by the written instructions of the cable manufacturer and termination kit manufacturer.

3.15 SPLICES FOR 600 VOLT CLASS CABLES

A. Splice in underground systems only in accessible locations with a compression connector on the conductor and by insulating and waterproofing by one of the following methods suitable for continuous submersion in water.

1. Provide cast-type splice insulation by means of molded casting process employing a thermosetting epoxy resin insulating material applied by a gravity poured method or by a pressure injected method. Provide component materials of the resin insulation in a packaged form ready for convenient mixing without removing from the package. Do not allow the cables to be moved until after the splicing material has completely set.

2. Gravity poured method shall employ materials and equipment contained in an approved commercial splicing kit which includes a mold suitable for the cables to be spliced. When the mold is in place around the joined conductors, prepare the resin mix and pour into the mold. Do not allow cables to be moved until after the splicing materials have completely set.

3. Provide heat shrinkable splice insulation by means of a thermoplastic adhesive sealant material which should be applied by a clean burning propane gas torch. Cables may be moved when joint is cool to the touch.

3.16 GROUNDING

A. Noncurrent carrying metallic parts associated with electrical equipment shall have a maximum resistance to solid "earth" ground not exceeding the following values:

Grounded secondary distribution system neutral and noncurrent carrying metal parts associated with distribution systems and grounds not otherwise covered.	25 ohms

When work in addition to that indicated or specified is directed in order to obtain specified ground resistance, provisions of the contract covering "Changes" shall apply.

3.17 GROUNDING ELECTRODES

A. Provide cone pointed, driven ground rods, driven full depth plus 6 inches, installed when indicated to provide an earth ground of the value before stated for the particular equipment being grounded.

3.18 GROUNDING CONNECTIONS BY EXOTHERMITE TYPE PROCESS

Make grounding connections which are buried or otherwise normally inaccessible, excepting specifically those connections for which access for periodic testing is required, by exothermite type process. Make thermit welds strictly in accordance with the weld manufacturer's written recommendations. Welds which have "puffed up" or which show convex surfaces indicating improper cleaning are not

acceptable. Mechanical connectors are not required at thermit weldments.

3.19 COMPRESSION GROUND GRID CONNECTOR

A. For accessible connections, in lieu of a thermit type process, a compression ground grid connector of a type which uses a hydraulic compression tool to provide the correct circumferential pressure may be used. Tools and dies shall be as recommended by the manufacturer. An embossing die code or other standard method shall provide visible indication that a connector has been adequately compressed on the ground wire.

3.20 GROUNDING CONDUCTORS

A. Bare soft-drawn copper wire No. 4 AWG minimum unless otherwise indicated or specified.

3.21 GROUND ROD CONNECTIONS

A. Connect exposed copper-bonded steel ground rods only to insulated, THW or RHW copper ground conductor and weld the connection. Insulate entire area of the rod in the vicinity of the weld and the connecting wire and seal against moisture penetration.

3.22 EARTHWORK – RECONDITIONING OF SURFACES

A. Unpaved Surfaces: Restore to their original elevation and condition unpaved surfaces disturbed during installation of duct. Preserve sod, topsoil, ground cover plants and trees removed during excavation and reinstall after backfilling is completed. Replace sod that is damaged by sod of quality equal to that removed. When the surface is disturbed in a newly seeded area, re-seed the restored surface with the same quantity and formula of seed as that used in the original seeding, and provide topsoiling, fertilizing, liming, seeding, sodding, sprigging, or mulching.

B. Paving Repairs: Where trenches, pits, or other excavations are made in existing roadways and other areas of pavement where surface treatment of any kind exists, restore such surface treatment or pavement the same thickness and in the same kind as previously existed, except as otherwise specified, and to match and tie into the adjacent and surrounding existing surfaces.

3.23 EMPTY CONDUIT

A. Provide empty conduits with a No. 14 AWG zinc coated steel wire or a plastic rope having a breaking strength of at least 200 lbs. Leave 24 inches of spare at each end of the pull.

3.24 SEALING

A. When the installation is complete, the Contractor shall 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.

3.25 FIELD QUALITY CONTROL

A. Test 600 volt class conductors to verify that no short circuits or accidental grounds exist. Make tests using an instrument which applies a voltage of approximately 500 volts to provide a direct reading in resistance; minimum resistance shall be 250,000 ohms.

3.26 GROUND RODS

A. Perform ground-impedance measurements utilizing the fall-of-potential method in accordance with IEEE 81. On systems consisting of interconnected ground rods, perform tests after interconnections are complete. On systems consisting of a single ground rod perform tests before any wire is connected. Take measurements in normally dry weather, not less than 48 hours after rainfall.

Use a portable megohmmeter tester in accordance with manufacturer's instructions to test each ground or group of grounds. The instrument shall be equipped with a meter reading directly in ohms or fractions thereof to indicate the ground value of the ground rod or grounding systems under test.

3.27 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks and tests, the Contractor shall show by demonstration in service that circuits and devices are in good operating condition and properly performing the intended function. As an exception to requirements stated elsewhere in the contract, the Contracting Officer shall be given 5 working days advance notice of the dates and times of checking and testing.

END OF SECTION

SECTION 16402

WIRING SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Provide all wiring system components and accessories as indicated in the specifications and the drawings.

B. SECTION 16050 – ELECTRICAL GENERAL REQUIREMENTS, applies to this section with additions and modifications specified herein.

1.02 REFERENCE SPECIFICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

ANSI C80.1	(2020) American National Standard for Electrical Rigid Steel Conduit (ERSC)
NEMA RN 1	(2018) Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC 2	(2020) Standard for Electrical Polyvinyl Chloride (PVC) Conduit
NEMA TC 3	(2021) Standard for Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2020) National Electrical Code

UL SOLUTIONS (UL)

UL 6	(2022) UL Standard for Safety Electrical Rigid

	Metal Conduit – Steel
UL 50	(2024) UL Standard for Safety Enclosures for Electrical Equipment, Non-Environmental Considerations
UL 360	(2025) UL Standard for Safety Liquid-Tight Flexible Steel Conduit
UL 514A	(2024) UL Standard for Safety Metallic Outlet Boxes
UL 514B	(2012; Reprint Mar 2024) UL Standard for Safety Conduit, Tubing and Cable Fittings
UL 651	(2011; Reprint Jan 2026) UL Standard for Safety Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings
UL 1449	(2021; Reprint Oct 2025) UL Standard for Safety Surge Protective Devices

1.03 SUBMITTALS

A. Submit in accordance with SECTION 01300 – SUBMITTAL PROCEDURES.

B. Manufacturer's Catalog Data:

1. Circuit breakers
2. Disconnect Switches
3. Loadcenters
4. Panelboards
5. Meter sockets
6. Junction boxes and cabinets

C. Shop Drawings:

1. Panelboards
2. Loadcenters

3. Enclosed circuit breakers

D. Field Test Reports: Submit test results for approval in report form.

1. 600-volt wiring test

2. Grounding system test

E. All shop drawings and other required submittals shall be submitted in electronic PDF format.

1.04 QUALITY ASSURANCE

A. In each standard referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears. Interpret references in these standards to "authority having jurisdiction," or words of similar meaning, to mean County Building Department.

PART 2 – PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials, equipment, and devices shall, as minimum, meet requirements of UL, where UL standards are established for those items, and requirements of NFPA 70.

2.02 CONDUIT AND FITTINGS

A. Rigid Steel Conduit (Zinc-coated): ANSI C80.1, UL 6.

B. Rigid Nonmetallic Conduit: PVC Type EPC-40, in accordance with NEMA TC 2, UL 651.

C. Plastic-coated Rigid Steel and IMC Conduit: NEMA RN 1, Type 40 (40 mils thick).

D. Liquid-tight Flexible Metal Conduit, Steel: UL 360.

E. Fittings for Rigid Metal Conduit and IMC: Threaded-type. Split coupling unacceptable.

F. Fittings for Rigid Nonmetallic Conduit: NEMA TC 3, UL 514B.

2.03 OUTLET BOXES AND COVERS

A. UL 514A. Zinc-coated (if ferrous metal.)

2.04 CABINETS, JUNCTION BOXES, AND PULL BOXES

A. UL 50. Volume greater than 100 cubic inches, galvanized, zinc-coated, if sheet steel. Provide of special materials (stainless steel, non-metallic, etc.) where indicated in the contract documents.

2.05 WIRES AND CABLES

A. Wires and cables shall meet applicable requirements of NFPA 70 and UL for type of insulation, jacket, and conductor specified or indicated. Wires and cables manufactured more than 12 months prior to date of delivery to site shall not be used.

B. Conductors: No. 10 AWG and smaller diameter shall be solid; No. 8 AWG and larger diameter shall be stranded. Conductors shall be copper.

C. Minimum Conductor Sizes: Minimum size for branch circuits shall be No. 12 AWG; for Class 1 remote-control and signal circuits, No. 14 AWG; and for Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.

D. Color Coding: Provide for service, feeder, branch, control, and signaling circuit conductors. Color shall be green for grounding conductors and white for neutrals; except where neutrals of more than one system are installed in same raceway or box, other neutrals shall be white with colored (not green) stripe. Color of ungrounded conductors in different voltage systems shall be as follows:

1. 120/208 volt, 3-phase:

    a. Phase A – black

    b. Phase B – red

    c. Phase C – blue.

2. 120/240 volt, single phase: red and black.

E. Insulation: Unless specified or indicated otherwise or required by NFPA 70 power and lighting wires shall be 600-volt, Type THHN/THWN-2. Provide only conductors with 90-degrees C insulation or better.

F. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller

diameter; Class B, stranded bare copper wire for sizes No. 6 AWG and larger diameter.

G. Service Entrance Cables: Service Entrance (SE) and Underground Service Entrance (USE) Cables.

2.06 SPLICES AND TERMINATION COMPONENTS

A. Connectors for No. 10 AWG and smaller diameter wires shall be insulated, pressure-type (twist-on splicing connector). Provide solderless terminal lugs on stranded conductors.

2.07 DEVICE PLATES

A. Provide UL listed, one-piece device plates for outlets and fittings to suit the devices installed. For metal boxes, plates on unfinished walls shall be zinc-coated sheet steel or cast metal having round or beveled edges. For nonmetallic boxes and fittings, other suitable plates may be provided. Plates on finished walls shall be [urea or phenolic, nominal 0.10-inch wall thickness. Plates shall be same color as receptacle or toggle switch with which they are mounted. Screws shall be machine-type with countersunk heads in color to match finish of plate. Sectional type device plates will not be permitted. Plates installed in wet locations shall be gasketed and UL listed for “wet locations.”

2.08 SWITCHES

A. Toggle Switches: Totally enclosed, specification grade, with bodies of thermosetting plastic and mounting strap. Handles shall be brown. Wiring terminals shall be screw-type, side-wired. Switches shall be rated quiet-type ac only, 120/277 volts, with current rating and number of poles indicated.

B. Disconnect Switches: Switches serving as motor-disconnect means shall be horsepower rated. Provide heavy duty-type switches where indicated, where switches are rated higher than 240 volts, and for double-throw switches. Provide switches in NEMA 4X enclosure unless otherwise indicated.

C. Breakers Used as Switches: For 120- and 277-Volt fluorescent fixtures, mark breakers "SWD".

2.09 RECEPTACLES

A. Heavy-duty, specification grade, grounding-type. Ratings and configurations shall be as indicated. Wiring terminals shall be screw-type, side-wired. Connect grounding pole to mounting strap.

B. Weatherproof Receptacles: Provide in cast metal box with gasketed, weatherproof, non-metallic cover plate enclosure listed for “wet locations with plug use.”

C. Ground-fault Circuit Interrupter (GFCI) Receptacles: Duplex type for mounting in standard outlet box. Device shall be capable of detecting current leak of 6 milliamperes or greater and tripping per requirements for Class A GFCI devices.

2.10 PANELBOARDS

A. Panelboards shall be circuit breaker-equipped. Design shall be such that individual breakers can be removed without disturbing adjacent units or without loosening or removing supplemental insulation supplied as means of obtaining clearances as required by UL. “Specific breaker placement" is required in panelboards to match the breaker placement indicated in the panelboard schedule on the drawings. Use of "Subfeed Breakers" is not acceptable unless specifically indicated otherwise. Main breaker, when required shall be "separately" mounted "above" or "below" branch breakers. Where "PFB" is indicated, provide bus-to-breaker mounting hardware to allow for future installation of breaker sized as indicated. Panelboard locks shall be keyed same. Typewritten directories shall indicate load served by each circuit in panelboard. Directories shall also indicate source of service to panelboard (e.g., Panel PA served from Panel MDP). Provide new directories for existing panels modified by this project as indicated. Type directories and mount in holder behind transparent protective covering. Panelboards shall be listed and labeled for their intended use. Panelboard shall have nameplates in accordance with paragraph NAMEPLATES.

B. Panelboard Buses: Support bus bars on bases independent of circuit breakers. Main buses and back pans shall be designed so breakers may be changed without machining, drilling, or tapping. Provide isolated neutral bus in each panel for connection of circuit neutral conductors. Provide separate ground bus identified as equipment grounding bus for connecting grounding conductors; bond to steel cabinet.

C. Circuit Breakers: Thermal magnetic-type with interrupting capacity of 10,000 amperes symmetrical minimum. Breaker terminals shall be UL listed as suitable for type of conductor provided. Series rated circuit breakers are unacceptable.

D. Multipole Breakers: Provide common trip-type with single operating handle. Breaker design shall be such that overload in one pole automatically causes poles to open. Maintain phase sequence throughout each panel so that any three adjacent breaker poles are connected to Phases A, B, and C, respectively.

E. Circuit Breaker With GFCI: Provide with "push-to-test" button, visible indication of tripped condition, and ability to detect and trip on current imbalance of 6 milliamperes or greater per requirements for Class A GFCI devices.

F. Arc-Fault Circuit – Interrupters: Molded case circuit breaker shall be rated as indicated. Two pole arc-fault circuit-interrupters shall be rated 120/240 volts. The provision of (two) one pole circuit breakers for shared neutral circuits in lieu of (one) two pole circuit breaker is unacceptable. Provide with "push-to test" button.

2.11 ENCLOSED CIRCUIT BREAKERS

A. Individual molded case circuit breakers with voltage and continuous current ratings, number of poles, overload trip setting, and short circuit interrupting rating as indicated. Enclosure type as indicated.

B. Where oversized conductors (for voltage drop compensation) or multiple conductors cannot be terminated on the standard load terminals of the circuit breaker, provide one of the following:

1. A circuit breaker with optional load terminals capable of accepting the quantity and size of conductors installed. Where optional load terminals are not available, provide a larger frame size breaker with suitable rating plug capable of accepting the quantity and size of conductors installed.

2. Splice oversized or multiple conductors to a single conductor (pigtail) suitable for terminating on the standard circuit breaker load terminals. The ampacity of the pigtail conductors shall not be less than the rating of the circuit breaker. Splices shall be made in a suitable location in accordance with the NEC.

2.12 SURGE SUPPRESSION SYSTEM

A. The systems individual units shall be UL listed and labeled under UL 1449 Standard for Surge Protection Devices.

1. Electrical Requirements:

a. Nominal system operating voltage shall be: 240 VAC, 3 or 1 phase, 4 or 3 wire plus ground as applicable to the system being protected.

b. Maximum Continuous Operating Voltage (MCOV): 150

c. Operating Frequency: The operating frequency range of the system shall be 60 Hz.

2. Design Requirements:

a. Protection Modes: The SPD shall provide protection as follows:

All modes, L-N or L-L, L-G and N-G (where applicable)

Note: L = Line, G = Ground, N = Neutral

3. Surge Current Capacity: The minimum SPD surge current capacity shall be as follows:

Surge Rating per phase (L-N + L-G)
50 kA

4. Environmental Requirements:

a. Storage Temperature: -40 to 140 degrees F (-40 to 60 degrees C)

b. Operating Temperature: -13 to 185 degrees F (-25 to 85 degrees C)

c. Relative Humidity: 0% to 95%

d. Operating Altitude: 0 to 12,000 feet above sea level.

5. Enclosure: UL/NEMA 4X

6. Warranty: The manufacturer shall provide a full five year parts and labor warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL Listing requirements, and any applicable national, state or local electrical codes. Direct, factory trained, ISO 9001-certified employees must be available for 48 hour assessment. A 24 hour 800 number must be available to support warranty.

2.13 GROUNDING AND BONDING EQUIPMENT

A. Ground rods shall be copper-bonded steel, with minimum diameter of 3/4 inch and minimum length of 10 feet.

2.14 NAMEPLATES

A. Provide as specified in SECTION 16050 – ELECTRICAL GENERAL REQUIREMENTS.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Electrical installations shall conform to requirements of NFPA 70 and to

requirements specified herein.

3.02 UNDERGROUND SERVICE

A. Underground service conductors and associated conduit shall be continuous from service entrance equipment to outdoor power system connection.

3.03 OVERHEAD SERVICE

A. Overhead service conductors into buildings shall terminate at service entrance fittings or weatherhead outside building.

3.04 SERVICE ENTRANCE IDENTIFICATION

A. Service entrance disconnect devices, switches, or enclosures shall be labeled or identified as such.

B. Labels: Wherever work results in service entrance disconnect devices in more than one enclosure, as permitted by NFPA 70, each enclosure, new and existing, shall be labeled as one of several enclosures containing service entrance disconnect devices. Label, at minimum, shall indicate number of service disconnect devices housed by enclosure and shall indicate total number of enclosures that contain service disconnect devices. Provide laminated plastic labels. Use lettering of at least 0.25 inch in height and engrave on black-on-white matte finish. Service entrance disconnect devices in more than one enclosure shall be provided only as permitted by NFPA 70.

3.05 WIRING METHODS

A. Provide insulated conductors installed in conduit, except where specifically indicated or specified otherwise or required by NFPA 70 to be installed otherwise. Provide insulated, green equipment grounding conductor in feeder and branch circuits, including lighting circuits. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated, green conductor for grounding conductors installed in conduit or raceways. Minimum conduit size shall be 3/4 inch in diameter for low voltage lighting and power circuits.

B. Restrictions applicable to Nonmetallic Conduit:

1. Do not use above grade, exposed or concealed, unless specifically identified on the drawings.

2. Conduit shall not be used in, nor penetrate fire walls, fire partitions, or floors. Do not use in areas where prohibited by the NEC.

3. Do not use in feeder circuits except where conduit is routed below a concrete floor slab or encased in 2" minimum concrete jacket.

4. Do not use in areas subject to severe physical damage including, but not limited to, mechanical equipment rooms, electrical equipment rooms, hospitals, and other such areas.

5. Do not use in hazardous areas.

6. Do not use in fire pump rooms.

C. Service Entrance Conduit, Overhead: Rigid steel from service entrance to service entrance fitting or weatherhead outside building.

D. Service Entrance Conduit, Underground: Galvanized rigid steel. Underground portion shall be encased in minimum of 3 inches of concrete and shall be installed minimum 18 inches below slab or grade.

E. Underground Conduit Other Than Service Entrance: Plastic-coated rigid steel; plastic-coated steel IMC; PVC, Type EPC-40. Plastic coating shall extend minimum 6 inches above floor.

3.06 CONDUIT INSTALLATION

A. Unless indicated otherwise, conceal conduit within finished walls, and floors. Keep conduit minimum 6 inches away from parallel runs of flues and steam or hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit will be visible after completion of project. Run conduits in crawl space under slab as if exposed.

B. Conduit Support: Support conduit by pipe straps, wall brackets, hangers, or ceiling trapeze. In suspended-ceiling construction, run conduit above ceiling. Do not support conduit by ceiling support system.

C. Fasteners: Fasten by wood screws to wood; by hollow wall anchors, toggle bolts or threaded drywall anchors in hollow wall construction; by toggle bolts or concrete screw anchors on hollow masonry units; by concrete insert-type anchors, concrete screw anchors, or expansion-type anchors in concrete or brick; and by machine screws, welded threaded studs, or spring-tension clamps on steel work. Spring-steel fasteners may be used for lighting branch circuit conduit supports in suspended ceilings in dry locations. Threaded C-clamps may be used on rigid steel conduit only. Do not weld conduits or pipe straps to steel structures. Fasteners shall be medium- or heavy-duty type only. Load applied to fasteners shall not exceed one-fourth proof test load. Fasteners attached to concrete ceiling shall be

vibration-resistant and shock-resistant. Holes cut to depth of more than 1 1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete joints shall not cut main reinforcing bars. Fill unused holes. Utilize stainless steel materials where indicated.

D. Directional Changes in Conduit Runs: Make changes in direction of runs with symmetrical bends or cast-metal fittings. Make field-made bends and offsets with hickey or conduit-bending machine. Do not install crushed or deformed conduits. Avoid trapped conduits. Prevent plaster, dirt, or trash from lodging in conduits, boxes, fittings, and equipment during construction. Free clogged conduits of obstructions.

E. Pull String: Install pull string in empty conduits in which wire is to be installed by others. Pull string shall be plastic having minimum 200-pound tensile strength. Leave minimum 12 inches of slack at each end of pull string.

F. Locknuts and Bushings: Fasten conduits to sheet metal boxes and cabinets with two locknuts where required by NFPA 70, where insulated bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, use minimum single locknut and bushing. Locknuts shall have sharp edges for digging into wall of metal enclosures. Install bushings on ends of conduits, and provide insulating type where required by NFPA 70.

G. Flexible Connections: Provide flexible connections of short length, 6-foot maximum, for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for motors. Provide liquid-tight flexible conduit in wet locations. Provide separate ground conductor across flexible connections.

H. Expansion Couplings: Provide watertight expansion joints or couplings at all building expansion joints, and in runs conduit, or other raceways which are subject to expansion and contraction resulting from changes in temperature. Examples of such an installation is when conduit is installed in exterior locations. PVC conduit runs where expansion and contraction may exceed 0.25 inch shall be provided with expansion couplings. The number of expansion couplings shall be determined by using the coefficient of expansion in the National Electrical Code to determine total expansion in the run and dividing it by the expansion allowance of the coupling selected. Install couplings at equal spacing along the conduit run.

3.07 BOXES, OUTLETS, AND SUPPORTS

A. Provide boxes in wiring or raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures. Boxes for metallic raceways shall be cast-metal, hub-type. Each box shall have volume required by NFPA 70 for number of conductors enclosed in box. Fasten boxes and supports

with wood screws on wood; by hollow wall anchors, toggle bolts or threaded drywall anchors in hollow wall construction; by toggle bolts or concrete screw anchors on hollow masonry units; by concrete insert-type anchors, concrete screw anchors, or expansion-type anchors in concrete or brick, and with machine screws or welded studs on steel. In open overhead spaces, cast boxes threaded to raceways need not be separately supported except where used for fixture support; support sheet metal boxes directly from building structure or by bar hangers. Where bar hangers are used, attach bar to raceways on opposite sides of box, and support raceway with approved-type fastener maximum 24 inches from box. When penetrating reinforced concrete members, avoid cutting reinforcing steel.

B. Boxes: Boxes for use with raceway systems shall be minimum 1-1/2 inches deep, except where shallower boxes required by structural conditions are approved. Boxes for other than lighting fixture outlets shall be minimum 4 inches square, except that 4-by-2-inch boxes may be used where only one raceway enters outlet

C. Pull Boxes: Construct of at least minimum size required by NFPA 70 of code-gauge galvanized sheet steel unless otherwise indicated, except where cast-metal boxes are required in locations specified herein. Furnish boxes with screw-fastened covers. Where several feeders pass through common pull box, tag feeders to indicate clearly electrical characteristics, circuit number, and panel designation.

3.08 MOUNTING HEIGHTS

A. Mount panelboards, circuit breakers, and disconnecting switches so height of any operating handle at its highest position is maximum 78 inches above floor. Mount lighting switches 48 inches above finished floor, receptacles 18 inches above finished floor, and other devices as indicated. Measure mounting heights of wiring devices and outlets to center of device or outlet.

3.09 ENCLOSED CIRCUIT BREAKER AND DISCONNECTING SWITCH INSTALLATION

A. Mount enclosed circuit breakers and disconnect switches on walls or independent support structure as indicated. Do not mount enclosed circuit breakers or disconnect switches directly to equipment enclosures, ductwork, or piping.

3.10 CONDUCTOR IDENTIFICATION

A. Provide conductor identification within each enclosure where tap, splice, or termination is made. For conductors No. 6 AWG and smaller diameter, color coding shall be by factory-applied, color-impregnated insulation. For conductors No. 4 AWG and larger diameter, color coding shall be by plastic-coated, self-sticking markers; colored nylon cable ties and plates; or heat shrink-type sleeves. Identify control circuit terminations.

3.11 SPLICES

A. Make splices in accessible locations. Make splices in conductors No. 10 AWG and smaller diameter with insulated, pressure-type connector. Make splices in conductors No. 8 AWG and larger diameter with solderless connector, and cover with insulation material equivalent to conductor insulation.

3.12 COVERS AND DEVICE PLATES

A. Install with edges in continuous contact with finished wall surfaces without use of mats or similar devices. Plaster fillings are not permitted. Plates shall be installed with alignment tolerance of 1/16 inch. Use of sectional-type device plates is not permitted. Plates installed in wet locations shall be gasketed.

3.13 ELECTRICAL PENETRATIONS

A. Openings around electrical penetrations (such as conduit penetrations or flush mounted equipment enclosures or junction boxes) through fire resistance-rated walls, partitions, floors, or ceilings shall be sealed to maintain fire resistive integrity. Use 3M P25, Putty 303, Type MPP-4S moldable putty or equivalent material to maintain fire resistive integrity for conduit penetration and flash mounted outlet boxes. Use other approved construction methods for larger enclosures.

B. All conduit penetrations through walls, floors, and ceilings must be tightly sealed.

3.14 GROUNDING AND BONDING

A. In accordance with NFPA 70. Ground-exposed, noncurrent-carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductor in metallic and nonmetallic raceways, and neutral conductor of wiring systems. Make ground connection at main service equipment, and extend grounding conductor to point of entrance of metallic water service. Make connection to water pipe by suitable ground clamp or lug connection to plugged tee. If flanged pipes are encountered, make connection with lug bolted to street side of flanged connection. Supplement metallic water service grounding system with additional made electrode in compliance with NFPA 70.Make ground connection to driven ground rods on exterior of building. Where ground fault protection is employed, ensure that connection of ground and neutral does not interfere with correct operation of fault protection.

B. Grounding Conductor: Provide insulated, green equipment grounding conductor in feeder and branch circuits, including lighting circuits. Grounding conductor shall be separate from electrical system neutral conductor. Provide insulated, green

conductor for grounding conductors installed in conduit or raceways.

C. Resistance: Maximum resistance-to-ground of grounding system shall not exceed 25 ohms under dry conditions. Where resistance obtained exceeds 25 ohms, contact Contracting Officer for further instructions.

3.15 EARTHQUAKE BRACING

A. Contractor shall provide earthquake bracing for all electrical equipment, apparatus and raceways. Bracing shall, as a minimum, comply with the County Building Code.

3.16 REPAIR OF EXISTING WORK

A. Repair of existing work, demolition, and modification of existing electrical distribution systems shall be performed as follows:

1. Workmanship: Lay out work in advance. Exercise care where cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings, or other surfaces is necessary for proper installation, support, or anchorage of conduit, raceways, or other electrical work. Repair damage to buildings, piping, and equipment using skilled craftsmen of trades involved.

2. Existing Concealed Wiring to be Removed: Existing concealed wiring to be removed shall be disconnected from its source. Remove conductors; cut conduit flush with floor, underside of floor, and through walls; and seal openings.

3. Removal of Existing Electrical Distribution System: Removal of existing electrical distribution system equipment shall include equipment's associated wiring, including conductors, cables, exposed conduit, surface metal raceways, boxes, fittings, etc., back to equipment's source.

3.17 FIELD QUALITY CONTROL

A. Devices Subject to Manual Operation: Each device subject to manual operation shall be operated at least five times, demonstrating satisfactory operation each time.

B. Test on 600-volt Wiring: Test 600-volt wiring to verify that no short circuits or accidental grounds exist. Perform insulation resistance tests on wiring No. 6 AWG and larger diameter using instrument which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

C. Grounding System Test: Test grounding system to ensure continuity and resistance

to ground is not excessive. Test each ground rod for resistance to ground before making connections to rod; tie grounding system together and test for resistance to ground. Make resistance measurements in dry weather, not earlier than 48 hours after rainfall. Submit written results of each test to the Contracting Officer and indicate location of rods as well as resistance and soil conditions at time measurements were made.

END OF SECTION